



Comparative Analysis of Carbon Sequestration and Operational Carbon Emissions A Case Study of Phakmaiwittayanukul School

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Abstract

This study compared carbon sequestration by trees with greenhouse gas emissions from electricity and fuel use at Phakmaiwittayanukul School.

Carbon sequestration was calculated from 60 trees using GLOBE Observer and TGO tools, while emissions were calculated from one year of school energy use. Results showed that trees sequestered 43,070.74 kgCO₂eq, which was much higher than total emissions of 4,265.72 kgCO₂eq. This indicates that green spaces in the school can effectively offset greenhouse gas emissions.

Introduction

Climate change and global warming are driven mainly by increased greenhouse gas emissions, especially CO₂ from human activities. Although schools are not major emitters, daily operations such as electricity use, transportation, and campus activities continuously generate carbon emissions. Trees and green spaces help mitigate these impacts by absorbing CO₂ through carbon sequestration while also improving air quality and learning environments. This study evaluates the carbon balance of a school by comparing operational CO₂ emissions with carbon sequestration from existing trees, providing a baseline for planning greener infrastructure, energy efficiency, and long-term sustainability.

Research Question and Hypothesis

Research Question

Can the trees in PhakMaiWitthayanukul School, Phak Mai Subdistrict, HuaiThapThan District, Sisaket Province store carbon? If so, how?

Research Hypothesis

Trees within the Phakmai Wittayanukul School area have the capacity to sequester carbon.

Materials / Equipment

Category	Description	
Measuring instruments	Measuring tape	
Note-taking materials	Notebook	
Writing materials for note-taking	Pen	
Various supporting equipment	Mobile phone Pencil	

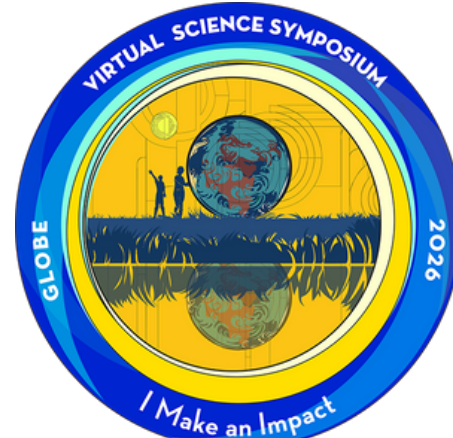
Optional Badges



I AM A DATA SCIENTIST



I AM A COLLABORATOR

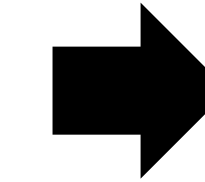


I MAKE AN IMPACT

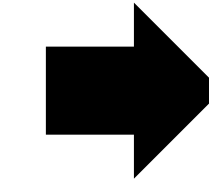
Research Methods and Materials



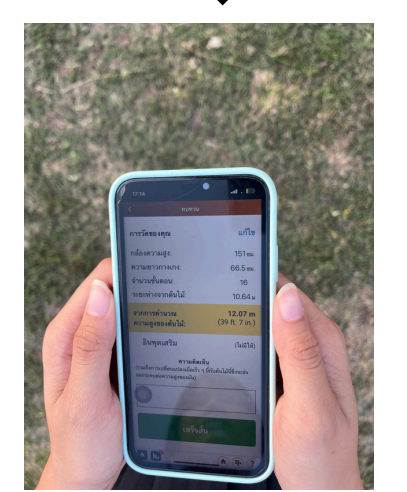
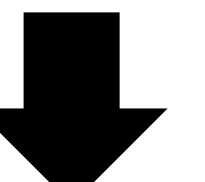
Step:1 Measurement of stem height



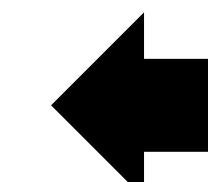
Step:2 Measurement of tree trunk circumference



Step:3 Recording the general characteristics of a tree



Step:4 Calculation and summary of tree height values



Step:5 Submit the measurements to the GLOBE Observer app

Results

Month/Year	Electricity consumption(kWh)	Carbon footprint (kgCO ₂ eq)
January/68	544.68	305.56
February/68	442.78	248.39
March/68	356.8	200.16
April/68	588.74	330.28
May/68	429.62	241.01
June/68	463.28	259.9
July/68	876.38	491.649
August/68	639.85	358.95
September/68	951.97	534.05
October/68	455.63	255.6
November/68	380.66	213.55
December/68	881.59	494.571
Total carbon footprint from electricity consumption:		3,933.58

The carbon footprint from electricity use during January–December 2025 showed monthly consumption of 356.80–951.97 kWh, with a constant emission factor of 0.561 kgCO₂eq/kWh. Monthly emissions ranged from 200.16 to 534.05 kgCO₂eq, with the highest emissions occurring in September.

Month/Year	Fuel consumption (Litre)	Carbon footprint (kgCO ₂ eq)
January/68	11.35	26.33
February/68	11.45	26.56
March/68	11.64	27
April/68	12.15	28.18
May/68	12.27	28.46
June/68	12.06	27.97
July/68	12	27.84
August/68	12.15	28.18
September/68	12.21	28.32
October/68	12.45	28.88
November/68	12.24	28.39
December/68	11.22	26.03
Total carbon footprint from fuel combustion :		332.14 (kgCO ₂ eq)

The fuel consumption and carbon dioxide emissions during January–December 2025 showed that average monthly fuel use ranged from 11.22 to 12.45 liters. The emission factor remained constant at 2.32 kgCO₂e per liter, resulting in a monthly carbon footprint of 26.03–28.88 kgCO₂e. The highest emissions occurred in October (28.88 kgCO₂e), while the lowest occurred in December (26.03 kgCO₂e).

Discussion

Trees at Phak Mai Wittayanukul School sequestered 43,070.74 kgCO₂eq, which was much higher than greenhouse gas emissions of 4,265.72 kgCO₂eq. This shows that green spaces in the school can fully offset emissions and help reduce global warming.

Bibliography

References

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