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RESEARCH ARTICLE

ARTISTIC ACOUSTIC PANEL RECYCLED MATERIAL FROM PLASTIC BOTTLES AND WASTE OF SAMPYAN, SAWDUST, HUSKS, STRAW

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ABSTRACT

Background - The problem of waste is one of big problems arise from various sectors. Recycling and reusing can be one good solution. Balinese people who still carry out traditions including the event with various arts, one of which is a beautiful offering. This beautiful offering is in the form of sampyan from art coconut leaves which ends as waste. In the past, when Balinese were going to cook, they could use fuel from this dry coconut leaves waste. On The Holidays for ceremonies, there is a 30% increase in waste. Even though this is a ceremonial waste, a balance in the relationship with God/Hyang Widi must be maintained in accordance with the Balinese concept of Tri Hita Karana. This concept is in the form of a balanced relationship towards Hyang Widi/God, to the fellow humans and to the environment that causes happiness. Therefore, waste must be processed. Husks and straw waste from rise field in Bali amounted to 54.65 million tons of GKG, then alot of sawdust waste from wood carving and wood architecture industries. This waste is often burned even though some are used for planting media and fuel. On the other hand, the tourism community and people in Bali produce 829 tons of plastic waste per day. Currently, appreciation of buildings with "Green Architecture" is a concern for tourism and will become of destinations. Thus, it will very possible in Bali. Purpose – provide economic value added for the community, wood workers and farmers and make the world a better place. Findings –Artistic acoustic panel recycled material from plastic bottles and waste of sampyan, sawdust, husks, straw. Originality/value – Acoustic Panel Material and Artistic Acoustic Panels with Balinese Architectural Ornaments is an original. Design/methodology/approach – Recycled plastic waste with the right mixture composition is heated and printed with a hot press machine. In this study, the Transmission Loss test was carried out using an Impedance Tube. Research limitations – Measurement of transmission loss on sheet panels has limitations. Measurements should be developed into room research.

KEYWORDS

Recycling Waste, Artistic Acoustic Panels, Balinese Architectural Ornaments

1. INTRODUCTION

Currently, waste is a big problem. The problem arises from various sectors. Recycling and reusing can be one of waste processed. This is a Sustainable Development Goals (SDGs).

Balinese people who still carry out traditions including the event with various arts, one of which is a beautiful offering. This beautiful offering is in the form of sampyan from art coconut leaves which ends as waste. In the past, when they were going to cook they could use fuel from this dry coconut leaves waste. However, nowadays, almost all people dispose of their event waste to the Final Disposal Site, which in turn becomes a problem for the government and the environment. On The Ceremony Holidays, the waste of the remaining event increases by 30% so it will be difficult to be handled by the environment without the intervention of people who love the environment.

Even though this is waste from ceremonies, a balance in the relationship with God/Hyang Widi must be maintained in accordance with the Balinese concept of Tri Hita Karana. This concept is in the form of a balanced relationship towards Hyang Widi/God, to the fellow humans and to the environment that causes happiness. Therefore, it does not damage the environment, waste must be processed. The environment will protect humans if humans also take care of it.

Bali tourism is undeniably very slumped in the conditions of the Covid-19 pandemic. Husks and straw waste from rise field in Bali amounted to 54.65 million tons of GKG, then alot of sawdust waste from wood carving and wood architecture industries. On the other hand, this waste is often burned even though some are used for planting media and fuel. This has the potential for air pollution

In addition, plastic waste produce from Balinese and tourism in Bali reaches 829 tons per day. Efforts are needed to educate people to action and this is done inclusively together with the community or children's creativity grup. This is continued and sustainable in the form of innovation. Innovation is carried out by processing waste into objects that have economic value added for farmers and the wood workers as well as the community and the children but still on standard Occupational Health and Safety.

According to a recent study, circular economy is one where the resources coming into the economy are not allowed to become waste or lose their value (Benton et. al., 2014). Plastic bottle waste that is initially considered

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as rubbish, evidently could be cleaned and then be processed into a new product that has money value.

Currently, appreciation of buildings with "Green Architecture" is a concern for tourism and will become of destinations. This appreciation is expected to give a positive response to tourism. Thus, Green Architecture buildings with ornaments and building materials from recycling and reuse of waste are very possible in Bali.

2. Literature Review

Research on products related to architecture in the form of tiles from recycled materials using plastic has been widely carried out. Research on plastic waste with a mixture of wood waste for tiles has also been carried out. Research on plastic waste tiles related to specifications for scratch strength, tensile strength and heat strength has also been found (search on websites about patents and Intellectual Property Rights). Stage of the art as reserch gap, research on panels made from plastic waste with a sampyan waste, husks and straw waste, also wood sawdust waste with acoustic specifications has never been carried out. The sampyan ceremonial waste will never stop, as long as Balinese people have the Tri Hita Karana concept. In addition, related to ornamentation tourism building in Bali, such efforts as mentioned above also need to be carried out. Therefore, research according to this title needs to be done.

Ida Bagus Putra Wirabawa, the head of the Denpasar Environment and Hygiene Service (bali.antaranews.com), said that after the celebration of Galungan Holyday there was the volume of waste increase a 20-30 percent in compared to the regulary day the average is 800-950 tons per day. On the occasion, he emphasized that the surge in waste was dominated by organic materials, such as ceremonial waste in the form of sampyan/art coconut leaf. On every ceremony of religious holidays, this public service is always standby because the volume of waste tends to increase. In addition, it is recommended that organic and inorganic waste be separated before being disposed of, in order to provide convenience in further handling, such as processing organic waste into compost. From the explanation above, it is significantly conveyed that the waste left over from the ceremony in the form of sampyan really needs attention.

Rice waste is the residue from the rice harvest carried out by farming communities. This waste is rice hull/husks and straw. Husk waste in unprocessed conditions can be used as building materials for wall. Research has conducted on the Correlation of Temperature, Humidity, and CO2 Level of a Rice Hull Insulated Indoor Environment (Lee, et al, 2018). As a result of temperature monitoring, the average temperature of mock-ups showed no significant difference, and thermal capacity of the rice hull was higher than EPS. Therefore, rice hull was confirmed effective in thermal stability. Rice hulls were confirmed effective concerning temperature and humidity control in an indoor environment.

In addition to utilization in raw conditions, rice waste can also be used as building material through processing. Research shows that rice waste/husks and straw can be used as the basic material for making sound absorbers (Rohim et al., 2020). The test material is a mixture of resin, husk and straw. This research is a type of laboratory experimental research with measurements using Impedance Tubes.

A study on the utilization of wood sawdust waste as a substitute for a soundproof lightweight brick mixture. It was concluded that the addition of sawdust can affect/increase the absorption value the better (Purba and Lubis, 2018).

For plastic waste, please note that there are two types of plastic. The first type is thermoset, which is a plastic whose constituent polymer, it cannot change when it is formed / hardens when the temperature is cold. In other words, thermosets cannot be melted or recycled. While the second type is thermoplastic, which is polymer plastic that hardens at low temperatures and melts at high temperatures. Thus, plastics that can be recycled are thermoplastic type plastics (Winnerdy and Laoda, 2020).

The type of plastic that will be used in the manufacture of this acoustic tile is PET (Polyethylene Terephthalate) plastic, this type of plastic is usually found in drinking water bottles, the use of this type of plastic cannot be used repeatedly because it can potentially cause cancer. The potential of plastic waste to be used in the manufacture of acoustic tiles is as an adhesive between the materials used. By using clear plastic material, the beauty of the motifs and natural colors of the filler waste material will be seen.

From the explanation above can be used as a reference that the use of rice waste and wood waste can absorb sound, but no one mentions the use of sampyan. Artistic acoustic panel material recycled from plastic bottles and waste of sampyan, sawdust, husks, straw have originality values

3. Methodology

The use of sampyan waste as a novelty for this research is collected by the community because its is very close in everyday life and Holidays of Balinese. The research steps carried out show the stages carried out from preparation to the implementation outputs research.

The waste of sampyan, husks, straw, sawdust, and plastic bottles were collected from various sources, from environmentally conscious communities, waste banks, post-harvest communities and collected in one place in comunities building of banjars or village.

Organic materials consist of sampyan, husks, straw and sawdust waste dried by drying on the sun shine for 2 weeks without rain (if it rains, an oven is needed). Furthermore, each raw material is chopped with a chopping machine and mixed with the same composition. Next, the waste plastic bottles are mixed with composition of 40% organic waste and 60% plastic waste bottles that function as adhesives. The plastic bottle material is PET (Polyethylene Terephthalate) plastic. One unit of mixed dough weighs 5 KG. Mixing of waste as a raw materials is carried out with a blender then heated and printed by hot press machine. The panel size is 50 CM2 (smaller than that tends to be called a tile). Research using an Impedance Tube to find out the sound loss, namely The Transmission Loss test was carried out at Building Science and Technology Laboratory, Department of Architecture, University of Hasanuddin.

Figure 1: Initial research panel printed in Weedo - BRP-Bali Foundation Rare Paduraksa. Foto: Ghana 2020

Figure 2: Artistic Acoustic Panels from recycled materials of sampyan, husks, straw and sawdust waste. Foto: Ghana, 2020

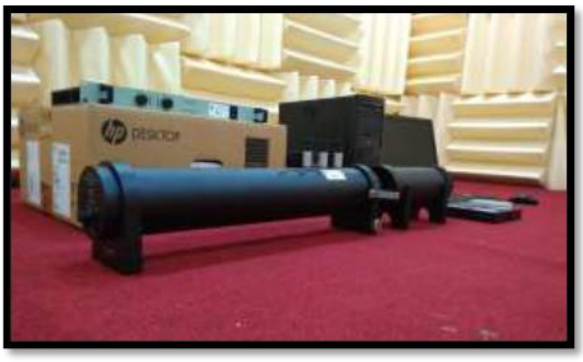

Figure 3: The Transmission Loss test using an Impedance Tube was carried out at the Building Science and Technology Laboratory, Department of Architecture, University of Hasanuddin. Foto: Asniawaty, 2021

This very recent study has limitations. Research should be carried out on various compositions according to the attenuation requirements of each room. At that time, research were used with a sound level meter

4. Result and Discussion

From similar research studies, it has been seen that the waste materials used can reduce sound. Some studies with rice hull, and another with husks and straw (Lee, et al., 2018; Rohim et al., 2020). While others with sawdust waste (Purba and Lubis, 2018). Which shows the ability to reduce can affect/increase the absorption value. These materials are basically materials for making sound absorbers.

Research is a laboratory experimental research with measurements using Impedance Tubes. From materials in the form of panels made of sampyan, husks, straw, sawdust, plastic bottles waste, tested at the Building Science and Technology Laboratory, Department of Architecture, University of Hasanuddin, It was found the results of measurements as shown in the table.

Tabel 1: Average Absorption Coefficients

Freq [Hz]	Average Absorption Coefficients
1.200	0.10
1.390	0.15
1.480	0.20
1.530	0.25
1.570	0.30
1.600	0.35

The table shows that there is a transmission loss with an average absorption coefficients which indicates that the higher the frequency, the higher the absorption coefficient.

5. Conclusion

The new material used in the form of sampyan provides added value because this material is in the daily life of Balinese people and also on Holidays. The use of other waste in the form of sampyan waste is a novelty for this research. In addition, Artistic Acoustic Panels from recycled materials with Balinese Architectural Ornaments is an innovation that has never been presented before.

This research is an initial research that needs to be improved with various compositions and various possibilities, so that optimal acoustic materials are obtained from waste basic materials. In addition, there are noble ideals to protect the universe from environmental damage.

Further research can also be carried out in a room that requires low noise levels, such as studio rooms and home theaters.

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