

Sustainable Materials Application in Interior Elements as Stimulant of The Visually Impaired Person's Movement in PSBN Wyata Guna's Dining Area

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Abstract

PSBN Wyata Guna is a foundation that aims to provide services for visually impaired people. The studied area functions to facilitate dining activities or its residents could take away their meal from the area. Dining rooms have high potential complexity and level of activity. While user movement is one consideration in the area, lack of treatment in the room causes frequent collisions and difficulties for the residents in finding directions. Stimulus is needed to support them to circulate through space, and the ones that play a high role are sound and layout. This study uses an experimental method to learn how the layout and sound stimuli influence them in circulation. Sustainable Material usage is underlined in response to the recent environmental issues. Distance, on the other hand, is not a determinant of the movement duration in the circulation. The most important for the visually impaired are instructions in the circulation and sound stimuli located at relevant points. The instructions could be furniture or other objects and should not inhibit circulation and be consistently distanced, while the sound is to convince them whether their direction is correct. This paper could be an allusion to further studies and an input for interior designers and architects.

Keywords

Visual impaired, layout, stimulant, space circulation, sustainable material

1. Introduction

In the estimated table for the number of people with visual disabilities and low vision by province processed by the Ministry of Health's Center for Data and Information and published in the Situation of Visual Disabilities and Blindness in 2014, West Java ranks third with the highest number of people with visual disabilities in Indonesia. West Java has a home for people with visual disabilities in Bandung, namely the Bina Netra Wyata Guna Social Institution,

this orphanage has noble goals but is constrained by several problems, namely inadequate space for people with visual disabilities and the available space elements are not suitable for their needs.

In addition, from the results of observations and interviews that have been conducted in previous studies, it was found that the type of layout that makes it easier for people with visual impairments to carry out their activities in this dining room is a layout with circulation area that has no barriers and an activity area that is close to the entry area or circulation area. In this experiment, we will test how people with disabilities choose a seat to eat and how sound affects their movements. This test was conducted on 20 people with visual disabilities from different dormitories and was carried out in the dining room of the Bina Netra Wyata Guna Social Home. The focus of this test is on how people with visual disabilities find their dining table, how much influence sound has on their mobility, and what difficulties people with visual impairments face in each condition.

1.1 Objectives

This research is conducted to show the most important senses used in finding direction are the sense of hearing and touch, and in making interior designs for people with visual impairments, objects to be touched and sound sources are needed to convince people with visual disabilities that the direction is correct and safe (Fransisca and Tedjokoemo, 2018). To ensure this, an experiment is needed in the PSBN Wyata Guna dining room. This experiment aims to determine the best layout system for persons with visual disabilities. People with visual disabilities need clues or what they usually call clues in finding directions, these clues can vary, but the most influential ones are sound and texture.

The texture here can also mean objects around such as furniture and other interior elements (Vermeersch, 2009). The texture itself will be sensed if we apply the correct finishing materials. To consider sustainable aspects in this research, sustainable materials should be placed in the interior elements or furniture. Sustainable materials which can be chosen are finishing materials with various rough textures. Bamboo, rattan, stone, and wood are several examples of sustainable materials in architecture (Prabowo et al., 2019).

2. Literature Review

2.1 Basic Concept of Person with Visual Disabilities

The basic concept can be defined etymologically as "a mental image of a person in something", while basic can be interpreted as "something that is fundamental or underlies something" (Majerova, 2017). So, it can be concluded that the basic concept is a fundamental mental image of a person and must be studied and known. (Directorate General of Social Services and Rehabilitation, Ministry of Social Affairs of the Republic of Indonesia in Guidelines for Orientation and Mobility of Social Institutions for the Blind, 2002). The types of basic concepts according to the Directorate General of Social Services and Rehabilitation of the Ministry of Social Affairs are:

- Motor perception components; use of other senses such as touch, smell, hearing, and proprioception.
- The concept of the body/body image, size, shape, surface, color, weight, location, use, position, movement, time, sound, taste, smell, direction, motor, space between objects, and the concept of the relationship between self and object.

The visually impaired person has magnificent tactile, olfactory, and hearing senses too. They tend to be more attentive and receptive to other senses rather than sight. They can perceive sound, touch, and smell into a complex sensorial concept to describe objects. Those senses become more sensitive and receive more stimulus comprehensively into their memory. However, touching senses are frequently used by them to understand new space and it is shown how it effectively works in the Table 1 below.

Table 1. Understanding the World of The Visually Impaired: Methodology Study Extracted Themes.

Source: (Oteifa et al., 2017)

Activities	Details	Perceptual Channel		
		Haptic Perception	Auditory Perception	Olfactory Perception
Nature Interaction	Airflow	✓	✓	
	Sunlight heat sensation	✓		
	The smell of nature elements			✓
	Atmosphere		✓	✓
Materials Texture	Material roughness and smoothness	✓		
	Material Temperature	✓		
	Touch and feel recognition	✓	✓	✓
Materials Identification	Material roughness and smoothness	✓		
	Material Temperature	✓		
	Touch and feel recognition	✓	✓	✓
Form Recognition	Touch and feel recognition	✓		
Space Comprehension	Ground topography and contours	✓		
	Width and height		✓	
Spatial Identification	Spatial properties	✓	✓	✓

The data above shows the frequent sense that is used by visually impaired people to understand architecture and interior sites rapidly. Haptic perception or touching sense is the main stimulus that can be divided into active and passive touch. Active touch can be described into two types, they are kinesthetic and tactile. Basically, kinesthetic is the activity that can be described as form recognition and touch and feel recognition. Meanwhile tactile more to topography and contour exploration as well as materials texture experiment. On the other hand, passive touch happens when the tactile event indirectly reaches the skin for example when we feel the heat sensation and airflow

2.2 Spatial Organization

Eventually, a discussion about facilities for visually impaired people connected to the effective space organization. Lay-out furniture and interior elements can become wayfinding for them to understand the space and recognize its physical attributes. In the discussion about lay-out furniture, there is a spatial organization to distribute the interior elements into design elements composition that aims to make it effective. There are several types of spatial organization that can help to identify a spatial organization in referring to spatial layout systems in this facility. It is explained in the table below.

2.3 Wayfinding

Wayfinding is the process of determining and following a road or route between the starting point and the destination. Wayfinding is an activity that is directed, has a purpose, and is motivated and can be seen as evidence of sensorimotor actions in the environment. The main purpose of wayfinding in humans is to find an accurate path from one place to another that is specifically intended and cannot be accepted spontaneously (Ching, 2014). Wayfinding is commonly used in public spaces, especially to inform people to go to the service area or important places in a public place such as ticket counters, toilets, exit doors, etc. There are several ways to visualize wayfinding in public space such as signage, arrows in interior elements such as floor and wall, etc.

Wayfinding for visually impaired people is the most helpful thing to locate a destination or pathway in a public space. Wayfinding will be effective if designers and architects understand how visually impaired people understand space by finding out how they perceive it from their nature to know their surroundings, experience the feel of its materials, and feel the characteristics of objects in the interior space. One of the ways to reach those effective ways can be shown as the usage of yellow braille blocks with tactile paving on the floor, rhythm in shapes of interior elements such as columns, materials texture, etc. Tactile sense for

2.4 Sustainable Finishing Materials with Tactile Sensation

The following senses that play a major role in learning and understanding the environment are the tactile senses. (Table 2) Human beings use their hands to help them respond to their environment, not those tactile senses that are only on our hands, in fact, tactile senses spread in every square inch of our skin and send messages to our brain nearly constantly about what we are feeling.

Eventually, designers may use textures to help blind people learn, understand, and walk freely around an area. However, as a tool for humans to understand the environment, some textures might provoke tactile defensiveness for some people. And materials applied in interior designs, in general, might be a threat, not only to the user but also to the environment. There are standard criteria for the sustainable building material that should be taken into consideration. These are (1) building materials used should be locally produced, (2) the materials should be reusable, (3) natural and minimally transformed, (4) materials are off-site prefabricated, (5) produced with a caring environment management system, (6) energy-efficient, (7) does not contain harmful compounds (8) has a safety performance to be used for visually impaired person. The following Table 2 below is a set of data to identify as well as evaluate the suitability of several textured materials that are potentially sustainable to the environment.

Table 2. Sustainable Material Identification for Visual Impaired Person's Facilities

Source: Prabowo A et al., 2019

Standard Criteria	Sustainable Material Possibilities					
	Cork	Wool	Fabric	Stone	Bamboo	Rattan
Locally produced	✓	✓	✓	✓	✓	✓
Reusable			✓	✓	✓	✓
Natural and minimally transformed	✓			✓	✓	✓
Off-site prefabricated	✓	✓	✓			✓
Produced with the environment management system	✓	✓	✓	✓	✓	✓
Energy efficient						
Does not contain harmful compounds	✓			✓	✓	✓

The likelihood to does not provoke tactile defensiveness	✓	✓	✓	✓	✓
Safe for visually impaired people	✓	✓	✓		✓

The sustainability process is not always about proper waste management, it also discusses approaches for controlling the flow of materials in general industrial and economic required systems (Khorasanizadeh et al., 2018). Material lifetime and material life cycle would make two opposed perspectives, one proposes to prolong the use of materials and products as long and efficiently as possible, on the other side, proposes to enable indefinite material and product circulation. Neither of them is incorrect, one hopes to extend the ‘functionality’ of materials which would make the materials durable, an example of this is plastic. The opposing side proposes that materials should be efficiently recycled [8]. Designers should seek to make qualified choices in the shadow of global climate change, social inequity, pollution, and a decrease in biodiversity.

One of the approaches that can be done when discussing sustainable design processes is the biophilic approach. Biophilia is an approach that connects wellbeing’s innate biology with environmental nature. Biophilic design can be categorized into three types, they are nature in space, natural analogs, and nature of space (Browning et al., 2014). This approach comprehends the provision of a framework to understand and enable the thought of diversity incorporation strategies in the built environment. Nature in space focuses on the direct physical and temporary presence of the naturally built environment (Browning et al., 2014). Tenacious natural space experiences are accomplished through the creation of substantial direct connections of natural elements, particularly through diversity, movement, and multi-sensory interactions. Natural analogs discuss organic, non-living, and indirect evocations of nature. Objects, materials, colors, shapes, sequences, and patterns found in nature, manifest as artwork, ornamentation, furniture, décor, and textiles in the built environment. The strongest Natural Analogue experiences are achieved by providing information richness in an organized and sometimes evolving manner. The nature of space addresses spatial configurations in nature. This includes our innate and learned desire to be able to see beyond our immediate surroundings, our fascination with the slightly dangerous or unknown; obscured views and revelatory moments, and sometimes even phobia-inducing properties when they include a trusted element of safety. The strongest nature of the space experiences is achieved through the creation of deliberate and engaging spatial configurations commingled with patterns of nature in the space and natural analogs.

The concept of biophilic design subsequently emerged. From 2001 on, academics and practitioners developed different interpretations of biophilic design. These interpretations demonstrate different taxonomies of ‘nature’ in architecture from categories to elements, in which psychologically experienced and physiologically perceived ‘nature’ are discussed inclusively. Among the numerous biophilic design interpretations, we chose three representative conceptual frameworks to conduct a comparative analysis. These three frameworks are often used as the conceptual basis to establish criteria regarding natural contact/connection in some important architectural certificates. They have also been adopted to investigate biophilic design in many other studies. (Figure 1)

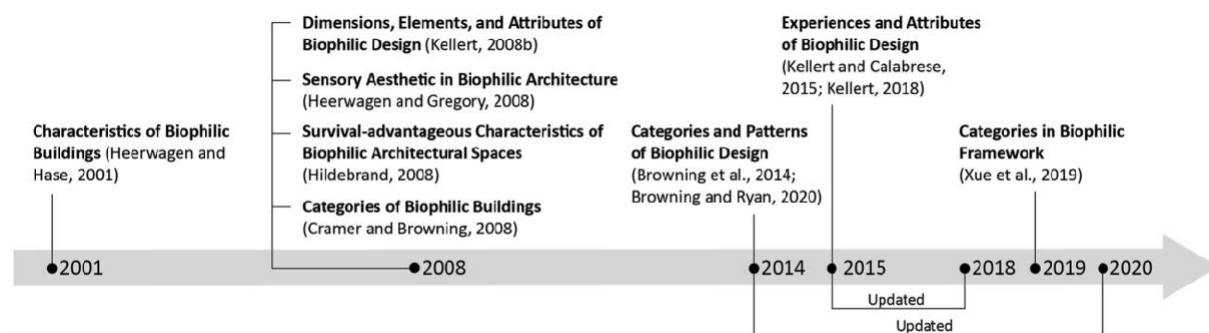


Figure 1. Timeline of various biophilic design interpretations
Source: Zhong, Schroder, et. al. 2021

2 Dimensions, 6 Elements, and 72 Attributes of Biophilic Design (Kellert, 2008b)					
I. Organic or Naturalistic				II. Place-based or Vernacular	
1. Environmental features	2. Natural shapes and forms	3. Natural patterns and processes	4. Light and space	5. Place-based relationships	6. Evolved human-nature relationships
• Color • Water • Air • Sunlight • Plants • Animals • Natural materials • Views and vistas • Façade greening • Geology and landscape • Habitats and ecosystems • Fire	• Botanical motifs • Tree and columnar supports • Animal (mainly vertebrate) motifs • Shells and spirals • Egg, oval, and tubular forms • Arches, vaults, domes • Shapes resisting straight lines and right angles • Simulation of natural features • Biomorphy • Geomorphology • Biomimicry	• Sensory variability • Information richness • Age, change, and the patina of time • Growth and efflorescence • Central focal point • Patterned wholes • Bounded spaces • Transitional spaces • Linked series and chains • Integration of parts to wholes • Complementary contrasts • Dynamic balance and tension • Fractals • Hierarchically organized ratios and scales	• Natural light • Filtered and diffused light • Light and shadow • Reflected light • Light pools • Warm light • Light as shape and form • Spaciousness • Spatial variability • Space as shape and form • Spatial harmony • Inside-outside spaces	• Geographic connection to place • Historic connection to place • Ecological connection to place • Cultural connection to place • Indigenous materials • Landscape orientation • Landscape features that define building form • Landscape ecology • Integration of culture and ecology • Spirit of place • Avoiding placelessness	• Prospect and refuge • Order and complexity • Curiosity and enticement • Change and metamorphosis • Security and protection • Mastery and control • Affection and attachment • Attraction and beauty • Exploration and discovery • Information and cognition • Fear and awe • Reverence and spirituality
3 Experiences and 25 Attributes of Biophilic Design (Kellert, 2018)					
1. Direct Experience of Nature		2. Indirect Experience of Nature		3. Experience of Space and Place	
• Light • Air • Water • Plants • Animals • Landscapes • Weather • Views • Fire		• Images • Materials • Texture • Color • Shapes and forms • Information richness • Change, age and the patina of time • Natural geometries • Simulated natural light and air • Biomimicry		• Prospect and refuge • Organized complexity • Mobility • Transitional spaces • Place • Integrating parts to create wholes	
3 Categories and 15 Patterns of Biophilic Design (Browning and Ryan, 2020)					
1. Nature in the Space		2. Natural Analogues		3. Nature of the Space	
• Visual Connection with Nature • Non-Visual Connection with Nature • Non-Rhythmic Sensory Stimuli • Thermal & Airflow Variability • Presence of Water • Dynamic & Diffuse Light • Connection with Natural Systems		• Biomorphic Forms & Patterns • Material Connection with Nature • Complexity & Order		• Prospect • Refuge • Mystery • Risk/Peril • Awe	

Figure 2. Three Key Frameworks of Biophilic Design

Source: Zhong, Schroder, et. al. 2021

Biophilia values are drawn from evolutionary psychology. In contrast, there are several investigations regarding human-nature relationships based on biological responses, ‘psychological, physiological health and well-being, and cognitive functionality and performance’(Browning et al., 2014). In addition, the first framework is introduced as a detailed ‘specification’ of biophilic design, in which all-inclusiveness is celebrated. This Figure 2 shows the developer’s ambition to use this concept as an omnipotent elaboration for understanding ‘nature’ in architecture (Zhong et al., 2021).

3. Methods

The research was conducted using the experimental method. The experiment was carried out in the dining room outside of lunchtime, the reason being so as not to interfere with the usual lunch activities. In addition, this experiment does not use the entire area of the dining room, it is enough to use an area in the corner of the room measuring about 40 m², below is a plan of the dining room and the red box is the area where the experiment was carried out. The layout for this experiment also doesn't change the existing layout too much. The layout for the experiment consists of 2 tables and 4 long chairs, with 1 table closest to the entrance. In addition, between the two tables, a sound source is placed, and for condition A, on the right side of the exit door, a sound source is also placed, here is the layout: (Figure 3)

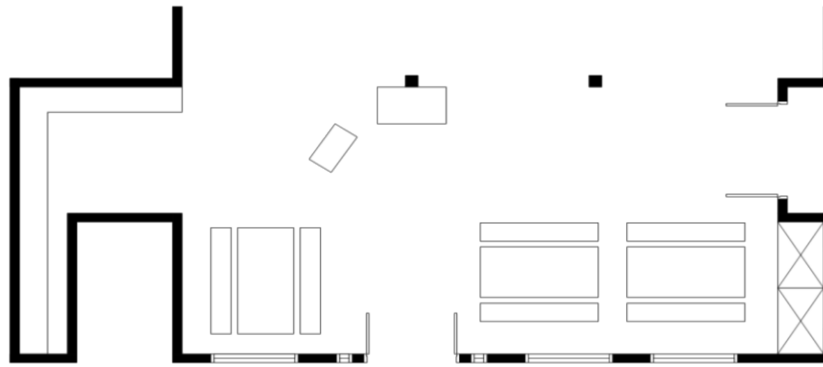


Figure 3. Existing Dining Room Layout
Source: Personal Data

There are 2 groups for this experiment and divided into 10 people with visual disabilities. Every 1 group describes 1 condition to experiment. The flow of this experiment is that initially people with visual disabilities enter one by one and walk to the serving table which is in a straight line with the door which is about 4 meters away. Then a sound source is played and people with visual impairments start walking to find the seat they want with the voice prompts. After finishing eating, one by one people with disabilities exit through the exit, for 10 blind people who are in experiment condition A will hear a sound again near the exit and walk with the sound instructions. Observations are made using a camera that is placed in a certain position so that all movements of people with visual impairments can be recorded.

4. Data Collection

4.1. Layout Organization Recommendation

Table 3. Layout Organization Simulation Options
Source: Personal Data

Layout Organization	Circulation	Blocking Area	Coordinates	Furniture Placement Effectivity	Capacity	Users Interaction
Type 1	Connected by serving area and every area surrounded by circulation area	The serving area is the center, surrounded by coordinate spots. The dining area is spread over 4 main spots. There is no wall attached furniture	Coordinate spots placed in the middle of the room, exactly near the serving area	Middle	Low	High
Type 2	The main user circulation is well connected, but there are several obstacles in the middle.	The main typology of this is in U character shape, with the serving area placed	Coordinate spots are placed in the center of the room.	Low	High	Low

Figure 4. Layout Furniture Type 1
Source: Personal Data

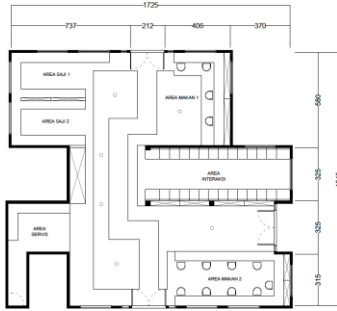


Figure 5. Layout Furniture Type 2 Source: Personal Data

on 1 side of the room, 2 dining areas, and an interaction area placed on the corner of the room.

Type 3



Figure 6. Layout Furniture Type 3 Source: Personal Data

The circulation is interconnected between the three main entrances, passing through the interaction area in the center of the room.

This layout is a combination of 2 room typologies, centered and radial, with the interaction area at the center.

Coordinated spots are placed in the center of the room, surrounding the interaction area.

High

Middle

High

Type 4

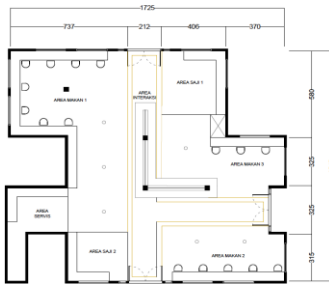


Figure 7. Layout Furniture Type 4 Source: Personal Data

This room circulation connects the three main entrances, passing through the interaction area at the center of the room.

This layout is categorized into the linear organization, with the interaction area placed in the middle, surrounded by the dining area and serving area.

Coordinated spots are placed in the middle of the circulation, surrounding the interaction area.

Middle

Middle

Low

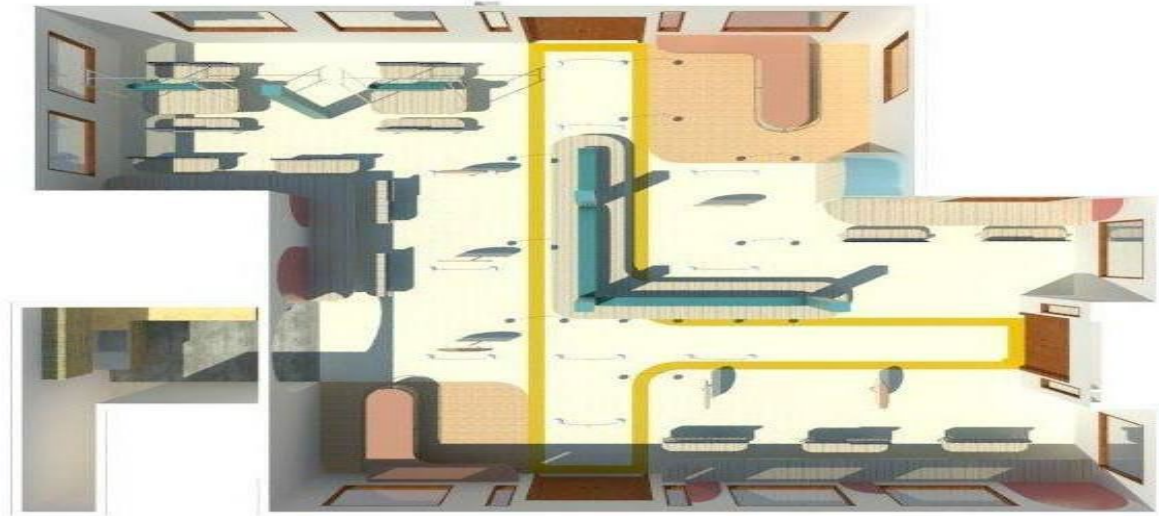


Figure 8. Layout Furniture Recommendation (Type 3)
Source: Personal Data

According to the Table 3 analysis of the explanation of the layout alternative, it is known that the type 3 alternative could be chosen as an effective alternative to support the activities of visually impaired people in the dining room of PSBN Wyata Guna. The layout organization above is the result of a behavior analysis of visually impaired people in the dining room of PSBN Wyata Guna. The yellow passage on the floor shows material difference which helps people navigate through the main circulation of the room. According to the behavior analysis, we found ideal dimensions for several conditions to facilitate visually impaired people as follows:

- Circulation among users is 1 meter
- Circulation among furniture is 1.3 meters
- Maximum distance between serving area and dining area is 3 meters
- Maximum distance among users in the dining area is 1 meter
- User's distance in circulation area is 0.5 meter
- Distance from the main entrance to the coordinate spot is 2.5 meters
- Maximum distance among coordinate spots is 2.5 meters

The layout shown in figure 11 is an optimization of the existing area while taking into account the user behaviors and habits already built in the room. The inmates are already used to the existing area, for that basis, the ideal concept for the layout should not change the existing context to help users to adapt to the new environment. The dining room of PSBN Wyata Guna has 3 doors that are mainly used for directly facing the dormitory. There are several kinds of different materials that are used to associate each door which is applied to the serving area, dining area, and interaction area in order based on users' behavior. The serving area is placed close to the entrance considering the user habit and movement effectiveness of the users when they are taking the food to the dining area. The dining area is spread on every side of the room and the interaction area is placed in the center. From the analysis result, there are blind spots where the inmates are losing direction. This problem is caused by the big spacing between furniture and there are no other signs of direction to help them navigate through the room. In response to the problem, coordinate points are placed to show the visually impaired users the next point for their direction.

5. Results and Discussion

5.2. Material Scheme Recommendation

Among others, user experience investigates the affective responses to concrete and abstract product attributes (Bahrudin et al., 2014). Material attributes such as textures, smell, and density, could be interpreted by visually impaired people as a form of communication. A material with an easy-to-differentiate texture could be placed in a certain area to indicate its room function. The material used in this project is considered two things, facilitating visually impaired people and sustainability issues. The material selection that is suitable to be chosen should consider its safety, wayfinding, as well as sustainable issues that are related to the continued sustainability of the environment. Considering the safety in the material selection for facilitating visually impaired people, the usage of non-harmful material needs to be thought about. Unsharp textured materials are priority materials selection that should be chosen. Sustainability issues that are brought

into this research can be applied as a part of the consideration to decide the material selection. Sustainable material that has texture should become a priority in material selection (Vermeersch, 2012). Texture in terms of smoothness, roughness, relief, and braille code application on materials are some ways to give visually impaired people treatment to visualize the interior space. (Figure 9. According to Table 3, there are three best kinds of sustainable materials that can be applied in the interior space that is used for visually impaired people.

Fabric, Stone, and Rattan are the three best sustainable materials that can be used. Fabrics are identified as sustainable materials because they have characteristics that are reusable, locally produced, off-site prefabricated, produced with an environmental management system, and foremost an important safety use for visually impaired people. Stone is categorized as sustainable material because it is made of natural materials which minimally transformed, can be reused, locally produced, off-site prefabricated, produced with an environmental management system, does not contain harmful compounds, likely to does not provoke tactile defensiveness, and is foremost important safety use for visually impaired people. Rattan is a well-known material that is identified as a sustainable material and this material also can be the best material to be chosen to facilitate the visually impaired people because it also has the same sustainable characteristics as fabric and rattan as mentioned before. Rattan is a natural resource prevalent where rainforests predominate in areas like Asia and Africa (Hurt, 2017). As an economic commodity for its rapid regeneration, the production and usage of rattan for commercial products sustain the market dynamics (Alfuraty, 2020). Rattan also can be formed as weaving that can have added value to apply relief as well as some tactile code or even braille language application to help visually impaired people adapt to the interior room facilities faster. Hereby we conclude the material scheme which can be used for this research and help visually impaired people to use the interior space happily.

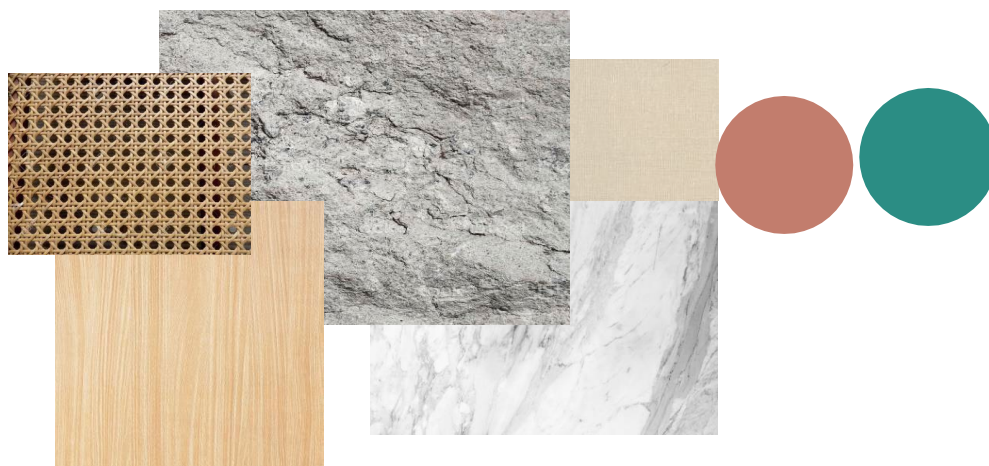


Figure 9. Sustainable Material Scheme to Facilitate Visually Impaired People

Source: Personal Data

There are four main areas that become a research focus in the material application of the design implementation in facilitating visually impaired people. Sustainable materials will be applied largely to differentiate serving areas, dining areas, interaction areas, and circulation areas. Moreover, texture and braille

code will be enhanced in the material application of those areas. In the serving area, rough materials should be applied to avoid slipperiness and distinguish the area from others. Hardstone will become an ideal material that can be applied in the serving area because it has a rough texture and is not slippery. In the dining area, there is no special treatment to be placed so that a soft texture of stone or parquet, or laminate floor can be used in this area.

On the other hand, the interaction area is the center of the room so yellow paving could be placed to help users use the seating facility in the area after coming through the main entrance. Finally, the circulation area can be differentiated by placing coordinate spots to make it easier to tell their position in the room. The material application of the circulation area might be focused on the application of the material in the coordinate spots. The coordinate spots should use soft material and are safe for the users to touch. Fabrics and rattan are ideal to be applied in the coordinate spots for it is not harmful to the users.

5.3 Design Development

Based on the analysis result, visually impaired people always use their hands to help them understand their orientation towards their direction by touching their environment. Hence, textures and shapes become important elements to be applied in interior designs for facilitating them, whether on the floor, wall, or furniture design as a part of the room. Visually impaired people tend to accidentally hit objects in their environment. Therefore, round-edged shapes should be applied as a response to keep them safe from daily- risky objects. The following statements are some suggestions to improve the user-safety interior and furniture design of the dining room of PSBN Wyata



Figure 10. 3D Modeling Prototype of Interior Design Final Recommendation

Source: Personal Data



Figure 11. 3D Modeling Prototype of Furniture Design Form Ideas

Source: Personal Data

Based on the visually impaired people's behavior analysis, the most often user's habit is touching the edge of the objects in their environment, that is, to sense the shape. Accordingly, in the figures shown Figures 10 & 11) above, there are material differences placed in the furniture edges. For the safety issue, it is recommended to reduce the part of the furniture near the feet to minimize people from tripping on their feet. In the figures shown above, there are also recommendations for dining chairs. They are intended for 2 users, with the automated movement of the backrest every time they are occupied. The feature is meant to help visually impaired people to know if the seating was occupied without the need for them to touch it. From the experiments that have been carried out, the following results were obtained:

- In condition A which has a sound on the right side of the door, persons with visual impairments tend to move towards the right side of the door and cross the empty circulation without hesitation. Meanwhile, in condition B, which does not have a sound at the door, people with visual disabilities tend to move towards the left side of the door closest to the furniture they use as a guide in walking.
- For the dining room conditions in PSBN Wyata Guna, the distance does not give too much difference in the time spent by each person with visual disabilities. There are several cases that have a considerable time difference, but this is followed by the layout of the furniture, sounds, and experiences of everyone.
- The area that is most visited is the area closest to the serving table or entrance because this area is the easiest to access for people with visual impairments, so most of them will go to this nearest area first. The pattern carried out by each respondent tends to be the same, namely, after taking food from the serving table, they will go straight to the nearest area.

6. Conclusion

Design requirements are obtained to proceed to the layout design stage of the Wyata Guna PSBN. The serving area is closest to the entrance. If it has more than one entrance, it should have the same orientation as each door. The dining area is on one side of the room and has sufficient circulation to get in and out of the dining table. If it is in the middle of the room, it should be accessible from all sides and not be an obstacle for people with visual impairments in carrying out movement in the dining room. Circulation areas should have directions for persons with visual impairments near important areas. Sound sources should not be installed adjacent to each other, but they should be located in relevant areas and are far enough from each other, for example, placed on door A which is on the west, and door B which is on the east. If setting up an interaction area, it should be on a route that is often traversed by large crowds. Use floor

patterns with different textures between areas, and also give floor patterns that are the main circulation in the dining room.

In addition, based on the results of the analysis that has been carried out, it can also be concluded that the use of materials in interior elements can help people with visual impairments in knowing the location and finding directions in the PSBN Wyata Guna dining area. According to the existing theory, it can also be seen that some materials that can be used in the PSBN Wyata Guna dining area ideally use materials that apply natural principles of sustainable materials. Because basically humans are more familiar with things that are always around them. The use of sustainable materials in the PSBN Wyata Guna dining area is applied with a biophilic design approach with consideration of human nature, which is more familiar with things that are always around, in this case, the natural surroundings. However, we must still pay attention to how the texture of the applied material will affect how people with visual impairments perceive the area.

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Biography

Friska Amalia is a senior interior designer in Magnarecon Studio and serves as a faculty member at Bina Nusantara University. Mrs. Friska holds a Bachelor of Design in Interior Design Major from Institut Teknologi Bandung and a Master of Design degree from Institut Teknologi Bandung. She has been recognized as a professional interior designer with over 5 years of experience in working with closely held businesses. She has taught courses in interior design studios of retail, hotel, and office, she also taught business in interior design as well as project management for designers. Mrs. Friska served as a member of Himpunan Desainer Interior Indonesia (HDII). Her research is focusing on interior design, residential, sustainable living, and conservation methods of interior design planning.

Deanawati Insani Wasilah is a senior interior designer at Lifetime Design also a design principal at Industriars Design and serves as a faculty member at Bina Nusantara University. Mrs. Dea holds a Bachelor of Design in Interior Design Major from Institut Teknologi Bandung and a Master of Design degree from Institut Teknologi Bandung. She has been recognized as a professional interior designer with over 5 years of experience in working with closely held businesses. She has taught courses in interior design studios of residential and retail, also courses about the theory that are essential in the interior design field. Mrs. Dea's research is focusing on human behavior and perception in interior spaces.

Janice Florencia Rachmat is a student at Bina Nusantara University, majoring in Interior Design. Ms. Janice was a member of Himpunan Mahasiswa Desain Interior Binus University. She has done some research about residential slums and healthy living interiors in 2020 with her lecturers. Currently, she is working as an intern at Asanka Studio, Ms. Janice was interested in enhancing her understanding of the interaction between humans and their environment through research and looking forward to opportunities to achieve her goals.