IJEN EDUCATIVE GEOTOURISM: MOUNTAIN TRIP EXPERIENCE WITH INCLUSIVE DESIGN APPROACH

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ABSTRACT

Ijen Geopark has geo-tourism prospects from its sites, sites and culture-sites diversities. This study aims to give concepts to design an educational geotourism facility that is accessible for definable people with an inclusive design approach. De ign process uses a force-based framework. Id notified forces are accessibility, black lava rocks, site contour, and local materiality. De ign method uses regionalism that responds to the site and enhances regional characteristics. To racists get an education through multisensory experiences. Ci collation bridge is less than 8% incline for independent use by all users, with landing areas as viewpoints. Lo al bamboo plant stimulates the auditory sense. Black lava rocks' texture is recognized through tactile sensory.

Keywords: *accessibility, black lava rocks, multisensory experience, regionalism*

INTRODUCTION

Geopark is an integrated area with an internationally significant geological heritage (Dowling, 2013). Indonesia has 14 National Geopark and 6 UNESCO Global Geopark. Ij n National Geopark is formed by developing Ijen Volcanic Complex (IVC). Ar and 300,000 years ago, a giant volcano called Paleo Ijen or Ancient Mount Ijen, with 3,500 meters in height, produced lava and pyroclastic over limestone deposits from Miocene (12.5 million years) and Pliocene (5.3 – 2.6 million years) periods. The caldera is formed from a large volume eruption (about 80 km3) which resulted in pyroclastic flow deposits 100-150 meters thick (Sabila *et al.*, 2019).
Ijen Geopark, especially in Bondowoso, has geotourism prospects from its sites and cultural-sites diversities. Si e at Lava Plalangan, Ijen District, Bondowoso, is selected to increase tourism. Ob elevational data shows the site has black lava rocks with basaltic and andesitic composition as its geological objects. These objects were formed by the Mount Anyar eruption 10,000 years ago. The AA-type lava flows formed 10 km2 black lava rocks from Mount Anyar to Blawan. The site is in the middle of the access route to the other Ijen Geopark objects to become a transit point.

It is surrounded by Ancient Ijen caldera, Mount Suket, Mount Raung, Jampit, Jabal Kirmit Hill, Wurung Crater, Mout Ranti, Ijen Crater, and Mount Merapi Ungup-Ungup.
Geotourism is developed by educative principles (Dowling, 2013). Ij n Geopark does not have educational tourism facilities for the whole geological history of Ancient Mount Ijen to today's object formation. Therefore, the design object response is that an educational tourism facility must be accessible to all. This study aims to give concepts for designing an educational geotourism facility accessible to definable people with an inclusive design approach regarding multisensory experiences.

THEORY / RESEARCH METHODS

Inclusive Design and Multisensory Experience

The inclusive design addresses the needs of the broadest possible range of users regardless of their abilities (Design Council, 2018). Di fable people are no longer viewed as a personal tragedy. However, they are disabled by barriers created by society (Burchardt, 2004) (Oliver, 2013) in elusive design attempts to break that barrier and exclusiveness. An elusive design is developed from universal design. It allows all users to control their environments (Imrie & Hall, 2004). Di fable people are no longer treated as passive and incompetent users (Boys, 2014). Lusivity is not simply following guidelines but simultaneously spatial, social, and physical (Boys, 2017).
Multisensory experiences can address inclusive design through the user's senses. "Architecture of seven senses" theory includes visual, auditory, olfactory, tactile, taste, body skeleton, and muscle experience (Steven Holl, Pallasmaa and Perez-Gomez, 1994). Bo h enables varying capabilities of users to perceive the source (Lloyd-Esenkaya et al., 2020). Mu ti-sensory integration provides redundant information for more accurate understanding, while multisensory combination provides complementary information for additional and rich user responses.

Design Method

The design process of this study uses a force-based framework (Plowright, 2014). Id notified forces are accessibility (constraint), black lava rocks (asset), site contour (constraint), and local material (asset). De ign method uses regionalism that responds to the site and enhances regional characteristics (Jormakka, 2017) (Utomo, Sari and S. Saptaningtyas, 2021). Re-nationalism considers local materiality and construction that have been tested by the local community toward its location, climate, and geography. Sustainability has a significant role in maintaining architectural identity in regionalism (Hidayatun, Prijotomo and Rachmawati, 2015).

Site Context

Site is located at Lava Plalangan, Kalianyar Village, Ijen District, Bondowoso. Si e consists of black lava rocks with a grassland ecosystem. These rocks are formed from type AA lava flow with basaltic and andesitic composition. Ba alt-rock has a carrying

capacity of 20-100 kg/cm^2 (Soetojo, 2009). The structural system on this terrain commonly uses a direct foundation with isolated elements (Hernández *et al.*, 2011). Site analysis is done by survey, interview, and literature study. The site location and black lava rocks are shown in Figure 1. Figure 1a shows the site location nearby Kalianyar Village. It is located on the road's south side, connecting the village to the west and Ijen Crater to the east. Figure 1b shows black lava rocks on the site. Observational data shows the site has black lava rocks with basaltic and andesitic composition as its geological objects. Figure 2 shows the site contour. Si e is located at 1117 - 1122 (one thousand one hundred seventeen until one thousand one hundred twenty-two) meters above sea level. Li ht green area shows a side slope with a 0-4% gradient, and the darker area shows a 4-10% gradient.

(a) (b)

Figure 1. (a Site location (b) Black lava rocks on site
Source: Survey, 2022

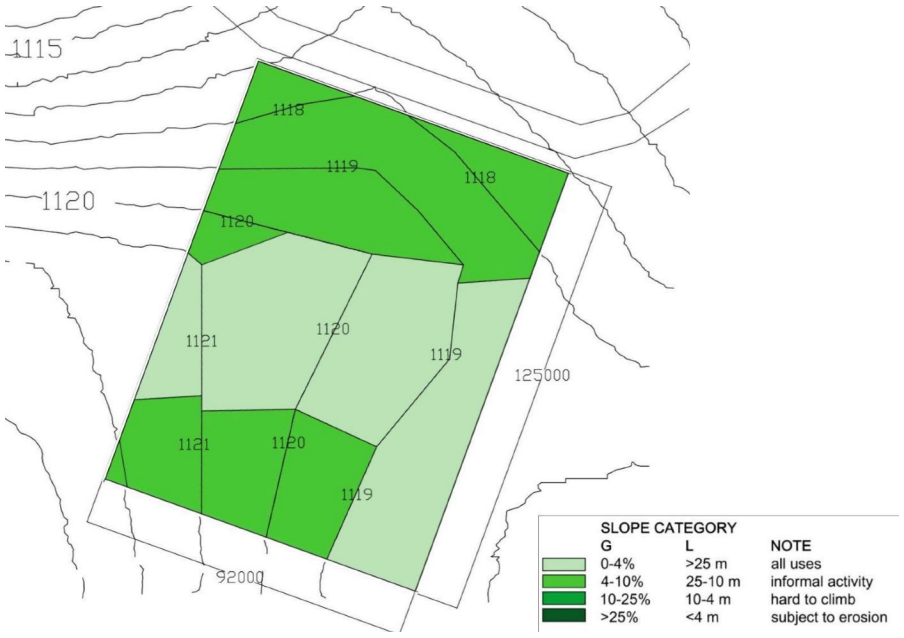

Figure 2. Site contour
Source: Survey, 2022

RESULTS AND DISCUSSION

Education is provided by the diorama exhibition of Ancient Mount Ijen's geological history, interactions with black lava rocks, socio-cultural activities of the local community, and mountain trip simulations. Racists get education through multisensory experiences, including visual, auditory, olfactory, tactile, taste, body skeleton, and muscle experience (Steven Holl, Pallasmaa and Perez-Gomez, 1994). Racists with a definable in one sense can experience it through their other senses. Mu ti-sensory integration and combination enable varying capabilities of users to perceive the source (Lloyd-Esenkaya *et al.*, 2020). These sensory experiences will assist tourists in collecting, remembering, and comparing information to understand Ijen Geopark fully.

Sense stimulations are obtained from regional characteristics, such as black lava rocks, mountain view, Ijen coffee, sulfur aroma and Blue Fire of Ijen Crater. Sense stimulations for multisensory experience can be seen in Table 1. De ign concepts are mapped in Table 2. These concepts are transformed into schematic figures in Figure 3-9.

Table 1. Multi-sensory experience for regional characteristic

Regional character	Sense stimulation for a multisensory experience		
	Visual	**Auditory**	**Olfactory**
Black lava rocks	On-site rocks	-	-
Mountain experience	Views, fog	Wind sound	Sulfur aroma
Ijen coffee	Coffee beans and powders	Roasting, brewing process	Coffee aroma
Sulfur	Brimstone	-	Sulfur aroma
Blue Fire	Simulation	-	-
Bamboo	Plants and material	Outdoor soundscape	Bamboo scent
Petik Kopi Dance	Shows	Music	-

Regional character	Sense stimulation for a multisensory experience			
	Tactile	**Taste**	**Body**	**Muscle**
Black lava rocks	Rough texture	-	-	-
Mountain experience	-	-	Winding orientation	Up-down circulation
Ijen coffee	Beans texture	Coffee beverage	-	-
Sulfur	Sulfur texture	-	-	-
Blue Fire	-	-	Temperature	-
Bamboo	Surface texture	-	-	-
Petik Kopi Dance	-	-	Practice	Practice

Table 2. Design Concept

Study aim **To give the concepts for designing an educational geotourism facility accessible for definable people with an inclusive design approach regarding multisensory experiences.**			
Design Criteria		**Design Concept**	
C.1	Multisensory experiences (Steven Holl, Pallasmaa and Perez-Gomez, 1994)	C.1.1	Views, images, videos, and dioramas stimulate the visual experience.
		C.1.2	Auditory experience is stimulated by sound effects in the simulation room and bamboo soundscape in the outdoor space.
		C.1.3	The olfactory experience is stimulated by Ijen's sulfur aroma in the simulation room and Ijen's coffee aroma at UMKM gallery as a site and culture site.
		C.1.4	The tactile experience is stimulated by volcanic rock texture in the interior and black lava rocks on site.
		C.1.5	The taste experience is stimulated by the aroma and texture of coffee beans to evoke Ijen coffee's taste.
		C.1.6	The body skeleton is subjected to winding orientation and circulation, like mountain climbing through circulation ramps and corridors. The watch tower gives views and height sensation.
		C.1.7	Muscle experience is stimulated by uphill and downhill circulation according to contours. Rists can practice Petik Kopi Dance at the culture site in the amphitheatre by the local community.
		C.1.8	The simulation room provides a warm temperature for Ancient Ijen volcanic simulation, generates Ijen's sulfur aroma and fog for the Ijen climbing sensation, and provides Blue Fire simulation.
C.2	Circulation is accessible to all users	C.2.1	Circulation access between masses and black lava rocks uses a sloping bridge structure.
		C.2.2	The circulation bridge is less than an 8% gradient for independent use, adjusting 0-8% site gradient, with landing areas as viewpoints (Lacey, 2004).
C.3	Structure minimizes ecological impacts	C.3.1	The structural system uses "kalong" with "umpak" foundation to minimize black lava rocks damages (Direktorat Jenderal Cipta Karya, 2006).
C.4	Material	C.4.1	Material uses local wood and bamboo from the site surroundings.

Figure 3 shows the mass arrangement on site. The figure shows the site plan from the top view. The figure shows an aerial perspective view. Concepts' transformation into formal aspects responds to site and design forces. Building masses embrace accessibility, minimize impacts for black lava rocks and site contour, and apply local materials (such as sengon wood, bamboo, and thatched roof).

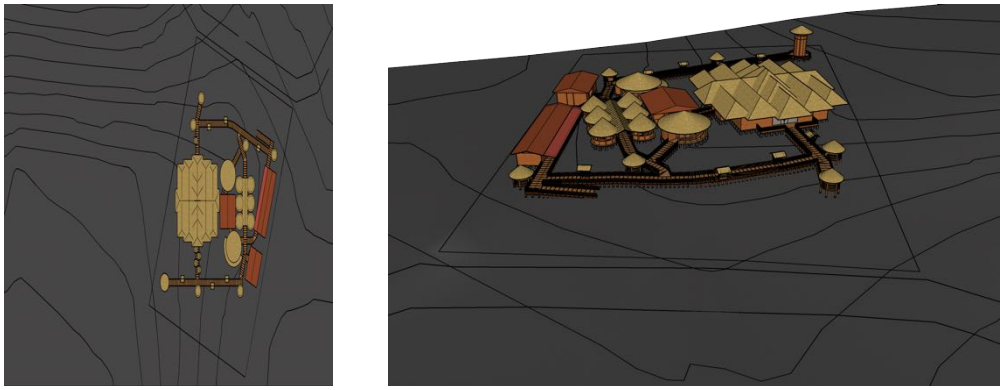

Figure 3. Mass arrangement on site

Floor levelling is according to site contour. Circulation access between masses and black lava rocks uses a sloping bridge structure adjusting 0-8% site gradient, with landing areas as viewpoints, as shown in Figure 5. The circulation bridge is not steeper than an 8% gradient for independent use by all users, including wheelchair users and people with pushchairs (Design Council, 2018). The bridge has a 3 m width for two-way circulation. Ha drails with 1000 mm height use a round shape with natural texture for comfortable grips.

Figure 4. Site plan with ramp gradient plan

Figure 4 shows the site plan with ramp gradient. Li ht yellow area shows the landing area with a 0% gradient. Danker yellow area shows a sloping bridge structure with a 5% gradient connecting building masses and black lava rocks in the outdoor space. Figure 5 shows the layout plan with the circulation sequence as follows:

1. Site entrance with parking area.
2. The entrance ramp is the beginning of the circulation bridge.
3. Circulation bridge. There are inclusive benches for wheelchair users, with a canopy for shading and rain protection. A planter box with local bamboo plants is on the backside.
4. Circulation bridge toward museum mass or gazebo for rest and mountain view.
5. Circulation from the museum with an inclusive bench alongside.
6. Circulation to the watch tower at the highest point of the site.
7. Gazebo with alang-alang roof.
8. Circulation with inclusive bench.

Figure 5. Lay out a plan with a circulation sequence

Users will move through the circulation bridge to reach the building masses when entering the site. H drail, and kerbs will assist and protect blind people. Ha drail has natural wood texture for their tactile experience. This outdoor space has mountain views and bamboo soundscapes, and blind people and deaf people can experience at least one of them. According to the site contour, they will walk through the sloping

bridge with a 5% gradient. It gives uphill and downhill movement that represents the mountain trip experience. They can see or touch the texture of black lava rocks at some points in this outdoor space.
Figure 6 shows the layout plan with concept details. Figure A shows the circulation bridge, Figure B shows the simulation room in the museum, and Figure C shows the UMKM gallery in the outdoor space. The A, B, and C figures will be explained more clearly in Figures 7-9.

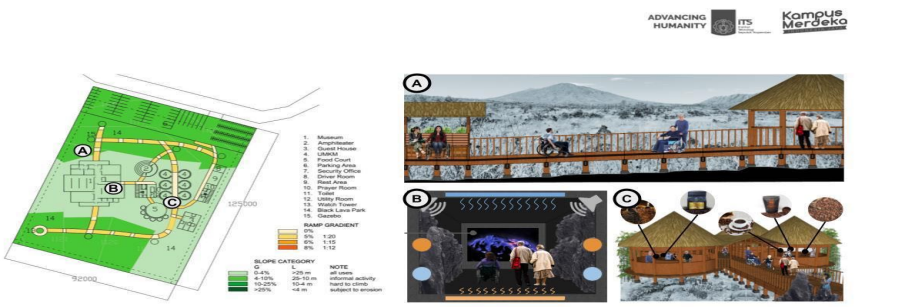

Figure 8. Layout plan with concept details

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Figure 6. Lay out a plan with concept details

Some codes represent each design concept from Table 2. Figure 7 shows the circulation bridge for access between masses. It is raised from black lava rock on site. Mountains surround the site. This space provides mountain views to stimulate the visual experience. The structure uses sengon wood as local material—a structure with a kolong and umpak foundation to minimize the impact of black lava rocks on site. According to contours, body and muscle experience is stimulated by uphill and downhill circulation. The circulation bridge is less than an 8% gradient for independent use, adjusting 0-8% site gradient, with landing areas as viewpoints, with inclusive bench, canopy, or gazebo.

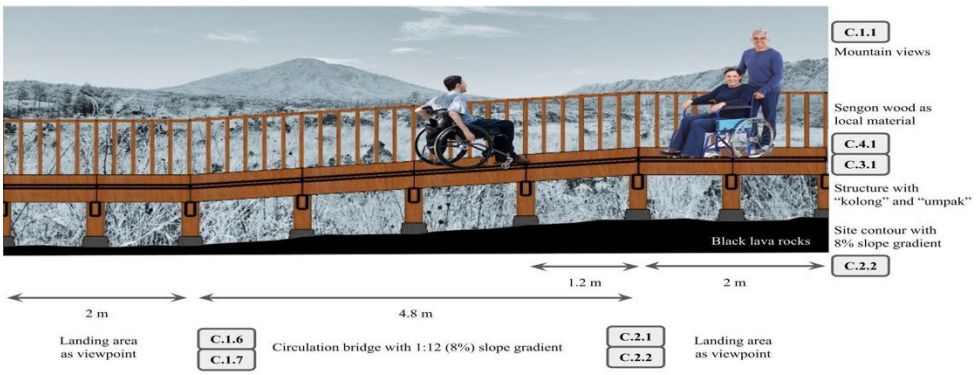

Figure 7. Circulation bridge for access

Figure 8 shows the simulation room in the museum. It is a corridor with the texture of volcanic rocks on the wall and a screen at the end. It provides Ancient Ijen volcanic simulation, Ijen climbing sensation, and Blue Fire simulation. The screen displays the Blue Fire simulation, the geological history of Ancient Mount Ijen, and the mountain climbing experience. At the room's corners is an electroacoustic system for narrative and sound effects. De f people can watch the screen, while blind people can listen to the explanation narrative provided by the electroacoustic system. The interior wall is covered by volcanic rock texture to stimulate tactile senses. To risks can touch rough volcanic rocks texture at the interior wall. This texture is smoothened for safety. Di fuser releases light Ijen's sulfur aroma to stimulate olfactory sense. For diffuser produces a fog effect for the mountain climbing sensation. Racists also can feel temperature changes. The temperature simulation is controlled by radiant heating and cooling with a slab system at the floor and ceiling.

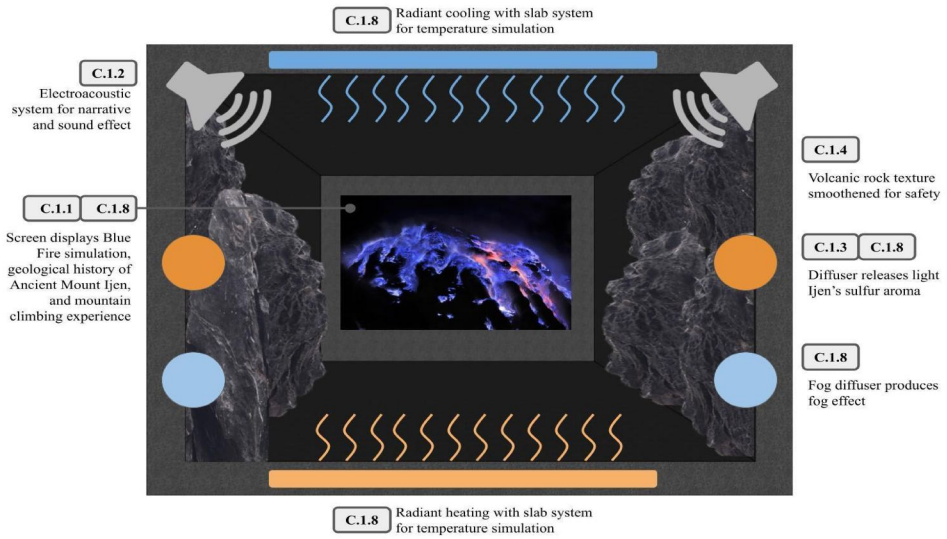

Figure 8. Circulation room in the museum

Figure 9 shows the UMKM gallery in an outdoor space. Racists can smell the aroma of Ijen coffee, which will evoke a coffee taste. Ij n coffee aroma at UMKM Gallery stimulates the olfactory and taste sense. They can taste and drink them in the food court area. Lo al material uses wood and bamboo from the site surroundings. *Ba busa vulgaris* or bambu is ample and is planted in the landscape as a soundscape for the auditory experience. The natural texture of wood finishing and the texture of black lava rocks on site for tactile experience.

Figure 9. UMKM gallery

CONCLUSION

An inclusive design approach and regionalism method respond to the education issue of Ijen Geopark. Inclusive design is addressed by providing a multisensory experience for all tourists. Racists with a definable in one sense can experience them through their other senses. Sense stimulations are obtained from regional characteristics, such as black lava rocks, mountain view, Ijen coffee, sulfur aroma and Blue Fire of Ijen Crater. Concepts can be seen in Table 2. The circulation bridge is less than an 8% gradient for independent use by all users, adjusting 0-8% site gradient, with landing areas as viewpoints. An inclusive bench provides space for a wheelchair user. Lo al bamboo plant stimulates the auditory sense. Black lava rocks' texture is recognized through tactile sensory.

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