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Assessment of CO₂ emissions in the rural set-up of the Vuwani area in Limpopo, South Africa.

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Abstract

The world is currently battling climate change through various mitigation and adaptation measures. Some of these measures include reducing greenhouse gas emissions, transitioning to renewable energy sources, implementing sustainable agriculture and forestry practices, and enhancing climate resilience in vulnerable communities. The Vuwani area plays a significant role in carbon emissions, where agriculture and land use change are major drivers of emissions. This area often has high levels of deforestation, burning of fossil fuels, and use of traditional biomass for cooking and heating, which contribute to carbon emissions. The assessment of CO₂ emissions in the Vuwani area is a growing concern due to its potential impact on climate change. This study focuses on the rural area of Vuwani in Limpopo, South Africa, where CO₂ emissions are high due to various anthropogenic activities. However, there was a gap in knowledge regarding the magnitude and sources of CO₂ emissions in this area. The availability of data on CO₂ emissions from the Vuwani eddy covariance flux tower filled that gap and shows the area as a source of carbon which can assist the country in formulating effective policies to mitigate climate change. The eddy covariance technique is used as a possible solution to estimate CO₂ emissions from the Vuwani area. The method measured the exchange of CO₂ between the surface and the atmosphere and provided accurate and continuous measurements of daily means of Net Ecosystem Exchange ranging from $-5 \text{ gCm}^{-2}/\text{day}$ and $+54 \text{ gCm}^{-2}/\text{day}$ that included meteorological parameters radiation (daily mean) of minimum 250 Wm^{-2} and maximum 504 Wm^{-2} . The daily CO₂ flux ranged from $\pm 7 \mu\text{mol/m}^2 \text{ s}^{-1}$, and close to 100% energy closure. The findings of this study assist in formulating policies and strategies to reduce CO₂ emissions in rural areas and mitigate climate change.

Keywords: Vuwani area, climate change, Net ecosystem exchange, CO₂ emissions, eddy covariance

Apply to be considered for a student ; award (Yes / No)?

yes

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MSc

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