CELIOS

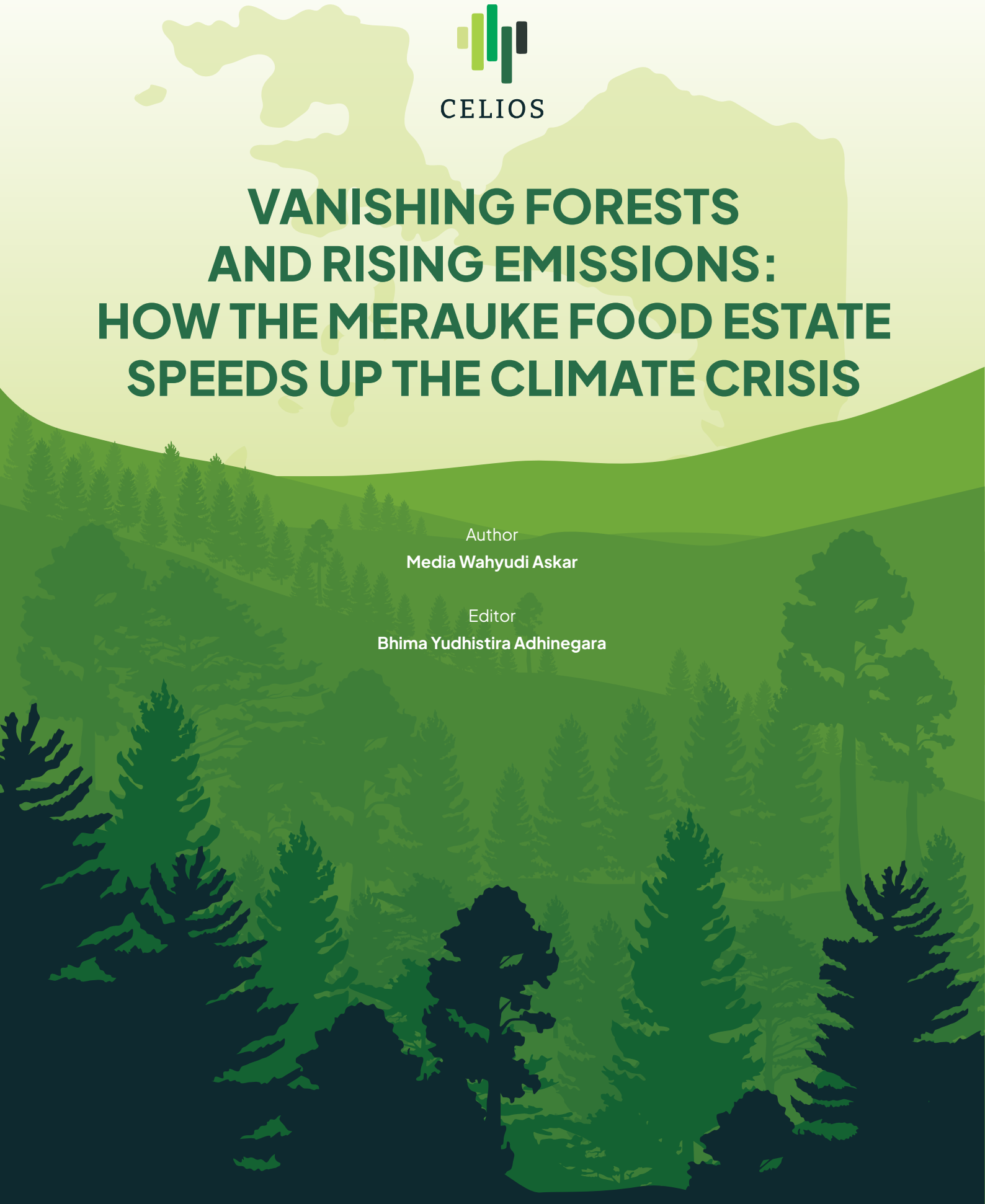
VANISHING FORESTS AND RISING EMISSIONS: HOW THE MERAUKE FOOD ESTATE SPEEDS UP THE CLIMATE CRISIS

Author

Media Wahyudi Askar

Editor

Bhima Yudhistira Adhinegara



December 2024

Documentation by CELIOS/Fiorentina

Vanishing Forests and Rising Emissions: How the Merauke Food Estate Speeds Up the Climate Crisis

Publication	December 2024
Author	Media Wahyudi Askar
Editor	Bhima Yudhistira Adhinegara
Publisher	Center of Economic and Law Studies (Celios) Jakarta, Indonesia
E-mail	admin@celios.co.id
Website	www.celios.co.id

Citation	Askar, Media Wahyudi (2024). Vanishing Forests Rising Emissions: How the Merauke Food Speeds Up the Climate Crisis. Adhinegara, Yudhistira (Ed). Jakarta: Center of Economic Law Studies. Report. Available at: www.celios.co.id
Ilustration	Freepik.com
Layout Designer	Mohammad Arifin

Key findings

The deforestation of 2 million hectares in Merauke has the potential to release an additional 782.45 million tons of CO_2 emissions, equivalent to a carbon loss valued at IDR 47.73 trillion.

This surge in emissions is starkly at odds with global efforts to reduce emissions, including Indonesia's own 2050 Net Zero Emission target.

A single food estate megaproject in Merauke could worsen Indonesia's global emission contribution from 2–3% to 3.96–4.96%, effectively doubling its share.

Assuming Indonesia's emission contribution increases by 2–3% by 2050 due to the Merauke food estate project, the country might miss its Net Zero Emission target for 2050 by 5 to 10 years.

This food estate project could more than double Indonesia's emissions.

Conversely, by adopting a restorative economy, Indonesia's global emission contribution could be reduced to 1–2%.

Preserving forests and developing sustainable products not only avoids waves of deforestation but also positions Indonesia as a strategic global carbon sink buffer.

Documentation by CELIOS

Calculating Carbon Emissions from Deforestation

To calculate carbon emissions from each tree felled in the food estate area in Merauke, the standard approach commonly used for estimating carbon emissions due to deforestation or tree cutting is applied.

First, it is necessary to measure tree biomass to estimate the forest's carbon sequestration potential. For above-ground biomass, allometric equations are used, which relate the tree's diameter at breast height (DBH), tree height, and species type to estimate above-ground biomass (Huy et al., 2016; Karyati et al., 2021; Kenzo et al., 2009). For below-ground biomass, root biomass is estimated as a percentage of above-ground biomass, typically around 20-30% of the total above-ground biomass in tropical forests. One commonly used equation for this purpose is:

$$\textit{Above-ground Biomass} = ß \times (DBH)^{\alpha}$$

where ß and σ are constants that depend on the tree species.

After calculating the tree biomass, it is converted to carbon by assuming that carbon constitutes approximately 45%, 47%, or 50% of the tree's biomass (Zhou et al., 2023). This study uses the following formula:

$$Carbon = Biomass \times 0{,}47$$

To calculate carbon dioxide emissions, the estimated carbon is converted to CO_2 using a conversion factor of 3.67, as recommended by the Working Group on Social Cost of Greenhouse Gases, United States Government (see Council, 2013).

$$Co_2\ Emissions = Carbon \times 3{,}67$$

Documentation by CELIOS/Fiorentina

Documentation by CELIOS/Fiorentina

Calculating Carbon Emissions from the Merauke Food Estate Project

To calculate the carbon emissions resulting from the food estate project in Merauke, we begin by establishing basic assumptions related to tree biomass in tropical forests. The average biomass per hectare in tropical forests ranges from 200 to 300 tons, depending on forest type, tree density, and species. In this simulation, we use an average value of 250 tons of biomass per hectare. Additionally, carbon is a significant component of biomass, with approximately 47% of the total biomass consisting of carbon. After determining the carbon content, the next step is to convert it into carbon dioxide (CO_2) emissions. The conversion factor used is 3.67, which transforms carbon into Co_2.

The first step in the calculation is to determine the total biomass for the area involved in the food estate project, which covers 2 million hectares. Assuming an average biomass of 250 tons per hectare, the total biomass for this area is 250 tons/hectare multiplied by 2,000,000 hectares, resulting in 5,000,000 tons of biomass. Next, to calculate the amount of carbon in this biomass, we multiply the total biomass by the carbon percentage, which is 0.47. This results in 235,000,000 tons of carbon. Finally, to calculate the total CO_2 emissions, we convert the carbon amount using the conversion factor of 3.67, resulting in a total emission of 862,450,000 tons of CO_2.

This simulation shows that deforestation in the 2 million-hectare area for the food estate project in Merauke would generate a substantial amount of carbon dioxide emissions, approximately 862,450,000 tons of CO_2. This indicates that the project could have a significant impact on climate change, especially if not accompanied by mitigation efforts.

Documentation by CELIOS/Fiorentina

Calculating Indonesia's Contribution to Global Carbon Emissions from the Merauke Food Estate Project

Carbon Emissions from Tree Cutting in the 2 Million-Hectare Food Estate Area Compared to Total Emissions from Deforestation Across Indonesia.

To calculate the percentage comparison of carbon emissions from tree cutting in the 2 million-hectare food estate area with total emissions from deforestation across Indonesia, we can use estimates of annual deforestation emissions in Indonesia. Based on previous estimates, emissions from the food estate project are approximately 862,450,000 tons of CO_2. Meanwhile, annual emissions from deforestation in Indonesia are estimated to range from 600 million to 1 billion tons of CO_2. With these figures, we can calculate the percentage of food estate emissions in relation to Indonesia's annual deforestation emissions, both at the lower bound (600 million tons) and upper bound (1 billion tons).

The percentage calculation shows a striking result. First, in relation to the lower bound (600 million tons of CO_2), the food estate emissions represent 143.74%, meaning the emissions from this project would more than double the total annual emissions from deforestation in Indonesia. Meanwhile, in relation to the upper bound (1 billion tons of CO_2), the percentage is still significant, at 86.25%, indicating that emissions from tree cutting in the food estate area are nearly equal to or even exceed half of Indonesia's total annual deforestation emissions.

This comparison highlights the significant impact of the food estate project on the national carbon emissions total. When compared to large-scale deforestation activities in Indonesia, such as deforestation in Kalimantan covering 1.4 to 1.7 million hectares or oil palm plantation expansion in Sumatra reaching 1.6 to 1.9 million hectares, it shows that this project could have a major impact on total national carbon emissions, potentially matching or exceeding the annual deforestation emissions across Indonesia.

Carbon Emissions from Sugarcane Planting

The estimated carbon emissions resulting from the sugarcane planting project on 2 million hectares of land can be calculated by considering the carbon sequestration capacity of sugarcane plants and the emissions from previous deforestation. Sugarcane plants have the capacity to absorb around 40 tons of CO_2 per hectare per year, although this is lower compared to mature trees in natural forests. Assuming that the entire 2 million-hectare area is used for sugarcane planting and carbon sequestration occurs annually, the total carbon absorption by sugarcane in this area would be 80,000,000 tons of CO_2 per year (2,000,000 hectares × 40 tons CO_2/hectare).

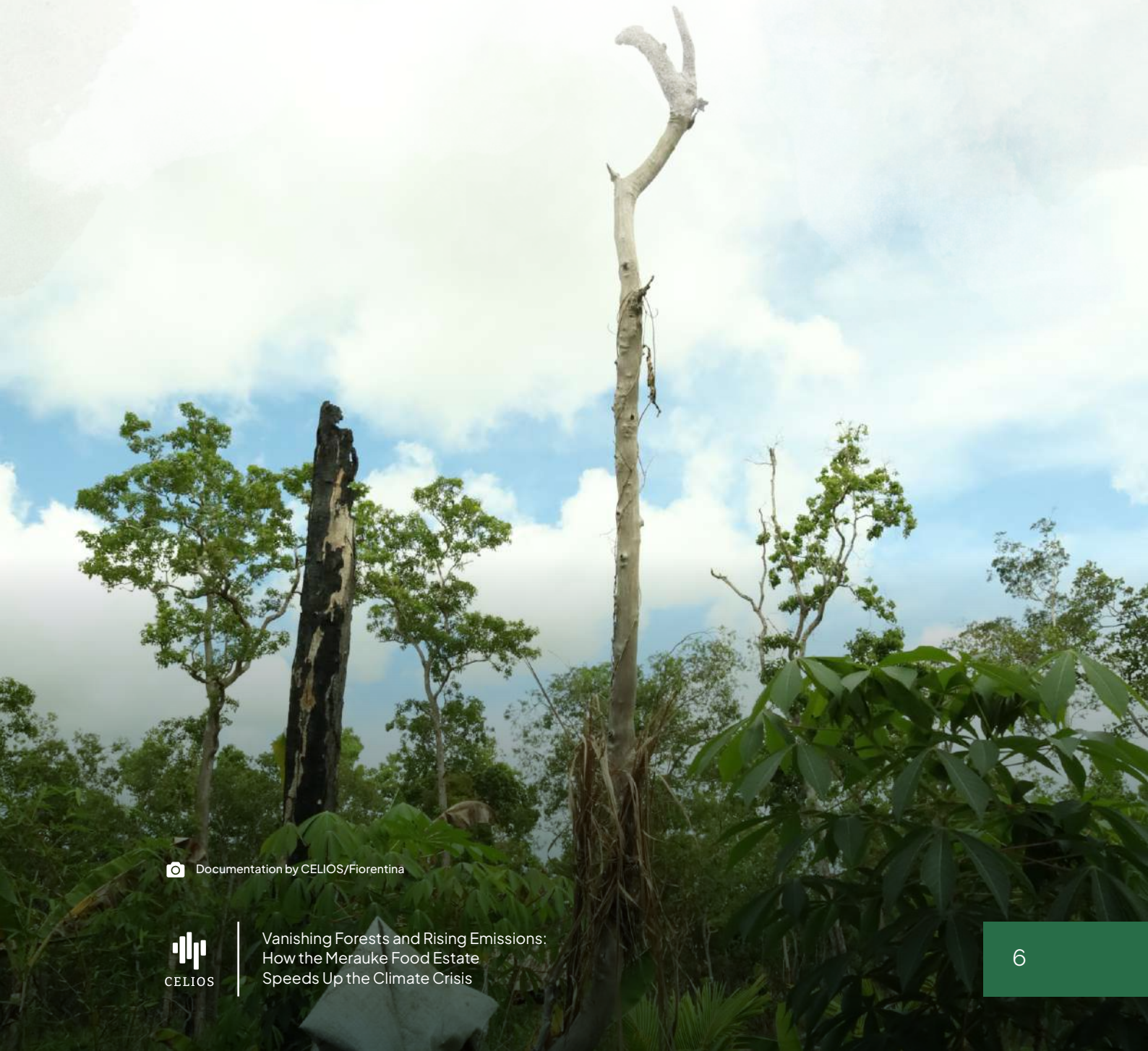
Previously, the estimated emissions from tree cutting in the same area were projected to reach 862,450,000 tons of CO_2. After accounting for the carbon sequestration by sugarcane, the net emissions per year would be 782,450,000 tons of CO_2 (862,450,000 tons CO_2 minus 80,000,000 tons Co_2).

Next, to calculate the contribution of these emissions to global emissions, we can consider two scenarios. In the first scenario, Indonesia's emissions before the food estate project are estimated to be 0.8 billion tons of CO_2 (2% of global emissions). After adding the emissions from the food estate, Indonesia's total emissions would become 1.58245 billion tons of CO_2 (0.8 billion tons CO_2 plus 782.45 million tons CO_2). In the second scenario, Indonesia's emissions before the project are 1.2 billion tons of CO_2 (3% of global emissions), which would then rise to 1.98245 billion tons CO_2 after adding the food estate emissions.

Thus, the contribution of new emissions from the food estate to global emissions can be calculated. In the 2% scenario, the contribution of new emissions is around 3.96% of total global emissions, while in the 3% scenario, it increases to around 4.96%. This shows that the food estate project will have a significant impact on Indonesia's and global carbon emissions, although sugarcane planting may slightly mitigate its impact by sequestering carbon each year.

With the 2 million-hectare food estate in Merauke, Indonesia's contribution to global emissions could increase from 2-3% to around 3.96-4.96%. This represents an increase of about 1.96% - 2.96% of global emissions. This increase is significant, as the addition of just one large project could raise Indonesia's contribution to global emissions by up to 3%.

This increase in Indonesia's contribution due to the food estate project could cause the country to miss its 2050 Net Zero Emission target by approximately 4% to 5%. Assuming that Indonesia's emissions contribution increases by 2-3% by 2050 due to the Merauke food estate project, Indonesia is likely to miss its Net Zero Emission target by about 5 to 10 years after 2050.



Documentation by CELIOS/Fiorentina

Documentation by CELIOS

Calculating the Carbon Emissions Comparison: Food Estate vs. Restorative Economy

To compare the carbon emissions impact between the food estate development scenario in Merauke and an alternative restorative economy scenario, we can observe significant differences in approaches to natural resources. In the food estate scenario, after accounting for the carbon sequestration by sugarcane plants, the net carbon emissions are estimated to reach 782.45 million tons of CO_2 per year. If these emissions are calculated in financial terms, with a carbon price of Rp61,000 per ton, the total value of carbon emissions generated by the food estate project would be around Rp47.73 trillion (782.45 million tons of CO_2 x Rp61,000).

In contrast, the restorative economy scenario focuses on the sustainability of forest and agricultural ecosystems without damaging forests. In this scenario, no deforestation occurs, and the existing forests in the 2 million-hectare area remain intact, continuing to sequester carbon. By maintaining trees and developing sustainable forest-based products, such as honey, rattan, and seeds, as well as agroforestry-based agriculture, this scenario does not generate significant carbon emissions like the food estate project. The restorative economy has the potential to preserve the carbon-sequestering function of forests sustainably without creating additional emissions that impact the climate.

In the restorative economy scenario, the additional assumption is that the entire 2 million-hectare area is maintained as natural forest that can absorb carbon. Mature tropical forests, such as those found in Papua, have the ability to absorb about 200 tons of CO_2 per hectare per year. With 2 million hectares, the annual carbon sequestration from this natural forest could reach 400 million tons of CO_2 per year (2,000,000 hectares x 200 tons CO_2/hectare/year).

When compared to the food estate development scenario, which results in net emissions of 782.45 million tons of CO_2 after considering the carbon sequestration from sugarcane, the restorative economy scenario shows very different results. This scenario not only avoids the carbon emissions caused by deforestation but also results in a net carbon sequestration of 400 million tons of CO_2 per year. In this case, the restorative economy has a positive impact on global emissions reduction, with carbon sequestration that is greater than the emissions produced by the food estate.

The environmental impact of both scenarios is significant. The food estate generates 782.45 million tons of CO_2, while the restorative economy has the potential to sequester 400 million tons of CO_2 per year, meaning the restorative economy has a far greater and more positive environmental impact. The total emissions produced by the food estate would be much higher compared to the restorative economy scenario, which not only avoids deforestation emissions but also absorbs more carbon.

With the food estate development on 2 million hectares, Indonesia's contribution to global emissions is estimated to increase to around 3.96–4.96%, or double the current contribution. This indicates a significant increase in Indonesia's emissions contribution, which contradicts global efforts to reduce emissions. With the development of a restorative economy, this scenario would reduce Indonesia's contribution to global emissions to around 1–2%. By preserving forests and developing sustainable products, Indonesia would not only avoid emissions from deforestation but also contribute to global carbon sequestration.

This comparison emphasizes the importance of a more sustainable approach, where natural resources are utilized without damaging existing ecosystems. If the restorative economy scenario is applied, Indonesia could avoid the large emissions produced by the food estate project, while maintaining ecosystem balance and contributing to climate change mitigation.

Documentation by CELIOS

Reference

CELIOS (2024). Menghitung Dampak Ekonomi Restoratif: Jalan Keluar Kebuntuan Ekonomi. www.celios.co.id

CELIOS (2024). Paradigma Baru Ekonomi: Dukungan Fiskal untuk Ekonomi Restoratif. www.celios.co.idCouncil, D. P. (2013). Technical support document:-technical update of the social cost of carbon for regulatory impact analysis-under executive order 12866. Environmental Protection Agency.

Huy, B., Poudel, K. P., Kralicek, K., Hung, N. D., Khoa, P. V., Ph ng, V. T., & Temesgen, H. (2016). Allometric equations for estimating tree aboveground biomass in tropical dipterocarp forests of Vietnam. Forests, 7(8), 180.

Karyati, K., Widiati, K. Y., Karmini, K., & Mulyadi, R. (2021). The allometric relationships for estimating above-ground biomass and carbon stock in an abandoned traditional garden in East Kalimantan, Indonesia. Biodiversitas Journal of Biological Diversity, 22(2).

Kenzo, T., Furutani, R., Hattori, D., Kendawang, J. J., Tanaka, S., Sakurai, K., & Ninomiya, I. (2009). Allometric equations for accurate estimation of above-ground biomass in logged-over tropical rainforests in Sarawak, Malaysia. Journal of forest research, 14, 365-372.

Setiadi, P. dkk (2024). Saatnya Ekonomi Restoratif. CELIOS https://admin.celios.co.id/uploads/Buku_Saatnya_Ekonomi_Restoratif_2024_89ae99e60c.pdf

Zhang, F., Tian, X., Zhang, H., & Jiang, M. (2022). Estimation of aboveground carbon density of forests using deep learning and multisource remote sensing. Remote Sensing, 14(13), 3022.

Zhou, X., Hu, C., & Wang, Z. (2023). Distribution of biomass and carbon content in estimation of carbon density for typical forests. Global Ecology and Conservation, 48, e02707.

Center of Economic and Law Studies (CELIOS)

Jl Abuserin, Kel. Gandaria Selatan,
Kec. Cilandak, Jakarta Selatan, Indonesia

E : admin@celios.co.id
W : celios.co.id