Utilization Of Wood Waste Materials To Make a Unique Public Trash Bin

Elisa Liliani Winata
Petra Christian University
**Corresponding author. Email:* elisa.liliani@gmail.com

ABSTRACT

Indonesia has a wealth of diverse natural resources, one of which is wood. Because of that, there are also many wood industries and wood craftsmen in Indonesia. The wood industry and craftsmen will certainly have wood waste from their production process. If this wood waste is not handled immediately, itwill pollute the environment. Therefore, an idea emerged to utilize this wood waste to be recycled and used as a public trash bin. In Indonesia many people litter in rivers, streets, and other public places. As a result, streets look dirty, rivers can get cloggedand cause flooding. The purpose of this scientific paper is to reduce wood wasteby designing a public trash bin, that also helps to reduce waste scattered in public places. The public trash bin is uniquely designed that attract people's attention to dispose of trash in its place. The method used is the design thinking method, which is consistingof five stages, empathize, define, ideate, prototype, and test. The result of this scientific paper is the design of a public trash bin that can reduce wood waste and overcome environmental pollution.

Keywords: *Environmental pollution, wood waste recycling, public trash bin design*

INTRODUCTION

Wood is widely used as the main material for various products in Indonesia. Thisis because Indonesia has abundant natural resources. According to data from the Central Bureau of Statistics, log production in Indonesia in 2021 is increasing compared to previous years (Widi, 2022). The wood industryin Indonesia is growing rapidly, many businesses use wood as a raw material. These businesses have wood waste from their production, that is not properly handled, causing environmental pollution (Sutarman, 2016). Therefore, the problem of wood waste must be handled immediately, so it will not pollute the environment.

Environmental pollution in Indonesiais also caused by people who often litter. According to research, most of the Indonesian people litter because of inadequate facilities and infrastructure (Marpaung, Iriyanti, & Prayoga, 2022). Other than inadequate public trash bins in Indonesia, there is also only one type of wastebin, where all types of waste are mixed into one. However, considering the many types of waste that exist, it is very important to providesegregated waste that helps sorting at the final disposal site. If people do not change this habit, it will certainly be bad for the environment andthe health of Indonesian people.

Seeing the two problems above, anidea emerged to utilize wood waste, that is recycled and designed to be used as a public trash bin. The public trash bin is also designed with the distribution of three types of waste, namely, organic, inorganic, and B3. The purpose of these design ideas is to reduce wood waste by using it as a material for makingpublic trash bins. In addition, the presence of these trash cans in public places is expected to be able to change the habits of Indonesian people who often litter. This product is justan initial conceptual idea that still needs to be produced so that it can be tested.

LITERATURE REVIEW

A. Wood Waste

Wood waste is a solid waste consistingof wood pieces or particles generated by a product or waste from wood product manufacturing (Law Insider, n.d.). Wood wastein Indonesia comes from forest harvesting andwood processing industry. Harvesting wood inthe forest can result in a wood residual from trees and around the trees that have been damaged during harvesting. The wood residualcan be classified into four types, that are branches and twigs, stumps, broken stems, and fallen trees. Meanwhile, waste from the wood industry is classified into damaged wood, sawdust, woodcuts, and wood blocks. (Haryanto, et al., 2021).

The data that have been obtained gives the conclusion that wood waste in Indonesia comes from two sources. If usedproperly, this wood waste can become a potential material for making a new product that has artistic and selling value.

B. Benefits of Wood Waste Recycling

There are several benefits of recyclingwood waste. The main reason is to limit the various types of wood that are going to be cut down to make new products or furniture. When wood waste is recycled, it fills the need for new wood to harvest. Recycling wood wastealso helps to reduce wood waste that accumulates in landfills. The last reason for recycling wood waste is that it is cheaper to make a product from wood waste compared to using new wood. It helps to keepproduct prices affordable (Pierucci, 2022).Wood waste can be recycled in many ways; therefore it is easy for people to come up with ideas from wood waste.

C. Types of Trash Bins

Trash in the surrounding environmentcan be overcome by having public trash bin facilities. There are many different types oftrash bins for waste management. First, commercial garbage bins, ideal for large amount or volume of waste. Second, recycling bins for recyclable items. Third, medical wastebins for clinical waste that comes from health care facilities. Fourth, disposable garbage bins, containers that is suitable for outdoorgatherings. Fifth, wheelie bins, are bins that come with two wheels, these bins make the cleaning worker to move heavy trash easier.

The last one is designer bins, trash cans that are available in many colors and designs to seamlessly integrate with the environment (Power Bear, n.d.). Of all the types of trash binsabove, this design is more focused on combining commercial garbage bins with designer bins and recycling bins.

D. Dimension of Public Trash Bins

There are many different sizes of public trash bin, these sizes categorize into 3, small, medium, and large (City of Nanaimo,2022).

Figure 1. Dimension of Public Trash Bins(Source: nanaimo.ca)

The picture above, are one of the sizesthat usually use for public trash bin. The 120- litre has a length of 62 cm, a width of 47 cm, and a height of 95 cm. The 240-litre has alength of 69 cm, a width of 68 cm, and a heightof 111 cm, meanwhile the 360-litre trash bin has a length of 85 cm, a width of 74 cm, and a height of 111 cm. These measurements will bea reference in designing public trash bins fromwood waste later.

E. Public Trash Bin in Indonesia

The distribution of types of waste in Indonesia is generally divided into 3, namely easily decomposed waste, recyclable waste,and hazardous and toxic waste (B3). In its management, B3 waste must be separated from other types because it contains hazardous substances. Therefore, it is important to sorting waste, so it doesn't mix in the final disposal site, or called *Tempat Pembuangan Akhir (TPA)* in Indonesian, which can cause health problems for the surrounding community (Tim Publikasi Katadata, 2020).

The Indonesian Ministry of Environment said that ideally waste separation is divided into five categories, namely B3 waste, easily decomposed waste, reusable waste, recyclable waste, and other waste. However, many regions in Indonesiaonly provide 3 types of waste separation, namely organic, inorganic, and B3. Although this sorting of waste is included not enough because of the various types of waste thatexist, there are still many public places in Indonesia that do not provide such sorting waste. Many still use only one trash can, whereall the trash is combined into one. This makes it difficult to process waste at TPA.

METHODOLOGY & DATA

This scientific work uses the design thinking method to provide solutions to problems. Design thinking is a process of understanding users, stating the problems, creating an innovative solution, makingprototypes, and doing tests on the product. It is a useful method of solving a problem. The method has five stages, that are empathize, define, ideate, prototype, and test. (InteractionDesign Foundation, n.d.).

A. Empathize

First stage in design thinking, is starting with observing the surrounding environment and looking for literature datarelated to the object that will be designed, thatis public trash bin from wood waste material. The data obtained from this stage is data on wood waste produced by Indonesia's sawmill industry which produces 40.48 percent waste,consisting of sawdust and wood chips. Meanwhile, the plywood industry

waste was 54.81 percent, consisting of lumpy pieces, remaining peeled sticks, wet veneer, shrinkage, dry veneer, trimmed ges of plywood, sawdust and, plywood dust (Djoko, 2009). So tha can be concluded that wood waste in Indonesia is very diverse in type, size and shape from this stage it is also found that 50.8 percent of respondents in five big cities inIndonesia do not sort waste. Of the 50.8 percent of households that did not sort their waste, 79 percent said they did not want to bebothered, according to the KIC survey (Tim Publikasi Katadata, 2020). Therefore, these two problems are important to address, sothat Indonesia can become a country that has a clean and healthy environment.

B. **Define**

The stage of defining and identifying the problems that have been found. The output of this stage is the define of the problem, namely the large amount of wood waste in Indonesia. The wood waste is accumulating in landfills which causes the environment to look dirty. Second problem is trash that are scattered in public places that cause environmental pollution and impact on human health.

C. **Ideate**

The stage of proposing a solution to the problem. For this scientific work, the solution is to design a public trash bin. The output in this stage is a design concept, two design alternatives with different forms and an analysis of the advantages and disadvantages of each alternative. The use of a design concept and alternative designs are to give the best result for the design of public trash bin.

D. **Prototype**

Prototype is the stage to visualize the concept design and the selected design alternative of the public trash bin in three-dimensional form. The use of prototyping is to make it easier for people to see the visual formof objects in real terms. The output in this stage is the construction drawing and 3Dmodel rendering of the public trash bin.

E. **Test**

The test stage is a stage of testing the design to find the advantages and disadvantages of the design. The output in thisstage can be in the form of reviews or input from users of this public trash bin, namely the people at the community so that this design can be developed in the future. But for this scientific work, it is still not possible to carry outthis stage because the design is still in the formof a prototype whose product has not been realized on an actual scale.

DISCUSSION

A. Design Concept

This public *trash* bin focuses on recycling wood waste and use it as the main material. It also focuses on the function as a commercial garbage bin, which means that thebin has the right size to accommodate community waste. It functioning as a recycling bin as well, which means that trash bin will be designed to be divided into 3 categories ofwaste, namely organic, inorganic andhazardous waste or called B3, accordance with the public trash bins that are generally found in Indonesia. In addition, the design of these public trash *bin* is also considered, so that laterthese designs can attract people to dispose of waste in its place.

B. Design Alternatives

Figure 2. First Design Alternative Front View

Figure 3. First Design Alternative Front View withTrash Bin Lid Open

The first design alternative is equippedwith a lid and has a dynamic shape that canattract people. Apart from using wood waste,this design also uses material to connect thebody of the trash can with the lid. The lid canbe open to take out the trash bucket inside thetrash bin. The bucket is also using stainlesssteel material which is shaped into a tube. Tomake it easier to dispose of trash according toits category, there are signs with illustrationsand writing that say organic, inorganic and B3.

But the disadvantage of this design is that the dynamic shape is quite difficult to work on, because there is a possibility that thewoodcraft is not neat. Besides that, the lid of the trash can is also a little disturbing, so whenpeople throw garbage, they have to go throughthe side of the trash bin, and it is possible to put the trash in incorrectly, which causes trashto scatter around the trash bin.

Figure 4. Second Design Alternative Front View

Figure 5. Second Design Alternative Top View

The second design alternative has aless dynamic design than the first alternative, but the woodworking is easier to realize. Even though the shape is not very dynamic, the trapezium shape makes this trash look less monotone. In addition, this design also has a more color and different shape of the hole fordisposing of waste is different so that attracts people to dispose of trash in its place. The shape of the hole is distinguished by waste thatcan be decomposed and waste that is difficult to decompose or cannot be decomposed.

A square shape for waste that can be decoms posed or recycled, while a circle

shapefor waste that is difficult to decompose or cannot be decomposed. The lid for taking the bucket in the trash can is at the back, so the design looks neater, and it is also easier to takeit out of the trash bin. This design is alsoequipped with signage that provide information about the category of waste making it easier for people to dispose of waste according to the category.

From the advantages and disadvantages of each alternative, the alternative chosen is the second alternativebecause the design can be done and realized. Itis also more efficient than the first alternative.Apart from that, in terms of design, the second alternative is also attractive because it is colorful and even though the shape is angular,the design does not look boring.

C. Construction Drawing and Rendering

The dimensions of the public trash bin is 146 cm long, 66 cm wide, and 97 cm tall. Thistrash can is equipped with 3 categories of waste, namely organic, inorganic and B3 aswell as a lid to put in or take out the trash bucket. The trash bucket inside the public trashbin is 50 cm long, 34 cm wide and 86 cm tall. The organic, inorganic, and B3 signs has a diameter of 30 cm. The size of the organicwaste pit is 38 cm long and 30 cm wide, while the inorganic and B3 waste pit has a diameter of 31 cm.

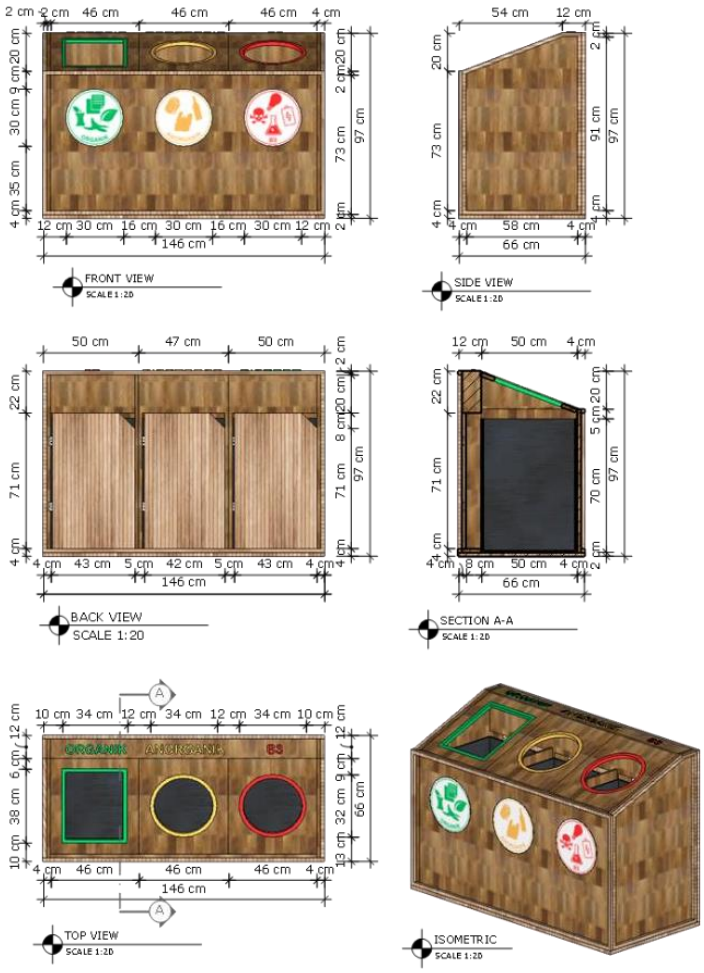

Figure 6. Construction Drawing of Public Trash Bin

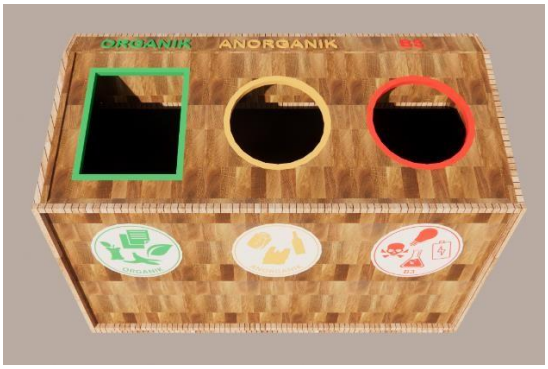

Figure 7. Public Trash Bin Perspective View (Top)

Figure 8. Public Trash Bin Perspective View (Side)

Figure 9. Public Trash Bin Perspective View (Back)

D. Material and Finishing

The material used for this public trash bin is wood waste in the form of small pieces that has been cut neater and has been refined.The pieces of wood that have been refined are going to be connected by using wood glue and composition it in an interesting way, so that they form a sheet of wood that will be used asmaterial for making public trash bin. forfinishing it will use a clear finish which will stillshow the material used to make this trash can,namely wood waste.

In addition, it also uses wood water- based paint for the writing and on the edge ofthe hole for dispose garbage, and the water- based paint is safe for health and the environment. The water-based paints that aregoing to be used are red, yellow and green, aligned with organic, inorganic, and b3 colors.The material of the trash bucket inside thetrash bin is using stainless steel material.

CONCLUSION

Wood waste that accumulates and nottreated properly has the potential to be used as a material for making a product, one of themis a public trash bin. In addition to overcomingthe problem of wood waste, the design of thispublic trash bin help people to be aware of environmental cleanliness, especially in publicplaces, by disposing of waste in its place. The public trash bin also has waste category that helps to sort waste and simplify the waste selection process at landfills. Through this design, it is hoped that people will be more sensitive to the problems of the surrounding environment, namely environmental health and industrial waste, and be able to turn theminto innovative products. This scientific paper is just a design idea that still needs to go through the advanced prototyping process, namely the production of the public trash bin product on an actual scale. So that after the product produced, it can be tested and further research carried out.

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