

Circular Economy For Disaster Risk Reduction

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Abstract

The international conference in Japan in 2005 produced the Kyoto Protocol which became the foundation and framework for all countries in the world to reduce the rate of global warming and climate change. Disasters are becoming risks increasing everywhere, so it is important to take comprehensive actions to reduce disaster risks and climate change by implementing disaster management and disaster risk reduction action plans, including mitigation, disaster preparedness, and management, emergency and recovery, and action plans. In the last decade, the main focus of attention in developing research and innovation related to low-carbon development as well as dealing with climate change and ecological disasters today is the circular economy, which carries the principles of use, return, and make. The circular economy focuses on the optimal use of resources in terms of production to consumption and can be a solution to waste and to meet energy needs based on waste. The circular economy makes waste that was residue turned into new inputs in life and sustainable activities as a systematic activity. The circular economy has a great opportunity as mainstream in efforts to mitigate climate change that creates a balance between economic, social and ecological. The implementation of a circular economy, the use or extraction of natural resources is reduced, so as to reduce emissions and buildup of waste or waste generated from various products. In a circular economy, waste that used to be waste to waste can now also be turned into energy or waste to energy. Waste processing can be categorized as a circular economy, namely a production process that never stops and strives to produce zero waste. The National Development Planning Agency (Bappenas) shows that the impact of climate change also has the potential to cause economic losses of up to IDR 544 trillion. Economic losses of up to IDR 544 trillion during 2020-2024 due to the impact of climate change, if policy interventions are not carried out or business as usual. The picture of losses caused by the disaster impacting the 4 priority sectors is estimated to be experiencing significant losses. First, the impact on the coast and the sea which is estimated to have the highest level of economic loss. The second is the agricultural sector. For example, the economic loss that can be caused by climate change is a decrease in rice production. The total loss is estimated at IDR 78 trillion. Third, the health sector, where an example of the estimated loss is an increase in dengue fever cases with a total economic loss of Rp 31 trillion. Fourth, the water sector which triggers a decrease in water availability to reach Rp. 28 trillion. From the fairly large losses due to the disaster, it became urgent to apply the circular economy model.

Keywords: circular economy, disaster reduction, global warming, climate change.

A. Background of Implementing Circular Economy

Global warming and ecological disasters have occurred since the early 20th century, starting from the beginning of the industrial revolution in European countries, global warming has had an impact on global climate change as a result of the greenhouse effect and the fulfillment of CO₂ gas emissions in the air which can lead to changes in temperature conditions. global warming affects the conditions of the meteorological and geological cycles, which result in natural disasters where the disaster conditions are related to global warming and sea-level rise due to the addition of seawater mass due to melting of polar ice that is generated every year, flooding due to unfavorable weather factors. and often coincide with other disasters such as landslides, tropical storms, and cyclonic storms. Disaster risk from the disaster is in the form of loss of community function, victims, material losses, physical damage, and environmental damage and resulting in death. In the last few decades, the world's population growth is very rapid, the need for energy and supply of gas emissions and greenhouse effects on earth is not balanced with the capacity of the region and waste that is no longer able to be managed properly. This condition is a serious problem for the world as a result of climate change. Ecological disaster will occur if the balance between living things and their habitat is not fulfilled so that it becomes a threat that can lead to disaster risk if there is a vulnerability in a community environment in accepting threats. In addition, global warming occurs as a result of the massive exploitation of natural resources that are part of the cycle of natural balance.

The international conference in Japan in 2005 produced the Kyoto Protocol which became the foundation and framework for all countries in the world to reduce the rate of global warming and climate change. Disasters that always occur one after another regardless of time and region, unbalanced natural conditions, and inappropriate changes in the climate cycle result in disasters that cannot be predicted with certainty, the loss of environmental balance due to unstable natural damage is something that must be overcome by all parties involved. there is. Disasters are becoming risks increasing everywhere, so it is important to take comprehensive actions to reduce disaster risks and climate change by implementing disaster management and disaster risk reduction action plans, including mitigation, disaster preparedness, and management, emergency and recovery, and action plans .

In the last decade, the main focus of attention in developing research and innovation related to low-carbon development as well as dealing with climate change and ecological disasters today is the circular economy, which carries the principles of use, return, and make. The circular economy concept does not only design an industrial model with the principle of zero waste but also focuses on social factors and the provision of sustainable resources and energy. The circular economy focuses on the optimal use of resources in terms of production to consumption and can be a solution to waste and to meet energy needs based on waste. The circular economy makes waste that was residue turned into new inputs in life and sustainable activities as a systematic activity. The circular economy has a great opportunity as mainstream in efforts to mitigate climate change that creates a balance between economic, social and ecological.

The implementation of a circular economy, the use or extraction of natural resources is reduced, so as to reduce emissions and buildup of waste or waste generated from various products. In a circular economy, waste that used to be waste to waste can now also be turned into energy or waste to energy. Waste processing can be categorized as a circular economy, namely a production process that never stops and strives to produce zero waste.

The National Development Planning Agency (Bappenas) shows that the impact of climate change also has the potential to cause economic losses of up to IDR 544 trillion. Economic losses of up to IDR 544 trillion during 2020-2024 due to the impact of climate change, if policy interventions are not carried out or business as usual. The picture of losses caused by the disaster impacting the 4 priority sectors is estimated to be experiencing significant losses. First, the impact on the coast and the sea which is estimated to have the highest level of economic loss. The second is the agricultural sector. For example, the economic loss that can be caused by climate change is a decrease in rice production. The

total loss is estimated at IDR 78 trillion. Third, the health sector, where an example of the estimated loss is an increase in dengue fever cases with a total economic loss of Rp 31 trillion. Fourth, the water sector which triggers a decrease in water availability to reach Rp. 28 trillion. From the fairly large losses due to the disaster, it became urgent to apply the circular economy model.

B. Circular Economy Concept

Difference between linear economy and circular economy. The concept of a circular economy was created to reduce the exploitation of natural resources that damage the environment, health, and the world economy. The circular economy provides strategic solutions in encouraging sustainable development practices and the involvement of stakeholders and the public in sustainable development.

The concept of a linear economy uses a take-to-dispose cycle to collect raw materials and turn them into products, which will be used until they are finally disposed of as waste. For example the use of food and beverage packaging, straws, and other disposable items. These objects can actually be recycled into new items that can be reused, but most large industries still use a linear economic model that is not sustainable and has a negative impact on the environment. So that they still produce goods that have a short life but can be mass-produced so that the income obtained is high. It is very clear that linear economy can no longer be used in the long term, both from an economic and environmental perspective.

The linear economy is transitioning to a circular economy, where this circular economy will balance economic benefits, the social environment, and resources. The circular economy model is an industrial strategy in avoiding factory waste, using efficient sources, and minimizing excess material. So goods that have been used can be recycled and can be reused as production inputs.

The circular economy is not a threat but will provide opportunities for all elements in economic activity to innovate and provide new jobs as well as create new income and simultaneously contribute to achieving sustainable growth. By reducing waste and pollution, preserving the products and materials used, and regenerating, the circular economy has made a major contribution to achieving global climate targets. This can all be realized if there is a collaboration between the government, the private sector, and individuals.



Figure 1. Circular Economy Concept (**Source:** <https://bk-bags.com/>).

The concept of a circular economy is

- Recycling, by melting product raw materials and making new ones.
- Reuse, by taking parts of a damaged product for repair and reuse
- Valorizing, by creating new renewable energy

The multiple benefits of a circular economy:

- Environment, by protecting ecosystems from plastic pollution, reducing landfill and CO₂ emissions
- Society, by providing jobs and literacy about the circular economy
- Businesses, by implementing sustainable processes, produce industrial waste into raw materials for energy and other products.

C. Disaster Risk Management Efforts

Ecological disasters are a threat to every country so that preventive measures are needed to reduce the risk of disasters that will be caused, climate change in a very long time is not limited to climate and environmental aspects, reducing CO₂ gas emissions in the air is something important to do the impact of global warming on the world. Environmental prevention and management must be initiated early to assess the risks and unstable natural conditions against the threat of ecological disasters.

Disaster is a phenomenon that occurs as a result of collectiveness of threat components, namely various global warming issues that affect natural and environmental conditions, as well as how the level of vulnerability of a community has a very high value so that there is a relationship between the three factors above to become a disaster (Paripurno, 2000).). In the world conference on disaster risk reduction in Japan (World Conference on Disaster Reduction, Kobe, Japan 2005), with reference to the United Framework Convention on Climate Changes (UNFCCC) disasters and climate change are the main issues because they are related to the occurrence of various disasters in the world. and produce the Hyogo action plan (Hyogo Framework for Action 2005 - 2015), from the results of this conference, disaster risk reduction is implemented at the community level where every country is encouraged to have an action plan as an effort to reduce disaster risk. In addition, efforts to reduce disaster risk have been carried out with the Kyoto Protocol in 2005, as a framework for every country in the world to carry out action plans for reducing climate change and environmental management to reduce the world from global warming which can lead to ecological disasters.

Disaster risk reduction includes the stages before the disaster, during the disaster, and after the disaster, at the stage before the disaster risk management can be done by taking prevention or mitigation efforts, is an integrated effort to minimize disaster risk, mitigation can be done by assessing disaster risk based on analysis of threats (hazards) caused by global climate change, recognize threats to determine the factors that influence the occurrence of disasters, especially ecological disasters, from the factors above then an assessment of vulnerability in a community is carried out to accept the impact of threats so that they can find out disaster risk level. Mitigation can be done by taking two approaches, including a structural approach that refers to infrastructure that supports reducing the effects of global warming and disaster risk, as well as a non-structural approach with a community approach as the designer and planner of a disaster mitigation action. A threat is something that can cause a disaster either naturally or as a result of human activity. Because disaster risk assessment can be used as a benchmark for a strategic plan in building preparedness in a community to face disaster risk, an early warning system must be owned as a sign that can provide information about the threat of disaster risk. Disaster risk is the relationship between the components of threats, vulnerabilities, and the ability to manage threats.

The higher the threat value and the vulnerability value, the higher the disaster risk, to reduce disaster risk it is necessary to increase the vulnerability value to capacity by strengthening the capacity within the community in managing the environment, recognizing threats, knowing the impact that can be caused by factors that lead to the occurrence of

disasters. disasters in the environment.

D. Circular Economy as a Disaster Management Model

There are four stages of disaster management as shown in table 1 below:

Disaster Stage	Responsibilities	Key Challenges
Mitigation	Evaluation, monitoring, and dissemination	Low public awareness, low commitment of government
Preparedness	Planning, exercise, and training	Inadequate early warning system, constrained budgets
Response	Need assessment, information exchange, and logistical expertise	Communication, coordination, inadequate public information, volunteer help
Recovery	Damage assessment, debris removal, and disaster assistance skills	Budget constraints, lack of expertise, and central government control

Table 1. Stages, Responsibilities, and Challenges of Disaster Management, (Source : Taulbee, 2019)

In the four stages in disaster management, the use of the circular economy concept into the disaster management model is as shown in Figure 2 below:



Figure 2. Circular Economy as a Disaster Management Model (Source: Author, 2022).

In the mitigation stage to preparedness, the involvement of the circular economy concept at the circular support model level, where the formation of culture and changes in the mindset of economic actors, government, and society in the same understanding to implement zero waste activities in all aspects of life.

In the preparedness stage to the response stage, the concept of the circular economy is at the optimal use model stage with the understanding that all economic actors and society not only understand the circular economy but carry out all activities in daily life so that at this stage the strengthening of behavior departs from the concept a good circular economy towards the implementation of a good circular economy

In the response stage towards recovery, the circular economy concept is at the value recovery model level which has the concept that part of the activities that have an impact on causing disasters are eliminated in such a way through the evaluation of activities with infrastructure involvement to return to a good circular economy concept.

In the recovery stage leading to the mitigation stage, it is the most important part of the disaster management model where the level of the circular economy concept in the circular design model is where the description of the reconstruction of the value base from the implementation of the circular economy is planned through the involvement of the parties.

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