

Evaluating Sustainable Energy Potentials through Carbon Emission Assessment of Small and Medium-sized Enterprises (SMEs) in the Global South: a case in Wula, CRS Nigeria

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Presentation Outline

- A. Introduction and brief Geography***
- B. Methodology and Evidence of fossil systems***
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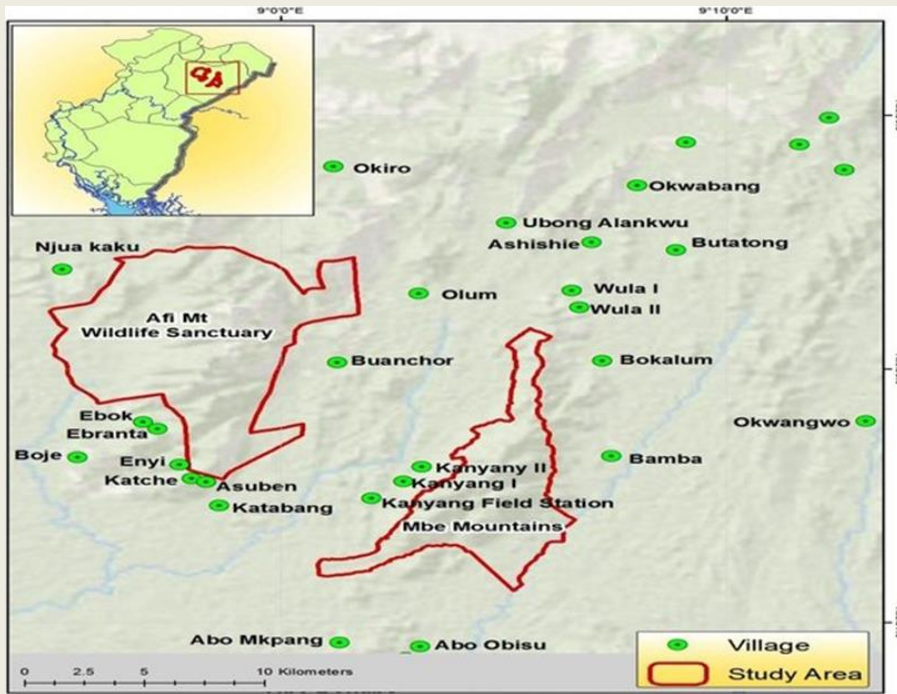


Introduction

- Around 40% of the world's population do not have access to clean energy (Ritchie and Roser, 2019) and the demand is increasing.
- In Nigeria, only 40% of the population is connected to the national grid (Aliyu and Adam 2015), hence, energy demand is high for economic of growth of SMEs.
- SMEs plays a significant role in economic development and achievement of the UN SDGs in Nigeria's rural and urban areas.
- Wula is a rural community located in CRS Nigeria with over 10,000 people and has protected forest reserves. It is host to endangered species of plant and animals. The people depend on small businesses and some 'illegal' forest wealth (Ezebilo and Mattsson 2010).
- SMEs in Wula lack access to national grid and rely on fossil-based energy sources. Continual dependence on fossil energy could exacerbate socio-economic consequences, environmental risks and carbon emission.

Geography and Forest Economy of Wula, CRS Nigeria

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Topographical Map of Wula I & II in Boki LGA of Cross River State, Nigeria. Source: (Shomkegh, Adaje and Verinumbe)



Methodology

- Adopted observatory investigation and semi-structured interviews to scope data on energy type & sources, cost implications, quantity consumed and identified sustainable energy potentials.
- Conducted one-to-one and focus group interviews with relevant community leaders and 16 SMEs to determine their acceptability level of renewable alternatives and formulate strong argument for co-creating sustainable energy.
- The direct fuel cost was calculated using the local retail price of N150.00/litre (about 39 cents) and N300.00/litre (about 77cents) for petrol and diesel respectively. Emissions and carbon footprint were estimated using the formular below according to quantity of petrol and/or diesel consumed per SME (Lingl and Carlson, 2010).

Carbon footprint (KgCO_2e) = emission factor (CV (kWh)) X quantity of fuel consumed

Tons of CO_2 equivalent (tCO_2e) = $\text{KgCO}_2\text{e}/1000$

- Standard emission factors for Petrol gross calorific value (**CV – 0.24099**) and diesel (**CV – 0.25267**) were used to estimate and compute carbon footprint (KgCO_2e) (Liu *et al.*, 2015).

Fossil Energy Generators

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Results and Analysis

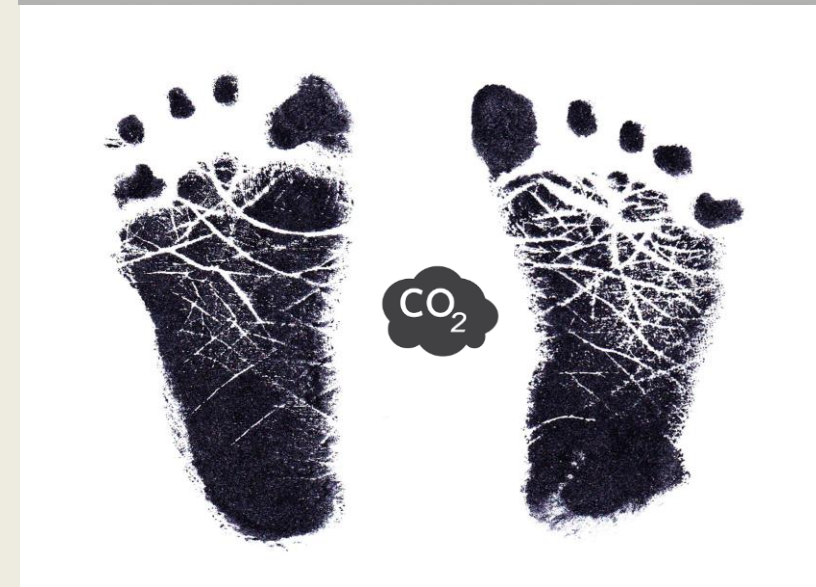
1. Energy Source, Consumption and Emissions

- ❖ 100% of SMEs’ energy is from fossil-fuel; a dare need for intervention
- ❖ Each SME consumes an average of 4.44ltrs/5 hrs/day (6 pm and 11 pm)
- ❖ Economic activities are severely impacted with cascading impact on livelihoods
- ❖ The direct exposure to kerosene have various consequences - **poisoning, dermatitis, chemical depression and headaches, loss of memory and affects respiratory effects, kidney and blood disfunctions** (Epstein *et al.*, 2013).
- ❖ These hazards are under reported and ignored by the concerned authorities
- ❖ This is in contrast with SDG 3 (Good Health and Well-being) which aim to ensure healthy lives and promote well-being for all, globally

SME TYPE	FUEL TYPE	DAILY USAGE (LITRES)	ANNUAL USAGE (LITRES)	ANNUAL EMISSION (KgCO2e)
Provision store for one-stop shopping	Petrol	4	1460	351.8454
Commercial Foodstuffs vendor	Petrol	6	2190	527.7681
Hair Dressing Shop	Petrol	5	1825	439.80675
Tailoring Shop (Making and mending cloths)	Petrol	5	1825	439.80675
Provision Store and Onestop shopping	Petrol	4	1460	351.8454
Commercial Mobile Phones Charging Shop	Petrol	8	2920	703.6908
Sports viewing Centre and Sale of cool drinks	Petrol	3	1095	263.88405
Sale drinks, Provisional items and Fast Food	Petrol	5	1825	439.80675
Provision Store for Onestop shopping	Petrol	10	3650	879.6135
Commercial Food vendor	Petrol	2	730	175.9227
Medicine Store (Chemist)	Petrol	3	1095	263.88405
Provision Store one-stop shopping	Petrol	6	2190	527.7681
Fast food and Food items	Petrol	3	1095	263.88405
Patent Medicine Store	Petrol	3	1095	263.88405
Medical Diagnostic Laboratory	Petrol	4	1460	351.8454
Iron fabrication and Welding	Diesel	20	7300	1844.491
TOTAL Consumptions & Footprints		71	25,950	8089.74685

2. Estimating Carbon footprint of SMEs

- ❖ The combine carbon footprint of 16 SMEs stands at 8, 089.747 kgCO₂^e (equivalent of 8.089 tCO₂e) per annum.
- ❖ An equivalent of 505.609 KgCO₂e/SME /annum. Implies that each SME emits at least 1/2 a ton of Carbon dioxide/year)
- ❖ The implication of this on the ambient climate system could be severe and most likely to exacerbate physical and socio-economic consequences (Yao, Huang and Song, 2019).
- ❖ And a huge hinderance to the success of the SDGs – mainly 7, 11, 13, and 14



3. Estimating Financial Cost of Energy (COE) on SMEs

- ❖ SMEs in the Wula are struggling with revenue losses due to the cost of energy. Data indicates that SMEs spent an equivalent of \$15,432.81 USD annually on 25,950 litres of fossil energy
- ❖ That excludes the cost of engine maintenance and parts replacement. The additional costs on SMEs *“has high impacts on...turnover”* and on families – mostly women and children
- ❖ On the contrary, a \$15,400 USD investment on renewable alternatives (solar, mini-wind and water systems) could serve the energy need of SMEs, offset carbon footprints and accelerate return on investment.
- ❖ It could improve the quality of life amongst the rural poor as well as safeguard the environment

SME TYPE	FUEL TYPE	ANNUAL USAGE (LTRS)	FUEL COST/ANNUAL (=N=)
Provision store for one-stop shopping	Petrol	1460	219,000
Commercial Foodstuffs vendor	Petrol	2190	328,500
Hair Dressing Shop	Petrol	1825	273,750
Tailoring Shop (Making and mending cloths)	Petrol	1825	273,750
Provision Store and One-stop shopping	Petrol	1460	219,000
Commercial Mobile Phones Charging Shop	Petrol	2920	438,000
Sports viewing Centre and Sale of cool drinks	Petrol	1095	164,250
Sale drinks, Provisional items and Fast Food	Petrol	1825	273,750
Provision Store for One-stop shopping	Petrol	3650	547,500
Commercial Food vendor	Petrol	730	109,500
Medicine Store (Chemist)	Petrol	1095	164,250
Provision Store one-stop shopping	Petrol	2190	273,750
Fast food and Food items	Petrol	1095	164,250
Patent Medicine Store	Petrol	1095	164,250
Medical Diagnostic Laboratory	Petrol	1460	219,000
Iron fabrication and Welding	Diesel	7300	2,190,000
Totals		25,950	6,022,500

RENEWABLE ENERGY POTENTIAL



Conclusion

- ❖ There is significant sustainable energy that could support SMEs in Wula that cannot be ignored, to reduce direct impact of fossil emissions on the protected forest, biodiversity, ecological systems and livelihoods (Amrinder, 2016; Midgley and Bond, 2015).
- ❖ Sustainable energy interventions would minimise local carbon emissions to about 8.089 tCO₂e/annum and boost economic growth whilst improving human health & well-being (SDG 3).
- ❖ Alternative renewables could save SMEs about \$15,432.81 USD/year. However, alternatives renewables often come with a cost which the community is willing to take
- ❖ Local interventions through available potentials could re-align empirical pathway to achieving SDGs such as SDG 7 (Affordable and Clear Energy), 9 (Industry, Innovation, and Infrastructure), 11 (Sustainable Cities & Communities and 13 (Climate Action).
- ❖ This project is a work in progress. The next step aims to conduct a need assessment of SMEs and local communities to highlight other possible needs that could potentially hinder the smooth achievement of renewable alternative sources.
- ❖ In alignment with the strategic energy objectives, this study proposes a further modelling of an integrated modular hydro-electric power (MHEP) systems for Wula with an attempt to suggest community collaboration for co-creating sustainable energy solutions.

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