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Mangrove Conservation and Biodiversity Protection Strategies in Universitas Diponegoro to Achieve Net Zero Emission

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Abstract. Indonesia is set the net zero emission target to be achieved by 2060. As part of that, Universitas Diponegoro (UNDIP) is committed to support the achievement of the goal by implementing several strategies. First is to reduce the amount of emission generated by the university daily activities, and second is boosting the activities of mangrove conservation and biodiversity protection. As UNDIP located in the northern part of Central Java, part of 108.000 kilometers coastline region of Indonesia, UNDIP prioritizes its academic activity and research focus on coastal region environmental and ecological development which enthuse the implementation of mangrove conservation and biodiversity protection. The strategy includes the structured mangrove and biodiversity conservation action directed by the University leaders, encouraging research and community service activities focusing on coastal region development and developing environmental-related curriculum for the students. In addition, UNDIP also supports research centers and students' communities who focus on mangrove conservation, biodiversity protection, and coastal region development. By that, there are more than 50 types of flora in UNDIP land forest with carbon stock calculation up to 6,480.20 metric tons CO_2 eq. According to those result UNDIP is expected to be carbon neutral by 2025.

Keyword:

biodiversity, conservation, coastal area, research, education

1. Introduction

Global warming and climate change is unavoidable lead to many threats and disaster for the environment and human such as ice in the pole are melting, sea level rising caused alteration in the environment system, rising temperatures are affecting wildlife and their habitats, storms, hurricanes, draughts, and floods. With climate change-induced disruption

to agriculture, workers in the industry face reduced income, further thrusting them into poverty and food insecurity (1–3). The effect of climate change is severe in many parts of the world, including Indonesia. With almost 280 million living in the world largest archipelagic state, disaster happened every time, flooding, drought, agricultural production loss, heatwave, and many more. Figure 1 represents the effect of climate change which is tidal floods in the coastal region of Indonesia.

Figure 1 Climate Change Effect in the coastal region of Indonesia

Global warming is mainly caused by the generation of greenhouse gases such as carbon dioxide, methane, nitric oxide from natural and human activities. Carbon dioxide is an important component in the atmosphere resulting from natural processes such as volcanic eruptions, human activities such as fossil fuel use and deforestation. Meanwhile, methane is components produced from nature as well as from living activities such as degradation of agricultural waste, peatlands, animal waste, transportation. Energy sources such as natural gas contain 70-90% methane. Nitric oxides, produced from agricultural activities, namely from the production and use of fertilizers. Nitric oxides are also produced from burning fossil fuels and burning land (4,5).

Case in Indonesia in the frame of carbon emissions the main cause of global warming is that out of total 1637 Mt CO_2 eq 40-60% of the carbon emissions is generated from fuel combustion. Total emissions in 2021 reached 607 million tons of CO2 eq, with the largest contribution from the power generation sector at around 49.8%, followed by the transportation and industrial sectors at 23.7% and 16.1% respectively (6–9).

University as an organization that involved in providing education, conducting research and community services can take parts in combating the global warming and reducing the effect of climate change.

2. Role of university in reducing the impact of climate change and achieving Net Zero Emissions

Universities including UNDIP can contribute to minimize the impact of climate change as well as to achieve the net zero emission goal through focusing on 2 sectors which are

emission reduction and carbon capture and storage, with more details proposed role can be seen in Figure 2.

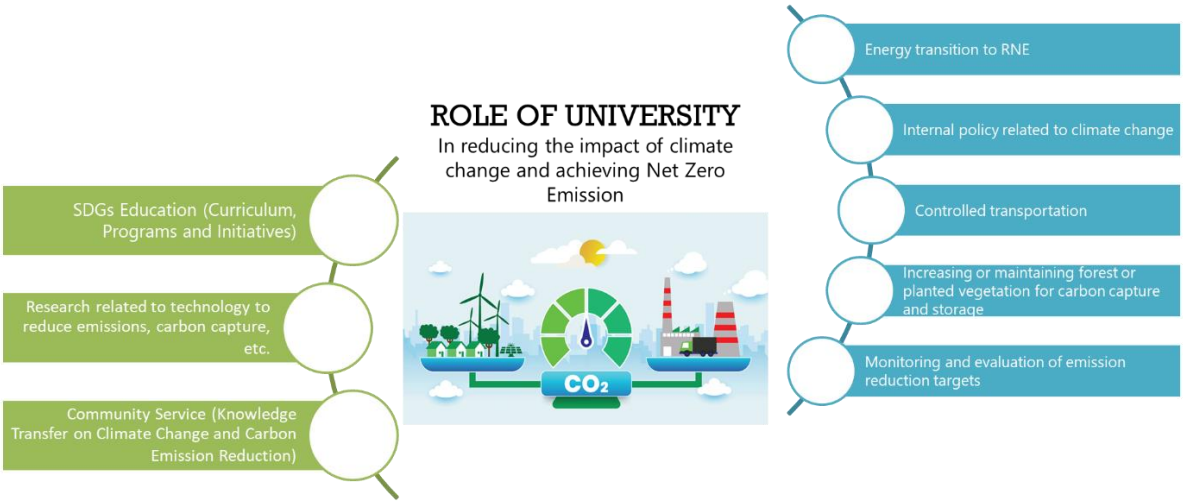

Figure 2 Role of university in reducing the impact of climate change and achieving Net Zero Emissions

In terms of emission reduction, university can initiate many programs such as energy transition to renewable energy source such as solar energy, wind energy, hydropower, and biogas, implementing the internal policy for climate action such as energy saving encouragement, reducing private vehicles, shifting to sustainable transportation, monitoring and evaluation of the emission reduction targets. For the carbon capture and storage, university can contribute through increasing and maintaining forest or planted vegetation available within the university area.

3. Mangrove Conservation and Biodiversity Protection Strategies and Implementation in UNDIP

UNDIP is located in the northern part of Central Java, part of 108.000 kilometres coastline region of Indonesia, UNDIP prioritizes its academic activity and research focus on coastal region environmental and ecological development which enthuse the implementation of mangrove conservation and biodiversity protection.

A mangrove is a shrub or tree that grows mainly in coastal saline or brackish water. Mangroves grow in an equatorial climate, typically along coastlines and tidal rivers. Mangrove is able to absorb and store numbers of carbon in its leaf stems, twigs, roots, litter and underlying sediment and mangrove forest is categorized as one of the highest carbon densities ecosystems (10,11) Mangroves, which grow on the coastline and river mouths, is also act as a barrier to seawater abrasion and reduce the risk of floods that protect local homes and livelihoods. These ecosystems not only provide large numbers of carbon storage but also provide shoreline protection from climate-related and other disasters such as storms and tsunamis and reduce flood-risks, inundation, and erosion (10,12–15).

Figure 3 Marine Science Techno Park UNDIP, Jepara Regency location of mangrove conservation

In UNDIP the mangrove conservation program implemented in Marine Science Techno Park located in the Jepara Regency as presented in Figure 3. The programme consists of mangrove plantation, monitoring and mangrove research and education. The output of the program is remarkable, the monitoring conducted in 2022 calculate the carbon stock estimation 721 -4901 tons/ha in MSTP. Research and education in mangroves also conducted to spread the awareness of the importance of mangrove ecosystem to combat the climate change.

Meanwhile, biodiversity protection program consists of many activities such as tree planting, biodiversity monitoring and biodiversity research that conducted in continuity. As a result, the diversity of flora species found on UNDIP campus is very high. The number of flora species was increasing more than 20% in the last three years. Likewise, the number of individuals from 2019 to 2022 has increased by around 12%. The increase led to the increment of the number of carbon stock that can support UNDIP to be carbon neutral by 2025. In 2021, UNDIP has 6,810 trees, with around 282 species of plants with an average diameter of 7.54 m with a basal tree area of around 219.67 Ha. The tree planted and with the additional mangrove ecosystems that has been continuously maintained can reduce around 6,480.20 metric tons of CO2 eq.

Figure 4. Biodiversity protection program in UNDIP main campus and education forest

4. Conclusions

UNDIP committed to take part in combating the climate change and reducing the effect as well as supporting the government vision to be zero emission in 2060. By implementing the programme of mangrove conservation and biodiversity protection, UNDIP can improve the numbers of carbon stocks, meeting in the point with the carbon footprint reduction number by other emissions reduction programme.

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