

IDENTIFICATION OF IMAGE AREA CONCEPT OF TSUNAMI DISASTER RESPONSE IN COASTAL SPATIAL Case Study : Serangan Island, Denpasar, Bali

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Abstract - Serangan Island is one of the favourite tourist destinations in Bali which is the result of reclamation in 1995-1998, famous for its image as "Turtle Island", the presence of Sakenan Temple, white sand beaches, marine tourism, watersport, coral reef cultivation and seaweed, and the the fishing village of Bugis and Bali. However, behind the many tourism potentials, Serangan Island is threatened with earthquakes and tsunamis because the island is located on the south coast facing the Indian Ocean and the island's relatively low topography and inland elevation. In 2014, the Provincial Government of Bali through the Regional Disaster Management Agency (BPBD) built a communal space in the form of a Temporary Evacuation Place (TES) which is integrated with the Serangan Village Market. This research will identify in detail the implementation of the concept of the image of the disaster response area in the coastal area of Serangan Island. The research method used is descriptive qualitative with purposive sampling, with the use of the image theory of the area and disaster response architecture as the basis of this research. The results of the study show that the concept of the image of the Serangan Island area has also applied the concept of disaster mitigation both in architecture and in spatial planning. This identification has been seen in the concept of paths, edges, districts, nodes and landmarks. The main attacks are on residential areas, although in some parts the potential and function of disaster mitigation aspects need to be maximized.

Keywords – image area concept, tsunami disaster response, coastal spatial

1. Introduction

Bali occupies the first position as the world's most favorite tourist destination in 2017 beating London (England) in second place and Paris (France) in third (Kompas, 2017). This predicate is inseparable from the many natural and cultural attractions that attract local and foreign tourists to visit Bali, one of which is the charm of the coastal area on Serangan Island, Denpasar, Bali. Serangan Island is one of the tourist destinations in Bali which is the result of reclamation in 1995-1998, famous with the image of the area as "Turtle Island" because it is the center of turtle breeding grounds. In addition, the image of the Serangan Island area has been formed due to the existence of one of the Dhang Khayangan temples in Bali, which once every six months invites thousands of Hindus across Bali and Indonesia to pray at Sakenan Temple. Apart from that, beach and marine tourism, watersports, coral reef cultivation and seaweed, and the presence of Bugis and Bali fishing villages add to the tourist attraction of Serangan Island. Moreover, with the construction of a bridge connecting Bali Island and Serangan Island in 1998, it is very easy for tourists to go to Serangan Island. In addition, the construction of an Eco Resort in the form of a museum, a center for creativity, hotels, villas, a marina area, and a turtle-shaped opera house that

was built in the middle of the sea starting in 2018 will certainly attract more local and foreign tourists to visit Serangan Island (Bali, 2016).

However, behind the many tourism potentials, it turns out that Serangan Island has the threat of an earthquake and tsunami because the island is located on the south coast facing the Indian Ocean and the island's topography and land elevation is relatively low, which is only 1-2 meters high above sea level. making it vulnerable to being submerged in sea water. In addition, several hundred kilometers south of Serangan Island lies one of the main tectonic stack zones on Earth (the Indo-Australian Plate), which is the main source area for earthquakes with a potential tsunami. Geologists and tsunami experts consider Serangan Island as one of the high risk areas for a tsunami hazard in Denpasar City in the future, because every major tsunami that reaches Serangan Island will have a severe impact on the population and tourism development (Sutarja, 2015).

In 2014, the Provincial Government of Bali through the Regional Disaster Management Agency (BPBD) built a communal space in the form of a Tempat Evakuasi Sementara (TES) Tsunami Building which is integrated with the Serangan traditional market with financial assistance from the Badan Penanggulangan Bencana Daerah (BPBD) Denpasar City. As is known, the TES Tsunami building stands on land reclaimed by the sea by the investor PT. Bali Turtle Island Development (BTID) and has been handed over to become the ownership and management of Desa *Pakraman* Serangan in 1998, through an agreement contained in the Momerandum of Understanding (MoU) dated October 14, 1998, to become the center of economic activity on Serangan Island in the form of a traditional market (Darmawan, 2018). This building is the only building to respond to the earthquake and tsunami disaster on Serangan Island.

The existence of a TES Tsunami Building should be supported by a disaster response architectural and environmental planning that is applied to good spatial planning and mutually supporting both in the event of a disaster and post-disaster management. Disaster response architectural planning in an area spatial planning must accommodate at least 5 concepts, namely planning of rescue and evacuation routes, protective areas, safe zones, open spaces and vegetation, and public facilities in disaster response settlements (Sukawi, 2008). In addition, determinants of disaster response / no in architectural planning of an area are determined by the function, location, orientation, type and age of the building (Wikantari, 2017). The existence of Serangan Island, which on the one hand in the future is expected to become stronger as a "magnetic field" for tourism in Denpasar, but on the other hand is a potential threat of disaster, especially the earthquake and tsunami, of course it is expected to be able to accommodate the concept of disaster response architecture or at least minimize the impact of casualties soul as a result of the threat of the disaster.

The implementation of the disaster response architectural concept on Serangan Island, of course, needs to also think about the image of the area that has been attached by the community as spiritual tourism, turtle recreation, watersport and marine, and fishing villages. Through the friend image theory approach which consists of paths, edges, districts, nodes, landmarks, it is hoped that the concept of disaster response architecture will be strengthened by elements forming the image of the area so that it can be evaluated and given input for the area image elements that need to be strengthened to support Serangan Island tourism.

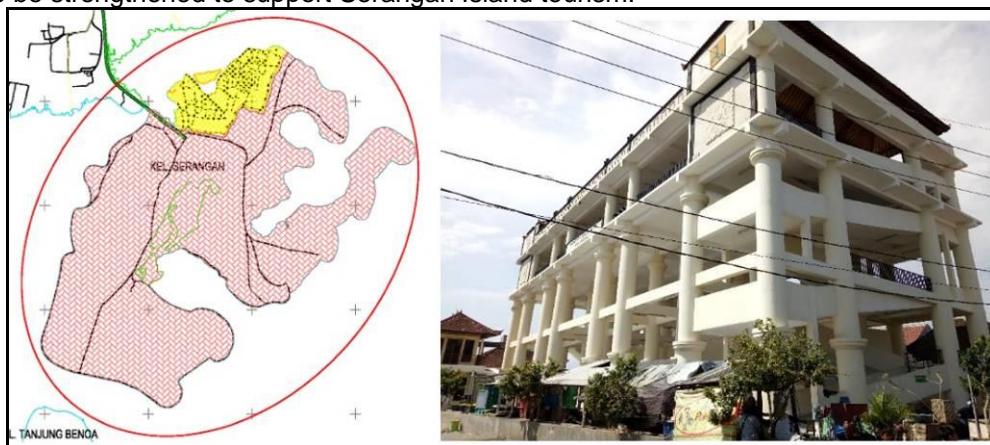


Figure 1: Integration of The TES Tsunami Building and It's Surrounding Spatial Planning, 2020
Source: Researcher Documentation

2. Literature Review

The concept of image towards an area is closely related to the identity of several elements in an area that are characterized and distinctive as identities that can differentiate from other cities (Purwanto, 2001). An image of a city / region can be created instantly, while an identity takes a long time to form. The identity of the city / region is related to the historical rhythm that has gone through a long process so that the identity of a city cannot be created just as different from the image of the city. An image requires (Lynch, 1975): the identity of an object or something that is different from others, a structure or pattern that is connected between the object and the observer, and the object has meaning for the observer. The elements that form the image of the city / region are :

- A. Paths**, is a path used by the observer to move or change places and becomes the main element because the observer moves through it when observing the city and along this path other environmental elements are arranged and connected.
- B. Edges**, is a boundary, it can be a design, a road, a river, a mountain. Edge has a strong identity because of its clear visuals. Edge is a barrier even though sometimes there is a place to enter which is the termination of a district or boundaries of a district with others.
- C. Districts**, is a part of the city that has a special character or activity that can be recognized by its observers. Districts have distinctive patterns and forms as well as district boundaries so that people know the end or beginning of the area. District has the characteristics and characteristics of the area that is different from the surrounding area.
- D. Nodes**, is a node or circle of strategic areas where the direction or activity meets each other and can be changed to another direction or activity, for example traffic intersections, stations, airports, bridges, the city as a whole on a large macro scale, markets, parks, squares, places rotational form of movement, and so on. A node is also a place where people have the feeling of 'coming in' and 'going out' in the same place.
- E. Landmark**, is a visually appealing symbol with an attention-grabbing placement nature. Usually landmarks have a unique shape and there are different scales in their environment.

Furthermore, in the context of disaster response architecture in spatial planning and settlement, there are several important concepts, including (Sukawi, 2008):

A. Escape Route

Apart from earthquake-resistant buildings, what is needed in an effort to minimize the impact generated by a disaster is planning for evacuation routes for disaster victims. Basically there are 2 types of evacuation route planning, namely the evacuation route in buildings and the evacuation route in residential areas.

- **Escape Route in Building**

Planning for escape routes in buildings / buildings, especially those with floors, is mostly done by making emergency stairs or lists that can be directly connected to the outer space. Usually the emergency stairs are placed on the side of the building or right in the middle which is the core of the building. This is intended to make access to and from the building easier and safer.

- **Escape Route in Housing or Settlements**

In planning a settlement, it should be considered regarding the service line planning system / environmental services. Because this system is a design of the flow of movement of service vehicles (such as garbage collectors, goods carriers, fire engines including ambulances) from a particular neighborhood block or plot, which is mapped to the hierarchy / class of roads that exist in the planning area. This is important because if one day a disaster occurs, as much as possible the rescue vehicle can immediately go to the location to provide assistance. Identification of rescue flow in case of disaster :

- Availability of pedestrian paths to higher areas. The road for the evacuation route.
- Construction of multi-storey building structures, must pay attention to better evacuation routes (for example : emergency stairs outside the building).
- Disaster-based spatial planning that has prepared itself with places and evacuation routes in the event of a flood or fire or other disaster.
- Disaster-based spatial planning that has prepared itself with places and evacuation routes if floods or fires or other disasters occur.

B. Protected Area

Protected areas are an important aspect of the concept of spatial planning and the environment for disaster response. Identification that is included in the protected area includes :

- Provision of safe zones in residential areas.
- Planning of support structures (embankments, mangroves, etc.)
- Planning for productive buffer zones (ponds, rice fields)
- Layered green line planning to filter debris / garbage in case of flooding.
- Nature conservation as part of the buffer zone. No deforestation. In residential areas, which are densely populated with buildings, so that the level of water infiltration into the ground is reduced, with insufficient catchment areas not available. If there is rain with high rainfall, some of the rainwater becomes surface water which has the potential to cause flooding.

C. Safe Zone

In planning that functions as a settlement, it must be considered everything related to building and environmental planning. This is intended so that the arrangement of the housing environment can be more optimal. In addition, with this arrangement, a clear mapping of land use will also be created. One of the things included in the building and environmental planning that needs efforts if it is linked in the case of a disaster, is the existence of a disaster safe zone. A safe zone can be in the form of open space in a residential area which in fact functions as green land such as fields and forests. It can also be in the form of a safety building / evacuation in the event of a disaster, whose real function is building public facilities.

D. Open Space & Vegetation

There is a boundary between the coastal area and the residential area which can reduce the level of sea water flow that enters during a disaster. One of the boundaries can be in the form of perennials (mangrove, nipah, waru, coconut). The beach is straight and protected by perennials, relatively good for settlement. The use of trees to absorb CO₂ and reduce air temperature can reduce the use of air conditioning. Between the coast and the residential area planted with coastal trees that are strong and have dense leaf volume (for CO₂ absorption).

The development of open space (open space) and city parks can be maximized which later can be used as an emergency room for the city. The emergency room for the city is equipped with the need for clean water, KM / WC for defecating, communication equipment and a warehouse for storing food and medicine for several days while waiting for help to come. So that we no longer hear the news of starving refugees and haven't eaten for 2 days or more because we haven't received any assistance.

Realizing a disaster response city can be done by increasing the vegetation in city parks which is a habitat for wild animals such as birds and other insects which can also serve as an early warning against disasters. We need to learn a lot from the community at the foot of Mount Merapi to develop sensitivity to natural changes marked by the behavior of wild animals.

E. Public Facilities in Disaster Response Settlements

In suburban areas, public facilities (shops, schools, community meetinghouses) serving residential areas are grouped close to houses that need them. So that residents do not need to drive their motorized vehicle to reach it. Meanwhile in large cities, the polycentric (multi-center) layout of the city can reduce the distance from the suburban area to the main functions (commercial, government center, etc.) located in the city center. Public facilities are placed at a safe distance and a central position from the housing so that they are easily accessible. Provided a number of public facility centers for a number of housing units it serves.

3. Methods

The research approach used in this study is a descriptive qualitative approach. The descriptive qualitative approach describes phenomena based on the informants' point of view, finds diverse realities and develops a holistic understanding of a phenomenon in a particular context (Hilal and Alabri, 2013). A qualitative approach is generally used in describing inductively, with assumptions based on social reality, variables that are difficult to measure, complex and interrelated, and the data collected contains a deep point of view from the informant (Almalki,

2016). In this case, it will be applied to examine the concept of the image of the tsunami disaster response area in the spatial layout of Serangan Island, Denpasar, Bali.

Research instruments can be interpreted as the tools needed to collect data. In qualitative research, the main instrument in data collection is the researcher and other people who help the researcher. In this study, researchers collected data by asking, asking, listening, and taking (Afrizal, 2014). The additional instruments needed by researchers in this study include: basic maps of coastal areas in Denpasar City, total station measuring instruments and laser meters, writing and drawing tools, computers with graphic specifications and cameras.

The data collection method uses 4 techniques, namely the method of observation, in-depth interviews and questionnaires, documents and FGD (Creswell, 2007). The method of observation is by mapping coastal areas through the google earth application, drones, taking photos, videos, and sketches of important zones related to research in coastal areas. The method of in-depth interviews using purposive sampling method is to take samples of informants who are considered to have the most useful information, namely the Head of the Regional Disaster Management Agency (BPBD) Denpasar City, Village Heads, Beach Managers, and Business Actors. Document method by taking maps on google maps, journals, books and research-related writings. As well as the FGD method by conducting limited coordination meetings with several local stakeholders to get an image of the area and the disaster mitigation efforts that have been implemented.

4. Results and Discussions

The image of the city / area can also be referred to as the impression or perception between the observer and the environment. The impression of the observer on the environment depends on the adaptability of the "observer" in selecting and organizing so that the environment he observes will provide a difference and a connection. Perception or perseive can be interpreted as an observation that is directly related to a meaning. Serangan Island which is known as "Turtle Island" and the stana of one of the Dhang Khayangan temples in Bali, namely Sakenan Temple, has unwittingly become the image of the Serangan Island area which has brought many local and foreign tourists to visit Serangan Island. Moreover, there is a discourse that the construction of an Eco Resort in the form of a museum, a center for creativity, a hotel, a villa, a marina area, and a turtle-shaped opera house which will be built in the middle of the sea in 2020 will certainly attract more local and foreign tourists to visit Serangan Island. The identification of space zones forming the image of the Serangan Island area will be presented based on the image theory of the area as follows :

4.1 Paths

Paths is a path used by observers to move or move places. Path is the most important element in a city image which shows the circulation routes that people usually use to move in general, namely roads, main alleys, transit roads, railways, channels and so on. On Serangan Island, the path is divided into 3 types, namely:



Figure 2: Path contained in Serangan Island, 2020
Source: Researcher Documentation

- A. Path with 12 meters width**, It is the main road connecting Bali Island with Serangan Island and is also recommended as the main route for evacuation against the tsunami disaster to get out of Serangan Island to a 4-storey building on the main road to Serangan Island, namely the BKN Building. This very wide road body coupled with the median of the road planted with trees and the left and right sides of the road planted with trees also adds to the cool impression and reinforces the impression of luxury and relief towards Serangan Island. In addition, on the left and right along the main road, there is a 4-meter lake which is usually used as a parking area and temporary stops for tourists who want to relax or enjoy the view towards Serangan Island.
- B. Path with 6 meters width**, is an environmental road that surrounds the coastal area of residential areas on Serangan Island. This circular path apart from giving a different nuance because the community and tourists can enjoy the beauty of the coastal area through vehicles, as well as for the border of buildings to the sea and ease of evacuation when natural disasters occur. The road to TES tsunami as well as the Village Market was also made spacious with a width of 6 meters apart from this building as the center of the local community's economic driving force, also as an evacuation route to TES tsunami.
- C. Path with 2 - 4 meters width**, is a local road connecting one house to another. The width of this road is not the same as the others where there are variations in the size of the roads ranging from 2 - 4 meters. This local road usually can only be passed by 2 passing motorbikes or 1 car. With the large number of settlements covering 7 banjars and 1 bugis village, the roads should be made with a minimum standard of 3 meters for convenient circulation and when a disaster occurs, the acceleration of the movement of people becomes faster to the evacuation site.

In the existing residential area of Serangan Island, there are already paths that circle the population area of Serangan Island. This indicates that there is a service line planning system for both the circulation of fire engines and ambulances. This is very important, especially when a disaster occurs, so that rescue vehicles can immediately go to the location and provide assistance and then get direct access outside of Serangan Island by circling the residential areas. In addition, a circular road can be used as the main access for residents to evacuate to the Tsunami TES Building and quickly leave the Serangan Island area.



Figure 3: Maps of Alert Signage (Left Picture); Map of Paths with Vehicle Types in Spatial of Serangan Island, 2020

Source: Researcher Documentation

Although there is already a ring road in residential areas, including a road shortcut in the middle with a road width that is more or less the same, in fact the ring road width is not completely the same, there are several circular road spots that have narrow road widths so the possibility of cars Fire and Ambulance have difficulty getting through this spot. In addition, the spot does not have any telecommunications in front of the residents' houses. In addition, the absence of pedestrian paths makes pedestrians walk on the vehicle path everyday. Some of these spots are of course a concern and evaluation in making architectural planning concepts and disaster response areas.

4.2 Edges

Edges are boundaries, it can be a design, a road, a river, a mountain. Edge has a strong identity because of its clear visuals. Edge is a barrier even though sometimes there is a place to enter which is the termination of a district or boundaries of a district with others. There are quite a lot of edges on Serangan Island, such as the bridge that connects Bali Island to Serangan Island, and a tourist canal that limits the ownership area of residential areas with PT. BTID as an investor, the boundary between the land area (ring road) and the sea is bordered by a Retaining Wall (DPT). The strongest edge that has become the iconic of Serangan Island is the crossing bridge from Bali Island to Serangan Island. The architectural arrangement that is made in such a way gives the impression of a reminder for tourists visiting Serangan Island. From this edge, we can see a panoramic view of the sea while looking at Sakenan Temple, Bali Island and Serangan Island as a whole in one place.

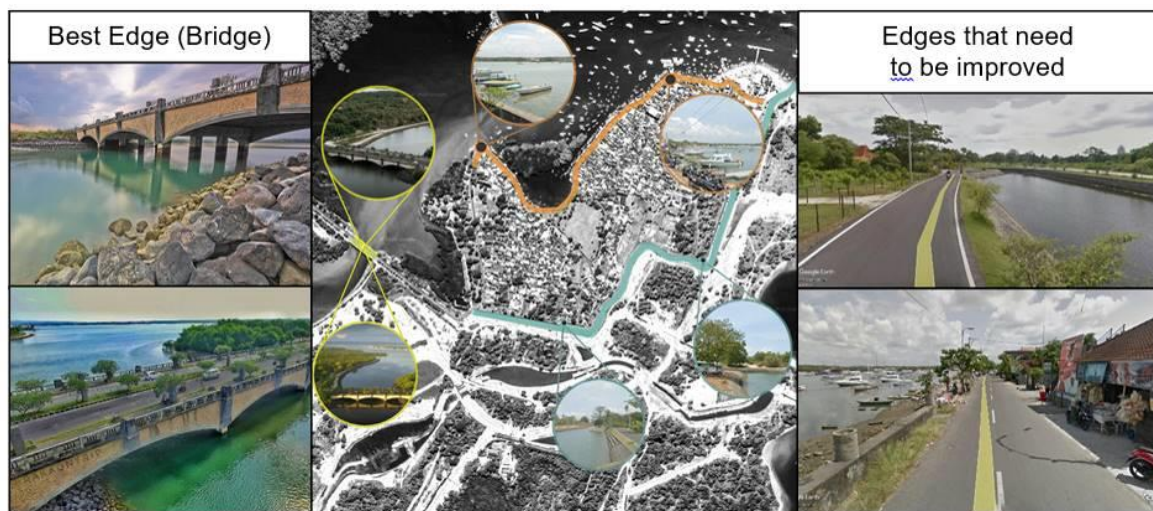


Figure 4: Map Edge Location Serangan Island, 2020
Source: Researcher Documentation

However, there are some edges that need to be planned better and neatly and give the image or feel of Serangan Island as Turtle Island and Fisherman Island. Some of the edges that need to be maximized include :

- Edge in the form of a tourist canal that borders the residential area ownership area with the PT. BTID, as an investor, can be maximized by: adding a pedestrian lane containing railings for security and directions to the evacuation site, at certain spots the arrangement of stalls is placed above the sea with a uniform concept, empty for fishing spots filled with ngsi arranged placement, signage made more interesting.
- Edge in the form of a border between the land area (ring road) and the sea which is bounded by a Retaining Wall (DPT), can be maximized by: adding a pedestrian lane containing railings for security and directions to the evacuation site, arranging stalls above the sea with a uniform concept , the placement function is adjusted, the signage is made more attractive.

Some edges are equipped with supporting structures such as mangrove trees in the right location which can also determine the disaster response of an area, besides providing thermal comfort to the area and being the area's vocal point. In the Serangan Island area, the placement of mangroves, both large and newly planted (still small) mangroves, is located in an inappropriate location, which is on the west side, which is the opposite of the high seas which provide the potential for a tsunami, namely on the east and southeast sides. If the mangrove forest is to function as a green belt, it should be placed in an area that is directly opposite to the open sea so that when the tsunami disaster occurs, mangrove trees can reduce / slow down the speed of

tsunami waves towards the mainland residential areas. Of course, this will give people and tourists more time to evacuate to the Tsunami TES or to the BKN Building which is outside Serangan Island.



Figure 5: Existing Mangrove Map Has Not Pay Attention To Disaster Mitigation, 2020
Source: Researcher Documentation

4.3 Districts

Is a part of the city has a special character or activity that can be recognized by observers. Districts have distinctive patterns and forms as well as district boundaries so that people know the end or beginning of the area such as trading areas, residential areas, suburban areas, downtown areas. On Serangan Island, there are very clear boundaries between residential areas and areas owned by the investor PT. BTID because it is limited by the tourist channel. In addition, the trading area in residential areas is also clearly visible with a towering building that functions as a Village Market as well as a tsunami TES. The surrounding environment is also supported by similar functions such as LPD and KUD.

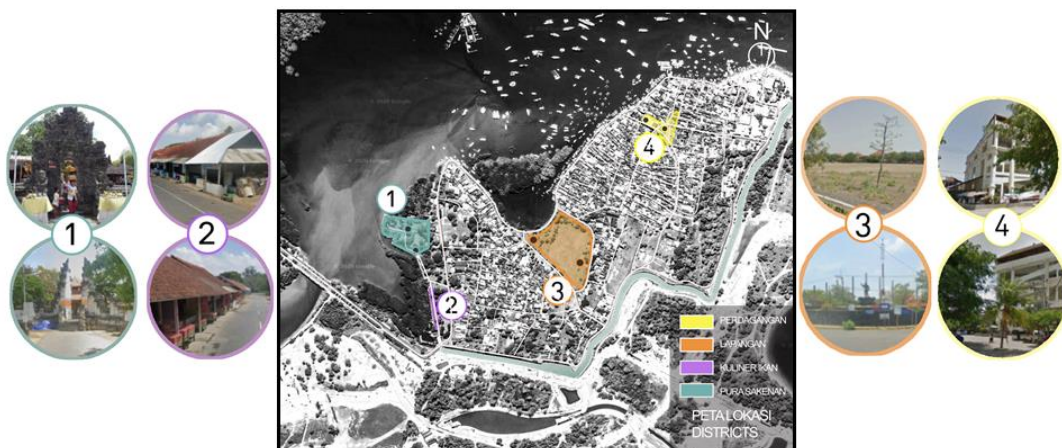


Figure 6: Districts Location In Serangan Island, 2020
Source: Researcher Documentation

Some districts also function as public facilities, especially in residential areas. Public facilities found in the residential area of Serangan Island are quite complete, namely the existence of educational facilities in the form of elementary and junior high schools, religious facilities in the form of temples and mosques, trade facilities namely markets, LPD and KUD, health facilities in the form of Puskesmas, security facilities in the form of TNI posts. Navy and Police Offices, Watersport facilities and Turtle Conservation Center, as well as other public facilities such as gas stations, sports fields and cemeteries. In the context of disaster response settlements, the placement of these public facilities is already in residential areas with scattered locations. All of these public facilities are already on major roads such as the Serangan Island ring road and roads that can be passed by cars, ambulances and damkar. With these conditions, it is possible for residents not to drive motorized vehicles to reach these public facilities. For example, the location of the puskesmas, police, village office and gas stations around the sports field which is used as a center for orientation and social activities for the people on Serangan Island.



Figure 7: Map of Supporting Facilities In Residential Area Of Serangan Island, 2020
Source: Researcher Documentation

4.4 Nodes

It is a node or circle of strategic areas where the direction or activity meets each other and can be changed to another direction or activity, for example traffic intersections, stations, airports, bridges. On Serangan Island, there are quite a number of nodes because of the many crossroads leading to a place such as an intersection that divides the road to Sakenan Temple, to settlements and to watersport facilities. Some of the nodes have been well laid out and give regional characteristics such as placing a large statue and tree as a marker for the nodes. Planning nodes should be supported by a good and neat appearance of corridor nodes. Some nodes are not well ordered because of the large number of advertisements that have been put up that do not pay attention to aesthetic value. Existing signage should have a uniform size, or better to make it in only 2 types, namely signage for advertising purposes and signage for evacuation purposes in the event of a disaster.

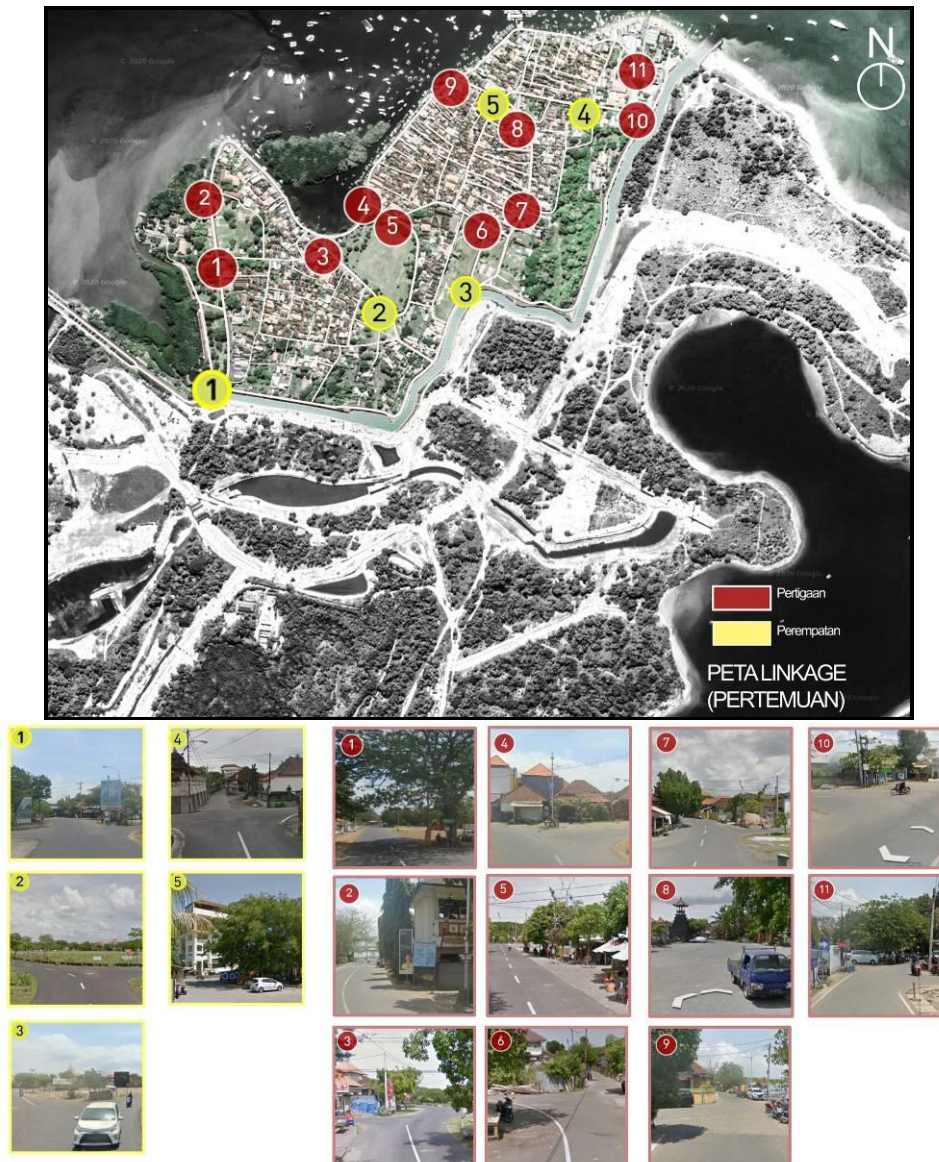


Figure 8: Nodes Location In Serangan Island, 2020
Source: Researcher Documentation

4.5 Landmarks

Is a visually appealing symbol with an attention-grabbing placement nature. On Serangan Island, there are quite a lot of landmark elements, especially in residential areas. For example, there is a pedestrian bridge that is made majestic as a sign before entering the Serangan Island area, the large and magnificent Temple of Bentar before entering Sakenan Temple which is visible from the main road, the landmark of the Turtle Statue before entering the Turtle Conservation Hall, there is a building with a height of 4 floors with a Market Function. as well as a Tsunami Temporary Evacuation Place when entering the trading area, and the sight of jetskiing, snorkeling, babana boat dolphin view activities and similar activities when entering the watersport area at the northern tip of Serangan Island.



Figure 9: Landmarks Location In Serangan Island, 2020
Source: Researcher Documentation

The main landmark that becomes the area's point of interest in terms of disaster response architecture is the temporary Tsunami Evacuation Site (TES) building which is used as the Serangan Village Market every day. The disaster safe zone is one of the important things in spatial planning and the disaster response environment. The placement of the Market building location as well as the Tsunami TEST has taken into account the scope of the area to be evacuated. If there is an indication of an earthquake that has the potential for a tsunami, at least the northern and eastern areas of Serangan Island which are directly adjacent to the sea can immediately evacuate to Tsunami Market / TES. In an emergency situation, at least residents of 5 banjars, namely Banjar Ponjok, Kaja, Tengah, Kawan, Peken and Kampung Bugis can take refuge in this building. If time allows, of course it is better to flee outside Serangan Island.

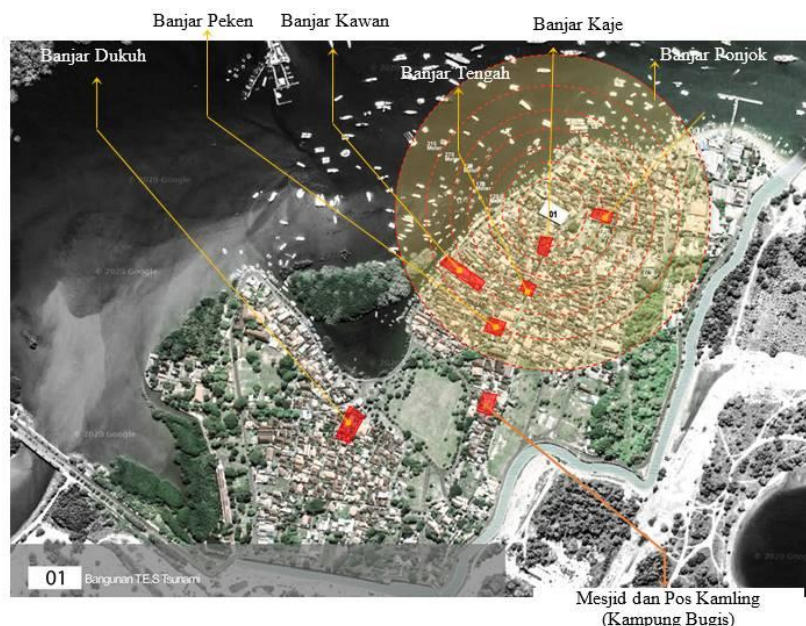


Figure 10: TES Tsunami Building Evasuation Coverage Radius, 2020
Source: Researcher Documentation

Based on the author's analysis based on the exposure to the Tsunami TES evacuation coverage map, it can be concluded that the residential areas of the Banjar Dukuh and Bugis Villages are not covered in the TES Tsunami radius area in the context of evacuation in an emergency, because they are quite far away so that it requires more time to evacuation. Of course, the people in the Tsunami TEST coverage area first fled to the building, so the author's suggestion is needed a similar development plan for the Tsunami TEST in the Banjar Dukuh area which is of course used for public facilities on a daily basis. In terms of building function in the context of disaster response, the tsunami test building has been designed and built with a function that can accommodate the local people of Serangan Island in particular and tourists visiting Serangan Island in general. The number of native inhabitants of Serangan Island in 2016 was 7,417 people. Meanwhile, the TES Tsunami building as high as 15 meters is estimated to be able to accommodate up to 1,000 people. The capacity of this building is of course still lacking (only 1/7 of the total population of Serangan Island) and even then it still uses data from 2016. It is estimated that the current population of Serangan Island is 10,000. So that in the event of a tsunami disaster, not all residents can evacuate to this Tsunami TES. For this reason, the recommendations of the researchers should be to build a similar building with the same or greater capacity but that can still function optimally on a daily basis.



Figure 11: Functions Contained in The TES Tsunami Building, 2020

Source: Researcher Documentation

Related to the daily function of buildings as a market (the driving force of the economy), it is very suitable to have multiple functions as a tsunami evacuation site because the market is actually a magnetic field for the people on Serangan Island. In addition, the location of the Village Market in the middle of the residential area makes it easy to evacuate from all directions. Apart from being a market and place for tsunami evacuation, on the 3rd floor of the building, daily functions as a children's play area as well as a semi-indoor open space. The 2nd floor functions as a void because there is no floor plate. In terms of the effectiveness of the Tsunami TEST building function as well as functioned daily as a market and children's playground also needs to be maximized because the market function is only effective in the morning, while the children's play area also looks not too crowded even though it is free for children who want to play there. So that in the afternoon and evening the market function on the 1st floor which only functions as a basar market can be combined with dry markets, namely selling clothes, handicrafts, gold and silver as well as other types of sales. The second floor can also be made permanent by making floor plates so that they can be used for market needs and other economic activities.



Figure 12: Placement of Ramps and Heliport in TES Tsunami Building, 2020
Source: Researcher Documentation

The vertical access of the TES Tsunami building uses a ram with a slope that takes into account the standard of user comfort, which is below 10 degrees. There are 2 ramps and are placed on the east and west sides of the building. The thing that needs to be corrected is the width of the ramp which has dimensions of only 1.5 meters. Under normal circumstances, it was as if the width of this ramp was too large. However, if there is an emergency situation and residents of Serangan Island flock to ride this ramp, of course the width of this ramp is very narrow because it can only be passed by 2-3 people in a row. The width of the ramp should be at least 2.5 meters so that 4-5 people can pass each other at once. Ramp is equipped with an evacuation route marker. On the top floor, which is the 4th floor, there is an open space which, apart from accommodating the people of Serangan Island, is also a BPBD heliport to evacuate the community to the exit from Serangan Island.

4. Conclusions

The image of the area on Serangan Island which is well known to the wider community so that it brings in many tourists has also applied the concept of disaster mitigation both in architecture and in spatial planning. This concept has been reflected in the five elements that form the image of the Serangan Island coastal area, namely:

- **Paths.** On Serangan Island, the path is divided into 3 types, namely: a 12 meter wide path which is the main road connecting Bali Island with Serangan Island and is recommended as the main route for evacuation against the tsunami disaster to exit Serangan Island towards a 4 storey building on the side of the main road to Serangan Island. namely the BKN Building, a 6 meter wide path which is an environmental road that surrounds the coastal area of residential areas on Serangan Island. This circular path apart from giving a different nuance because the community and tourists can enjoy the beauty of the coastal area through vehicles, also for the border of the building to the sea and ease of evacuation when a natural disaster occurs, as well as a 2-4 meter wide path which is a local road connecting one house. with others.
- **Edges.** The strongest edge that is iconic to Serangan Island is the crossing bridge from Bali Island to Serangan Island because we can see a panoramic view of the sea while looking at Sakenan Temple, Bali Island and Serangan Island as a whole in one place. Some of the edges are provided with a supporting structure such as a mangrove tree. The mangrove forest placement, both large and newly planted (still small) mangroves, is located in an inaccurate location, which is on the west side which is the opposite of the high seas which provide the potential for a tsunami, namely on the east and southeast sides. If the mangrove forest is to

function as a green belt, it should be placed in an area that is directly opposite to the open sea so that when the tsunami disaster occurs, mangrove trees can reduce / slow down the speed of tsunami waves towards the mainland residential areas.

- **Districts.** District which is a public facility in the resident area of Serangan Island can be said to be quite complete and in accordance with the context of disaster response settlements with its scattered location. All of these public facilities are already on major roads such as the Serangan Island ring road and roads that can be passed by cars, ambulances and damkar. With these conditions, it is possible for residents not to drive motorized vehicles to reach these public facilities. For example, the location of the puskesmas, police, village office and gas stations around the sports field which is used as a center for orientation and social activities for the people on Serangan Island.
- **Nodes.** There are already quite a number of intersections connected to major roads to facilitate evacuation. A tsunami hazard alert system and its evacuation have also been found at almost all intersections. However, some nodes are not well organized due to the large number of advertisements that are not paying attention to aesthetic value. Existing signage should have a uniform size, or better to make it in only 2 types, namely signage for advertising purposes and signage for evacuation purposes in the event of a disaster.
- **Landmark.** There is the highest landmark in the area, namely the Tsunami Temporary Evacuation Site (TES) building which functions as the Serangan Village Market, made with a 4-story structure, with an evacuation route in the form of a ramp and on the 4th floor there is a heliport. However, in terms of capacity and evacuation radius, it seems that it needs to be reviewed to make similar buildings but above functions that can be used daily such as schools and health centers.

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