

SIH-2024

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## 1. Carbon Emissions Estimation

For each activity (e.g., excavation, transportation):

$$\text{Total Emissions (CO}_2\text{)} = \sum (\text{Activity Data} \times \text{Emission Factor})$$

- **Activity Data:** The measurable quantity of each activity (e.g., fuel consumed, distance traveled, hours of operation).

- **Emission Factor:** The amount of CO<sub>2</sub> emitted per unit of activity (e.g., kg CO<sub>2</sub> per liter of diesel).

Example:

CO<sub>2</sub> Emissions from diesel use = Liters of diesel used × Emission factor (kg CO<sub>2</sub>/liter)

## 2. Per Capita Emissions Estimation

$$\text{Per Capita Emissions (CO}_2\text{)} = \frac{\text{Total Emissions (CO}_2\text{)}}{\text{Number of People}}$$

- **Total Emissions (CO<sub>2</sub>):** The sum of all emissions from various activities.

- **Number of People:** Total number of employees or residents associated with the mining operations.

## 3. Afforestation Offsets Calculation

Carbon Offset (CO<sub>2</sub>) = Area of Land × Carbon Sequestration Rate (tons CO<sub>2</sub>/hectare/year)

- **Area of Land:** The amount of land dedicated to tree plantation.

- **Carbon Sequestration Rate:** The rate at which trees absorb CO<sub>2</sub>, depending on tree species, soil type, and climate.

To calculate the area required for a target offset:

$$\text{Required Area (hectares)} = \frac{\text{Total CO}_2 \text{ Emissions to Offset (tons/year)}}{\text{Carbon Sequestration Rate (tons CO}_2\text{/hectare/year)}}$$

## 4. Carbon Credits Estimation

Carbon Credits (tons CO<sub>2</sub>) = Emissions Reduced or Offset (tons CO<sub>2</sub>)

- **Market Value of Carbon Credits:**

Market Value = Carbon Credits (tons CO<sub>2</sub>) × Market Price (currency/ton CO<sub>2</sub>)

- **Emission Reduction Strategies:** Can include adoption of cleaner technologies or afforestation, which reduce or offset emissions.

## 5. Energy Consumption Reduction

For alternative energy sources:

Energy Consumption Reduction (kWh) =  $\sum$ (Traditional Energy Use – Renewable Energy Use)

- **Traditional Energy Use:** The energy used by conventional sources (e.g., coal, diesel).

- **Renewable Energy Use:** The energy provided by renewable sources (e.g., solar, wind).

## 6. Gap Analysis between Emissions and Carbon Sinks

Gap (tons CO<sub>2</sub>) = Total Emissions (tons CO<sub>2</sub>) – Total Carbon Sinks (tons CO<sub>2</sub>)

- **Total Emissions:** The total emissions calculated from various activities.

- **Total Carbon Sinks:** The total amount of CO<sub>2</sub> absorbed by carbon sinks (e.g., forests, soil).

## 7. Scalability and Emission Estimation for Different Mine Sizes

For scalability, the same emission estimation formula can be applied but adjusted based on the size of the mine:

Adjusted Emissions (tons CO<sub>2</sub>) = Total Emissions (tons CO<sub>2</sub>) × Scaling Factor

- **Scaling Factor:** A ratio based on the size and type of the mine (e.g., larger mines may have a higher scaling factor).