Utilizing the wood waste for eco-friendly mixed-media artwork

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Abstract. Wood waste can be found easily around us. It is usually used as household fuel resulting burning smoke that pollutes the air and reduces oxygen intake, later it would have a contribution to climate change. As alternative, to reduce air pollution due to wood waste combustion, it can be use as part of media artwork. This study used action research to create mixed-media artwork by utilizing the wood waste to reduce wood waste from industry. The results of this study are expected to help maintain eco-friendly industry and reduce the impact of climate change.

1. Introduction
The use of wood waste for firewood as a cooking medium is still quite high in Indonesia. In 2017 it was estimated that 31.3% of people in rural area still cook using firewood. Meanwhile, on 5.15% of people in urban areas use wood waste for cooking. The types of wood waste used for firewood include wood pieces, twigs, bark, wood sawdust, wood from fallen trees, industrial wood, and leftover wood from house demolition. The wood waste is used as firewood for industry, wood-burning stoves, household cooking needs, and food stalls with traditional concepts. The total amount of wood waste used for firewood may pollute the air around us. Wood-burning stoves can have a detrimental effect on indoor air quality while the alternative-fuel appliance emits pollutants indoors too [1]. The smoke produced from burning wood is as harmful as pollutants from burning minerals and motorized vehicle engines that damage the lungs [2]. In his research, George Thurston, the director of Particulate Matter Health Effects Research Centre in New York, found that the smoke from burning wood can irritate the respiratory system and has been shown to have adverse health effects on the lungs, especially children. The major concern regarding pollution and health today is that elevated air pollution has been directly responsible for the increase in mortality and morbidity rate in the general population [3]. Most of the common pollutants can directly affect the respiratory system, especially the lungs [4]. Detriments in air quality cause adverse changes in the lower respiratory tracts of susceptible individuals [5].

A solution is needed to reduce wood waste used for firewood. Wood scraps, which are usually produced by furniture factories, will only become waste if people cannot find the way to use them. In fact, wood scraps can be upcycled to become objects that have a function again [6]. Other research suggests replacing wood-waste burning stoves with gas. However, this is not an optimal solution because it is related to the economy of each person. Not everyone in Indonesia can afford to use gas fuel as a medium for cooking. Restaurants and industrial entrepreneurs also often prioritize advantage over
health. From the research results, the most widely used fuel is firewood with a percentage of 82.5% and the least used fuel is gas with a percentage of 7.5% [7]. Another solution is to try to reduce wood waste and use it for handicrafts. Utilizing wood waste as a material for functional goods add value to it and it can boost the economy in the craft sector. In this research, an additional solution was identified, namely creating mixed-media artwork using wood waste as the main ingredient. The wood waste used is the one usually used for firewood. The main goal is to reduce wood waste, thus reducing air pollution due to wood burning smoke.

2. Methods
This research sought to explore the potential of utilizing wood waste to reduce firewood waste and air pollution. This research was an action research using descriptive qualitative approach. The data were collected using several methods including field observations, in-depth interviews, and document study. The action taken was to use the research results as a prototype work related to eco-friendly mix media artwork because the material used for this artwork was firewood waste. In addition to action research analysis, this research also used methods to assess the effect of wood waste on the environment. The use of wood waste was selected because it is easily accessible and it can help reduce the air pollution due to the use of firewood. It can also support the development of eco-friendly mix media artwork industry.

3. Results and discussion
Wood waste is widely used for firewood especially in suburban and rural areas. The smoke resulted from the furnace can spread and cause pollution within a radius of 50-100m, depending on the wind speed in the area. The air pollution will interfere with respiratory health. A study stated that pollution also pose high risks to health. Air pollution adds CO2 to the air and can cause pneumonia or bronchitis. It is estimated that globally, there are eight people who die each minute, or 4.3 million people annually, due to diseases caused by air pollution. When people breathe, air containing harmful particles will be inhaled into the lungs [8].

Wood waste has actually been used in crafts or for other equipment. However, not all types of wood is used. People prefer durable and quality wood. Wood waste with low quality, such as bark, “sengon” wood, low quality mahogany, and teak wood waste with messy cuts are often thrown away and become cooking fuel.

The researchers tried to explore and observe the volume of wood waste used for firewood per day and the total in a month. The number then compared to the use of gas stove. The results showed that the monthly consumption of firewood of the rural households studied ranged from 165 - 256 kg. The action taken was to utilize wood waste into eco-friendly works of art in the form of mixed-media. The eco-friendly concept is the activity, guide and policy that seeks to maintain environmental conditions by applying various ways. The results and discussion related to the specifications of the type of wood waste, the cost of using it in a day and in total in a month is shown in Table 1. This section also discusses the way to create mixed-media artworks using wood waste materials. The quantity and cost analysis of using wood waste as Firewood was carried out in several food stalls in Colomadu District, Karanganyar Regency– Indonesia. One stick of firewood costs IDR 1,000. The daily need is 30 sticks, the weekly need is 210 sticks, and the monthly need is 900 sticks (Table 1).

| Time  | Total Stem | Cost ( IDR ) |
|-------|------------|--------------|
| Day   | 30         | 30,000       |
| Week  | 210        | 210,000      |
| Month | 900        | 900,000      |
Figure 1 shows wood waste that is wasted or used as firewood. Figure 2 shows several types of wood in different sizes in the forms of logs and tree branches. Figure 3 and 4 shows wood waste used for cooking in large and small stoves. People need a lot of logs in a day, as shown in the calculation of Table 1. Figure 5 shows the process of making artwork from wood waste. The final artwork of the eco-friendly mixed-media artwork can be seen on Figure 6, 7, and 8. Figure 9 shows all the needs for the production process, starting from the concept, preparation of wood waste, equipment, selection of wood shapes, cutting, creating the artwork, to finishing. This requires a structured and appropriate stage of initial concepts and ideas.
4. Conclusion
The utilization of wood waste is needed to reduce air pollution due to the use of firewood. Some previous research has proven that pollution from firewood can interfere with health, especially for children. Air pollution control program is needed to minimize the impact of climate change. One of the latest solutions is the utilization and reduction of wood waste that was previously used for firewood into an eco-friendly mixed-media artwork. This is an effort to protect the environment from the increasingly widespread air pollution. The result of this research is expected to bring a new hope and benefits in reducing pollution and developing art work using mixed media.
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