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Integrating Sensory-Symbolic Aesthetics into Green Roofs Design to Foster Social Engagement and a Culture of Environmental Love

[1*)] Cindy Fiolita Graciela, [2]Ridwan Sanjaya, and [3]Robert Rianto Widjaja

[1,2] Environmental Science Doctoral Program, Faculty of Environmental Science & Technology, Soegijapranata Catholic University, Semarang, Indonesia

[3] Architecture, Faculty of Architecture & Design, Soegijapranata Catholic University, Semarang, Indonesia

[1] cindy@unika.ac.id, [2]ridwan@unika.ac.id, [3]robert@unika.ac.id

[*]Corresponding author

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[1] cindy@unika.ac.id, [2]ridwan@unika.ac.id, [3]robert@unika.ac.id

[1,2] Environmental Science Doctoral Program, Faculty of Environmental Science and Technology, Soegijapranata Catholic University, Semarang, Indonesia

[3] Architecture, Faculty of Architecture and Design, Soegijapranata Catholic University, Semarang, Indonesia

[*)] Corresponding Author

Abstract: A culture of environmental love is needed to deal with earth's ecological crisis. In creating a culture of love for the environment, ecological behavior is needed. Green roofs are one of the spaces to create this culture. The case study chosen for this article is PVJ Sky Garden, Bandung which uses symbolic sensory aesthetics to encourage ecological behavior in local communities. The theory used to measure the social aspects to encourage ecological behavior is Nguyen Dang's (2022) social impact framework which has 7 points. These points are: 1) social wellbeing, 2) economy, 3) sustainable development, 4) mood state, 5) collective identity, 6) place identity, and 7) physical benefits. The research method used is qualitative research using in-depth interviews, observations and questionnaires to mall visitors. The result of this research is a symbolic-sensory aesthetic model that influences social aspects to encourage ecological behavior to become a culture of environmental love. The research found that the social impact framework is the most dominant factor, followed by economic and place identity to have encouraged the ecological behavior to create a culture of environmental love in the local community of PVJ Sky Garden.

Key words: symbolic aesthetics, social aspects, green roofs, ecological behavior, culture of love environment

Abstrak: *Budaya mencintai lingkungan diperlukan untuk menangani krisis ekologi. Dalam menciptakan budaya cinta lingkungan, diperlukan perilaku ekologis. Atap hijau menjadi salah 1 ruang untuk menciptakan budaya tersebut. Studi kasus yang dipilih adalah PVJ Sky Garden,Bandung yang menggunakan estetika sensorik simbolik dalam mendorong perilaku ekologis masyarakat lokal. Teori yang digunakan untuk mengukur aspek sosial untuk mendorong perilaku ekologis adalah kerangka dampak sosial Nguyen Dang (2022) yang memiliki 7 poin. Poin-poin tersebut adalah: 1) kesejahteraan sosial, 2) ekonomi, 3) pembangunan berkelanjutan, 4) mood state, 5) identitas kolektif, 6) identitas tempat, dan 7) manfaat fisik. Metode penelitian yang digunakan adalah penelitian kualitatif dengan menggunakan wawancara mendalam, observasi dan kuesioner kepada pengunjung mall. Hasil penelitian ini adalah Model estetika simbolik-sensorik yang mempengaruhi aspek sosial untuk mendorong perilaku ekologis menjadi budaya cinta lingkungan. Poin kerangka kerja dampak sosial pembangunan berkelanjutan adalah yang paling mendominasi, disusul poin ekonomi dan identitas tempat. 3 poin ini*

mempunyai peran penting dalam mendorong perilaku ekologis untuk menciptakan budaya cinta lingkungan pada masyarakat lokal di PVJ Sky Garden.

Kata kunci: *estetika simbolis-sensori, aspek sosial, atap hijau, perilaku ekologis, budaya cinta lingkungan*

INTRODUCTION

The ecological crisis such as loss of biodiversity, UHI, floods, landslides and forest fires, are caused by irresponsible human behavior. As a result of this irresponsible behavior, nature's carrying capacity is increasingly degraded and this has an impact on current and future generations. The living environment is a space that has a unity of conditions, power and living creatures, where humans and their behavior have an important role in influencing environmental conditions themselves. Humans should then have great ethical and moral responsibilities, because human behavior towards nature greatly determines the quality and condition of the environment (Muthmainnah, Mustansir, & Tjahyadi 2020). Therefore, human ecological behavior is needed to save the environment. When instilling awareness of love for the environment through ecological behavior, a culture of love for the environment will be formed. A behavior that is repeated continuously and becomes a habit will create a culture, namely a culture of environmental love.

To support this culture of environmental love, facilities are needed. One of them is a green roof which can be a space where ecological behavior and a culture of environmental love can occur in dense urban areas. Ecological behavior is basically an attitude or behavior that supports ecological sustainability and supports the environment. Human behavior and knowledge of the environment make the greatest contribution to improving and preserving the environment (Fauzie, Aquarisnawati, and Widagdo, 2016).

Green roofs or ecological roofs or roof greening, are roof gardens that are used for human activities. Green plants usually contain certain plants (Kotzen 2018). The type of green roof reported in this research is an intensive green roof because it can be accessed by humans to carry out various activities on it. The aesthetic aspect of a green roof has an important role in creating a social aspect within it, this is because the creation of social space is supported by the aesthetic enjoyment of the green roof.

Therefore, the aims of this research are 1) To find out how symbolic sensory aesthetics influences the social aspects of PVJ Sky Garden in encouraging ecological behavior, 2) To test Nguyen Dang's (2022) social impact framework to find out whether these social aspects can influence local communities to behaving ecologically which then gives birth to a culture of environmental love and 3) Creating a model through the influence of sensory symbolic aesthetics on social aspects to encourage ecological behavior which creates a culture of love of the environment in local communities.

In the next discussion, the results of Nguyen Dang's 2022 social impact framework testing through a questionnaire will be displayed in table form. Each point in the framework will be tested one by one and displayed in 7 tables. The researchers also added a final table to examine whether the social impact framework drives ecological behavior.

This questionnaire aims to determine how important social aspects can encourage the ecological behavior of local communities through the influence of sensory symbolic aesthetics. So the results of this questionnaire are used for data analysis which can prove that aesthetics can create social aspects which ultimately encourage the ecological behavior of local communities. The results of this questionnaire analysis will be used as a basis for creating a Sensory-Symbolic Green Roof Aesthetic Model, which is the finding of this research.

Researchers have examined the aesthetics of green roofs as a component of ecosystem services, which can have social impacts on social well-being, place attachment, and health for users (You, 2016; O'Hara et al. 2022). However, no studies have delved into the model of symbolic-sensory aesthetic influence to create social aspects that encourage ecological behavior to foster a culture of environmental love in local communities.

LITERATURE REVIEW

A. Cultural History of Green Roofs

The history of green roofs dates back thousands of years and developed rapidly when humans began to innovate to make the environment sustainable. The aesthetics of the Hanging Gardens of Babylon (if they still exist) were designed by combining stepped arches and elevated walkways. The first reference found to a green roof is a high quality man-made garden in the form of a Mesopotamian Ziggurat built in the 4th century BC. This first green roof was designed with a stepped tower planted with trees and shrubs. This design aims for a microclimate. Then, in the Middle Ages, roof gardens began to be designed above domed spaces, such as the gardens of the monastery of Mont-Saint-Michel, Palazzo Piccolomino in Pienza Italy, Medici in Careggi. Some of these examples represent the first and best-preserved roof garden developments.

In the early 1900s, Germany constructed the first green roofs in urban areas for aesthetic and social purposes. Then, in the 1970s during the oil crisis, Germany led research on the use of green roofs for energy conservation. By the 1990s, an estimated 13 million square meters of roofs in Germany were covered with green roofs (Richardson, 2023). This provides local German communities with knowledge and awareness of the function of green roofs as building aesthetics and plays a major role in energy conservation in Germany, which saves the environment and people. So, historically green roofs were designed for comfort and aesthetics that can be enjoyed by the users themselves (Richardson, 2023). The longer the use of a green roof in the place, the more ecological and energy efficiency benefits will be realized. Examples of some of these roof gardens are designed for aesthetic and social purposes, where people of all ages can sit among the plants and admire the beautiful integration between plants and architecture, enjoying the textures, aromas and wildlife that the roof garden has (Kotzen, 2018). So the green roof aesthetic provides a space that allows residents to enjoy the beauty of the plant composition by sitting and walking around, socializing and discussing the environment while enjoying the beauty of the green roof.

In supporting a culture of environmental love in local communities, social spaces on green roofs need to be supported by aesthetic aspects so that users are comfortable spending time in these spaces (Bridgman, 2023). Because aesthetic and social aspects influence behavior, ecological behavior can be encouraged and create a culture of environmental love.

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The aesthetic aspect influences the creation of the social aspect. Local people of all ages can walk to enjoy the beauty of the plant arrangements combined with architectural elements. This ultimately creates activities such as environmental interactions and discussions, which can raise awareness and encourage behavior to protect the environment. When this behavior is consistently practiced and embraced by society, it can ultimately lead to the formation of a culture.

B. Symbolic-Sensory Aesthetics

Theories regarding aesthetics are divided into objective and subjective. Objective theory argues that aesthetics is a characteristic or quality inherent in an object called an object (Winansih, 2010). The characteristic that describes beauty is the existence of balance between each part of an object, so that the basics of form can be fulfilled. This objective theory is "formal aesthetics". This aesthetic can be enjoyed from the beauty of the composition of the shape.

Meanwhile, subjective theory argues that beauty is a response to the feelings of humans who observe an object, so it depends on the observer's perception or understanding whether the object is beautiful or not. This subjective theory is called sensory-symbolic aesthetics. This aesthetic is related to a meaning that can provide pleasure or satisfaction for the user (Winansih, 2010). In this research, researchers use sensory-symbolic aesthetics because the creation of this social aspect will be analyzed based on the perceptions and understanding of local people who visit Sky Garden PVJ.

C. Social Aspects of Green Roofs

Green roofs provide tangible, socially measurable ecosystem services. This is possible because culturally, a green roof is a place that supports ecological behavior and creates a culture of love for the environment. Green roofs have benefits for the environment. One of the benefits is the cultural services provided by ecosystem services (Kotzen 2018). Examples of cultural services in ecosystem services are social, aesthetic value, cultural diversity, education, recreation.

Researchers proposed a link between social impact and green roofs by referring it to the concept of biophilia. In biophilia, there is a hypothesis from Nguyen Dang et al. (2022) that there is an inherent connection between humans and nature, and that contact with nature plays a fundamental role in human's social, mental and physical well-being (Wilson, 2017; Lin, Egerer, & Ossola, 2018).

Nguyen Dang et al. (2022) formulated the biophilia framework to include how the green roofs of the local community impact the 1) social wellbeing, 2) economy, 3) sustainable development, 4) mood state, 5) collective identity and place, and 6) physical benefits. In the first framework, namely social wellbeing, which was developed by Finlay et al (2015), there were 7 points that examine the aspects of green and blue spaces that create social interaction. In dealing with green roofs, Finlay et al (2015) saw 7 points to analyze. First is how the green roof area gave opportunities to meet colleagues/friends. Second is whether the facility can help build new communities/social groups. Then, it finds if the area is providing opportunities to interact/observe nature and animals, providing social interactions, minimizing social isolation, creating feelings of joy when paying attention to other people around them, and increasing feelings of safety, security and accessibility. Examples of these seven points are found in the application of green roof spaces.

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Green roofs also give economic impact. According to economic impact by Nguyen Dang et al. (2022) consists of 3 points, namely user perceptions regarding property value, energy costs and increased economic activity. There are also physical benefits in green roofs. They are measured through 6 points, namely the user's perception of the green roof which contributes to physical strength, body posture, increased metabolism, breathing, circulation and agility.

Developed by Thomas et al (2016), green roofs are also measured by its collective identity namely, measuring the user identification with other people who use green roofs, such as identifying and having a sense of commitment to other users by having something in common with other users to become part of the community. In identifying collective identity, it is important to feel that someone is part of the crowd and thus, can feel loyal to the group of people who use the green roofs.

In addition to collective identity, analyzing place identity is important in green roofs research. A scale developed by Budruk et al. (2009) has 4 points to look into, namely how far the space is significant/meaningful for the user, how feeling attached the user is to the space how users strongly identify with the space, and how users are feeling no attachment/commitment to the space. The mood state by Gray (2017), and McNair et al (1992) which consists of 4 items, namely how far the green roof helps users to relax, reduce fatigue, increase enthusiasm and reduce tension are also equally important to measure.

Sustainable Development (SDGs) from the UN which is used to measure user opinions about the role of green roofs consists of 8 items, namely user opinions on green roofs include their role in promoting a healthy lifestyle, providing a safe and inclusive space accessible to all ages, encouraging thoughts on nature and sustainable development, and minimizing the impacts of climate change while preserving biodiversity (Manso et al. 2021). The entire framework proposed by several researchers is used to evaluate and demonstrate the social impact realized by green infrastructure on society as a form of environmentally friendly innovation. The stated measurements can help change behavior and thought patterns at the macro level, namely the general public, and the micro level, namely organizational partners (Nguyen Dang et al. 2022). All points of this social impact framework will be used to examine whether social aspects influenced by sensory-symbolic aesthetics can encourage ecological behavior that creates a culture of environmental love.

METHOD

The method used in this research is qualitative by distributing questionnaires to 112 respondents in Bandung, in-depth interviews with 3 staff and 3 visitors to the PVJ Sky Garden as well as conducting observations and documentation. The questionnaire is distributed via Google Form in the form of multiple-choice questions so that respondents can choose more than 1 or several options and has an open option where respondents can add special answers if they are not in the list of options. The sampling technique uses convenience sampling because mall visitors are always changing.

The questions given to visitors were based on Nguyen Dang's (2022) 7 social impact frameworks, which were asked in more detail. Several demographic questions were also asked, such as who visited PVJ Sky Garden in terms of age and gender, frequency and duration of visits. Questions in accordance with the 7-point framework that were asked, were whether the

respondent interacted with other visitors when they were at Sky Garden, whether they interacted with nature and animals, whether they felt happy, comfortable and safe when they were at Sky Garden. Other questions asked whether the facility was easy to access, what respondents thought about Sky Garden when it can increase economic activity and save energy, whether walking on the green roof can help improve breathing, circulation and metabolism, also when respondents were on the green roof did they felt part of the crowd and still want to be there. These questions were asked to fill in the information on whether each space in the Sky Garden had meaning made respondents felt connected to each space. There were also questions on whether there were changes in the respondents' mood such as feeling more relaxed, enthusiastic, less tired and less tense, so the Sky Garden was thought to improve respondents' healthy lifestyle. The question on how friendly and accessible to all ages, that were encouraging behavior that can prevent the impacts of climate change were also asked. Related to ecological behavior, the question was whether the Sky Garden design have encouraged and triggered awareness of ecological behavior, and whether it encouraged a feeling of love and preservation of the environment.

Figure 1:
Interviews with Visitors and Staff

The case study in this research is at Paris Van Java mall (PVJ) which is located on Jalan Sukajadi No. 131-139, Cipedes, Sukajadi District, Bandung City, West Java 40162. This mall is one of the largest malls in Bandung City with European-style concept with an outdoor feel. The Sky Garden facility is an intensive green roof type that can be used for activities by mall visitors, so this facility differentiates PVJ from other malls.

Figure 2:
Sky Garden PVJ

The consideration for choosing PVJ Sky Garden was because it is an intensive green roof, that has access in the form of circulation paths and walkways. They are wide enough so that it

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is easy to access the facilities provided. This Sky Garden has spaces in it such as Sunfest facilities (flower plants), Dahlia Orchid House, ice skating, Kids Zoo, Cats and Ice Cream café, Rabbit Brother (rabbit farm), bird breeding, and other livestock used as educational facilities for children. This Sky Garden also has a green wall designed with a vertical garden and waterfall, thus creating an ecosystem and natural space within it (Nur Aeni, 2019).

Figure 3:
Kids Zoo and Vertical Garden with Waterfall

RESULTS AND DISCUSSIONS

Based on the results of in-depth interviews and questionnaires, it was found that users appreciated and enjoyed sensory-symbolic aesthetics. Sensory-symbolic aesthetics were identified through in-depth interviews and questionnaires with PVJ Sky Garden visitors. Hallways and circulation areas, users feel encouraged to move, walk, enjoy the view and exercise while looking at green plants (see figure 4). Green plants and the sound of waterfalls make users calmer and more relaxed both mentally and psychologically. This area is interpreted as a place to take a healthy walk while relieving boredom. The sensors involved are kinetic, visual and audio. Kinetic because users are encouraged to walk leisurely by looking at the view and visuals of the aesthetics of the green roof. Audio because the sound of the waterfall is calming and make users connect with nature.

Figure 4:
Sensory-Symbolic Aesthetics in the Space and Circulation Area

Users who are animal lovers feel happy and like being at Kids Zoo and Rabbit Brother because they can see and interact with the animals there (see figure 5). Users who participate in this facility feel encouraged to love and care for animals, so this area is interpreted as a place to

interact and maintain the existence of animals. The sensors involved are tactile, visual, kinetic and audio. Tactile because the user strokes and comes into direct contact with the animals in Kids Zoo and Rabbit Brother. Kinetic because users, especially small children, run around to play and interact with animals. Visual because you enjoy the design of the Kids Zoo and Rabbit Brother rooms. Audio because hearing the sounds of animals will be educational for children and encourage them to love animals.

Figure 5:
Symbolic-Sensory Aesthetics in Kids Zoo and Rabbit Brother

The Sky Garden design has natural elements such as a vertical garden, flower garden (sun fest and orchid house), vegetation, a gazebo surrounded by vines (see figure 6 & 7), the presence and sound and smell of a splashing waterfall, encouraging user awareness of the importance of loving nature and behaving ecologically. Users feel that spaces designed with natural elements give a positive impression, by triggering users to engage in discussions, motivation and environmental education, so that this area is interpreted as an area that encourages users to behave ecologically. The sensors involved are visual, audio and kinetic. Visual because users enjoy the integration of flower garden arrangements with bright colors and vertical gardens. Audio due to the sound of the waterfall, the wind blowing the vegetation, the sound of the birds. Kinetic because users walk on the path to enjoy the beauty of the flower garden, vertical garden, sit in the gazebo and visit the waterfall.

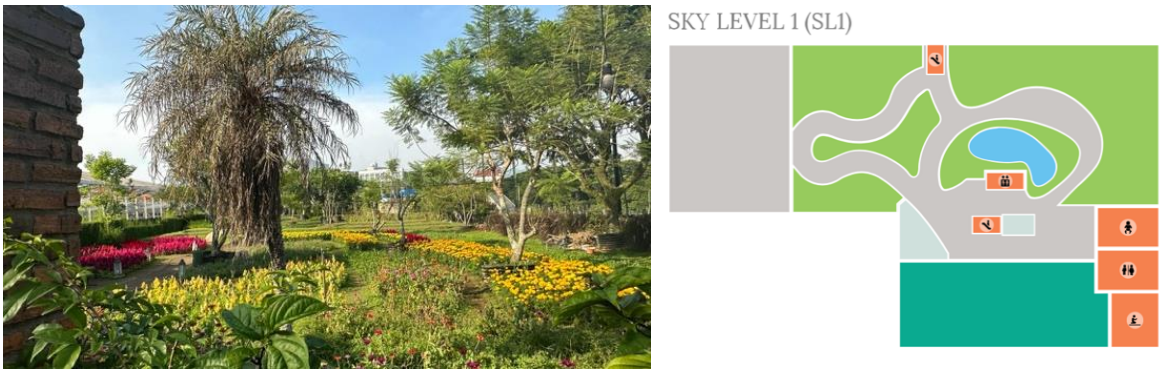

Figure 6:
Sky Garden Floor Plans

PVJ Sky Garden design inspires users to have a similar space so they can interact more with nature in the middle of dense urban areas. The air produced by the trees makes users breathe

fresher and more comfortable in the Sky Garden. Enough sunlight enters, it's not too hot or dazzling because of the many trees, making users enjoy the resulting view comfortably. The seating areas in each hallway and in front of the facility help users to rest for a while by enjoying the atmosphere of the trees, encouraging interaction and conversation with each other. Users feel distanced from pollution because they are above the building. So PVJ Sky Garden provides a pleasant experience because of its unique design and facilities.

Figure 7:
PVJ Sky Garden Design

The symbolic-sensory aesthetics provided by PVJ Sky Garden influence the creation of a social aspect for local users, because there are access/circulation routes in the form of hallways, seating facilities, natural views, Kids Zoo facilities, cafés, orchid houses, etc. which encourage social interaction between humans and nature, humans with animals and humans with humans.

To find out the social aspects influenced by symbolic-sensory aesthetics, below is a discussion of the survey results from 112 respondents at Sky Garden PVJ Mall Bandung. These results will show the demographic information of respondents (Holt et al. 2019), whether the findings from the overall social impact framework can influence users to behave ecologically. The first survey data (see figure 8) shows that the age of most respondents who visited PVJ Sky Garden was 25 years old, 34 people (30.4%), 26 years old, 24 people (21.4%), and the remaining age range was 27 – 35 years old, 23 – 24 years old, 17 – 21 years old. Based on this data, the most visitors to Sky Garden PVJ are those aged 30 and over who are working and have a family. Where visitors want to refresh and relieve boredom at Sky Garden PVJ because of the busy schedule.

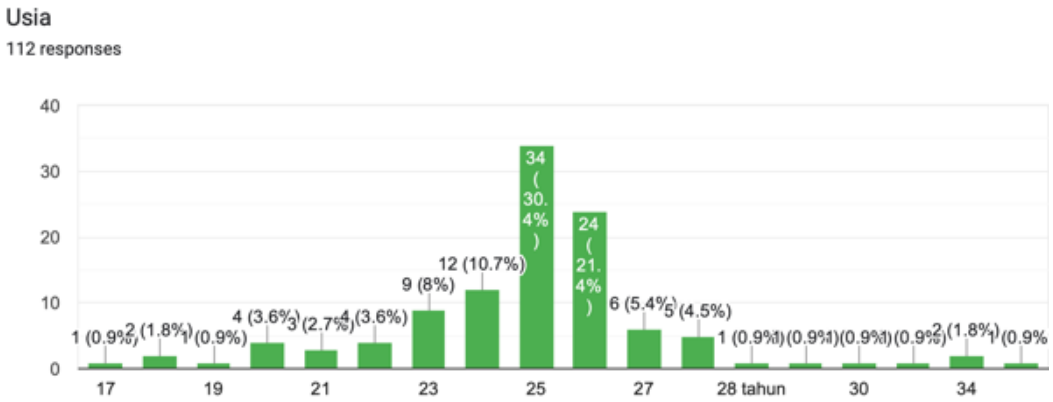

Figure 8:
Sky Garden PVJ Visitor Age Chart

Respondents were then asked questions about whether or not they had ever visited PVJ Sky Garden. The majority of respondents answered that they had visited, 98.2% and 1.8% (2 people) had never visited (see figure 9). Based on this data, we can see that almost all local people have visited Sky Garden PVJ.

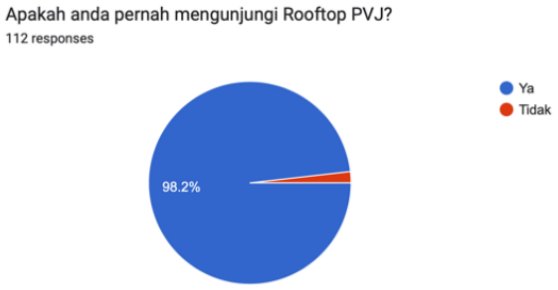

Figure 9:
Whether or not you have ever visited PVJ Sky Garden

Based on survey results, the most visitors who visit the rooftop are 59% women (66 people) and the remaining 41% men (46 people) (see table 1). Because 23.2% (26 people) of female visitors took photos in front of the waterfall and around the park. Most female visitors visit Sky Garden because they like looking at the views, taking photos, relaxing and sitting in the cafe.

Table 1:
Gender

Gender	N (%)
Woman	66 (58,9%)
Man	46 (41%)

Visitors were also asked questions about the frequency of visiting the rooftop based on the number of weeks, months and years (see table 2). The highest frequency of rooftop visitors is 1-2 times in 1 month (56 people) and 1-time in 1 week as many as 24 people, other common answers are 1-2 times in 1 week, 2-times in 3 months and 1-time in 1 year, which is quite a small frequency. The maximum frequency of visits is 1-2 times a month because amidst the busy schedule of visitors who are workers, families and schools, most people visit on weekends to go up to the top of the Sky Garden.

Table 2:
Frequency of Visits

Frequency	N(%)
1 week 1 time	24 (21,4%)
1 week 2 times	9 (8%)
1 month 1-2 times	56 (50%)
3 months 2x	9 (8%)
1 year 1x	12 (10,7%)
Never	2 (1,7%)

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Respondents were then asked questions about the duration of their visit to PVJ Sky Garden, the most answers were more than 1 hour, 62.5% (70 people). Other common answers are 2-3 hours 31.3% (35 people), 5 hours 5.4% (6 people), more than 5 hours 0.9% (1 person), 12 hours 0.9% (1 person) and 1.8% (2 people) never visited (see fugure 10). Most visitors visit Sky Garden for more than 1 hour because they walk to see the views on each side of Sky Garden, sit relaxed in the seating area provided, enter facilities such as cafes, kids zoo etc. Where all these activities take approximately 1 hour on average.

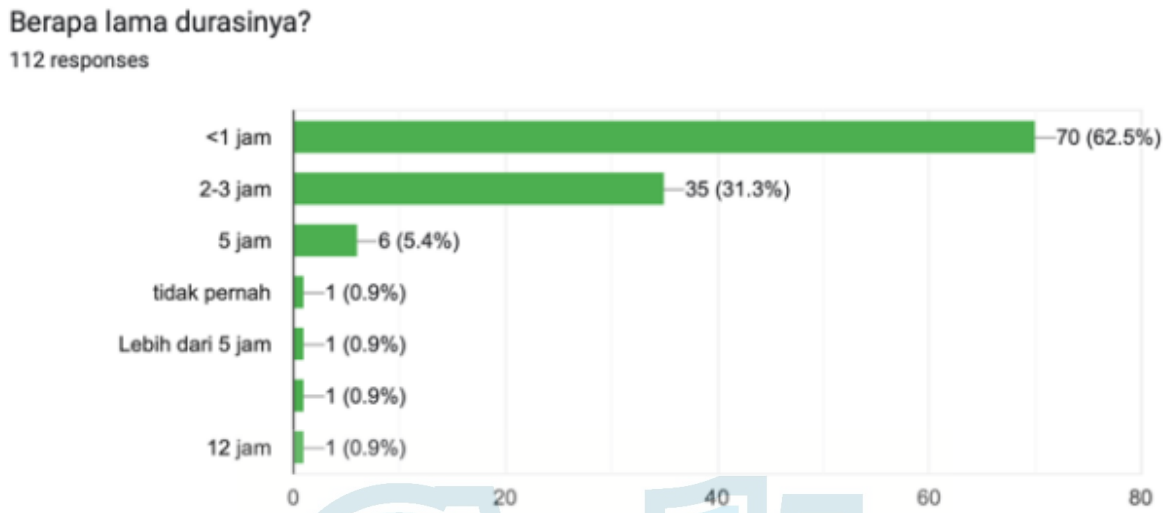

Figure 10:
Duration of Visit at PVJ Sky Garden

The next questions refer to each point of the first social impact framework, namely social wellbeing (see table 3). The first question regarding Sky Garden being a meeting place for friends and colleagues as well as a place for interaction, 8% of respondents answered (9 people). This is reinforced by interview data that users only interact with those they go with, such as family and friends, but do not socialize with strangers. So the opportunity to create a new community at Sky Garden tends to be low, only 1.8% (2 people). So that it minimizes social isolation for users, it doesn't have much of an impact on 2.6% (3 people) because users only interact with people they know.

Figure 11:
Visitors Interact and Observe Nature

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Providing opportunities to interact and observe nature was the highest at 76.8% (86 people) (see table 3).. This is supported by interview data that young children and families like going to animal areas such as Rabbit Brother, Kids Zoo, bird areas, where they enjoy interacting and playing together with various types of animals. Orchid plant lovers always visit Claudia's orchid house facilities to have a look and buy them to plant in their own homes. Families and small children always visit the Sunfest area which has various types of flowers and the surrounding circulation contains gardens, vines and tall trees. Visitors like to walk around the circulation area to see the plant view.

Figure 12:
Visitors Interact with Animals and Accessibility to the Sky Garden

As many as 60.7% (68 people) of visitors also felt happy when they were in the Sky Garden, supported by interview data because the atmosphere was cool, there were lots of green plants, and many users were comfortable interacting in the Sky Garden (see table 3).. Visitors, especially those with small children, felt 8% (9 people) safe and 9.8% (11 people) safe, because their children only played around the circulation route. Accessibility to Sky Garden is quite easy to reach via the 1st floor escalator which is near the front lobby. However, some users who went to PVJ for the first time did not necessarily find the escalator, 26.7% (30 people) and vice versa. The circulation path is quite comfortable for visitors to interact and has escalator access to the 2nd floor waterfall area which is very easy to find.

Table 3:
Social Wellbeing

Social Wellbeing	
Item	N (%)
Opportunity to meet friends/colleagues	9 (8%)
Building a new community	2 (1,8%)
Interact and observe nature and animals	86 (76,8%)
Social Interaction	9 (8%)
Minimizing Social Isolation	3 (2,6%)
Creates a feeling of joy	68 (60,7 %)
Sense of Security	9 (8%)
Safety	11 (9,8%)
Accessibility	30 (26,7%)
Total	227 (202,6%)

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On the economic aspect point, visitors were then asked questions regarding their perception of whether the property value with a green roof was higher than one without plants, and the majority were aware of this, 85.7% (96 people) (see table 4). Visitors are aware of the reduced energy costs in the building due to the presence of plants by 75% (84 people) and the increase in economic activity on the rooftop for users such as staff who can sell, orchid house keepers, kids zoo etc. by 92.9% (104 people). The perception of increased economic activity is due to the large number of people selling in the sky garden, permanent or pop up stores opened on each side of the circulation route as visitor facilities.

Table 4:
Economy

Economy	
Item	N (%)
Perception of Property Value	96 (85,7%)
Perception of Energy Costs	84 (75%)
Increased Economic Activity	104 (92,9%)
Total	284 (253,6%)

The physical benefits based on surveys and interviews are less significant (see table 5), because visitors rarely exercise on the Sky Garden circulation path except for ice skating. However, the benefits on breathing are considered to have a good impact because the air is fresher for 85 people, so indirectly circulation is also considered to have increased for 63 people. Meanwhile, the benefits of agility for 20 people are because visitors only walk and sit relaxed on the circulation path so that it has less impact on physical strength, body posture and increased metabolism.

Table 5:
Physical Benefits

Physical Benefits	
Item	N (%)
Physical Strength	7 (6,3%)
Body Posture	6 (5,4%)
Increased Metabolism	9 (8%)
Respiration	85 (75,9%)
Circulation	63 (56,3%)
Agility	20 (18%)
Total	190 (169,6%)

Collective identity based on survey and interview results is considered quite low because visitors only focus on those they know and therefore pay less attention to other visitors (see table 6). Identifying identities with other users tends to be low (5 people), there is a lack of a sense of bond or commitment to other unknown users (7 people), feeling like they have a lot in common

with other users also tends to be low because Sky Garden is visited by various different groups (8 people). Visitors feel like they are part of a crowd (15 people) when they are in the same area, such as Rabbit Brother, Sunfest, etc. Loyalty in the group of people who use the green roof is considered less (3 people) because visitors carry out their respective activities with people they know.

Table 6:
Collective Identity

Collective Identity	
Item	N (%)
Identify with other users	5 (4,4%)
A sense of commitment to other users	7 (6,25%)
Has many similarities with other users	8 (7,1%)
Become part of a community	6 (5,4%)
Become a part of the crowd	15 (13,4%)
Loyal in the group of people who use green roofs	3 (2,7%)
Total	44 (39,3%)

The identity of the place in PVJ Sky Garden is considered quite high because each space has its own meaning for visitors, such as providing an environmental educational impact on caring for plants, gaining experience interacting directly with plants and animals in an area designed to resemble nature in the midst of dense urban areas 61.6% (69 people) (see table 7). This causes users to feel attached to each space because it supports 70.5% (79 people) environmental love. Visitors show their love for the environment by not littering, not destroying plants, petting and feeding animals in the right way. Visitors have activities that they are interested in, like walking leisurely, talking about the sky garden environment, starting from various plants, animals, sitting in the café, so 79.5% (89 people) indirectly identify the space. However, some visitors do not feel attached to some spaces because they just walk around and feel a little bored.

Table 7:
Place Identity

Place Identity	
Item	N (%)
Space has meaning for users	69 (61,6%)
Users feel like they have a bond/connection with the space	79 (70,5 %)
Users identify the space	89 (79,5 %)
Users have no attachment to space	33 (29,5 %)
Total	270 (241%)

At the point of mood state (see table 8), visitors can relax, relieve boredom while interacting and discussing by enjoying the diversity of plants in PVJ Sky Garden 50% (56 people). Even

though it can relieve boredom, it does not have a big impact on reducing physical and psychological fatigue by 16% (18 people) and tension by 11% (12 people). Only a few visitors felt their enthusiasm increased by 9.8% (11 people). Because the many plants provide relaxation and relieve boredom, visitors can feel enthusiastic again after taking a leisurely walk to see the sky garden.

Table 8:
Mood State

Mood State	
Item	N (%)
Relax	56 (50%)
Reduces Fatigue	18 (16,1%)
Increase the Spirit	11 (9,8%)
Reducing Tension	12 (10,7%)
Total	97 (86,6%)

The sustainable development goals realized through PVJ Sky Garden have quite significant value (see table 9), especially in encouraging a healthy lifestyle for 80% (90 people). Visitors are encouraged to enter and spend time at PVJ Sky Garden 98% (110 people) because of its unique design, it has a water feature in an artificial waterfall with a calming soundscape, a design that is connected to nature so that it triggers users to think about nature and sustainable development 33% (37 people).

Figure 13:
Sustainable Development Goals at PVJ Sky Garden

Through designs that are associated with nature and environmental education about the diversity of plants and animals, it indirectly encourages visitors to behave in ways that prevent the impact of climate change 80% (90 people) and preserve and protect biodiversity 35.7% (40 people) so that climate change can be minimized by 48% (54 people). The Sky Garden can be accessed by 87.5% of all ages (98 people) because the access and circulation paths are comfortable for walking.

Table 9:
Sustainable Development Goals (SDGs)

Sustainable Development Goals (SDGs)	
Item	N (%)
Encourage a healthy lifestyle	90 (80%)
A safe and inclusive space	47 (42%)
Accessible to all ages	98 (87,5%)
Trigger users to think about nature and sustainable development	37 (33%)
Encourages users to get into green roofs & spend their time	110 (98%)
Minimizing the impact of climate change	54 (48%)
Encourage user behavior that can prevent the impacts of climate change	90 (80%)
Preserve and protect biodiversity	40 (35,7%)
Total	566 (505,4%)

Visitors were also asked questions about whether they interacted with nature and animals, the majority answered "Yes" 76.8% and 23.2% "No" (see figure 14). This is because some users are animal lovers and like seeing greenery in the middle of the dense city of Bandung.

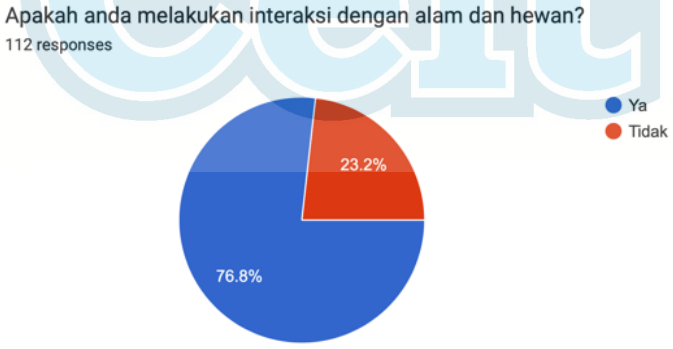

Figure 14:
Visitor Interaction with Nature and Animals

In surveys and interviews, visitors were asked whether the overall social impact framework that had been carried out from the 6 points had an effect in encouraging ecological behavior and the majority of 80.3% (90 people) answered yes with various opinions such as "after visiting from PVJ Sky Garden, encouraged me and my family to start growing plants at home", "can trigger us to have discussions on the topic of plants, and rooftop designs etc. so that it makes us want to design like that", "becomes a new habit for us at home to plant" , "several tourist attractions for children, such as playing and interacting with animals, can encourage children's interest in loving and getting to know animals", "with lots of plants and education such as Rabbit Brother, Sunfest, Kids Zoo, made me realize that humans, nature and animals must live side by side and love each other" (see table 10).

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Figure 15:
Bird Breeding Facility and Rabbit Brother

During visits to the Sky Garden facility or while walking around, 18.8% (21 people) engaged in discussions about environmental education. This experience led to 35.7% (40 people) developing a love for environmental preservation, 37.5% (42 people) feeling encouraged to care for animals, and 49.1% (55 people) becoming more aware of ecological behavior.

This final table shows the results of checking with respondents whether this social impact framework can encourage ecological behavior. The researcher asked several questions related to ecological behavior towards social aspects as support for the last question.

Table 10:
PVJ Sky Garden can encourage ecological behavior through social aspects that are influenced by aesthetic aspects

Item	N (%)
Sky Garden PVJ can encourage user ecological behavior that is tested and checked through a social impact framework	90 (80,3%)
Environmental Education	21 (18,8%)
Encouraging a sense of love and preservation of the environment	40 (35,7%)
Encourages us to love and care for animals	42 (37,5%)
Triggering user awareness to behave ecologically	55 (49,1%)

Based on the data above, a model of symbolic-sensory aesthetics (see figure 17) have an important role in triggering the creation of social aspects at PVJ Sky Garden. In the 7-point social impact framework, what drives the ecological behavior of local communities the most is the sustainable development point which has the highest score, followed by the economy and place identity points. Social wellbeing points encourage visitors to have environmental discussions with others they know or when they are in the same location, such as discussing with the staff who look after the Sunfest facilities, Kids Zoo, etc., thus raising awareness to love and care for the environment.

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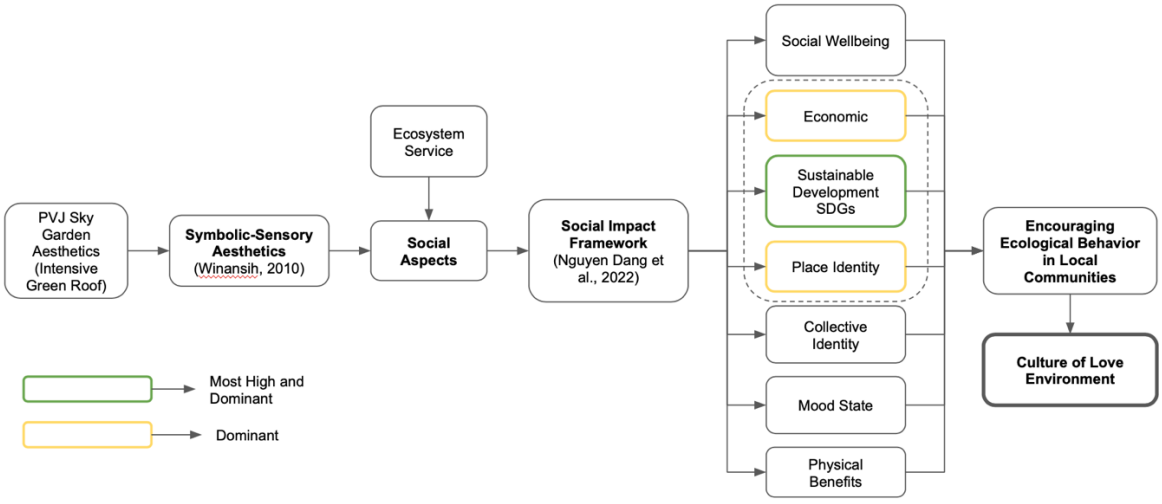

Figure 16:
Model Findings of the Sensory-Symbolic Aesthetic Influence in Creating Social Aspects at PVJ Sky Garden to Encourage Ecological Behavior of a Culture of Environmental Love

The findings of this research in the form of a sensory symbolic aesthetic model have a significant influence on creating social aspects (see figure 17). This social aspect is tested through a 7-point social impact framework to find out which points best encourage the ecological behavior of local communities. In brief, the 7 points that were on social wellbeing, economy, sustainable development, cultural identity, collective identity, mood state and physical benefit, gave an impact on encouraging the ecological behavior of local communities. These 7 points are needed to form a culture of love environment, by encouraging visitors to have a space that has a variety of plants. This can encourage visitors to plant and garden in their own homes or create small gardens inspired by the aesthetics of Sky Garden PVJ.

CONCLUSION

A culture of environmental love that is evident from visitors behavior, as they show a desire to have a space adorned with plants, just like every space in the sky garden. This is achieved by developing new habits, such as planting various kinds of plants like vertical gardens and flowers. Visitors also contribute to the upkeep of the sky garden by refraining from littering and taking care of the animals by properly petting and feeding them at Kids Zoo and Rabbit Brother. This demonstrates the community's understanding that nature and humans coexist and must protect each other, as encouraged by the architect, resulting in ecological behavior at PVJ Sky Garden. The culture of environmental love is encouraged by ecological behavior at Sky Garden PVJ. This culture push social aspects that are influenced by the Symbolic-Sensory Aesthetic aspect. The importance of encouraging ecological behavior in local communities will create new cultures or habits that have a good impact on the environment. Awareness to love, protect and care for the environment starts from ecological behavior which ultimately forms a culture of loving the environment at Sky Garden. This culture of loving the environment will continue to be carried by the community to their homes and the surrounding environment.

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The research findings indicate that the sensory-symbolic aesthetic model significantly influences the social aspects of PVJ Sky Garden. The research tested Nguyen Dang's social impact framework (2022), demonstrating that it encourages users to adopt ecological behaviors and fosters a culture of environmental appreciation. The sensory-symbolic aesthetic aspect is crucial in shaping the social aspect of PVJ Sky Garden. Without proper aesthetics, the social aspect would not be as impactful, potentially resulting in fewer visitors and less environmental awareness. This social impact framework can be applied to the PVJ Sky Garden case study, with sustainable development having the greatest impact, followed by economic factors and place identity in promoting ecological behaviors within local communities. These behaviors are triggered by the sensory-symbolic aesthetics.The results of testing through this social impact framework may differ when applied to different case studies.

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