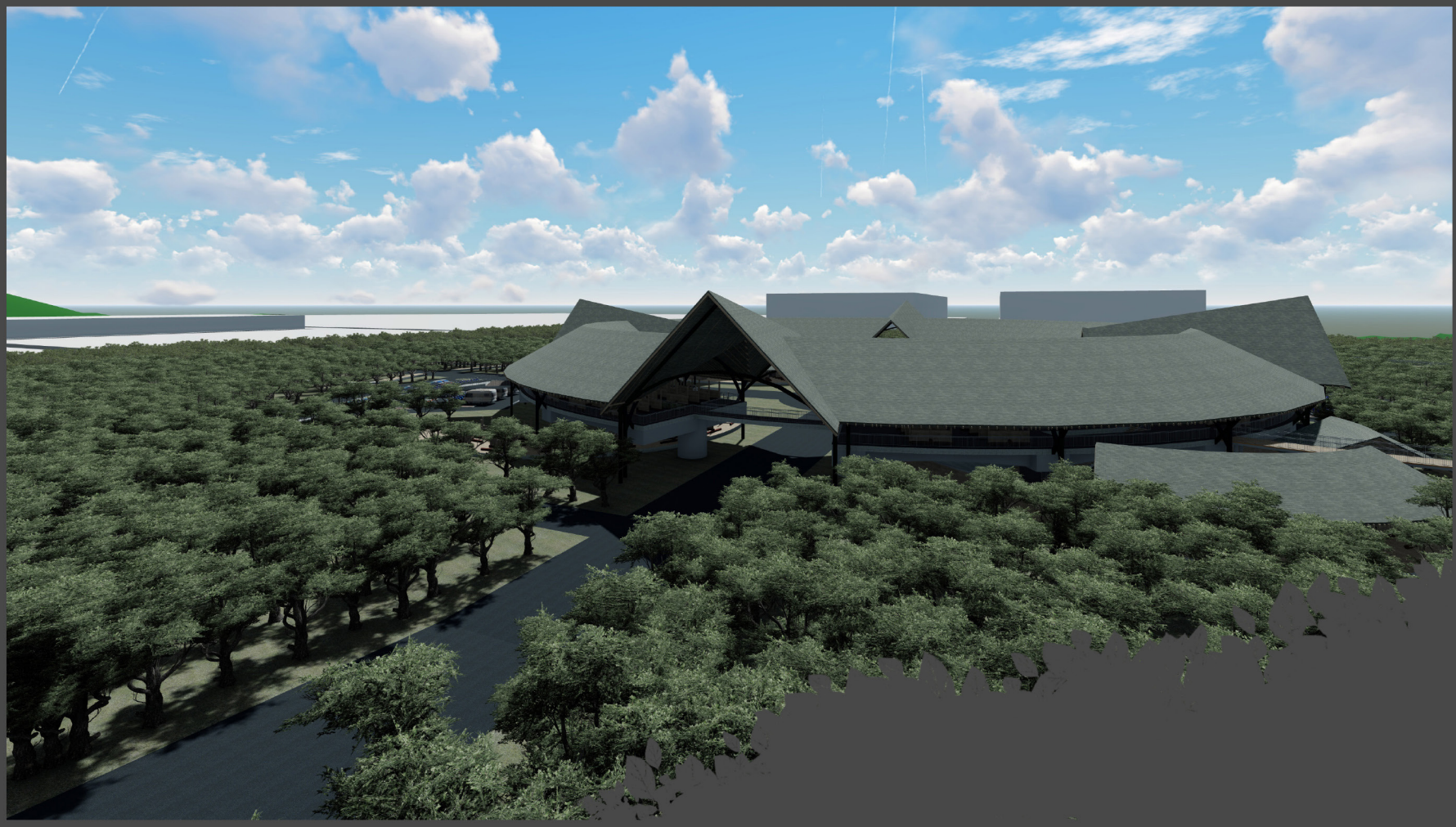
DESIGN OF TONDO BIOPHILIC MARKET IN PALU AS RE-NATURALISATION OF URBAN SPACE



Written and composed by :
Abi Dzar Ghifari - 17512174

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Laboratorium Pemodelan Arsitektur dan Perkotaan

UNIVERSITAS ISLAM INDONESIA

DEPARTMENT of ARCHITECTURE

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Legalization Page

Final Architecural Design Studio Entitled :

Design Of Tondo Biophilic Market In Palu As Re-naturalisation of Urban Space

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Student's Identification Number : 17512174

Final Architecural Design Studio Entitled :

Design Of Tondo Biophilic Market In Palu As Re-naturalisation of Urban Space

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

So that.

***recommended) *not recommended)**

To be a reference for Final Architectural Design Studio

Yogyakarta, 10 Dec. 2021

Supervisor,

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I state that this Final Architectural Design Studio Project that I write and work on is my own work, not the transfer of other people's writings or thoughts that I acknowledge as my own results or thoughts. As for the Final Architectural Design Studio work, there are parts of quotes from other people's work that I have written down according to the norms, rules, and ethics in writing.

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Yogyakarta, 29th November 2021

The one who made the statement



Abi Dzar Ghifari

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Design Premise

After the earthquake disaster in 2018, the northern palu which was once a projected as dedicated green area turned into a projected next development of dwellings and housings. This is both good since the findings of safety land to use in Palu will increase the survive probability of the local people but also will significantly reducing the amount of green area from the earlier case. On the other hand, the thermal issues inside the city has been rarely fixed. In Addition, the fact that trees can limit the damages of earthquake can actually be an answer for Palu to face the threat and adapt to the situation. However, the dwellings project is not yet started means several dedicated area is still not designed. To avoid the future bad impacts, this project has been proposed by using the traditional market area as an objective. The concept is to show the crucial role of trees and forest in saving Palu city from uncomfortable thermal issue by using biophilic approach by considering the context of traditional local markets and its problems.

Keywords : Biophilic, Thermal, Market

CHAPTER 1.

PROJECT BRIEF

1.1 BACKGROUND
1.2 PROBLEM FORMULATION
1.3 SITE AND REVIEW OF REGULATIONS
1.4 ORIGINALITY AND NOVELTY

1.1 BACKGROUND



Fig. 1.1. Palu City In A Frame
Source : celebes.co

Palu in a frame

Palu is the capital city of Central Sulawesi, which lies in the estuary of a river. In conclusion of several sources, Palu is a “New City” which was dwelled by people from highland. That being said, the first dwellers of Palu was from Ulayo mountains. These group of people followed the movement of the growth of population where they ended up to a place known as Boya Pogego.

Palu is geographically located in a bay where it faces a sea and surrounded by mountains of Nokilalaki. In addition of being located below the equator line, Palu is an extremely hot city specially during dry season.



Fig. 1.2. Permanent Housing Aid
Source : kompasiana.com

Permanent housing aid

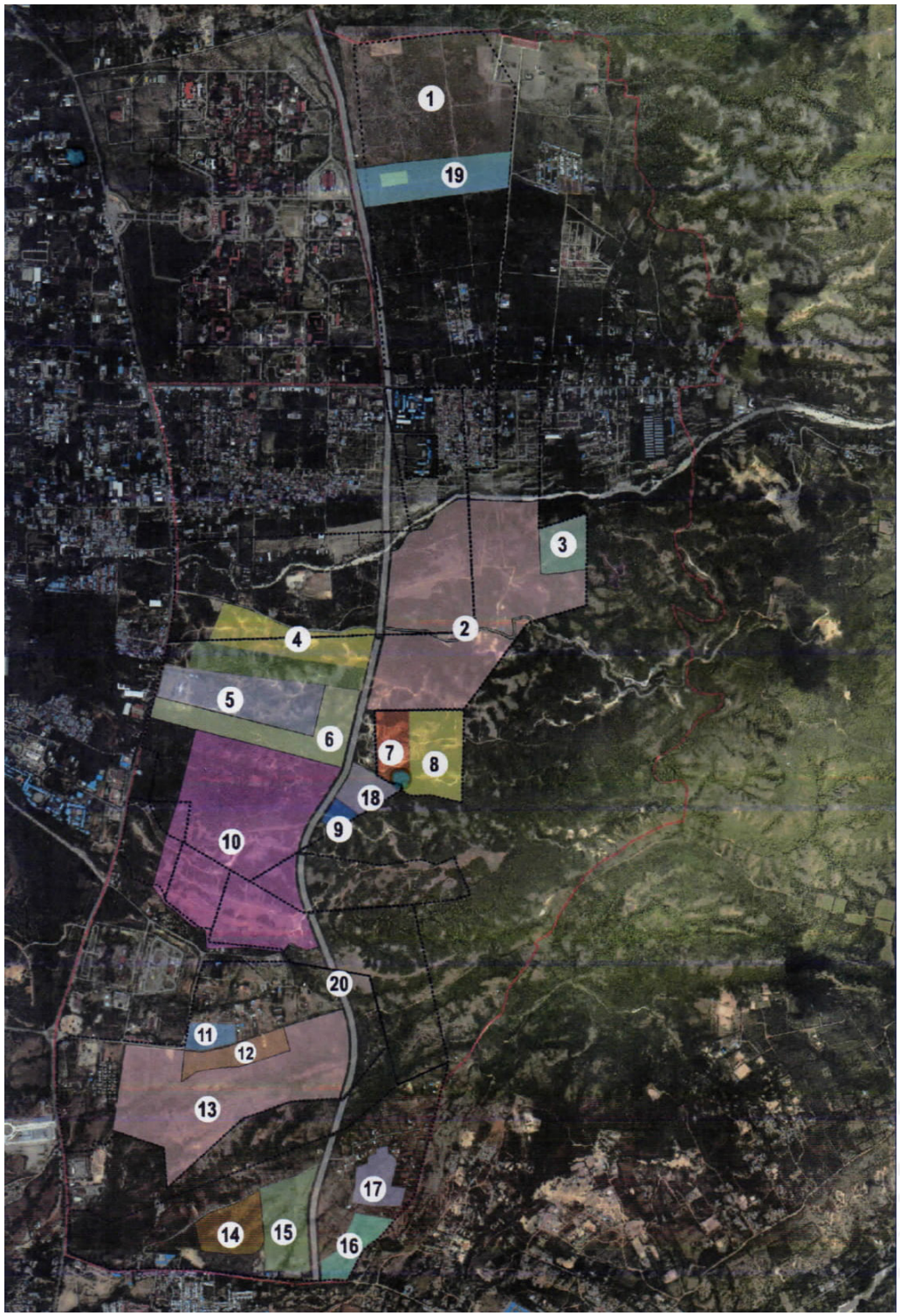
After the disaster in 2018, there are several changes on spatial planning of the city which is moving the dwelling territory into a more safe place. This decision is based on the findings that the current dwelling areas are built on top of the active fault.
Following the government strategy of moving the development of the city into northern area of Palu, the permanent housing aid was then built in the mentioned area. The housing is meant to be given for the victims of liquefaction who lost their dwellings due to the disaster. The type of the houses, however, is type of 36 means it has at least 36 m2 floor area ratio.
The housing is proper enough and by far only suffered some of unexpected extreme climate change but on the other hand it managed to survive. However, the housing complex are not completely designed, built and planned. Since the area is new, it still is not easy to find public spaces and facilities around since the area was once meant to be a green area of Palu. Therefore people who already moved there need to come pretty far to the southern of Palu to shop and buy goods.



Fig. 1.3. Traditional Market Sellers
Source : Mumtahina Tanni via Pexels

Traditional market

Considering the needs of public spaces around the HunTap (Hunian Tetap/Permanent Housing), of course the government already prepared a dedicated public space area to be designed. The area is currently for traditional market, one of the most basic needs for every people.



PEMERINTAH KOTA PALU

JL. BALAI KOTA NO.1 PALU TELP. (0451)412344-421665
TELP. (0451)411354

KETERANGAN

RENCANA PEMANFAATAN	LUAS (Ha)
1.HUNTAP 1	45
2.HUNTAP 2	62,2
3.PEKUBURAN	5,3
4.ISLAMIC CENTRE	11,9
5.POLDA	15
6.PENGEMBAGAN POLDA	14
7.PASAR TRADISIONAL	5,3
8.PERUNTUKAN WARGA TONDO	10,4
9.PSU	1,5
10.PERKANTORAN PEMERINTAHAN	58,6
11.PUSAT REHABILITASI NARKOBA	2,5
12.RUMAH SAKIT	5,3
13.HUNTAP 3	40,7
14.ALTERNATIF ASRAMA POLDA	6,8
15.ALTERNATIF MAKOREM	9,8
16.TVRI PALU SULTENG	4,8
17.LEMBAGA PEMASYARAKATAN	4,7
18. OLAHRAGA EXTRIM	3,9
19. HUNTAP 1 TONDO USULAN PENAMBAHAN	12,5
20. JALAN PENGHUBUNG HUNTAP	14,1

Fig. 1.4. New Spatial Planning Project From The Government of Palu In 2021
Source : Spatial Planning Division of Palu City

PROJECTED SITE

Above is the official spatial planning from the government of Palu City. According to the map, the market site is marked with number 7, surrounded residential area.

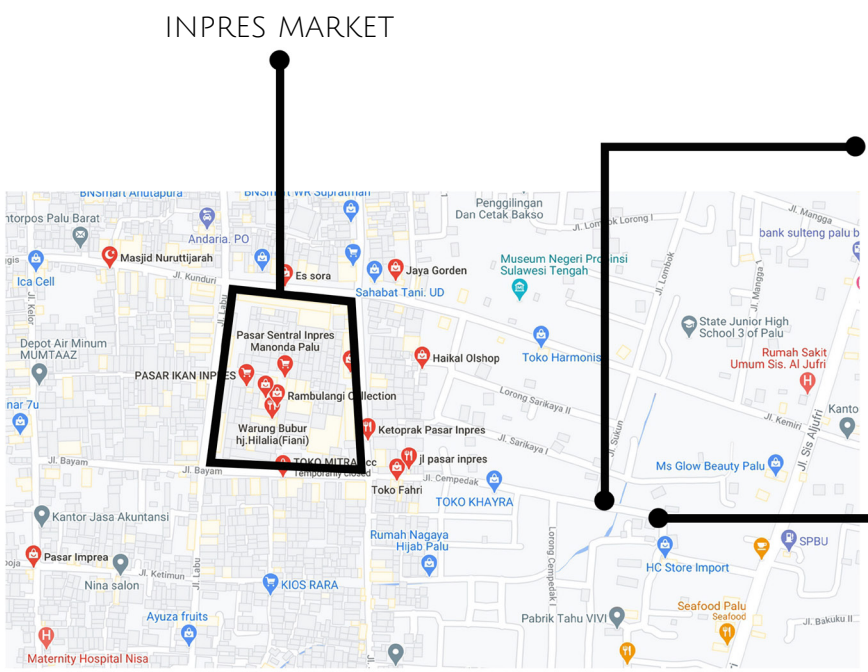
Market's circulation issue

As the same as the other cities, the problem in traditional local market in Palu is its circulation and accessibility. The numbers of sellers are increased each year where on the other hand, the competition among them force them to find a strategic position for their stalls and in return ruined the space program of the market location itself. For the record, most sellers in Inpres Market of Palu are provided with location in the market complex but they choose to sell their products outside of the complex for the users to be easier to find them and buy theirs. This bad habit will indirectly invite another sellers to do the same thing by the term of competition which later cause them to sell in an illegal area and causing troubles such as traffic, and contaminated products because those are sold beside the street.



Fig. 1.5. New Mayor of Palu Dealing With Order of Sellers In Market Area
Source : palu.tribunnews.com

Main complex of Inpres Market



Sellers are trading far from market



Sellers are trading far from market



Fig. 1.6. Undisciplined Sellers
Source : Researcher Documentation

This is the picture of how wild the movement of the sellers is. As what the picture shows, it is not that they are moving just to one point to the marked outside market area. They are continuously growing and moving there one by one means there are a lot of them in the line from the market to the marked spot. These area however will have a really horrible traffic all day long since the 'market' operates and is busy from 6 in the morning up to 6 in the afternoon.

The new palu



Fig. 1.7. Palu City
Source : celebes.co

Before the disaster, northern Palu was meant to be the green area of the city as it is considered as outskirt of Palu. Therefore even after the disaster, government still provided the designed green area named Hutan Kota (The City's Forest) as a movement to realized the consideration about green area or green space in Palu.
However, since the new strategy is to move the development of the city to this new area, it mostly can be easily speculated that the dedicated green area will be reduced. Simply because the number of buildings will be increased significantly.

Trees and temperature

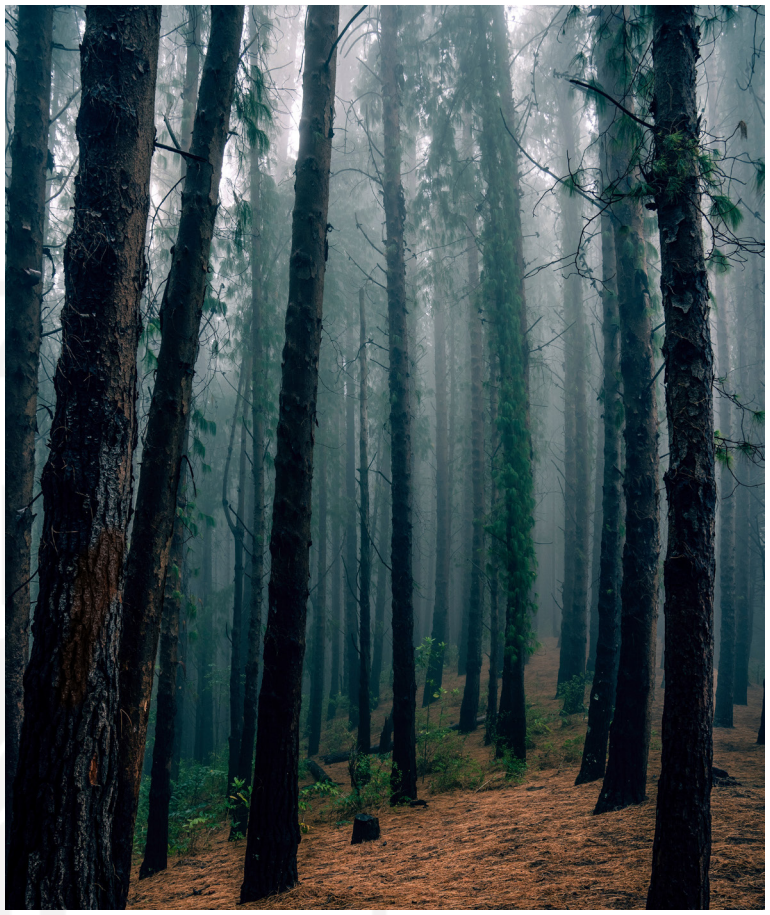


Fig. 1.8. Forest
Source : Jose Vega via Pexels

Despite of how government will cover the needs of green area by at least meet the minimum requirement of the regulation, the urgency of having more green area specially trees inside the city is a serious thing to be considered. Palu has a high temperature and is included as one of the hottest city in Indonesia. According to BMKG (Badan Meteorologi, Klimatologi dan Geofisika/ Meteorology, Climatology, and Geophysical Agency), the average temperature in Palu in sunny days during dry season is up to 37 or even 38 degrees of celcius. This is because Palu lies right below the equator line, and as a city that faces the sea, the dry air in mid day will make the inconvenience be even more.
However, it is not a secret that trees is a solid solution to reduce heat islands. Trees are able to lower air temperatures by its ability in providing shades which are 11-25 degrees of celcius cooler than the peak temperatures of unshaded area. As the result of this, it can be concluded that the trees reduce the demand of air conditioning too.

Benefits of trees



Fig. 1.9. Jewel Changi Airport
Source : Tiff Ng via Pexels

Trees turned out to be even more needed specially for earthquake prone area such as Palu. According to Sébastien Guenneau of the Fresnel Institute in Marseille, seismic waves known as love waves are able to be distracted by making it go through forest containing trees of a certain height. The basic principle works similar to artificial structure that often is used to control electromagnetics around objects. In addition, Guenneau mentioned that forest and trees are able to halve the work of civil engineers.
Therefore other than shading and other replacable thermal control instruments, having trees as the main focus actually gave extra benefits which is a solution to another big problem.

MAIN PROBLEMS IN SCHEMATIC DIAGRAM

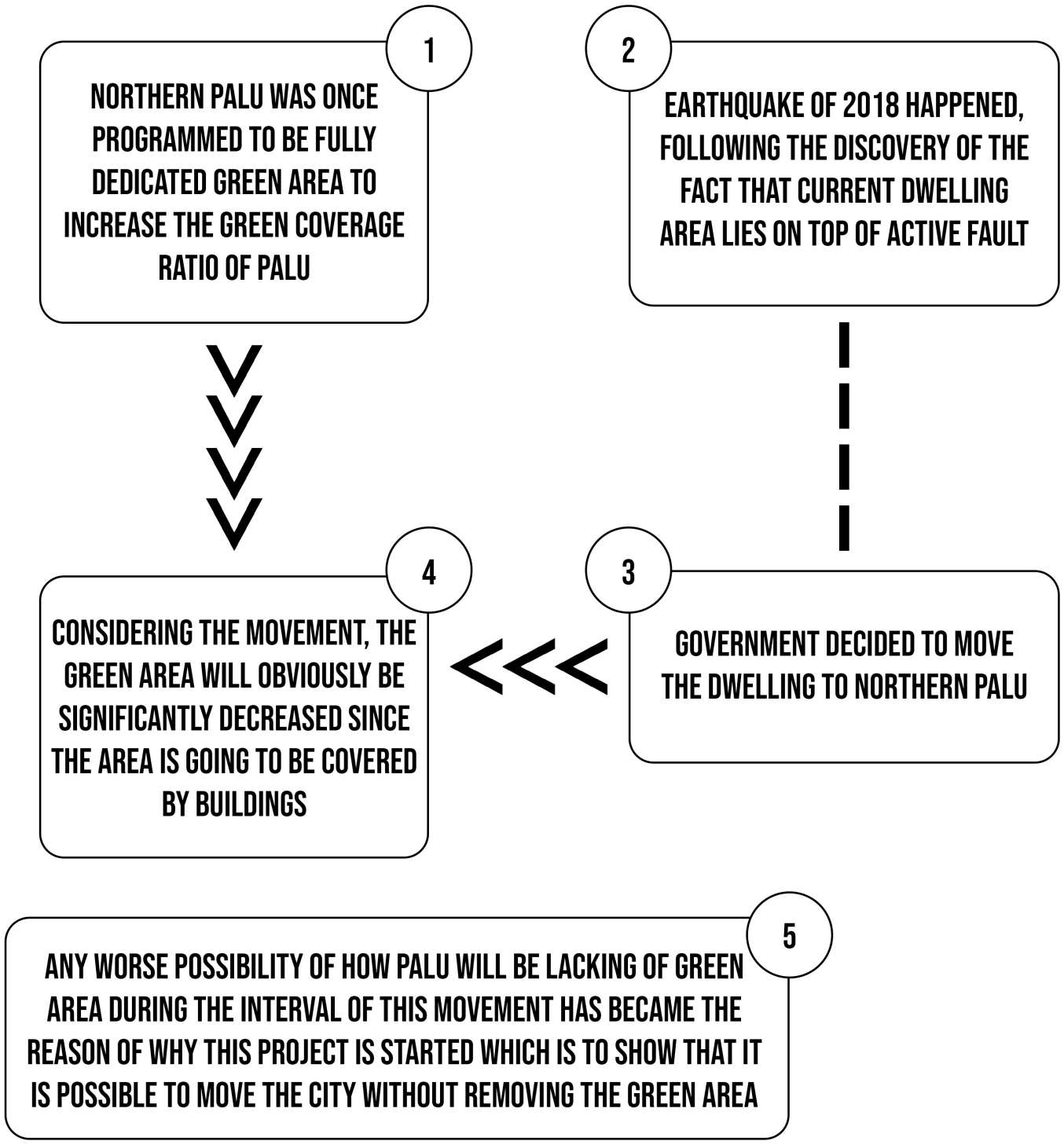


Fig. 1.10. Problems Schematic Diagram
Source : Researcher Documentation

1.2 PROBLEM FORMULATION

I. DESIGN PROBLEMATIQUE

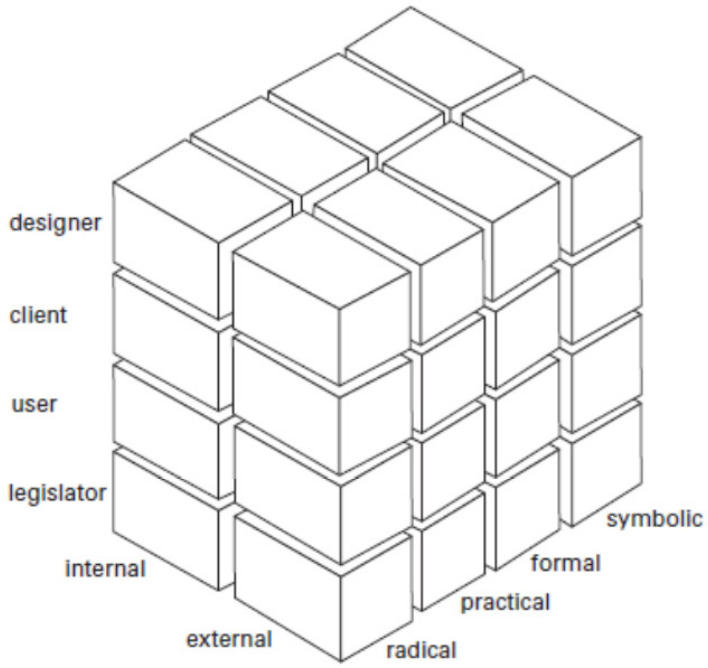


Fig. 1.11. Design Problematique
Source : How Designer Thinks by Bryan Lawson

In the book entitled “How Designer Thinks”, Bryan Lawson stated that designing has an integrated system of works which affects the decisions and final product. The system of this designing process consists of designer, client, user and legislator. Therefore it can be concluded that architect cannot create an absolute decisions alone. The limitations or parameters regarding this consists of 4 types which are symbolic, formal, practical and radical.

The marked ones are the main focuses to be achieved in this project.

	DESIGNER	CLIENT The Municipality of Palu	USER Local People of Palu	LEGISLATOR Municipality, Ministry of Public Work And Housing
SYMBOLIC	New idea of trees usage within a building design as a natural shading system.	A design that implements local architecture.	The image and experience on local architecture.	Integration within the market and its surroundings.
FORMAL	Fits to the local market context in terms of circulation. Fits to the trees sizes in terms of building performances.	Low cost project on the total budget.	The spatial quality specially on thermal, humidity and circulation.	Building codes and regulations application.
PRACTICAL	The appropriation of biophilic variables towards the thermal comfort within the design. Achieving thermal comfort by reducing the average sun radiation on the site. The appropriation of circulation design towards the concept.	Achieved thermal comfort and proper circulation design.	The use of local materials in the project.	Local materials and building process regulations.
RADICAL	Implementing the biophilic approach by using trees as natural shading system on local market context.	Preserving the ideas of local architecture in local market context at any cost.	Normalizing the existence of biphilic elements in the daily activities inside a market.	Determined functions by the government.

II. DESIGN PURPOSES

1. The connection to the surroundings is important. Therefore designing the urban context and variables in order to create a better circulation and view, and how to connect it to biophilic concept is a must.

2. Designing masses and its form which are integrated with trees as the main natural shading in order to gain maximum potential of the shading system and avoiding disadvantages such as disturbation on circulation or damages to substructure caused by the root of the tree.

3. Designing layouts of floor plans which can be efficiently enhance and fix current circulation problems by plotting tenants alongside the main path for all of them to be found by buyers or costumers easily.

III. DESIGN AIMS

1. Creating a clear idea of how beneficial trees can be for the future development of the new area of Palu in urban scale.

2. Pioneering local market in enhancing thermal comfort by using natural shading system by reducing average sun radiation on the site. That being said, the project may create a new type of market.

3. Fixing the circulation problems caused by competition among tenants.

IV. DESIGN SCOPE

1. In designing the urban scale of the surroundings, connection between sites to the project site shall not have barriers.

2. In using the biophilic approach, the focus is on using trees as natural shading system therefore the objective is to have best and most efficient way on plotting it towards the masses.

3. In designing the circulation or accessibility, the main objective is to have all the tenants to be easily reached by customers.

4. In designing the mass, the implementation of traditional architecture will be a good touch to local people.

V. DESIGN PROCESS

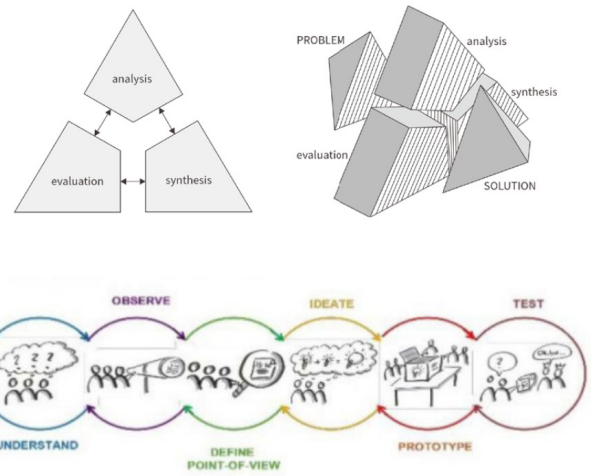


Fig. 1.12. Design Method Scheme
Source : How Designer Thinks by Bryan Lawson

Above is the design method scheme formulated by Bryan Lawson (2006) which explains how a design process does not have to start from a certain point and be finished in a straight procedural line. However it is more like a chain of some phases which each can be starting point to start a design, and can be repeated as long as it is still needed to achieve the targeted design.

Problem Statement

Analyzing then synthesizing the odds of urban development to determine the point of where an architectural design which includes macro and micro will be able to solve it and avoid future threats.

Data Collection

Gathering the necessary variables of current condition which include primary datas such as site boundaries, views, sun path, vegetations, and surroundings, and secondary datas which are annual sun path and radiation, precipitation, average site temperature.

Data Analysis

1. Analysis of urban connectivity towards the site project
2. Analysis of biophilic approach
3. Analysis of market typology
4. Analysis of existing nature elements on the site

Program

Program is design guide in the process of problem mapping and identifying.

Design Concept

This is the phase of creating strategy to solve the problem that has been identified which will result an answer in a form of a design.

Design Development

Generating all the analyzed datas to one form of a design carefully based on the design concept as the strategy.

Design Evaluation

Testing the initial design produced from the previous phase to find out whether it is able to answer the problem or not. In this case of project, Ladybug software will be used to find out the result of the design.

Final Design

Whenever the design meet the target of solving the problem throughout the evaluation, then the product will be completed with details and is ready to be used.

1.3 SITE AND REVIEW OF REGULATIONS



Fig. 1.13. Site Satellite Imagery
Source : Google Earth Documentation

Building codes for commercial building

Building Coverage Area : 70%
Floor Area Ratio : 3
Height :12 m (3 Floors)
Minimum of Green Area Ratio : 20%

Regulation based on the context of the project

According to The Government Regulation of Palu Region No. 6 of 2011 about buildings, here are some notable regulations regarding the building context.

Article 29

(1) Buildings that has form of blocks has maximum 10 units for each block or has maximum length of 100 m.

(3) Spaces between blocks shall not be converted into another functions except for open space or public space area.

Article 31

(2) Every buildings shall consider the aesthetic aspects by reffering to local products and cultures.

(3) Buildings shall reffer to the form and characteristics of local architecture.

(4) The requirement on point (3) has to consider about the open spaces and green areas to create a harmony to its surroundings.

Article 32

(3) Every commercial buildings shall not create boundaries to the street surveillance area.

1.4 PROJECT ORIGINALITY AND NOVELTY

REDESAIN PASAR TRADISIONAL GENTAN DENGAN PENDEKATAN ARSITEKTUR BIOPHILIC

Approach : Biophilic Design
Designed By : Insan Mutaqin
Publication : 2020
Concept : Redesigning
Similarity : Approach
Difference : Implementing several variables of biophilic aspect but not specifically on thermal issues.

Penataan Ulang Pasar Cikurubuk Tasikmalya Penekanan pada Perencanaan Pola Tata Ruang dan Sirkulasi Pasar

Approach : Space Grouping Based On Activities
Designed By : Roni Apriliansyah
Publication : 2000
Concept : Redesigning
Similarity : Concern to the issues of circulation and accessibility
Difference : Has nothing to deal with the integration to biophilic approach

Re - Disain Pasar Bawang Klampok sebagai Pasar dan Pusat Pengolahan Bawang Merah di Kabupaten Brebes (Penggabungan Sirkulasi Pasar dan Pusat Pengolahan serta Pengkondisian Termal pada Ruang Penyimpanan Bawang Merah)

Approach : Designing By Taking Advantages of Several Characteristics of Activities
Designed By : Risky Andriadi Zulmi
Publication : 2007
Concept : Redesigning
Similarity : Concern on thermal and circulation issues
Difference : Approach on biophilic concept

CHAPTER 2 .

DESIGN STUDY

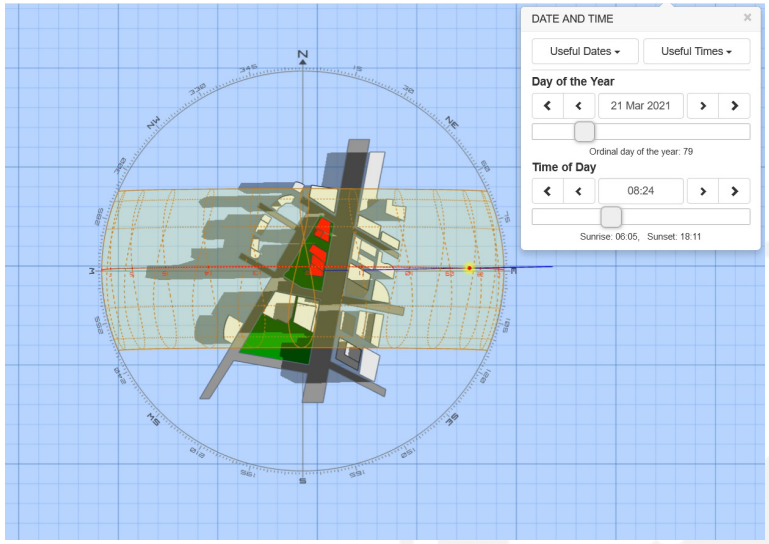
2.1 SITE ANALYSIS
2.2 BUILDING FUNCTION
2.3 DESIGN APPROACH
2.4 PRECEDENT REVIEW

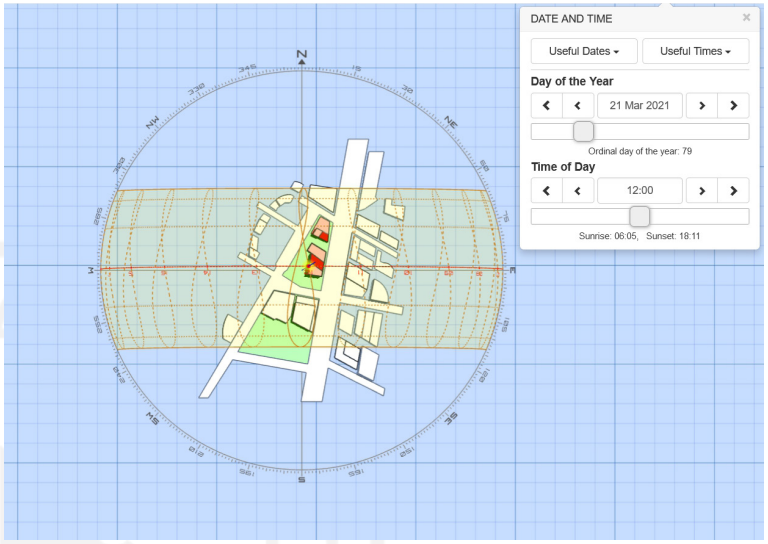
Fig. 2.1. Site Satellite Imagery
Source : Google Earth Documentation



2.1 SITE ANALYSIS

I. SUNPATH





The site is located almost precisely below the equator line. Therefore the sunpath does not have significant move throughout the years. The scheme of the sun movement shows how the sun actually rises and sets in a straight line from the east to the west. Even during the mid day, There are days where the sun will be located perpendicular to the ground.

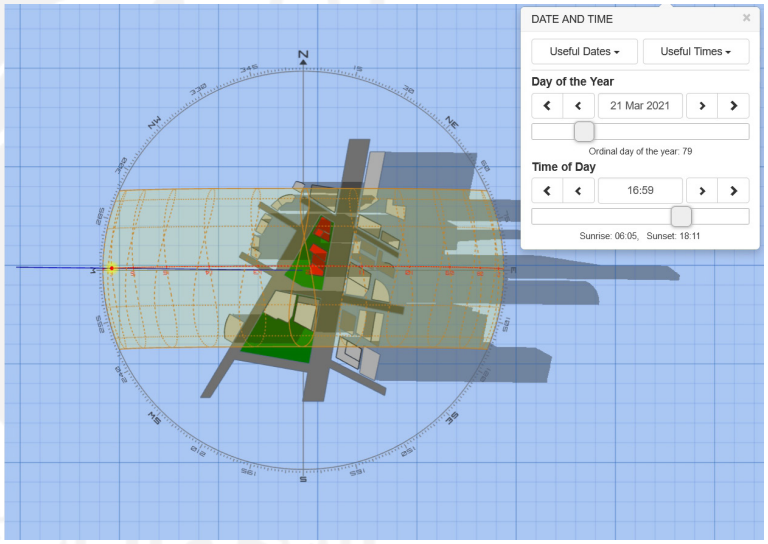


Fig. 2.2. Sunpath of The Site
Source : andrewmarsh.com

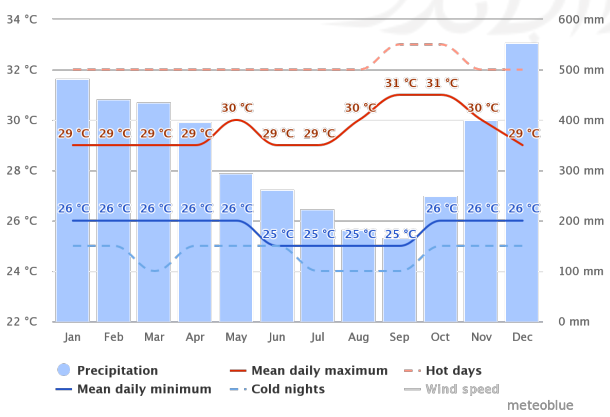


Fig. 2.3. Average Temperature of Palu
Source : Meteoblue

Because of the sunpath geographical movement, Palu and specially the site itself is considered as a high temperature area. The graphic shows the average number of temperature in Palu where it is possible for it to hit more than 35 degrees of celcius more than once specially between August and October in a year.

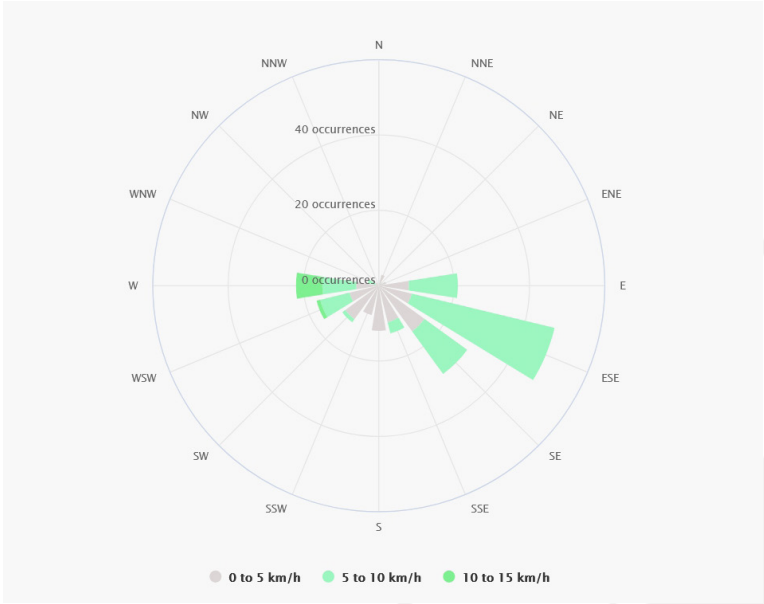


Fig. 2.4. Windrose
Source : Meteoblue

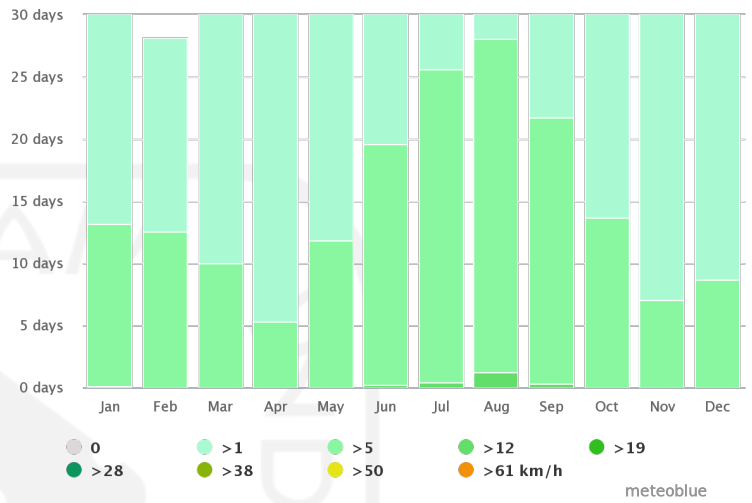


Fig. 2.5. Wind Speed
Source : Meteoblue

II. WINDROSE ANALYSIS

Despite of being a high temperature area, the site is quite windy. This is because it is located on the bay side of Palu City which faces the open sea directly. Therefore the cycle of sea breeze is continuously affecting the windflow in the site. However, this type of wind is not always a low temperature wind. The one that comes from the sea sometimes brings out a warmer air which slightly increases the temperature.

III. RAINFALL ANALYSIS

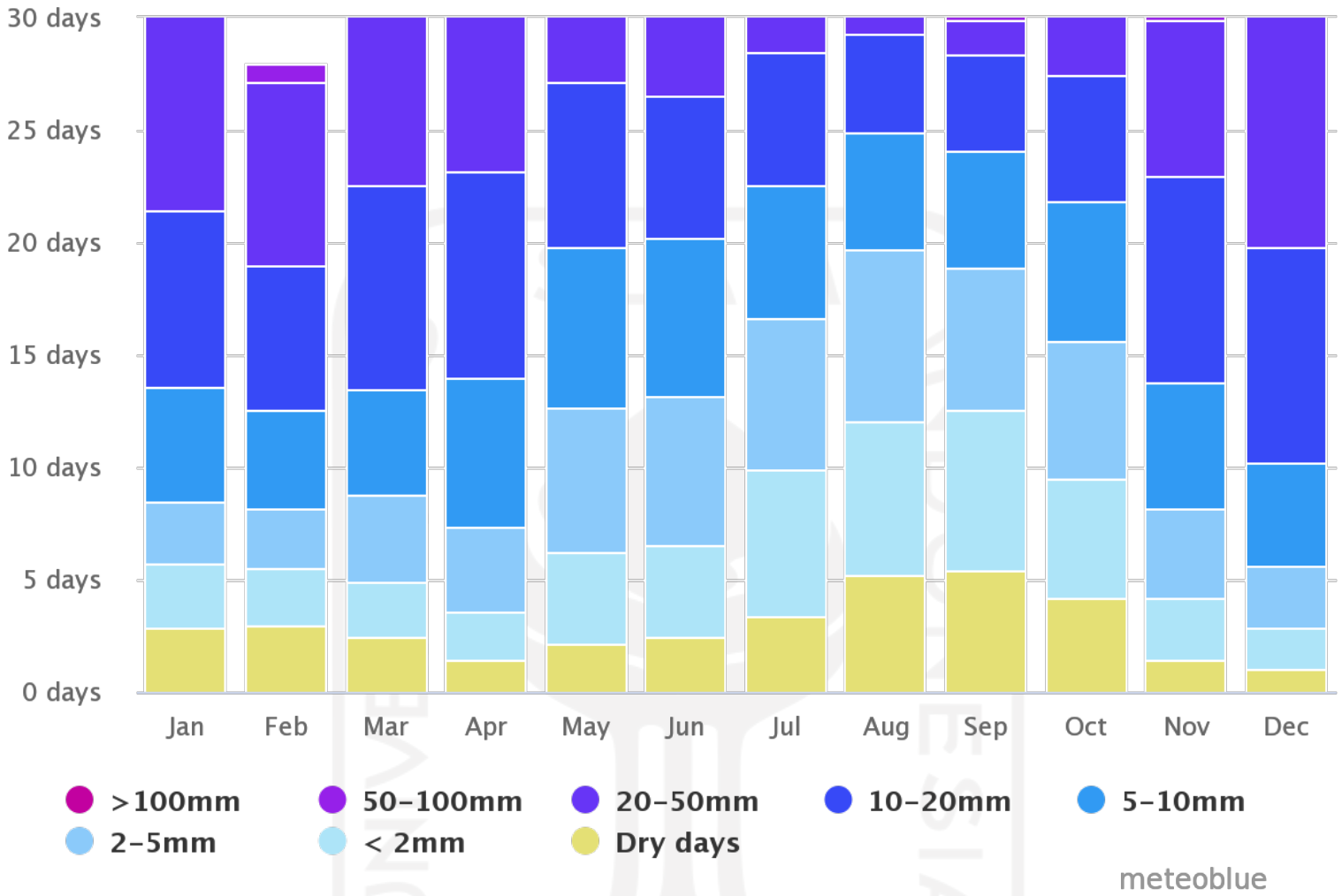


Fig. 2.6. Precipitation Diagram
Source : Meteoblue

Despite of having high temperature during sunny days. when it comes to be rainy ones, Palu also has a decent number of precipitation. These rainy days often happen mostly in december to january.

IV. NEIGHBORHOOD AND ACCESS



Fig. 2.7. Views
Source : Researcher Documentation

A. VIEWS



Fig. 2.8. View A
Source : Researcher Documentation

View A : Palu Bay
The mountains of nokilalaki and the view of Palu Bay is a selling point for the project. Preserving this is a must.



Fig. 2.10. View C
Source : Researcher Documentation

View C : Hills of Tondo
The Hills of Tondo surround the area and is another attraction of view for the users.



Fig. 2.9. View B
Source : Researcher Documentation

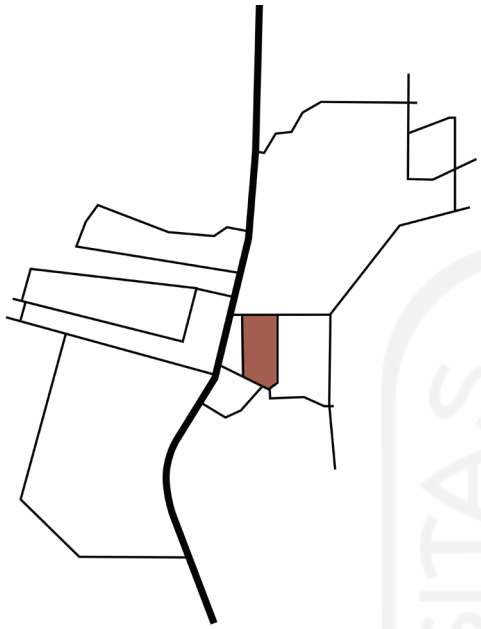
View B : South Entrance



Fig. 2.11. View D
Source : Researcher Documentation

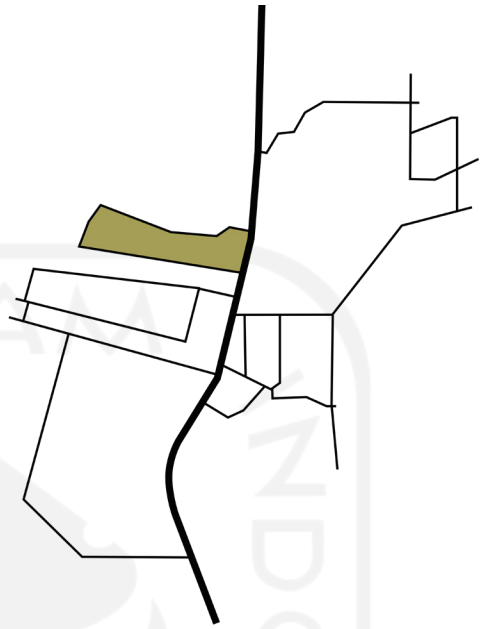
View D : North Entrance

B. SURROUNDINGS AND CIRCULATION



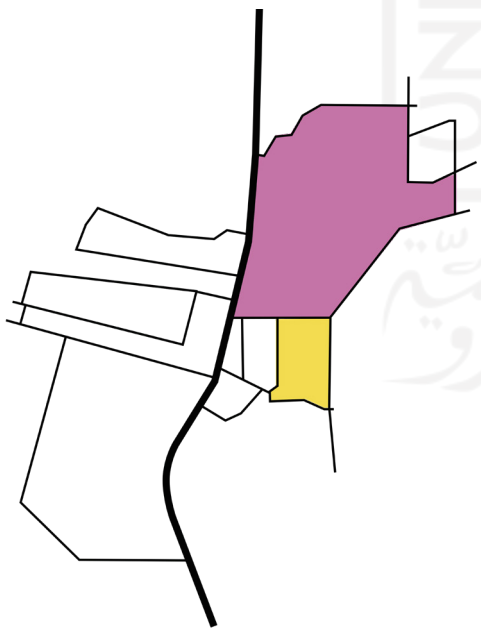
This is the area of the market which has 7,5 ha area. The site itself is surrounded by residentials and public facilities which makes it a strategic yet crucial location.

Fig. 2.12. Market Area
Source : Researcher Documentation



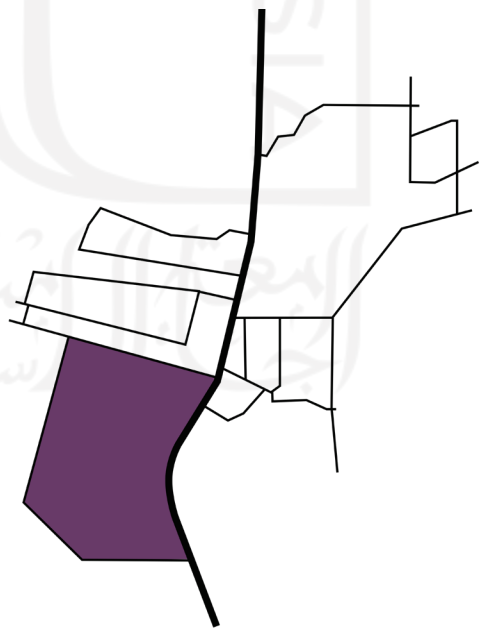
Islamic Centre is an important element due to its use during big events. The building is very common to have its function as ceremonial or symbolic events. Therefore considering this, the market shall be a good support for this building.

Fig. 2.13. Islamic Centre Area
Source : Researcher Documentation



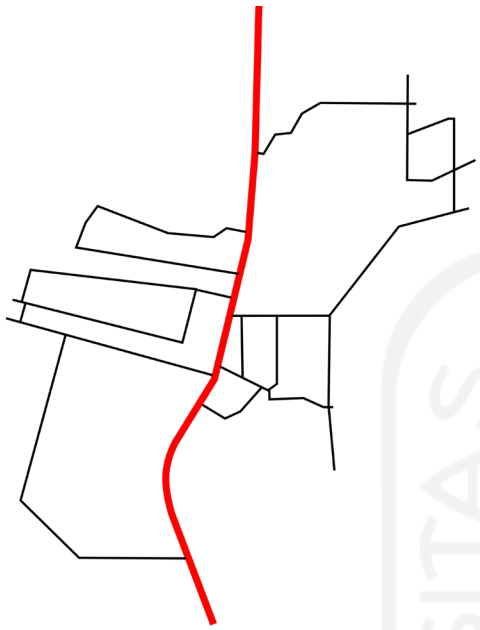
These areas are both used as residential area. Therefore since it is also connected to the site of the market, the circulation and interraction between these sites and the market shall not be blocked by anything.

Fig. 2.14. Residentials Area
Source : Researcher Documentation



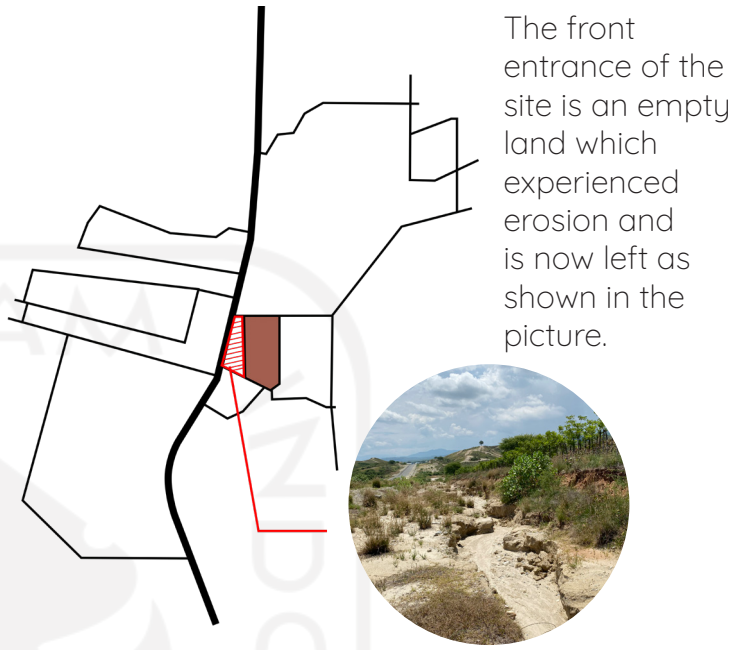
The Police Office is located slightly close to the area.
By considering the activities of the users, it is most likely for the polices to have several break times such as for lunch. Therefore the market needs to support the area for this activities.

Fig. 2.15. Police Office Area
Source : Researcher Documentation



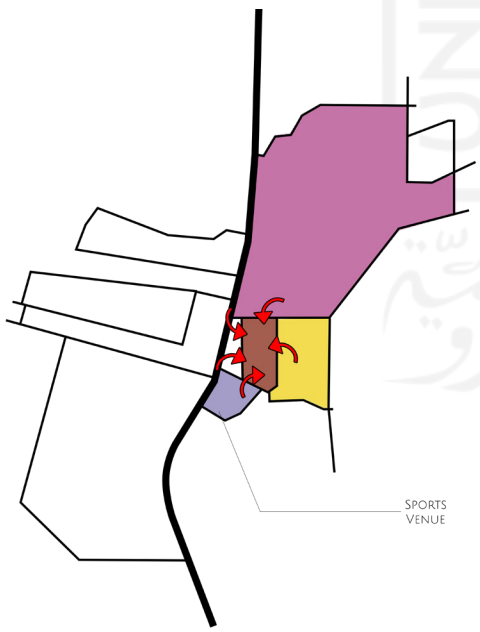
The main strees is located in the west of the site and is considered as a big street. This street even is often used for trucks to pass by.

Fig. 2.16. Main Entrance
Source : Researcher Documentation



The front entrance of the site is an empty land which experienced erosion and is now left as shown in the picture.

Fig. 2.17. Front Entrance
Source : Researcher Documentation



These areas are the closest and adjacent to the site. Therefore to be a good support for these areas, the site needs to have all sides to be able to be accessed.

Fig. 2.18. Entrances
Source : Researcher Documentation



2.2 BUILDING FUNCTION

Fig. 2.19. Traditional Market
Source : Ryutaro Tsukata via Pexels

I. THE DEFINITION OF MARKET



Fig. 2.20. Traditional Market
Source : Julia Volk via Pexels

The market can be divided into two types: concrete and abstract. The specific market is where buyers and sellers meet and conduct bargaining activities. The characteristic of a specific market is that the buyers and sellers and the goods are in the same place in the market itself.
In specific markets, what is sold includes consumer goods, such as a market that sells live animals. However, in the abstract market, buyers and sellers do not have the opportunity to bargain in a specific area, but they can reach a transaction.

II. THE TYPOLOGY OF TRADITIONAL MARKET



Fig. 2.21. Traditional Market
Source : Maria Orlova via Pexels

According to the regulation of Ministry of Trade of Indonesia No. 37/M-DAG/PER/5/2017 about the guide of building and operating the facilities of trading, traditional market is divided into 4 types :

Type A
This type of market is operated for daily use with at least 400 users and has at least 5000 m2 of land area.

Type B
This type is operated at least 3 times a week. The capacity of sellers inside are atleast 275 and the land area is not less than 4000 m2.

Type C
This type of market is operated by atleast twice a week with minimum of 200 sellers and has minimum of 3000 m2 land area.

Type D
This type is operated at least once a week with minimum of 100 sellers and has atleast 2000 m2 of land area.

According to the regulation, this project is categorized as type A.

2.3 DESIGN APPROACH

I. PRELIMINARY REVIEW OF BIOPHILIC



Fig. 2.22. Architecture And Nature
Source : Zack Melhus via Pexels

Biophilic design is a construction method that aims to connect the building occupants more closely with the natural environment. The bio-designed buildings combine natural lighting and ventilation, natural landscape features and other elements to create a more efficient and healthier built environment for people.

The fundamental challenge of biophilic design is to solve these shortcomings in the modern built environment by initiating a new framework for the beneficial existence of nature. The effective application of biophilic design begins by adhering to the basic principles previously described. From there, special practices of biophilic design can be employed to help achieve positive and beneficial results.



Fig. 2.23. Direct Experience of Nature
Source : Max Ravier via Pexels

a. Natural Shading System (Direct Experience)

Direct experience of nature is sometimes implemented by basically injected vegetations or another nature elements into a design of a building without further interpretation. Therefore the important thing to be considered by using this strategy is the integration between the nature elements and the existence of the design.
In this case, however, this strategy will be used by having direct natural shading system with real trees.



Fig. 2.24. Indirect Experience of Nature
Source : Tiff Ng via Pexels

b. Natural Framing (Indirect Experience)

In order to fulfill the concept of controlling the circulation, there is a term that can be used called “Framing The Nature” or “Natural Framing”. This term is a famous technique in photography which highlights a specific element of the nature by taking benefits of its surroundings. However, in architecture, this technique is sometimes implemented in creating scenery of a sacred places or creating a value of specific spots inside or outside of the building. This strategy is known as an efficient method of directing attention of the people or the users. Therefore combining it with biophilic design is a perfect match.

II. PRELIMINARY REVIEW OF RENATURALISATION



Fig. 2.25. Renaturalisation In Architecture
Source : Rachel Claire via Pexels

The term is currently used in the fields of urbanism, architecture and nature conservation. “Re-naturalization” (or planned ecological restoration) is the process of modifying part of space, building area, block, quarter, plot, landscape, or territory by expanding the scope of occupation. Natural elements-flora, fauna, surface water flow, morphological dynamic activities, etc. However, this mutation can take different forms. It may involve the spontaneous state process after human activities invaded a part of the space, or it may be the artificial landscape to some extent (in urban and industrial environments and in many rural spaces, for example, like the former pol fields, now has been sent back to the sea.

2.4 PRECEDENT REVIEW

I. MULTIFUNCTIONAL VERTICAL PARK (SALON VERDE / MVRDV)

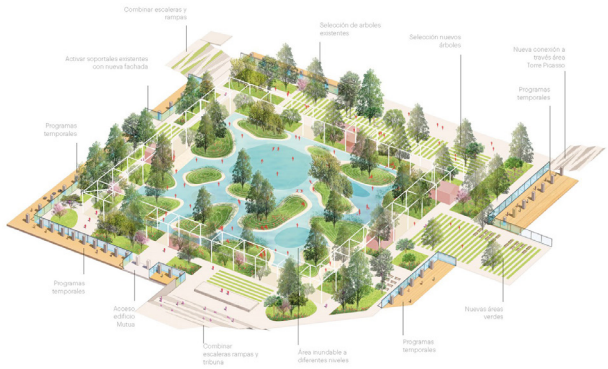


Fig. 2.26. Salon Verde
Source : MVRDV.nl



Fig. 2.27. Salon Verde
Source : MVRDV.nl

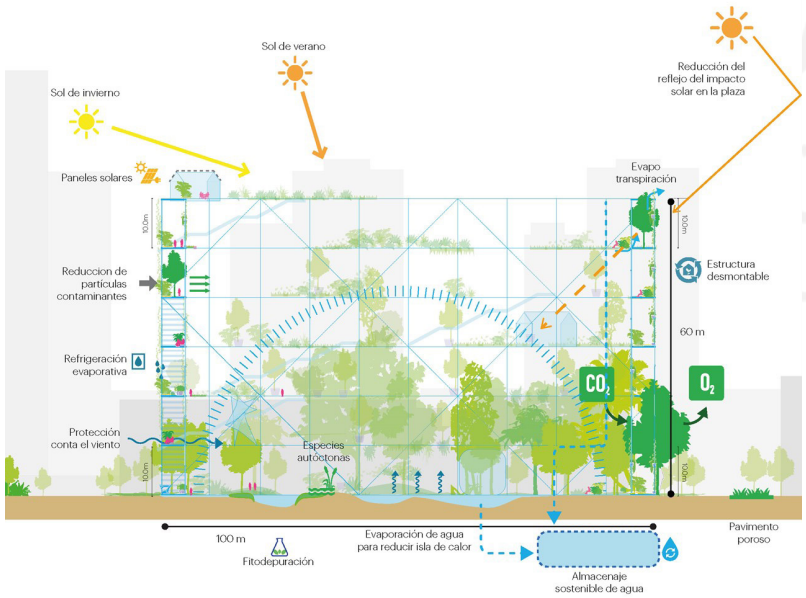


Fig. 2.28. Salon Verde
Source : MVRDV.nl

This project is surrounded by vertical park which consists of vertical arrangement of trees. This arrangement of trees provide shading system and directly filtering the air. However unlike Salon Verde, this Tondo Biophilic Market project does not need to use really high vertical protector as long as it follows the principle to use it literally as shading system, and as long as the protector follows the sun path the amount of reduced heat is adjustable with less structures than it is shown by this project of mvrdv.

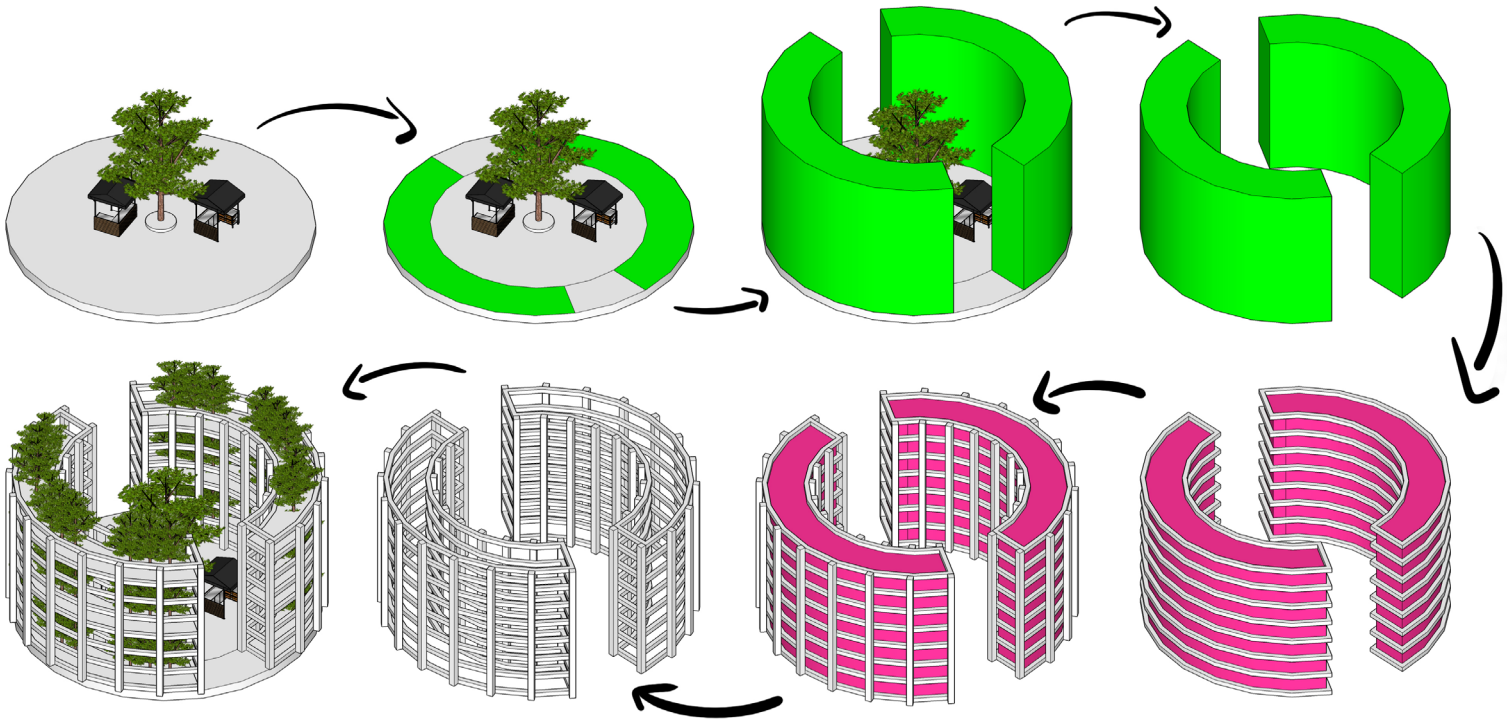


Fig. 2.29. Illustration of Vertical Park Concept Adaptation
Source : Researcher Documentation



Fig. 2.30. Illustration of Vertical Park Concept Adaptation Source : Researcher Documentation

The concept of this vertical park is choosen to be adopted into the market design. Using this kind of massing system will maximizing the shading of the area specially when the sun is slightly inclined to the east or west while not consuming too much space in the middle for trees.
This will also be suitable regarding the sunpath of the site which does not have significant movement throughout the year because of its geographical location which lies below the equator line.

II. Circular based circulation (Ring around a tree / tezuka architects)



Fig. 2.31. Ring Around A Tree
Source : Divisare.com

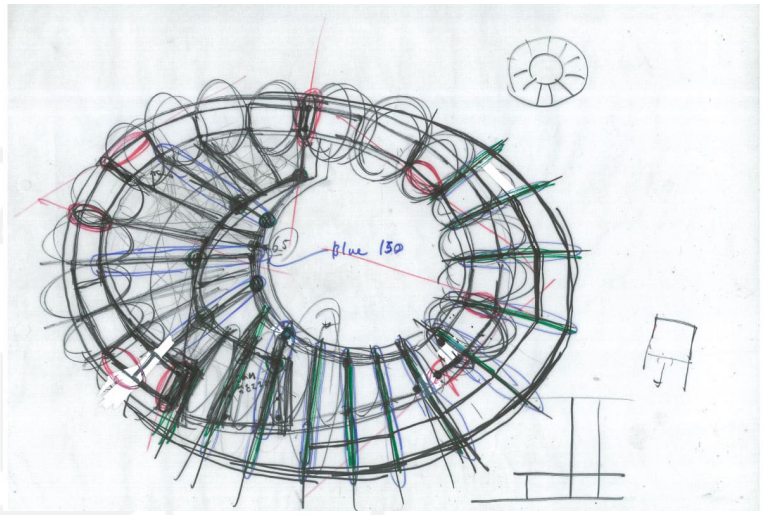


Fig. 2.32. Ring Around A Tree
Source : Divisare.com

This project is an annex building which was designed to be a bus waiting station and english class room for kindergarten students. Despite of being a multifunctional architectural element, this project was actually meant to be a preserving unit of the tree which has been there for at least 50 years. Therefore, it was designed to blend the existence of the tree with the daily life of the students.

To create interactions and fluid circulation for the activities, this project used circular shape as its main form. As we know, circular or circle is already known as a fluid element since it barely has blind spot, edges, or a stopping point. Circle is also sometimes related to infinity movement for its neverending sensation in space.

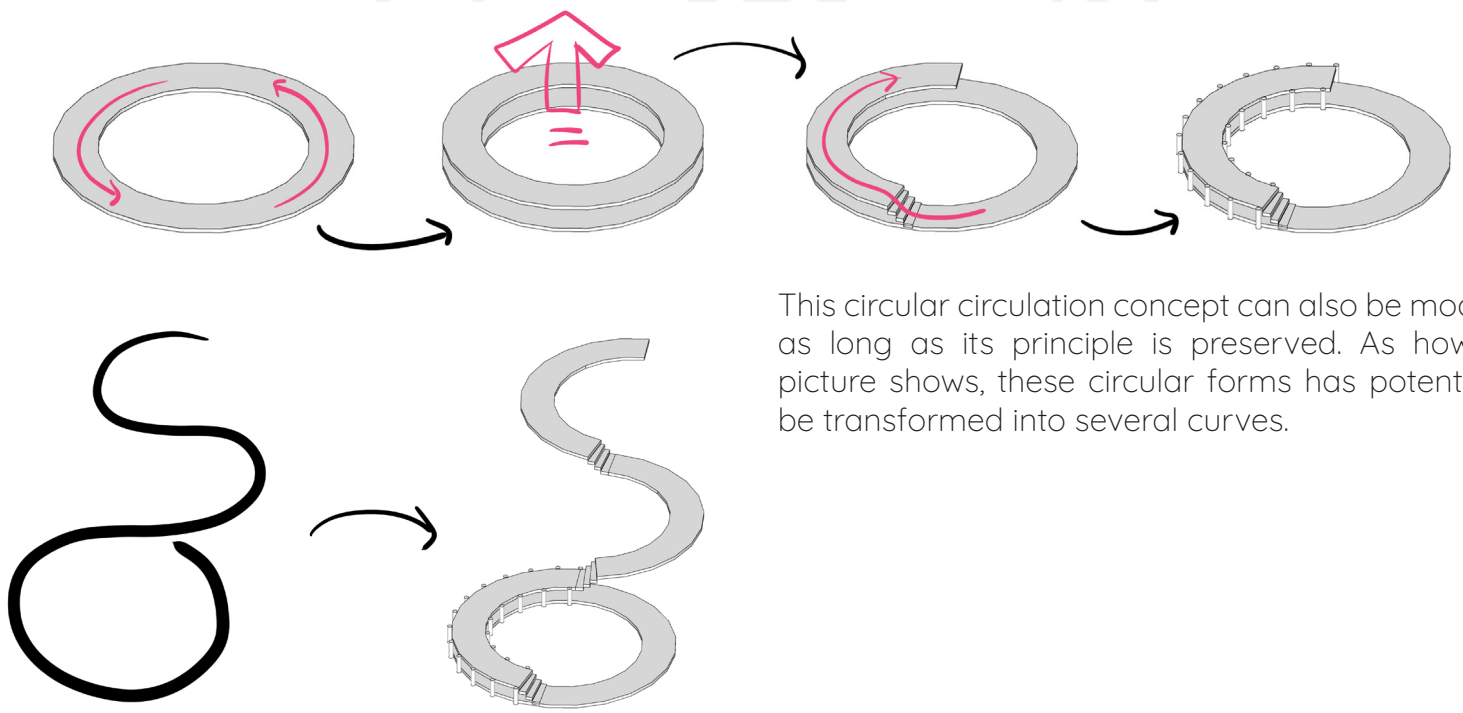


Fig. 2.33. Ring Around A Tree Concept Adaptation
Source : Researcher Documentation

This circular circulation concept can also be modified as long as its principle is preserved. As how the picture shows, these circular forms has potential to be transformed into several curves.

III. Scenery Framing Concept (Zen Centre at Baoguosi Buddhism Temple / Approach Architecture studio)

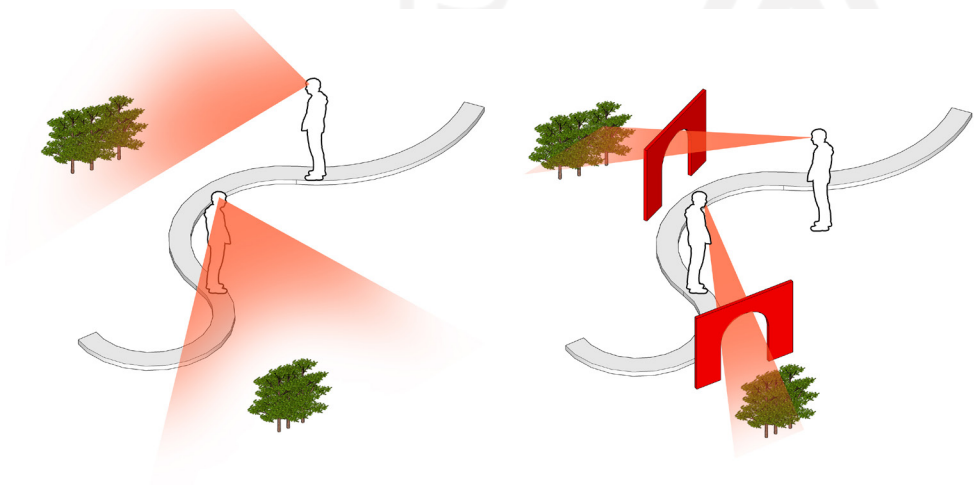




Fig. 2.34. Zen Centre
Source : Archdaily

This project is located among mountains and forest. In order to not break the connection within its surroundings, the trees are preserved and it is the site that adapted into the situation. This project even used wooden structure to be easily assembled in the site without using massive construction machine so that it would not damage the forest.

Its great connection with nature elements is the selling point of this project. Things like transparrent roof or even open balconies in the end of each corridors were designed to take off any boundaries from the nature. One of the biggest role of archiitecture in this project is how it is used to preserve the sceneries and the existence of the forest.



The illustration shows how a simple gate can actually control users attentions and explains that architectural elements, even in its simple form is able to connect any tangibles and intangible variables inside of the building.
This basic principle is going to be adapted into the market design to support the biophilic concept by connecting the nature and the building.

Fig. 2.35. Zen Centre Concept Adaptation
Source : Researcher Documentation

IV. Distracted Sign Concept (Shengli Market / Luo Studio)



Fig. 2.36.
Shengli Market
Source :
Archdaily

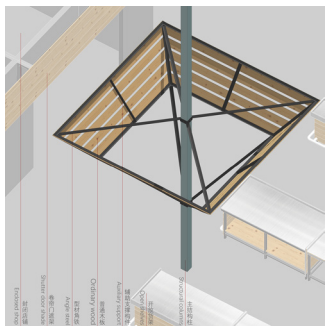


Fig. 2.37. Shengli Market Extension
Source : Archdaily

This project is a temproary market and was designed due to the immediate needs of people since the old market is under renovation and construction. Therefore as the temporary market, it was considered as a must low cost project and on the other hand sustainable in order to be still useful whenever it faces future renovation or redesign project. As the result of low cost and sustainable concept, the project proposed steel construction and other lightweight materials as its core to significantly achieve their target.

What is interesting from this project is the use of this simple modular extension. As the conditional case was a crowded, unarranged and as a sudden market, the designer proposed this as one of architectural elements to instantly put the stalls inside of the market 'in order'. The usage of this extension is not only as a sign to show the areas inside of the market but also to be a lighting fixture installation.

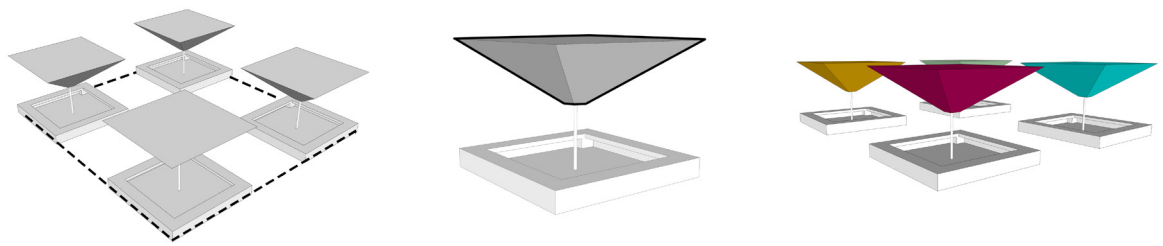


Fig. 2.38. Shengli Market Extension Concept Adaptation
Source : Researcher Documentation

These extensions, however, is designed to have a distractive element by creating pyramid shaped signs inside a rectangular based design. By having this distraction the signs are able to catch people attention and is easier to be noticed.

CHAPTER 3 .

DESIGN CONCEPT

3.1 DESIGN CONCEPT FRAMEWORK
3.2 URBAN CONNECTION
3.3 BIOPHILIC DESIGN AND IMPLEMENTATION
3.4 SITE DEVELOPMENT AND MASS PROGRAMMING
3.5 ZONATION DIAGRAM BASED ON GOODS

3.1 Design Concept Framework

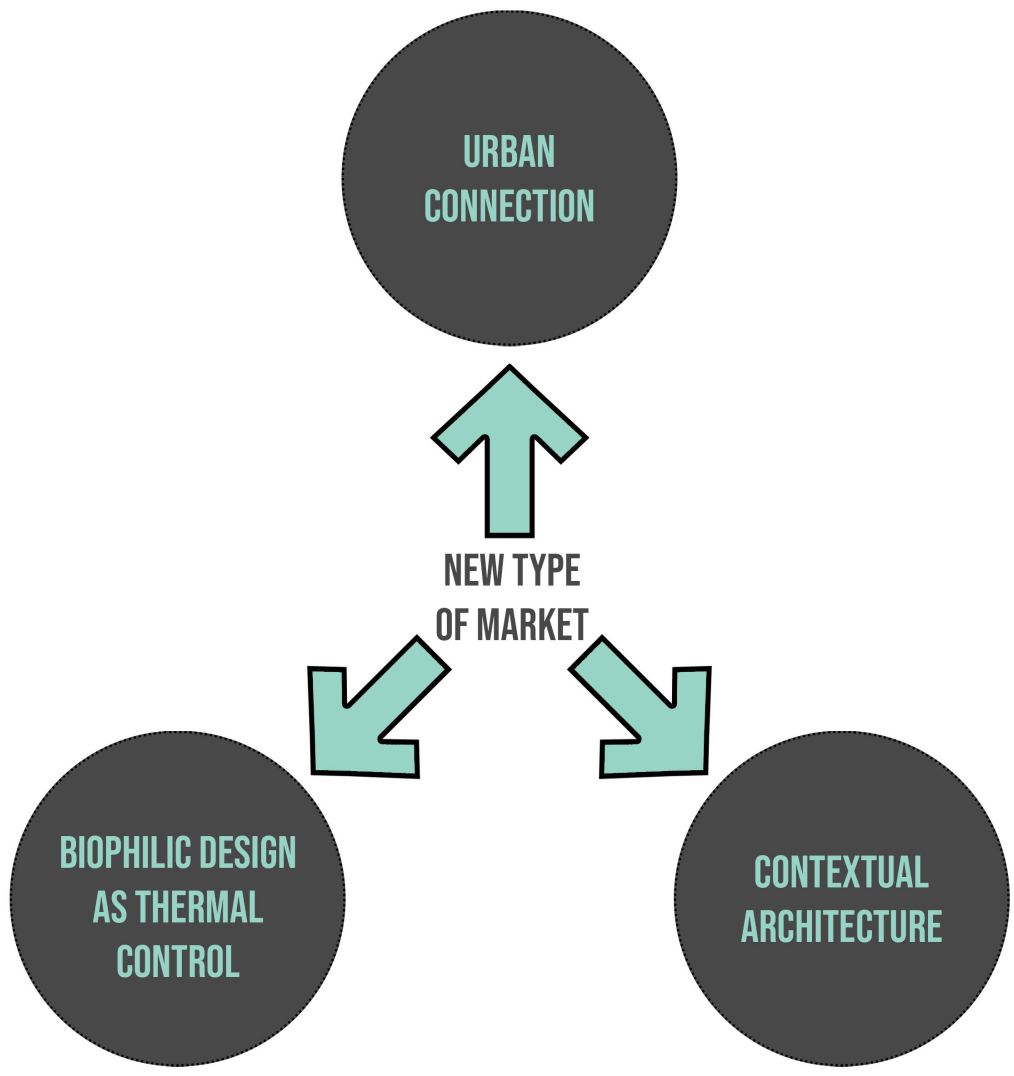


Fig. 3.1. Design Concept Framework
Source : Researcher Framework

The integration of biophilic use to fix the thermal comfort and circulation issue is important in this project as how it is shown in the diagram. However, since all of the ideas are connected, removing one from another will absolutely fail the goals of the project.

3.2 URBAN CONNECTION

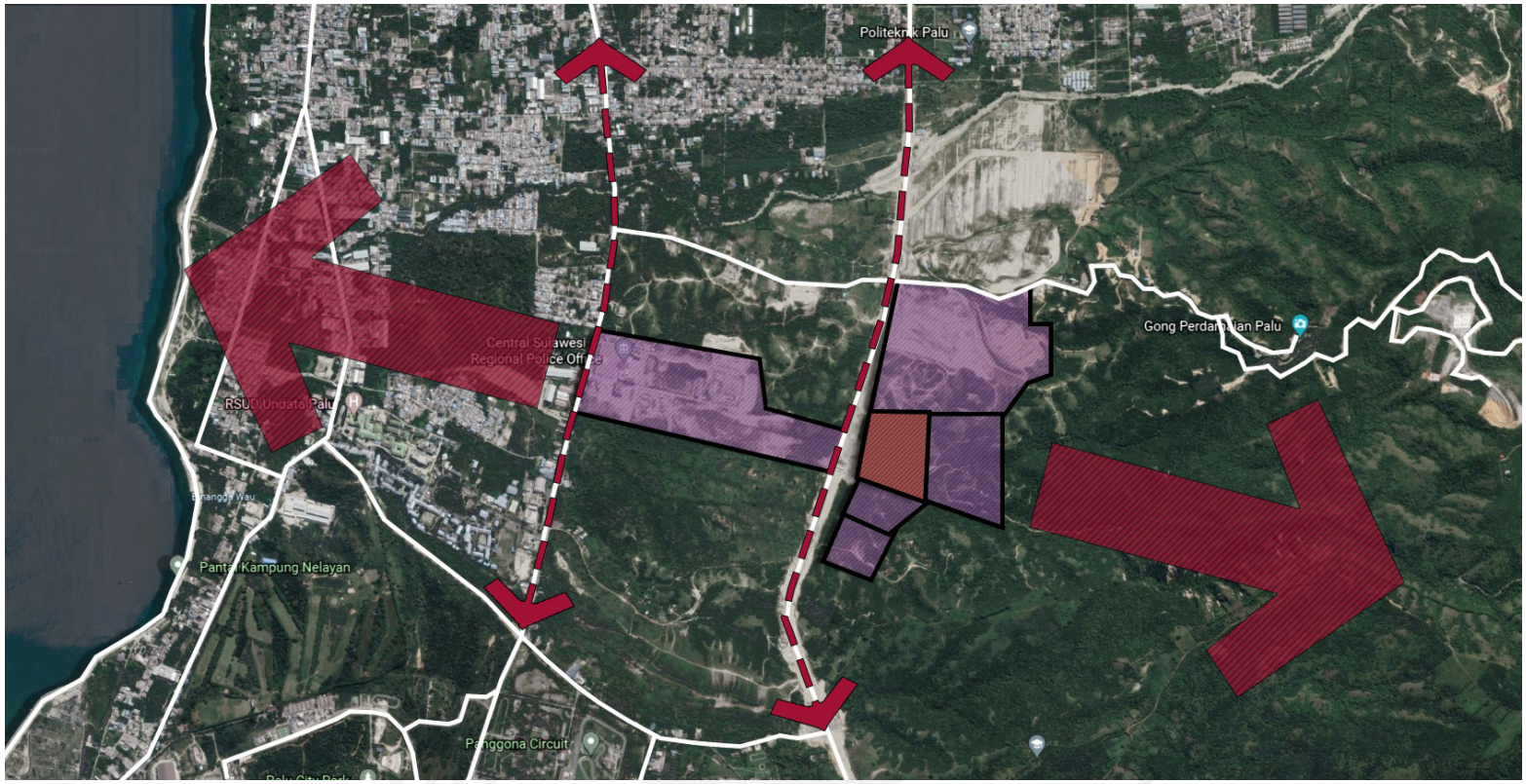


Fig. 3.2. Urban Axis Scheme
Source : Researcher Documentation

I. URBAN AXIS

The site is located in a unique axis based on the strong existences of the main street and two opposite natural features; sea and hills. However there are some disarranged problems towards the shape of the site and its adjacent ones alongside with unconnected circulations which will be a total waste considering the advantageous position.

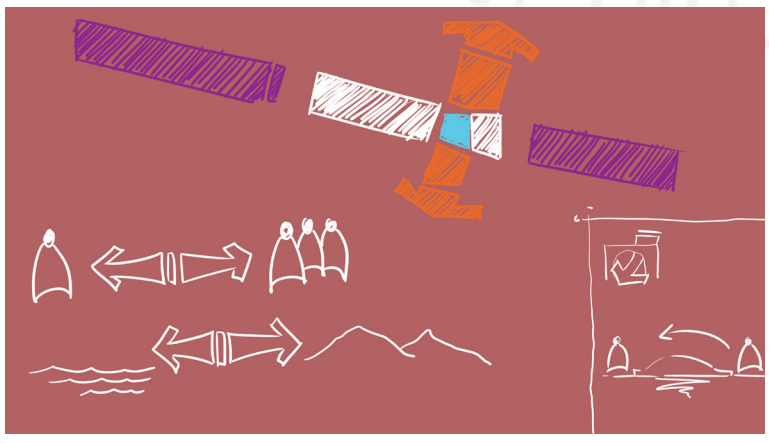


Fig. 3.3. Urban Axis Sketch Source : Researcher Documentation

As the conceptual process goes, it shows that the site does not only lies in the middle of two opposite natural variables but also communities such as as local people and police officers, or the ones from the housing area and the extreme sport venue. By learning the condition of how the site is able to distinguish those variables, it is also able to connect them.

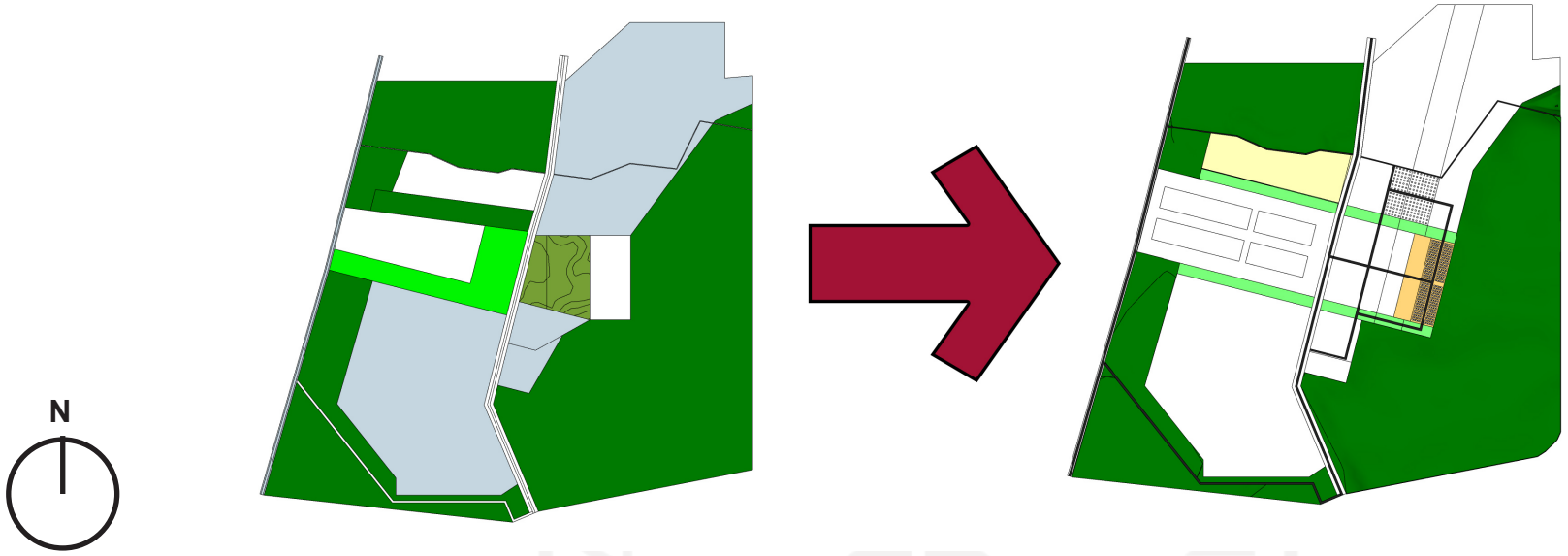


Fig. 3.4. Urban Design Transformation
Source : Researcher Documentation

From the previous idea, the urban situation has been redesigned following the urban axis, the connectivity to each sites and additional implementation of biophilic elements.

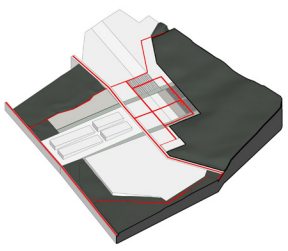


Fig. 3.5. Accessibility
Source : Researcher Documentation

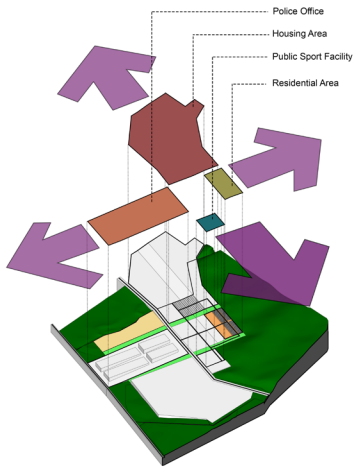


Fig. 3.6. 3D Axis Diagram
Source : Researcher Documentation

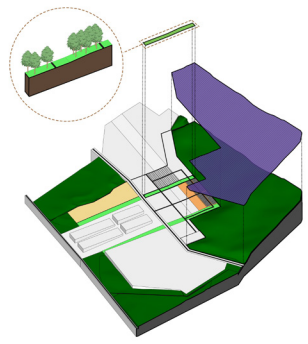


Fig. 3.7. 3D Green Area Diagram
Source : Researcher Documentation

The new urban plan has a one connected main access all the way through the adjacent sites of the project site in order to remove the site and the future building itself as a barrier of movement to the communities.

The axis can be seen clearly here. The new urban plan is certainly more arranged than the previous one.

In empowering the urgency of this project, several green areas has been designed in between the sites. It is part of the movement to invite people to live with trees since it has a lot of benefits. Of course, the existing green areas remain untouched.

II. URBAN DESIGN IMPLEMENTATION

3.3 BIOPHILIC DESIGN AND IMPLEMENTATION
I. LADYBUG SUN RADIATION ANALYSIS

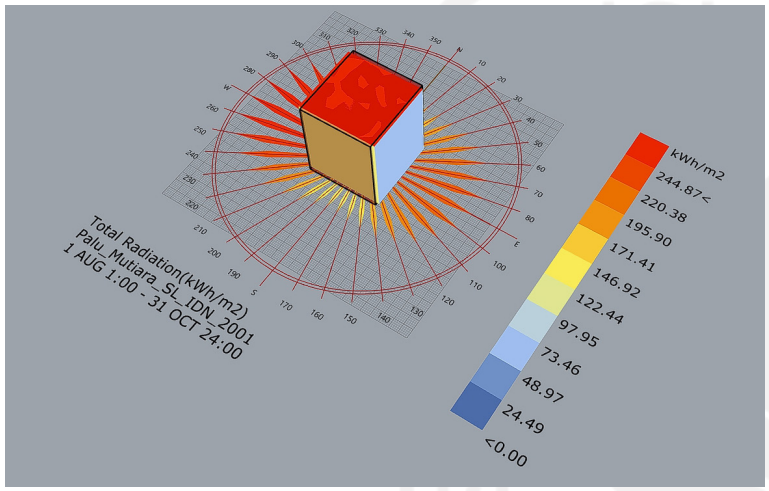


Fig. 3.8. Ladybug Radiation Analysis
Source : Researcher Documentation

As mentioned before, the main consideration of the biophilic concept in this project is how to promote trees as the easiest, healthy, and natural answer to counter the hot temperature of the city. For a quick picture, this is the sun radiation diagram, based on real climate data of Palu from august to october which has been rendered and calculated by using Ladybug software.

The radiation data shows that most of the radiation in total comes from west part of the site. Where the lesser one comes from the east. Therefore in conclusion of this data, it can be concluded that :

- Building orientation must be covered on west side.
- Building shall be opened from the east and southeast side.
- The zone in the west part of the building must not contain sensitive goods.

II. Trees to be used

Red Sandalwood

Red Sandalwood is a known species in Indonesia, commonly goes with a name “Cendana Merah”. The tree is able to grow up to 45 feet. Therefore, as a shading system, this tree is quite famous.



Fig. 3.10. Red Sandalwood
Source : kompasiana.com

Ebony Tree



Fig. 3.9.
Ebony Tree
Source :
portalinfokom.
id

Ebony tree is an endemic species of Central Sulawesi. The tree has been known as a conserved tree because of its rare black wood. However, since the project is going to be govenrmental asset, the land can be used as a place for this tree to be freely grown and cultivated.

3.4 SITE DEVELOPMENT AND MASS PROGRAMMING

I. LAND EROSION AND WATER RESERVOIR



Fig. 3.11.
Site Condition
Source : google earth

This aerial picture shows despite the site has unusual heat during dry season, it has potential to suffer the same damage during heavy rain one just as how it normally happens in tropical areas, specially the ones which are located below the equator line, like Palu.

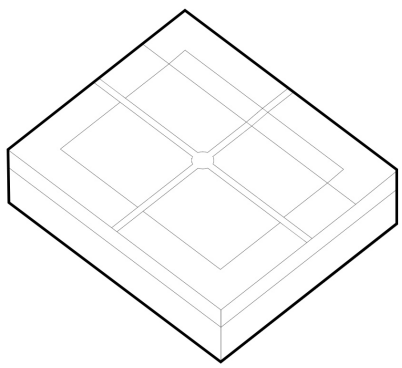
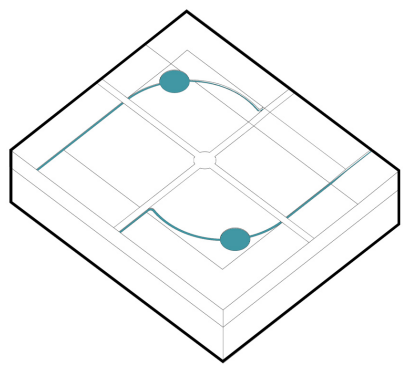
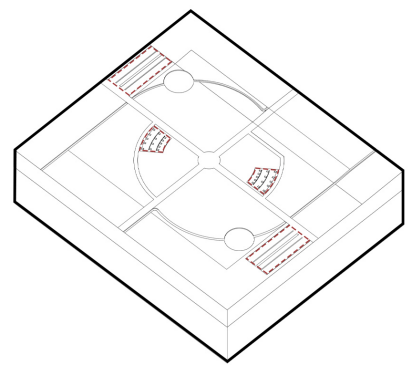


Fig. 3.12.
Dev Diagram
Source : Researcher Documentation

This is the current condition of the site with the cross streets from the previous urban design process.



By looking at the existing condition of the site that has a lot of erosion marks, the site will potentially encounter massive impacts of heavy rainfall and to avoid this, the drainage and water reservoir has been added.



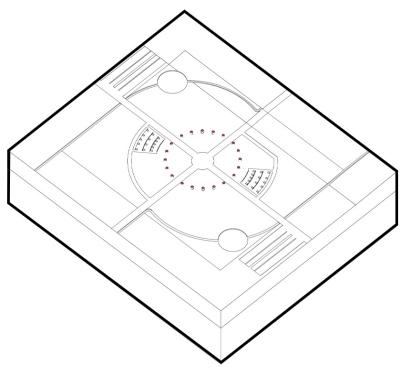
Another one is the parking lots which are plotted based on the path of the street to ease the movement of vehicles.

II. PRECEDENT IMPLEMENTATION ON MASSING PROCESS

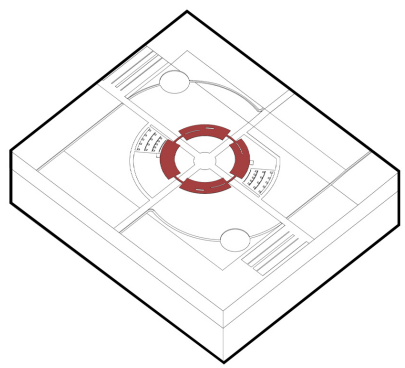
The precedent that has been reviewed in (2.4) will be applied on the building massing process which are :

Natural shading system and distracting sign concept are the reason why the mass is in the middle, right on top of the street. The purpose is both to be shielded by trees from the sun radiation evenly, and becoming strongly noticable because it is in the position where it will always be visible from any directions.

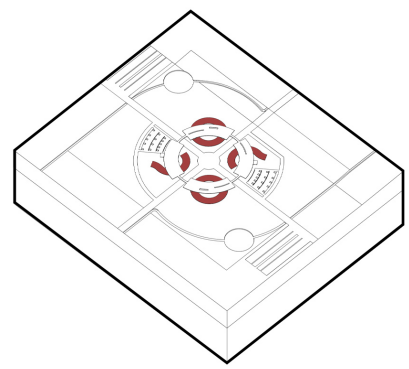
The next precedents which are circular floor plan and framing the nature is combined to create a movement path on top of a strategic location surrounded by nature. With that being said, all of the precedent is fully applied on the project.



Considered its done, the next phase of site development is placing the mass by first putting the main structural beam to lift up the main area above the ground.



The next one is adding the concrete slab that will be used as sellable area.



The next phase is to add more sellable area on the space below the main structure.

Fig. 3.13. Dev Diagram
Source : Researcher Documentation

III. TAMBI FACE AS BUILDING ENVELOPE

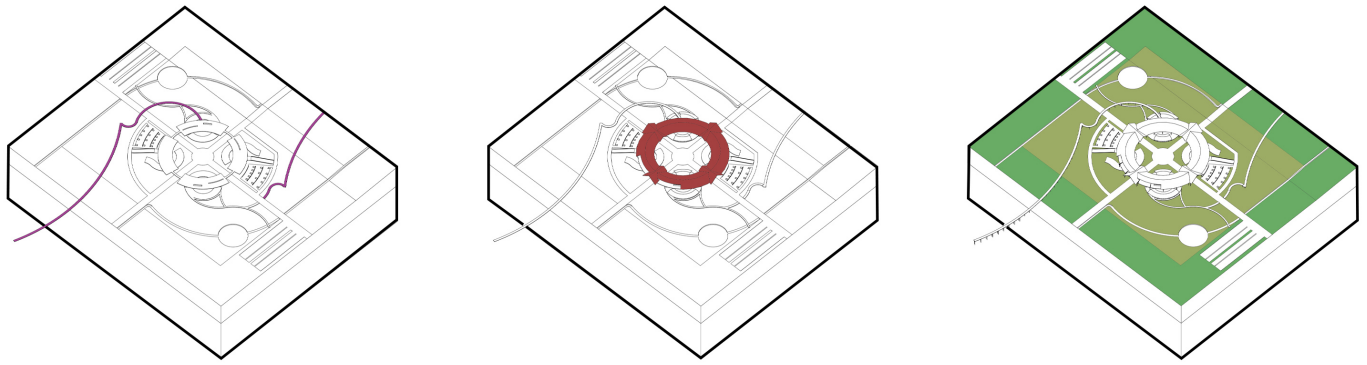


Fig. 3.14.
Dev Diagram
Source :
Researcher
Documentation

The next step is creating another connectivity directly to the police office and the residential area to ease of the access of pedestrians to come to the market.

The next one is having a building envelope which is transformed by the iconic traditional house of Central Sulawesi which was named Tambi. The picture of Tambi has been implied on 4 sides or every entrances to welcome and people to the site. However, the iconic triangle is also part of the triangle as it transformed into circular geometry.

The last part is covering the green area with trees.

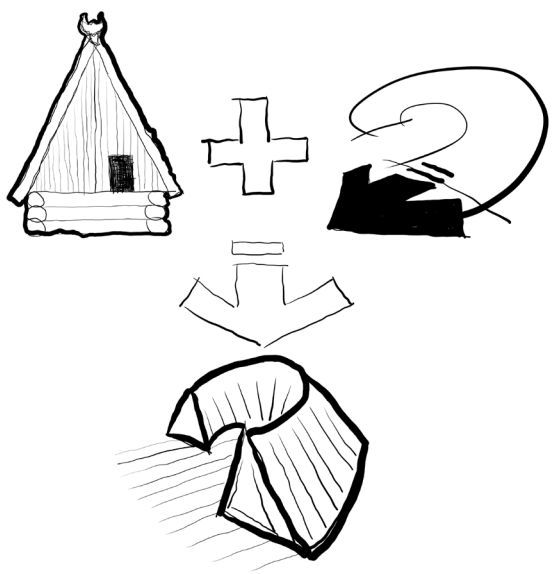


Fig. 3.15.
Tambi Sketch
Source :
Researcher
Documentation

This is the transformation of the circular roof which is actually also came from the iconic triangle of Tambi that has been transformed by following the circular geometry.

3.5 ZONATION DIAGRAM BASED ON GOODS

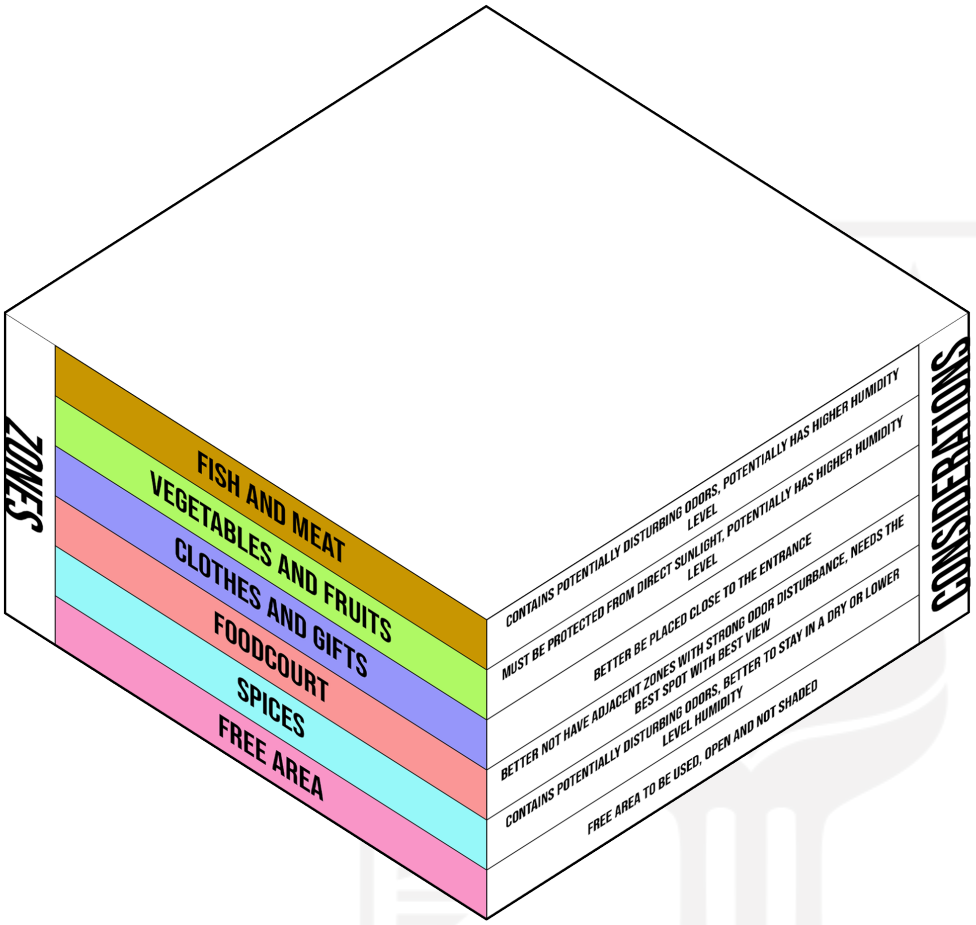


Fig. 3.16. Zone Diagram
Source : Researcher Documentation

These are the schematic diagram that shows how the areas or zones within the building are divided based on the goods since no matter how, the context of the building is still a market that needs to provide something to sell.

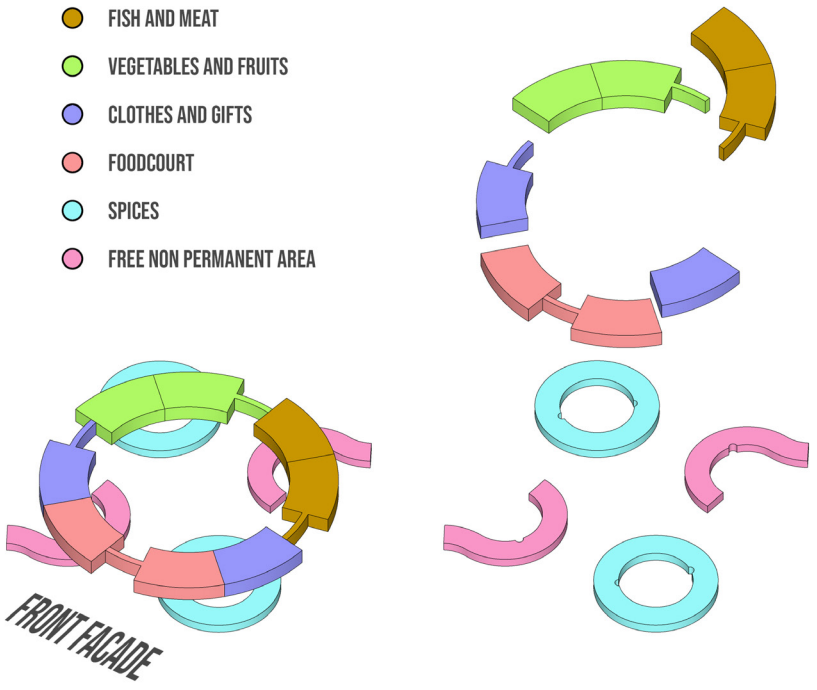


Fig. 3.17. Zone Diagram
Source : Researcher Documentation

Chapter 4.

Design results

4.1 PIONEERING FUTURE DEVELOPMENTS
4.2 COMMUNITY CONTRIBUTION
4.3 URBAN HEAT REDUCTOR
4.4 NEW TYPE OF MARKET
4.5 IMPLEMENTATION OF LOCAL ARHITECTURE AND MATERIALS
4.6 CONCLUSION

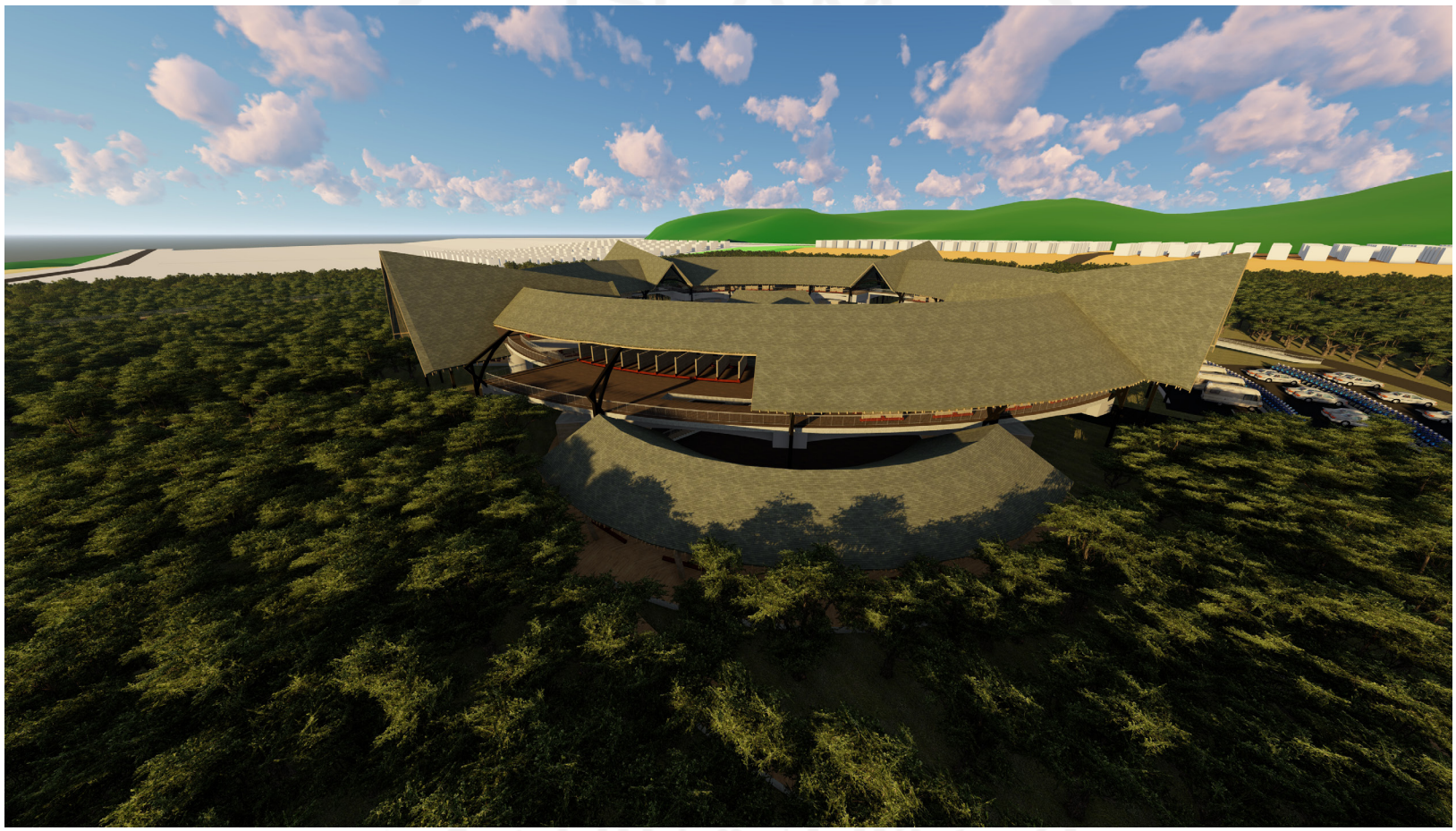


Fig. 4.1. Tondo Biophilic Market
Source : Researcher Documentation

4.1 PIONEERING FUTURE DEVELOPMENTS

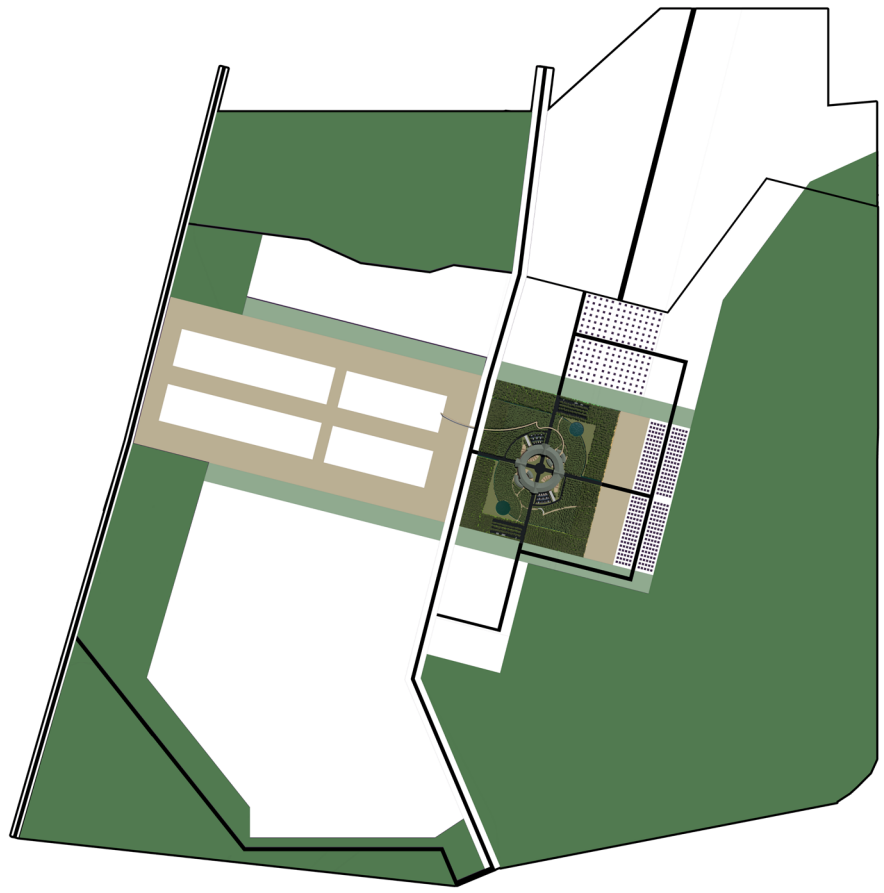


Fig. 4.2. Situation
Source : Researcher Documentation

The main purpose is to pioneering the future development of any architectural project to involve trees as the main elements and that is why people need to understand its value soon.

Therefore by having this project interract with people directly on daily basis, it is aimed that the needs of green architecture will significantly increased in urban scale.

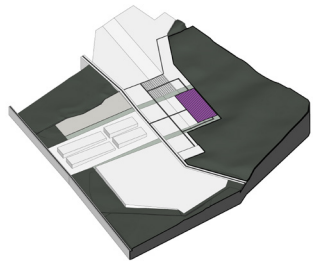


Fig. 4.3.
Diagram
Source :
Researcher
Documentation

The first one is the local people. In common, most of local people in this area are fishermen. Therefore providing an easy-to-access marketplace will help them a lot to feed their family.

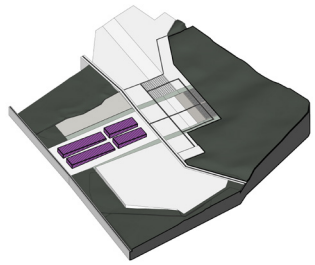


Fig. 4.4.
Diagram
Source :
Researcher
Documentation

The second is the police office. Currently, in this area, the closest cafetaria or place to eat during lunch needs to be accessed by vehicles. However, it is now easily visited by walking.

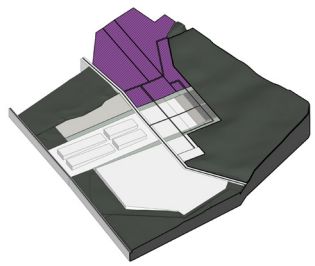


Fig. 4.5.
Diagram
Source :
Researcher
Documentation

The housing is actually a new project, alongside the market that has been initiated by the government. Therefore having a central groceries or places to purchase goods will always be a good thing.

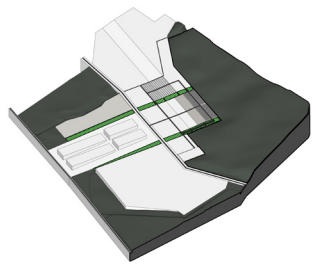


Fig. 4.6.
Diagram
Source :
Researcher
Documentation

Since the project is supposed to be done under the authority of the government, means other than housing, all the facilities belong to no one. This is actually good news, because the green area can be suggested to be used by people to grow commodity such as table grapes.

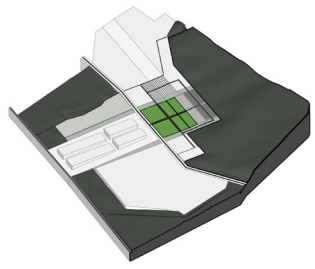


Fig. 4.7.
Diagram
Source :
Researcher
Documentation

Lastly, despite it has been mentioned several times, it is still a main target that having a ‘forest’ in the middle of crowd will awaken the awareness of local people of how important the nature elements are.

4.2 COMMUNITY CONTRIBUTION

Aside from connecting the community socially, the impact of the spatial arrangement in urban scale in this area will also ease people to have better life quality.

4.3 Urban Heat Reductor

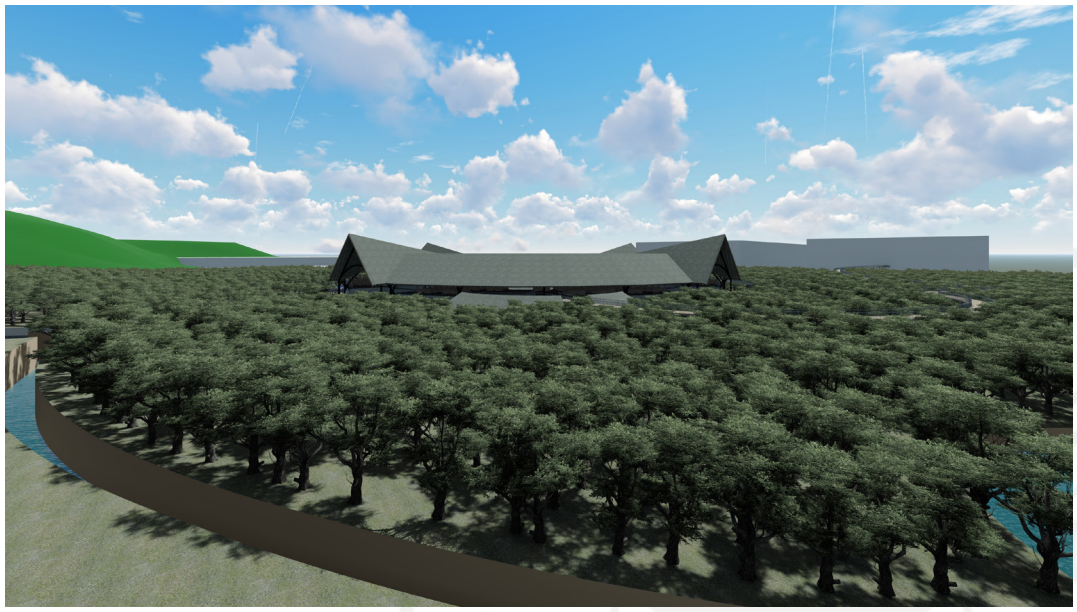


Fig. 4.8. Tondo Biophilic Market
Source : Researcher Documentation

To prove that trees has a decent ability in significantly reducing urban heat temperature, this design will show a simulation of how it works and prove it.

Below is the Grasshoper's program that has been coded by gathering the epw data of Palu. The data then connected to the skymatrix then to the sun radiation.

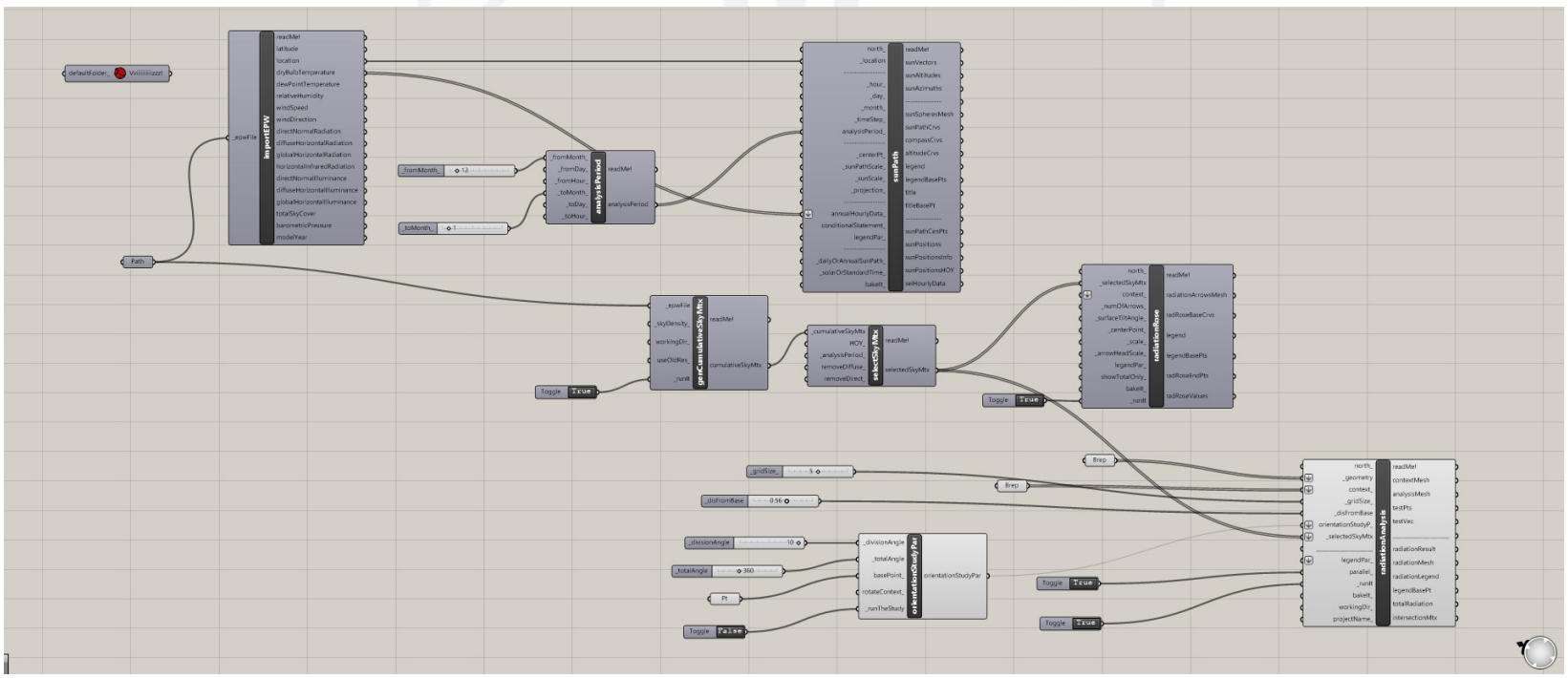


Fig. 4.9. Ladybug Program Script
Source : Researcher Documentation

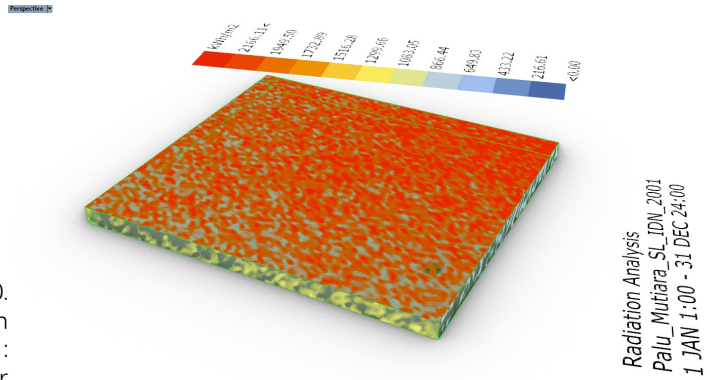


Fig. 4.10.
Simulation
Source :
Researcher
Documentation

As the start of the simulation, beside is the temperature on this area without trees.

The white part is the schematic shading form of the canopy of a tree, since it is unnecessary to have 3D model of real trees, and it will make the file bigger and the process slower which will be potentially fail to be processed.

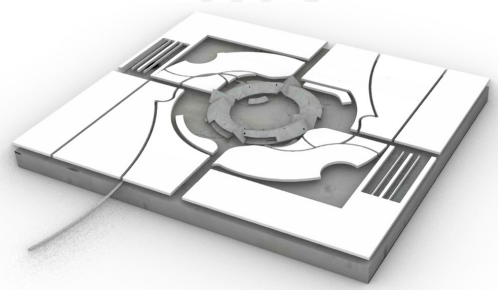


Fig. 4.11.
Simulation
Source :
Researcher
Documentation

This is the result of the sun radiation test. It shows the difference of number in shaded and non shaded area.

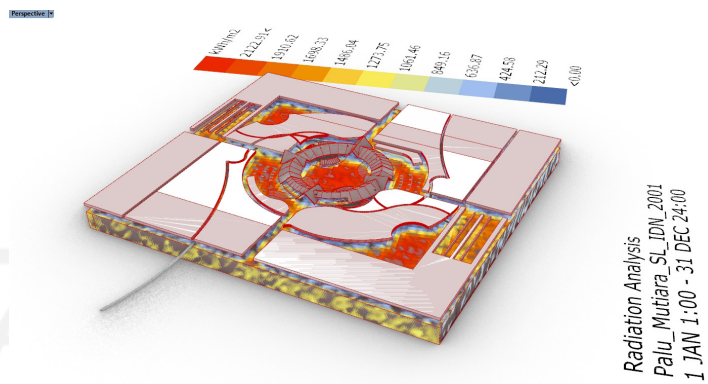


Fig. 4.12.
Simulation
Source :
Researcher
Documentation

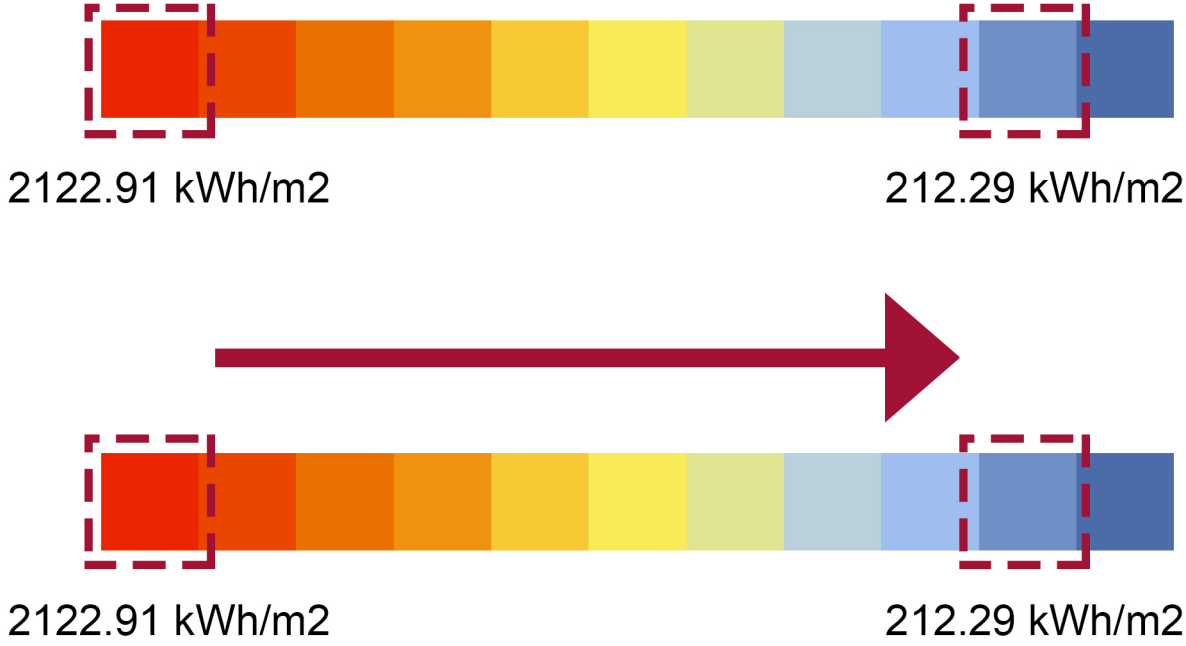


Fig. 4.13.
Simulation
Source :
Researcher
Documentation

It is mentioned previously that one of the aim of this project is to reduce the sun radiation in this site and as how it is shown by the indicator bar above, it can be seen that the number of sun radiation is reduced significantly.

4.4 New Type of Market

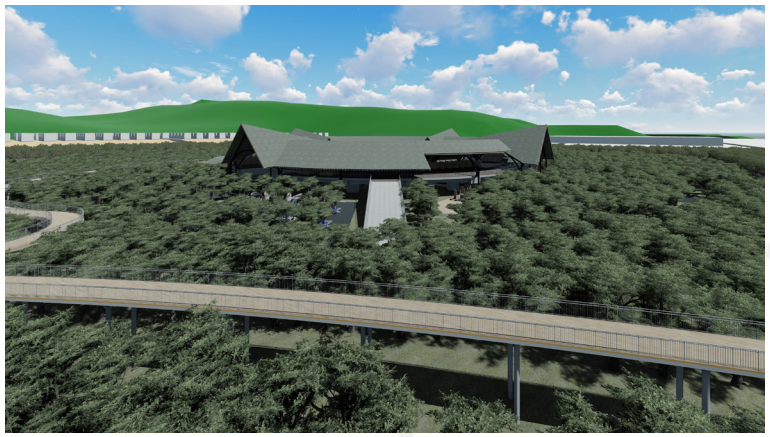


Fig. 4.14. Tondo Biophilic Market
Source : Researcher Documentation

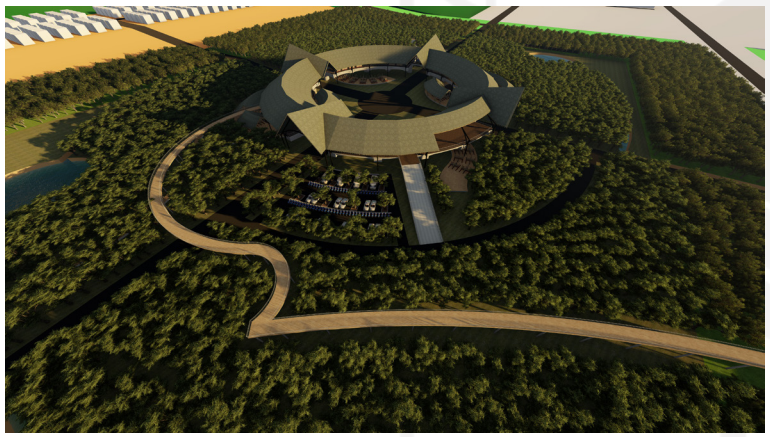


Fig. 4.15. Tondo Biophilic Market
Source : Researcher Documentation

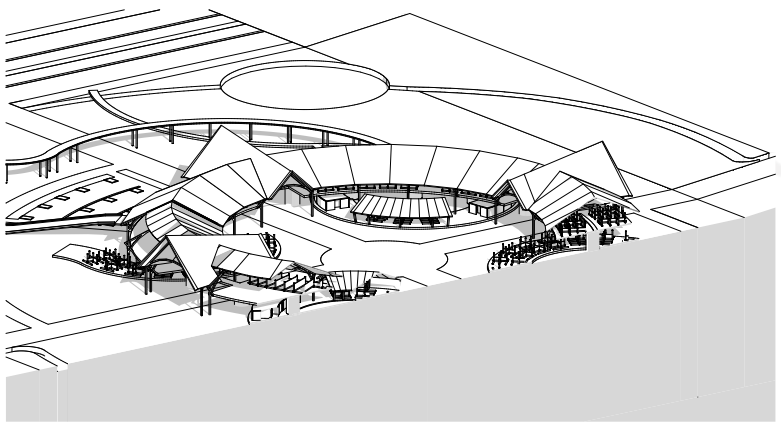


Fig. 4.16. Section
Source : Researcher Documentation

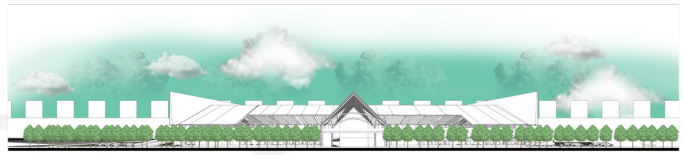


Fig. 4.17. West Elevation
Source : Researcher Documentation



Fig. 4.18. South Elevation
Source : Researcher Documentation

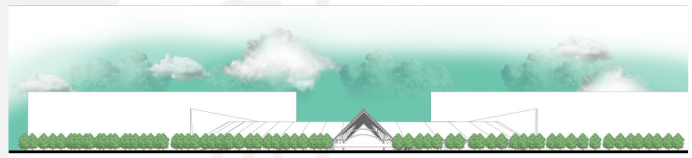


Fig. 4.19. East Elevation
Source : Researcher Documentation

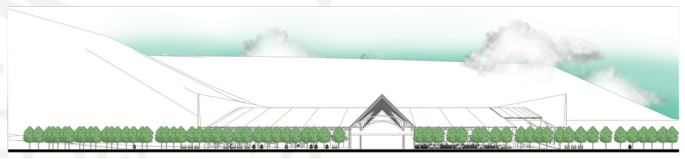


Fig. 4.20. North Elevation
Source : Researcher Documentation

Despite of being contextually a market, this project has created a new type of market because of its unusual approach by fusing a “forest” with a trading area and how it connects people with an unusal form of building to the local people. Therefore despite of the function as a market, this project can also be considered as park.

These are the technical drawings of the market that shows some of details of the building.

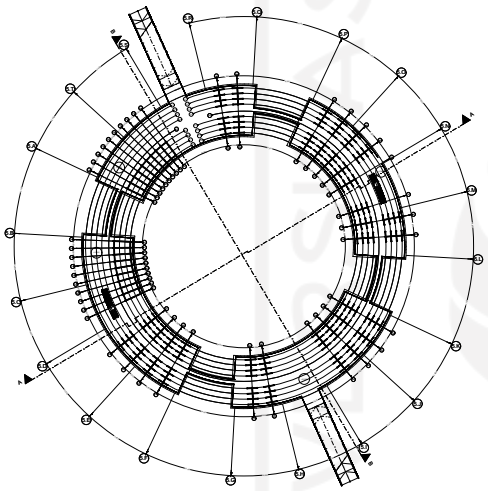


Fig. 4.21. 1ST FP
Source :
Researcher
Documentation

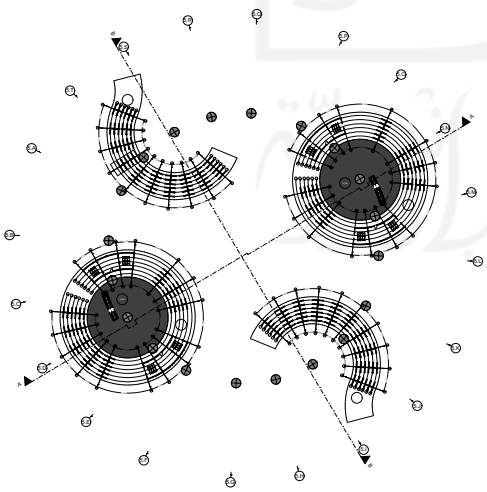


Fig. 4.22. GFP
Source :
Researcher
Documentation

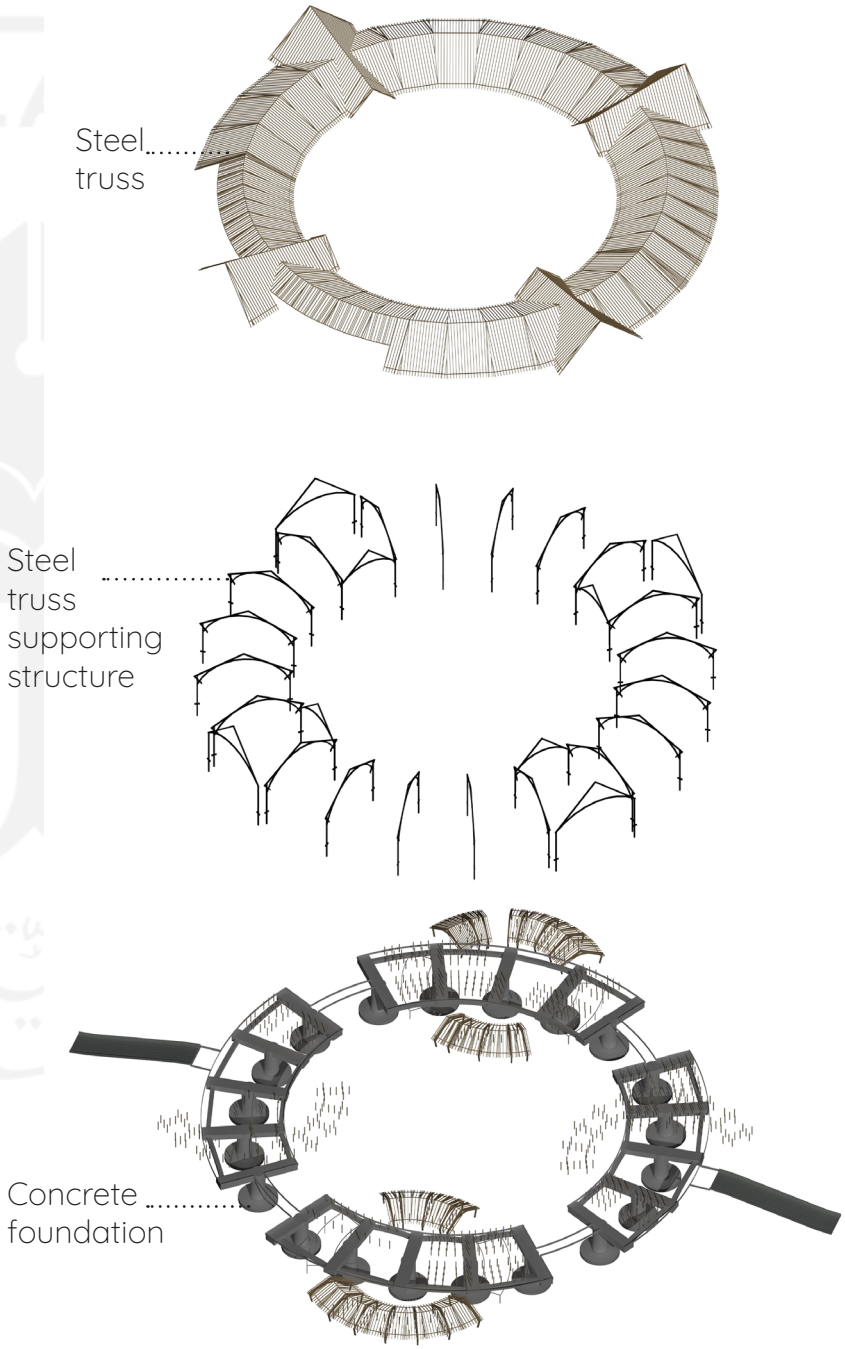


Fig. 423. Structure Axonometry
Source : Researcher Documentation

4.5 Implementation of Local Architecture And Materials

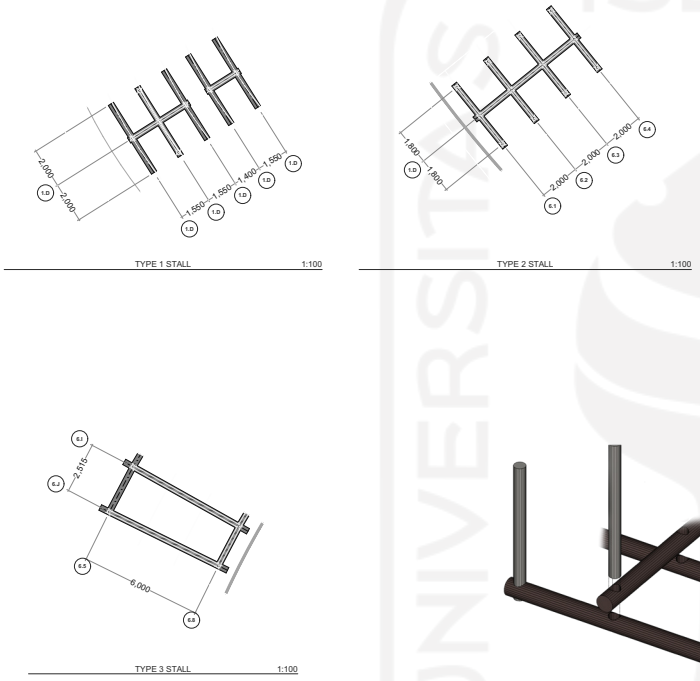


Fig. 4.24. Stalls
Source : Researcher Documentation

As for the stall, the stall inside the market will be semi permanent by using the stacked wood structure which is adapted from Tambi traditional house.

This is the closer look of the Tambi iconic triangle explicitly implemented to one of the side of the building. This part will not only be an attraction to the visitor but will also be a good farewell for people who pass by.

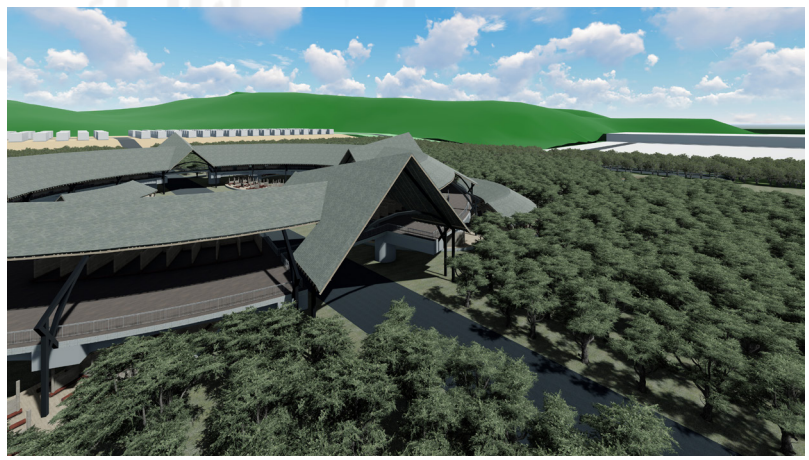


Fig. 4.25. Tondo Biophilic Market
Source : Researcher Documentation

4.6. CONCLUSION

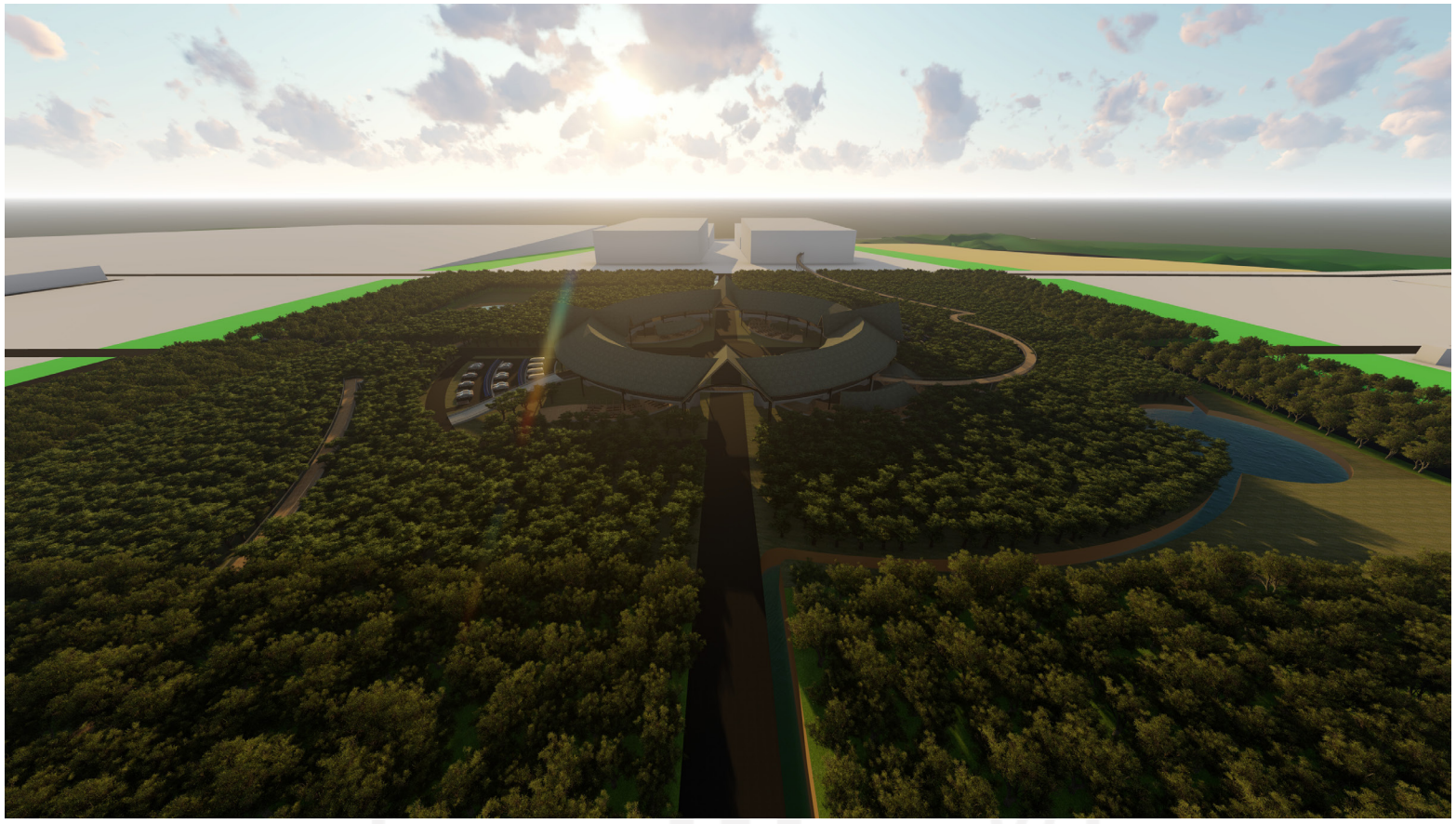


Fig. 4.26. Tondo Biophilic Market
Source : Researcher Documentation

Tondo Biophilic Market is programmed to be the new hope of Palu. The project has been proved that it is able to reduce the urban heat significantly, and is able to integrate it with architectural design without abandoning its impacts to the surrounding areas. That being said, it is proven that it is possible for Palu to start over a new development of a city by involving nature and trees for better lives to its people.

Chapter 5.

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ATTACHMENTS .

ATTACHMENT 1 : PLAGIARISM TEST RESULT

ATTACHMENT 2 : APREB

ATTACHMENT 1 : PLAGIARISM TEST RESULT

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Fakultas / Prodi : Teknik Sipil dan Perencanaan/ Arsitektur
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Karya ilmiah yang bersangkutan di atas telah melalui proses cek plagiasi menggunakan **Turnitin** dengan hasil kemiripan (*similarity*) sebesar **1 (Satu) %.**

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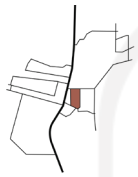
Yogyakarta, 12/8/2021
Direktur

Joko S. Prianto, SIP., M.Hum

ATTACHMENT 2 : APREB

ABSTRACT

After the earthquake disaster in 2018, the northern palu which was once a projected as dedicated green area turned into a projected next development of dwellings and housings. This is both good since the findings of safety land to use in Palu will increase the survive probability of the local people but also will significantly reducing the amount of green area from the earlier case. On the other hand, the thermal issues inside the city has been rarely fixed. In Addition, the fact that trees can limit the damages of earthquake can actually be an answer for Palu to face the threat and adapt to the situation. However, the dwellings project is not yet started means several dedicated area is still not designed. To avoid the future bad impacts, this project has been proposed by using the traditional market area as an objective. The concept is to show the crucial role of trees and forest in saving Palu city from uncomfortable thermal issue by using biophilic approach by considering the context of traditional local markets and its problems.



This project is located in Tondo, Palu, Central Sulawesi, Indonesia.
0°51'31.9"S 119°54'00.2"E.

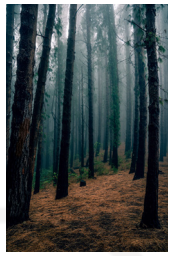
MARKET CIRCULATION ISSUE

As the same as the other cities, the problem in traditional local market in Palu is its circulation and accessibility. The numbers of sellers are increased each year where on the other hand, the competition among them force them to find a strategic position for their stalls and in return ruined the space program of the market location itself. For the record, most sellers in Inpres Market of Palu are provided with location in the market complex but they choose to sell their products outside of the complex for the users to be easier to find them and buy theirs. This bad habit will indirectly invite another sellers to do the same thing by the term of competition which later cause them to sell in an illegal area and causing troubles such as traffic, and contaminated products because those are sold beside the street.



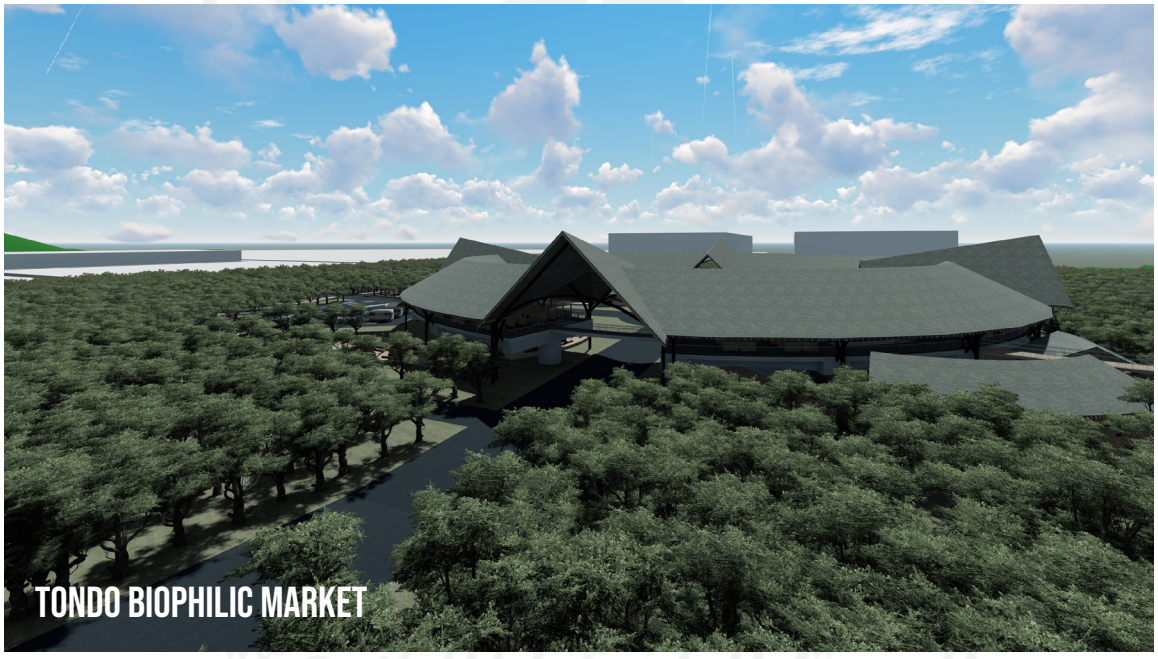
This is the picture of how wild the movement of the sellers is. As what the picture shows, it is not that they are moving just to one point to the marked outside market area. They are continuously growing and moving there one by one means there are a lot of them in the line from the market to the marked spot. These area however will have a really horrible traffic all day long since the 'market' operates and is busy from 6 in the morning up to 6 in the afternoon.

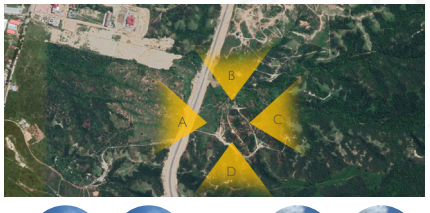
TREES AND TEMPERATURE



Despite of how government will cover the needs of green area by at least meet the minimum requirement of the regulation, the urgency of having more green area specially trees inside the city is a serious thing to be considered. Palu has a high temperature and is included as one of the hottest city in Indonesia. According to BMKG (Badan Meteorologi, Klimatologi dan Geofisika/ Meteorology, Climatology, and Geophysical Agency), the average temperature in Palu in sunny days during dry season is up to 37 or even 38 degrees of celcius.

This is because Palu lies right below the equator line, and as a city that faces the sea, the dry air in mid day will make the inconvenience be even more.
However, it is not a secret that trees is a solid solution to reduce heat islands. Trees are able to lower air temperatures by its ability in providing shades which are 11–25 degrees of celcius cooler than the peak temperatures of unshaded area. As the result of this, it can be concluded that the trees reduce the demand of air conditioning too.







View A : Palu Bay
The mountains of nokilalaki and the view of Palu Bay is a selling point for the project. Preserving this is a must.



View B : South Entrance

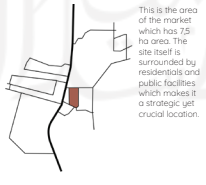


View C : Hills of Tondo
The Hills of Tondo surround the area and is another attraction of view for the users.

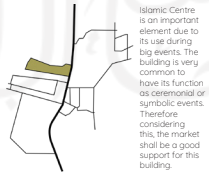


View D : North Entrance

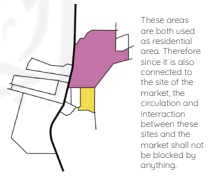
SITE EXISTING AND SURROUNDINGS



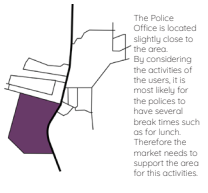
This is the area of the market which has 7.5 ha area. The site itself is surrounded by residentials and public facilities which makes it a strategic yet crucial location.



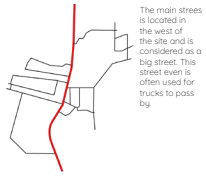
Islamic Centre is an important element due to its use during big events. The building is very common to have its function as ceremonial or symbolic events. Therefore considering this, the market shall be a good support for this building.



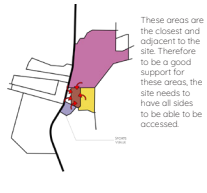
These areas are both used as residential area. Therefore since it is also connected to the site of the market, the circulation and interraction between these sites and the market shall not be blocked by anything.



The Police Office is located slightly close to the area. By considering the activities of the users, it is most likely for the polices to have several break times such as for lunch. Therefore the market needs to support the area for this activities.



The main strees is located in the west of the site and is considered as a big street. This street even is often used for trucks to pass by.

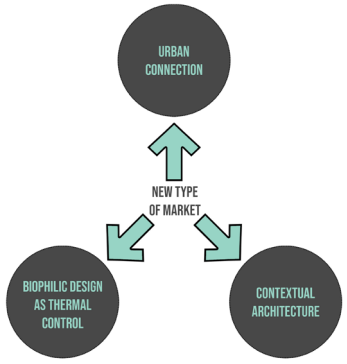


These areas are the closest and adjacent to the site. Therefore to be a good support for these areas, the site needs to have all sides to be able to be accessed.

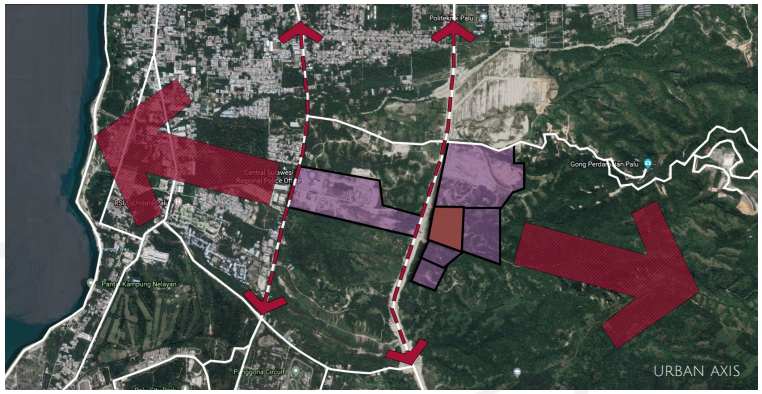
Written and composed by :
Abi Dzar Ghifari - 17512174

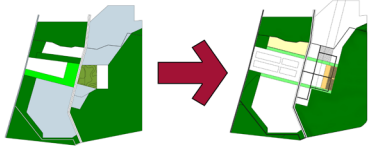
Supervised by :
Dr.-Ing. Ilya Fadjar Maharika, IAI

Design Concept Framework



The integration of biophilic use to fix the thermal comfort and circulation issue is important in this project as how it is shown in the diagram. However, since all of the ideas are connected, removing one from another will absolutely fail the goals of the project.





From the previous idea, the urban situation has been redesigned following the urban axis, the connectivity to each sites and additional implementation of biophilic elements.

Community Contribution



The first one is the local people. In common, most of local people in this area are fishermen. Therefore providing an easy-to-access marketplace will help them a lot to feed their family.



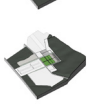
The second is the police office. Currently, in this area, the closest cafetaria or place to eat during lunch needs to be accessed by vehicles. However, it is now easily visited by walking.



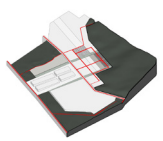
The housing is actually a new project, alongside the market that has been initiated by the government. Therefore having a central groceries or places to purchase goods will always be a good thing.



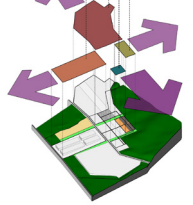
Since the project is supposed to be done under the authority of the government, means other than housing, all the facilities belong to no one. This is actually good news, because the green area can be suggested to be used by people to grow commodity such as table grapes.



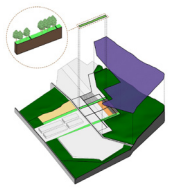
Lastly, despite it has been mentioned several times, it is still a main target that having a 'forest' in the middle of crowd will awaken the awareness of local people of how important the nature elements are.



The new urban plan has a one connected main access all the way through the adjacent sites of the project site in order to remove the site and the future building itself as a barrier of movement to the communities.

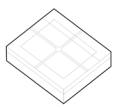


The axis can be seen clearly here. The new urban plan is certainly more arranged than the previous one.

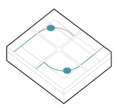


In empowering the urgency of this project, several green areas has been designed in between the sites. It is part of the movement to invite people to live with trees since it has a lot of benefits. Of course, the existing green areas remain untouched.

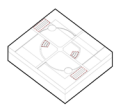
Site Development and Mass Programming



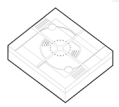
This is the current condition of the site with the cross streets from the previous urban design process.



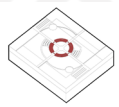
By looking at the existing condition of the site that has a lot of erosion marks, the site will potentially encounter massive impacts of heavy rainfall and to avoid this, the drainage and water reservoir has been added.



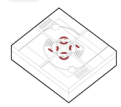
Another one is the parking lots which are plotted based on the path of the street to ease the movement of vehicles.



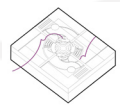
Considered its done, the next phase of site development is placing the mass by first putting the main structural beam to lift up the main area above the ground.



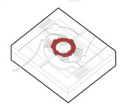
The next one is adding the concrete slab that will be used as sellable area.



The next phase is to add more sellable area on the space below the main structure.



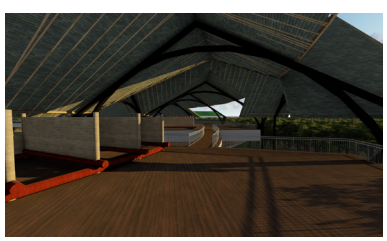
The next step is creating another connectivity to directly to the police office and the residential area to ease of the access of pedestrians to come to the market.

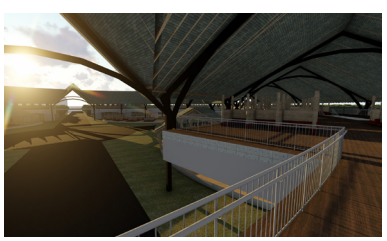


The next one is having a building envelope which is transformed by the iconic traditional house of Central Sulawesi which was named Tambi. The picture of Tambi has been implied on 4 sides or every entrances to welcome and people to the site. However, the iconic triangle is also part of the triangle as it transformed into circular geometry.



The last part is detemining the green area which is the area left, then cover it with trees.



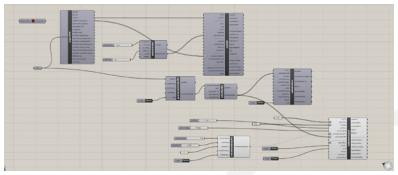


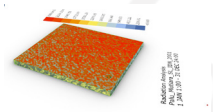


COMPUTATIONAL SUN RADIATION ANALYSIS AND SIMULATION BY USING LADYBUG

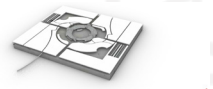
To prove that trees has a decent ability in significantly reducing urban heat temperature, this design will show a simulation of how it works and prove it.

Below is the Grasshoper's program that has been coded by gathering the epw data of Palu. The data then connected to the skymatrix then to the sun radiation.

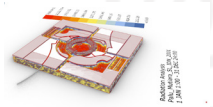




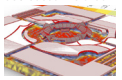
As the start of the simulation, this is the temperature on this area without trees.



The white part is the schematic shading form of the canopy of a tree, since it is unnecessary to have 3D model of real trees, and it will make the file bigger and the process slower which will be potentially fail to be processed.

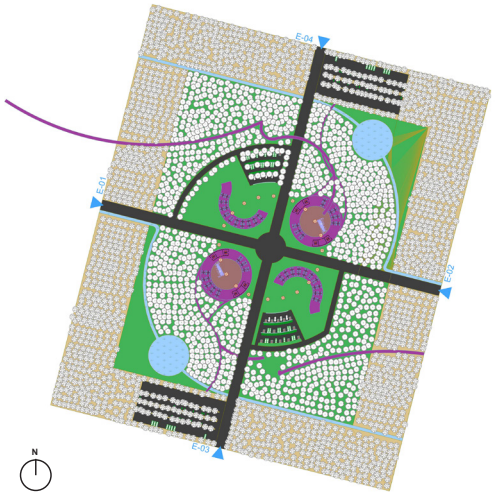


This is the result of the sun radiation test. It shows that there is significant difference of number in shaded and non shaded area. However, since most of the site is fully covered by trees, it is clear that the design has successfully decreased the urban heat temperature by a lot.



This is the closer look of how the part below the shaded area is marked with blue color.

SITEPLAN

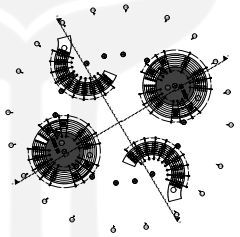


1 : 2000

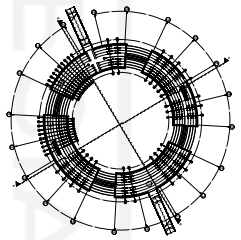
RED SANDALWOOD

EBONY TREE

FLOOR PLAN

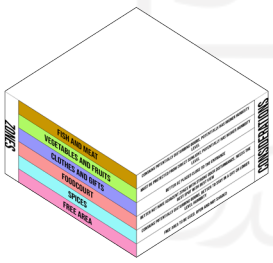


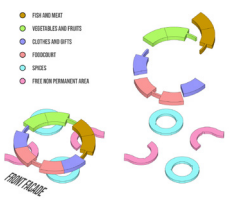
GROUND FLOOR



1ST FLOOR

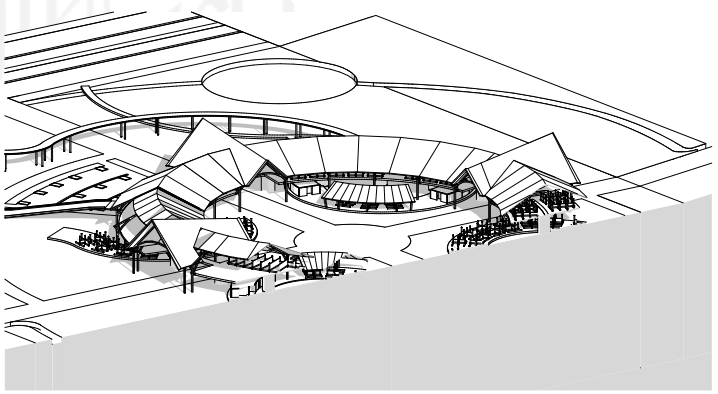
ZONATION DIAGRAM BASED ON GOODS



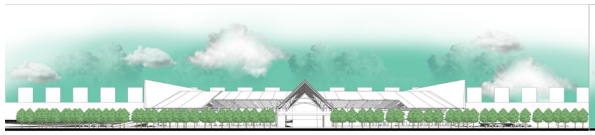


These are the schematic diagram that shows how the areas or zones within the building are divided based on the goods since no matter how, the context of the building is still a market that needs to provide something to sell.

AXONOMETRY SECTION



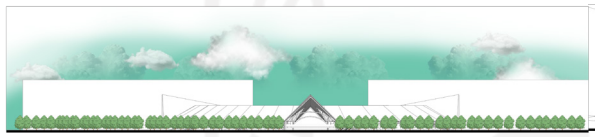
WEST ELEVATION



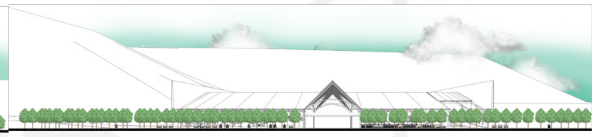
SOUTH ELEVATION



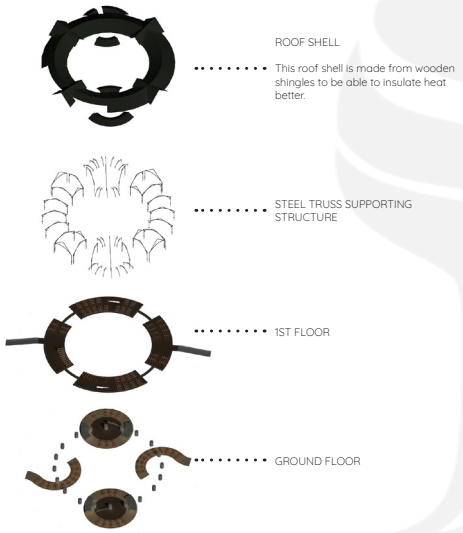
EAST ELEVATION



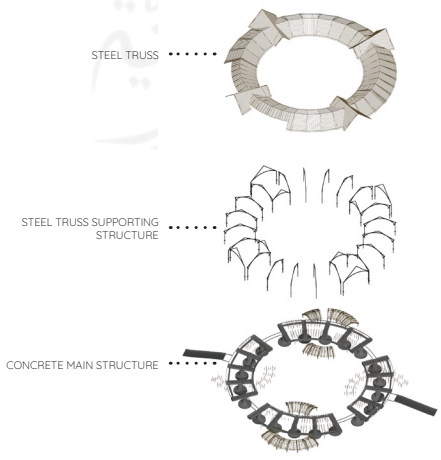
NORTH ELEVATION

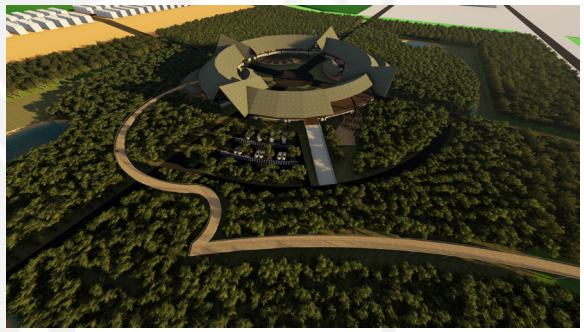


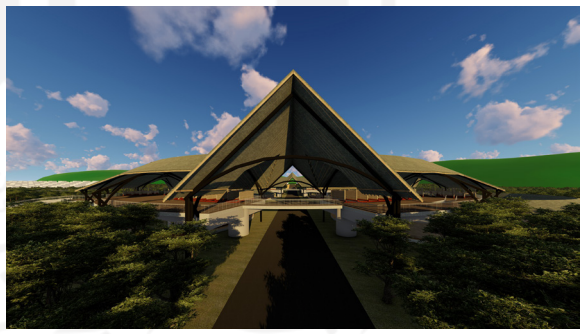
EXPLODED FLOOR PLAN

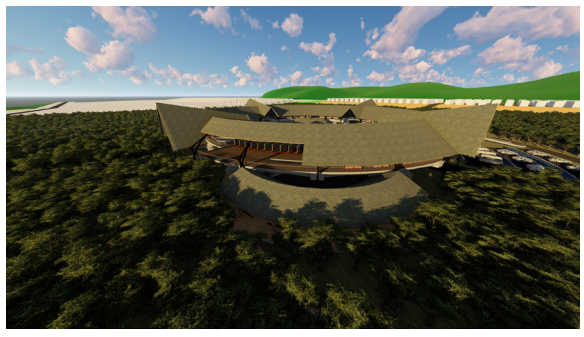


EXPLODED STRUCTURAL SYSTEM









DESIGN OF TONDO BIOPHILIC MARKET IN PALU AS RE-NATURALISATION OF URBAN SPACE

Laboratorium Pemodelan Arsitektur dan Perkotaan

UNIVERSITAS ISLAM INDONESIA

DEPARTMENT of ARCHITECTURE

KAAB 한국건축학교육인증원 Korea Architectural Accrediting Board

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