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**| RESEARCH ARTICLE**

## **Tyre Drop Structure for Treatment of Erosion**

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**| ABSTRACT**

Soil erosion is a serious issue in many regions, with detrimental environmental and land sustainability impacts. One approach to overcome erosion is using recycled materials such as used tires to make erosion-retaining structures. This research aims to utilize used tires as a drop structure as a barrier to erosion. This research was conducted in the monkey area of PT Antareja Mahada Makmur Site Multi Harapan Utama. This research used a qualitative approach to gain an in-depth understanding of using used tires as a drop structure. Data was collected through literature study and direct observation. The collected data will be analyzed qualitatively by organizing, compiling, and interpreting the data. The results showed that the tire drop structure used as erosion management could have various impacts on various aspects, including the impact of environmental innovation, namely increasing the use value of waste and cost efficiency because it only requires the cost of mobilization of removal and the impact on other innovations such as reducing maintenance costs.

**| KEYWORDS**

Tyre Drop Structure, Handling, Erosion

**| ARTICLE INFORMATION**

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### **1. Introduction**

Coal utilization activities without conservation measures will cause environmental damage, including the danger of erosion (Hidayat et al., 2022). Erosion is moving or transporting soil or parts of land from one place to another through water or wind. In areas with a wet tropical climate, such as Indonesia, water is the main factor causing erosion, while wind has a less significant effect (Jasmadi, 2022). The impact of soil erosion outside agricultural locations (off-site) has a significant influence. Sediments carried by soil erosion and contaminants bound to these sediments can cause huge losses and costs in everyday life. These off-site impacts include the muddying and silting reservoirs, burial of agricultural land and buildings, decreased water quality, and damage to aquatic ecosystems (Uniqbu et al., 2021).

Mining activities also produce much non-B3 waste from the units used, one of which is tire used. Used tires are tires that have been used and are no longer suitable for use on vehicles. These used tires are usually produced after the vehicle tires are worn out or damaged, so they cannot be used safely. Used tires often waste that must be managed properly not to harm the environment. However, used tires also have the potential to be reused by recycling or used in other applications, such as raw materials for making new products or as construction materials, including in the manufacture of tire drop structures as a barrier to erosion and made from an old tire dump truck filled with stones measuring more than 10 cm. The purpose of building a tire drop structure is to strengthen the channel and slow down the speed of water flow (Alcoholic & Murad, 2019).

In previous research done by (Hidayat et al., 2022), the use of a tire drop structure can reduce the speed by up to 3.8 m/s which is included in the permissible speed based on the type of material so that erosion can be reduced by up to 11.7 tons/ha/month or 96% of the natural erosion rate. Research also showed that the tire drop structure can minimize flow velocity (Pamungkas et al.,

2021). This research attempts to utilize used tire waste as an environmentally friendly and economical solution for reducing erosion. In addition, this research also focuses on the effectiveness of the tire drop structure in slowing down the flow of water and preventing erosion on certain lands. This research aims to utilize tire former to be made drop structure as a barrier to erosion.

## 2. Methods

This research was conducted in the area work PT Antareja Mahada Makmur Site Multi Harapan Utama. This study uses a qualitative approach to understand the use of used tires as drop structures. According to (Sugiyono, 2019), qualitative research methods are often called methods study naturalistic because the research is conducted in natural conditions (natural setting). Data was collected through literature study and direct observation. Data collection techniques in the study of literature involve gathering information from various literature sources relevant to the research topic. Literature sources can be books, scientific journals, articles, research reports, and other documents related to research problems. The data collected in the literature study are in the form of theories, concepts, previous research findings, and opinions of experts in related fields (Hermawan, 2019). While in observation, data is collected by directly observing the object of research in the field. Observations can be made through visual observations, interviews, or recordings. Observation techniques allow researchers to directly observe the phenomenon under study and record behavior, interactions, and occurring situations (Djaelani, 2013). The collected data will be analyzed qualitatively by organizing, compiling, and interpreting the data.

## 3. Discussion

Used tires are one of the mining wastes that can be reused as a supporting aspect of mine reclamation. Reclamation is a process carried out in the stages of mining activities to restore and restore environmental conditions and ecosystems that have been disturbed. Reclamation aims to restore the quality of the environment and ecosystem so that they can function according to their original designation (Tryanko & Desianda, 2022).

The Indonesian government has strictly regulated mining reclamation obligations that mining owners or companies must carry out after exploiting an area's natural resources. Mine reclamation or repair is important in preventing ecosystem damage due to mining activities. The rules regarding this matter have been regulated in Law No. 11 of 1967, Law No. 4 of 1982, and Law No. 24 of 1992 (Budi, 2015).

The provisions in the law provide clear instructions and guidelines regarding the responsibilities of mining owners or companies in carrying out reclamation. The main objective of mine reclamation is to restore environmental conditions damaged by mining to their original condition or at least close to their original condition.

The tire drop structure uses used dump truck tires that are no longer used, which are arranged in the form of a drop structure that adapts to open channel flow, and the ends of the channel are given stakes so that water currents do not carry away the used tires.



Figure 1. Tyre Drop Structure

The use of used tires is quite a lot in the manufacture of tire drop structures. Even so, the costs required are relatively insignificant because most of the costs are only related to the removal of used tires compared to the construction of concrete construction which can cost ± Rp. 150,000,000. One of the advantages of using used tires is reducing mining waste. Used tires are included in the category of mining waste, which can cause negative impacts on the environment. However, by utilizing it to manufacture tire drop structures, the mine waste can be reused as one of the supporting aspects of mine reclamation.

Efforts to use used tires as a tire drop structure construction material and reduce mining waste also provide added value to using used tires, which were previously considered useless goods. Thus, using used tires in tire drop structure construction is an environmentally friendly effort. Furthermore, it can support mine reclamation activities effectively.

The use of tire drop structures in drainage canals positively impacts other aspects, especially in reducing maintenance costs. This structure can prevent or reduce the rate of erosion that occurs in drainage channels. Thus, the need for repairs or routine maintenance on drainage channels can be reduced. Erosion that occurs in drainage canals can cause damage to the canal structure, such as erosion of soil or canal covering material. This will require additional costs to repair and maintain damaged drainage channels. However, with the existence of a tire drop structure that functions as a barrier to erosion, the risk of damage to the drainage can be minimized; with lower maintenance costs, the use of a tire drop structure can provide economic benefits for drainage canal owners, especially in the long term.

This innovation has a relevant contribution to achieving Sustainable Development Goals (SDG) Number 6, namely clean water and proper sanitation; using used tires to manufacture drop structures can provide multiple benefits in the context of clean water and sanitation. First, using tires can reduce the rate of water erosion, thereby helping to maintain the sustainability of the quality of water sources and reduce the potential for pollution. This positively impacts the provision of quality, clean water for the community. Second, reducing the erosion rate can reduce the cost of cleaning ponds and draining water. This can lead to budget savings for maintaining water and sanitation infrastructure to allocate resources more efficiently. Thus, this innovation makes a real contribution to increasing the availability of clean water and proper sanitation and supports the achievement of SDG No. 6 sustainably.

#### **4. Conclusion**

The use of tire drop structures as erosion control has a significant impact on various aspects, including the impact of environmental innovation and the impact on other innovations. In terms of environmental innovation, tire drop structures utilize used tire waste, which was previously considered useless. By utilizing these used tires, we can increase the use-value of waste and reduce the negative environmental impact of improperly managed disposal of used tires. This aligns with the principles of sustainable and environmentally friendly waste management. In addition, using a tire drop structure also provides cost efficiency in handling erosion. Because tire drop structures are made from used tires that are no longer usable, the costs involved are mainly related to the costs of moving and mobilizing them. In this case, construction costs become more affordable than new materials or conventional erosion control techniques. This provides benefits in terms of efficient use of resources and budget savings. In addition to environmental innovation and cost efficiency, using a tire drop structure also impacts other innovations, such as reducing maintenance costs. This structure helps protect the drainage canal from erosion which can cause damage and require frequent repairs. The cost of maintaining drainage canals can be reduced by reducing the risk of erosion, resulting in long-term benefits.

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