Name = Nikhil

Subject = M602B Computer Programming

Email = paulnikhil881@gmail.com

Project Analysis Report: CO2 Emission Report Calculator

1. Project Objective

This project calculates CO2 emissions based on user-provided data for:

- Energy usage (electricity, natural gas, and fuel)
- Waste generation and recycling practices
- Business travel

It generates a PDF report summarizing the calculated emissions.

---

2. Key Features

1. **CO2 Emission Calculations**:
    - Electricity usage: Based on monthly bills and conversion factors.
    - Natural gas usage: Calculated using gas bills and emission coefficients.
    - Fuel consumption: Estimated from monthly transportation expenses.
    - Waste management: Incorporates recycling percentage to adjust CO2 emissions.
    - Business travel: Uses kilometers traveled and vehicle fuel efficiency to compute emissions.

2. **Report Generation**:
    - A professional PDF report is created using the **FPDF** library.
    - The report includes user inputs, detailed CO2 calculations, and a total emissions summary.

3. **User Input Handling**:
    - Collects essential information interactively via prompts.
    - Automatically calculates and summarizes results.

---

3. Technologies Used

- **Python**: For computation and data processing.
- **FPDF Library**: For creating PDF reports.

---

4. Observations

1. **Code Structure**:
   - Modular and well-organized with dedicated functions for different calculations.
   - Reusable and scalable design.

2. **User Experience**:
   - Interactive prompts for user input enhance engagement but may benefit from a GUI for broader usability.

3. **Strengths**:
   - Clear separation of logic for calculations and reporting.
   - Easy-to-read code with descriptive function names and comments.

Github Project Profile Link:-

https://github.com/NikkuPaul

Project Name :- Co2EmissionCalculator.py (Under Python folder)

Project code :- (if link is not work)

```
from fpdf import FPDF

# Functions for CO2 calculations
def calculate_electricity_usage_co2(electricity_bill):
    return electricity_bill * 12 * 0.0005
```

```
def calculate_natural_gas_usage_co2(natural_gas_bill):
    return natural_gas_bill * 12 * 0.0053

def calculate_fuel_usage_co2(fuel_bill):
    return fuel_bill * 12 * 2.32

def calculate_energy_usage_co2(electricity_bill=0, natural_gas_bill=0,
fuel_bill=0):
    """Calculate CO2 emissions from energy usage."""
    electricity_co2 = calculate_electricity_usage_co2(electricity_bill)
    natural_gas_co2 = calculate_natural_gas_usage_co2(natural_gas_bill)
    fuel_co2 = calculate_fuel_usage_co2(fuel_bill)
    return electricity_co2 + natural_gas_co2 + fuel_co2

def calculate_waste_co2(total_waste, recycling_percentage):
    """Calculate CO2 emissions from waste."""
    waste_co2 = total_waste * 12 * (0.57 - (recycling_percentage / 100))
    return waste_co2

def calculate_business_travel_co2(kilometers_traveled, fuel_efficiency):
    """Calculate CO2 emissions from business travel."""
    travel_co2 = kilometers_traveled * (1 / (fuel_efficiency / 100)) * 2.31
    return travel_co2

def generate_pdf_report(data):
    """Generate a PDF report with CO2 emissions results."""
    pdf = FPDF()
    pdf.add_page()
    pdf.set_font("Arial", size=12)

    # Title
    pdf.cell(200, 10, txt="Monthly CO2 Emissions Report", ln=True, align="C")
    pdf.ln(10)
    pdf.set_font("Arial", style="B", size=14)
    pdf.cell(200, 10, txt=f"Name: Nikhil", ln=True, align="L")
    pdf.cell(200, 10, txt=f"Email: paulnikhil881@gmail.com@gmail.com",
ln=True, align="L")
    pdf.ln(10)
    # Energy usage section
    pdf.set_font("Arial", size=12, style="B")
    pdf.cell(200, 10, txt="Energy Usage", ln=True)
    pdf.set_font("Arial", size=12)
    pdf.cell(200, 10, txt=f"Question: What is your average monthly electricity
bill in euros?", ln=True)
    pdf.cell(200, 10, txt=f"Response: Euro {data['electricity_bill']:.2f}",
ln=True)
    pdf.cell(200, 10, txt=f"Electricity Usage CO2:
{data['electricity_co2']:.2f} kgCO2", ln=True)
```

```
    pdf.ln(5)

    pdf.cell(200, 10, txt=f"Question: What is your average monthly natural gas
bill in euros?", ln=True)
    pdf.cell(200, 10, txt=f"Response: Euro{data['natural_gas_bill']:.2f}",
ln=True)
    pdf.cell(200, 10, txt=f"Natural Gas Usage CO2:
{data['natural_gas_co2']:.2f} kgCO2", ln=True)
    pdf.ln(5)

    pdf.cell(200, 10, txt=f"Question: What is your average monthly fuel bill
for transportation?", ln=True)
    pdf.cell(200, 10, txt=f"Response: Euro{data['fuel_bill']:.2f}", ln=True)
    pdf.cell(200, 10, txt=f"Fuel Usage CO2: {data['fuel_co2']:.2f} kgCO2",
ln=True)
    pdf.ln(10)

    # Waste section
    pdf.set_font("Arial", size=12, style="B")
    pdf.cell(200, 10, txt="Waste", ln=True)
    pdf.set_font("Arial", size=12)
    pdf.cell(200, 10, txt=f"Question: How much waste do you generate per month
in kilograms?", ln=True)
    pdf.cell(200, 10, txt=f"Response: {data['total_waste']:.2f} kg", ln=True)
    pdf.cell(200, 10, txt=f"CO2 emissions from waste: {data['waste_co2']:.2f}
kgCO2", ln=True)
    pdf.ln(5)

    pdf.cell(200, 10, txt=f"Question: How much of that waste is recycled or
composted (in percentage)?", ln=True)
    pdf.cell(200, 10, txt=f"Response: {data['recycling_percentage']:.2f}%",
ln=True)
    pdf.ln(10)

    # Business travel section
    pdf.set_font("Arial", size=12, style="B")
    pdf.cell(200, 10, txt="Business Travel", ln=True)
    pdf.set_font("Arial", size=12)
    pdf.cell(200, 10, txt=f"Question: How many kilometers do your employees
travel per year for business purposes?", ln=True)
    pdf.cell(200, 10, txt=f"Response: {data['kilometers_traveled']:.2f} km",
ln=True)
    pdf.cell(200, 10, txt=f"CO2 emissions from business travel:
{data['travel_co2']:.2f} kgCO2", ln=True)
    pdf.ln(5)

    pdf.cell(200, 10, txt=f"Question: What is the average fuel efficiency of
the vehicles used for business travel in liters per 100 kilometers?", ln=True)
```

```
    pdf.cell(200, 10, txt=f"Response: {data['fuel_efficiency']:.2f} L/100km",
ln=True)
    pdf.ln(10)

    # Total emissions
    pdf.set_font("Arial", size=12, style="B")
    pdf.cell(200, 10, txt=f"Total CO2 Emissions: {data['total_co2']:.2f}
kgCO2", ln=True)

    # Save the PDF
    pdf.output("CO2_Emissions_Report.pdf")
    print("PDF report generated: CO2_Emissions_Report.pdf")

# Collecting data from user
data = {
    "electricity_bill": float(input("Enter your monthly electricity bill (in
euros): ")),
    "natural_gas_bill": float(input("Enter your monthly natural gas bill (in
euros): ")),
    "fuel_bill": float(input("Enter your monthly fuel bill (in euros): ")),
    "total_waste": float(input("Enter the total waste generated per month (in
kg): ")),
    "recycling_percentage": float(input("Enter the recycling/composting
percentage: ")),
    "kilometers_traveled": float(input("Enter the kilometers traveled annually
for business purposes (in km): ")),
    "fuel_efficiency": float(input("Enter the vehicle's fuel efficiency
(liters per 100 km): "))
}

# Calculate emissions
data["electricity_co2"] =
calculate_electricity_usage_co2(data["electricity_bill"])
data["natural_gas_co2"] =
calculate_natural_gas_usage_co2(data["natural_gas_bill"])
data["fuel_co2"] = calculate_fuel_usage_co2(data["fuel_bill"])
data["waste_co2"] = calculate_waste_co2(data["total_waste"],
data["recycling_percentage"])
data["travel_co2"] =
calculate_business_travel_co2(data["kilometers_traveled"],
data["fuel_efficiency"])
data["total_co2"] = (
    data["electricity_co2"] + data["natural_gas_co2"] + data["fuel_co2"] +
    data["waste_co2"] + data["travel_co2"]
)

# Generate PDF report
generate_pdf_report(data)
```

Result :-

```
PS C:\Users\PC\OneDrive\Desktop\python> python -u "c:\Users\PC\Downloads\CO2EmissionCalculator.py"
Enter your monthly electricity bill (in euros): 100
Enter your monthly natural gas bill (in euros): 50
Enter your monthly fuel bill (in euros): 120
Enter the total waste generated per month (in kg): 20
Enter the recycling/composting percentage: 50
Enter the kilometers traveled annually for business purposes (in km): 5000
Enter the vehicle's fuel efficiency (liters per 100 km): 8
PDF report generated: CO2_Emissions_Report.pdf
PS C:\Users\PC\OneDrive\Desktop\python>
```

Generated Pdf images Below :-

Monthly CO2 Emissions Report

Name: Nikhil

Email: paulnikhil881@gmail.com@gmail.com

Energy Usage

Question: What is your average monthly electricity bill in euros?

Response: Euro 100.00

Electricity Usage CO2: 0.60 kgCO2

Question: What is your average monthly natural gas bill in euros?

Response: Euro50.00

Natural Gas Usage CO2: 3.18 kgCO2

Question: What is your average monthly fuel bill for transportation?

Response: Euro120.00

Fuel Usage CO2: 3340.80 kgCO2

Waste

Question: How much waste do you generate per month in kilograms?

Response: 20.00 kg

CO2 emissions from waste: 16.80 kgCO2

Question: How much of that waste is recycled or composted (in percentage)?

Response: 50.00%

Business Travel

Question: How many kilometers do your employees travel per year for business purposes?

Response: 5000.00 km

CO2 emissions from business travel: 144375.00 kgCO2

Question: What is the average fuel efficiency of the vehicles used for business travel in liters per 100 kilom

Response: 8.00 L/100km

Total CO2 Emissions: 147736.38 kgCO2