DIJEMSS:
Dinasti International Journal of Education Management and Social Science
E-ISSN: 2686-6331
P-ISSN: 2686-6358
https://dinastipub.org/DIJEMSS dinasti.info@gmail.com +62 811 7404 455
DINASTI PUBLISHER

DOI: https://doi.org/10.38035/dijemss.v6i4

Utilization of Sulfur Material from Ijen Crater Banyuwangi as Interior Room Clock Accessory

Vindy Reychani Iktarishafa[1], Sunarmi[2], Sumarno[3]
[1]Faculty of Fine Arts and Design, Institut Seni Indonesia Surakarta, Surakarta, Indonesia vindyreychani@gmail.com
[2]Faculty of Fine Arts and Design, Institut Seni Indonesia Surakarta, Surakarta, Indonesia, sunarmi.interior67@gmail.com
[3]Faculty of Fine Arts and Design, Institut Seni Indonesia Surakarta, Surakarta, Indonesia, sumarno@isi-ska.ac.id

Corresponding Author: vindyreychani@gmail.com[1]

Abstract: Ijen Volcano is an area of active volcanic activity located in East Java Province, on the border of Banyuwangi and Bondowoso Regencies. The abundance of sulfur encourages sulfur mining activities on Mount Ijen. This can provide both benefits and impacts on the community's economy and the environment. Sulfur in the Ijen Crater must continue to be mined so that the spread of gas can be reduced and does not endanger visitors and miners who climb Mount Ijen. Therefore, it is necessary to develop the utilization of sulfur as a functional product. The method used in this research is design thinking, which includes five stages in the process of creating work, namely Empathize, Define, Ideation, Prototype, and Test. The result of the development of sulfur utilization is as an interior accessory for a room clock that functions as a timepiece, beautifies the room, has drawers to store items, and helps reduce the presence of mosquitoes in a room that is not too large. The conclusion of this research shows that further research is needed regarding the effectiveness of sulfur in repelling mosquitoes in more detail. This interior accessory in the form of a room clock plays a role in helping to increase the income of sulfur miners and support the stability of nature conservation through the development of sulfur utilization as an interior accessory.

Keywords: Sulfur, Interior Accessories, Sulfur Miners, Mount Ijen

INTRODUCTION

Ijen Crater in Banyuwangi is one of the active volcanic regions that generates large quantities of sulfur. The abundant sulfur reserves in this area have driven mining activities that have been carried out for generations. While these activities provide economic benefits to the surrounding communities, sulfur mining also faces various challenges, including economic, social, and environmental issues (Rahmatin, 2021). The mining process in Ijen Crater is still conducted using traditional methods, with wages that are disproportionate to the high level of difficulty and occupational risks involved (Fatimah et al., 2016). Additionally, the low market value of sulfur and high transportation costs further exacerbate the economic conditions of the miners (Fatimah et al., 2016). Consequently, many miners seek additional sources of income to improve their economic well-being.

From a social perspective, sulfur mining activities have negative impacts on workers' health. Exposure to toxic gases from volcanic activity and mining operations contributes to an increased risk of respiratory diseases, which often go untreated due to limited access to healthcare services (Kibria, 2013). Furthermore, labor migration to mining areas can lead to other social issues, such as rising prices of basic necessities and the spread of infectious diseases (Kibria, 2013).

The environmental impact of sulfur mining in Ijen Crater is also significant. One of the major concerns is acid mine drainage, which contaminates local water sources and affects biodiversity around the mining area (Moraes, 2010). Moreover, the release of toxic gases from mining activities contributes to long-term environmental degradation, threatening ecosystem balance and reducing air quality in the mining region (Noi & Ciroth, 2018).

On the other hand, sulfur utilization is still predominantly limited to conventional applications, such as raw materials for the chemical industry and sulfur-based ointments for skin diseases (Pakadang et al., 2021). Meanwhile, the potential for sulfur utilization in the creative industry, such as handicrafts and souvenirs, remains stagnant due to a lack of design innovation and low product appeal for tourists (Firdaus, 2015; Putra et al., 2019). Although there are opportunities in the tourism sector, the sales trend of sulfur-based souvenirs has declined, as most visitors are repeat tourists who are no longer interested in purchasing the same products (Putra et al., 2019).

To enhance the economic value of sulfur and improve the welfare of miners, innovative strategies for developing sulfur-based products are needed. One viable solution is the development of sulfur-based interior accessories, such as multifunctional wall clocks combined with resin and wood materials. This concept aligns with the study by Arsetyasmoro (2022), which highlights the important role of interior accessories in enhancing the aesthetics and functionality of a space. With an appealing and multifunctional design, this product is expected to attract market interest, both from domestic and international tourists, thereby creating new economic opportunities for communities around Mount Ijen.

In addition to economic considerations, more responsible sulfur resource management is crucial to ensuring environmental sustainability. An ecological approach emphasizes that the exploitation of natural resources must maintain ecosystem balance by thoroughly considering both biotic and abiotic factors (Darmaya et al., 2021). Therefore, the implementation of more environmentally friendly mining practices and innovative strategies for sulfur utilization are essential steps toward achieving sustainable development in the Ijen Crater region (Apriliani et al., 2024). Accordingly, this study aims to explore the potential development of sulfur-based products that not only increase economic value but also contribute to social and environmental sustainability in the region.

METHOD

Type of Research

This type of research is experimental and developmental research that aims to create innovative products and test their effectiveness in a user context. The approach used is an environmental ecology approach, focusing on the sustainable utilization of sulfur natural resources.

Research Methods

This research uses the Design Thinking method in the process of creating interior accessories made from sulfur. Design Thinking is a strategic approach to design innovation that focuses on problem solving through a deep understanding of users (Rachim, 2021). This method involves five main stages, namely Emphatize, Define, Ideation, Prototype, and Test (Karnawan, 2021; Soedewi, 2022)

Table 1. Stages of Design Thinking Method in Developing Sulfur-based Room Clock Interior Accessories

Stage	Description	Implementation in Research
Emphatize	Understand user needs through observations and interviews.	Observations were made in the Mount Ijen area to see the utilization of sulfur as a material for interior clock accessories. Interviews were conducted with sulfur miners, local people, and tourists.
Define	Identification and formulation of key problems based on data from the Emphatize stage.	The main issue found was the lack of innovation in the utilization of sulfur as a high economic value product as well as the potential use of sulfur in aesthetic and functional interior design.
Ideation	Brainstorming to find solutions to the problems identified.	Developing the idea of making interior accessories made from sulfur that not only has aesthetic value but also functions as a natural mosquito repellent.
Prototype	Design prototyping based on developed ideas.	Modeling a space clock made of sulfur, testing sulfur materials, and exploring aesthetic and functional shapes and designs.
Test	Product testing to assess material effectiveness and durability.	1) Effectiveness Test as Mosquito Repellent: Conducted in a room with a size of 2.5 x 3 meters without air conditioning, with the participation of 10 people for one week. Results showed that sulfur reduced mosquitoes but was not as effective as factory mosquito repellents. 2) Material Durability Test: Conducted for one year (December 2023 - December 2024) under room conditions without artificial ventilation to see the durability of the sulfur material.

Research Object

The object of research in this study is interior accessories for room clocks made of sulfur. Meanwhile, the research subjects include sulfur miners, communities around Mount Ijen, and visitors to Mount Ijen.

Population and sample

The population in this study consisted of people around the Mount Ijen area who are associated with the use of sulfur, while the sample was taken purposively and consisted of 10 people who participated in the mosquito repellent trial as well as interview respondents from among sulfur miners and tourist visitors.

Data Sources and Data Collection Techniques

The data sources used in this research consist of primary data and secondary data. Primary data was obtained through observations, interviews, and trials of interior clock room accessories. Meanwhile, secondary data was obtained from literature and previous research related to Design Thinking and the utilization of sulfur in interior design.

Data collection techniques in this research include observation, interviews, and experiments. Observations were conducted in the Mount Ijen area to understand the environment and user behavior. Interviews were conducted with sulfur miners, the surrounding community, and tourist visitors to gather information on the potential utilization of sulfur. In addition, experiments were conducted by testing interior accessories for one year to observe the durability of the material and its effectiveness in repelling mosquitoes.

Data Analysis Technique

In analyzing the data, this research uses descriptive analysis techniques, experimental analysis, and qualitative analysis. Descriptive analysis was used to understand user needs based on observation and interview data. Experimental analysis was conducted to test the durability of interior room clock accessories and their effectiveness in repelling mosquitoes. Meanwhile, qualitative analysis was used to interpret the results of interviews and observations to gain an in-depth understanding of the utilization of sulfur as an interior design material.

RESULTS AND DISCUSSION

Analysis Result

Traditional Sulfur Mining and its Challenges

Interviews with miners, such as Suwarno (63) from Tamansari Village and Sutomo (55) from Rejoagung Village, revealed that sulfur mining is seen as both a necessity and a livelihood. Despite the economic benefits, the number of miners has declined to around 50 due to hazardous working conditions and low financial incentives. Miners have begun to explore alternative uses of sulfur, including in the manufacture of decorative items.

Potential for Sulfur-Based Interior Accessories

Wisnu Panduwinata (21), a visitor to Ijen Crater, suggested that sulfur could be developed into high-value products, such as home decorations. This is in line with the opinion of Ismania (42) from Jambesari Village, who emphasizes the importance of continuous sulfur mining to prevent the accumulation of toxic gases. This study explores the development of a sulfur-based room clock combined with resin and wood, offering aesthetic appeal as well as an insect repellent function.

Sulfur Processing Technique

The sulfur processing process goes through several stages to ensure the quality and purity of the final product. The first stage is manual selection, where the raw sulfur is carefully selected to ensure there is no contamination. Next, the cleaning process is carried out using traditional tools to remove any impurities on the surface of the sulfur. After the cleaning stage, the sulfur is melted at a controlled temperature in a large pan until it liquefies, then filtered using monel wire and calico cloth to separate any remaining impurities. The purified liquid sulfur is then molded into various shapes as needed and reinforced with a layer of resin to increase the durability of the product. The final stage is the finishing process, where the molded sulfur is assembled with wooden materials using adhesives or nails, then coated with lacquer for added protection and to enhance the durability and aesthetics of the final product.

Effectiveness of Sulfur in Repelling Insects

A one-year trial (December 2023-December 2024) evaluated the effectiveness of sulfur-based room clocks in repelling mosquitoes in a 2.5 x 3 x 3.5 meter room without air conditioning. Observations showed a significant reduction in the mosquito population. This finding is reinforced by the testimony of Mudi Aries Suryanto (48), a nature conservation activist, who recalled that for one month after being exposed to sulfur-containing crater water while evacuating victims in 1991, he did not experience any mosquito bites.

Table 2. Results of Research on Sulfur Utilization in Ijen Crater

No	Aspects Analyzed	Findings
1	Sustainability of Sulfur Mining	Sulfur mining is done traditionally and sustainably to prevent blockage of volcanic pipes and volcanological hazards.
2	Economic Impact for Local Communities	Sulfur mining contributes to the community's economy, but the number of miners is decreasing due to low income and shifting to other occupations.
3	Potential for Sulfur-Based Product Diversification	In addition to the chemical industry, sulfur can be processed into interior accessories such as room clocks that have aesthetic and functional value as mosquito repellents.
4	Sulfur Processing Technique	The processing process includes manual selection, cleaning, cooking, screening, molding, and resin and wood coating to improve product durability.
5	Effectiveness of Sulfur as a Mosquito Repellent	Trials show that sulfur can reduce the number of mosquitoes but is not as effective as commercial mosquito repellents.
6	Management and Sustainability of Ijen Crater	The implementation of an ecotourism system is necessary to balance the exploitation of natural resources with environmental preservation.

The following are the results of a 10-person trial on the dispersion strength of sulfur that can reduce mosquitoes in a room with a medium-sized lump of sulfur for one week from Saturday, January 11, 2025 to Friday, January 17, 2025 as follows.

Table 3. Material Test Results of Sulfur Spreading Power as a Mosquito Repellent

No.	Room User	Room Size (meter)	Mosquito Reduction Effectiveness		
			Did Not Reduce	Moderately Reduced	Significantly Reduced
1.	Erliana Fabrella (21 Yr)	2,5 x 3	-	-	✓
2.	Melifera Rizky Ramadhani (22 Yr)	2,5 x 3 meter	-	-	✓
3.	Kristiani Mytazasi (22 Yr)	2,5 x 3	-	-	✓
4.	Nefri Trihadi Yatmoko (35 Yr)	4 x 3	-	✓	-
5.	Muhamad Ma'ruf Nurcholis (23 Yr)	4 x 4	✓	-	-
6.	Viana Hadi Purwantari (46 Yr)	5 x 3	✓	-	-
7.	Eko Purnomo (37 Yr)	2,5 x 3	-	-	✓
8.	Vilanindah Gusvian Hadi (41 Yr)	5 x 4	✓	-	-
9.	Yeyen Putri Dwitya (21 Yr)	4 x 3	-	✓	-

No.	Room User	Room Size (meter)	Mosquito Reduction Effectiveness		
			Did Not Reduce	Moderately Reduced	Significantly Reduced
10.	Whina Nur Aida Mukaromah (22 Yr)	3 x 3	-	✓	-

Based on Table 3, the results of the material strength test on the dispersal effectiveness of sulfur as a mosquito repellent indicate that its ability to reduce mosquitoes varies depending on room size and occupant conditions. Among the ten respondents tested, none experienced a significant reduction in the number of mosquitoes in their rooms. The majority of respondents with small to medium-sized rooms (ranging from 2.5 × 3 meters to 3 × 3 meters) did not observe any decrease in mosquito presence. Some respondents with larger rooms (ranging from 4 × 3 meters to 5 × 4 meters) reported a moderate reduction in mosquito numbers, though not to a significant degree. These findings suggest that under the tested conditions, sulfur dispersal is not highly effective in fully repelling mosquitoes, particularly in smaller rooms.

Sulfur's health benefits are primarily derived from its organic compounds known as sulfides. Sulfides play a role in metabolism, protein synthesis, detoxification, and cell protection. Sulfur also possesses antiseptic, antibacterial, antifungal, and antiparasitic properties, making it capable of repelling pests or insects in its vicinity (Hermawan, 2024). However, based on the data, sulfur can only reduce mosquito populations rather than eliminate them over a wide range. For optimal use, sulfur should be in its pure form and undergo proper processing. In interior accessories, sulfur placement should be limited to prevent the emission of strong odors that could cause discomfort. Although pure sulfur is generally odorless, some sulfur materials may retain a slight smell. Additionally, using minimal amounts of sulfur can help mitigate the risk of acid rain, which can cause corrosion on metal surfaces. Therefore, proper sulfur processing is essential to ensure both comfort and health considerations are adequately addressed.

Discussion

According to Wijaya (2022), technology is a broad concept encompassing various fields of science and research. Therefore, the innovation of sulfur-based interior clocks presents a novel development that may attract both tourists and local communities. A previous study by Adeline et al. (2022) demonstrated that producing wall clocks with Batik Toba ornaments made from wood powder could be a unique attraction for consumers. Wall clocks serve not only as time indicators but also as decorative elements in various settings, including homes, offices, and schools. Compared to previous studies, the development of sulfur-based interior clock accessories offers distinct advantages in terms of aesthetics and its function as an insect repellent. This innovation can, therefore, provide economic benefits for sulfur miners while also contributing to the conservation of the natural tourism area of Mount Ijen.

This interior clock accessory possesses several advantages, including good durability as long as it is not subjected to strong impacts against surfaces or solid objects. Additionally, it reduces the number of mosquitoes in a room, enhances interior aesthetics, and functions as a timepiece. The drawer at the bottom of the clock provides storage space for small items such as keys, coins, or watches. In terms of design, in the Indonesian language, design is known as a plan, pattern, or creation. It involves organizing elements such as lines, shapes, colors, sizes, textures, sound, light, and aroma to produce a specific work. Interior design aims to create an aesthetically pleasing appearance within a space (Novitasari et al., 2022). Therefore, interior accessories play a crucial role in interior design.

The sulfur-based interior clock accessory incorporates a minimalist and contemporary design concept. It has a symmetrical form with a combination of black, wood brown, clear, and sulfur yellow colors. Each color carries symbolic meaning: yellow represents the natural sulfur

material, black conveys a bold impression, brown symbolizes the natural element of wood, and clear resin reflects minimalist aesthetics. In design, minimalism emphasizes simplicity, functionality, form integrity, and meaning concentration (Zulfahmy & Sulistyono, 2023). Meanwhile, the contemporary style is characterized by flexibility, innovation, and material variation, often incorporating asymmetrical forms (Kusuma et al., 2023). Minimalism is evident in the symmetry of the resin and wood, as well as the use of clear resin, while the contemporary style is reflected in the asymmetrical sulfur fragments embedded in the resin and on the top part of the drawer.

The primary advantage of this accessory's production method lies in the use of acrylic resin. This resin type has gained popularity due to its ease of application and finishing process (Budiprasojo & Erawantini, 2021). The resin is molded using a wooden frame that is shaped according to the clock's dimensions, followed by drying and coloring to achieve the desired design concept. Sulfur is embedded in the clock structure before the resin fully hardens. Teak wood is used as the resin molding frame and as the primary material for the drawer. The wood grain is finished with varnish to enhance its aesthetics. Aside from serving as a storage compartment, the sulfur element in this accessory also acts as an additional mosquito repellent. Once all materials have dried, the numbers, battery slot, and clock hands are installed to complete the production process. To ensure longevity, the accessory should be wrapped in thick layers when transported and regularly cleaned with a dry cloth, avoiding direct contact with the sulfur.

The experimental results show that the mosquito-repellent effect of sulfur disperses according to the room size. In a 2.5 x 3-meter room without air conditioning, the accessory effectively reduces the number of mosquitoes. A one-week trial involving 10 participants in various room sizes indicated that while sulfur does not entirely eliminate mosquitoes like commercial insect repellents, it helps reduce their population in moderately sized rooms. The development of sulfur utilization in interior accessories also holds significant economic potential, as it increases the market value of sulfur. Previously, sulfur from Mount Ijen was primarily used to produce souvenirs in the form of flowers, turtles, or inscriptions. While these uses have been beneficial, further development into interior accessories such as room clocks can enhance the value of sulfur as a material.

Despite its many advantages, this accessory also has some limitations. The product is susceptible to breakage if dropped from a height or subjected to a strong impact. Additionally, the drawer has limited capacity and cannot store large items. However, every creation has its strengths and weaknesses, and proper maintenance is necessary to ensure durability. From a health perspective, the use of sulfur in this accessory does not pose significant risks to human health as long as the quantity remains within safe limits, preventing strong odors from accumulating in the room. The primary benefit for users is the natural reduction of mosquitoes. From an economic standpoint, this product can increase the income of local communities around Mount Ijen by expanding the market for sulfur-based products. Furthermore, utilizing sulfur for interior accessories can help balance mining activities, thereby mitigating environmental risks such as acid rain and volcanic disturbances. Thus, the development of sulfur-based interior accessories not only offers aesthetic and functional benefits but also supports community welfare and environmental sustainability.

The findings on sulfur utilization in interior accessories have several theoretical implications that contribute to various fields of study. From an economic perspective, this research supports product diversification theory, which posits that natural resources can be optimized through innovation to enhance economic value and sustain local industries. Specifically, the diversification of sulfur into interior accessories, such as room clocks, demonstrates that resources previously limited to the chemical industry can be expanded into more creative and high-value sectors. In terms of product design, this study enriches the theory of nature-based design by illustrating how a combination of sulfur, resin, and wood can produce

aesthetically pleasing yet functional products. This aligns with the principles of minimalist and contemporary design, which prioritize simplicity, function, and visual appeal.

Moreover, this research contributes to ecotourism and environmental sustainability theories by highlighting the importance of balancing resource exploitation with ecosystem conservation. By transforming sulfur into value-added products, traditional mining activities that may harm the environment can be redirected toward more eco-friendly creative industries. Additionally, in the fields of biochemistry and ecology, this study supports theories on the effectiveness of natural materials as insect repellents. The trials indicate that while sulfur possesses antiparasitic properties, its effectiveness in repelling mosquitoes is lower than that of commercial products, necessitating further research to enhance its usability. From a material technology perspective, this study expands knowledge on sulfur processing techniques, including purification, molding, and material integration to improve product durability and functionality. Consequently, this research not only reinforces existing theories but also opens new avenues for innovative and sustainable utilization of natural materials.

CONCLUSION

Based on the results of the study, traditional sulfur mining in Ijen Crater continues to contribute to the community's economy despite the decline in the number of miners due to hazardous working conditions and low financial incentives. Diversifying the utilization of sulfur into interior accessories such as sulfur-based room clocks has promising economic potential, as it not only increases the added value of sulfur but also offers functional benefits as a mosquito repellent. However, the effectiveness of sulfur in repelling mosquitoes is still limited, depending on the size of the room and the conditions under which it is used. Proper processing of sulfur and combination with resin and wood increases the durability and aesthetic value of the product, while reducing environmental impacts such as acid rain and corrosion risks. As a recommendation, further innovation in sulfur processing is needed to increase its effectiveness as a mosquito repellent, for example by researching the combination of sulfur with other more potent ingredients. In addition, the government and related parties can support the diversification of sulfur-based products with training and capital assistance for miners to switch to safer and more profitable businesses. The implementation of an ecotourism system that emphasizes a balance between resource exploitation and environmental sustainability is also important to maintain the sustainability of Ijen Crater.

REFERENCES

Adeline, W., Misgiya, M., & Azis, A. C. K. (2022). Jam Dinding Ornamen Batak Toba Berbahan Serbuk Kayu Dengan Teknik Membentuk. *Gorga : Jurnal Seni Rupa*, *11*(2), 387. https://doi.org/10.24114/gr.v11i2.38493

Apriliani, A., Sholihah, L. Z., Abidah, K. N., & Irawanto, R. (2024). Peran Cagar Biosfer Dalam Pembangunan Berkelanjutan Di Jawa Timur. *Jurnal Ekonomi, Manajemen, Bisnis, Dan Sosial (EMBISS)*, *4*(4), 422–436. https://doi.org/10.59889/embiss.v4i4.333

Arsetyasmoro, D. (2022). Pengembangan Desain Asesoris Interior Dengan Metode Atumics di Sentra Batik Kayu Krebet Bantul, Yogyakarta. *LINTAS RUANG: Jurnal Pengetahuan Dan Perancangan Desain Interior*, *10*(2), 59–72.

Budiprasojo, A., & Erawantini, F. (2021). Kekuatan Mekanis Antibacterial Resin Campuran Titanium Dioksida. *Jurnal Rekayasa Mesin*, *12*(1), 227–233.

Darmaya, S., Hidana, R., Latumahina, F. S., Nendissa, S. J., Situmorang, M. V., Juniatmoko, R., Widarawati, R., Mz, N., Swardana, A., Octorina, P., Siagian, G., Hasibuan, A. K. H., Yusal, M. S., & Mutolib, A. (2021). *Ekologi, Lingkungan Hidup dan Pengembangan*. Widina Bhakti Persada Bandung.

Fatimah, A., Wahdjoedi, W., Murwani, D., & Witjaksono, M. (2016). The Efforts to Increase the Income of Sulfur Miners through Economic Transformation in Mount Ijen

Banyuwangi, Indonesia. *IOSR Journal of Humanities and Social Science*, *21*(10), 23–31. https://doi.org/10.9790/0837-2110032331

Firdaus, M. (2015). *Cara Bertahan Hidup Penambang Batu Belerang Tradisional untuk Mencukupi Kebutuhan Keluarga*. Universitas jember.

Hermawan, H. (2024). Diversity Of Aquatic Insects As An Indicator Of Water Cleanliness In The Cirahab Serang-Banten Water Sources Area. *TRANSPUBLIKA INTERNATIONAL RESEARCH IN EXACT SCIENCES*, *3*(4), 21–27. https://doi.org/10.55047/tires.v3i4.1405

Karnawan, G. (2021). Implementasi User Experience Menggunakan Metode Design Thinking Pada Prototype Aplikasi Cleanstic. *Jurnal Teknoinfo*, *15*(1), 61. https://doi.org/10.33365/jti.v15i1.540

Kibria, G. (2013). Mining: Friend or foe? Economic, environmental & social impacts-an overview. *J. Sci. Technol*, *35*(13), 1–16.

Kusuma, K. M., Malinda, S., & Purnomo, A. D. (2023). Gaya Kontemporer Jawa Pada Interior Spa. *Jurnal Vastukara: Jurnal Desain Interior, Budaya, Dan Lingkungan Terbangun*, *3*(1), 84–90. https://doi.org/10.59997/vastukara.v3i1.2308

Moraes, N. C. de. (2010). *Abatimento de drenagem ácida de mina com cobertura de entulho de construção civil: uma proposta de reabilitação de uma antiga mina de pirita.*

Noi, C. Di, & Ciroth, A. (2018). Environmental and social pressures in mining. Results from a sustainability hotspots screening. *Resources*, *7*(4), 80. https://doi.org/10.3390/RESOURCES7040080

Novitasari, N., Hidayatul Habibah, F., Vera Yuniar, D., Sari Sulistiowati, I., Rarin Erlina, K., Umah, K., Hilya, N., Ning Rahayu, R., Kholifah, S., Mahfudhoh, S., Muafiyah, S., Zayyinatul Mustafidah, S., & Azkiyyah, C. (2022). Perancangan Kelas Desain Interior dalam Membentuk Pertumbuhan dan Perkembangan Anak. *Murhum : Jurnal Pendidikan Anak Usia Dini*, *3*(2), 52–61. https://doi.org/10.37985/murhum.v3i2.128

Pakadang, S. R., Karim, D., & Ahmad, T. (2021). Meracik Herbal Pilihan Untuk Pencegahan Dan Komplementer Pengobatan Tuberkulosis. *Jurnal Pengabdian Kefarmasian*, *2*(1), 15–20.

Putra, A. P., Halil, H., & Pratiwi, N. (2019). Strategi Pengembangan Cinderamata Belerang Wisata Kawah Ijen Banyuwangi. *Jurnal Pariwisata Pesona*, *4*(1), 32–41. https://doi.org/10.26905/jpp.v4i1.2428

Rachim, F. (2021). *Design Thinking with Design Process*. DPP Harmoni Pendidik Pengajar Indonesia (HIPPER Indonesia).

Rahmatin, L. S. (2021). Persepsi Masyarakat terhadap Dampak Perkembangan Taman Wisata Alam Kawah Ijen. *Jurnal Kajian Dan Terapan Pariwisata*, *1*(2), 22–34.

Soedewi, S. (2022). Penerapan Metode Design Thinking Pada Perancangan Website Umkm Kirihuci. *Visualita Jurnal Online Desain Komunikasi Visual*, *10*(02), 17. https://doi.org/10.34010/visualita.v10i02.5378

Wijaya, I. B. A. (2022). Studi Penerapan Prinsip Interaktif Pada Desain Interior. *Mintakat: Jurnal Arsitektur*, *23*(2), 98–108. https://doi.org/10.26905/jam.v23i2.7841

Zulfahmy, A., & Sulistyono, I. B. (2023). Desain Interior Solo Creative Center dengan Konsep Minimalis. *Ars: Jurnal Seni Rupa Dan Desain*, *26*(2), 103–112. https://doi.org/10.24821/ars.v26i2.5701