

## SIIC025

# EVALUATION OF CARBON DIOXIDE EMISSIONS IN MALAYSIA'S HIGHLANDS USING AIRBORNE REMOTE SENSING

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### **Abstract:**

Environmental issue is one of the serious issues affecting the ecosystem. Release of CO<sub>2</sub> emissions is really important that need to be considered. Most of spatial region at highlands in Malaysia were affected due to the excessive release of CO<sub>2</sub> emissions and many changes occur such as air temperature and atmospheric moisture changes. However, some previous study shows that the CO<sub>2</sub> emission forecasting is hardly being considered on multiple factors. Therefore, the Grey Relational Analysis approach was proposed in this study to investigate the correlation between multiple factors and CO<sub>2</sub> emission signified the objective of this study which to analyse the CO<sub>2</sub> emission data in Malaysia's highlands using correlation coefficient analysis (GRA) method. The satellite database remote sensing that suitably used for the collection of the data is Giovanni which correlate to the objective in collecting CO<sub>2</sub> emission data. The comparison between the multiple factors shows that the proposed method has higher accuracy compared on forecasting method presenting that correlation between atmospheric moisture and CO<sub>2</sub> emissions has the significant outcomes in proving the factors that been affected by the CO<sub>2</sub> emissions. From result analysed by GRA method, presenting the most affected factors due to the CO<sub>2</sub> emissions is atmospheric moisture within Cameron Highland as it states the higher grey relational degree compared to the other associated factor within other highlands in 2009 and 2011 which were 2.812451 and 2.394842 respectively. While in 2010, the atmospheric moisture within Kundasang is the most greatly been affected by the CO<sub>2</sub> emissions based on higher grey relational degree between other highlands which about 1.705437. Thus, the studying in satellite database remote sensing in analysing CO<sub>2</sub> emissions in Malaysia's highlands can be proved in this study.

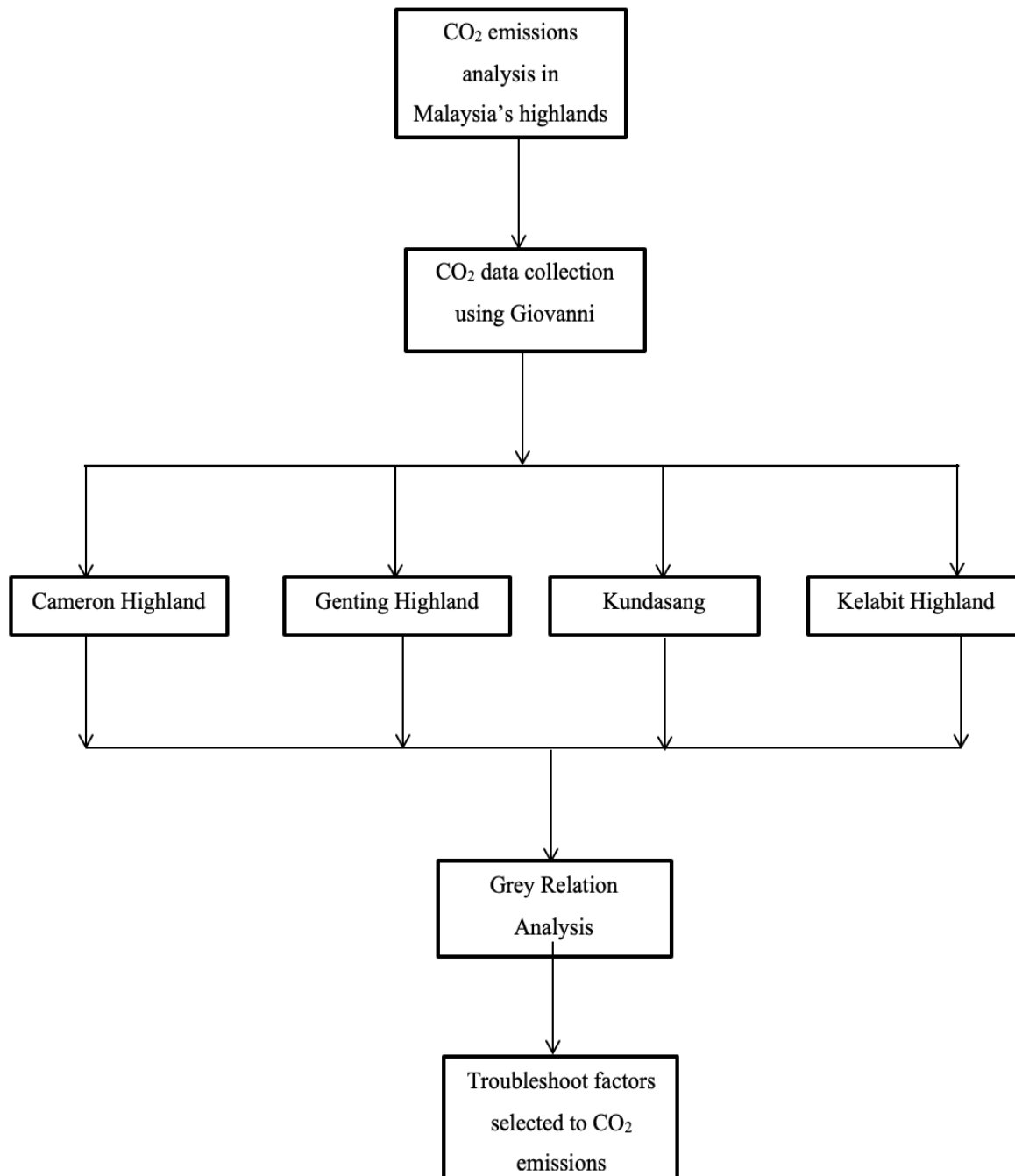
### **Keywords:**

Grey relation analysis; carbon dioxide emissions; Giovanni; airborne remote sensing; highlands.

### **Objectives:**

- To collect CO<sub>2</sub> emission data in Malaysia's highlands from Giovanni remote sensing database.
- To analyse the CO<sub>2</sub> emission data in Malaysia's highlands using correlation coefficient analysis (GRA) method.
- To investigate factors that affected by CO<sub>2</sub> emission in Malaysia's highlands.

*Methodology:*



**Results:*****Cameron Highland***

Years	2009	2010	2011
Air Temperature (K)	0.988006	0.367361	0.57619
Atmospheric Moisture (kg/kg)	2.812451	1.526079	2.394842

***Genting Highland***

Years	2009	2010	2011
Air Temperature (K)	0.925408	0.661818	1.3497
Atmospheric Moisture (kg/kg)	1.534459	1.318653	2.102245

***Kundasang***

Years	2009	2010	2011
Air Temperature (K)	0.994065	0.845841	1.378406
Atmospheric Moisture (kg/kg)	2.059817	1.705437	2.169858

***Kelabit Highland***

Years	2009	2010	2011
Air Temperature (K)	1.015308	0.860707	1.705824
Atmospheric Moisture (kg/kg)	1.6699	1.369606	2.119393

**Conclusion:**

In this study, the principal findings show that the atmospheric moisture have been affected critically from the CO<sub>2</sub> emissions compared to the atmospheric temperature. Statistically, the atmospheric moisture has been correlated with CO<sub>2</sub> emission apparently based on GRA analysis method. The study had assimilated the GRA method in considering several of factors to estimate the specific factors that had been affected by CO<sub>2</sub> emission in multiple highlands. The approach had been used in this study by estimating the factors that had been affected by CO<sub>2</sub> emissions that comprise of two associated factors such as air temperature and atmospheric moisture and one main factor which is CO<sub>2</sub> concentration to encounter the objectives of this study. Several highlands were chosen as the research region such as Cameron Highland, Genting Highland, Kundasang and Kelabit Highland. Estimating the accurate factors affected by CO<sub>2</sub> emissions quite conflicting, thus, GRA was used in this research in determining the exact factor correlate with CO<sub>2</sub> emissions. As a conclusion, the performance of GRA method had been successfully determined the factors that have been affected by CO<sub>2</sub> emissions. Atmospheric moisture is the associated factor that had been correlated with the CO<sub>2</sub> emissions based on the grey relational degree calculated for all highlands selected for this research. Accordingly, it can be concluded that in year 2009, Cameron Highland has higher grey relational degree compared to Genting Highland, Kundasang, and Kelabit Highland which about 2.812451. For 2010, the highest grey relational degree was recorded in Kundasang which about 1.705437. Last but not least, for 2011, Cameron Highland once more recorded the highest grey relational degree compared to other highlands which about 2.394842. In a nutshell, Cameron Highland has the higher concentration of CO<sub>2</sub> within 2009 and 2011 due to the tourism attraction and development.