My Smartphone Carbon Emission Analysis

Introduction:

Smartphones have become indispensable in our daily lives, yet their carbon footprint is often overlooked. From charging to internet usage and gaming, each activity consumes energy that contributes to greenhouse gas emissions. This mini project aims to analyze and visualize daily smartphone-related emissions over a specified period (February 16, 2025 – March 14, 2025) and propose strategies to reduce them.

Objectives:

1. Measure daily smartphone usage across multiple factors:
   - Screen Time
   - Charging Hours
   - Internet (Mobile Data & Wi-Fi)
   - Gaming Hours
2. Calculate the corresponding carbon emissions (kg CO_2).
3. Visualize the data using Power BI to identify trends and patterns.
4. Recommend methods to lower smartphone-related emissions.

Data Collection & Methodology:

1. Data Period: February 16, 2025 to March 14, 2025.
2. Data Points Tracked:
   - Screen Time (hrs): Total hours the screen was active.
   - Charging Hours (hrs): Estimated hours plugged in for charging.
   - Mobile Data (GB) & Wi-Fi Data (GB): Internet usage split by connection type.
   - Gaming Hours (hrs): Subset of screen time used for gaming.
3. Emission Factors (Approx.):
   - Charging Emission: 0.0045 kg CO_2 per charging hour.
   - Internet Emission:
     0.5 kg CO_2 per GB (Mobile)
     0.1 kg CO_2 per GB (Wi-Fi)
   - Gaming Emission: 0.009 kg CO_2 per gaming hour (assuming gaming is more energy-intensive).
4. Data Recording:
   Entered into an Excel sheet with columns for each activity and the Total Smartphone Emission as a calculated field.

Key Findings:

1. Overall Statistics:
   - Total Contribution (Feb 16 – Mar 14): 14.05 kg CO_2
   - Average Screen Time: 6.06 hours per day
   - Highest Emission Date: February 28, 2025

These figures indicate that, on average, each day contributed around 0.50 kg CO_2 from smartphone usage alone.

2. Daily Usage Comparison
   - Screen Time vs. Charging Hours: A direct correlation is observed—days with higher screen time (e.g., 11.5 hours on Feb 28) typically required more charging hours (5.75 hours).
   - Gaming Hours: Though gaming hours are often part of the screen time, any additional or more intensive gaming sessions spike emissions due to higher power draw.

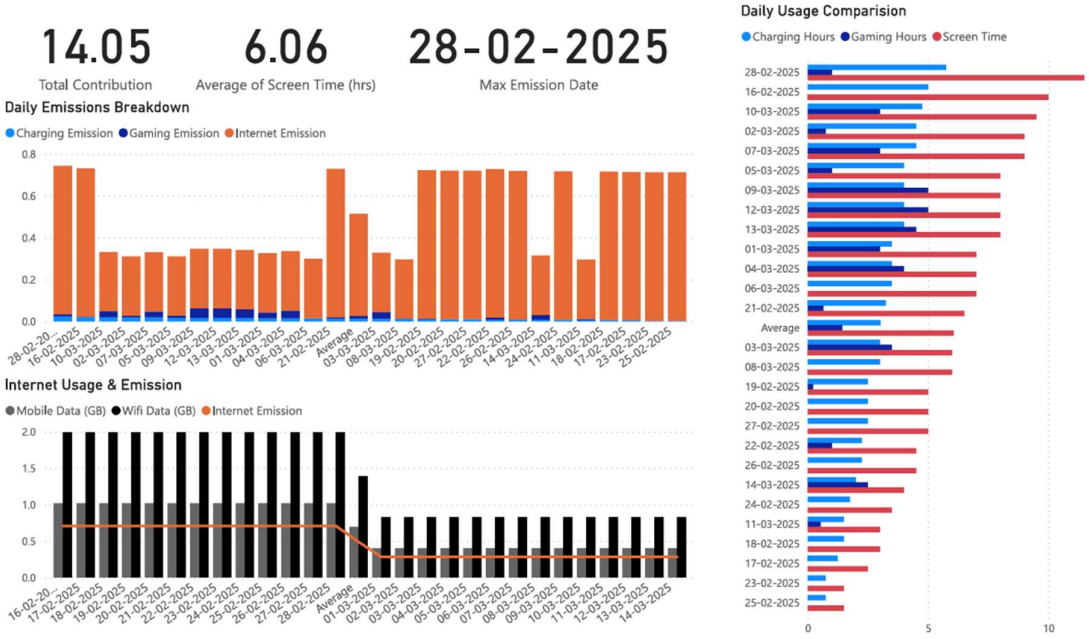
3. Daily Emissions Breakdown
   - Charging Emission: Ranged roughly between 0.003–0.026 kg CO_2. Longer screen time days had higher charging emissions.
   - Gaming Emission: Typically small but spikes on days with long gaming sessions (e.g., March 9 had 5 gaming hours, adding 0.045 kg CO_2).
   - Internet Emission: Depended on daily GB usage. When using mobile data (0.5 kg CO_2/GB) frequently, emissions were higher than Wi-Fi (0.1 kg CO_2/GB).

4. Internet Usage & Emission
   - Mobile Data: Initially higher in late February (1.02 GB/day), then reduced to 0.4 GB/day in March.
   - Wi-Fi Data: Higher in February (1.99 GB/day), then down to 0.83 GB/day in March.
   - Internet Emission Trend: Aligned closely with data usage volumes. Mobile data caused larger spikes due to the higher emission factor.

5. Notable Observations
   - 28-02-2025 had the maximum emission (0.734875 kg CO_2), primarily due to high screen time (11.5 hrs) and 1 hour of gaming.
   - The lowest emissions generally occurred on days with minimal screen time (e.g., 1.5–2.5 hours).
   - Gaming on top of regular screen time can notably increase daily totals.

Power BI Dashboard Overview:

1. Key KPI Cards:
   - Total Contribution (14.05 kg CO_2
   - Average Screen Time (6.06 hrs)
   - Max Emission Date (28-02-2025)
2. Daily Usage Comparison (Bar Chart): Illustrates how Charging Hours and Screen Time vary by date.
3. Daily Emissions Breakdown (Stacked/Clustered Column Chart): Compares Charging, Gaming, and Internet Emission day-to-day.
4. Internet Usage & Emission (Line + Bar Combo): Shows Mobile Data & Wi-Fi Data vs. Internet Emission over the reporting period.



Recommendations:

1. Reduce Screen Brightness & Unused Apps
   - Lower brightness or switch to Dark Mode to conserve battery.
   - Close unused background apps to reduce power consumption.
2. Smart Charging Practices
   - Avoid leaving the phone plugged in overnight once fully charged.
   - Use fast charging only when necessary.
3. Leverage Wi-Fi Over Mobile Data
   - Whenever possible, use Wi-Fi instead of mobile data. Wi-Fi has a lower emission factor (0.1 kg CO_2/GB vs. 0.5 kg CO_2/GB for mobile).
4. Optimize Gaming Sessions

- Limit or schedule high-intensity gaming to reduce continuous high power draw.
  If playing for long durations, use a power-efficient mode (if available).

5. Monitor Usage
   - Keep tracking daily screen time and data usage.
     Evaluate monthly trends to identify further improvement opportunities.

Conclusion:

This mini project underscores the significant environmental impact smartphones can have when factoring in charging, internet usage, and gaming. By monitoring daily usage for approx. 30 days and visualizing the data in Power BI, it becomes easier to identify peak emission days and take corrective actions. Adopting simple measures—like smart charging and reducing mobile data usage—can help lower the overall smartphone carbon footprint and contribute to a more sustainable lifestyle.

Appendix: Emission Factors Used

- Charging Emission: ~0.0045 kg CO_2/hour
- Mobile Data: 0.5 kg CO_2/GB
- Wi-Fi Data: 0.1 kg CO_2/GB
- Gaming Emission: 0.009 kg CO_2/hour

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