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"Glass Waste" in the Perspective of Religious Awareness and Artistic Creativity

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Abstract
This article explores the environmental impact of glass waste and offers creative solutions through art and religious awareness. Glass is crucial in various human activities despite its fragility and slow decomposition. The study investigates innovative ways to reuse glass waste in artistic and religious contexts, focussing on its application in ceramics and decorative arts. By presenting case studies, the article proposes that glass waste can be creatively repurposed, addressing environmental concerns while enhancing religious and artistic value. This approach provides a new perspective on integrating glass waste into art for environmental and spiritual benefits.

Keywords: Waste glass; natural environment; magical-religious; artistic creation

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1.0 Introduction

The history of glass dates back to approximately 3500 BC, originating in Egypt and Eastern Mesopotamia. The technology to produce transparent glass had yet to be developed during this early period. Instead, glass created opaque luxury items, particularly beads, which held significant cultural and symbolic value. Beads were considered unique, rare, and magical, often evoking associations with exotic nature. This allure made them desirable as status symbols, representing wealth and power. The multifaceted significance of beads extends across disciplines like cosmology, anthropology, history, and archaeology, reflecting their role as artistic objects and cultural artifacts (Nasruddin, 2017).

Beads also played a role in religious and spiritual practices. They were often buried with the deceased as provisions for the afterlife, symbolizing a high social status and believed to facilitate the journey to a better existence. This dual function—a symbol of wealth and a religious object—further highlights their cultural importance (Oktaviana, 2005).

Regarding practical applications, glass technology advanced significantly in Central Mesopotamia, where artisans began crafting functional items such as bowls, plates, and vases. These innovations were spread by Venetian merchants along the Mediterranean Sea, leading to the diversification of glass products, which became thinner and more intricate. The craft then expanded to regions like

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Greece, China, and Western Austria, where new techniques, such as dipping molds into molten glass, allowed for more elaborate designs (Christina E., 2019).

However, alongside this rich history, the modern issue of glass waste has emerged as a significant environmental concern. While highly durable, glass is not biodegradable and can persist in landfills for centuries. The same material that once symbolized wealth and status now contributes to growing waste management challenges. Inadequate systems for separating and recycling glass exacerbate this problem, with much of it ending up in landfills, where it poses risks to workers and ecosystems. Addressing this issue requires a renewed focus on recycling and reusing glass, transforming what was once a luxury material into a sustainable resource for the future. The evolution of glass from a revered object to a waste problem underscores the need for responsible production and consumption practices in modern society.

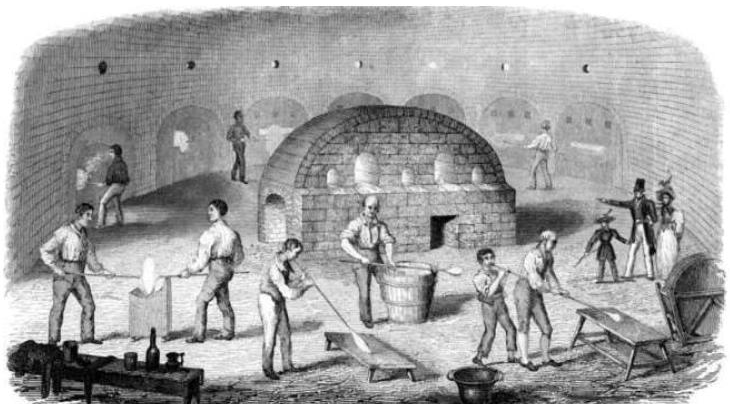

Fig 1. Illustration of the glass industry in the early centuries, all stages are still done manually
(Source: https: www.bioglass.org/news/)

2.0 Literature Review

Glass and its applications have significantly evolved since its invention, with various types of glass being developed to meet specific functional needs. Flat glass, commonly used in construction, curved glass for vehicles, and round glass for food and beverage containers are just a few examples of how glass has become integral to modern life. It is also widely used in industries such as fiberglass production and optics. Despite the widespread use and benefits of glass, it has inherent drawbacks: it is fragile and non-biodegradable. Glass waste, unlike organic materials, takes an estimated one million years to decompose, making it a pressing environmental concern (Silva et al., 2020).

The increasing consumption of glass, driven by its aesthetic appeal and versatility, has led to a surge in glass waste. In 2018, the United States generated over 12 million tonnes of glass waste, with a recycling rate of only about 25%. European countries, such as Germany and Italy, have achieved higher recycling rates, exceeding 60%, but even in these regions, significant amounts of glass end up in landfills (Mutha et al., 2021). While generating less glass waste than these larger economies, Indonesia still needs to work on managing this non-biodegradable material, with minimal infrastructure for proper recycling practices (Supriyanto & Wibisono, 2022).

The global focus on plastic waste often overshadows the environmental impact of glass waste, yet glass poses equally severe risks. Given its long decomposition time and the high consumption of glass products, more attention must be given to recycling and repurposing glass waste. This calls for creative, sustainable solutions integrating glass waste into various aspects of human life, including socio-cultural practices and artistic endeavors (Kumar & Singh, 2019).

Despite growing awareness, more research on innovative ways to handle glass waste is still needed, particularly in ceramics and art. Recent studies have increasingly explored the intersection of glass waste and sustainability in art, but challenges remain in scaling these initiatives. Much of the existing research, while providing valuable insights, needs comprehensive long-term solutions for reducing the environmental impact of glass waste. Practical applications of glass waste in art and ceramics are still in their infancy. Many efforts are confined to small, localized projects rather than integrated into broader environmental strategies (Zhang & Li, 2020). This study addresses these gaps by focusing on the creative reuse of glass waste within ceramics and art. By applying Owen Jones' aesthetic theory—which suggests that aesthetics arise from the harmonious relationship between humans and their environment (Jones, 2004)—the research explores how artistic creativity can provide new perspectives on waste management.

Furthermore, recent studies, such as those by Mutha et al. (2021) and Silva et al. (2020), have underscored the importance of sustainability in modern art practices, with glass waste offering significant potential for artistic and environmental advancements. Using a qualitative approach, this study adopts a descriptive case study method, which allows for an in-depth examination of contemporary, real-life phenomena (Yin, 2018). Through this approach, the research provides both theoretical and practical insights into how glass waste can be minimized and its economic value extended within society. The findings will be presented through descriptive data, drawing on written and oral explanations from subjects involved in the creative reuse of glass waste. In summary, while significant strides have been made in understanding the environmental impact of glass waste, challenges remain in scaling innovative solutions and integrating

them into broader waste management strategies. By contributing to this field of research, the study aims to provide a deeper understanding of how glass waste can be repurposed artistically, offering sustainable solutions for both the environment and the creative industry.

3.0 Methodology

This study employed a qualitative research approach using a descriptive case study method. The primary data were collected through observations, interviews with artists, and analysis of glass waste utilization in creative and religious contexts. The selected case studies include glass waste applications in ceramic art, architectural ornamentation, and flameworking techniques used by local artists. Literature reviews further supported data to deepen the understanding of glass waste's environmental and cultural impact. The selection of specific artists and religious practices was purposeful, based on their prominent use of glass waste in their artistic and spiritual expressions. Artists who integrated glass waste into their works were chosen because they represent innovative practices in waste repurposing, particularly in the context of sustainability in the creative industry. The study focused on glass waste repurposed in creative industries, particularly ceramic art and religious-based artistic works. Local religious practices that use glass, such as creating decorative elements for places of worship or sacred objects, were also considered due to their cultural and symbolic significance in Yogyakarta.

Yogyakarta was selected as the primary observation site because of its strong artistic community and cultural relevance. The city is home to many artists and artisans known for experimenting with unconventional materials, including glass waste. This allowed for an in-depth exploration of how artists approach the environmental issue of glass waste while creating aesthetically, culturally, and spiritually significant works. The data analysis was conducted in two main phases: thematic and comparative. Thematic Analysis: The observations and interviews were transcribed and analyzed using a thematic approach to identify recurring patterns and themes related to glass waste repurposing. Key themes included the environmental awareness of artists, the religious symbolism attached to glass in religious practices, and the aesthetic considerations when using glass waste in art. The thematic analysis helped reveal how glass waste is perceived as an artistic medium and a material with religious or spiritual significance. Comparative Analysis: This phase involved comparing the practices of different artists and religious groups in their use of glass waste. For example, the methods used by ceramic artists to integrate glass waste into their work were compared to the use of glass in religious ornamentation. The comparative analysis highlighted the creative differences and similarities in how glass waste is treated in secular and religious contexts, thus enriching the study's understanding of the broader implications of glass waste repurposing.

Artists were selected based on their significant contributions to glass waste repurposing, particularly those utilizing ceramic and flameworking techniques. Flameworking was particularly interesting due to its ability to transform glass waste into new artistic forms that are both functional and decorative. Artists involved in ceramic art were chosen because they frequently experiment with mixed media, making them ideal candidates for studying the intersection of glass and ceramic materials. These artists' works address environmental sustainability and explore the aesthetic potential of reusing glass in unexpected ways. Religious practices involving glass were selected because they provided insight into how communities assign sacred value to repurposed materials. In particular, glass ornamentation in religious contexts was analyzed for its symbolic meaning, often representing purity, light, and transcendence. This choice allowed the study to examine how waste materials, commonly viewed as undesirable, could be recontextualized into objects of beauty and spiritual significance; by combining these different perspectives—artistic, cultural, and religious—the study aimed to provide a holistic view of glass waste repurposing, highlighting both its environmental benefits and its capacity to enrich creative and religious expressions. The framework was guided by Owen Jones' aesthetic theory, which emphasizes the relationship between humans and their environment through artistic expression, making it a fitting lens for analyzing these diverse applications of glass waste.

4.0 Findings

The findings of this study reveal the potential of glass waste as an alternative material in art and design, particularly in ceramics and decorative arts. In Yogyakarta, artisans have successfully incorporated glass waste into pottery, using it as a decorative element and a glaze substitute. The research demonstrated that when finely ground and mixed with other materials, glass waste can be applied to ceramics at firing temperatures of 1050 °C. This results in visually appealing, durable, cost-effective, and environmentally sustainable finishes. Additionally, religious symbolism was found to play a significant role in the utilization of glass waste in Javanese culture. In traditional Kudus houses, glass shards are used in roof decorations (wuwungan) that convey spiritual messages and cultural values. These decorations reflect the Javanese philosophy of "manunggaling kawula lan Gusti" (unity of the individual with God), adding a layer of religious awareness to the creative reuse of glass waste. Finally, the study highlighted innovative practices in flameworking, particularly in the work of Ivan Bestari Minar Pradipta, who transforms glass waste into high-value artistic pieces. His use of flameworking techniques allows for the creation of jewelry and abstract art, showcasing the versatility of glass waste as an artistic medium. These findings suggest that glass waste can be creatively reused with increased awareness and support, providing economic and environmental benefits.

5.0 Discussion

Glass has been vital in human culture, serving in magical-religious practices, jewelry, functional objects, and art. However, its production significantly impacts the environment. Glass is made from silica sand, soda ash, and limestone, materials often mined in ways that harm ecosystems. The manufacturing process requires high temperatures (around 1700 °C), consuming large amounts of energy, often from

fossil fuels, leading to greenhouse gas emissions and pollution. Additionally, poor glass waste management can cause injuries and long-lasting environmental harm. Although recyclable, glass recycling rates remain low, highlighting the need for increased awareness and sustainable production practices.

5.1 Glass Material and its Impact on Human Life

Unlike solid materials like iron or wood, glass is often seen as translucent and fragile. However, modern glass can be nearly as strong. Since the 1990s, glass has been famous in architecture due to its transparency, giving a sense of openness (Garg, 2007) while providing a modern aesthetic (Lestari, 2014). Glass varies in type due to differences in composition and manufacturing. However, silica sand is the primary material. Glass is chemically a supercooled liquid, with particles spaced far apart like in liquids, forming this structure when cooled quickly (Agus Cahyana, 2014). Though glass has many benefits, improper disposal can cause severe injuries and contribute to environmental pollution. It is non-biodegradable and increases carbon emissions during production, contributing to climate change (Pratama, 2019). Greenhouse gases like CO2 and CH4 are vital contributors to climate change (Mona et al., 2024). Managing glass waste requires responsible use, better recycling, and government policies. In places like Bantul, Yogyakarta, improper handling of glass waste has injured workers, with little done to address the growing waste issue.

Fig 2. Broken glass waste in Bantul Waste Management Landfill that has not been tidied up yet
(Source: Author's Documentation, 2024)

5.2 Glass Waste in Religiosity and Art Creativity

Ceramic artists have utilized glass waste as a decorative element in pottery, offering a creative solution to the abundance of glass waste, especially in Yogyakarta. Despite its small size, Yogyakarta faces significant waste management challenges, particularly after the closure of the Piyungan landfill in July 2023, which led to uncontrolled waste accumulation. Public awareness of waste management needs to be higher, even though regulations like Law No. 18/2008 encourage the 3R (Reduce, Reuse, Recycle) approach. However, waste sorting still needs to be improved, with mixed organic and inorganic waste, including glass (Ardhi, 2023). Culturally, glass waste holds significance in Javanese society, reflected in the phrase "ngenteni beling bosok" (waiting for rotten Glass), symbolizing the futility of waiting for the impossible. This philosophy is also seen in using glass shards in traditional Javanese decorative art, particularly in the wuwungan of houses in the Kudus region. These glass shards are arranged to create luminous, aesthetic designs with symbolic meanings, passing cultural messages through art (Suharson, 2022; Haryono, 2009). This tradition emphasizes that art and practicality can coexist in addressing waste, offering valuable lessons for modern waste management practices.

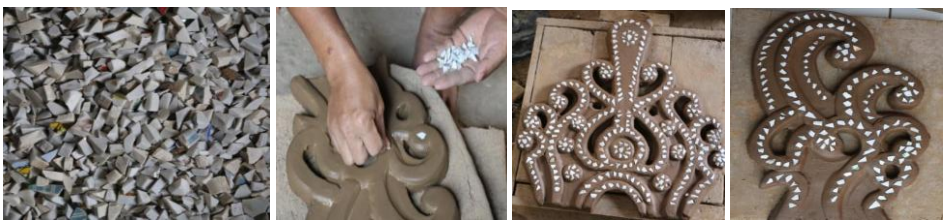

Fig 3. Traditional Kudus house with *wuwungan* decorative art creations using shards of shard/glass
(Source: Author's Documentation 2022)

The *wuwungan* decorative art in traditional Kudus houses serves practical and symbolic purposes. It protects the roof while conveying cultural and moral messages rooted in Javanese philosophy. In *joglo pencu* Kudus houses, three main patterns are placed on the roof, blending aesthetic design with cultural significance.

1. *Gunungan* patterns have a shape similar to the *gunungan* in shadow puppet art.
2. Vine, *lung*, or *ukel* patterns.
3. Cungkrik, gelung cekak, or rooster cockerel patterns.

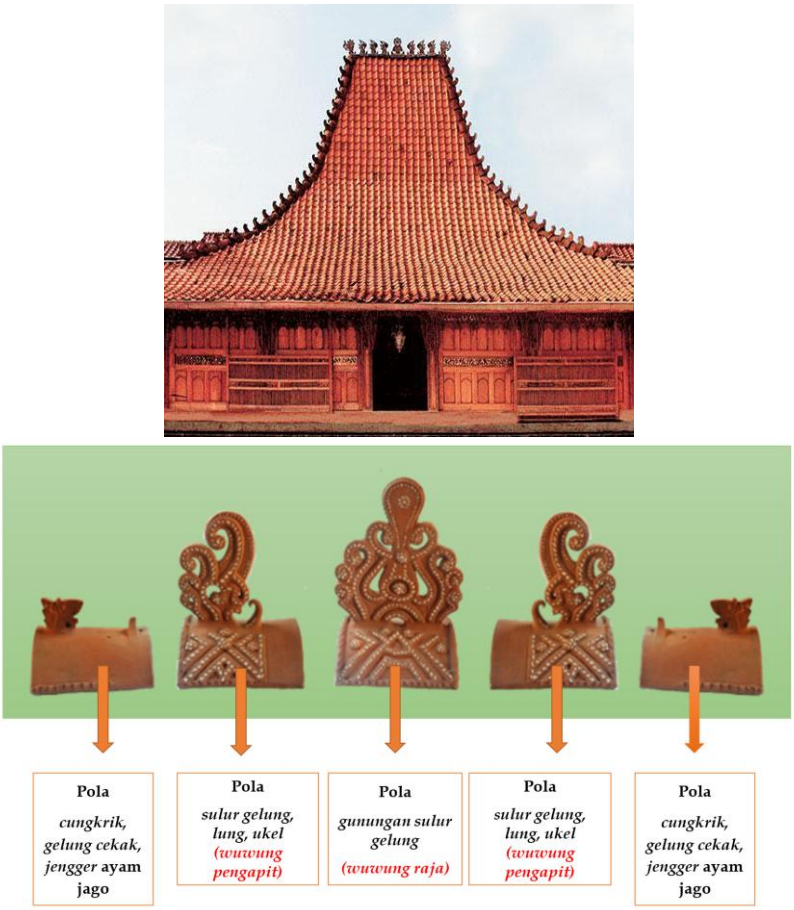

Fig 4. Traditional Kudus house with *wuwungan* decorative art creations using shards of shard/glass
(Source: Author's Documentation 2022)

The ornamental patterns in *wuwungan* art of traditional Kudus houses are rooted in the *gusjigang* philosophy (good, religious study, and trading) and avoid realistic depictions of living beings adhering to Islamic teachings. Owen Jones emphasizes that aesthetics in ornamental art stems from geometric constructions reflecting human-nature relationships (Jones, 2004). Kudus artisans incorporate nature and cultural acculturation into detailed and symbolic *wuwungan* designs, reflecting Javanese cosmology and the belief in divine light. The white porcelain shards at the roof's peak symbolize the connection between humanity and the divine (Pitana, 2014). Glass waste has also been creatively used in pottery. Transparent glass shards are applied decoratively to pottery pieces, adhering with glue and cement to cover imperfections. This approach emerged from broken pottery in Kasongan, and using glass fragments enhances the aesthetic appeal while reinforcing the structure. Andreola et al. (2016) highlight that glass waste can be successfully integrated into ceramics, producing durable products comparable to traditional tiles.

Fig 5. Glass waste is recreated in pottery products in Kasongan Village as plates, flower vases, and wall hangings.
(Source: Author's Documentation 2024)

Glass's flexibility should be leveraged for sustainable innovations that benefit the environment and future generations. One such innovation is using glass waste as an alternative glaze material for ceramics. This approach aims to educate artisans and the public on reusing glass waste instead of costly glazes like TSG. Glaze, primarily composed of glass-forming silica (SiO_2), can be replaced by waste glass materials. Fluorescent lamp glass waste, with its suitable thickness and softness, has proven particularly easy to process into the glaze. It can be crushed, screened, and mixed with colorants, making it ideal for ceramic surfaces. With a melting point of 600–

800 °C, glass waste adheres well to pottery, enhancing its character and color. Colored glass shards—blue, green, brown—maintain their hues after firing, offering versatile decorative potential.

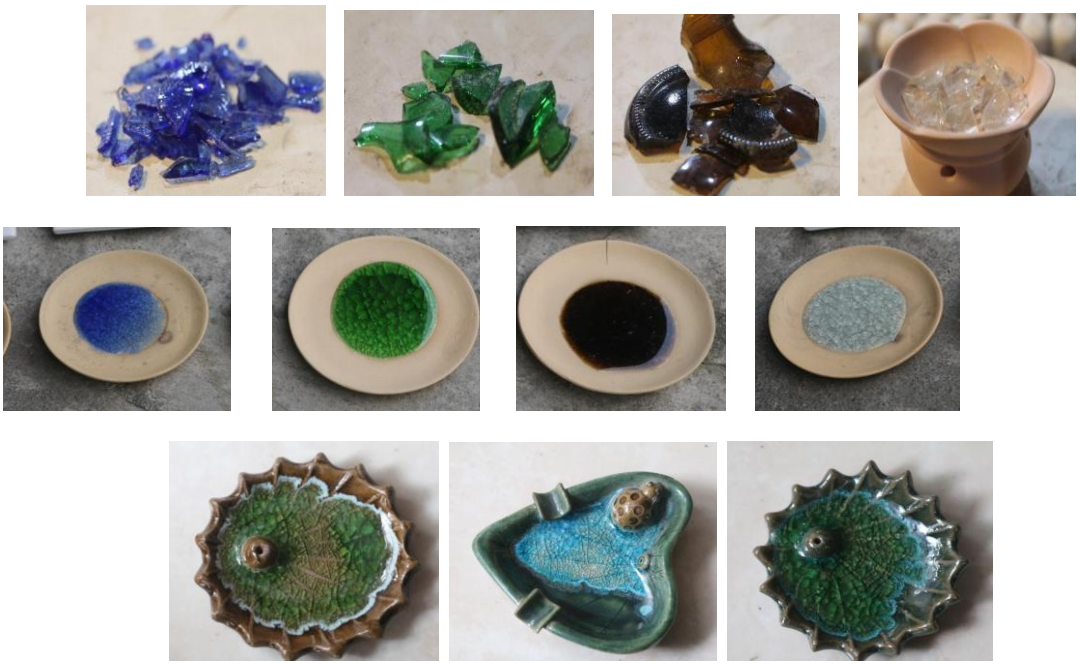

Fig 6. The result of the effect of broken glass waste sprinkled directly on the pottery/ceramic body with a convex side as an alternative finishing.
(Source: Author's Documentation 2019)

Our experimental research explores ways to use glass waste as a direct alternative for finishing pottery. We are working to find the best method for glass waste to adhere to pottery bodies with perpendicular sides, aiming for an aesthetic and value-enhancing solution. Ideally, this can be achieved without purchasing additional materials, using waste, or accessible resources. One technique involves crushing glass waste into a fine powder, mixing it with clay and water, and applying it to pottery bodies using a brush. Fired at 1050°C, the glass waste adheres reasonably well, although results are still being refined. This approach extends the life of glass waste and offers a creative solution to environmental concerns while enhancing the visual appeal of ceramics.

Fig 7. The result of the effect of powdered glass waste shards combined with soil and applied to ceramic products.
(Source: Author's Documentation 2019)

Fig. 8. Ivan's creative process in creating innovative works with glass waste
(Source: Pradito Reda Pertana, 2022)

Yogyakarta, renowned for its creativity and education, showcases artists like Ivan Bestari Minar Pradipta, who transforms glass waste into high-value art using the flameworking technique. This method involves melting glass with a furnace, stove, or torch at 1000–1200 °C (Nukke Sylvia, 2018). Ivan's gallery, Otakatik Creative Work, features unique glass creations, including jewelry and abstract pieces. He sources glass waste from other artisans, melts it with an LPG gas cylinder and oxygen, and shapes it into intricate designs, demonstrating his skill in producing decorative and functional art.

Fig. 9. Ivan's work with the flameworking technique
(Source: MLDSPOT, 2020)

Ivan Bestari Minar Pradipta's passion for glass art began during an internship at a glass blower in Yogyakarta, leading him to explore this rare art form in Indonesia. He transforms glass waste—such as mirrors, bottles, and stained glass—into unique handicrafts and jewelry. He uses two main techniques: hot working, involving fire, and cold working, which includes carving and grinding. Ivan's work exemplifies how glass waste can be repurposed to reduce environmental pollution. Both policymakers and individuals must actively prevent glass waste and recognize its potential. We can create high-value art and functional products by innovating and reimagining waste materials. This approach not only addresses waste management but also contributes to environmental sustainability.

6.0 Conclusion and Recommendations

This article presents an innovative solution to mitigate the environmental impact of glass waste through aesthetic and artistic methods. Case studies reveal that glass waste can be transformed into artistic creations, reducing ecological burdens and adding value from both creative and spiritual perspectives. This approach highlights the role of spiritual awareness and artistic creativity in developing sustainable solutions. The findings encourage further research and innovation in glass waste utilization, supporting broader environmental conservation efforts.

Acknowledgments

This research, generously funded by the Faculty of Visual Art at ISI Yogyakarta, focuses on Yogyakarta due to its vibrant cultural and artistic landscape, making it an ideal setting to explore the environmental and creative solutions to glass waste through art and religious practices. Yogyakarta, known for its integration of traditional and contemporary art forms, offers a unique environment where local artists and religious communities have repurposed glass waste in both symbolic and practical ways. A few case studies were selected to allow for a focused and in-depth analysis of these practices, enabling the research to delve deeply into the techniques, challenges, and cultural meanings associated with glass waste reuse. The study highlights broader trends in sustainable art practices and religious symbolism by concentrating on critical examples while offering insights that can inspire similar efforts in other regions. The selected case studies illustrate how glass waste can be transformed into culturally significant and environmentally responsible works, contributing to the growing discourse on sustainability in the creative and religious sectors.

Paper Contribution to Related Field of Study

This paper contributes to the study of integrating glass waste into art for environmental and spiritual benefits.

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