

# Redesign of Urban Parks to Improve Users' Perception of Nature through Biophilic Design

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**Keywords:** biophilic design, plan vert, mahamasina area, and urban parks.

**Abstract:** Biophilic design is an innovative and sustainable aspect in architecture and urban design that connects people with the natural environment. The biophilic design has been implemented in developed countries, although in developing countries like Madagascar have not yet implemented this new concept. Besides, Antananarivo city has a program "Plan Vert" which is a tool for urban development and beautification focusing on public health based on natural systems. This paper focuses on the users' perception in urban parks in Mahamasina area, where a restricted qualitative assessment has been conducted on users' perception with nature and its phenomenology. Assessments were made on the users' perception in urban parks through initial observation, surveys, and behaviour observation. Findings across all research methods suggested that each park in Mahamasina area was designed for some dominant activities such as relaxation, recreation and as meeting places. These places are perceived as pleasant to users due to calm and shady. To highlight the phenomenological aspects of the perception of nature, parks should be redesigned to maintain the original design. The new experience will focus on adding numbers and types to fauna-flora. Additionally, there will be provisions for shading, a change in the elevation and the circulation flow. It is important that urban parks are maintained to improve the experience of the place. This is done by providing new material in the roundabout that links urban parks.

## 1 INTRODUCTION

Nature in urban parks plays a role important as an element that cannot be separated from people. Nature elements in urban parks are given opportunities for enjoying and resting in the parks for a long time. Meanwhile, in three decades or more, EO. Wilson introduced the word biophilia in scientific lexicons, and was popular as a nomenclature, and explored as the meaning of "need for nature" (Kellert and Wilson, 1995). In architecture, biophilia is a part of the sustainable concept that aims to provide and connect humans and the natural world back in the built environment. Biophilic architecture and design are where humans and nature influence each other through non-physical environments. According to Kellert et al. (2008), the concept of biophilic seeks to improve humans' physical, emotional and intellectual health. Besides, many researchers have broadly examined the concept of biophilia in developed countries such as Australia, United States and Singapore, although in developing countries like Madagascar, have not yet implemented this concept. The study has shown that the parks and green spaces

in Antananarivo city have changed in several typologies of space like a parking lot, buildings and roads (Camie, 2017). From that study, Antananarivo city needs to integrate nature in the whole city or even in open space, especially in urban parks. Antananarivo city has Plan Vert program as a tool for urban development and beautification focusing on public health and accentuating the identity of the city based on natural systems to enhance the PUDi (Plan d'Urbanisme Directeur) in terms of urban environment and landscape (Thierry Haua, 2006). The first initiative to achieve Plan Vert program, in 2012, there was a workshop in Séminaire International sur le développement Urbain focusing on Mahamasina area and Anosy Lake. The results proposed from that workshop were that Mahamasina area and its surroundings should be renovating as open space for the transition to Mahamasina Stadium or to Anosy Lake. Also, the main problem of urban parks in Antananarivo city is in bad condition due to the users' bad behaviour and incivility. Thus, the lack of green space and lack of linkage of urban parks are far from users' needs and international standard of parks. In response to this, this study aims to identify,

determine the design concept and develop the concept of redesigning urban parks in Mahamasina area based on how seeing nature can affect the users' perception through biophilic design.

## 2 LITERATURE REVIEW

### 2.1 Urban Parks

The urban park is one of the types of parks from the Urban landscape. Meanwhile, urban park is a park located in an urban environment that can be anticipated urban development and can be enjoyable for the public. According to IFPRA (International Federation of Parks and Recreation Administration) (2013), urban park is open space which dominated by vegetation and air, and also reserved for the public.

#### 2.1.1 Typology of Urban Parks

These followings are the typology of urban parks by OCR (Office of Community Revitalization and Reinvestment):

- Pocket Park: it is a small urban park that has an area of less than 1ha. This type is located adjacent to a solid pedestrian environment that can provide space for social interaction, short breaks, playing with children, reading and eating places. Or located around buildings, retail or offices.
- Common Green: this is a larger park that has various functions and is located in the city hall. Easily accessible from commercial and residential areas.
- Civic Plaza: it is an open space for the public meeting. This park is located near public transportation, an important intersection, easily accessible by urban road networks. This park is more emphasized on hardscapes such as benches, concrete, and fountains.
- Recreation-focused Park: the park which provides recreational facilities for residents and workers nearby. This is an active park with sports activities.
- Local area: it is an open space that provides short-distance recreational facilities for local residents of various Planning Blocks in the Local Area Plan.
- Neighbourhood Park: it is open space for recreation passive and sports area in between 0.2 – 1ha.

- Playground: it is an open space as recreation function for children and babies in the settlements around.
- Green Connectors: it is green space for pedestrians and cycles in metropolitan and local open space, and environment.

#### 2.1.2 Elements of Urban Parks

According to the OCR (Office of Community Revitalization and Reinvestment), urban parks have these following elements:

- Location: the urban park is successful due to the selection of the right location. How well city parks are related to the network of cities and public areas. City parks should be found directly on the city's main road.
- Access and Visibility: Physical and visual planning is very important to access the success of city parks. The pedestrian must be visible and circulation must be relatively easy. However, the urban park is designed to be beautiful but it will be empty and not utilized if it is difficult to find. Consider visibility, markers, and access security.
- Function: this is the key that distinguishes the typology of urban parks. The function of the park depends on the needs of an area. Ensure that the type of park is comprehensive in order to be recommended based on the district context and considerations for the surrounding land to be compatible.
- Form: form refers to the arrangement of park elements and how to respond to user needs, ecological attention, and influence the surroundings. Make sure the streetscape is provided around the edge of the park to the street. The form also reflects function expectations.
- Facilities: Facilities are provided for convenience, supporting activities, and tracing park characters. Visitors can identify their identity, style, and feel the garden.
- Programs: Programs that refer to the ability of space for activities and events of different sizes and types such as festivals, markets, concerts, and sporting events.
- Maintenance: maintenance of high-quality city parks must be maintained regularly to ensure visitors' safety, health and comfort. Availability of financial investments to maintain environmental quality, materials and facilities. We recommend that the design process should consider material maintenance requirements.

Based on this theory, it can be concluded that urban parks in the Mahamasina area categorize as “pocket parks” because these are located in the median of the road and provide recreational facilities for residents and workers surrounding.

## 2.2 Plan Vert of Antananarivo City

Antananarivo city has a Plan d’Urbanisme Directeur (PUDi) for the development of agglomeration in terms of structural equipment, roads and various networks as well as zoning. This PUDi can be seen the lack of effort to achieve the concept of sustainable development and natural recovery. Then, PUDi has extended its concept by creating the Plan Vert Antananarivo (2006), which has an environmental approach to the management and planning and designing the city.

In 2006, Plan Vert was designed by “Commune Urbaine d’Antananarivo” (CUA) in partnership with the “Ile-de-France Region” to achieve PUDi (Plan d’Urbanisme Directeur) in aspects of the urban environment and its landscape. Thus, Plan Vert aims to create new identities and improve the quality of life of the population by paying attention to micro-projects.

In Plan Vert propose actions of recommendation that need to be done at CUA. Green open space and agriculture in the Antananarivo city need to be considered with a garden system to ensure visual continuity while respecting the land. It also strengthens the system of multifunctional social parks, for example, a place of quiet relaxation, a sports park especially for young people, social and economic places such as fountains, and parks for food.

## 2.3 Biophilic Design

Perceptions of urban parks in this study are based on sensation and perception of nature that impact to phenomenological aspects. This phenomenon is useful in a place or space that will be more meaningful. Biophilic design is a theory more relevant in this study.

“Biophilic” is taken from the Latin word “bio” and “philia” which means “love of nature”. Biophilia is a process where humans have evolved based on nature. According to Downtown et al. (2017), the role of biophilic design can be discerned historically by analyzing examples of the built form and landscape design that demonstrate biophilic sensibilities or eliciting biophilia-informed responses.

In general, biophilic design has two dimensions, which are:

- Place-based or Vernacular dimension where the design should pay attention to context local; and
- Organic or Natural dimension is about how the quality of nature can be implemented in the built environment. (Kellert, 2008)

Regarding these dimension, this research focuses on Place-based due to seeking to find the phenomenological of nature in urban parks and its design concept in the context local. Biophilic design seeks to create a beautiful habitat for humans that can improve health, fitness and general well-being.

### 2.3.1 Principle of Biophilic Design

In the book entitled “The practice of biophilic design” by Kellert, Elizabeth and Calabrese (2015) they formulate principles to implement and achieve this new concept of biophilic design. The principles of biophilic design are the following:

- Biophilic design requires repeated and sustained engagement with nature.
- Biophilic design focuses on human adaptations to the natural world that over evolutionary time have advanced people’s health, fitness, and wellbeing.
- Biophilic design encourages an emotional attachment to particular settings and places.
- Biophilic design promotes positive interactions between people and nature that support an expanded sense of relationship and responsibility for the human and natural communities.
- Biophilic design develops mutual reinforcing, interconnected, and integrated architectural solutions.

### 2.3.2 15 Patterns of Biophilic Design

According to Christopher Alexander in 1977 (in Browning et al., 2014), patterns describe problems that are repeated in the environment and describe solutions for those problems in terms of utilizing millions of times of that solutions without repeating the same way. Besides, the word “patterns” in biophilic design can be used in three reasons:

- To propose a clear and standard of terminology;
- To prevent confusion between metrics, attributes, conditions, characteristics, and typology.
- To maximise accessibility between disciplines and sustain the general language.

The patterns of Biophilic design proposed by Browning et al., (2014) to highlight a human’s health

and well-being in the built environment. The following are three aspects that can be shown in the 15 patterns of biophilic design.

Table 1: 15 patterns of biophilic design.

Aspects	15 Patterns of Biophilic Design
Nature in the Space	Visual Connection with Nature
	Non-visual Connection with Nature
	Non-Rhythmic Sensory Stimuli
	Thermal and Airflow Variability
	Presence of water
	Dynamics and diffuse light
	Connection with natural systems
	Virtual Connection with Nature (Downtown et al, 2016)
Natural Analogue Approach Organic	Biomorphic Forms and Patterns
	Material connection with nature
	Complexity and order
Natural of space	Prospect
	Refuge
	Mystery
	Risk/peril

Based on the objective of this paper that seeks to improve the users' perception of nature, the chosen patterns are a visual connection with nature, Material connection with nature, Prospect and Refuge. These are due to the high level of importance in the book entitled 14 Patterns of biophilic design.

**2.3.3 Benefits of Biophilic Design**

This paper is more focusing on the benefits of Biophilic design that can be divided into three benefits. Such as Physiological health, Cognitive Performance, and Psychological health (Browning et al, 2014). Thus, the benefits of biophilic design based on these chosen patterns are in this followings:

Table 2: Benefits of biophilic design.

15 Patterns of Biophilic Design	Physiological health	Cognitive performance	Psychological health
Visual Connection with Nature	Lowered blood pressure and heart rate.	Improved mental engagement	Positively impacted attitude and overall happiness
Material connectio	-	Decreased diastolic	Improved comfort

n with nature		blood pressure	
Prospect	Reduced stress	Reduced boredom, irritation, fatigue	Improved comfort and perceived safety
Refuge	-	Improved concentration, attention and perception of safety.	-

**2.4 Precedent Study: Paley Park**

Paley Park is one of pocket park located in the heart of the nation's commercial epicentre in New York city that is a good example in implementing biophilic design ([www.terrapinbg.com](http://www.terrapinbg.com)).



Figure 1: Paley Park, New York City.

Figure 2 shows that there are three patterns of the biophilic design seen in this park, which are the Presence of water, Dynamic and Diffuse light, and Refuge.

- Presence of water: this space draws users in from the street by providing access to water. The sound of water reduces the street noise and offers a calming auditory and visual experience.
- Dynamic and Diffuse light: the porous canopy of loose, rustling leaves allows light to penetrate and create shadows that dance on the cobbled ground.
- Refuge: The noise from the waterfall provides privacy and refuge to occupants conversing.

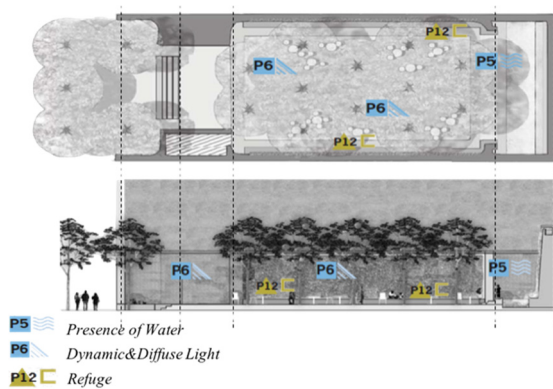


Figure 2: Plan and Section Paley Park, New York.

In conclusion, Paley Park has a strong correlation between patterns of biophilic design identified in terms of the physical, mental, and well-being of users.

### 3 METHODOLOGY

#### 3.1 Study Area

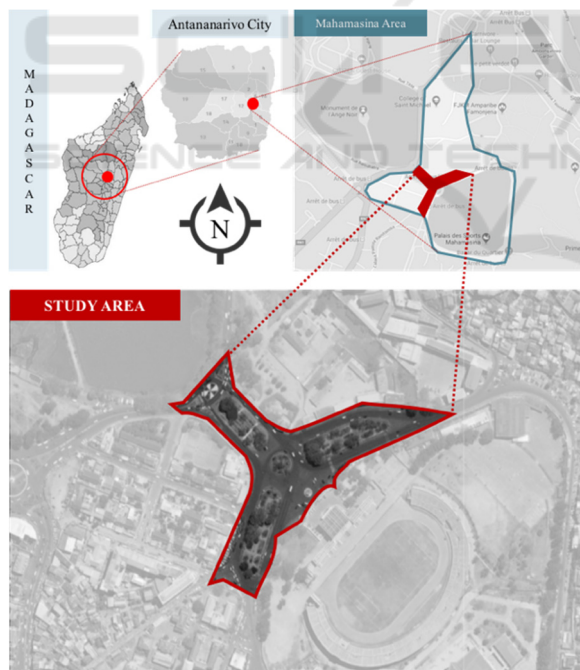


Figure 3: Mahamasina Area, Antananarivo City.

Antananarivo city is the first largest city in Madagascar. Thus, this city is the capital city and center of politics, administration, and the economy.

Mahamasina area is one of the “Fokontany” in the “Quatrième Arrondissement” in “Commune Urbaine d’Antananarivo”. This area of the case study has an "urban park" with the following limitations:

- North: College d’Enseignement Générale Antanimbarinandriana - Sainte Famille Mahamasina.
- East: Mahamasina Stadium.
- West: Anosy Lake.
- South: Ecole de Medecine. (Figure 3)

#### 3.2 Design Method

This research uses a mix-method design involving the collection of qualitative and quantitative data. There are three parts of data collection processes:

- Site observation is the initial observation that occurred impromptu and allows for the mapping of existing conditions. Assessment of site observation support to formulate and design the questionnaire.
- The survey questionnaire focused on the users’ perceptions of nature and behaviours based on the patterns of biophilic design that we use.
- Behaviour Observation is to define the typical activities and behaviour of urban park users, focusing on the type of activities performed and the attitude through nature.

Analysis of data is an assessment of the qualitative descriptive method. Furthermore, Mahamasina area has divided 4 zones (Figure 4) between conducting the analysis more efficiency and more details. Overall, the survey was conducted in mid-February until mi-March 2019 and disseminated to 120persons of varying age and gender, which are 30 persons in each zone.

The collective findings of site observation, surveys and behaviour observation informed understandings of users’ perception of nature in each park in Mahamasina area and its phenomenology of the perception of nature. These findings also provided the design characteristics, design recommendation and concept design that encourage the user activities within the urban park in Mahamasina area.

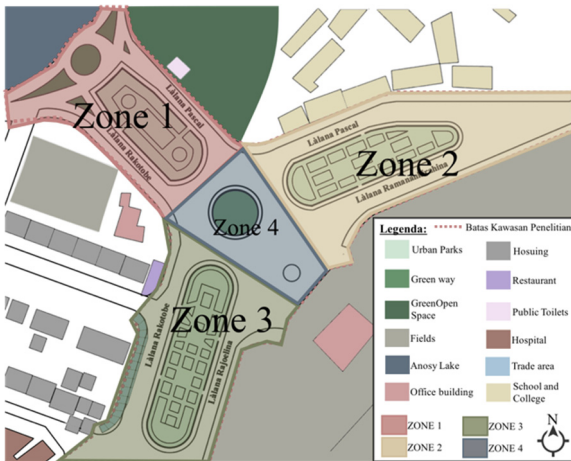


Figure 4: Distribution of Zones in study area.

## 4 RESULTS AND DISCUSSION

### 4.1 Site Observation

This section outlines the results and discussion of the initial site observation including design site mapping and social activity mapping.

#### 4.1.1 Zone 1 – Antaninandrokely

The following is analysis based on the elements of urban parks by OCRR (Office of Community Revitalization and Reinvestment).

- **Location:** this park that directly adjacent to Rakotobe road and Pascal road is part of the focus in the study area with the pedestrian way.
- **Access and Visibility:** Access to this urban park is easy to find because users immediately see the entrance available on both sides of the road. However, vegetation is seen from far but consider visibility, markers, and lack of access to security with poor conditions. From entrances, it is easy to find because it is visible from far away from the available seats and benches. However, the circulation of the lane in this park is quite clear. However, experience in urban parks is not enjoyable for users due to the circulation path can only be used in a short time. (Figure 3)
- **Function:** This park has as function a waiting time, dating and resting due to this park is pretty quiet and still in good condition.

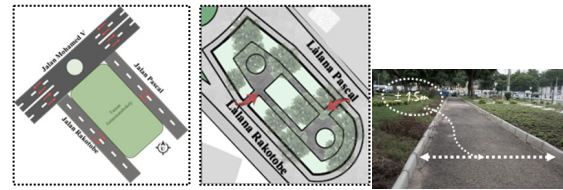


Figure 5: Access and Visibility of Park – Zone 1.

- **Form:** Mohamed V road, Rakotobe road and Pascal road delimit this park with a square shape.
- **Facilities and furnitures:** Urban park in zone 1 has items of furniture and facilities such as benches with 10 concrete materials, 3 trash bins, 3 solar lamp-posts, and security posts.

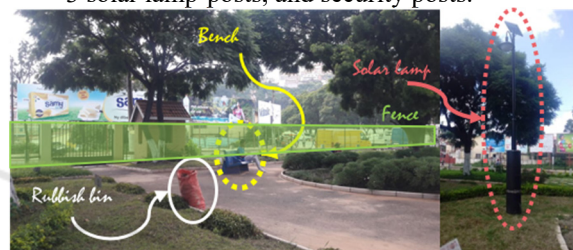


Figure 6: Facilities and furnitures in park – Zone 1.

#### 4.1.2 Zone 2 – Square

- **Location:** the urban park that directly adjacent to Pascal road and Ramanankirahina road is part of the focus in the study area with the pedestrian way.
- **Access and Visibility:** Access to this urban park is easy to find because visitors immediately see the entrance that spread on both sides of the road. In contrast, signages are not enough in term of numbers. Benches and seats are easy to find due to its visibility from entrances. However, this park can merely be used in a short time; the circulation flow is quite clear. That makes users do not enjoy in this park.

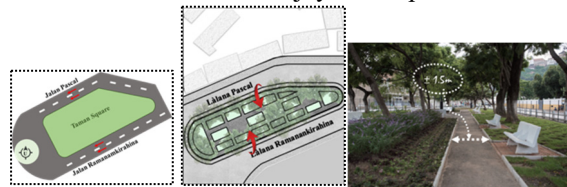


Figure 7: Access and Visibility of park – Zone 2.

- **Function:** This park has the function as waiting time, dating and resting. This is because this park is quiet enough and in good condition.

Thus, in the lunchtime almost all students around this park use as a place for lunch.

- **Form:** Rakotobe road and Pascal road create the form of this park as a square shape.
- **Facilities and furniture:** In terms of aesthetics and visuals, some of the facilities are less good and less numerous due to lack of facilities such as rest area, bench, and CCTV. The statue spread in this park is merely shown inside the park and cannot be seen from the outside. As well, this park also does not have special furniture other than benches, trash cans, and lamp posts and furniture that are not enough for visitors and are less attractive.

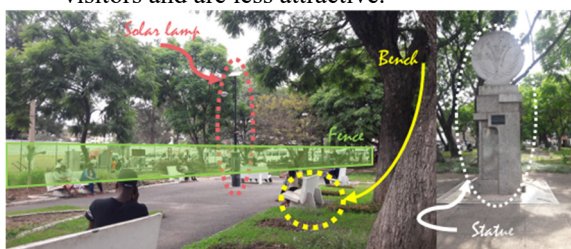


Figure 8: Facilities and furnitures in park – Zone 2.

#### 4.1.3 Zone 3 – Mahamasina 23

- **Location:** the urban park is directly adjacent to Rakotobe road and Rajoelina road.
- **Access and Visibility:** In this park, 4 entrances make it easy to see. From entrances, the seats and benches are comfortable to find. Besides, the circulation flow in the park is quite clear and wide, although the material used is not efficient. In contrast, there is fewer users' experience in this park because the path can only be used for a short time. Meanwhile, the two entrances are in the bus stop used to be functioned as a path to move the transportation mode because the entrances were aligned straight from each other. But the rest two entrances has a function as entry directly to find the place resting activities, wasting time and talking.



Figure 9: Access and Visibility of park – Zone 3.

- **Function:** The activity in this park is mostly a seating area due to supporting facilities. Workers and students who work and study

around this area use the park as for meeting and resting and relaxing. Also, the activity like business spread inside the park.



Figure 10: Facilities and furnitures in park – Zone 3.

- **Form:** Rakotobe road and Rajoelina road formed this park with a square shape.
- **Facilities and furniture:** The facilities and furniture available in this park still do not meet the standards to provide comfort for visitors due to the lack of activity support.

#### 4.1.4 Zone 4 – Kintana

- **Location:** This park is a roundabout that connects 4 roads: Rakotobe road, Rajoelina road, Pascal road, and Ramanankirahina road.
- **Access and Visibility:** As a park, it is a green open space as nodes that all vehicles or pedestrian paths should pass through this location. So, this is the junction where pedestrians can choose which parks will be visited. However, the accessibility of these parks is not seen from the roundabout because of the car used to park in front. Kintana park has no internal circular path because it is not available for users to visit. However, there is a pedestrian way around it.

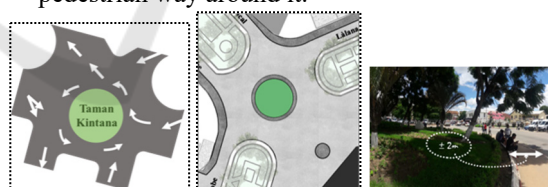


Figure 11: Access and Visibility of park – Zone 4.

- **Function:** The presence of users who are seating on the border of the fence, and some users only pass through the park defines the function of this park. So this park is a place to waste time, meeting place and rest. This is because the park has a pretty shady and beautiful area.
- **Form:** This park is formed by Mohamed V road, Rakotobe road and Pascal road with a rounded shape.
- **Facilities and furniture:** For pedestrians, this park is uncomfortable and unsafe. Whereas in terms of street furniture, zebra crossing, and

signage that are not provided information for users and vehicles. Besides, there is no furniture such as traffic lights, electric poles, and lights, signage, bins, benches, CCTV, and bollards, which cause deficiencies for users. As well, the pedestrian path does not have ornaments and vegetation or greenbelt sections to provide comfort for them and to enjoy the beauty. In terms of aesthetics and visuals, some of the facilities and furniture are in bad condition and not enough in terms of numbers. As well, this park also does not have benches, trash bins, and lamp posts as well as facilities that are not meeting the users' needs and are less attractive.



Figure 12: Facilities and furnitures in park – Zone 4.

## 4.2 Surveys and Behaviour Observation

This section outlines the results and discussion of surveys and behaviour observation that included the impact and perception of nature and design.

### 4.2.1 Zone 1 – Antaninandrokely

- **Visual Connection with Nature:** 26 of all respondents felt that the vegetation and natural features in zone 1 are well designed to facilitate the enjoyment of nature and 4 respondents felt the natural feature has no significant impact to enjoy nature in this park.



Figure 13: Perception of Nature – Zone 1.

The type of shady trees that provided green colour in this park is the “Jacaranda” tree. But reforestation and other natural elements are less visually attractive and harmonious, and there are a few natural elements besides vegetation such as birds.

- **Material Connection with Nature:** 22 respondents out of 30 respondents stated that using natural material in this park can be enhanced the image of the city and restored the users' attitude through the park to take care of the park. 6 respondents stated that it is good to use the natural feature like a tree to produce more oxygen.

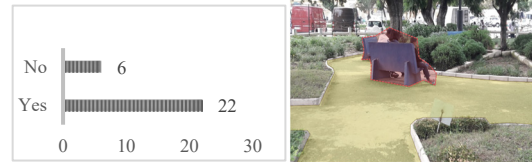


Figure 14: Perception of natural material – Zone 1.

In this urban park, it can be seen that the material used on the surface is asphalt. That material provides heat inside the park. Besides, the type of material used on the bench is concrete that is neither good aesthetically nor less comfort for visitors.

- **Prospect:** Merely 1 respondent stated that this park is good enough to see and to seat. 16 respondents stated that facilities and furniture have enough significant impact on users' needs. 13 respondents stated that furniture and facilities have no significant impact on users' needs.

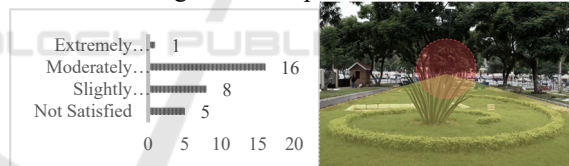


Figure 15: Perception of facilities and furniture – Zone 1.

In the theory of prospects in book 14 Patterns of biophilic design by Browning et al. (2014), the benefits in terms of behaviour are reducing boredom, irritation, and fatigue. This is due to love and attachment to space. This urban park is less visited by visitors because they feel and see the lack of facilities.

- **Refuge:** 16 respondents stated that inside the park is safe, while 14 respondents stated that it is strongly safe for them. That is because of the presence of a fence surrounding the park. Based on the benefits of refuge is to increase concentration, attention, and perception of safety, due to the presence of protection who can protect people in space. In the park, there are



found two types of fences, namely; a fence with trellis and a concrete fence made around the parks.



Figure 16: Perception of safety – Zone 1.

#### 4.2.2 Zone 2 – Square

- **Visual Connection with Nature:** 24 respondents stated that they enjoyed the beauty of nature. This provides benefits such as the shade of the tree, providing fresh air. Seeing vegetation provides comfort and helps to enhance relations with nature. Meanwhile, 5 respondents stated that around the park, there is parking on-street that it hides harmonious and beautiful.



Figure 17: Perception of Nature – Zone 2.

In zone 2, natural elements such as trees like “Jacaranda” that dominate the city park are provided, and the green colour in this park is quite visible.

- **Material Connection with Nature:** 29 respondents stated that the use of natural materials in the park makes the city more attractive, and it can be enhanced the users’ attitude to maintain or to care about its park. In contrast, only 1 respondent concluded that it is better to use nature like a tree to provide more oxygen in the area. In this urban park, it can be seen that the material used on the surface is asphalt. That material provides heat inside the park. Besides, the type of material used on the bench is concrete that is neither good aesthetically nor less comfort for visitors.

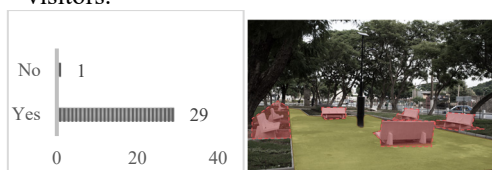


Figure 18: Perception of natural material – Zone 2.

- **Prospect:** 16 respondents stated that the facilities in this park were sufficient to meet their needs. This is because the number of seats is quite large. 13 respondents stated that there is a lack of chairs/bins, trash cans, tap water, and ornaments. As well as, there are no tables for study, and playground for children.

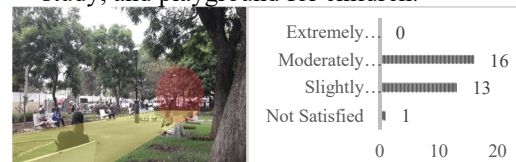


Figure 19: Perception of facilities and furniture – Zone 2.

In the theory of prospects in book 14 Patterns of biophilic design by Browning et al. (2014), the benefits in terms of behaviour are reducing boredom, irritation, and fatigue. This is due to love and attachment to space. This urban park is less visited by visitors because they feel and see the lack of facilities.

- **Refuge:** 20 respondents stated that inside the park, it is safe for visitors, while 8 respondents stated it is strongly safe inside the park. This is because the city park is fenced in and the entrance is easy to see, and the city park is located near the police station, so there has never been a case. Based on the benefits of refuge is to increase concentration, attention, and perception of safety, due to the presence of protection, which can protect people in space. In the park, there are found two types of fences, namely; a fence with trellis.

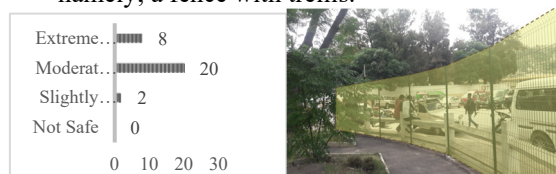


Figure 20: Perception of safety – Zone 2.

#### 4.2.3 Zone 3 – Mahamasina 23

- **Visual Connection with Nature:** 23 respondents stated that they enjoyed the beauty of nature, while 4 respondents felt that nature is strongly not enough for users' needs. Due to this provides benefits such as the shade of the tree, providing fresh air. Seeing vegetation provides

comfort and helps to enhance relations with nature.

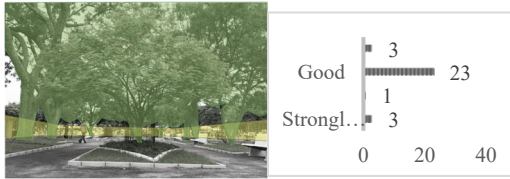


Figure 21: Perception of Nature – Zone 3.

Natural elements such as trees like “Jacaranda” that dominate the city park are provided, and the green colour in this park is quite visible. But reforestation and other natural elements are less visually attractive and harmonious and there are not many natural elements besides vegetation such as birds.

- **Material Connection with Nature:** However, there is no material in the form of nature, but 17 respondents stated that the use of natural materials in the park makes the city more beautiful and it can be enhanced the users’ attitude to maintain or to care about its park. In contrast, 13 respondents stated that it is better to use nature to increase oxygen in the region.

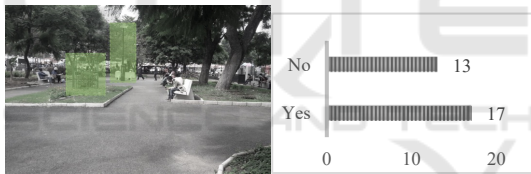


Figure 22: Perception of natural material – Zone 3.

In this urban park, it can be seen that the material used on the surface is asphalt. The material used in this park provides heat inside the park. Besides, the type of material used on the bench is concrete that is neither good aesthetically nor less comfort for visitors.

- **Prospect:** 16 respondents stated that the facilities in this park did not meet their needs while 12 respondents stated that said the facilities in the park were enough for them. This is due to a lack of chairs/bins, trash cans, tap water, and ornaments, there are no tables for study, and play areas for small children. In the theory of prospects in book 14 Patterns of biophilic design by Browning et al. (2014), the benefits in terms of behaviour are reducing boredom, irritation, and fatigue. This is due to love and attachment to space. This urban park is

less visited by visitors because they feel and see the lack of facilities.



Figure 23: Perception of facilities and furniture – Zone 3.

- **Refuge:** 18 respondents stated that the park is safe for visitors. Meanwhile, 11 respondents felt very safe. This is because the park is enclosed and the entrance is easy to see, and the city park is located near the police station so there is never a case.



Figure 24: Perception of safety – Zone 3.

Based on the benefits of refuge is to increase concentration, attention, and perception of safety, due to the presence of protection who can protect people in space. In the park, there are found two types of fences, namely; a fence with trellis and a concrete fence made around the parks.

#### 4.2.4 Zone 4 – Kintana

- **Visual Connection with Nature:** 18 respondents said that they enjoyed the beauty of nature. This provides benefits such as the shade of the tree, giving the air a fresh feel when it gushes. Seeing vegetation provides comfort and helps to enhance relations with nature. Meanwhile, 10 respondents stated that there was parking on-street surrounding park, so the noise of the vehicle is still dominated inside the park. Natural elements such as trees like “Jacaranda” that dominate the city park are provided, and the green colour in this park is quite visible. But reforestation and other natural elements are less visually attractive and harmonious, and there are not many natural elements besides vegetation such as birds.

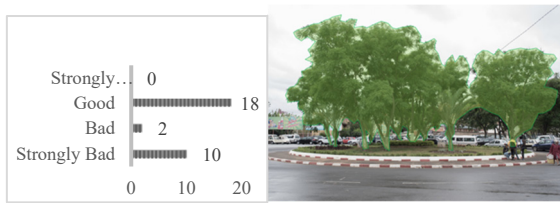


Figure 25: Perception of Nature – Zone 4.

- **Material Connection with Nature:** 14 respondents stated that the use of natural materials in the park makes the city more beautiful, while 16 respondents stated that it is better to use nature to add beauty to the region.

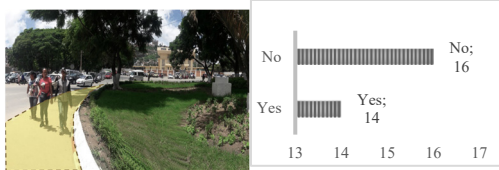


Figure 24: Perception of natural material – Zone 4.

In this urban park, it can be seen that the material used on the surface is asphalt. That material provides heat inside the park. Besides, the type of material used on the bench is concrete that is neither good aesthetically nor less comfort for visitors.

- **Prospect:** In the theory of prospects in book 14 Patterns of biophilic design by Browning et al. (2014), the benefits in terms of behaviour are reducing boredom, irritation and fatigue. This is due to love and attachment to space. This urban park is less visited by visitors because they feel and see the lack of facilities.

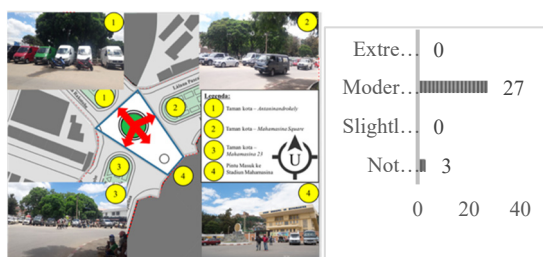


Figure 26: Perception of facilities and furniture – Zone 4.

- **Refuge:** 28 respondents stated that they were safe in the park (roundabout) due to this park is rarely crowded, and is located near the police station.



Figure 27: Perception of safety – Zone 4.

Based on the benefits of refuge is to increase concentration, attention, and perception of safety, due to the presence of protection, which can protect people in space. In the park, there are found two types of fences, namely; a fence with trellis and a concrete fence made around the parks.

## 5 REDESIGN CONCEPT

The concept of redesign urban parks in Mahamasina area is a way to provide the solution of users' perception of nature in Mahamasina area. Redesigning urban parks in Mahamasina area is done by highlighting each identity, and original design such as Antaninandrokely park is used as a relaxing place, Square is a recreation place, and Mahamasina 23 is for the meeting area, and Kintana as the roundabout is a junction for these three parks.

The main concept is done to link each park by changing the circulation flow (Figure 27) and the position of the main entrance located on Mohamed V road (Antaninandrokely park) because it is easily seen. Thus, Square and Mahamasina 23 provide side entrance. As well, the Mahamasina 23 park is given a pedestrian bridge for pedestrians to move public transportation modes. The solution of bad behaviour and attitude in these parks is done by using the patterns of biophilic design (Figure 28):

- **Visual connection with nature:** this is done by elevating the green area inside the urban parks and giving more fauna-flora to enjoy while walking through.
- **Material connection with nature:** in this using material that is easy to find and can produce locally. Especially, the material of the pavement that can enhance the linkage of these three parks is rounded cobblestone in two different colours which are brown and grey.
- **Prospect:** this is done by providing a good view of each park from Kintana park (roundabout).
- **Refuge:** this is done by maintaining the original design using the trellis fence in term of visitor safety. Besides, the low level of the path-ways creates also a sense of protection while walking through.



Figure 28: Circulation Flow.

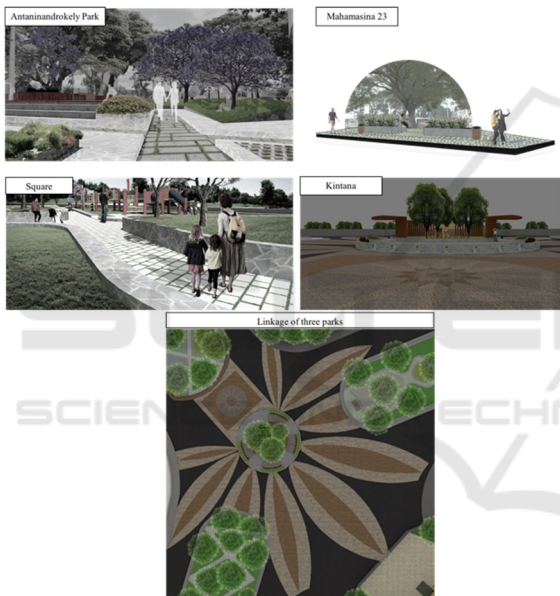


Figure 29: Redesign Concept of urban parks in Mahamasina area.

## 6 CONCLUSIONS

Research findings suggest highlighting the experience of nature inside parks. Urban parks in Mahamasina area were not designed to support the human connection with nature. Redesign of urban parks in Mahamasina is done by changing the circulation flow to encourage prolonged walk and stay activities so that the users can enjoy and perceive nature. Thus, this is made urban parks to be given a diversity of fauna-flora that can be enjoyed (Visual connection with nature). Then, urban parks use new materials so that urban parks will become more

attractive and beneficial for users (Material connection with nature). Besides, urban parks need to be considered beauty and needs of facilities for visitors. Roundabout is designed as a point of view of overall parks (Prospect). Moreover, urban parks should maintain the original design in term of safety for users (Refuge). So, the implementation of biophilic design in urban parks in Mahamasina area can be the one of innovative design park to support the program “Plan vert” Antananarivo city and Madagascar as well (Thierry Huau, 2006). As well it is the initial research about biophilic design (Browning et al., 2014; Stephen and Calabrese, 2015; Stephen and Wislon, 1995; Timothy, 1957) and urban parks in developing countries.

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