

Use of Alternative Materials in the Interior of the Indonesian Coffee Museum

Karmelia Geraldine¹, Mariana², Eddy Supriyatna³

¹ Interior Design Department, Universitas Tarumanagara, Jakarta, Indonesia
Email: Karmelia.615210021@stu.untar.ac.id

² Interior Design Department, Universitas Tarumanagara, Jakarta, Indonesia
*Email: Mariana@fsrd.untar.ac.id**

³ Interior Design Department, Universitas Tarumanagara, Jakarta, Indonesia
Email: Eddys@fsrd.untar.ac.id

*Corresponding Author

Submitted: dd-mm-yyyy, Revised: dd-mm-yyyy, Accepted: dd-mm-yyyy

ABSTRACT

Global warming is worsening, causing a temperature increase of up to 1.25°C, driving the need for innovative solutions in the use of sustainable materials. One of the abundant organic wastes is coffee grounds, which have the potential to be processed into environmentally friendly construction materials. This study explores the utilization of coffee grounds waste as an alternative material for interior elements in the Indonesian Coffee Museum to support sustainable design and reduce the impact of global warming. Using a descriptive qualitative method, this study analyzes the characteristics of coffee grounds mixed with resin as a composite material. The results show that the combination of coffee grounds and resin produces a sturdy, durable, and aesthetically valuable material. The implementation of this material includes wall panels, furniture, partitions, and decorative elements, providing a natural texture with an environmentally friendly feel. The use of coffee grounds in interior design not only reduces organic waste but also creates innovative solutions that support circular economy principles. Furthermore, coffee ground-based materials have the potential to be further developed in various other design applications. With its lightweight nature and flexibility in various forms, this material can be a sustainable alternative to conventional materials. This study proves that coffee grounds have significant potential as an alternative material in sustainable interior design and organic waste management, contributing to environmental conservation efforts.

Keywords: *Coffee, Grounds, Global Warming, Material, Sustainable*

1. INTRODUCTION

In 2024, global temperatures will become more extreme due to increasing global warming. The summer of 2024 was the hottest on record, with an average global temperature 1.25°C higher than the mid-20th century average. The summer of August 2024 also set a record high, continuing the trend of rising temperatures caused by human activity (Brief, 2024). The major impacts of this phenomenon include increasingly unpredictable changes in weather patterns, forest fires, melting polar ice, extreme heat waves in various countries, and rising sea temperatures. In addition, sea ice in the Arctic and Antarctic oceans reached record lows in history.

Global warming is the most frequently discussed world environmental issue by the public, because it has a major impact on daily life. According to (Zulfikar, 2022) Global warming is a global phenomenon caused by human activities, especially land use change and the use of fossil fuels. This activity results in an increase in the number of gases in the atmosphere, especially carbon dioxide (CO₂), which causes the earth's temperature to increase (Corpencinus, 2024).

Global warming occurs due to various human activities that produce greenhouse gas emissions, with the burning of fossil fuels, deforestation, and agriculture being the largest contributors. To overcome global warming, major changes in greenhouse gases are needed using renewable

energy, forest conservation, changes in consumption and production patterns, and the burning of fossil fuels and deforestation (BBC, 2024). This situation shows how important sustainability efforts are to reduce the impact of global warming. These efforts include reducing carbon emissions, using renewable energy, and improving waste management to reduce the environmental footprint. One step that can be taken is waste processing. Methane (CH₄), which has the ability to trap heat 25 times greater than carbon dioxide (CO₂), is one of the greenhouse gases produced by waste, especially organic waste. With effective waste management, these greenhouse gas emissions can be reduced. In this discussion, we will discuss waste processing as a substitute material in interior elements, as a form of sustainable development in interior design. According to (Arsimedia, 2022) Sustainable development is a sustainable construction method and the use of materials and construction materials that prioritize environmental quality, economic vitality, and social benefits during the design, operation, maintenance, and deconstruction of the environment at the construction site.

The replacement material in this discussion aims to utilize leftover materials for construction, use old building components or materials that can still be used, use materials that are still abundant. In the Interior of the Indonesian Coffee Museum, the main replacement material that will be used is coffee grounds waste. This is due to the lifestyle of the middle to upper class, especially the people of Jakarta. This is indicated by the development of many famous cafes or coffee shops. And this causes the accumulation of coffee grounds waste that is disposed of irresponsibly. According to (Defitri, 2023) Coffee grounds have the impact of spreading an unpleasant odor when exposed to rainwater, besides that it can pollute the environment. This is due to the high-water content of coffee skin (75-80%) which makes it easy for bacteria to grow (Purwanto, 2020).

In this design, the use of coffee grounds waste processing will be maximized in interior, decorative and supporting elements. As for other replacement materials or recycled materials, which will be used in the interior elements of the Indonesian Coffee Museum. This research aims and seeks to maintain a balance between nature's ability to meet current human needs and human needs for future life.

2. RESEARCH METHOD

This study uses a qualitative method. This method is carried out through research procedures that produce information in the form of oral, written, pictures, or photos, which contribute to answering the problems that have been formulated (Rahardjo, 2011). A research approach that aims to understand the phenomenon in depth through observation, interviews, and descriptive analysis. This method focuses on aspects of quality and meaning concentrating on the quality and value of human experience, behavior, or interaction. This study examines by analyzing primary data through relevant theories obtained from literature reviews and online observations, including books, e-books, and e-journals.

3. RESULTS AND DISCUSSIONS

Based on data collected by the Economist Intelligence Unit (EIU) in 2016, Indonesia is in second place in the world in terms of food waste production, only behind Saudi Arabia. According to a case study conducted by Dwi Husna and Joko S in 2015, instant coffee producers who process 720 tons of coffee per month produce 324 tons of solid waste (45%).

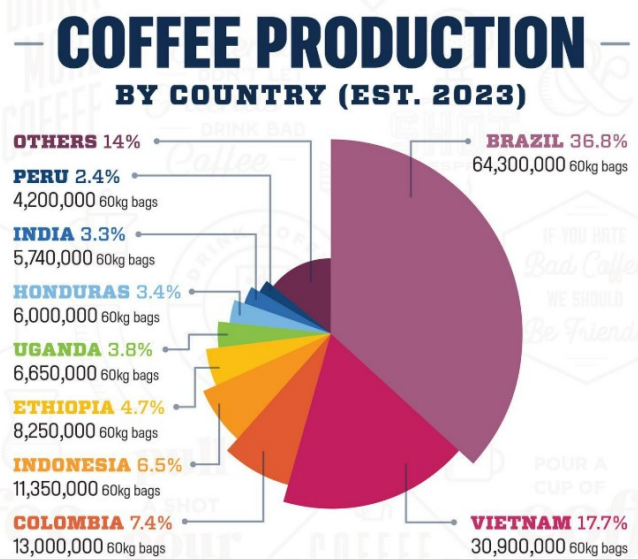


Figure 1. World Coffee Producer Diagram
Source: Pull and Pour Coffee, 2023

In Figure 1. It can be seen that in 2023 Indonesia ranked 4th after Brazil, Vietnam, and Colombia as a coffee producing country. If this study is used as a basis for calculating the solid waste of Indonesian coffee producers, there is a possibility that 45% of the solid waste can be converted into briquettes, or 117,000 tons per year (Annisa, 2022). Coffee grounds are the remains of coffee beans that have been processed and extracted to make coffee drinks. Usually considered as useless organic waste after the coffee making process is complete. Coffee grounds, however, have a lot of potential to be reused in various ways, such as compost, natural fragrance ingredients, and even as ingredients for new products such as interior decorations or furniture.

Coffee grounds are rich in organic matter, such as nitrogen, which makes them good for compost. In addition, its unique texture and natural brown color make it attractive to use as a raw material for recyclable decoration and construction products. Some examples of products made from coffee grounds include wall panels, furniture, and decorative accessories.

According to (Santoso, 2020) Mixing coffee grounds with resin is a very suitable combination, but there are several things to consider, namely:

1. A mixture of coffee grounds and resin with a ratio of 65% coffee grounds and 35% resin produces a strong character and is not easily broken.
2. The more coffee grounds mixed with resin, the more catalyst is needed because the mixture will not harden properly if the catalyst used is lacking.
3. Resin types 108, 850, 3126, epoxy, polyester, and acrylic are suitable for coffee grounds adhesives and hardeners because they are hard and sticky but have a pungent odor. They then added epoxy, which has a hard, clear, glass-like character, and is odorless.
4. Mixing coffee grounds with resin in a ratio of 4:1 is a very strong ratio, because when tested in several ways, such as being slammed, hit with a hammer, drilled with a nail or drill, put in a cup containing boiling water at a temperature of +16 °C, and soaked in water for one day.



Figure 2. Application of Coffee Grounds for Furniture
Source: belllivinglab.com

One example of the use of existing coffee grounds waste is Kaffeeform. German company Kaffeeform has succeeded in turning coffee grounds waste into creative and sustainable products. Kaffeeform sees coffee grounds in the manufacture of furniture and other interior accessories besides cups. This product not only reduces coffee waste but also replaces plastic and single-use materials, making it a more environmentally friendly solution for sustainable design and lifestyle (Dezeen, 2015). The following are examples of recycled products made by Kaffeeform. One of the Indonesian brands that processes coffee waste is Bell Living.



Figure 3. Coffee Grounds Waste Glass Products
Source: kaffeeform.com

The application of coffee grounds waste at the Indonesian Coffee Museum includes:

1. Wall panels and displays

Coffee grounds wall panels have an organic texture with a natural speckled pattern of coffee grounds, skin and grains. The surface can be compacted with resin and smoothed or it can be left rough rustic.

2. Café Furniture

Wooden chairs and tables are covered with a composite material made of coffee grounds, which gives a unique appearance with natural brown nuances.

3. Pillows and Upholstery

Coffee grounds can provide antimicrobial properties to pillows and covers made of fabric mixed with coffee grounds can provide a natural aroma.

Other sustainable materials that will be used in the Indonesian Coffee Museum are:

1. Reclaimed Wood
Reducing deforestation by using previously used wood (from old structures, pallets, or ships). In addition to having strong natural properties, reclaimed wood has a unique appearance.
2. Eco-Friendly Concrete (Geopolymer)
Geopolymer concrete, made from industrial waste such as fly ash or slag, has a lower carbon footprint than conventional concrete.
3. Clay Plaster
Clay plaster production is energy-efficient and has natural moisture-regulating properties, making it good for indoor air quality.
4. Used Instant Coffee Wrappers
Used instant coffee wrappers will be used as decorative and creative installations.

Design Implementation

The pictures below are example of the application of recycled waste from coffee grounds, husks and skins. In the implementation of the Indonesian Coffee Museum, the dominant replacement materials are Coffee Grounds, Skins and Husks. The implementation mostly applied to the museum display, partition walls, custom table information panels and seat cushions.



Figure 4. Application of Coffee Waste Recycling on Information Boards and Seat Mats
Source: Karmelia Geraldine, 2024



Figure 5. Application of Coffee Waste Recycling on Parti Walls
Source: Karmelia Geraldine, 2024



Figure 6. Application of Coffee Waste Recycling on Wall Panel Display
Source: Karmelia Geraldine, 2024

The use of coffee grounds and husks in the interior design of the Indonesian Coffee Museum has a positive impact in terms of sustainability, aesthetics, and functionality. From a sustainability perspective, utilizing coffee waste helps reduce organic waste while supporting the circular economy concept by transforming waste into valuable materials. Additionally, coffee-based materials are more environmentally friendly than conventional materials, as they reduce dependence on non-renewable resources. In terms of aesthetics, coffee grounds and husks provide a natural texture and distinctive color, creating a warm and authentic ambiance that aligns with the museum's coffee-themed concept. These materials can be applied to interior elements such as wall panels, furniture, partitions, and decorations, adding a unique visual appeal. Functionally, the combination of coffee grounds with resin or other binding agents produces a sturdy, durable, and lightweight material, making it easy to use in various interior design applications. Moreover, the subtle coffee aroma retained in the material enhances the sensory experience for museum visitors. incorporating coffee grounds and husks in the museum's interior design not only creates an aesthetically pleasing and innovative space but also promotes sustainability principles in architecture and interior design.

The use of coffee grounds and husks as interior materials has a significant environmental impact, particularly in reducing waste, lowering carbon emissions, conserving natural resources, and promoting sustainable practices. One of the most crucial benefits is the reduction of organic waste. Coffee waste, if not properly managed, often ends up in landfills, where it decomposes and releases methane, a greenhouse gas far more potent than carbon dioxide. By repurposing coffee grounds and husks into construction materials, the amount of waste sent to landfills is minimized, directly contributing to waste management efficiency and reducing environmental pollution.

Furthermore, utilizing coffee-based materials helps lower carbon emissions associated with conventional building materials. The production of traditional materials such as wood, plastic, and concrete often require energy-intensive processes that release significant amounts of CO₂ into the atmosphere. By replacing or supplementing these materials with recycled coffee waste,

the overall carbon footprint of interior design projects can be reduced. Additionally, coffee-based materials offer an alternative to deforestation-driven industries, helping preserve forests that play a crucial role in absorbing CO₂ and maintaining biodiversity.

The concept of sustainability is further reinforced through the promotion of a circular economy. Instead of treating coffee waste as a disposable byproduct, it is transformed into valuable resources, extending its lifecycle and reducing reliance on virgin materials. Some coffee-based composites are biodegradable or more environmentally friendly than synthetic alternatives, ensuring that, even at the end of their use, they do not contribute to long-term pollution.

Moreover, the processing of coffee grounds and husks into interior elements like wall panels, furniture, and decorative pieces aligns with eco-friendly design principles by reducing the use of non-renewable materials. The natural properties of coffee waste can also improve indoor environmental quality by regulating humidity and, in some cases, retaining a mild coffee aroma, enhancing the sensory experience without the need for artificial air fresheners.

Overall, the incorporation of coffee grounds and husks in interior design not only provides innovative and aesthetic solutions but also actively contributes to environmental conservation. By reducing waste, lowering emissions, and promoting sustainable material use, this approach supports the global effort to combat climate change and fosters a more responsible, eco-conscious design industry.

4. CONCLUSIONS AND SUGGESTIONS

The conclusions that can be drawn from the study of the Use of Alternative Materials at the Indonesian Coffee Museum are as follows:

1. The summer of August 2024 set a record for the hottest in history, with an average global temperature of 1.25°C higher than the mid-20th century average. The global phenomenon caused by humans, especially land use change and the use of fossil fuels, is known as global warming.
2. Waste processing is one of the actions that can be taken. One of the greenhouse gases produced by waste, especially organic waste, is methane (CH₄), which has the ability to trap heat 25 times greater than carbon dioxide (CO₂).
3. Indonesia is the second producer of food waste in the world, only behind Saudi Arabia. perhaps 117,000 tons per year, or 45% of solid waste.
4. Coffee grounds can be reused in a variety of ways, such as compost or natural fragrances. They can even be used as ingredients for new products, such as furniture or interior decoration.
5. Mixing resin and coffee grounds in a ratio of 4:1 is a very good ratio,
6. Other sustainable materials that will be used in the Indonesian Coffee Museum are reclaimed wood, recycled glass, concrete and recycled plaster.

ACKNOWLEDGEMENT

The author would like to thank the Indonesian Coffee Museum for the opportunity to develop this sustainable design concept, the authors of previous journals, and all parties who have contributed with ideas, suggestions, and support. Hopefully this work can provide inspiration for sustainability and beauty in interior design.

REFERENCES

- Studio Interior Jayadi-Sign). *JURNAL PATRA*.
- Nabila Rahmania, A. F. (2019). Pengolahan dan Penyajian Makanan Negara India. *Jurnal Pendidikan, Tata Boga dan Teknologi*.
- Purwanto, G. D. (2020). *PEMANFAATAN LIMBAH AMPAS KOPI MENJADI BAHAN KOMPOSIT SEBAGAI BAHAN DASAR ALTERNATIF PEMBUATAN PRODUK DOMPET*.
- Rahardjo, M. (2011). Metode Pengumpulan. <https://www.uin-malang.ac.id/r/110601/metode-pengumpulan-data-penelitian-kualitatif.html>.
- Rosemary Kilmer, W. O. (2014). *Designing Interiors*. United States .
- Santoso, H. (2020). *Pengembangan Meja kKafe dengan Eksplorasi Material Limbah Ampas Kopi Berbasis Alam*.
- Zulfikar, F. (2022). *Pemanasan Global: Pengertian, Penyebab, dan Dampaknya*. Detik edu .