

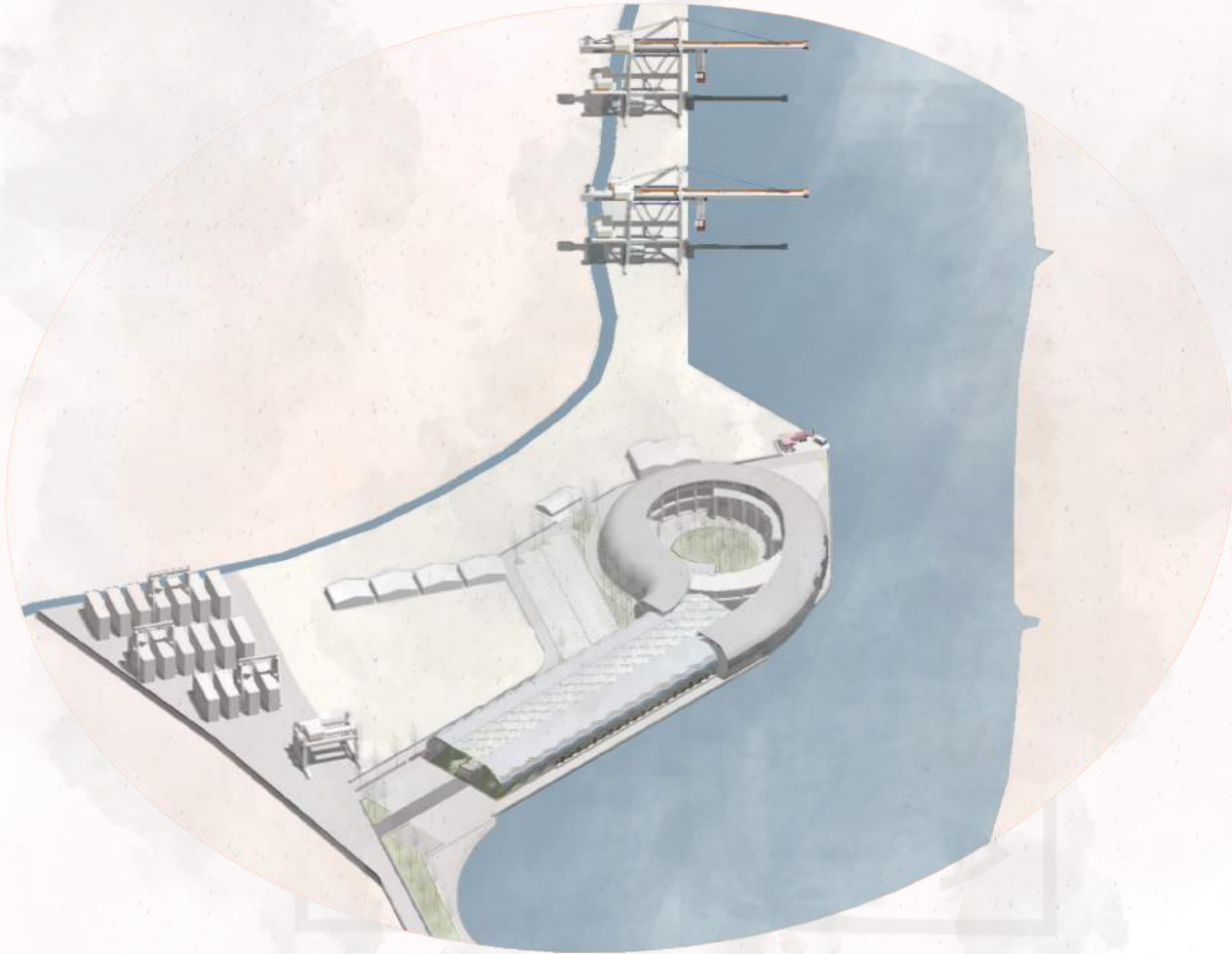
FINAL ARCHITECTURAL DESIGN STUDIO DESIGN OF JUWANA SMART AND INTEGRATED FISH HUB IN PATI



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Supervisor:
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Final Architecture Design Studio
Department of Architecture
2021/2022

Design Title.



Design of Juwana Smart and Integrated Fish Hub in Pati

Elang Priambodo | 17512024

Supervised by:

Ilya Fadjar Maharika, Dr.-Ing. Ir. MA., IAI.



DEPARTMENT of
ARCHITECTURE



한국건축학교육인증원
Korea Architectural Accrediting Board



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Final Architectural Design Studio

Department of Architecture
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Department of Architecture
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Validation Sheet

Final Architectural Design Studio entitled:

Design of Juwana Smart and Integrated Fish Hub in Pati

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Final Architectural Design Studio Entitled :

Design of Juwana Smart and Integrated Fish Hub in Pati

Quality of Final Architectural Design Studio Book : ~~average~~ *good) ~~excellence~~

So that.

*recommended) ~~not recommended~~

To be a reference for Final Architectural Design Studio

Yogyakarta, _____ 2021

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Statement of Originality

With the signing of this form, I:

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Program : **Architecture - International Program**
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Title : **Design of Juwana Smart and Integrated Fish Hub in Pati**

I state that this final project in Final Architectural Design Studio is my own work, write and is not an imitation, copy or publication of the work, project, or other final project that has been used to obtain a Bachelor of Architecture degree either at the Indonesian Islamic University, or other universities, and has never been published.

This statement is made with full awareness and responsibility and is willing to accept sanctions if it turns out that the above statement is not true.

Yogyakarta, December 3rd 2021
Author



Elang Priambodo
I7512024

Foreword

Praise and gratitude we pray to Allah SWT for His grace and blessing in giving the author the convenience of completing a new achievement in completing the Final Architecture Design Studio in the form of a design and writing entitled “JUWANA SMART AND INTEGRATED FISH HUB IN PATI”.

The author realizes that without the help and encouragement of many parties, this thank you would never have been written and this final project would never have been realized. Hereby, the author sincerely, humbly expresses his gratitude and highest appreciation to:

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Fellow Sinawang Architects, Rezandi Zaki, Muhammad Naufal Al Fikri, Irena Fauziyyah. Who almost every day becomes a friend for discussion, providing criticism, suggestions, encouragement and motivation without stopping.
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15. All people who cannot be mentioned one by one who have helped the writer in completing this thesis.

Yogyakarta, December 3rd 2021



Elang Priambodo

17512024

Design Premise.



Aerial Picture of TPI Juwana I and TPI Juwana II

Source: Priambodo, 2021

The design concept that will be proposed is a place for the fisheries and marine industry in Pati Regency which is more modern, efficient and productive. Based on Peraturan Daerah Nomor 5 Tahun 2011 tentang Rencana Tata Ruang Wilayah Kabupaten Pati Tahun 2010 - 2030, Pati Regency has set a target to build TPI Juwana Unit 3 whose task is not only to serve as a place for fishermen to land their marine products, but also as a distribution channel for manufacture products and logistics industries in Pati Regency and its surroundings. Therefore, a Fish Auction Center (TPI) is planned to be integrated with a Commercial Port which has a management system and production line that is more effective and efficient than TPI and Commercial Ports in general. For that reason, the design approach introducing IoT (Internet of Things) in the form of artificial intelligence or AI (Artificial Intelligence) was chosen to form a fishery and marine industry network that is able to cut traditional way that consume a lot of production lines so that they are less than optimal. With easy access and transparency for users and workers, TPI and the Commercial Port can form a modern built environment within the Juwana Smart and Integrated Fish Hub.

Generally, the design concept gives a different presentation from TPI buildings and Commercial Ports in

general starting from simplifying the building mass which has dozens of separate functions for industrial needs, to the idea of changing the community's stigma about TPI and Ports which are synonymous with hot, fishy, and dirty conditions, to be more recreational to visit as a marine tourism place. The main facility in the Juwana Integrated Fish Hub is a fish auction model that accommodates more fish catch production, while being able to accommodate large numbers of visitors and centralize office areas. With details in the form of Fish Auction Places, FnB areas with relaxing areas, fish markets, fish processing, urban sea farms and service functions in the fishing industry such as harbormaster offices, banks and water police stations.

The thing that distinguishes Juwana Smart and Integrated Fish Hub from other TPI and Commercial Ports is the application of IoT as a place that facilitates the relationship between users, visitors, workers, with the fisheries and marine industry sector, as well as the tourism sector. The concept of building design at Juwana Smart and Integrated Fish Hub takes modernity for buildings that have a wide expanse that tries to give a calm and close to nature design through maximizing natural light and building shapes that adopt dynamic river water flows.

Keywords: Fish Hub, Commercial Port, IoT, Business Model

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Chapter 1

Preliminary.

Background.

Marine and Fishery Business In Juwana

The fishing industry is 1 of 5 sectors of the economy driving industry in Indonesia and has always experienced an increase in the graph every year (Kusdiantoro et. al, 2019). One form of the impact can be felt in the TPI area in Juwana, Pati Regency. Juwana is an area known for its abundant marine productions. Where in 2017 in a day it is able to auction off 15 tons of fish and an increase of 5 tons to 20 tons in a day at the beginning of 2020 (Detik Finance, 2017). Juwana currently has 2 TPI, namely TPI Juwana Unit 1 and Unit 2. Both of which are in Bajomulyo Village. and is located on the Juwana River, 5 Km from the Java Sea.



Schematic Map of Juwana Port and Fish Market

Source: Google Maps, 2021

According to the testimony of the Head of Bajomulyo Village, Pak Sugito, the response carried out through several researches from the government and academic institutions suggested zoning the marine and fisheries industry centers in the Juwana area. Especially regulating the integration between lines on the Juwana River in ensuring the quality of effectiveness, productivity, safety and accessibility of both land and water routes. In accordance with the Pati Regency Spatial Plan 2011 - 2030, the addition of TPI Juwana Unit 3 was announced in conjunction with the Commercial Port to support the Pati - Rembang industrial area and the Semarang - Surabaya Toll Road.

TPI Units 1 and 2 are always busy with the capacity of fish that are landed every day from thousands of fishing boats, which are dominated by the types of gill net ship, cantrang ship and bubu ship. This ship with dimensions between 13 meters - 22 meters and a width of 2 meters - 5 meters cannot be separated from the role of the Juwana River. Starting from ship crafting, parking, ship maintenance, ship traffic and docking, as well as ships that go back then forth every day on the Juwana River.

The capacity of the Juwana River, even according to the testimony of the Head of Bajomulyo Village, Pak Sugito, the Juwana River is experiencing 1 cm of siltation per day. The effects of sedimentation carried by the Juwana River flow to the estuary and spread and settle in the riverbed. Silting on the Juwana River occurs when the sediment mass that is carried and settles in the mouth of the Juwana River is caused by the small surface area of the flow which results in weak water flow (Indrianingrum, 2016). As a result of the water flow of the Juwana River, in addition to being the cause of silting the Juwana River, it also often results in flooding in the upper reaches of the Juwana River, to be precise in the Gabus and Jakenan Districts. Therefore, the Juwana River is often normalized by routine dredging of the river.

Problems caused by silting the river also resulted in the circulation of ships that occurred in the Juwana River, especially the ships that were at sea and anchored or unloading their marine products at TPI Juwana Units 1 and 2. This could be proven by the chaotic parking of ships that occurred on the banks of the Juwana River. Overcrowded vessels, apart from disrupting the circulation of water transportation and reducing the productivity of the fishing industry in Juwana, have resulted in a disaster in the form of ship fires that often occur in the Juwana River which often occur due to sparks during ship repair and easily spread to other ships due to overcrowded condition. The last fire occurred on May 8th, 2020 and as many as 2 units of cantrang type vessels were burned, with an estimated loss of 3 - 4 billion rupiah.

To answer this problem, the Regency and Provincial Governments invested in a pond area of 148.842.92 m² in Growong Lor village to build a fishery and marine area that is able to accommodate the flood of demand for marine products as well as the challenges that occur in the Juwana River problem. The fisheries and marine industry that continues to grow requires a new platform that is more connected not only as a TPI, but also the image of Pati Regency as a maritime area and an advanced and innovative industry. In contrast to TPI Juwana Units 1 and 2 which are located in Bajomulyo Village, these locations are located in other villages to equalize regional income in Juwana District so that it is not concentrated in Bajomulyo Village which can cause additional problems in the form of unhealthy social inequality and population density in only one area.

IoT (Internet of Things)

Internet of thing (IoT) is a concept that aims to expand the benefits of internet connectivity that is connected continuously (Efendi, 2018). IoT is “the next big thing” that is transformed into the world’s largest industrial ecosystem. Modern IoT has been widely used daily with the aim of simplifying human work. In the context of Juwana Integrated Fish Hub, IoT works by expanding the fishing industry market, bringing the fishing industry market closer, and simplifying the work system of distribution in the fishing industry.

The fishing industry is the main market for economic growth in Pati, especially in Juwana. With the Juwana Integrated Fish Hub, including to build TPI Juwana Unit 3, utilizing IoT to reach the fishing industry market that is not only in Pati Regency and its surroundings, but can reach national and even international markets. So, in the scope of the marine and fisheries industrial area in Juwana, the existence of the Juwana Integrated Fish Hub does not provide competition with TPI Juwana Units 1 and 2 which focus on the regional scope, especially as a fishery distributor in Pati Regency and its surroundings.

Digital industrialization is the main idea in the planning stages of the Juwana Integrated Fish Hub. From the perspective of the industrial world, the utilitarian concept is maximized in designing a built environment that accommodates various elements of its users. With the scheme to maximize production and sales results from the marine industry.

Based on several different and separate building functions, it requires integration within the Juwana Integrated Fish Hub area. Where urban contemporary is required to take a universal perspective. If Juwana Integrated Fish Hub introduces an IoT-based industrial system, it automatically requires a supporting infrastructure, a big data room.

Big Data refers to large sets of complex data, both structured and unstructured which in a shape of algorithms that unable to operate on. It aims to reveal hidden patterns in a data-driven processing (Taylor-Sakyi, 2016). Big data room which functions as a place for all Artificial Intelligence (AI) based systems to operate. In charge of storing millions to billions of information about the fishing industry which includes production, processing, distribution and market data. Big data holds the big secret of an industrial system. For that, it is a must to make the most secure place with data confidentiality, the safest place from potential disasters, and the safest place to store data that is collected in its own cloud system.

Thus, the IoT built environment introduces a built environment where all users are connected to each other. A modern built environment where human activities become more efficient at work. The job of a fisherman is easier in mapping the quality of fish in a waters and has a large market in expanding his market network. Connecting distant seafood processing companies. Providing buyers who come to the Juwana Integrated Fish Hub can get information on fish availability. As well as fish processing entrepreneurs can select the fish before landing, the port is easier in categorizing containers on the CFS (Container Freight Station). Thus, the need for a design approach to the area refers more to the configuration of space, security and safety to create a comfortable work environment so that production results at the Juwana Integrated Fish Hub can be more optimal.

Juwana Industrial Plan



Aerial Picture of Juwana Downtown

Source: Priambodo, 2021

Juwana is the center of the fishery industry in Pati Regency. Juwana is famous for its Central Java souvenir, namely Bandeng Juwana and has become an icon of Pati Regency. In Pati Regency, there are 5 TPI (Fish Auction Sites) and 2 of them are located on the Juwana River. Along with the plan to add TPI Juwana Unit 3, a commercial port will also be built which is targeted at improving infrastructure in an effort to boost the fishing industry business in Juwana as well as plans to build an industrial center along the Pati - Rembang pantura route.

Juwana Port which will later be developed into a commercial port is a long-term project that will function not only to support the Juwana 1 and 2 Fish Landing Base (PPI) ports, but also as a public port as a community service in the context of developing an industrial area along Pati - Batangan. The new port development plan will become the third port on the Juwana River. Where there is also a studio to fully unravel the ports at TPI Juwana 1 and 2 which are located in Bajomulyo Village. Finally, Juwana Port is also located in a different village with services for a more equitable distribution of regional income taxes.

Matrix Problem Definition.

| | Formal Problem | Practical Problem | Symbolic Problem | Radical Problem |
|---|--|---|---|---|
| Designer The architect acted as the initiator of design solutions in the design of the TPI Juwana unit 3 area and commercial port | Integrated building function Various building functions are integrated into one port area and the TPI on the Juwana River | Design to achieve efficiencies The space configuration framework according to the contemporary built environment to achieve quantity product | Industrial Recreation Planning that persuasively attracts visitors because of the port's distinctive features and accessible | Balance output design A design that balances scale, productivity, context, user activity, safety and security under the IoT circumstances |
| User Fishermen, TPI administrators, port employees, traders, TPI visitors, regional officials, distributors of goods | Ship Traffic Control A design that can be a solution to the problem of ship capacity far above the extent of the river that covers it | Bold and Connect A clear design between functions but interconnected in the private and public. the role of IoT in reaching a wider and more efficient market. | Paradigm Changer An idea that can change the stigma about ports and TPI in general with modernization industry and more public space attraction | Contemporary Built Environment Growth, healthy and efficient ecosystem in modernization as the pioneer of modern in fishery and marine industry |
| Client Government (Municipality and Provincial) | Public service and economic center A design that provides vice-versa between government, workers, visitors and the surrounding community | Effective Typical Work Center Optimal design for the comfort of users as workers and visitors. Connect and classified wider range of market | The Face of the City The design function as a commercial port represents industrial development in Pati Regency | Effective Maintenance and Construction Selection of materials that are easy to construct, durable and easy to maintain |
| Regulator The government has special powers in making policies that can influence planning | Disaster Resilient Silting the river that occurs 1 cm per day is minimized by expanding the face of the Juwana River | Flexible in Development The distance from residential areas has flexibility in the direction of industrial development, pioneered by the presence of commercial ports | Industrialization Integration with industrial area that spread across the Juwana River | River Together A design that is friendly to river activities used by the wider community |

Problem Formulation.

General Issues

How is the planning of the Juwana Smart and Integrated Hub on the Juwana River?

Distinctive Issues

1. How is the integration in spatial planning design based on the separation of the functions of the area in the form of the building mass and layout for the multiple function of the building?
2. How can the design maximize the number of fish and commercial vessels to get more production?
3. How the design can connect between the users, in terms of contemporary built environment?

Design Entity.



Commercial Port

Commercial Port which functions as the main sea transportation infrastructure at Juwana Port. Where to provide services for logistical, industrial and mass transportation needs.



Fishing Port

Pebuhan Perikanan or Fish Landing Base as well as the third fishing port in Juwana and along the Juwana river. Used as a direct link between fish landings and fish distributors. Another function of the 3rd Fishing Port is to unravel the chaos of the boats parked at TPI Juwana 1 and 2.



Fish Market

Fresh Fish Market or Tempat Pelelangan Ikan (TPI) is a vital function at Juwana Port. With the fishing product processing program, not all fish are directly accepted by fish distributors in markets in the Pati region, especially, but the marine products are projected to be processed to be sold directly to the general public who come directly to Juwana Port.

Diagram Issues.

Issues

Local government development plans for a commercial port and additional fish auction center in Juwana River.

Contextual Issues

Development of the port area by responding to water traffic space on the Juwana River

Design as the problem solution to achieve optimum productivity

Modern industry to facilitate human work

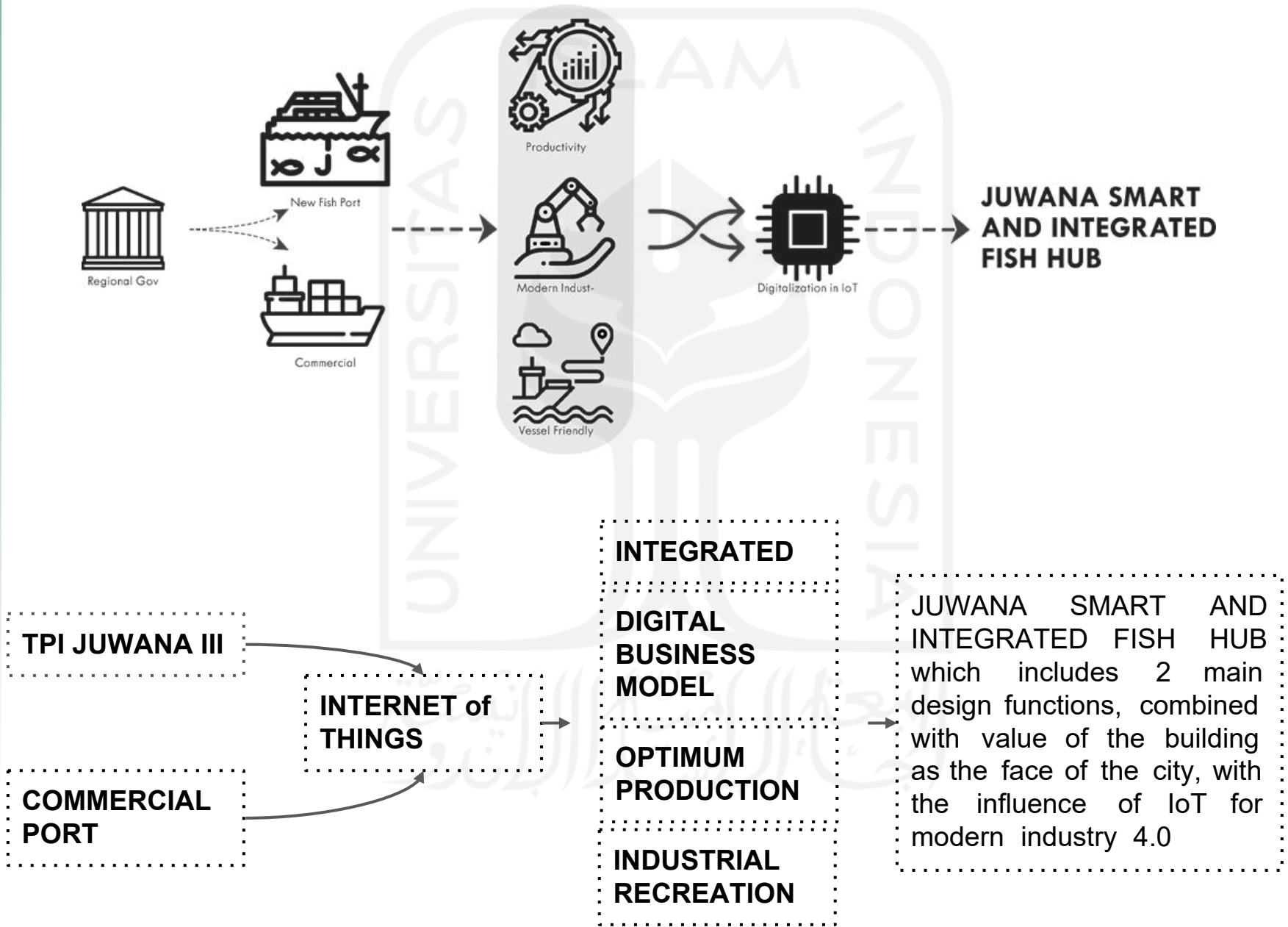
Analysis

Implementing IoT based development for the industry and make built environment.

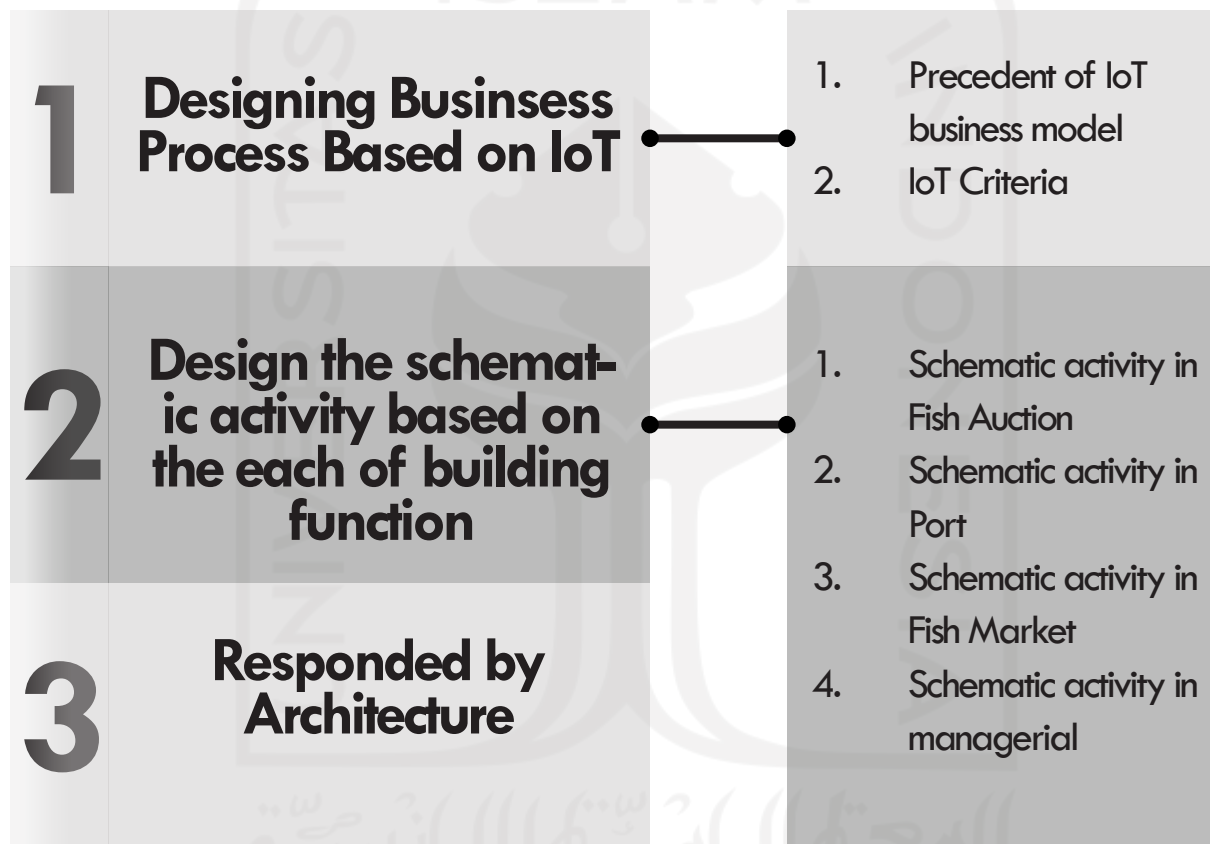
Hypothesis

Planning of the Juwana Integrated Fish Hub with IoT built environment to respond the new normal of modern industry environment.

Diagram Concept.



Frameworks.



Excellency, Originality & Novelty

1. Design of Hygienic Fish Auction By Open Building Approach in Sadeng, Gunungkidul

Approach: Open Building
Writer: Febriansah Wijaya
Published: 2020
University: Universitas Islam Indonesia
Typology: Fish Auction Place
Similarity: Fish Auction Place
Difference: Design approach and not concerning about increasing quantitative aspect of practically productive

2. Re - Desain Pasar Wameo sebagai TPI dan Pasar Wisata di Kab. Buton - Sulawesi Tenggara Berdasarkan Transformasi Bentuk dari Filsafat Hidup dan Motto Masyarakat Buton "Bolimo karo somanamo lipu"

Approach: Historic and Critical Regionalism
Writer: Seko Kaimuddin Haris
Published: 2001
University: Universitas Islam Indonesia
Typology: Re-design of Market into Fish Auction and Tourism Market
Similarity: Fish Auction Place
Difference: Design Approach and the concern is transforming the existing traditional market into fish auction

3. Pasar Ikan Higienis (PIH) di Rembang Pendekatan Karakteristik Budaya Berdagang Masyarakat Pesisir ke dalam Perancangan Bangunan

Approach: Human Behavior Characteristic Based Design
Writer: Yulianto Purwono Prihatmaji, Araina Dwi Rustiani
Published: 2007
University: Universitas Islam Indonesia
Typology: Fish market with floating fish market concept
Similarity: Fish market and processing space of fishery industry
Difference: Design Approach and not concerning about increasing quantitative aspect of practically productive

4. Pengembangan Fisik Bangunan TPI Juwana

Approach: Emphasis on post modern architecture design
Writer: Yuni Muntafiah
Published: 2020
University: Universitas Diponegoro
Typology: Fish Auction Place
Similarity: Fish Auction Place in Juwana
Difference: The main focus is to develop the existing TPI with an emphasis on Post Modern Architecture, not based on the function of needs as an industrial commercial place

5. Modern Fish Market Sebagai Landmark Kampung Bahari Tambaklorok, Semarang

Approach: Modern integrated Smart City
Writer: Muhammad Pangki Lukito
Published: 2019
University: Universitas Muhammadiyah Surakarta
Typology: Fish market as an urban landmark
Similarity: Fish market
Difference: Design approach and the concern is to make a landmark for tourism purpose

6. Redesain Pasar Tradisional Siwa Dengan Pendekatan Arsitektur Modern di Kabupaten Wajo

Approach: Modern Architecture
Writer: Wildan Alghiffari
Published: 2018
University: Universitas Islam Negeri Alauddin Makassar
Typology: Redesign traditional market with modern architecture
Similarity: Contemporary architecture
Difference: The building function is not into fish auction place, commercial port or fish market

Chapter 2

Design Study.

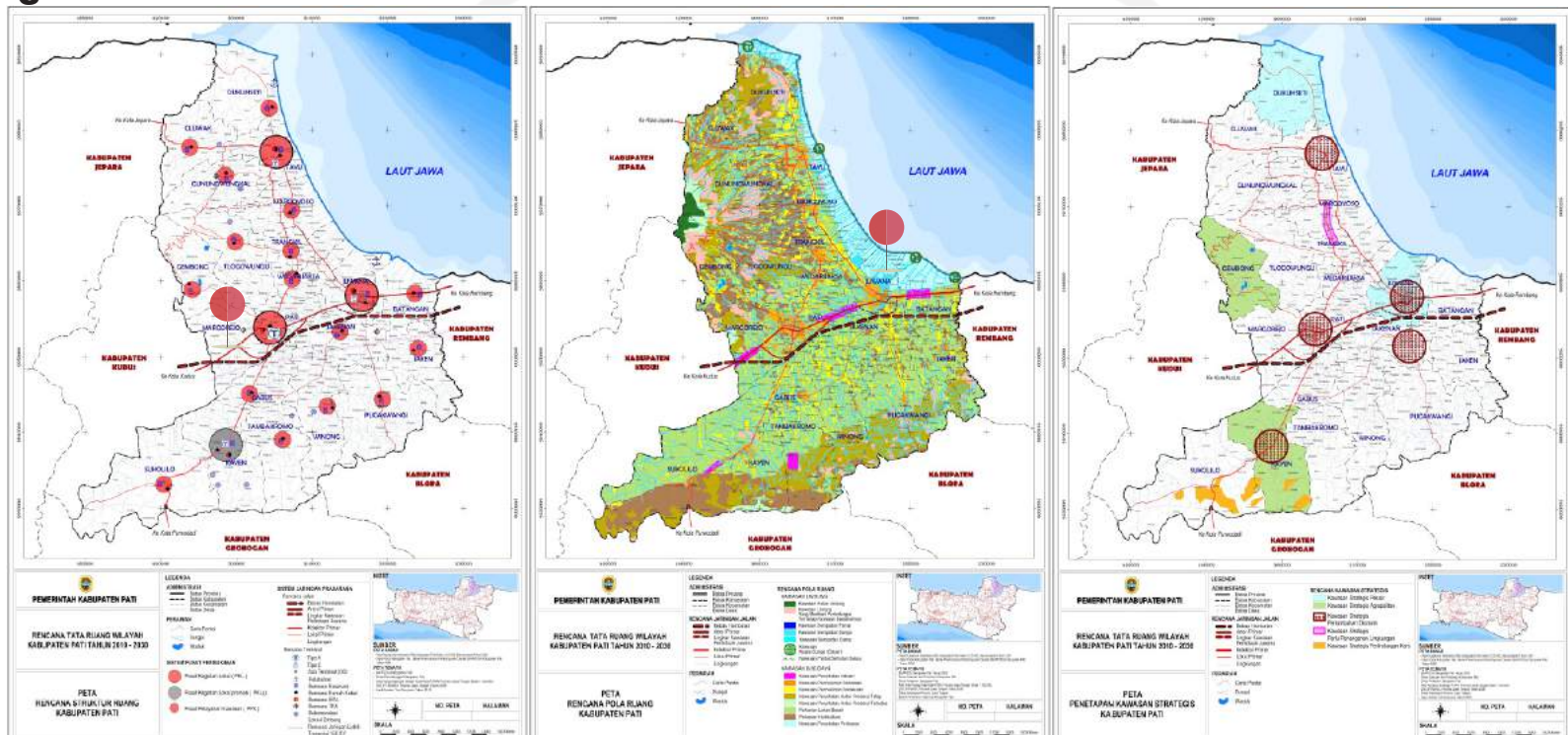
Location Detail.



Contextual Condition.

Macro Scope

Regional Context



- The area planned as a port
- Juwana is Local Activity Center
- Located in Fishery allotment area
- The site location is in the river bank of Juwana River
- Located in the strategic seashore area
- Located in strategic economic growth area

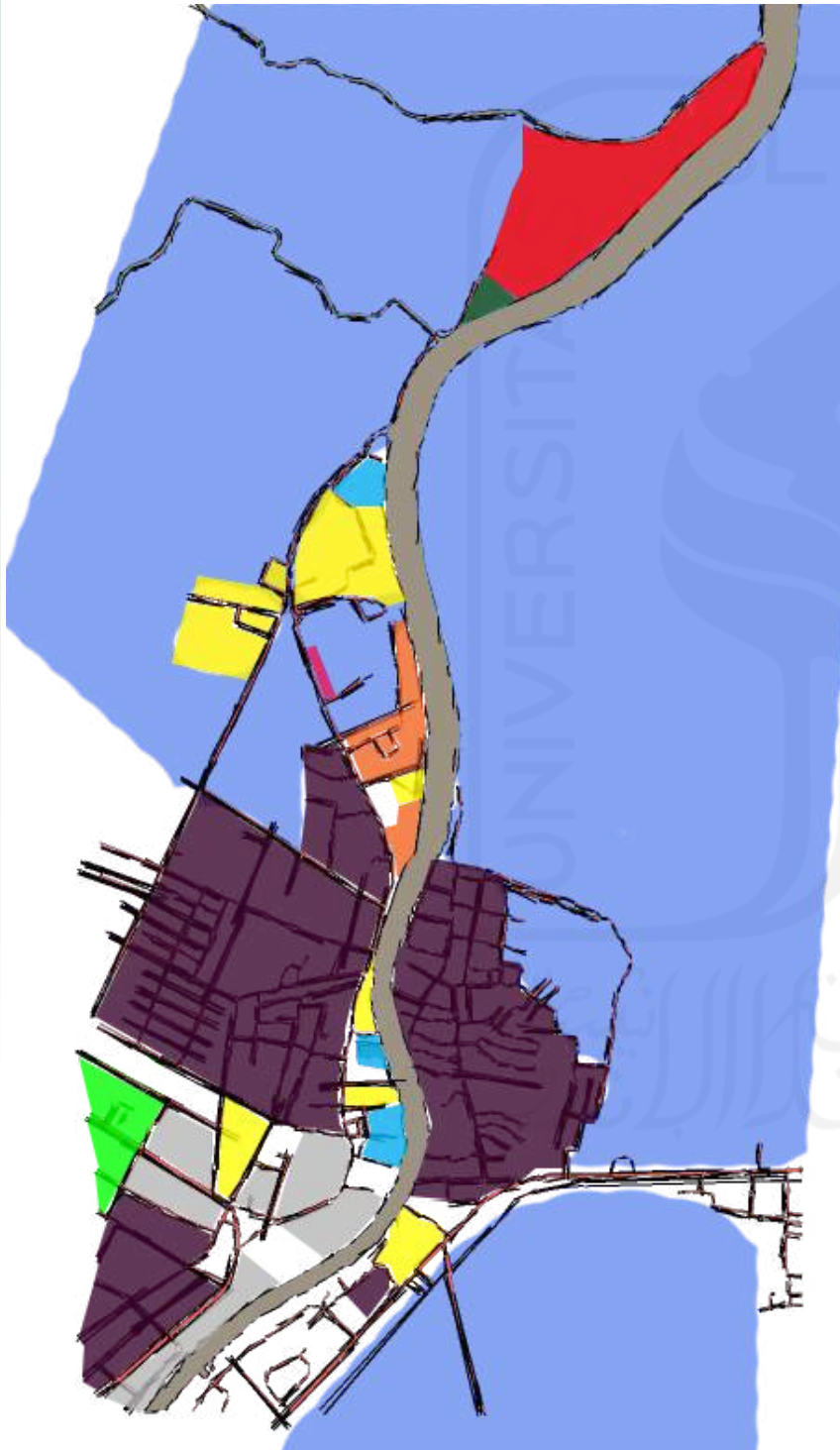
Regulation

Peraturan Daerah Nomor 5 Tahun 2011 about Rencana Tata Ruang Wilayah Kabupaten Pati Tahun 2010 - 2030, BAB 3 about Rencana Struktur Ruang in Paragraf 4 about Rencana Sistem Prasarana Laut Pasal 23 huruf b mention that; Pengembangan pelabuhan niaga sebagai pendukung pengembangan kegiatan industri, perdagangan dan jasa di Kecamatan Juwana.

And in BAB 6 about Arahan Pemanfaatan Ruang Pasal 82; Arahan perwujudan Kawasan Pelabuhan Juwana includes:
a. peningkatan sarana pendukung pelabuhan;
b. pengembangan kegiatan pengolahan hasil perikanan; dan
c. peningkatan fasilitas sarana pengolahan dan pemasaran perikanan.

Contextual Element.

Meso Scope



Neighborhood and Connectivity

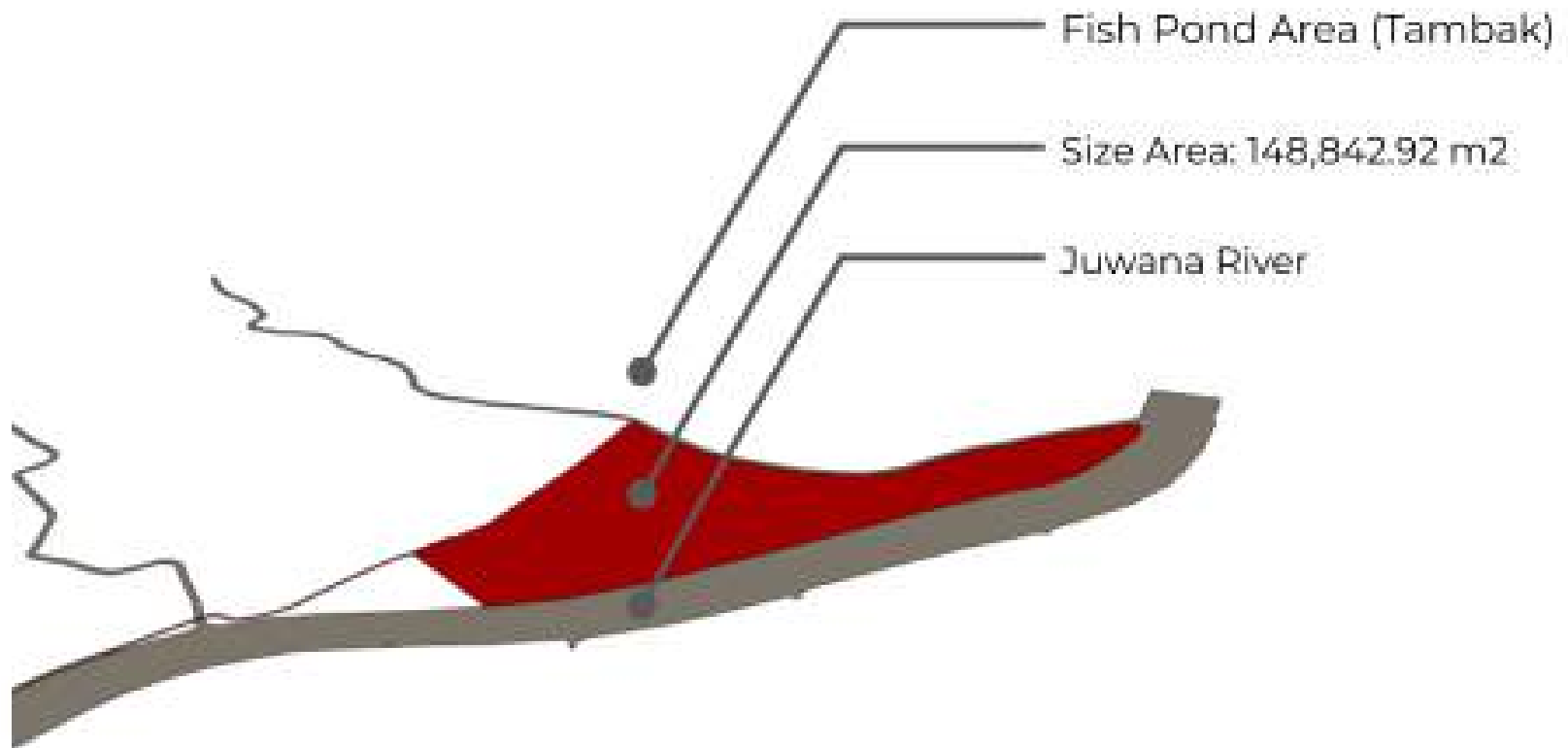
Legends:

- Fish Pond (Tambak) Area
- Site Project Area
- Datuk Lodang Beach
- Fishery and Marine Industry
- Mooring (Tambatan Kapal)
- Fish Processing Center
- TPI Juwana Unit 1 & 2
- Residential Area
- Traditional Market
- Institution and Business Center
- Juwana River

The Juwana River border area has a variety of different activity functions. The positive thing about the design location site is that it is located far from residential areas, unlike TPI Juwana Units 1 and 2 which are in the middle of residential and industrial areas. This can be maximized for the development of the port area and TPI Juwana Unit 3 without thinking about the impact on the surrounding buildings, such as blocking sunlight or causing a distinctive harbor odor in residential areas.

Contextual Site.

Micro Scope



Theoretical Review

Study.

Internet of Things

2 decades ago the term Internet of Things (IoT) was coined by Kevin Ashton in 1999 at Procter 12 and Gamble (P&G) while connecting the latest scheme of RFID in the supply chain of that company (Gandhi, 2019). One of the definitions of the IoT described it as 'a self-configured dynamic global network infrastructure with standards and interoperable communication protocols where physical and virtual 'things' have identities, physical attributes, and virtual personalities, and are seamlessly integrated into the information infrastructure (Yang et al, 2013). Internet of thing (IoT) itself is a concept that aims to expand the benefits of internet connectivity that is connected continuously (Efendi, 2018). Now, IoT is "the next big thing" that is transformed into the largest industrial ecosystem in the world. Where modern humans cannot be separated from the Internet of Things itself. An example of a case in the world of architecture, IoT is manifested in the term Building Information Modeling (BIM).

IoT is an emerging technology. The integration of embedded systems and the Internet paved the researchers in new directions and technology was developed (Gandhi, 2019). The applications of IoT mostly use in retail supply chain, medical and health industry, aid for aged and physically disabled person, transportation, manufacture, safety and security, automation, pharmaceutical, construction and marine industry.

Contextually, Juwana is one of the sub-districts that drives the economy in Pati Regency through its marine and fishery industries. Meanwhile, so far, the two fish auction centers in Juwana have always produced seafood to be distributed to fish traders around the Pati area and its surroundings. By implementing IoT, it can maximize the market reach of the distribution of its seafood. The application of IoT to the Juwana Integrated Fish Hub has the potential to divide the market share between the fish auction center unit 1, unit 2 which will continue to be active and also unit 3 which is incorporated in the Juwana Integrated Fish Hub which is aimed at covering a wider market. With the benefits that can be obtained from implementing IoT in the form of cost reduction, efficiency and productivity, business opportunity, customer experience, mobility and agility (Impact Networking, 2021).

IoT Industries Criteria.

1. Connectivity methods
 - a. Type of connectivity
 - b. Type of device
 - c. Flexibility of IoT in the building
 - d. Connectivity options to fit the requirements of current and future initiatives
2. Scalability & Flexibility
 - a. Scalability of devices, services, or users for requirements change in the future
 - b. The limitation of bandwidth or data storage
3. OTA (Over-the-Air) Firmware Updates
 - a. Maintenance updates
 - b. Fix bugs conditions
 - c. Period of firmware updates
 - d. The complexity of process
4. Security & Privacy
 - a. Mechanism of equipment, business network and data protection
 - b. Redundancy and disaster recovery, GDPR, and user data protection system
 - c. Regular protection control
 - d. Reliability and availability of the platform
 - e. GDPR Requirement
5. Market Lifetime
 - a. The age of the IoT platform in operation
 - b. Readiness of IoT platform
 - c. Roadmap's IoT platform

IoT Industries Criteria.

6. Hardware & edge intelligence

- a. Software application packages by vendor
- b. Hardware edge intelligence
- c. Customisation

7. Device management

- a. Device management requirement
- b. Segments
- c. Device and systems that available to connect in IoT platform
- d. Access to devices in a network behind the connected devices

8. Data management & analysis

- a. Data acquiring systems
- b. Data analysis and visualization
- c. Data actionable value
- d. Fair data plan

9. Integration & API (Application Programming Interface) access

- a. Openness of the IoT platform
- b. IoT platform limitation and data storage
- c. Cross-application business logic
- d. Function integration
- e. Support and material development

10. User management

- a. Users control
- b. Access securities
- c. Service, management and operator
- d. Remote access
- e. Customers management
- f. Mobile access
- g. Extras and upgrading

IoT Industries Criteria.

11. Industry 4.0 transformation

- a. IoT's platform roadmap and needs
- b. Growth model
- c. The scope of services

12. Industry experts

- a. Vendor connection
- b. Support access

13. Whitelabel

- a. Whitelabeling services
- b. Extensible and customisable web interface and brand

Source: Ixon Cloud, 2021



Theoretical Review

Study.

Existing Built Environment

Modernist design principles pursued the eradication of this type of discrete boundary, proposing a more continuous vision of space; one where the interior moved out into the exterior and the exterior was drawn into the interior space (Routledge, 2015). Contemporary critical thinking can be considered as dynamic mindsets. Which is an architectural product that is more functional, efficient, and simple.

The dominant influence of Western architecture in Indonesia lately, especially is the international style (International Style) of Modern Architecture (Modern Architecture), which was originally launched by the Modern Architecture Movement (Modern Movement), characterized by the same appearance for all places in the world. Followed later by the influence of Post Modern architecture (Post Modern), which is a reaction / rejection of the International Style, characterized by highlighting the appearance of local architecture. Modern architecture is considered to ignore natural and cultural conditions including the built environment (existing architectural works). Such characters are considered a source of architectural chaos, especially visually (Djumiko, 2016). But in the terms of a contemporary built environment in the context of the Juwana Integrated Fish Hub, is a design as an efficient solution in responding to a new built environment that elaborate in industrial area and able to compete with the development of the digital era.

Basically, the nature and character of an ideal built environment is formed from several elements contained in it, namely the synergy between nature, humans/society and network buildings/houses (Annaw, 2015). Which in forming a new built environment based on digitization and utilizing the Internet of Things, requires the integration between different building functions and varied patterns of human activity into patterns.

So far, the built environment in the surrounding area such as in Bajomulyo Village, Bendar Village, Growong Lor Village is formed from the livelihoods of the community. These areas are closely related to the marine and fishery industries as well as manufacturing industries such as brass and batik. The Juwana settlement has specific characteristics, namely that at first they lived on the banks of the Juwana River and the seaside with a linear settlement form. Then developing inland with the formation of a radial settlement in the middle in the form of open space as the center of orientation, roads appear that penetrate the initial linear settlement. Eventually the area grew into a Juwana city with buildings with Dutch, Indonesian, Chinese and Javanese colonial architecture, and Silugonggo still played an important role in its development, thus forming the character of the city as seen today (Widayati et al, 2017). However, geographically, the planning for Juwana Integrated Fish Hub is located in an industrial area, has no boundaries with nearby buildings and is far from residential areas. A contemporary built environment is needed as a new built environment on a macro scale as a response to the digitalization of an industry that is always connected to its users

Space Requirement

Commercial Port.

1. Parking for 4 or more wheeled vehicles
2. Parking for 2-wheeled vehicles
3. Ground loading dock
4. Commercial port service office
5. Container Freight Station (CFS)
6. The weigh and registration door
7. Cash offices/Bank Jateng/Koperasi Unit Desa
8. Work unit office
9. Mushola
10. Main Canteen
11. Port equipment workshop
12. Ship equipment workshop
13. Ship workshop
14. Warehouse of equipment
15. Field canteen
16. Forklift parking
17. The wharf
18. Dry dock
19. Public Toilets

Space Requirement

Fish Auction Center.

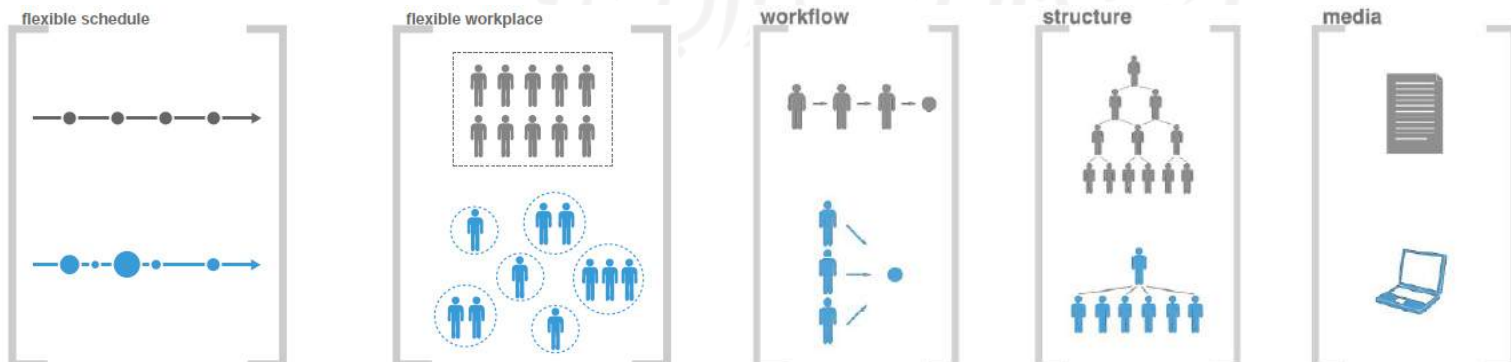
1. Parking for 4 or more wheeled vehicles
2. Parking for 2-wheeled vehicles
3. Ground loading dock
4. The auction room
5. Fish collection room
6. Door scales
7. Cash offices/Bank Jateng/Koperasi Unit Desa
8. Work unit office
9. Fishery port service office
10. Water police station
11. Storage
12. Office for leasing marine equipment
13. Ice factory
14. Wharf
15. Gas station ship
16. Fish processing room
17. Waiting room
18. FnB
19. Mushola
20. Public Toilets

Sumber berdasarkan hasil pengamatan dan interview di kawasan TPI Juwana Unit 1 dan Unit 2

Space Requirement

IoT Industry Sector.

1. Parking for 4 or more wheeled vehicles
2. Parking for 2-wheeled vehicles
3. Work space
4. Archive room
5. Storage
6. Printing room
7. Locker area
8. Smoking room
9. Library
10. Mail Room
11. Pantry
12. Rest Area
13. Games Room
14. Waiting Room
15. Small Meeting Room
16. Large Meeting Room
17. Small Meeting Space
18. Large Meeting Space
19. Brainstorm Room
20. Meeting Point
21. Open Office
22. Team Space
23. Private Space
24. Shared Office
25. Study Booth
26. Working Lounge
27. Touch Down
28. Team Room



Business Model Study.

Pati Smart City

For now, the Pati Regency government has implemented the Pati Smart City program. Pati Smart City is a city governance concept that is smartly structured to solve any problems or problems faced by the community, through the management of existing resources and communities which are manifested in problem solving strategies, improving the quality of public services and creating a prosperous and comfortable city situation and condition (Smart City Pati Kab, 2021).

The goal of Pati Smart City is to become a guide in solving various problems in Pati Regency intelligently so that development in Pati Regency can continue to run well and bring any problems or problems faced by the community, through the management of existing resources and communities which are manifested in problem solving strategies, improving the quality of public services and creation of a situation and condition of the city that is prosperous and comfortable (Smart City Pati Kab, 2021).

However, in its development, Pati Smart City is not running with expectations. Discussions from Pati Smart City have been started since 2015 and the application from Pati Smart City itself has been launched since the end of 2018.

The following is just a small example of the neglect of the Pati Smart City realization program. As a small example, e-TPI or from the fish auction sector is 1 of 38 community service program channels in Pati Smart City which is divided into 3 Smart City service groups, namely in terms of business, information and government. In which the entire program channel is in the same condition as e-TPI.

If seen from the specifics, the ineffectiveness of e-TPI occurs due to several factors;

1. Lack of human resources.
2. In its implementation, e-TPI is continuous in real time with other program channels within the scope of Pati Smart City. Mixed with other program channels in the scope of business, information, and government services.
3. Lack of socialization with the community. only 91 reviews on the Pati Smart City app play store page. Whereas, even with a 4.4 rating, the review is in the form of a request for a more serious development and more improvements in terms of access to the application itself.
4. Lack of working on a mature master plan. It is indicated from application systemation that there are many bugs etc.



Figure of Main page of Pati Smart City on e-TPI for TPI Juwana Unit 1

Source: Pati Smart City web page, 2021

Financial System at TPI Juwana

Since 2019, the buying and selling transaction system at TPI Juwana has been updated. The payment transaction system underwent a change that was previously carried out between producers and consumers, through intermediaries. This system is also contained in the e-TPI/SISIPA (Sistem Pelelangan Ikan Pati) which is also included in Pati Smart City (Naufal, 2019).

1. Credit transactions between auction winners and ship owners and fishermen. Often times, ineffective, undisciplined and less transparent payments by credit/installment.
2. All types of transactions on a large scale from consumers through Bank Jateng so that installment plans occur in a professional manner through the Bank Jateng credit system.

The advantages of implementing the people's credit system in transactions include:

1. Reducing KPCI (Kekurangan Pembayaran Lelang Ikan).
2. The accuracy of fish production data increases.
3. All auction results are recorded in a more transparent manner.
4. TPI management will be more transparent.
5. Avoiding the practice of Corruption, Collusion, Nepotism).
6. Increase in PAD (Pendapatan Asli Daerah).

Fishery Production System at TPI Juwana

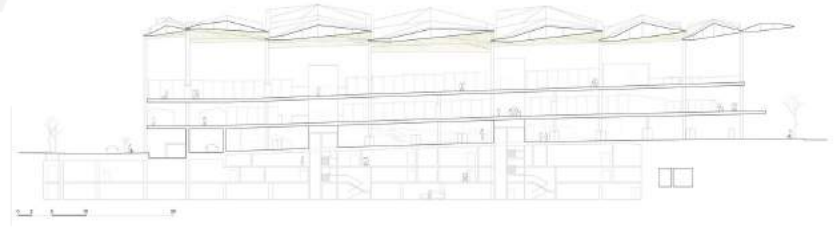
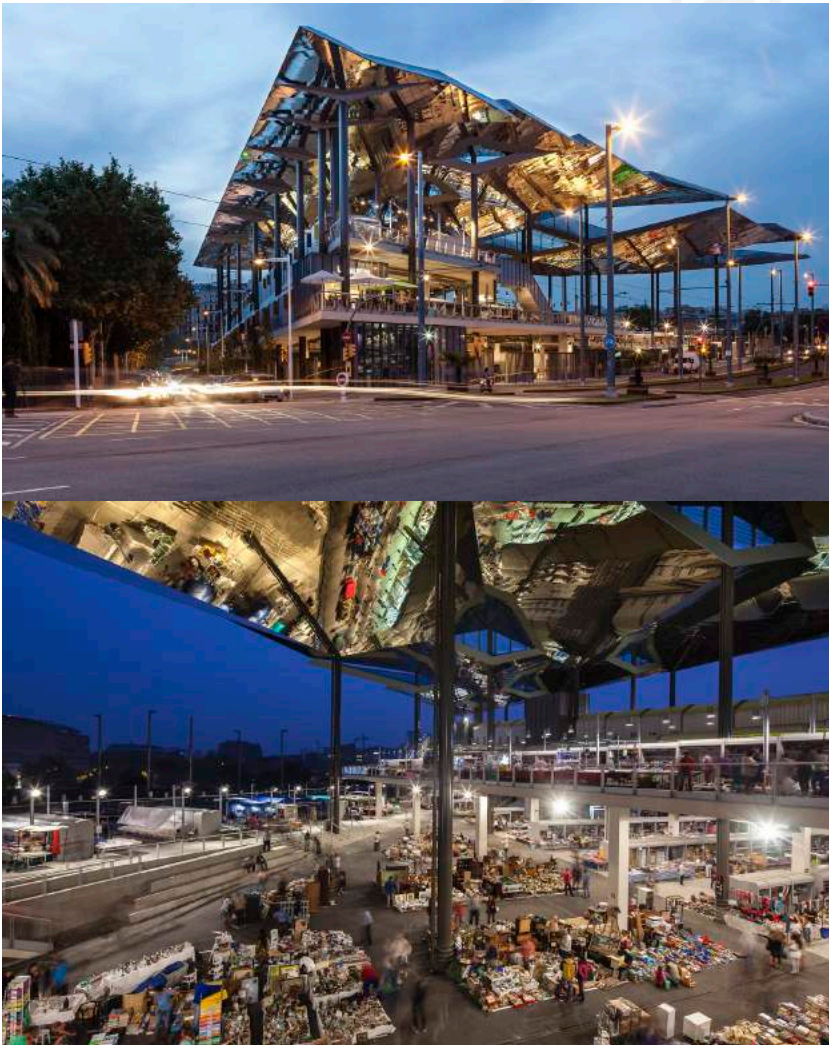
According to Pak Sugeng, the secretary officer in Syahbandar/TPI Juwana Unit 1 Service Office, the management of fishery production at TPI Juwana uses a system that has long been implemented not only in Juwana, but also in many regions in Indonesia.

1. Fishermen who sail from TPI Juwana only carry fishing needs, weather information from the BMKG at the TPI Service Office and the position or movement of fish based on information from other vessels that have already gone to sea.
2. After the boat has obtained the desired fishery product, the types of fish are sorted based on the type, quality, weight and condition.
3. The grouped fish are specifically distributed to collectors who stay in the middle of the sea to be sold to TPI in Jakarta and Surabaya. There are also requests from fisheries companies such as the canned fish and frozen food industries.
4. The remaining unsorted fish on the collectors ship will be brought back to TPI Juwana Unit 1 for purse seine vessels and small vessels. And for TPI Juwana Unit 2 it is intended for larger cantrang and gill net type vessels.
5. The fish is then lowered to the basket to be weighed and an open auction is conducted with several buyers at the same time at the TPI.
6. Fish will be distributed to the winner's location by motorbike or frozen box truck, according to the number of fish.

Precedent & Typology Study.

Mercat Encants, Barcelona

b720 Fermín Vázquez Arquitectos



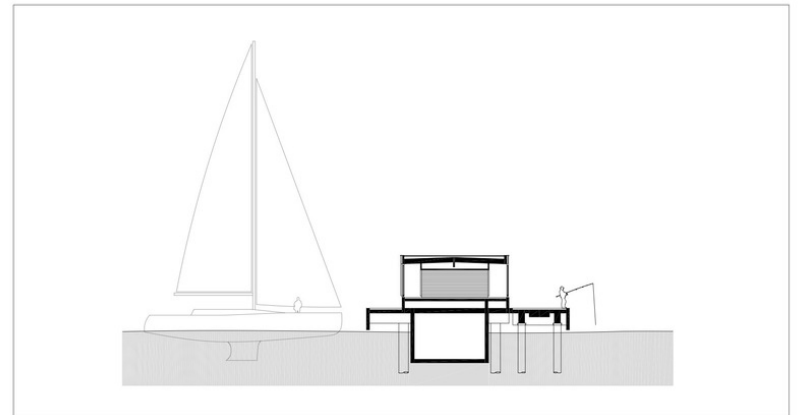
1. The concept of an open building gives the impression of a large space and is able to maximize natural ventilation systems and maximum natural lighting
2. An open building facade displays a clearer buying and selling activity. And cheaper in terms of construction costs
3. The leveling game on buildings is used in maximizing the height and capacity which can be optimized from a productivity point of view

Precedent & Typology

Study.

New Services For Boaters On The Port Of Cannes

Heams et Michel



Coupe / Section

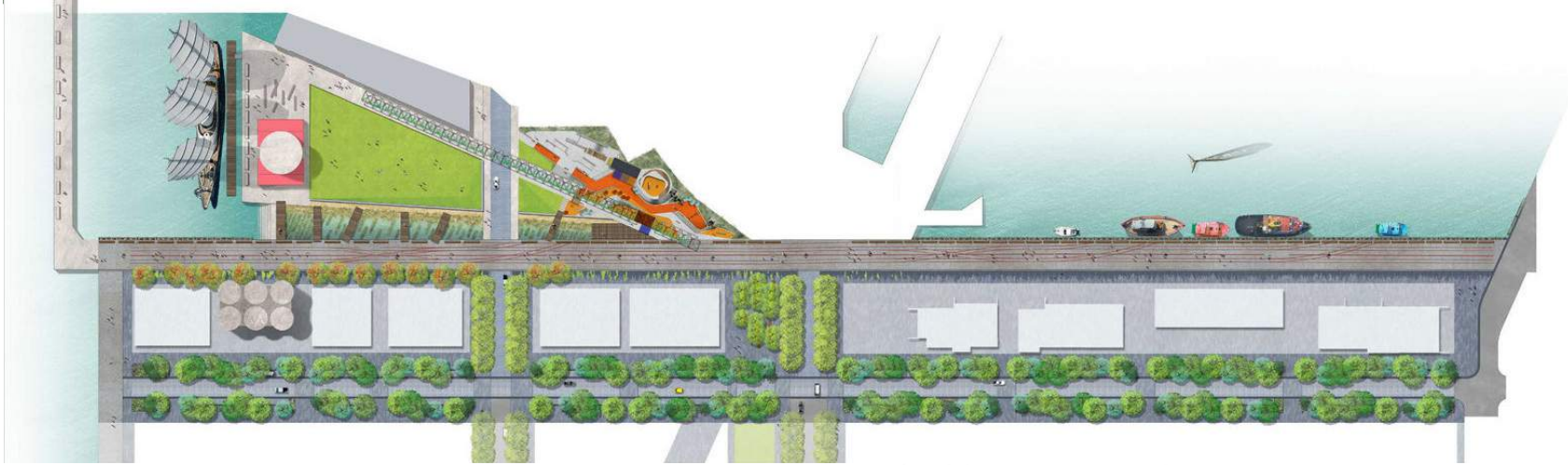
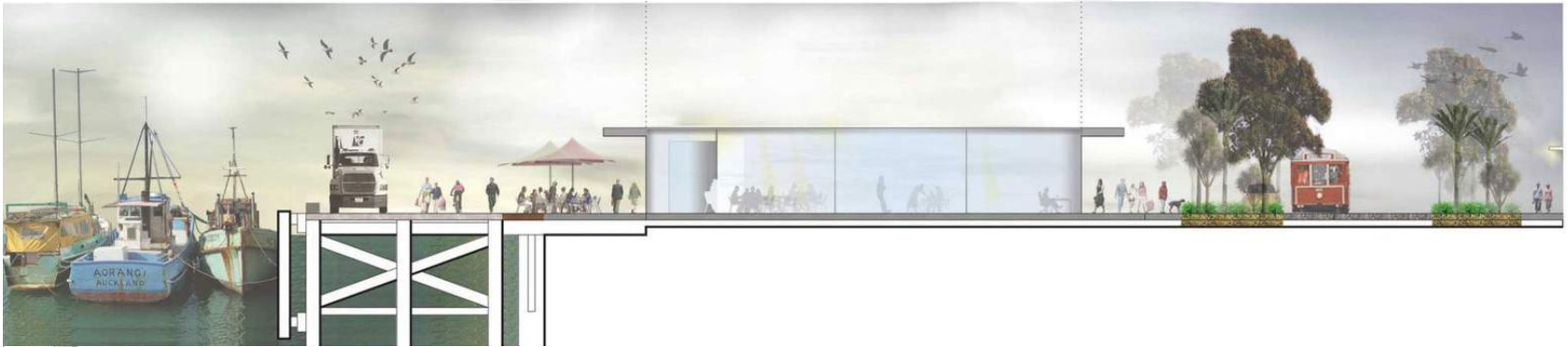
0 1 5 10m

1. The slim form of the building makes it easy to integrate functions with other functions.
2. The position of the building which is located in the middle and surrounded by ship parking also makes it easier from a security point of view.
3. The single bank concept for a closed building is the best translation of optimal workspace quality while still meeting the criteria for maximum air ventilation and natural lighting.

Precedent & Typology Study.

Jellicoe Harbour and Silo Park, Auckland

Taylor Cullity Lethlean, Wraight + Associates

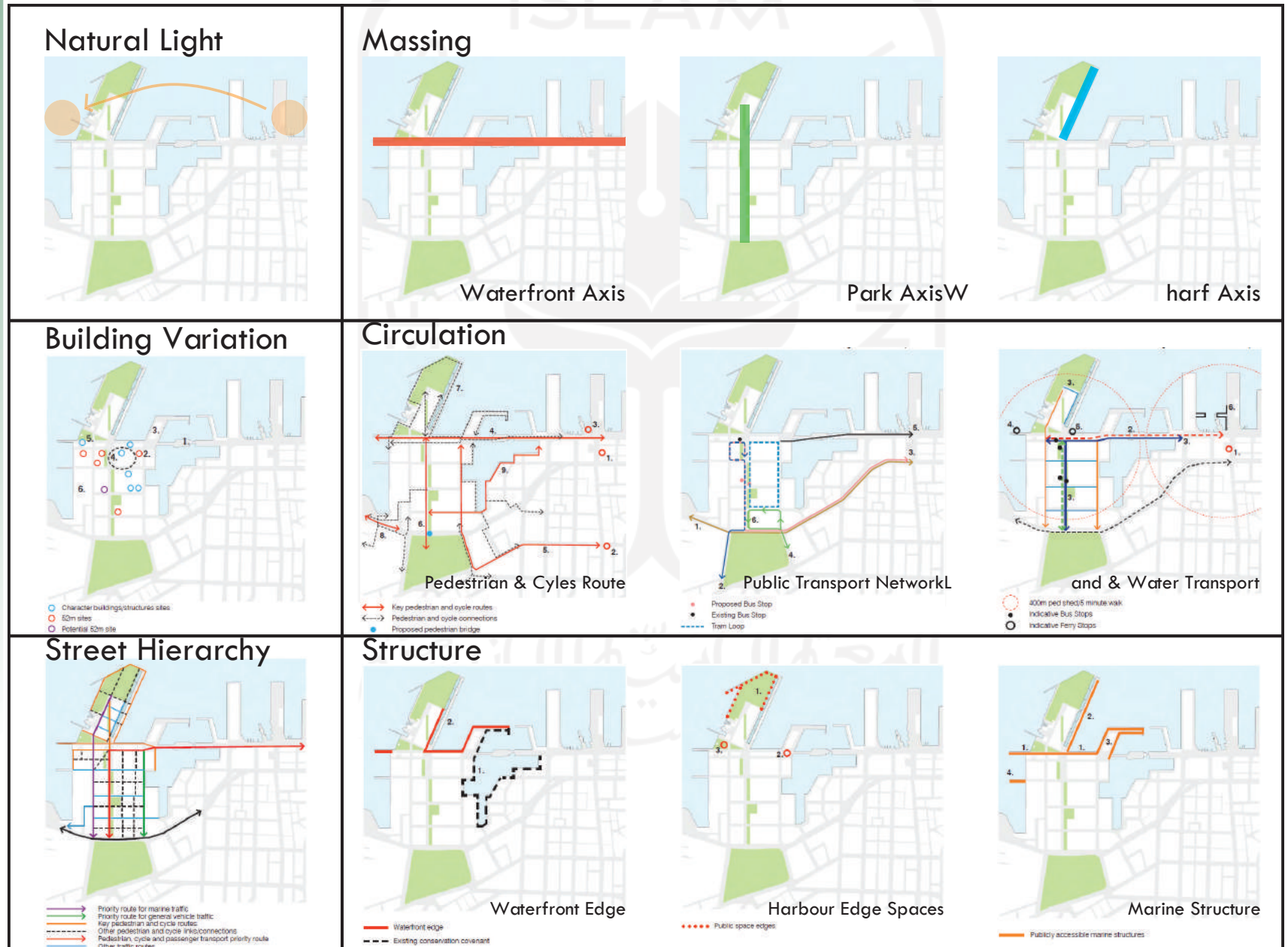


1. The concept of combining public space with ports and warehouses has been very successful in breaking the bad stigma about the port atmosphere as well as the attractive integration in combining green industries.
2. The utilitarian concept is applied to the context of a recreational park with industrial and commercial retail nuances in attracting visitors.
3. These spaces promote an alternative design approach to the typical erasure of waterfront memory. Here, friction is encouraged, smelly fish are the attraction, rust, grit and patina are embraced and derelict artefacts are reprogrammed

Precedent & Typology Study.

Waynard Quarter, Auckland

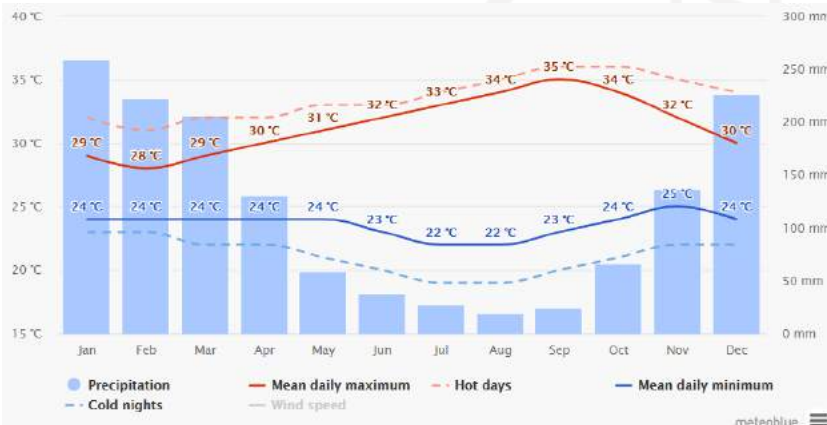
Panuku Development Auckland



Climate

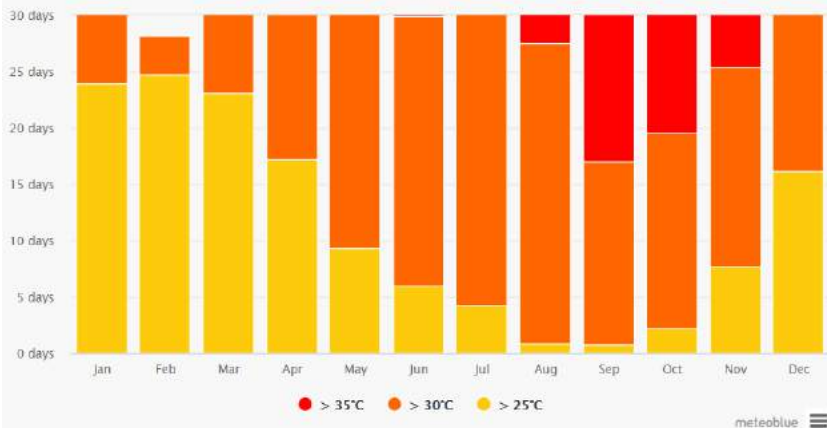
Data.

Temperature and Maximum Temperature.



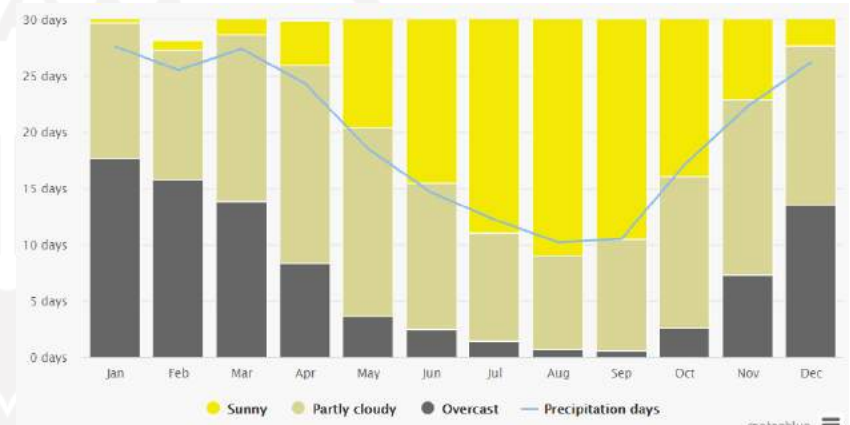
The “mean daily maximum” (solid red line) shows the maximum temperature of an average day for every month for Juwana. Likewise, “mean daily minimum” (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years.

The precipitation chart is useful to plan for seasonal effects. Monthly precipitations above 150mm are mostly wet, below 30mm mostly dry.

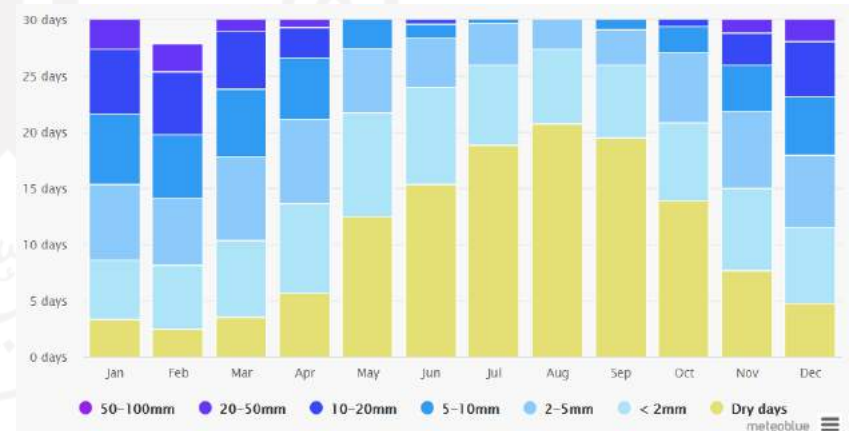


The maximum temperature diagram for Juwana displays how many days per month reach certain temperatures.

Sun Cloud Weather and Precipitations.



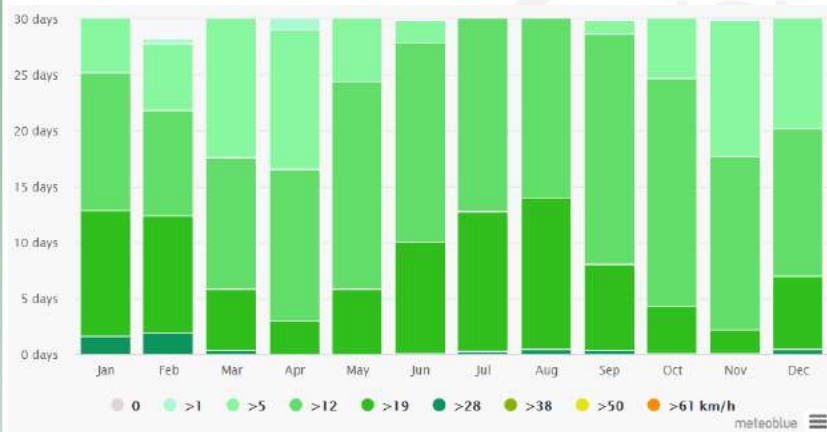
The graph shows the monthly number of sunny, partly cloudy, overcast and precipitation days. Days with less than 20% cloud cover are considered as sunny, with 20-80% cloud cover as partly cloudy and with more than 80% as overcast.



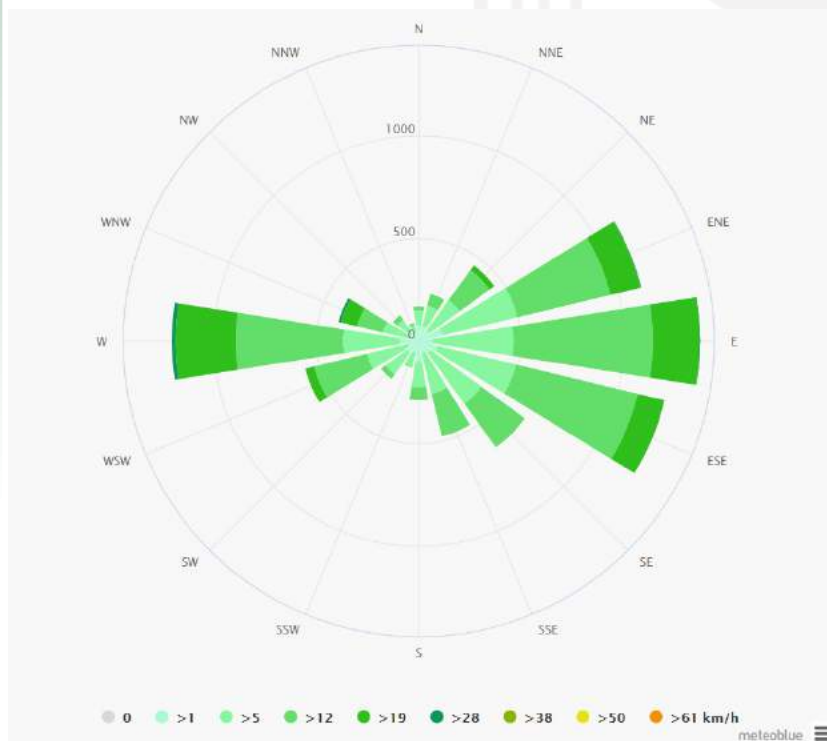
The precipitation diagram for Juwana shows on how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated.

Climate Data.

Windrose.



The diagram for Juwana shows the days per month, during which the wind reaches a certain speed.



The wind rose for Juwana shows how many hours per year the wind blows from the indicated direction.

Sun Orientation.







Orientation considerations
the sun is related to the amount of light exposure
direct sun hitting the veil
fish auction building, commercial port and fish market



Site Analysis and Exploration.

Circulation Analysis.





View Analysis.

| Data | Respond | Data | Respond |
|---|---|---|---|
|  |  |  <p data-bbox="1170 521 1334 611">West Side: fishery allotment</p> <p data-bbox="1170 706 1353 795">South Side: Datok Lodang Beach</p> <p data-bbox="1170 891 1325 1016">North Side: fishery allotment and canal</p> <p data-bbox="1170 1062 1325 1220">North East Side: fishery allotment and canal</p> |  <ul data-bbox="1386 872 1791 1087" style="list-style-type: none"> ● Transparent border to respond the fish allotment area and several access to canal. ● Border wall to divide the JIFH area. ● Juwana River access to JIFH. |
| <p data-bbox="102 864 510 1220">Desa Growong Lor Road which was previously operated as one of the accesses to the fishpond area. In accordance with the planning regulations for the development of the TPI Juwana Unit 3 area and the Commercial Port, the road was then refurbished by the district government.</p> | <p data-bbox="529 864 940 1054">Utilizing the main road as a boulevard for access in and out of JIFH which is divided into the Fish Auction Center and Commercial Port.</p> | | |

Site Analysis and Exploration.

Acoustic Analysis.





Vegetation Analysis.

| Data | Respond | Data | Respond |
|--|---|--|--|
|  |  |  |  |
| <ul style="list-style-type: none"> ● The noise level around the site is moderate, caused by motorized vehicles and motor boats. ● High noise levels around the site, due to the Juwana River as the main access for boats of various sizes passing by. | <ul style="list-style-type: none"> ● The main building area does not require a quiet situation or activities that can cause high noise. ● Support areas do not need a quiet place. Where is the main function as a buffer zone for the maritime industry. | <p>Site is a vacant lot. And only overgrown with shrubs along the Juwana River and canals.</p> | <ul style="list-style-type: none"> ● Planting trembesi trees around the main building to minimize heat and dust generated by goods field activities. Besides that, it aims to provide shade for the boulevard. ● Planting mangrove trees as the border of the JIFH area to prevent the abrasion. |

Site Analysis and Exploration.

Drainage Analysis.

Climate Analysis.





| Data | Respond | Data | Respond |
|---|--|---|---|
|  |  |  |  |
| <p>Site is an empty land surrounded by fish allotment area. Squeezed by two waterways, namely a small canal and the Juwana River.</p> <ul style="list-style-type: none"> ● Canals serve as irrigation flows to each pond and water transportation routes. ● Juwana River. | <ul style="list-style-type: none"> ● Drainage planning on the boulevard which divides the 2 sites. So that the overflow of water can be forwarded directly to the canal and the Juwana River. | <p>Winds with a speed of 5 - 15 km/h from the east during the dry season and occasionally from the west in the rainy season with less intensity.</p> <p>Air temperature is 31°C.</p> <p>Rainfall occurs during November to April.</p> | <ol style="list-style-type: none"> 1. The building mass is recommended to follow the wind direction so that the air pressure is smaller. 2. Opening can be adjusted according to the direction of the wind, but must provided the use of shading to avoid exposure to direct sunlight. 3. Using a drainage system that collects rainwater. |

البعثة الاستاذة الاندوة

Site Analysis and Exploration.

Land Use Analysis.

Disaster Mitigation Analysis.

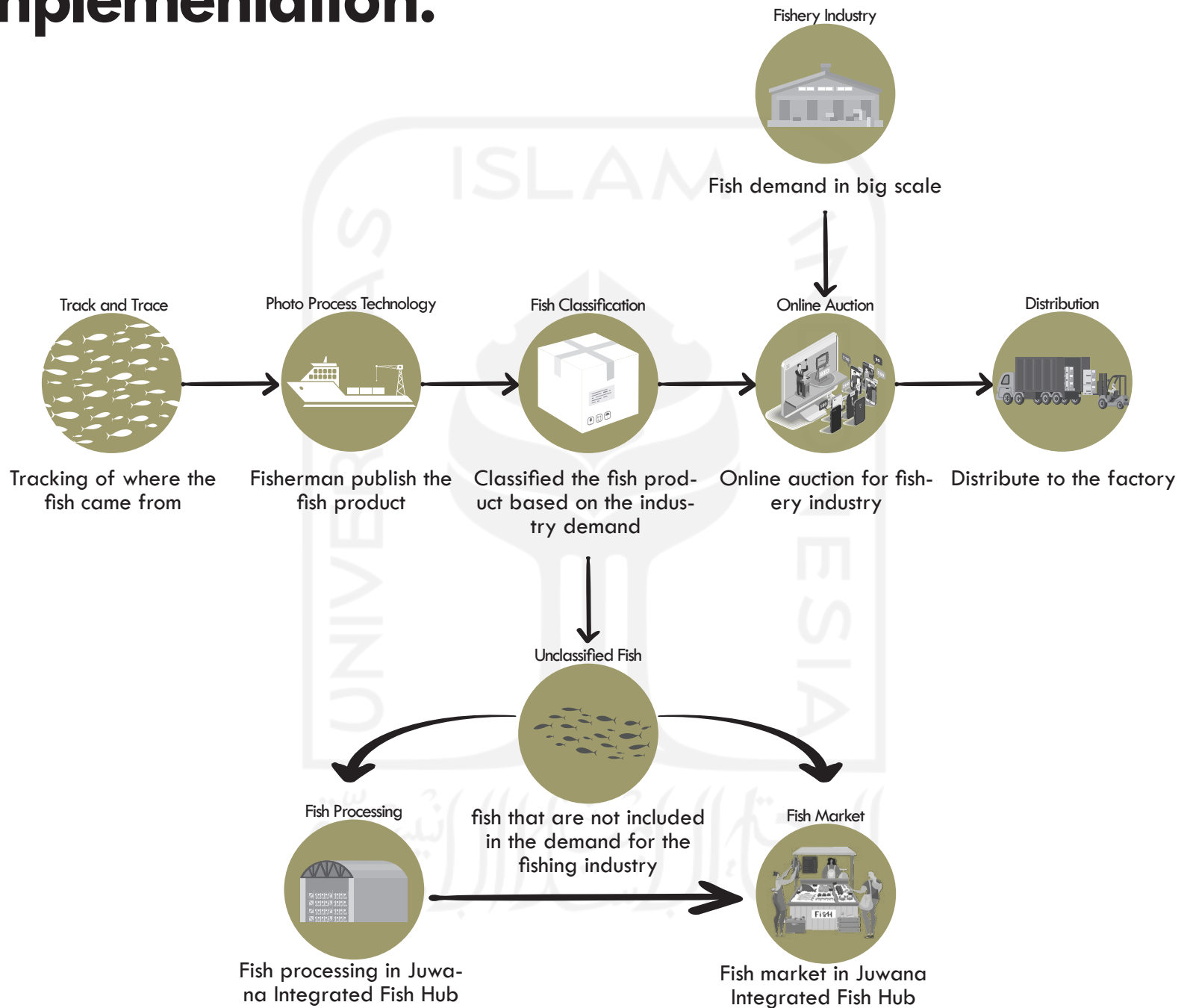
| | | Data | Respond |
|---|--|--|---|
|  |  |  |  |
| <ul style="list-style-type: none"> ● The Juwana River, with a width of 80 - 90 meters, functions as the main transportation route in Juwana, as well as parking for fishing boats. ● The canal to the north of the site with a width of 10 - 15 meters will function as an irrigation route for fish allotments and a small boat transport route. | <ul style="list-style-type: none"> ● Recommendation to widen the Juwana River in the JIFH area. With the aim to accommodate more ships to dock and land fish. Another effect is that it does not interfere with the vessel's circulation in the river, making it easier for ship control and maintenance. | <p>There was silting at the bottom of the Juwana River, an increase of 1 cm per day.</p> | <ul style="list-style-type: none"> ● Planning of embankments along the river banks. With the aim of reducing abrasion and making it easier for excavators to perform periodic dredging. ● Recommendations for elevating the site or building to anticipate flooding due to silting. |



Chapter 3

Schematic Design.

IoT Concept Implementation.



Implementation of IoT in Production Systems Fisheries at Juwana Integrated Fish Hub

The use of IoT in the Fishery Production System at the Juwana Integrated Fish Hub is intended for the effectiveness of the work system between the actors involved. IoT is also used to control fishermen's safety at work and optimize the net income of the fishermen themselves. Hereinafter referred to as JIF-PHONE (Juwana Integrated Fish & Production Hub Online)

1. Fishermen departing from TPI Juwana bring real time weather information and navigate the position of fish in the sea. Using sonar technology used by commercial ships or control vessels.
2. Fishery equipment which is the inventory of TPI service offices such as basket, coolers, nets and fuel. Enter the bucket-list via JIF-PHONE. So that the availability of goods can be monitored and make it easier to maintain equipment.
3. Fishing boats can track movement at sea as well as anticipate hazards that occur at sea internally and externally such as the risk of accidents, fire or damage to ships and weather conditions that can change at any time.
4. Each time the net is lifted, sorting is carried out based on the type of fish, weight and worthiness of the fish. Adjusted to market demand and sustainability fishing criteria.
5. The sorted catch can be uploaded in an open auction in real-time. So that companies on a large scale and local consumers can monitor their needs. And the auction can be done online without waiting for the fish to be landed first.
6. Fishery companies that have a large demand or auction winners can prepare fish transportation from JIFH as the arrival of the ship can be calculated on time based on the track of the ship's movement.
7. Fish delivery services from JIFH can also be ordered through JIF-PHONE which provides couriers who are ready based on the volume of fish desired. So that it does not require other parties whose fish freshness can be optimized.
8. By using online auctions that can be accessed by anyone, it will broaden the reach of the market, large and small. This means that fish production from JIFH fishermen can be distributed directly to the TPI closest to the consumer.
9. JIFH fishermen no longer need to sell their fish products to shipping vessels in the middle of the sea. It is more functional for distribution vessels that take fish products from fishermen who are still at sea and go directly to the TPI location closest to the consumer.
10. Without involving collector ships, it will increase fishermen's income more optimally and increase PAD (Pendapatan Asli Daerah). Where the fish that are registered enter through JIFH become more leverage.

Implementation of IoT in the Transaction System Trading at the Juwana Integrated Fish Hub

Combining the credit system in TPI Juwana Unit 1 and Unit 2 with the principles of online payment, paylater, and online trading. The goal is to facilitate a more transparent and easy circulation of money. Hereinafter referred to as JIF-SHOP (Juwana Integrated Fish & Social Hub Online Payment).

1. The role of Bank Jateng together with OJK (Otoritas Jasa Keuangan) was shifted to supervise turnover at the TPI, as well as as a debtor and credit lender for auction payments.
2. JIF-SHOP is a platform for connecting transactions in real-time, like online transactions in general. Also clarify the traces of local and international transactions by wire via Western Union or VISA.
3. The scope of transactions at JIFH includes auction payments, borrowing fishing equipment, production of ice cubes, ship maintenance, distribution of fishery products, savings and loans, investments, insurance, donations to charities, development and planting of mangrove forests.
4. JIF-SHOP also provides real-time statistical data on the increase in fish price fluctuations. By adopting an online trading system through a curve that is influenced by the season of fish, demand and the type of fish.

The impacts arising from the implementation of IoT on the transaction and financial systems at JIFH are as follows:

1. Speed up the circulation of money between consumers and producers.
2. More organized and easier financial management.
3. Reducing risks when taking credit or loans.
4. Payment through credit loans has become more transparent and detailed. Because all parties can monitor and supervise it directly.
5. Bank Jateng's performance in providing loans has become more transparent because it is directly monitored by OJK and supervisors from JIFH Marine Services.
6. Reducing the risk of KKN (Korupsi, Kolusi and Nepotisme) in the JIFH environment.
7. Maintenance of physical and non-physical assets is made easier.
8. Maintenance of assets for borrowers becomes easier to control and monitor.
9. Development donation program aimed at JIFH area development and regional development. Especially in the Juwana area and the supporting areas.
10. The charity donation program is aimed at equalizing the welfare of the population in the Juwana area or channeling it to social foundations in the Juwana area and its surroundings.
11. Donation program for planting mangrove forests as part of JIFH's efforts to achieve sustainable fishing. And efforts are made to do it regularly on each beach that is at risk of abrasion.

Implementation of IT / OT Convergence at Commercial Ports at Juwana Integrated Fish Hub

IT/OT is used to simplify the convergence between Information Technology (IT) and Operational Technology (OT) to benefit from machines and data connected to manufacturers. Hereinafter referred to as JIF-MSH (Juwana Integrated Fish & Marine Station Hub).

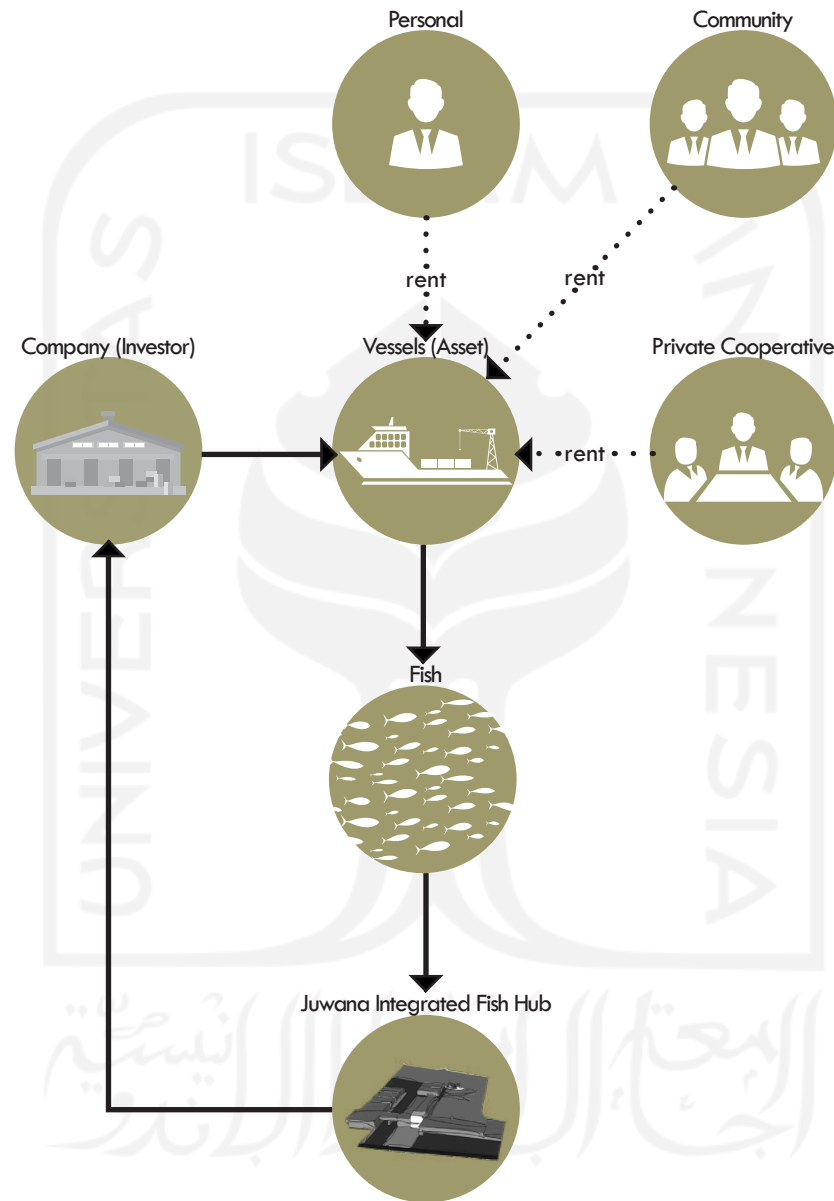
1. Use of technology in terms of operations, engineering and loading and unloading.
2. Unifies the manufacture process controls to achieve minimum operational cost.
3. Administrators can use a management platform or IoT in field performance at the port to monitor, manage and maintain the process.
4. Manufacturers implement predictive analytics, where IoT sensors in machines alert workers when they need maintenance. More effective control and maintenance to save cost and eliminate unplanned downtime periodically.
5. Operational Technology that uses automation can be controlled from the center through Information Technology.

Implementation of IoT at Commercial Ports at Juwana Integrated Fish Hub

IoT is used in the process of controlling machine performance, online user access, and port managerial access. Hereinafter referred to as JIF-MSH (Juwana Integrated Fish & Marine Station Hub).

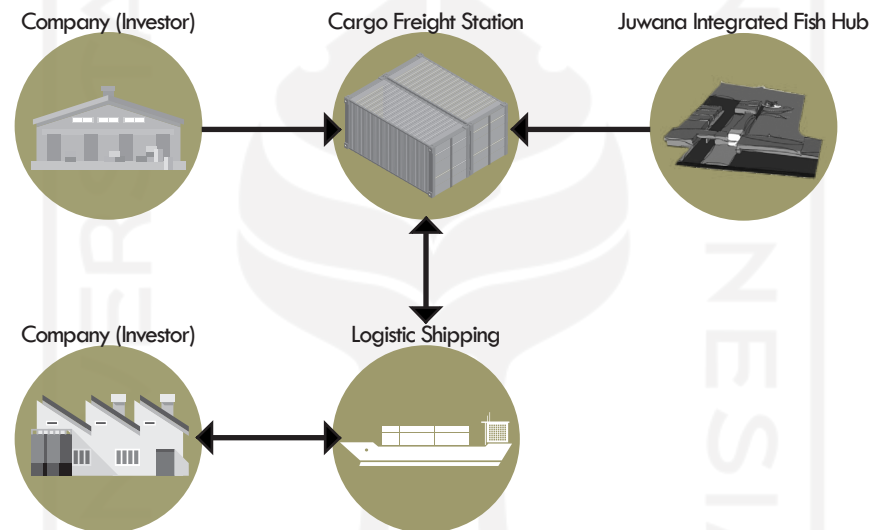
1. Adopting an Subscription Business Model based on IoT.
2. Facilitate industrial access in distributing goods.
3. Companies can subscribe to CFS (Container Freight Station) for a certain period of time regularly through JIF-MSH. So there is no need to manually confirm the availability of CFS stock.
4. Using Assets-Sharing Business Model 2 based on IoT.
5. JIFH synergizes with logistic companies as investors in providing containers of various types and sizes.
6. Customers can access the availability of shipping vessels through JIF-MSH based on the date and time of berth at JIFH. So that the order can be adjusted according to the availability of the ship.
7. Customer can access CFS Online for subscription or per usage via JIF-MSH.

Assets-Sharing Business Model 1.



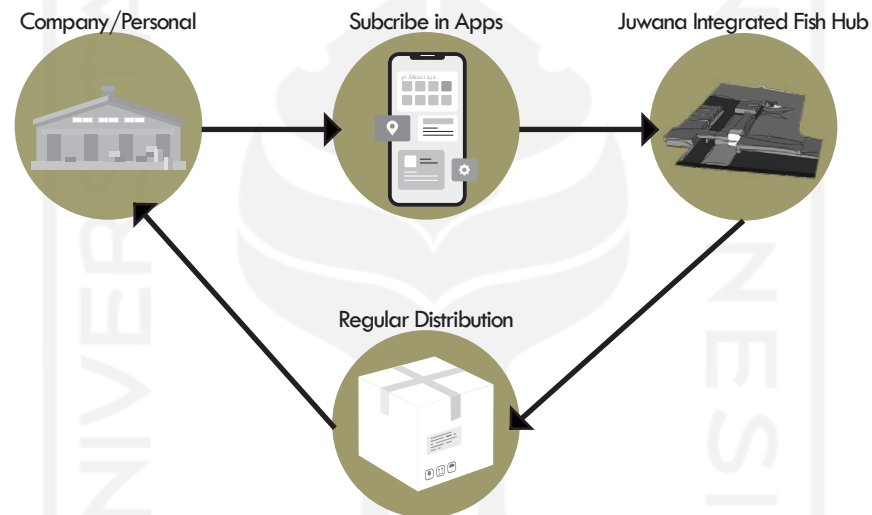
Assets-Sharing Business Model 1 is a form of business model that utilizes IT in IoT. Broadly speaking, this business model attracts investors to invest physically in the form of supporting facilities for the maritime industry. Where these investors can also come from companies or individuals. With a structured revenue record between investors, tenants, seafood and JIFH as platform provider.

Assets-Sharing Business Model 2.



The difference between Assets-Sharing Business Model 1 and 2 is that Assets-Sharing Business Model 2 focuses more on the logistics industry. Where is the role of investors as logistic service providers, transportation services, and JIFH as location and managerial providers.

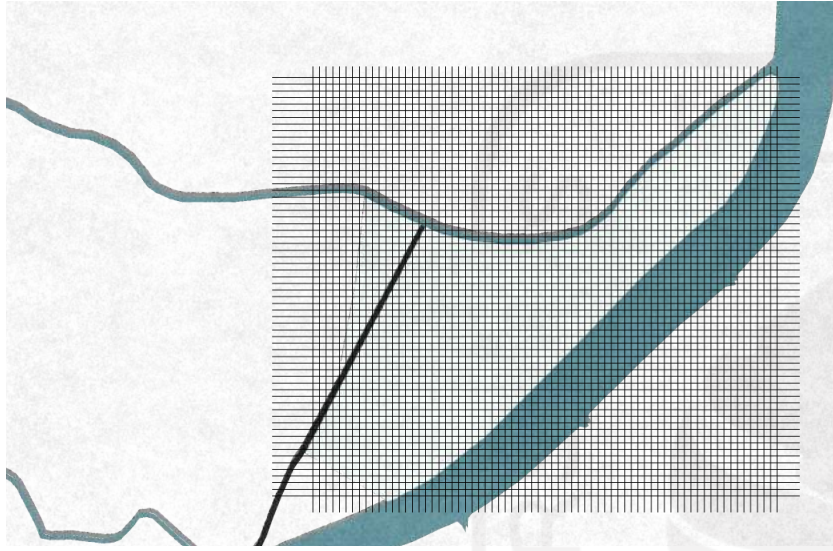
Subscription Business Model 1.



The Subscription Business Model focuses more on consumer access to existing products at JIFH. It was explained that implementing IoT at JIFH to boost revenue is to reach the widest possible consumer. Through JIF-PHONE, JIF-MSH, JIF-SHOP in one application, the subscription business model provides a bond between the user and JIFH itself. That way, it means that in legalizing the need for marine product production or logistics can be met.

Design Alternatives.

Grid in Design.



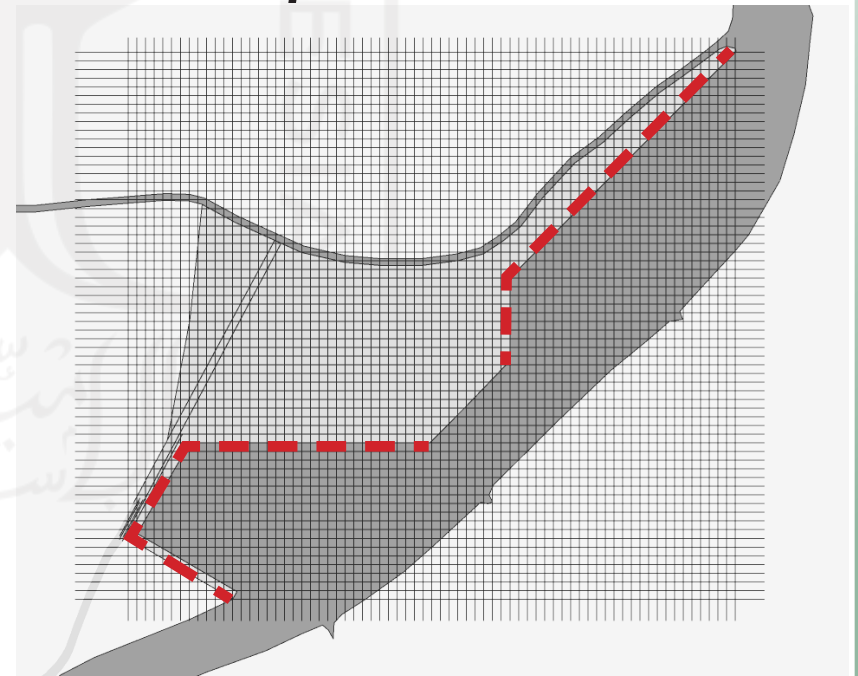
Grid adapted to environmental conditions. Especially the wind direction and the movement of the sun from east to west. That way the mass orientation of the building can later be adjusted according to the comfort level of its users. Using grid 10 x 10 meters.

Land Use Response Alternatives 1



Based on the design objective, which is to maximize the vessels that land on JIFH, some of the sites function as river extensions. Riverbank facing shipyard as recreational and communal space.

Land Use Response Alternatives 2



Based on the design objective, which is to maximize the vessels that land on JIFH, some of the sites function as river extensions. This condition is also intended to strengthen the soil structure on the riverbank.

Design Alternatives.

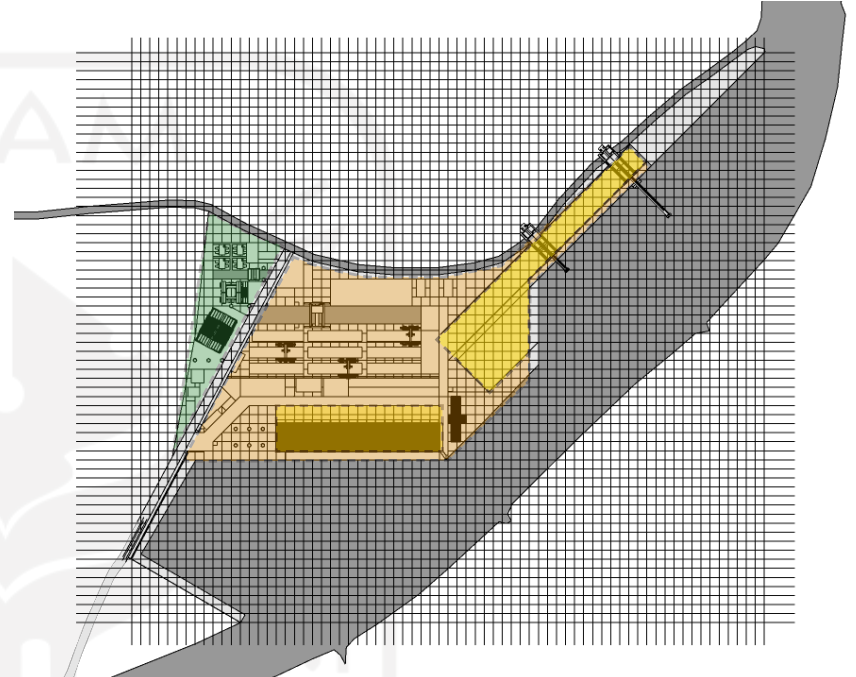
Zoning Alternatives 1.



- The part of land use that is earmarked is focused on industrial operational functions. Application of the OT (Operational Technology) function.
- Part of the division of land designated as managerial functions and amenities. Application of IT (Information Technology) functions.

The IT zone is in charge of OT controller. The system works using IT/OT convergence. So that system maintenance will not need to go to the industrial zone and in terms of performance it will be more effective.

Zoning Alternatives.

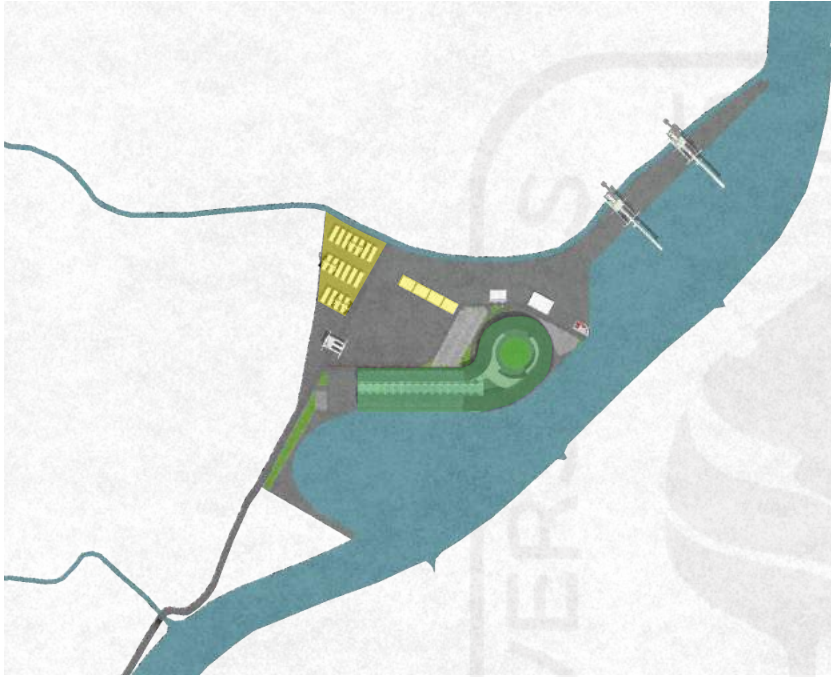


- The part of land use that is earmarked is focused on industrial operational functions. Application of the OT (Operational Technology) function.
- Part of the division of land designated as managerial functions and amenities. Application of IT (Information Technology) functions.

The IT zone is in charge of OT controller. The system works using IT/OT convergence. So that system maintenance will not need to go to the industrial zone and in terms of performance it will be more effective.

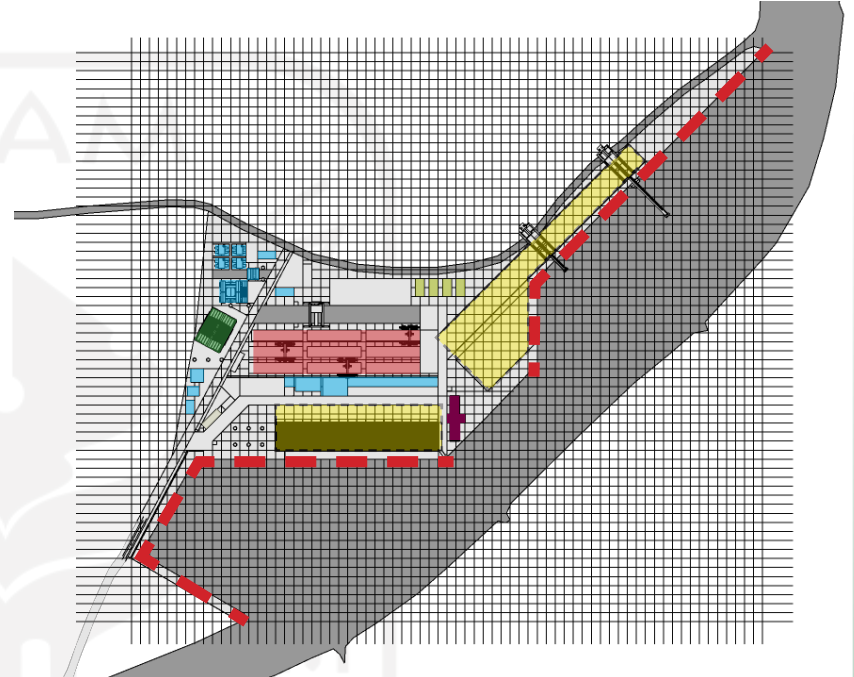
Design Alternatives.

Massing Alternatives 1.



- The period and the function of strenuous activities near the pavement of the riverbank, so that it can withstand heavy pressure on the ground surface. As well as following its main function as a berth for fishing and commercial vessels.
- The orientation of the building is adjusted to the grid. Where it extends from east to west. or oriented east and west.

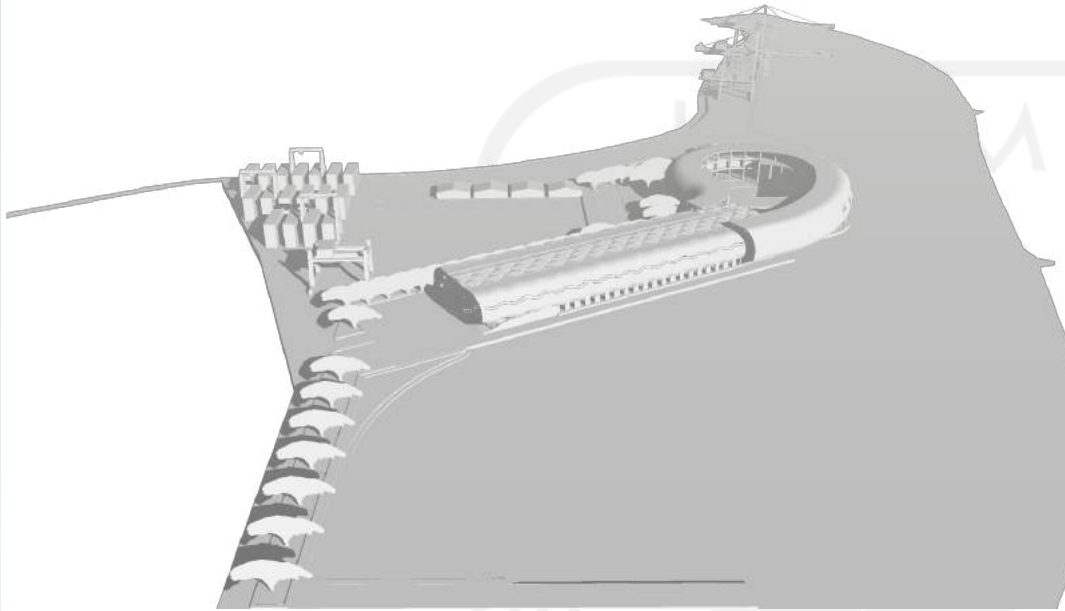
Massing Alternatives 2.



- The period and the function of strenuous activities near the pavement of the riverbank, so that it can withstand heavy pressure on the ground surface. As well as following its main function as a berth for fishing and commercial vessels.
- The orientation of the building is adjusted to the grid. Where it extends from east to west. or oriented east and west.
- The orientation of the mosque is adjusted to the direction of the Qibla.
- The orientation of the Syahbandar office is adjusted to the access in the Fish Auction Center.
- In CFS, the container arrangement is placed in a position extending from east to west. With a note reducing wind pressure as well as a wind breaker.
- Markets and fish processing intentionally face east and west. Wide building and large openings as a wind breaker.

Building Mass.

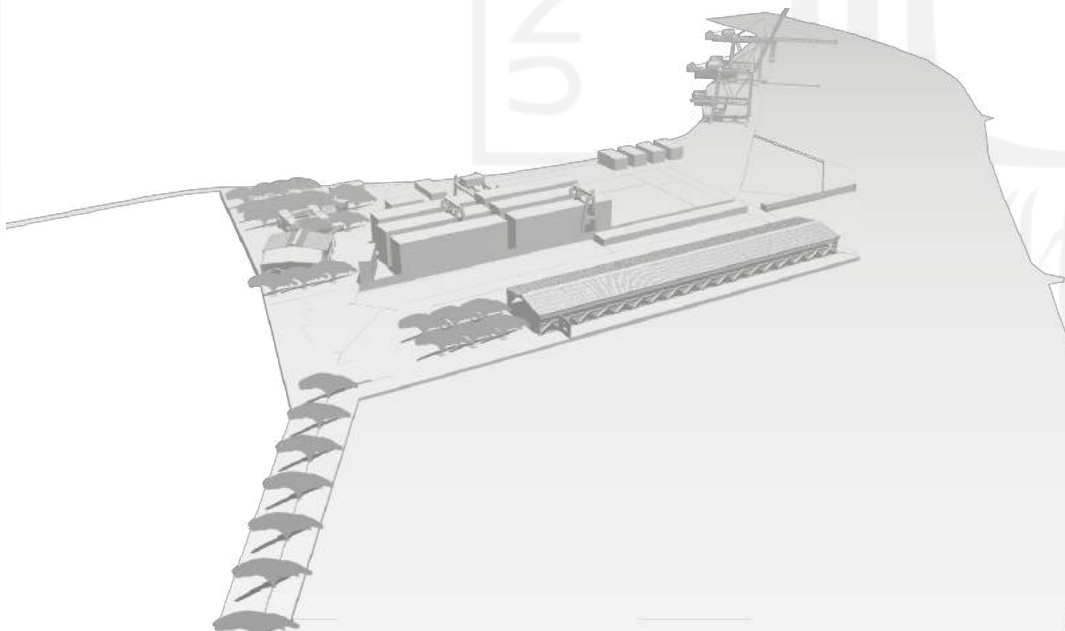
Alternatives 1.



The mass of the building is designed to be more compact where the proximity between users is intersect but still separated by 2 main functions; Fish Hub and Commercial Port. Visitor interaction is centered on the main building. While the Commercial Port is specifically only for industrial activities that are private.

The main building is designed to be elongated so that it can accommodate more ships and the distance is not too far from the shipyard, where all visitors can see. It is the vice versa of watching and learning from each other. Shipyards become more tidy and organized, reducing the risk of ship fires because based on experience, 80% of them are caused by overcrowd shipyards and accidents occur while doing ship maintenance.

Alternatives 2.



The building period is separated based on its function. Where each building has its own function so that all activities are private. There are 3 main zoning divisions in the Juwana Smart and Integrated Fish Hub area; Fishery Production, Office Complex and Commercial Port.

Each is designed to spread and intertwine through IT/OT systems and Clouds. It focuses on distributing visitors based on their needs;

1. Visitors to the fish market,
2. JIFH employees,
3. And distributor of Port goods.

Chapter 4

Final Design.

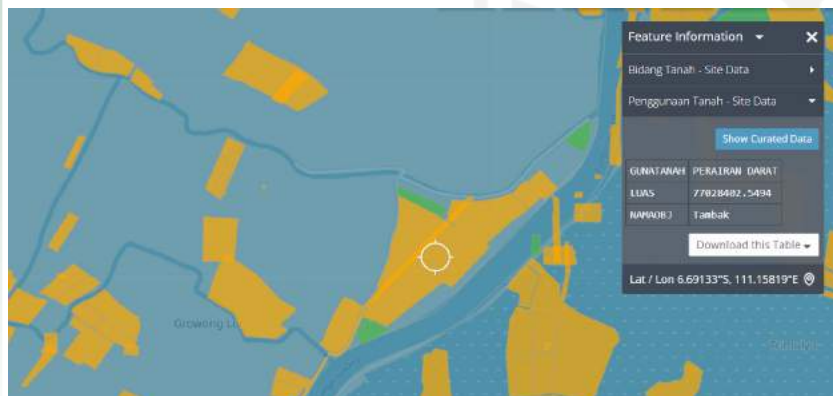
Property size.

Berdasarkan Peraturan Bupati 2015 Rencana Tata Bangunan dan Lingkungan Kawasan Kabupaten Pati. Pada Bab IV, Bagian Ketiga, Pasal 11 tentang Rencana Tapak, Poin a dan b;

- mengintegrasikan penggunaan lahan yang saling mendukung antara kegiatan perkantoran dan kegiatan perdagangan dan jasa yang ditunjang dengan kegiatan RTH;
- mengarahkan ketinggian bangunan untuk mempertajam karakter dengan tetap memperhatikan peraturan daerah tentang bangunan dan gedung setempat.

Bagian Keempat menhatur tentang Pengaturan intensitas pemanfaatan lahan sebagaimana dimaksud dalam Pasal 9 huruf c meliputi:

- ketinggian bangunan;
- koefisien lantai bangunan (KLB);
- koefisien dasar bangunan (KDB);
- koefisien dasar hijau (KDH); dan
- koefisien tapak besmen (KTB).



The site that is planned to be designated the Juwana Smart and Integrated Fish Hub area has the following points:

- Floor Area Ratio (FAR): 2,4
- Ground Floor Ratio (GFR): 70%
- Ground Cover Ratio (GCR): 20%
- The basement footprint coefficient is calculated for service trading buildings, parking buildings and offices that provide a basement for land expansion whose value is the same as the KDB value.
- The building setback is minimum 21 meters from the road

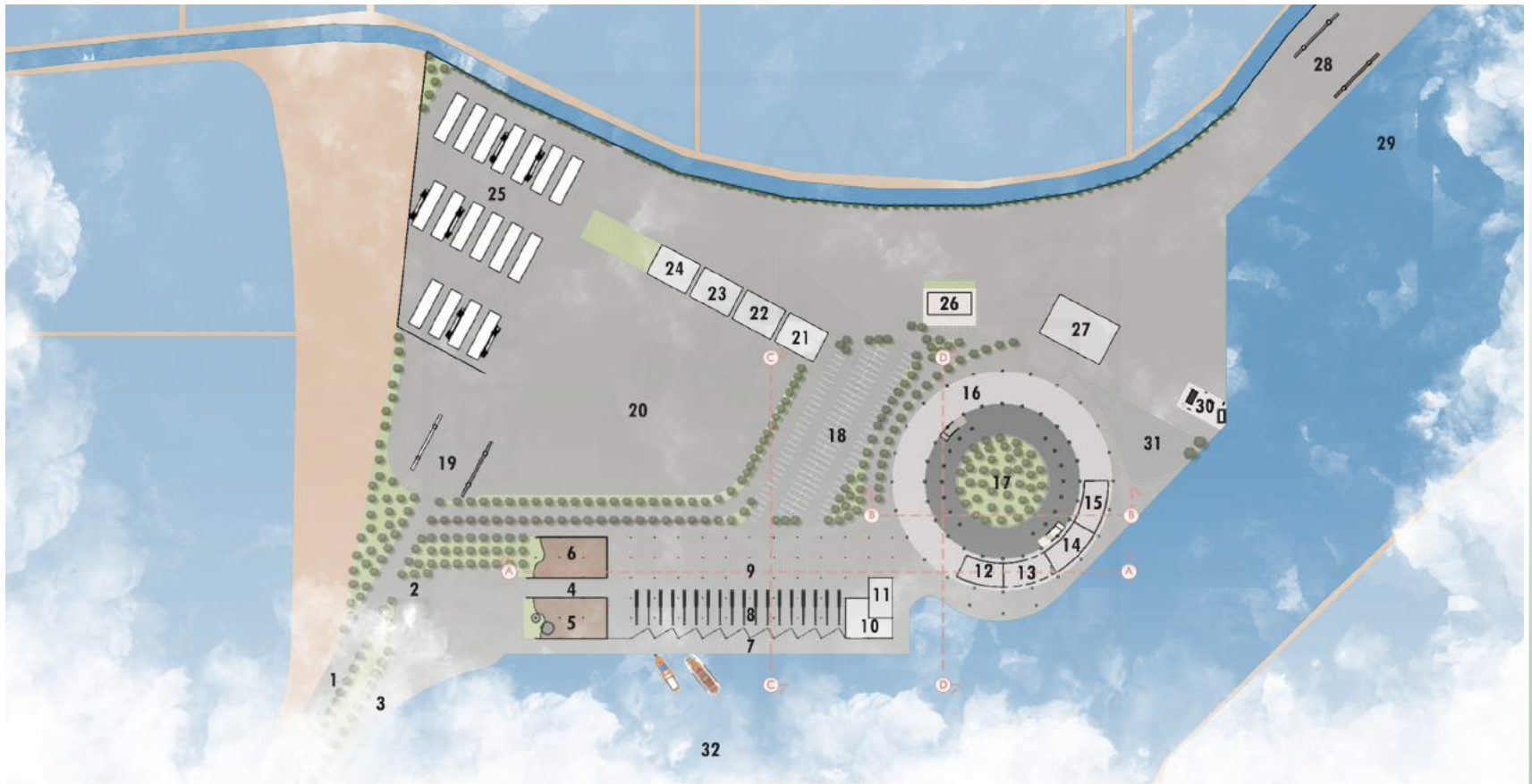
SITE AREA: 148,842.92 m²

GFR: 70% x 148,842.92 m² = 104,190.044 m²

FAR: 2,4 x 148,842.92 m² = 357,223.008 m²

GCR: 20% x 148,842.92 m² = 29,768.584 m²

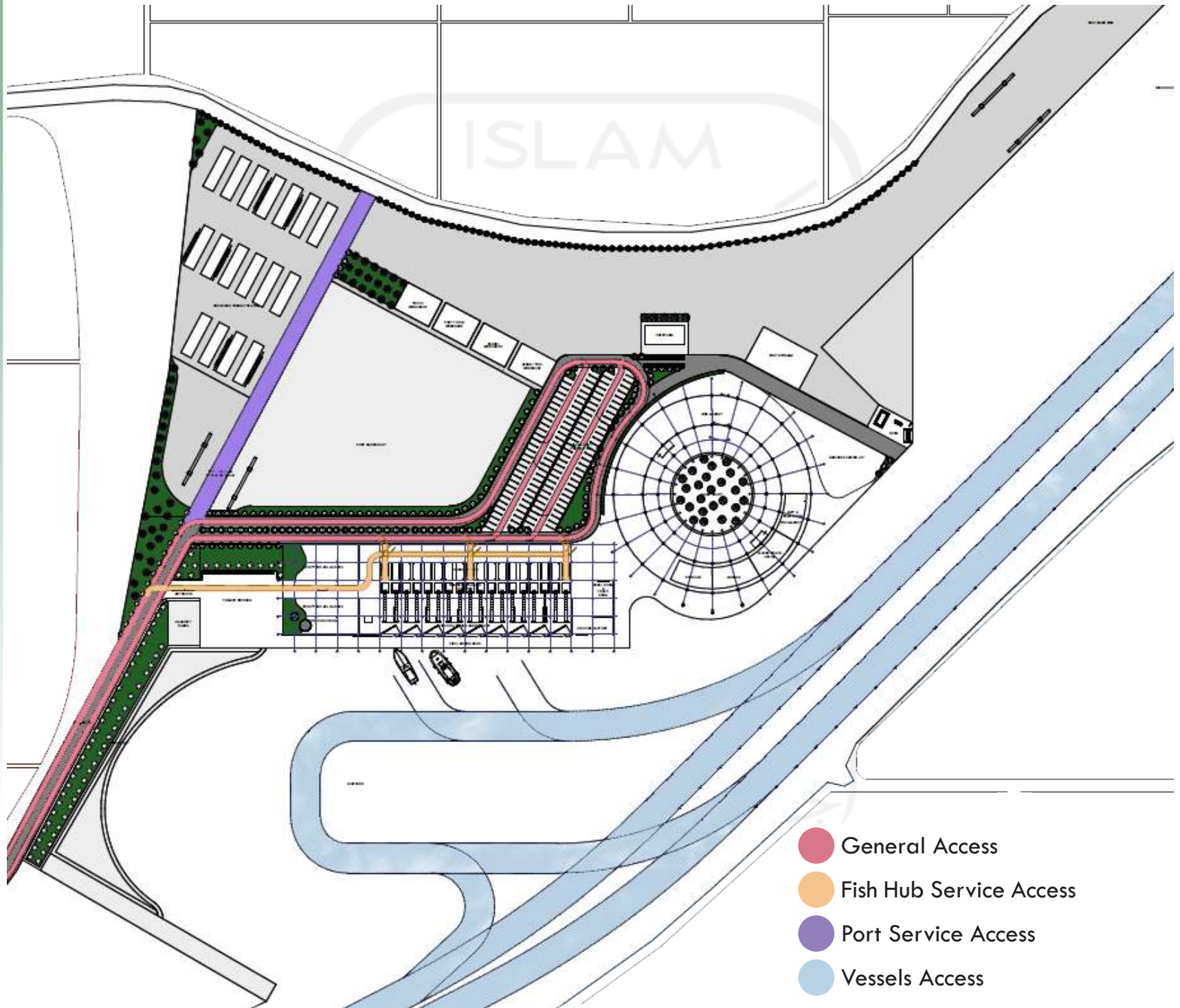
Masterplan Organization.



1. Boulevard
2. JFH Main Building Access
3. Riverfront
4. Tunnel
5. Urban Sea Farm
6. Hillside Garden
7. Fish Landing Base
8. Fish Shorting and Collecting
9. Loading Docks
10. Ice Cube Factory
11. MEE Room
12. Storage
13. Praying Room
14. Water Police Office
15. GWT & Pump Room
16. Fish Market

17. Inner Courtyard
18. Parking Lot
19. Port Gate & Container Scales
20. Port Parking Lot
21. Vessel Tool Workshop
22. Vessel Workshop
23. Port Tools Workshop
24. Truck Workshop
25. CFS (Container Freight Station)
26. Cafeteria
27. Port Storage
28. Container Pier
29. River Dock
30. SPBN
31. Service Parking Lot
32. Shipyard

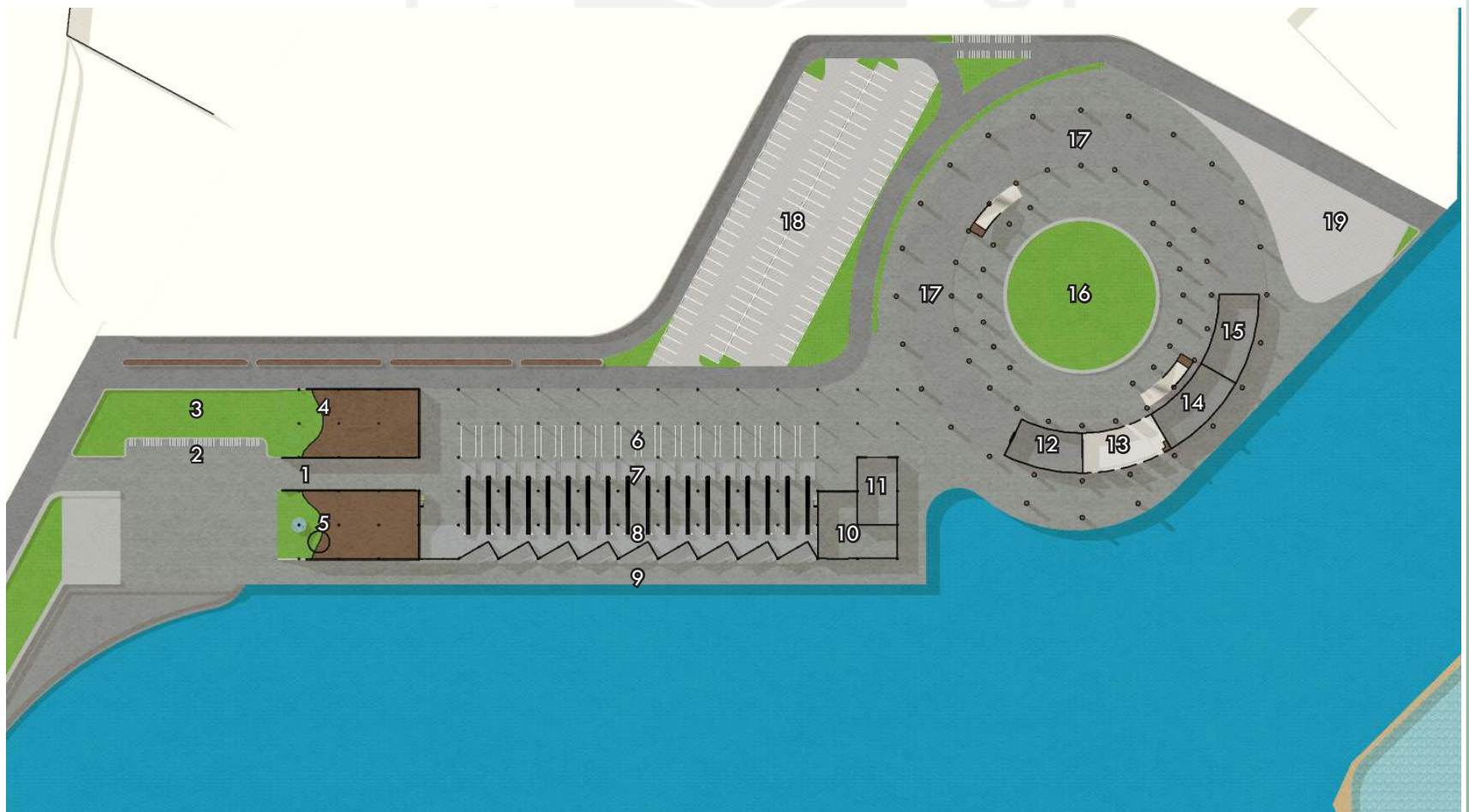
Urban Circulation.



Fish Hub Center Plan.

Ground Floor Plan

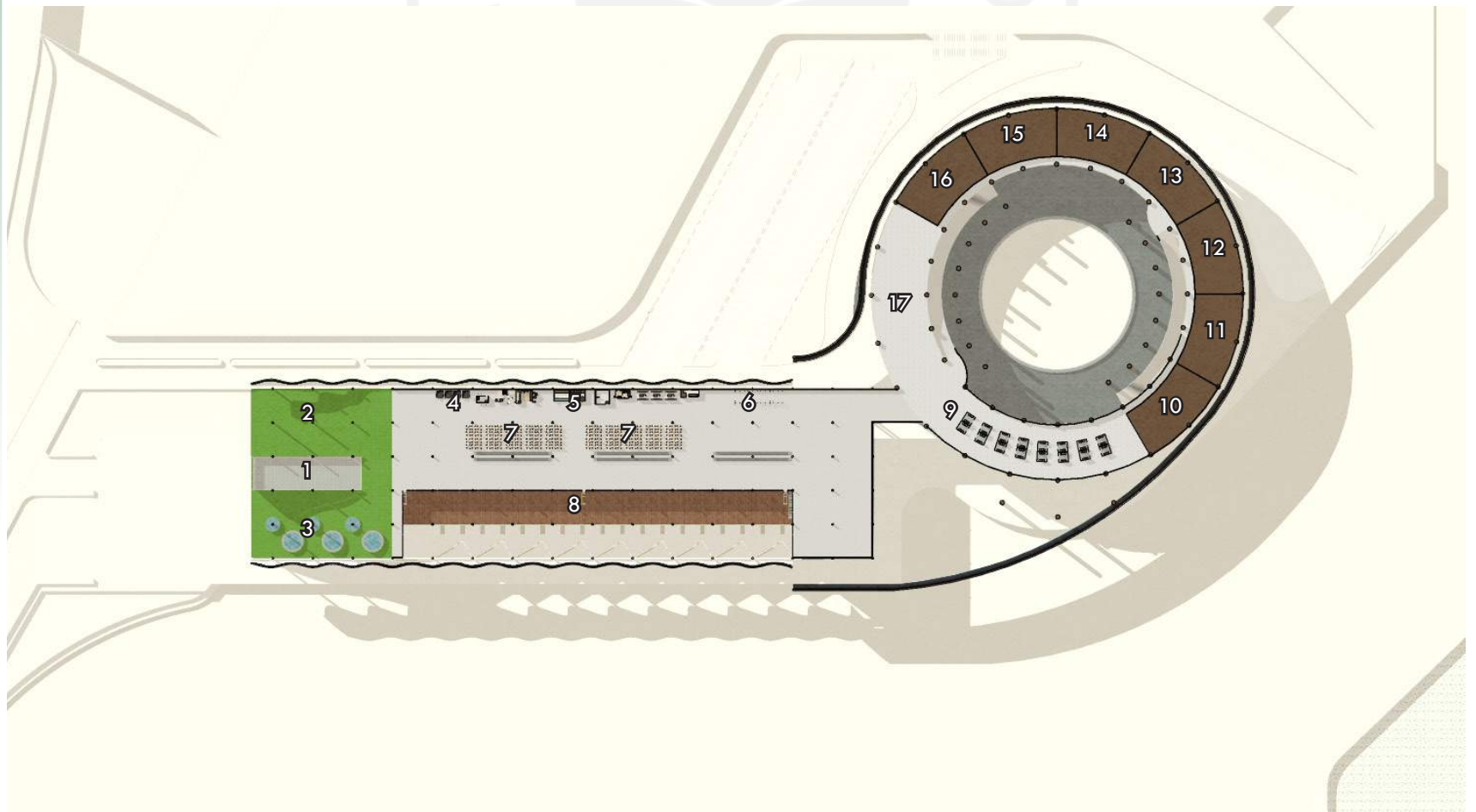
1. Tunnel
2. Visitor Parking Lot
3. Front Garden
4. Hillside Garden
5. Urban Sea Farm
6. Loading Docks
7. Fish Sorting & Cleaning
8. Fish Collecting
9. Fish Landing Base
10. Ice Cube Factory
11. MEE Room
12. Storage
13. Praying Room
14. Water Police Office
15. GWT & Pump Room
16. Inner Courtyard
17. Fish Market
18. Parking Lot
19. Service Parking Lot



Fish Hub Center Plan.

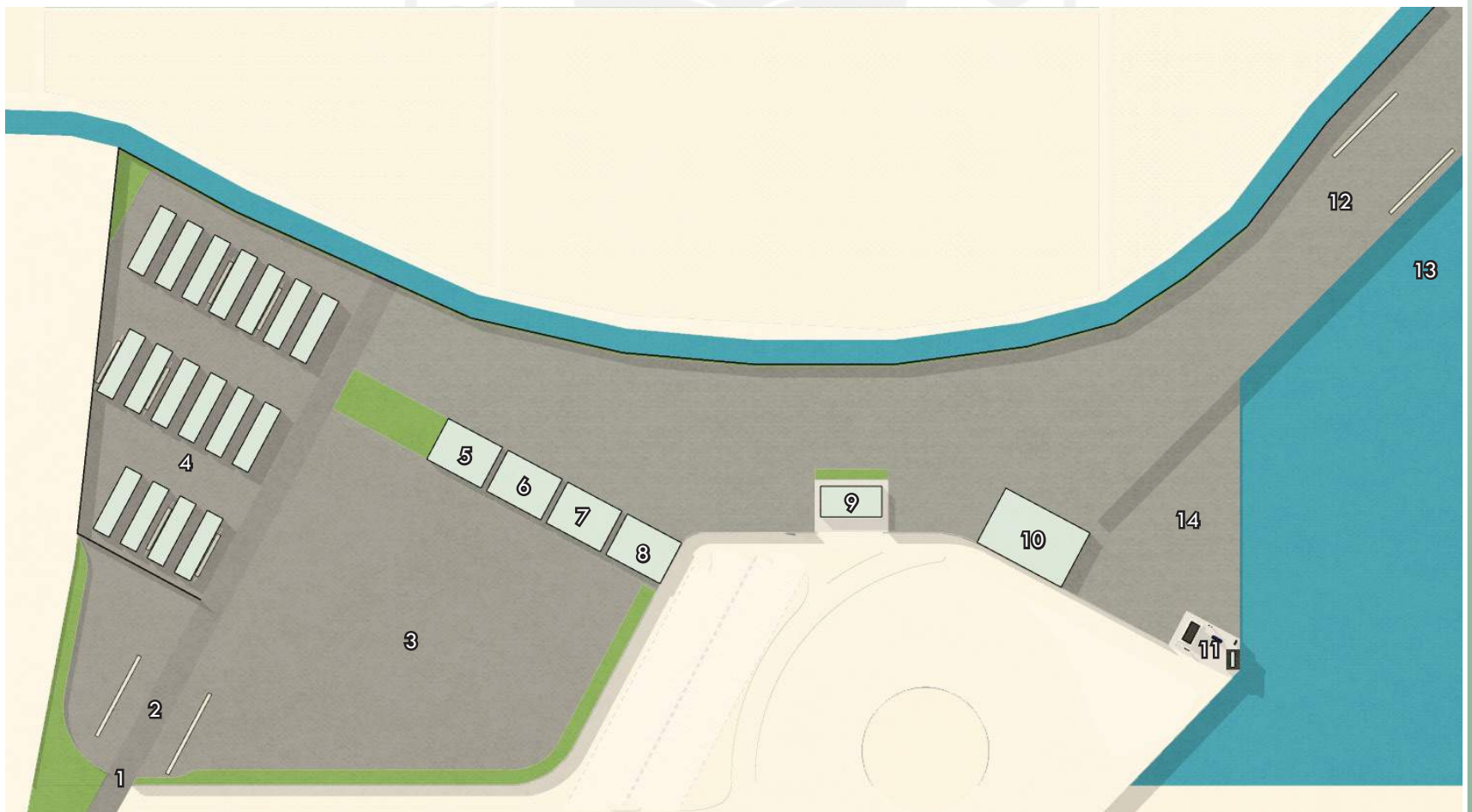
Upper Floor Plan

1. Porch
2. Hillside Garden
3. Urban Sea Farm
4. Souvenirs
5. FnB
6. Decorative Fish
7. Eating Space
8. Mezanine
9. Working Boxes
10. JSIFH HQ
11. Maintenance Room
12. Local Bank
13. Toilet & Shower
14. Working Unit Office
15. Port Service Office
16. Syahbandar
17. Communal Space

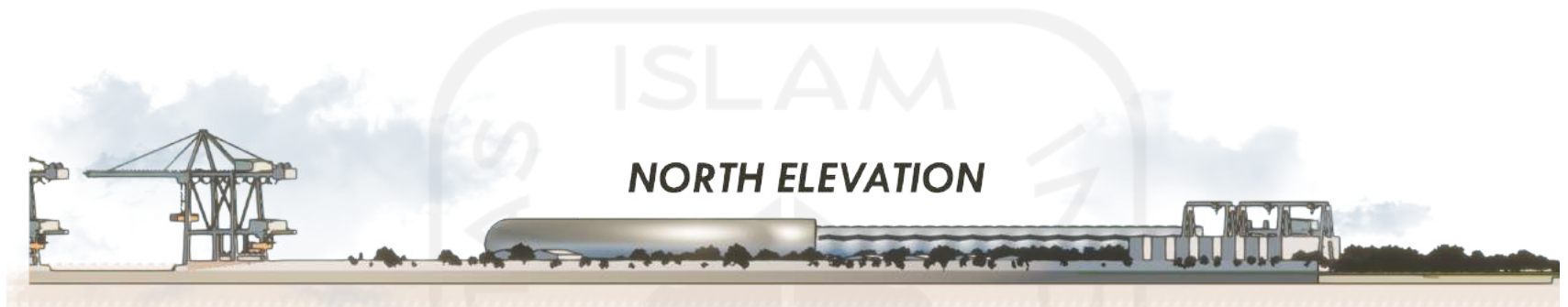


Commercial Port Area Plan

1. Main Access Road
2. Registration and Weighing Gate
3. Truck Parking Lot
4. Container Freight Station (CFS)
5. Truck Workshop
6. Port Tools Workshop
7. Vessel Workshop
8. Vessel Tools Workshop
9. Cafeteria
10. Port Storage
11. SPBN
12. Container Pier
13. River Docks
14. Dry Docks



Juwana Smart and Integrated Fish Hub Elevation.



Fish Hub Center Section.

AA SECTION



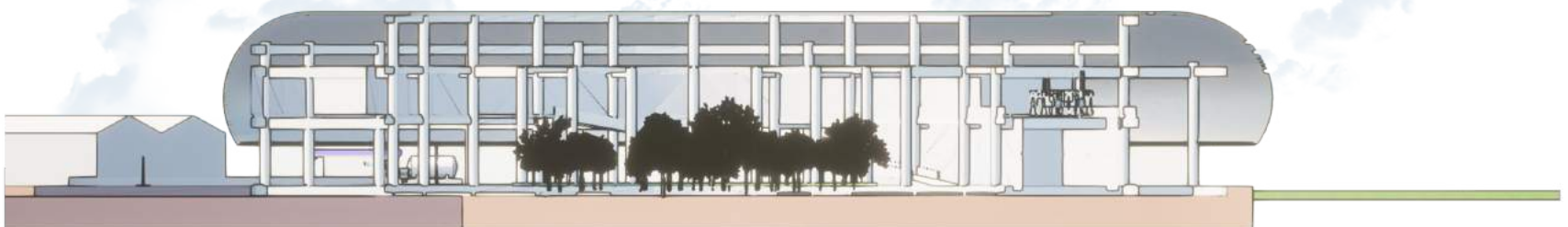
BB SECTION



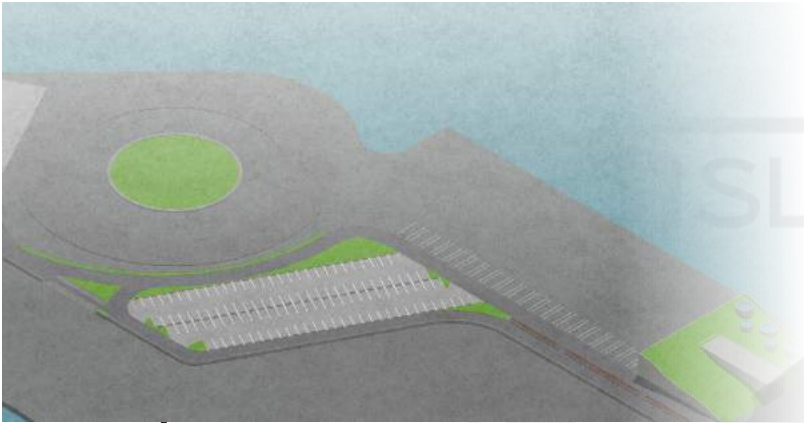
CC SECTION



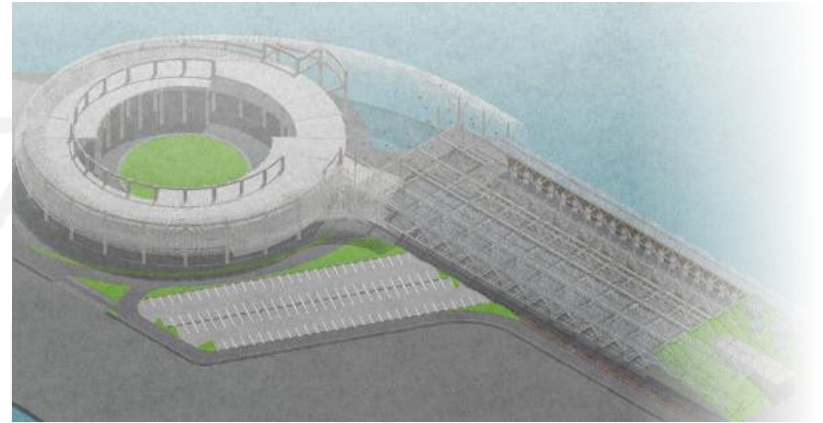
DD SECTION



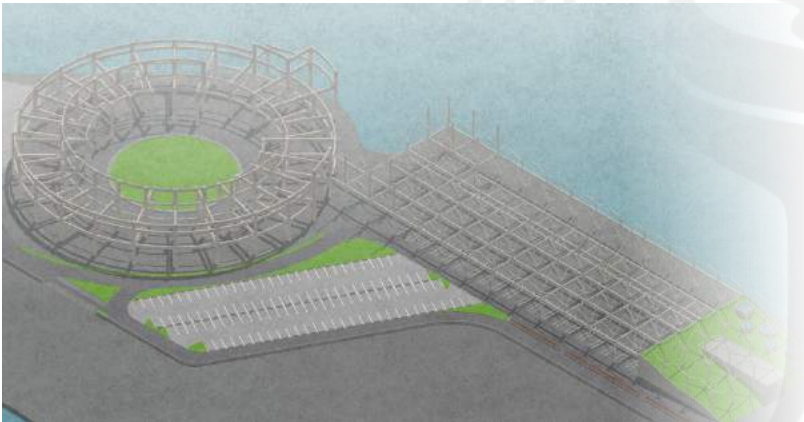
Building Design.



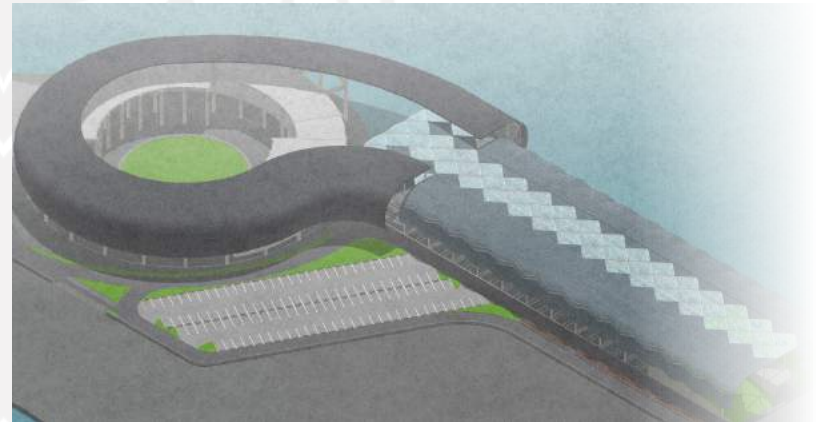
1. Ground Site



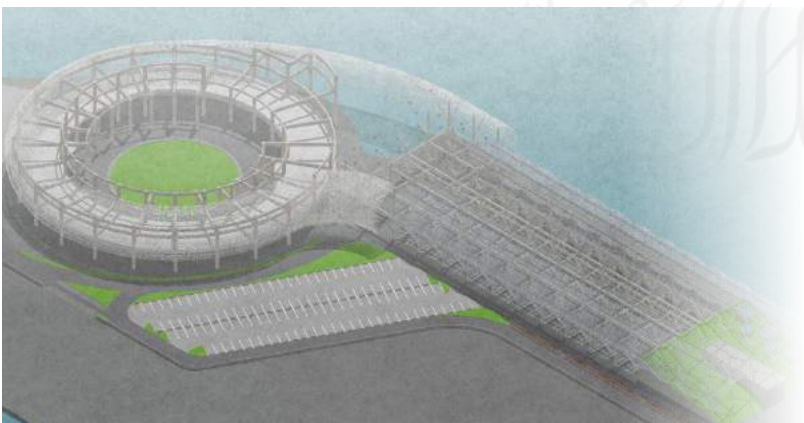
4. Bearing Systems



2. Structure Systems

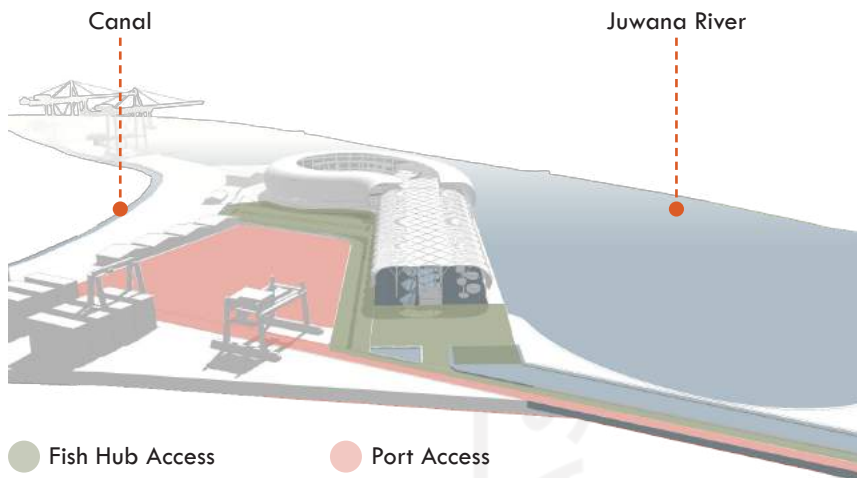


5. Building Envelope

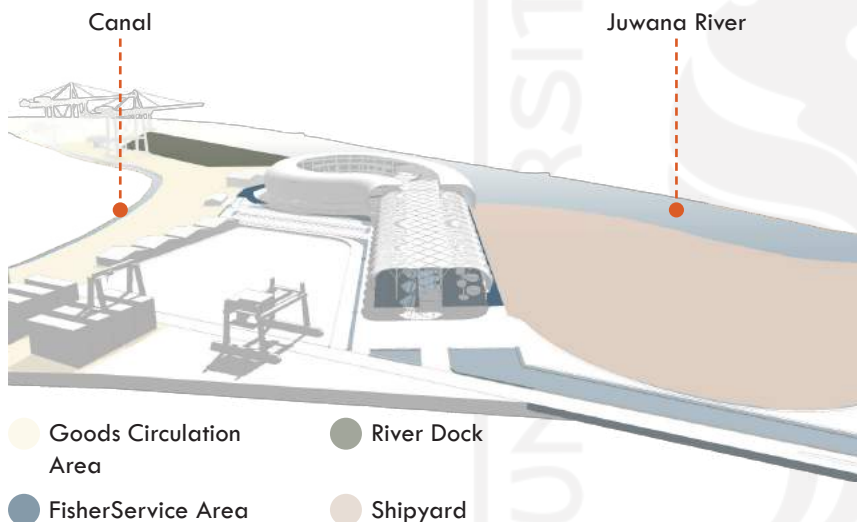


3. Secondary Skin Structure Systems

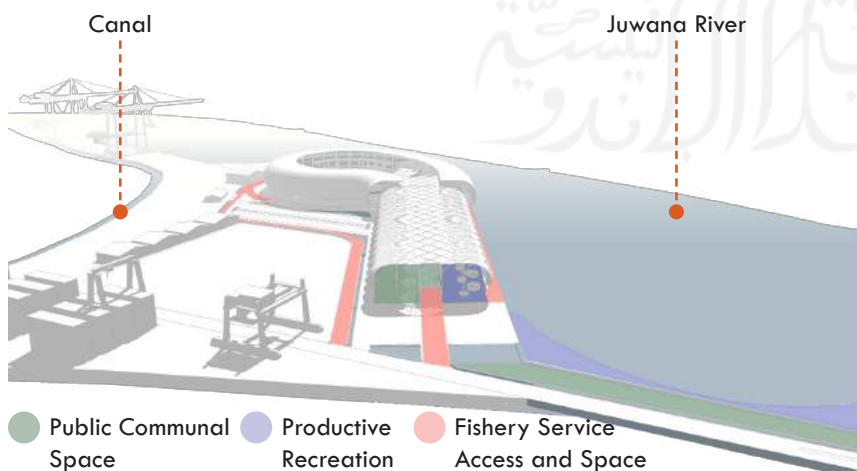
Accessibility by Function



Service Focus Area



Community Spaces

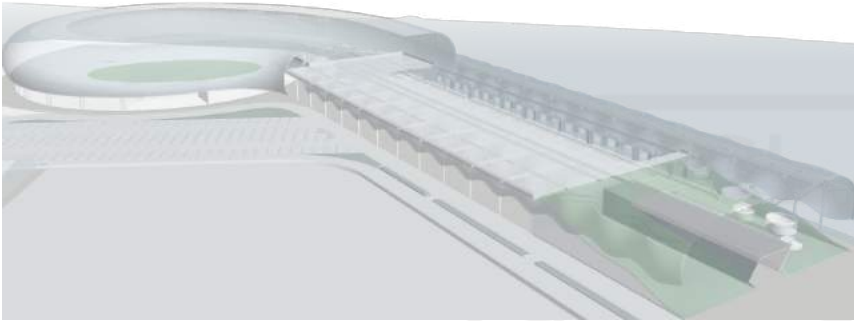


The main access to the Juwana Smart and Integrated Fish Hub area is via a local road which was later developed into the main road for the Juwana Smart and Integrated Fish Hub. Where the road is shared between users and visitors of Juwana Smart and Integrated Fish Hub, but inside it is separated based on 2 main functions in the area. The Fish Hub Building covers the activities of buying and selling marine products, recreation, and offices which are more general, open and intended for all people. Meanwhile, the commercial port zone is devoted to transitional functions in the logistics and manufacturing industries. So it is limited to target visitors who are more private and special.

The division between service zones applies to the division of zoning functions in the area. Where the focus of commercial port activities and Fish Hub do not intersect or overlap with each other. It aims to create a clear barrier of security, openness, comfort and effectiveness in the work environment, which greatly affects the productivity level of the any aspect that involved in Fish Hub and commercial ports.

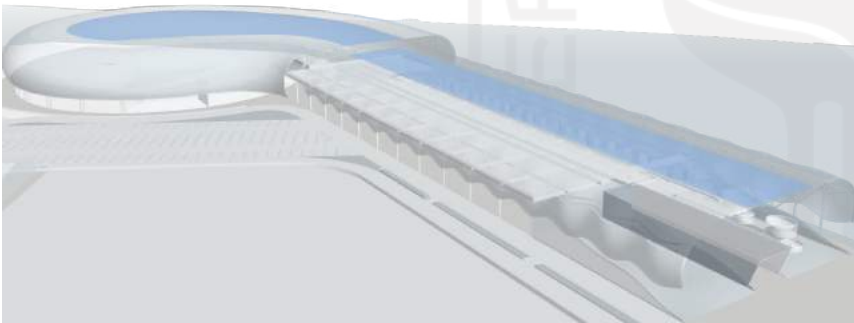
In the Fish Hub Area, the division of community space is interrelated and involves visitors and workers, where these activities are basic. Where there are areas that focus on recreational activities in general in communal spaces, recreation with the theme of marine production and fish port activities, as well as the use of service rooms that are intended for the marine industry, with the exception of service access outside the building which is also public access in the Juwana Smart and Integrated Fish Hub.

Green Space



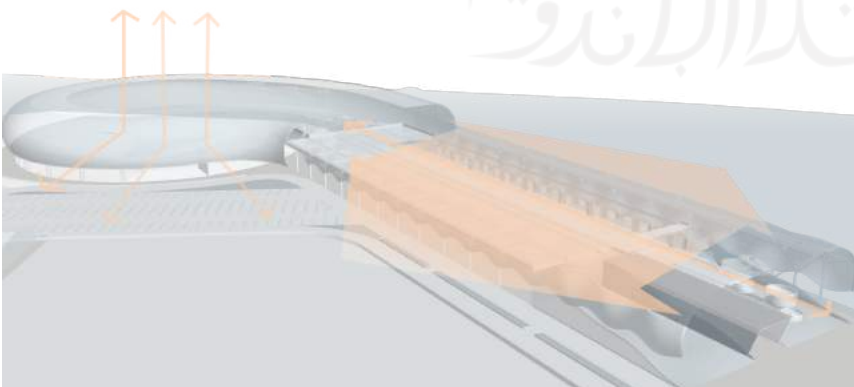
Juwana Smart and Integrated Fish Hub, which is oriented towards the productivity of the marine and fisheries industry, does not necessarily stick to strictly industrial areas that are synonymous with pollution, rigid and unfriendly to visitors. With the mission to change this paradigm, green open space is maximized which is also an open space for visitors as well as a communal space that can be used not only for visitors but also for all workers involved in the Juwana Smart and Integrated Fish Hub.

Natural Light Ventilation



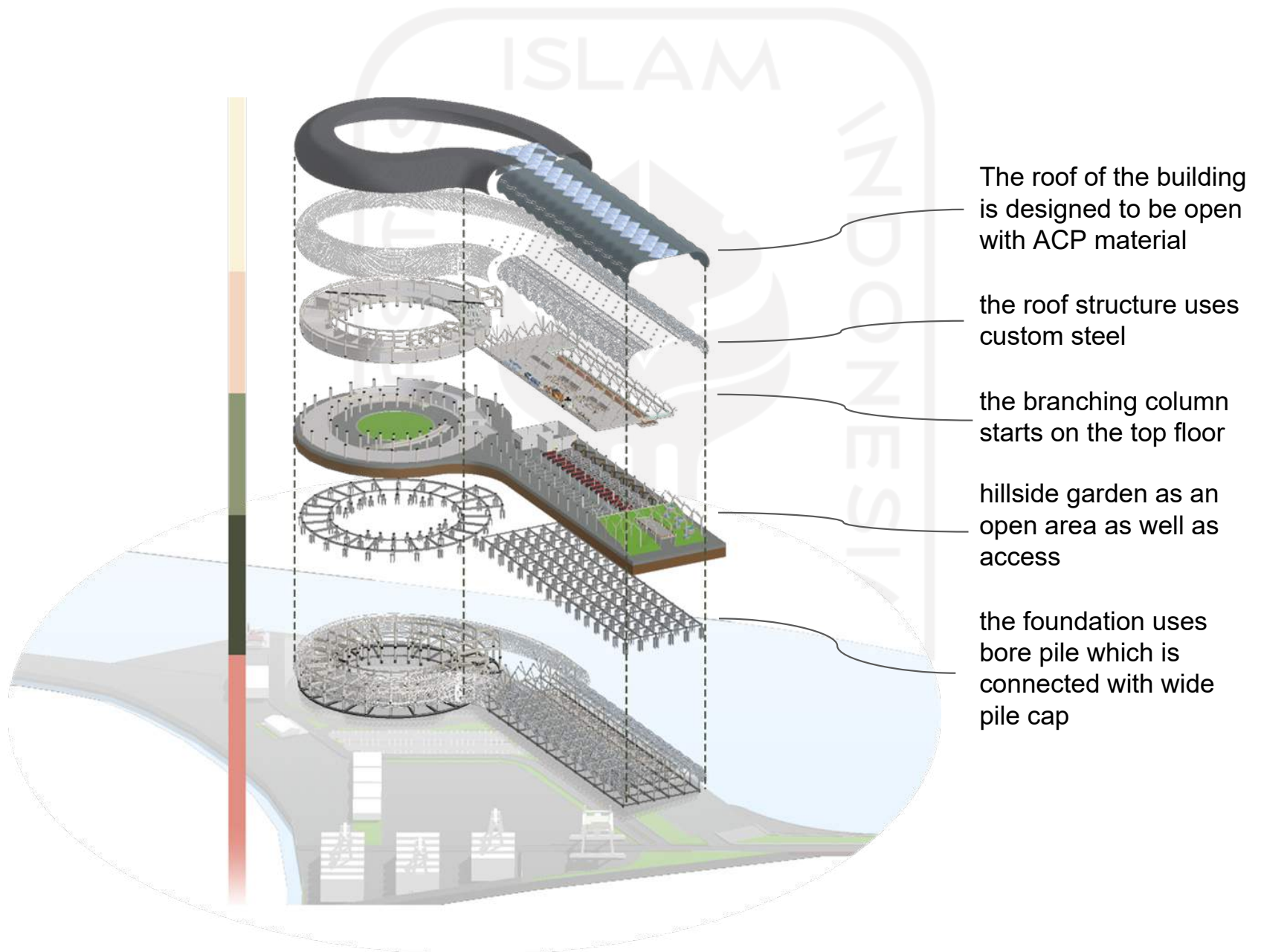
Fish Hub Building adapts the form of a wide-span building and has an integrated building envelope between the auction place, public space, office area and fish market. The need for a work space that is able to accommodate fishery production capacity as much as possible is juxtaposed with public activities that are oriented towards user comfort in space. Therefore, the shape of the roof is made organic and repetitive with an acrylic frame that is composed of the front of the building to the transition between the front fish hub building and circular building at the back.

Indoor Air Circulation



The design of Fish Hub Building is very open. The combination of high ceilings, wide expanses, buildings without partitions, close to the water, the orientation of the buildings adjusted to the average wind direction from east to west or vice versa is a design that is expected to be able to sweep away various types of odors mixed with the typical smell of fish auction places, ports, fish markets that are forced to coexist with office and recreational activities. Air circulation is given as free space as possible in the cross ventilation system. Where the indoor comfort also provides a solution to the coolness indoor and changes the paradigm of the fish auction place with its distinctive smell.

Exploded Axonometry.



Facade and Building Envelopes.



Facade pada bangunan utama dirancang lebih organik, hal tersebut dapat merangkul berbagai macam tujuan desain. Bentuk yang organik dan eye-catching direncanakan sebagai elemen rekreasional dan menarik pengunjung. Dilain sisi, repetitif gelombang yang disesuaikan dengan tenangnya Sungai Juwana, juga difungsikan sebagai pemecah angin karena berlokasi di tengah kawasan pertambakan dan reflektor suara dari kegiatan pelabuhan dan riuh aktivitas perkapalan.



The east side of the building is made of a circle and resembles a snail. The shape of the 2-storey circular building which is closed on top shows the exclusive side of the form of activity above it, namely the office area. While at the bottom is made open as a fish market.

The fish market is not covered by a veil and is designed without a barrier. It aims to achieve a healthy fish market. Based on the goal to change the market paradigm in general, the fish market at Juwana Smart and Integrated Fish Hub is designed to be open. Where to maximize air movement that sweeps away unpleasant odors that are at risk of being trapped if designed with a closed space. The single bank building with an inner court also helps maximize natural lighting in the fish market.

The office area requires a level of comfort that is 1 level above other forms of activity in the Juwana Smart and Integrated Fish Hub area to support the concentration and productivity of its workers. The location of the office on the top floor is also affected by the noise intensity which is minimized by the separation of more field works on the lower floor. And the upper floor also accommodates workers not to have to go far to find a place to rest and refresh because it is located on one floor with the FnB area in the main Fish Hub building.

The single bank design is also applied with an inner court in the middle. So that even though it is closed from the outside, every room in the office area still gets sufficient natural light and adequate cross ventilation.

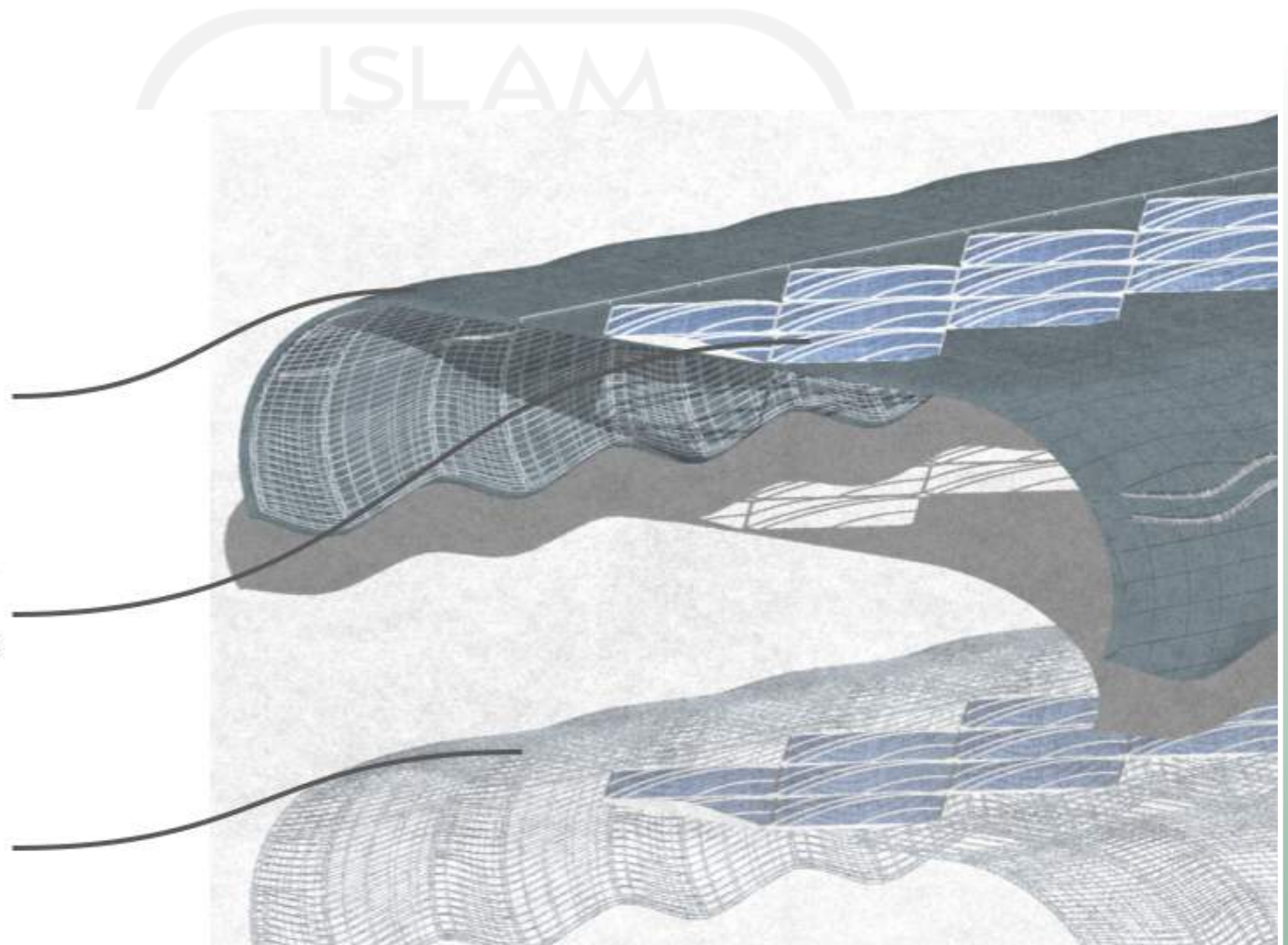


Envelope Concept.

the roof of the building is designed to be open with custom ACP material

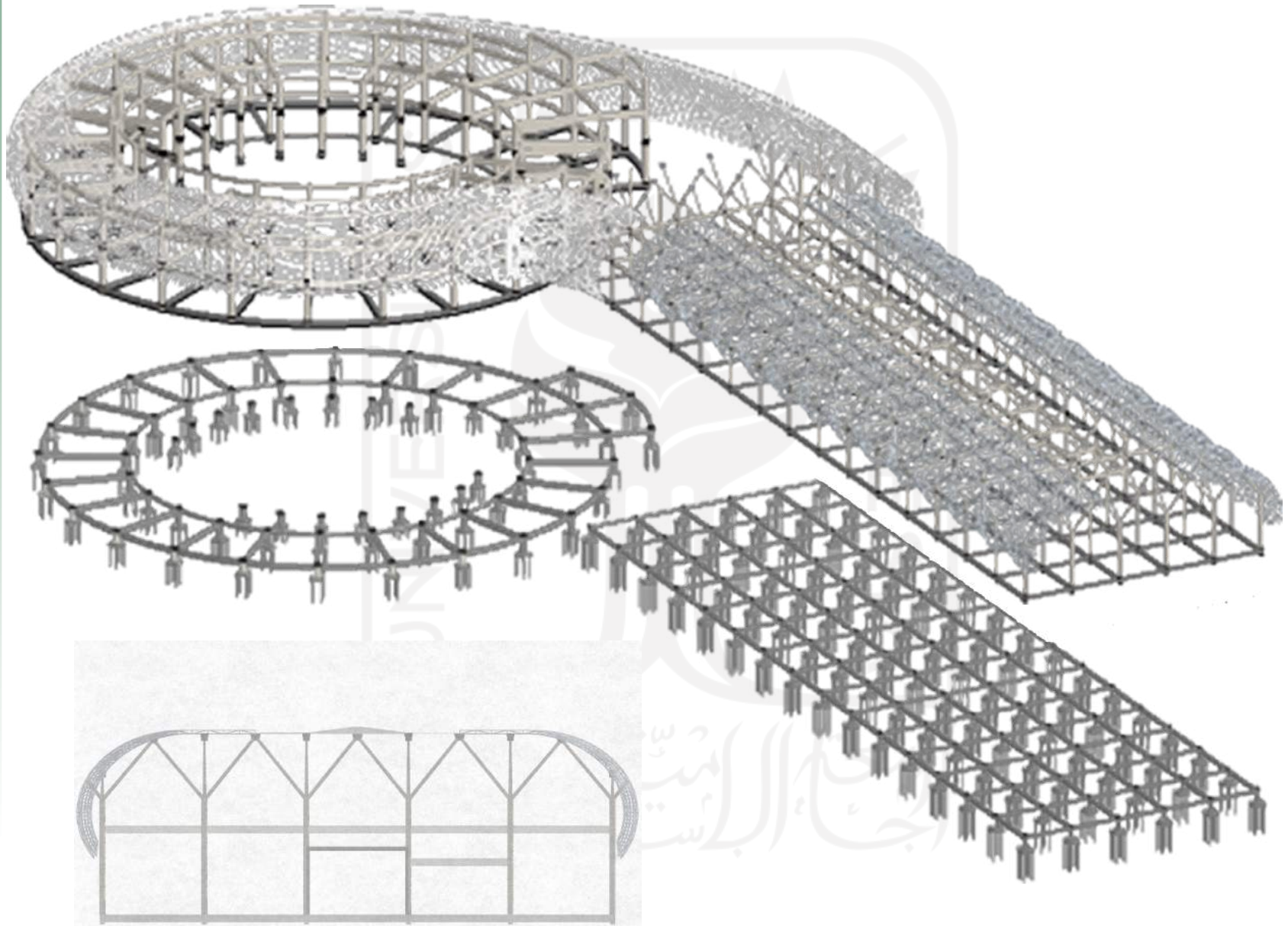
skylights that divide the building mass to optimize natural lighting using curb mount skylights with Heat Block Acrylic and clear anodized finished frame

the roof structure uses custom steel with a repetitive model which is then hung on the building column



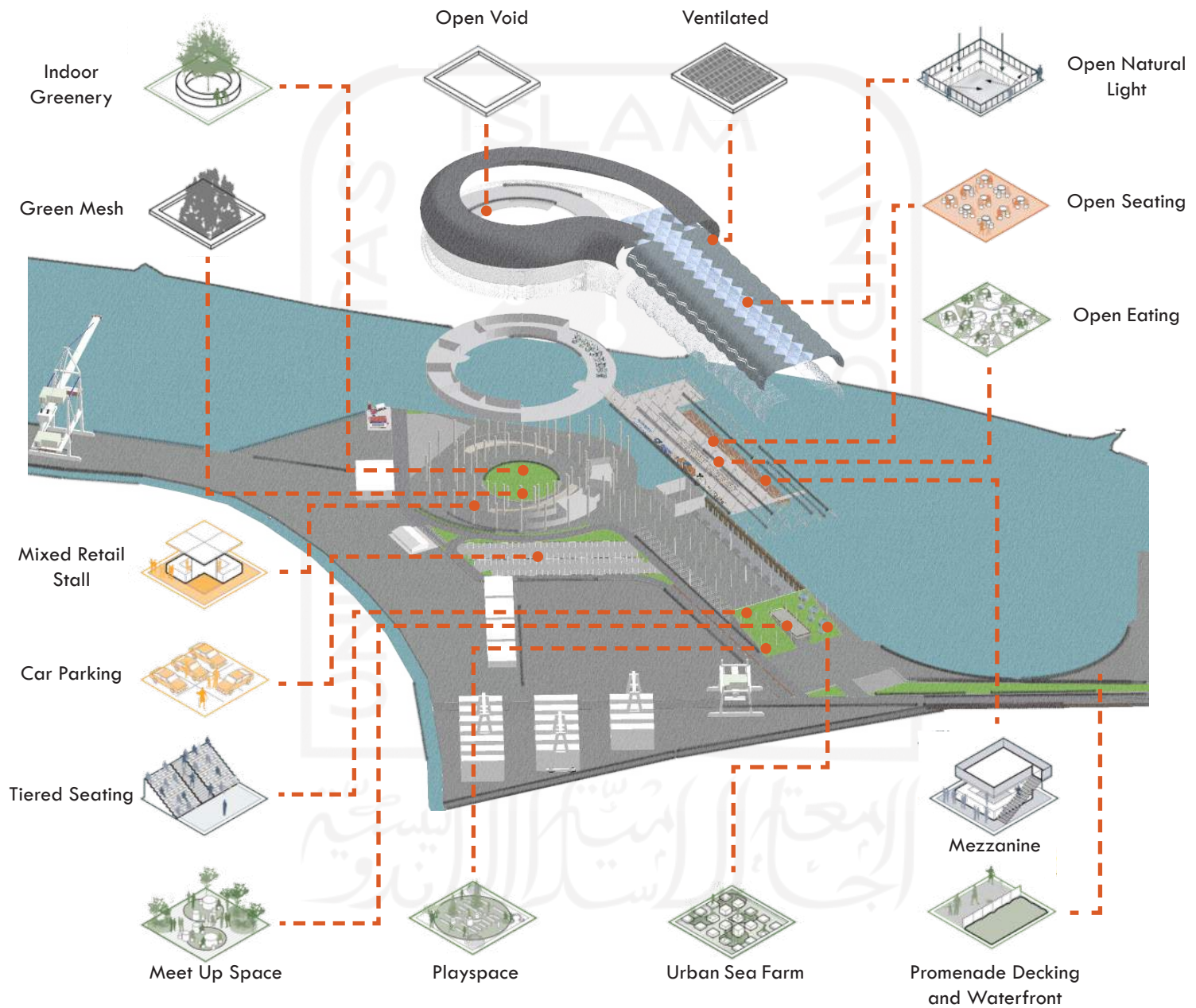
Structure & Infrastructure

Concept. *Structure Systems.*

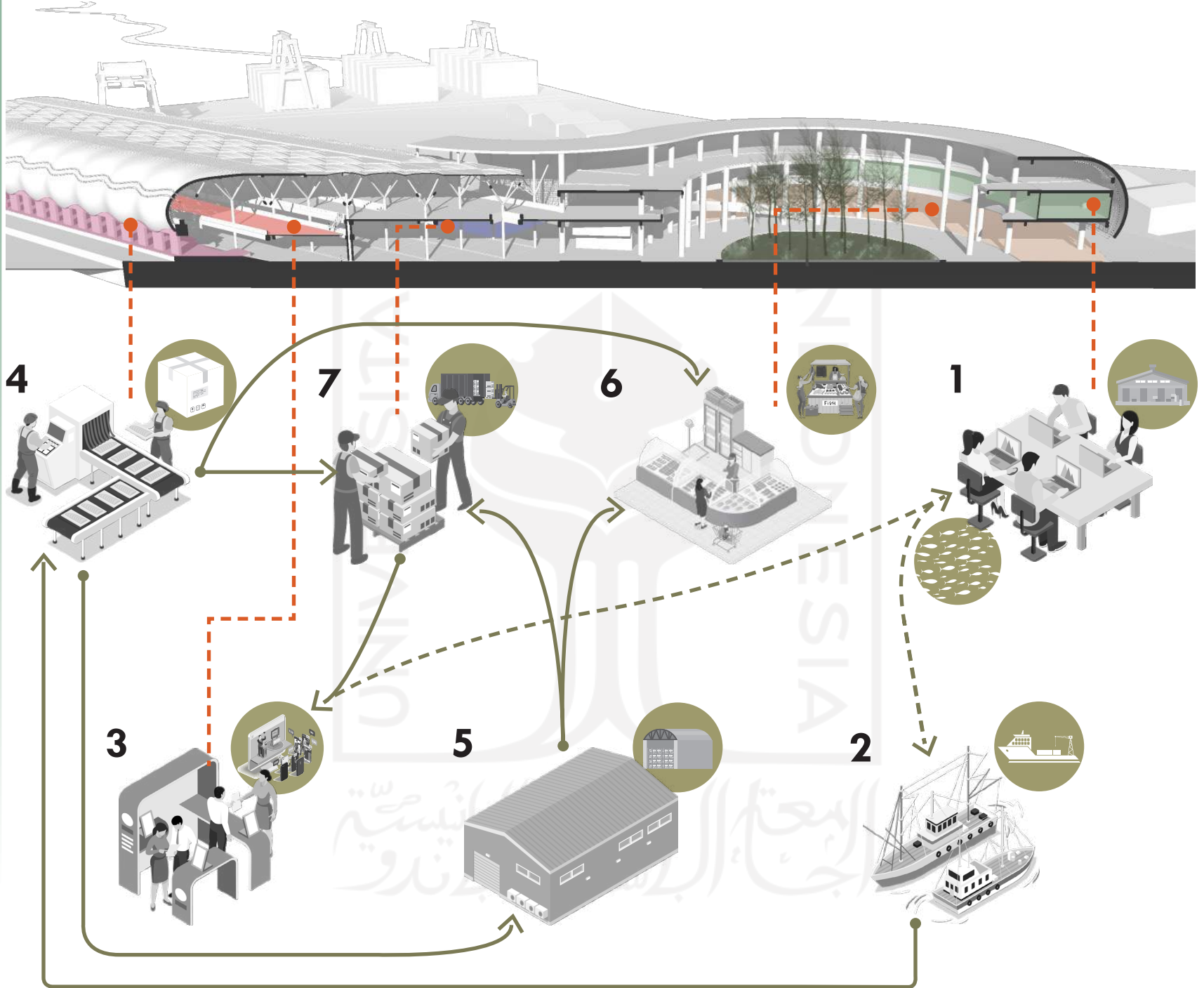


Juwana Smart and Integrated Fish Hub is included in the wide span category, with a span between columns of 10.8 m and 9.2 m. The design uses a bracing column type that is able to reach wide spans and does not require too large column and beam sizes.

Scale, Experience and Flexibility.



IT/OT in Building Design



1. The Office manage the demand, order, and inform to the customer. In the same time give real-time information about fish tracking and weather information to the fisherman.

2. The Fisherman give data of sea product to to customer.

3. The online andoffline customer for fish market and auction.

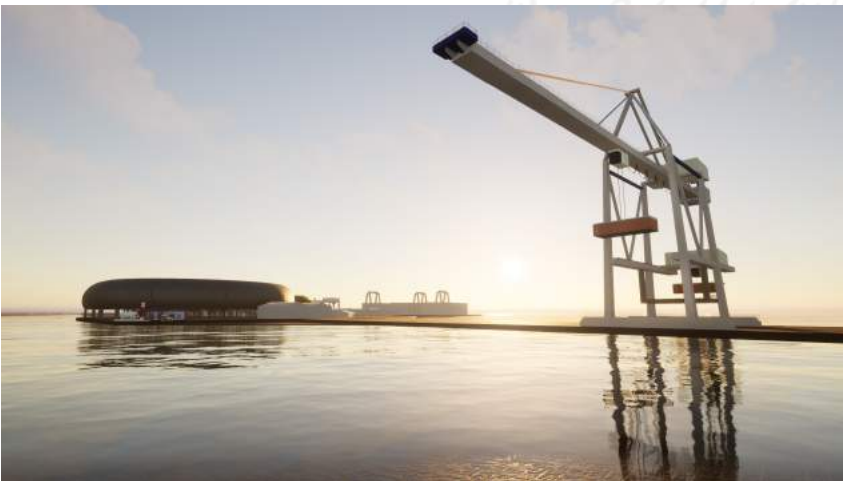
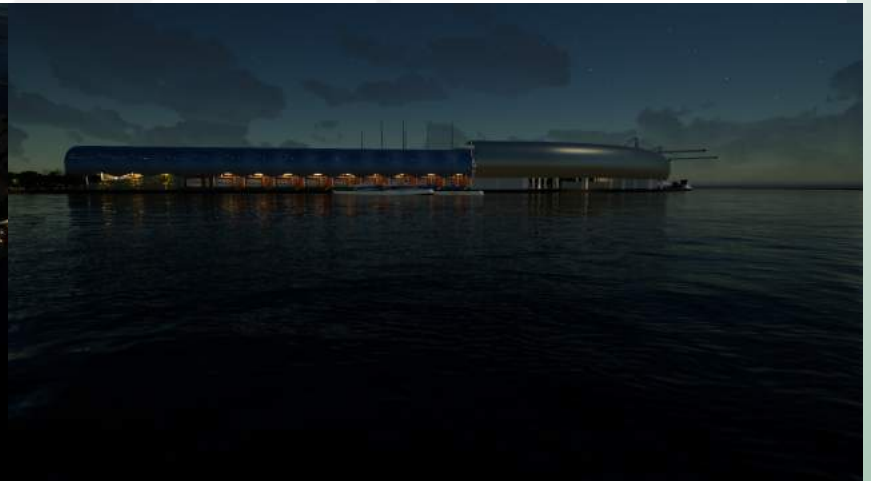
4. Fish selection for high demand, auction, processing and market needs.

5. Fish processing in local business shareholders.

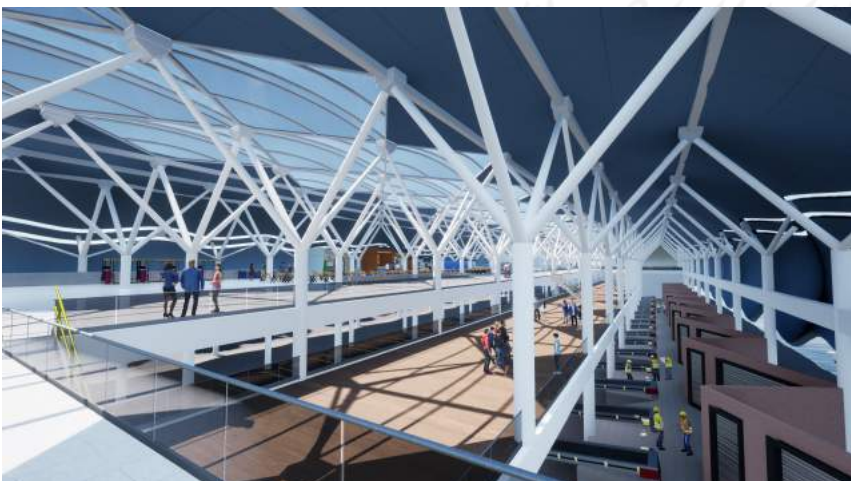
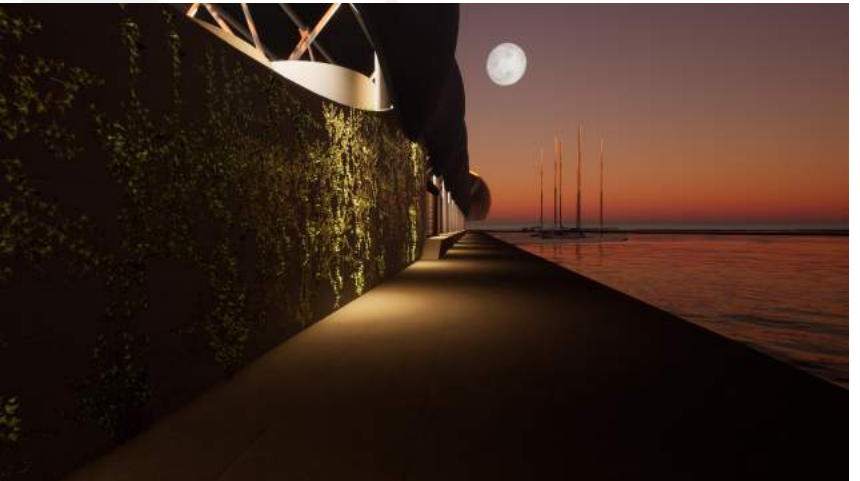
6. Fish market.

7. Distribution of product fresh or processed to customer.

Exterior Looks.



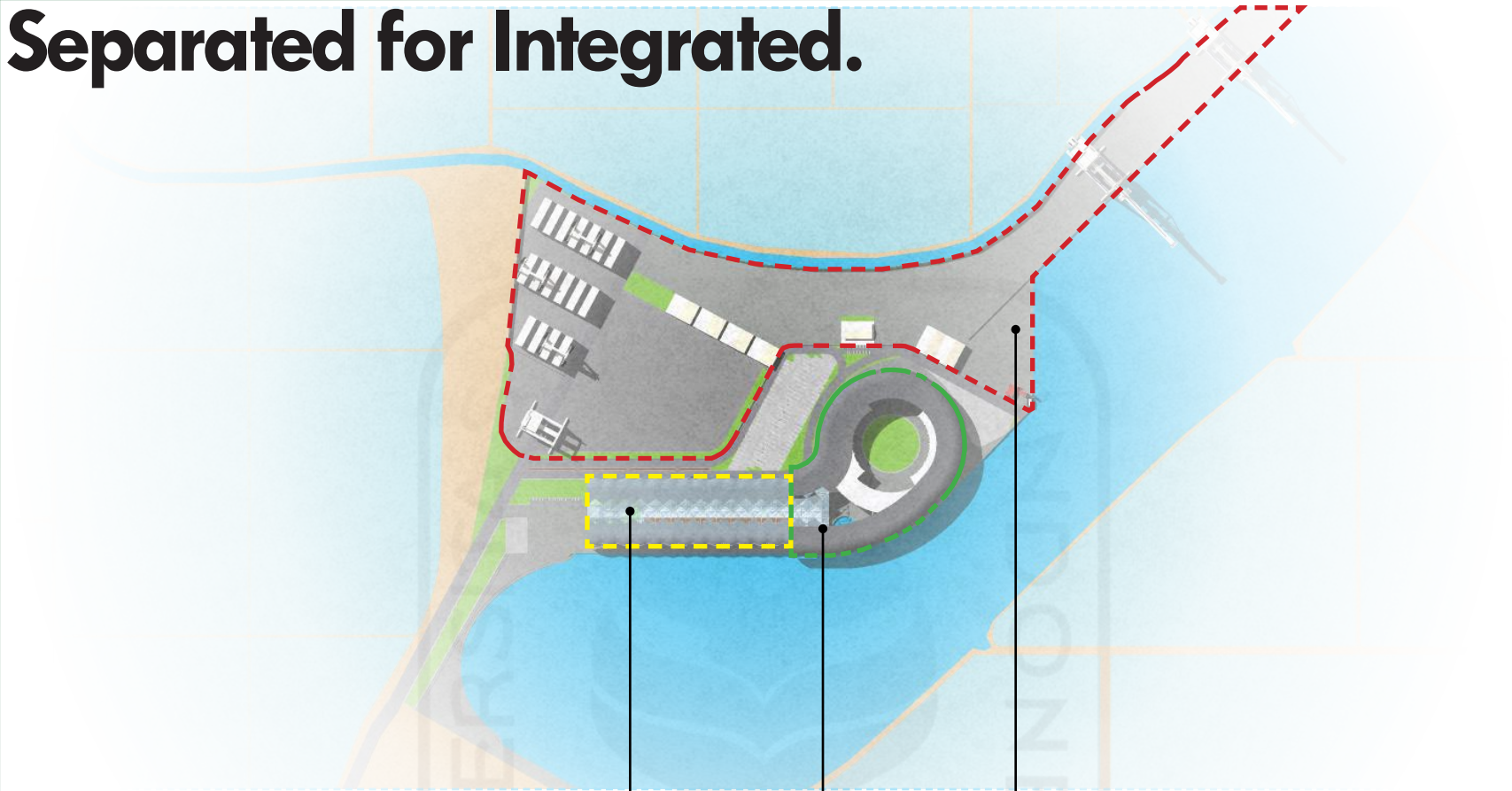
Interior Looks



Chapter 5

Design Evaluation.

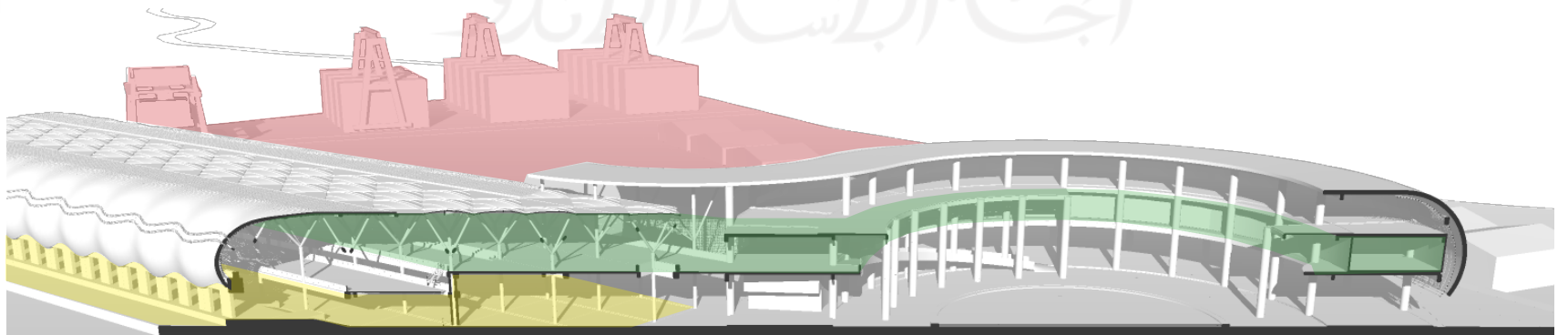
Separated for Integrated.



The site plan shows a waterfront area divided into three functional zones. A red dashed line outlines the entire site. A yellow dashed line highlights the 'Fish Production' area, which includes a large circular structure and a rectangular building. A green dashed line highlights the 'Managerial Area', which is a central circular plaza. A black dashed line highlights the 'Commercial Port' area, which is a long pier extending into the water. Three vertical lines with dots at the top point from the labels below to the corresponding zones in the plan.

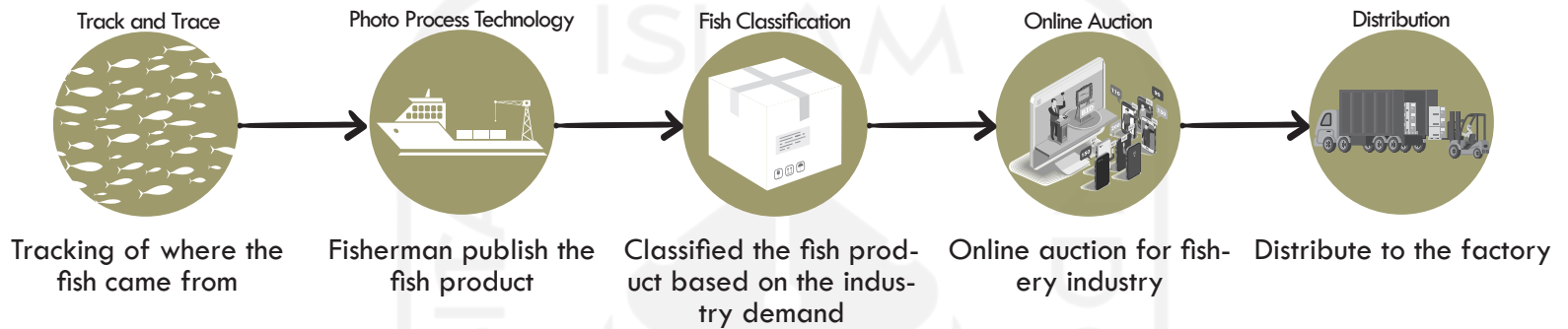
Fish Production
Managerial Area
Commercial Port

The separation based on the function of the major function. Because one of the problems to be solved is how to design a Fish Hub that is comfortable for various kinds of visitors, but does not damage the productivity of the existing types of work. Then it is integrated through the system. Where the Managerial Area is the key. The dilated design within the scope of the Fish Hub facilitates the accessibility and monitoring of marine product production while providing equal rights for workers with the same amenities as visitors. Commercial Port is run with IT/OT principles, so its management can also be centered in the Managerial Area.



Business Model to Design.

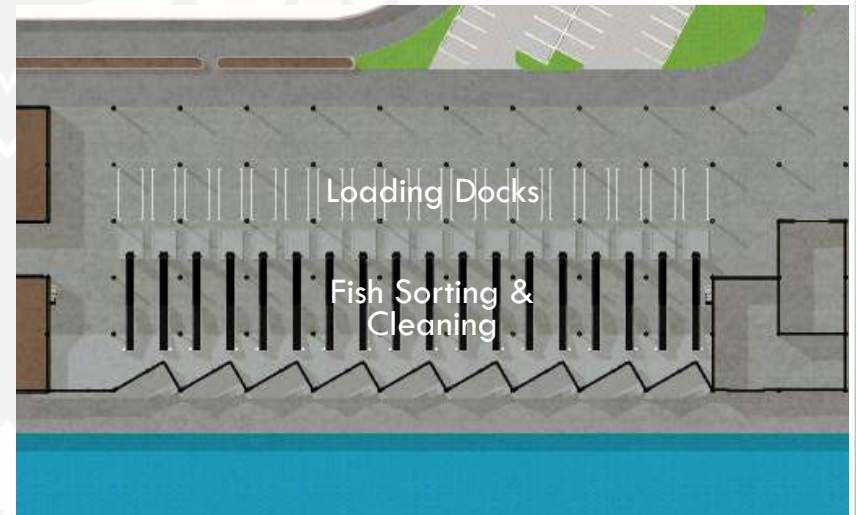
The introduction of a new business model at the Juwana Smart and Integrated Fish Hub is not only to facilitate the reach between customers, buyers, sellers, workers, shareholders, stakeholders, and government with the marine products to be easy. The business model automatically selects space requirements that are replaced by digital systems to be more concise and efficient. The remaining space can be used for production needs in terms of production time and number of commodities.



The thing that most influences the implementation of digitization in the fishing industry is that there is no need for the presence of buyers and fish auction activities. These two activities generally affect the production cycle, especially in terms of time consumption, space fulfillment and fishery production hygiene.



The activities that took place at TPI Juwana Unit II were adapted to modern needs for effectiveness and efficiency. Therefore, digitalization was introduced for more efficient use of space.



The absence of buyers, provides more room for innovation in accelerating fishery production. The space that was previously intended to collect tons of fish before an auction is held with prospective buyers watching and selecting the fish they want to buy all day long will be replaced by a space that focuses on product distribution and product quality control.

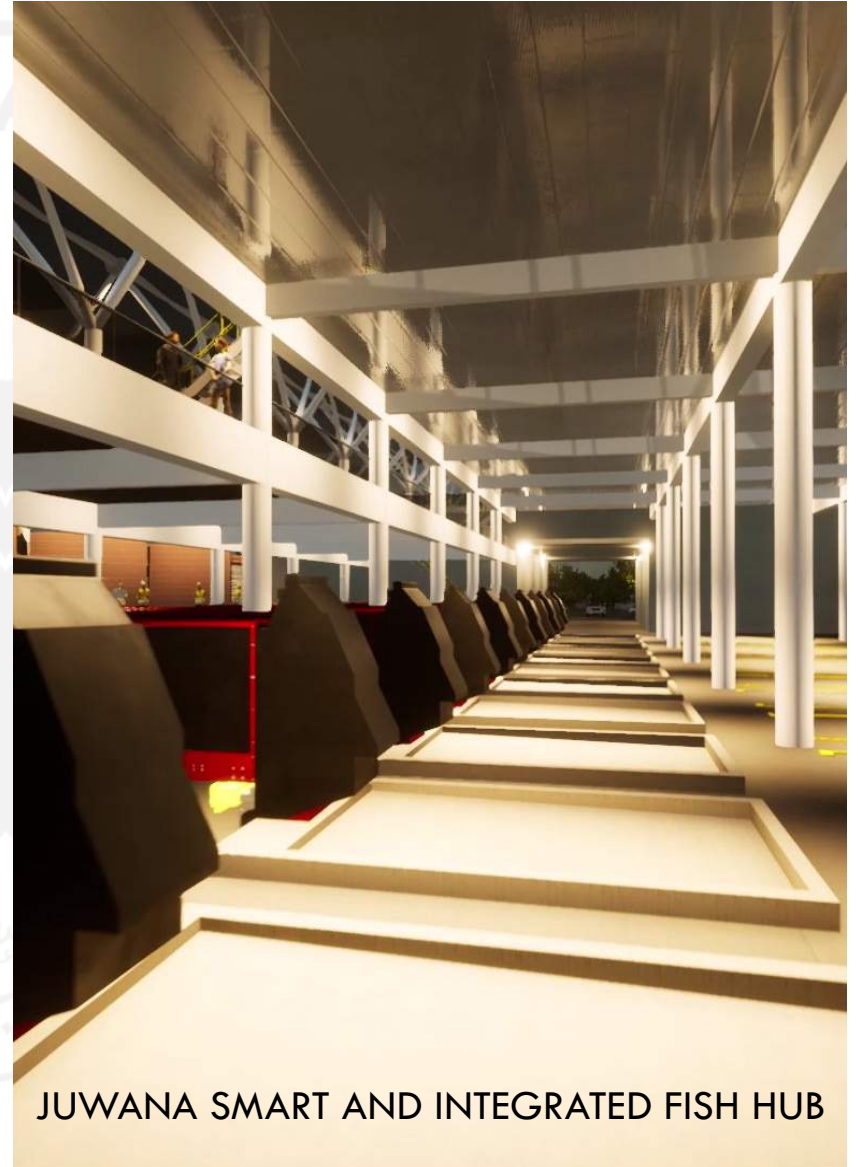
Each fish gate is connected in a single hub attached to the loading docks, and connected via conveyors. The application of this has an impact not only on space effectiveness, maintaining production quality, but also on the comfort of visitors. The faster the fish pass, the less odor is left, the more comfortable it is for general visitors and other workers.

Design to Change.

Indoor Fish Distributions.



TPI JUWANA UNIT II

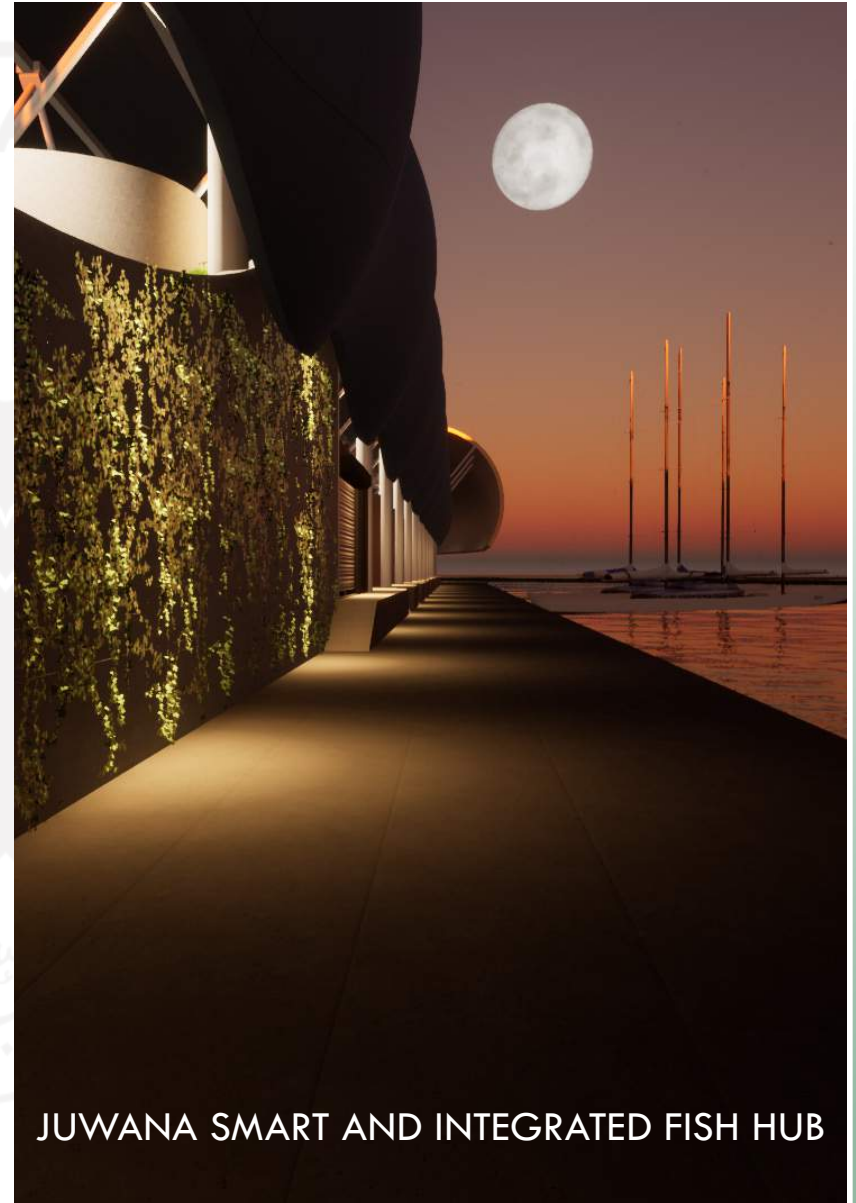


JUWANA SMART AND INTEGRATED FISH HUB

The system at TPI in general still uses manual trains which are limited by the TPI. At the Juwana Smart and Integrated Fish Hub, the manual system is replaced by an automatic conveyor which distributes marine products that have been weighed, then re-sorted automatically on conveyors and into automatic cleaning before being collected at the loading dock without additional human intervention which risks compromising the hygienic quality of the fish, and make the turnover of marine product production faster and more efficient.

Design to Change.

Fish Landing Base.



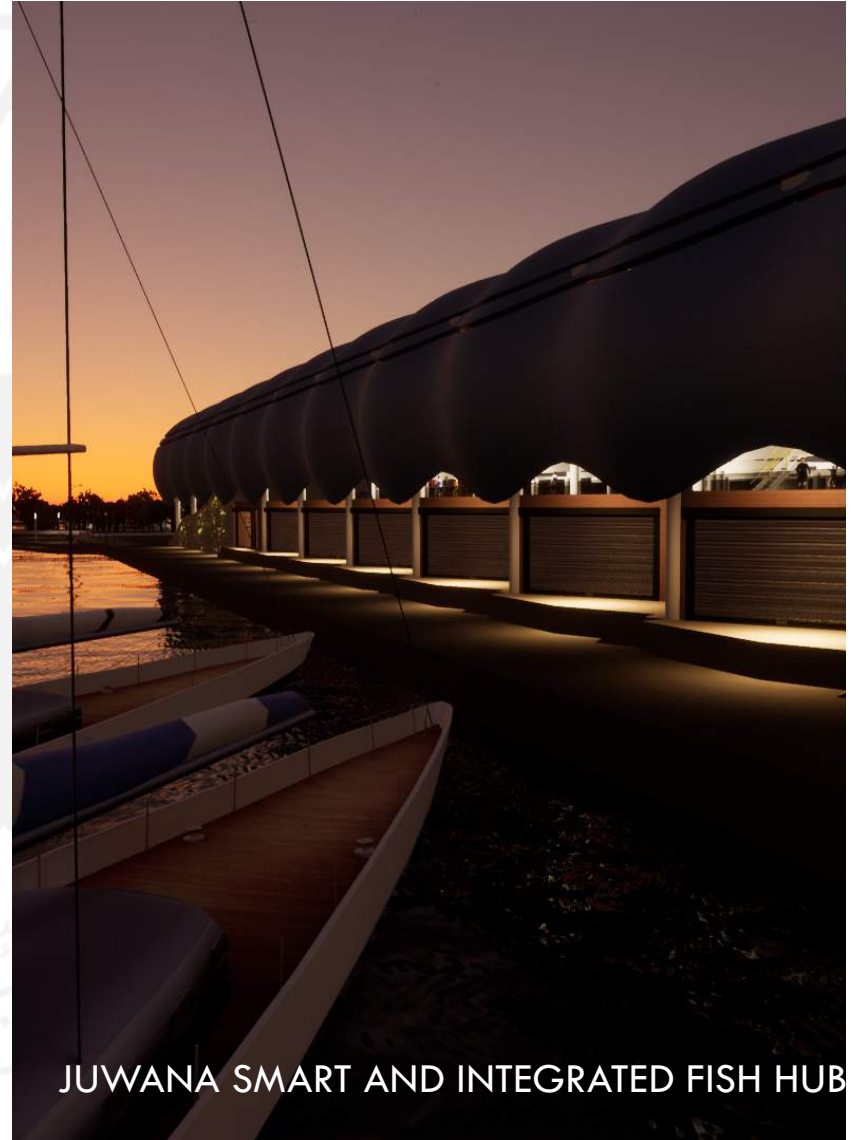
Activities at the Fish Landing Base in conventional TPI are still very messy and dirty. Where there are a lot of activity distractions that occur during the unloading of marine products. Where starting from all the fish are confirmed again, collected docks and ship transit. At Juwana Smart and Integrated Fish Hub, the marine product drop system is made as fast and neat as possible. In the IoT system, actually the fish that arrived have become the ownership of the winner of the online auction, so the packaging has been adjusted according to the provisions. So that when it arrives, the fish only need to be channeled directly to the scale door and re-sorted to make sure.

Design to Change.

Door Scale and Sorting.



TPI JUWANA UNIT I



JUWANA SMART AND INTEGRATED FISH HUB

Door scaling systems in conventional TPI are usually not effective. Where many of the scales are broken, below standard, and every fish gate is not sure there are scales. So that the distribution of fish products needs to be re-weighed manually by the buyer or in the recording process by the porter. At the Juwana Smart Integrated Fish Hub, fish that enter each fish gate are automatically recorded by sensors and can be confirmed by the online auction winner if the number of fish is in nominal terms and automatically recorded on the website and application in real-time.

Design to Change.

FnB.

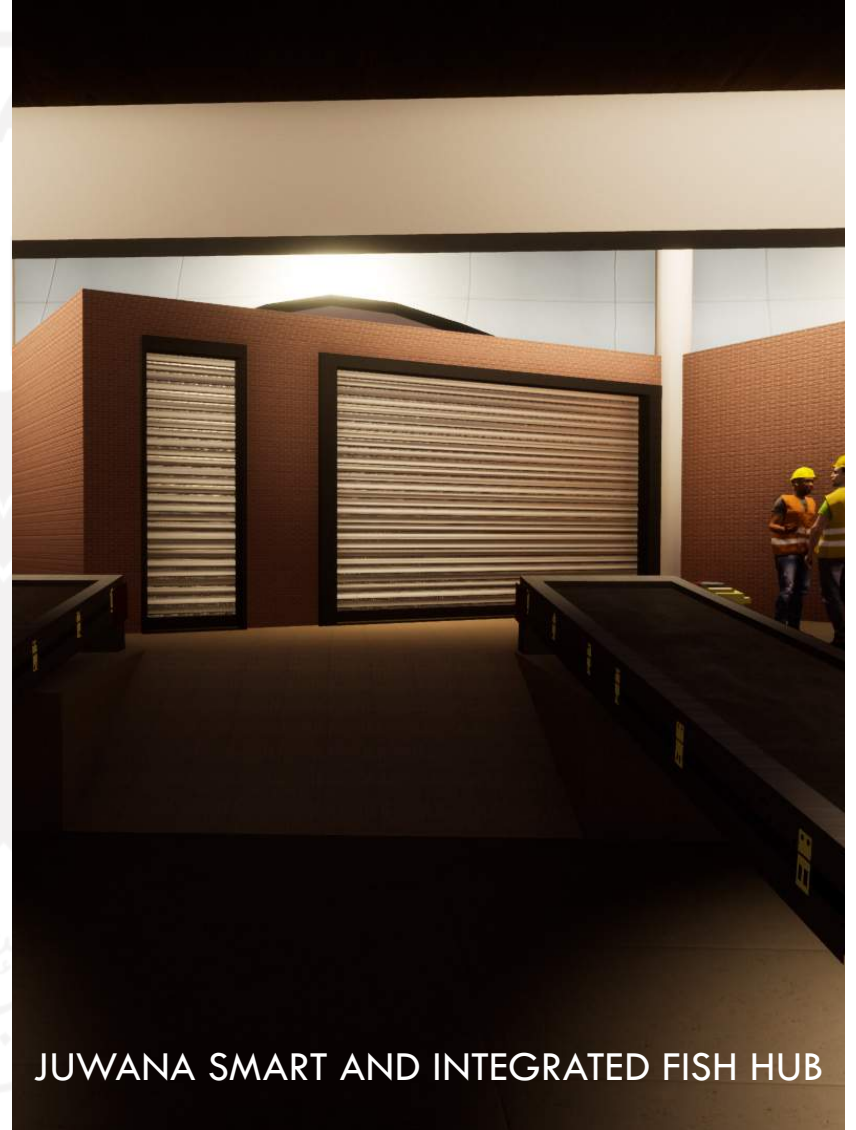


Design to Change.

Fish Gate.



TPI JUWANA UNIT II



JUWANA SMART AND INTEGRATED FISH HUB

Juwana Smart and Integrated Fish Hub targets more optimal fish production. One of the things that is implemented is to increase the number of Fish Gate. At TPI Juwana Unit I there are 6 gates, while at TPI Juwana Unit II there are 9 gates with 5 door scales as a formality. In Juwana Smart and Integrated Fish Hub, there will be 9 fish gate that designed diagonally to optimizing the dropping flow. And each gates could accumulate until 2 vessels in the same time. In addition, IoT applications cut work efficiency. For example, in a ship that is capable of carrying 10-25 tons of fish, it takes 30 minutes to 1 hour to drop the fish and has just been collected in the main hall, has not undergone an auction process etc. So that a lot of fish accumulate in the building. Before auction every 7 am to 4 pm. At Juwana Smart and Integrated Fish Hub, the process from dropping fish to being loaded onto trucks for distribution to buyers takes the same amount of time. This means that every 1 hour, there is always a very fast turnover of fish production.

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26th, 2021)

Attachment 1 : Palgiarism Test Result
Attachment 2 : APREB



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SURAT KETERANGAN HASIL CEK PLAGIASI

Nomor: 1611913602/Perpus./10/Dir.Perpus/VI/2021

Bismillaahirrahmaanirrahiim

Assalamualaikum Wr. Wb.

Dengan ini, menerangkan Bahwa:

Nama : Elang Priambodo
Nomor Mahasiswa : 17512024
Pembimbing : Dr.-Ing. Ir. Ilya Fadjar Maharika MA., IAI.
Fakultas / Prodi : Teknik Sipil Dan Perencanaan/ Arsitektur
Judul Karya Ilmiah : Juwana Smart and Integrated Fish Hub

Karya ilmiah yang bersangkutan di atas telah melalui proses cek plagiasi menggunakan **Turnitin** dengan hasil kemiripan (*similarity*) sebesar **4 (Empat) %**.

Demikian Surat Keterangan ini dibuat untuk dapat dipergunakan sebagaimana mestinya.

Wassalamualaikum Wr. Wb.

Yogyakarta, 25 Juni 2021

Direktur



Joko S. Prianto, SIP., M.Hum



JUWANA SMART AND INTEGRATED FISH HUB

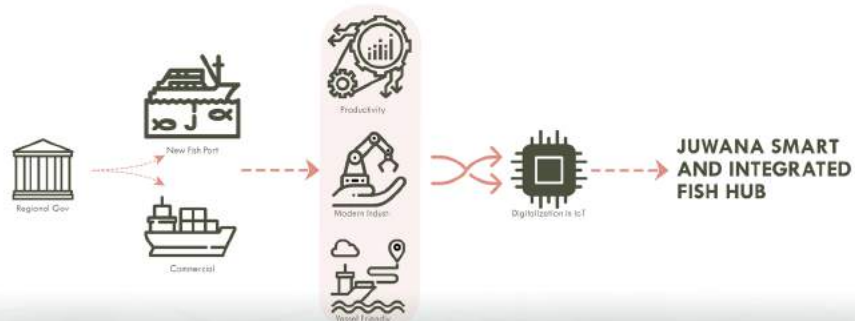


Fish Allotement Area, Growing Lor, Juwana District, Pati Regency, Central Java

6°41'27.9"S 111°09'29.1"E

The purpose of the planning for the development of the Juwana Integrated Fish Hub is based on the increasing number of seafood production occurring in the fishing industry in Juwana. The impact of TPI Juwana Units 1 and 2 which runs is not optimal due to the large supply. Coupled with the industrialization incident in the Pantura area, especially along Pati - Rembang. So that not only the marine and fisheries industry, but plans to expand the industry for staple goods, logistics and manufacturing. So that the Juwana Integrated Fish Hub is designed to anticipate the increase in supply of marine products through TPI Juwana Unit 3, as well as support infrastructure for industrial centers that have been projected through the transportation sector in the form of commercial ports. Taking advantage of the IoT concept in the fishing industry at Juwana, is a golden step to take part in the development of technology and information that is very fast. Combined with a contemporary built environment, it is hoped that it can form an ecosystem where human activities in the Juwana Integrated Fish Hub become more flexible, healthy and efficient. Where the main idea from the point of view of an industrial area is the maximum productivity that can be produced. From the point of view of the general public, visitors and buyers are what they want quickly, easily and affordable.

DIAGRAM ISSUES



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17512024

SUPERVISOR:
Dr.-Ing. Ir. ILYA FADJAR
MAHARIKA, MA. IAL.

BACKGROUND



JUWANA INDUSTRIAL PLAN

DIGITAL ERA INDUSTRIES

Targeted at improving infrastructure in an effort to boost the Fishery industry business in Juwana as well as plans to build an industrial center along the Pati - Rembang pantura route.

IoT works by expanding the fishing industry market, bringing the fishing industry market closer, and simplifying the work system of distribution in the fishing industry.

MATRIX PROBLEM

| | Formal Problem | Practical Problem | Symbolic Problem | Radical Problem |
|--|--|--|--|---|
| Designer The architect acted as the initiator of design solutions in the design of the TPI Juwana and 3 area and commercial part | Integrated building Function Various building functions are integrated into one part area and the TPI on the Juwana River | Design to achieve efficiencies The space configuration framework according to the contemporary but environmentally achieve quality product | Industrial Recreation Planning that persuasively attracts visitors because of the port's distinctive features and accessible | Balance output design A design that balances scale, productivity, cost, user activity, safety and security under the lot circumstances |
| User Fisheries, TPI administrators, port employees, traders, TPI visitors, regional officials, distributors of goods | Ship Traffic Control A design that can be a solution to the problem of ship capacity for above the sector of the river that covers 1 | Build and Connect A clear design between functions but interconnected in the private and public, the role of lot in reaching a wider and more efficient market. | Paradigm Changer An idea that can change the image about ports and TPI is generated with modernization industry and more public space attraction | Contemporary Built Environment Growth, healthy and efficient ecosystem in modernization as the pioneer of modern in fishery and marine industry |
| Client Government (Municipality and Provincial) | Public service and economic center A design that provides vice-versa between government, workers, visitors and the surrounding community | Effective Typical Work Center Optimal design for the comfort of users as workers and visitors. Connect and classified wider range of market | The Face of the City Center The design function as a commercial port represents industrial development in Pati Regency | Effective Maintenance and Construction Selection of materials that are easy to construct, durable and easy to maintain |
| Regulator The government has special powers in making policies that can influence planning | Disaster Resilient Sliding the river that occurs 1 on per day is minimized by expanding the face of the Juwana River | Flexible in Development The distance from residential areas has flexibility in the direction of industrial development, pioneered by the presence of commercial port | Industrialization Integration with industrial area that spread across the Juwana River | River Together A design that is friendly to river activities used by the wider community |

DESIGN ENTITY



Commercial Port



Fishing Port



Fish Market

BUSINESS MODEL FRAMEWORKS DESIGN

- Designing Business Process Based on IoT**
 - Precedent of IoT business model
 - IoT Criteria
- Design the schematic activity based on the each of building function**
 - Schematic activity in Fish Auction
 - Schematic activity in Port
 - Schematic activity in Fish Market
 - Schematic activity in managerial
- Responded by Architecture**



SITE LOCATION AND NEIGHBORHOOD

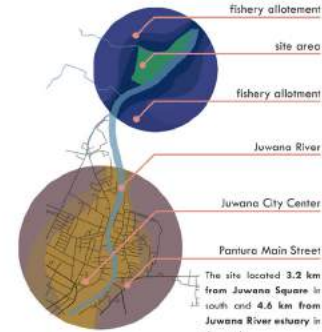
SITE LOCATION:

Area Tambak, Grawang Lor, Kec. Juwana, Kabupaten Pati, Jawa Tengah 59185

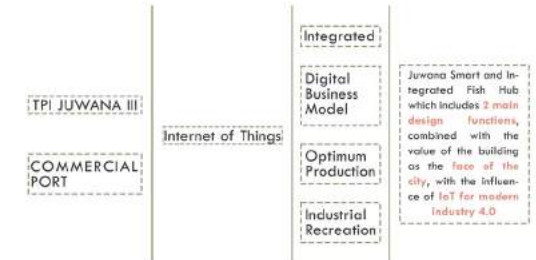
6°41'27.9"S 111°09'29.1"E



Juwana District in Pati Regency

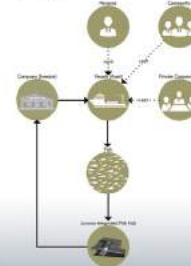


DESIGN CONCEPT



BUSINESS MODEL

assets-sharing business model 1



assets-sharing business model 2



subscription business model



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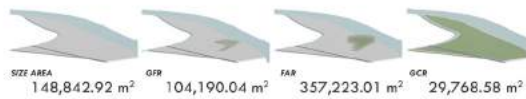
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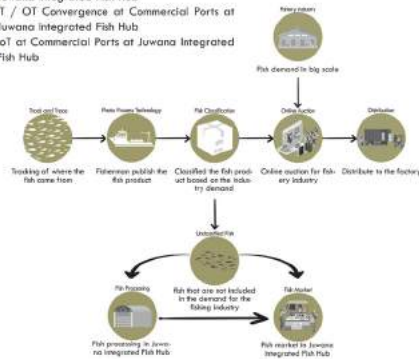
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PROPERTY SIZE



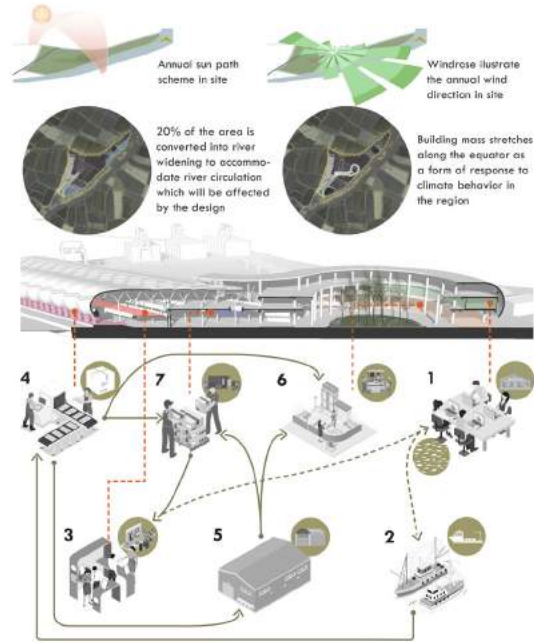
IoT CONCEPT IMPLEMENTATION

- IoT in Production Systems Fisheries at Juwana Integrated Fish Hub
- IoT in the Transaction System Trading at the Juwana Integrated Fish Hub
- IT / OT Convergence at Commercial Ports at Juwana Integrated Fish Hub
- IoT at Commercial Ports at Juwana Integrated Fish Hub

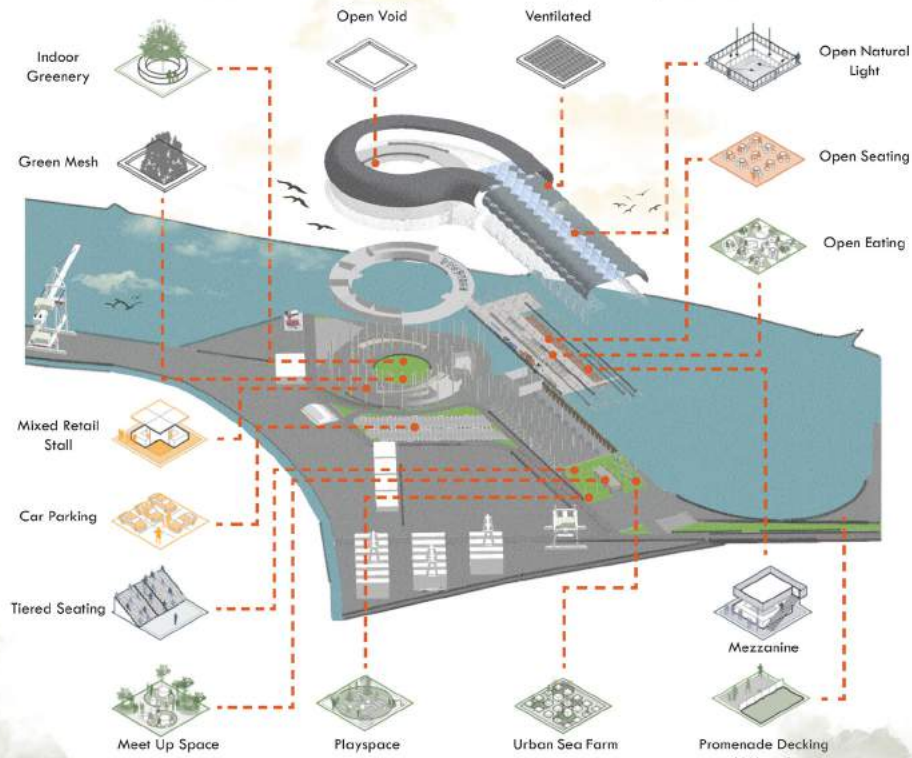


- The Office manage the demand, order, and inform to the customer. In the same time give real-time information about fish tracking and weather information to the fisherman.
- The Fisherman give data of sea product to customer.
- The online andoffline customer for fish market and auction.

SITE RESPOND



- Fish selection for high demand, auction, processing and market needs.
- Fish processing in local business shareholders.
- Fish market.
- Distribution of product fresh or processed to customer.



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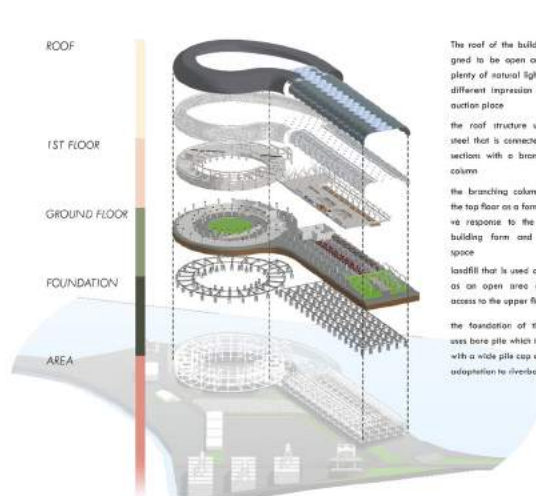
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The roof of the building is designed to be open and there is plenty of natural light to give a different impression of the fish auction place

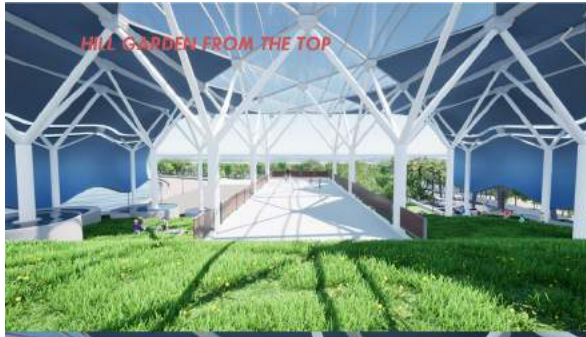
the roof structure uses custom steel that is connected between sections with a branching main column

the branching column starts on the top floor as a form of effective response to the wide-span building form and filling the space

loadfill that is used on a hillside as an open area as well as access to the upper floor

the foundation of the building uses bore pile which is connected with a wide pile cap as a form of adaptation to riverbank soil





HILL GARDEN FROM THE TOP



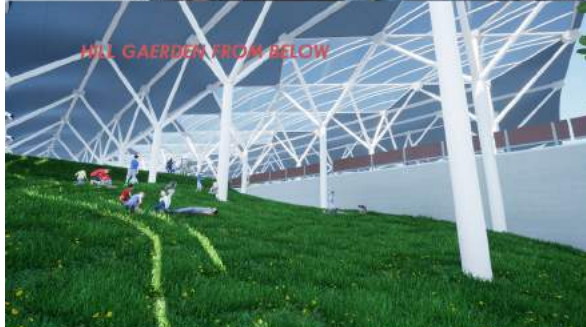
FRONT YARD



UPPER GROUND INTERIOR



MAIN ACCESS



HILL GARDEN FROM BELOW



BIRD-VIEW OVER THE PORT



MEZZANINE



OVER THE URBAN AREA



PARKING LOT



SOUTH ELEVATION

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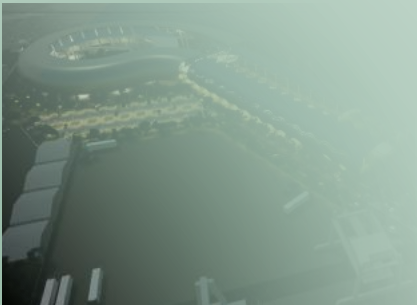


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