Mapping Baseline Assessments to Evaluate Carbon Footprint and Sustainability Metrics

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Semester Project: Evaluating Carbon Footprints for BNU Labs

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Carbon Footprints Estimation of SCIT Labs

Carbon Footprints Estimation of SCIT Labs

Step 1: Estimate Power Consumption per Processor

The average power consumption of different processors varies, but we assume the following estimates:

- **Intel Core i5 → 65W**
- **Intel Core i7 → 95W**
- **Intel Core i9 → 125W**

Assumptions:

- These values are average power consumption figures under normal usage.
- Each computer operates for **5 hours per day**.

Carbon Footprints Estimation of SCIT Labs

Step 2: Calculate Daily and Annual Energy Consumption

We calculate the daily energy consumption for each processor type:

Energy Used per Day (in kWh) = Powers(kW) x Hours Used

i5 computers → 60 x (65W ÷ 1000) x 5 = 19.5 kWh

i7 computers → 70 x (95W ÷ 1000) x 5 = 33.25 kWh

i9 computers → 70 x (125W ÷ 1000) x 5 = 43.75 kWh

Total daily energy consumption = 19.5 + 33.25 + 43.75 = 96.5 kWh per day

Annual Energy Consumption (assuming 365 days) = 96.5 × 365 = 35,222.5 kWh per year

The total daily energy consumption is **96.5 kWh per day**, and the annual energy consumption is **35,222.5 kWh per year**.

Carbon Footprints Estimation of SCIT Labs

Step 3: **Calculate Carbon Footprint**

Energy Source	**Share (%)**	**CO_2 Emission Factor (kg CO_2 per kWh)**
1. Fossil Fuels (Coal, Oil, Gas)	60%	0.85 kg CO_2/kWh
2. Hydropower (Dams)	0%	0.024 kg CO_2/kWh
3. Solar Power	40%	0.05 kg CO_2/kWh

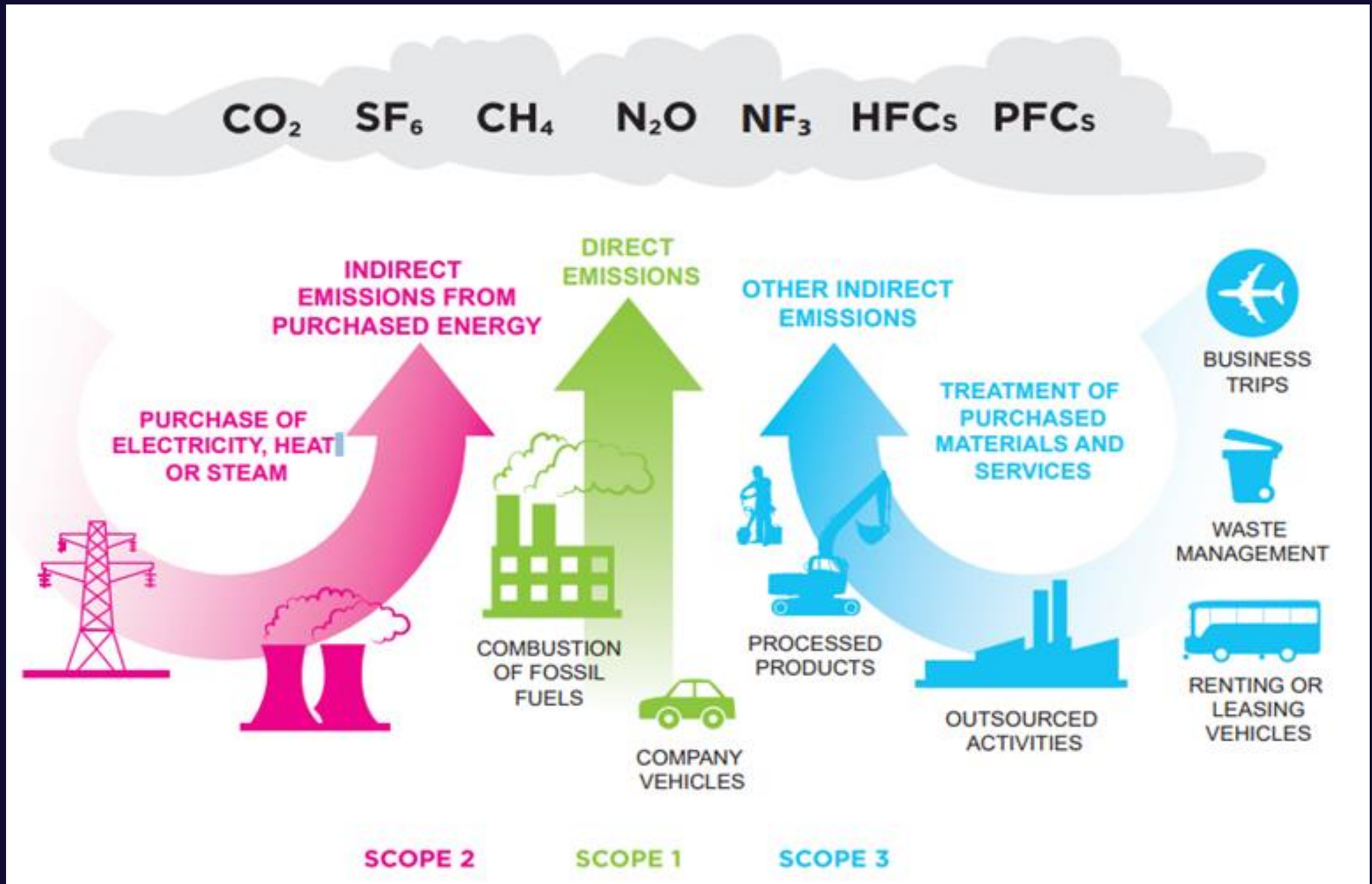
CO_2 Emissions Contribution:

1: Fossil Fuels Contribution → (35,222.5 × 0.6) × 0.85 = 17,963.48 kg CO_2
2: Hydropower Contribution → (35,222.5 × 0) × 0.024 = 0
3: Solar Contribution → (35,222.5 × 0.4) × 0.05 = 704.45 kg CO_2

Total Annual Carbon Footprint before using solar panel: 35,222.5 x 0.85 = 29,939.13 kg CO_2

Total Annual Carbon Footprint after using solar panel: 17,963.48 + 704.45 = 18,668 kg CO_2

Scope 1, 2 & 3 Emission sources



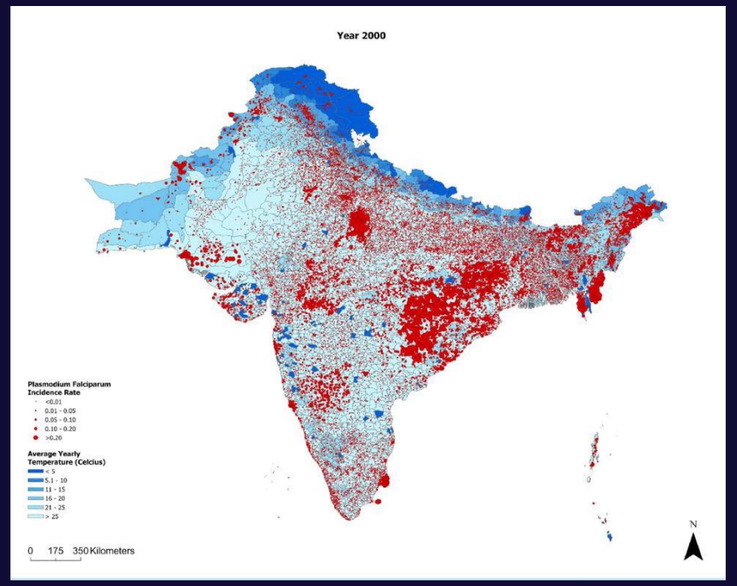
Emission Sources – Scope 1, 2 & 3

SCOPE 1 **Direct Emissions**	**Scope 2** **Indirect Emissions – Purchased Energy**	**Scope 3** **Other Indirect Emissions – Activities Related to the School**
School Generator – Fuel used in the generator	**Electricity Bill** – Energy used from the power company 1. Fossil Fuels 2. Solar power	**Paper Use** – Printing, photocopying, and notebook usage
School-Owned Vehicles – Fuel used in school's own vans/buses		**Water Bill** – Water used in the school
Fire Safety Equipment – Gas used in fire extinguishers		**Hired School Transport** – Fuel used in buses not owned by the school
Cooling Machines – **Number and model of air conditioners & refrigerators** (to estimate power usage)		**Personal Vehicles** – Fuel used by students and staff coming in their own cars/bikes
Kitchen Gas – Gas used for cooking in the school		**Waste Generation** – Disposal of 1. food, 2. paper, 3. plastic, and other materials

AI-driven Climate Informatics & Interdisciplinary Collaboration

Climate Impact Assessment

Our research has focused on developing AI-driven climate impact assessment models. As demonstrated in our publication in **PNAS 2025**, NeurIPSw 2024, **The Lancet Journal 2024,** ICLRw 2023, **JSTARS 2020**, CV4GC 2019.



Interdisciplinary Collaboration

1. Illegal Kiln Activity in SMOG period [EPA 2020]
2. MODALES – Power based Fuel consumption [University of Leeds, UK, 2021]
3. Prediction of Malaria Outbreaks using Earth Observation Data [NDORMS, University of Oxford, 2022]
4. Acute Respiratory Infection vs. Gaseous Indicators and Air Quality Index [University of London, 2024]
5. Three-decade mapping of brick kilns reveals intensified environmental and health threats in the Asian Brick Belt [University of Hong Kong, 2025]

Recent Publications from the Center for AI Research (CAIR)

- **Three-decade mapping of brick kilns reveals intensified environmental and health threats in the Asian Brick Belt, PNAS Journal (submitted), 2025**
- **Mapping air pollution sources with sequential transformer chaining: A case study in South Asia** NeurIPS workshop 2024.
- **2022 flood impact in Pakistan: Remote sensing assessment of agricultural and urban damage** AAAI Fall Symposium, 2024.
- **Data-Driven approach to assess and identify gaps in healthcare set up in South Asia** ICONIP, 2024.
- **Mending of spatio-temporal dependencies in block adjacency matrix** ICONIP, 2024.

Research Collaboration with NDORMS, University of Oxford

- U. Nazir, et al. Predicting malaria outbreaks using earth observation measurements and spatio-temporal deep learning modelling: a South Asian case study from 2000 to 2017, **The Lancet Journal, 2024**.
- U. Nazir, et al. Humanitarian costs of climate change: mapping the impact of extreme floods on population displacement and disruption to education and health using earth observation and data fusion, **PHAM, 2024.**
- U. Nazir, et al. Predicting malaria outbreaks using earth observation measurements and spatio-temporal deep learning modelling: a South Asia case study from 2000 to 2017, **PHAM, 2024**.
- U. Nazir, et al., Towards a spatio-temporal deep learning approach to predict malaria outbreaks using earth observation measurements in South Asia NeurIPS Workshop on Tackling Climate Change with Machine Learning: Blending New and Existing Knowledge Systems 2023.
- U. Nazir, et al., Spatio-Temporal driven Attention Graph Neural Network with Block Adjacency matrix (STAG-NN-BA) for Remote Land-use Change Detection AAAI Symposium, 2023.
- Mitigating climate and health impact of small-scale kiln industry using multi-spectral classifier and deep learning, ICLR workshop: Tackling Climate Change with Machine Learning, 2023.