Buto character developing with utilization of firewood waste to eco-friendly eco-artworks

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Abstract. Firewood waste is a discarded item, and some people used substitute for stoves or cooking utensils for both industrial and household. Firewood smoke affects the air, environment pollution and global warming. Research used a qualitative method and actions with creative ideas to be prototype by utilizing firewood waste into eco-artworks, several prototypes from wood waste with various types of wood, mahogany, teak, and silk tree/sengon wood waste. They aims to gain a deep understanding programs directed at the creative process in response to environmental damage. Besides being a source education to the public, they can also be used as cultivating sensitivity to protecting the natural environment. In addition, eco-artworks from firewood waste is represented become a eco-friendly concept to relevant program namely reintroducing Indonesian culture, especially for buto character to public.

1. Introduction

Wood has a variety of functional values, from logs into furniture, furniture, houses and the needs of the carpentry industry in Indonesia, according to data in statistics that the demand for raw materials for the wood industry reaches 60 million m3/year [1]. In 2014 the production capacity of the Timber Forest Products Primary Industry (IPHHK) was 70.013,474 m3 and only 2.000 m3/year. According to the Regulation of the Minister of Environment and Forestry P.1/MENLHK/SETJEN/ KUM.I/1/2019 concerning Forest Products Primary Industry Permits that Harvesting Waste is all types of wood left over from trunk division in the form of stump, defective/rotten/gerowong wood with reduction above 40% (forty percent), branches and twigs left in the forest [2]. For individuals in rural areas, sub-district and sub-district levels, that firewood waste is disposed of as waste, and some people use it as a substitute for stoves or cooking utensils for both small industry and household needs. For the primary industry, a business permit for the primary industry of timber forest products or IU-IPHHK is required with a Production Capacity of 2.000 to 6.000 m3/year.

People used wood waste for cooking needs, with the technique of burning to produce fire, but will be pollute of the air, if wood burning lasts long and with large volumes, can massive pollution and
possible that climate change. also the industryfree used wood waste as a substitute for gas, the smoke of each region will be continue to grow, the percentage of pollution will be higher. They many businesses utilizing wood waste and powder, and they are used as economic goods, it is hoped that the community will have economic value for the use of wood waste, there are several areas that already have their communities related to the nature of the use of wood waste. The existence of industries that utilize wood waste and sawdust into selling points, such as furniture, furniture, craft, etc. Findings related to pine wood waste that can be used as an alternative because of the soft nature of pine and has straight and smooth fibers. Furniture wood waste can be an option to replace polystyrene material, because wood is a material that is easily biodegradable. An industrialised construction method can significantly reduce the amount of wood waste, this indicated that the use of prefabricated (or precast) concrete structures reduced the wood waste generated by 70–90% (by volume) in commercial and residential building [3].

People's behavior today leads to the consumption of environmentally friendly products (green consumer) [4], but unfortunately only a few areas have people who have these characteristics. With the above conditions, the author tries to conduct research related to the use of firewood waste into works that are environmentally friendly and do not pollute the environment. With the use of wood waste, it is hoped that it will reduce the wood used by the community for firewood and reduce environmental pollution. The recycling potential of woodwaste is still low, mainly caused by a lack of sustainable reusingor recycling applications [4], contaminants represent a real issue in waste manage-ment that can conduct to health and environmental issues during the end of life of wood. there are companies that try to process used wood into materials such as boards, boards, hardboards, etc., with the aim of reducing waste or wood waste from industry. Wood recycling requires special technologies for the segregation, cleaning, and preparation as EWPs, plywood for instance, contain both a number of adhesives [5].

Many ways to utilize wood waste, and require special treatment, such as in developing the character of Buto into environmentally friendly artwork, with a cultural concept to be aiming to reintroduce the character of Buto in the form of artwork made from used wood. Techniques of carving, sticking, nailing, one of the ways to make the wood leather. Also many wood parts are thrown away from wood waste, they could be formed into environmentally friendly works of art. Types of wood can used are very diverse, teak, mahogany, pine, oak, etc. all wood waste can be used in the manufacture of Buto artworks. Eco-friendly will be the basic concept in this artwork.

Wood waste that is disposed of for firewood, various types of mixed wood (Figure 1). Large size of wood waste from the furniture industry or used from buildings, type of mahogany and silk tree wood/sengon with size between 20-50 cm (A). Second figure is wood waste from wood shavings, we often find wood shavings waste which used for industrial fuel, brick burning media, etc. we often find waste wood shavings from furniture manufacturers with small shavings, wood type of teak (B). Wood waste with small size from industrial waste, waste from often used for firewood with medium size, variations in type of wood an type of teak and mahogany wood, size 5-15 cm (C).

![Figure 1](image_url)

**Figure 1.** Wood waste with variation pieces with large size, type of mahogany and silk tree wood/sengon (A), Wood shaving of teak wood (B), Small size wood, type of teak and mahogany wood (C)
2. Research methods
The research was conducted in Colomadu, Karanganyar which has many wood waste and potential to be developed for action research to less pollution. This research was a action research with descriptive study method using a qualitative approach. Data collection was carried out through several methods including site observation, in-depth interviews, document study methods. The sampling technique was carried out by using purposive sampling method [6]. Data were analyzed using an interactive analysis model. The action that will be taken is to try to use the research results into a prototype work related to the utilization of wood waste into environmentally friendly works of art with the visualization of the buto character which is considered more attractive and expressive.

In addition to interactive analysis, this research also used 4-A analysis. The 4-A analysis used to assess wood waste potential to support the development of eco-friendly eco-art (Attractions), wood waste locations can be accessed (Accessibility), facilities currently exist and facilities need to be provided to support development of wood waste of firewood, as well as activities while visiting wood waste sites and eco-art production [7].

3. Results and discussion
The potential for wood waste, especially materials for firewood, varies greatly from the size of large pieces that are not neat because of intact wood waste, some are small pieces of waste from industrial production. Often we find wood waste in the form of shavings from former shavings in the furniture industry. Many industries use this waste as use value and function, such as furniture, furniture, partitions. Wood waste is crushed and recycled into hardboard plywood sheets, plywood, Pressed wood shavings fragments or wood shavings which are compacted into sheets measuring 224 x 144 cm. Findings demonstrated that about 1.0 million tons of wood-waste recycled per year in building construction, paper, furniture, and energy industries [8].

Industrial wood shavings waste is a soft and good material in creating works of art, wood of various types does not cause problems for artists. Machine shavings also have various sizes, some are 1-5 cm with a thin thickness of 0.2-0.5 cm, with a rough texture that is also curved due to shavings or machine friction. the utilisation of waste wood materials both in the form of wood powders and wood fibres provides a greener alternative for the waste recycling of industrial debris with respect to the existing waste management options [9].

The ideas for creating artworks with wood waste materials have been carried out by artists, it's just that the art designs are very diverse, artists create works of art from medium cuts, this is usually used to design sculptures, such as fauna in the form of horses, giraffes, lions, tigers, humans, etc. This statue is formed from a combination of wood waste with various sizes. The technique used by attaching one wood to another wood, also using nails.

The purpose of this research is to make art from wood waste is to reduce the waste that is often used for firewood. More firewood for burning and cooking processes will pollute the environment and air, because the volume of CO2 increases, clean air will be polluted. In the long term the air will interfere with breathing and air as a whole and is likely to be a change in climate in the area or more broadly.

There are many types of wood shavings, with mahogany, teak, and other types of wood. Types vary with different fibers depending on the type of wood. For teak wood, it will be softer and softer, with more water content which will make this wood waste more flexible and easier to process. Apart from teak, mahogany has coarser fibers but the texture will be more visible after the molding and drying process. So the type of wood will determine the shape and wood grain seen in the final finishing process.

After doing research, the design process starts from making a sketch which then makes a draft of the artwork from wood waste from machine shavings, which is mixed with wood powder, then starts making molding from cement, then combines all the ingredients, namely waste wood shavings and sawdust mixed with wood processing glue affixed to the mold that has been prepared, after drying begins the process of finishing and sanding the raw materials.

Wood waste disposed of firewood shaving, various types of type of wood shavings, an waste from the furniture industry, used whole wood shavings or logs that are shaved to them smooth and precise.
Also wood of type variety with fiber structures an soft, sleek, mild (Table 1). Type of wood shavings, Teak wood shavings, with fiber structure of soft, sleek and mild (A), Oak wood shavings, Fiber structure type of hard and sleek (B), Pine wood shaving, type of fiber structure are soft, sleek and mild (C). Type of wood shavings for silk tree/sengon and mahogany, with different fibers from others (Figure 3). Silk tree/sengon more wet elements contains, also soft and mild (A), mahogany wood shaving more dry element contains, they are hard and sleek too (B).

### Table 1. Type of waste wood and fibers structure to artwork.

| Type      | Fiber Structure         |
|-----------|-------------------------|
| Teak      | Soft, sleek, mild       |
| Mahogany  | Hard, sleek, dry        |
| Oak       | Hard, sleek             |
| Pine      | Soft, sleek, mild       |
| Silk Tree | Soft, mild, wet         |

(Figure 2). Figure 2. Type of wood shavings, Teak wood shavings (A), Oak wood shavings (B), Pine wood shaving (C)

(Figure 3). Figure 3. Type of wood shavings, silk tree/sengon wood shavings (A), Mahogany wood shavings (B)

Type of wood shavings for the Buto artwork is influenced by element of wood, like a teak wood, mahogany, slik tree/sengon, all artworks produce different fiber structures, this variation can be seen in the picture. Buto character from silk tree/sengon wood shavings, looks soft, moist and the color is brighter (Figure 4). Buto character from teak wood shavings looks Soft, sleek, mild and heavier with little bit to red color (Figure 5). Buto character from mahogany wood shavings looks hard, sleek, rough,
dry, also the dark color to be heavier (Figure 6). Buto character from teak wood shavings with paint coloring, more complex and looks sturdy and durable (Figure 7).

Figure 4. Buto character from silk tree/sengon wood shavings

Figure 5. Buto character from teak wood shavings

Figure 6. Buto character from mahogany wood shavings

Figure 7. Buto character from teak wood shavings

4. Conclusion

Wood waste, especially those used as firewood media and furniture/furniture media, can actually be used more widely, apart from being useful goods and complementary functions but also works worthy of high art, besides being targeted and conceptualized to develop the buto character. Become more value, become a product of art but also culture and not the essence of Indonesian culture. It is hoped that from this research, similar research will emerge in developing wood waste into works of art with cultural elements. It is an advantage and uniqueness if every artist has the ability to work with wood waste materials and at the same time culture. In addition, the benefits of using wood waste materials into works of art will reduce air pollution produced by firewood while reducing climate change.

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