1M1B Green Internship
Project Report

Team Name :- Team Carbon.

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Project Name :- Individual Carbon Footprint Reducing Challenge**.**

Table of Contents

List of Figures

Abstract

- The "Individual CO_2 Footprint Reduction Challenge" is a system designed to help interns track and reduce their personal carbon footprint through daily sustainable actions. In the face of growing climate concerns, there is a need for simple, engaging tools to promote individual accountability.

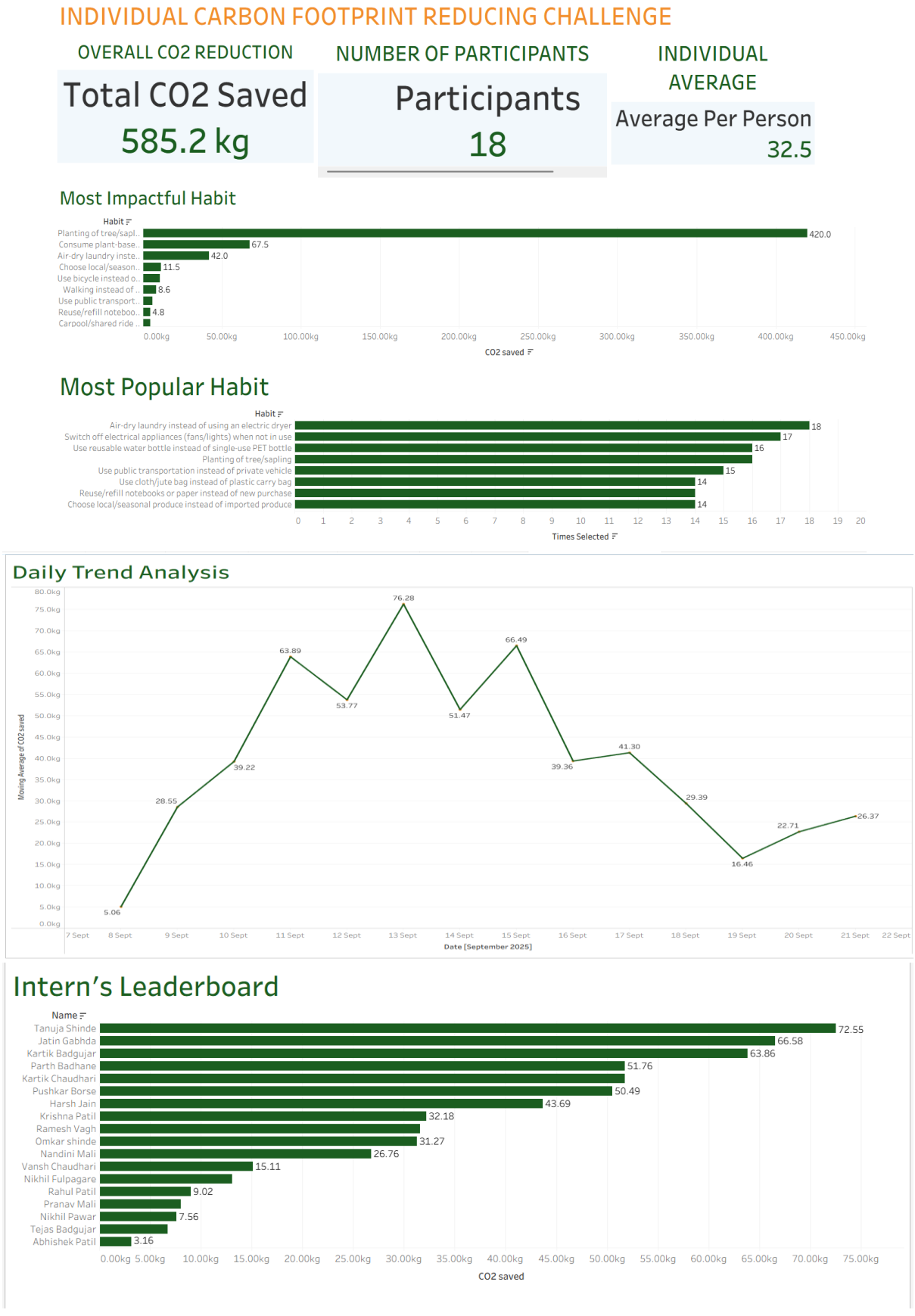
- Current methods for carbon tracking often lack real-time feedback and motivational elements, leading to inconsistent engagement. This project addresses these issues by providing a scalable and cost-effective digital framework using Google Forms, Google Sheets, and Tableau.

- The platform allows for easy logging of sustainable habits, automated conversion into CO_2 savings, and real-time visualization through interactive dashboards and leaderboards. By implementing this system over a 14-day period with 18 interns, the project successfully demonstrated that gamified, data-driven feedback can significantly motivate behavioral change and achieve measurable environmental impact, surpassing its initial goals by 390%.

Chapter 1: Introduction

- Climate change remains one of the most pressing global challenges. While corporate-level actions are impactful, the role of individual behaviour is often underestimated.
- Simple lifestyle choices collectively contribute significantly to carbon footprint reduction.
- However, the challenge lies in tracking and quantifying these actions in a structured and motivating way.
- Internship programs provide a unique opportunity to bridge this gap. The Individual CO_2 Footprint Reduction Challenge was designed with this motivation.
- It aimed to demonstrate that even within a short period, interns could meaningfully reduce their carbon footprint.
- By combining data-driven methodologies with engaging visualizations and gamification, the project turned abstract climate goals into tangible, measurable results.

- ***Figure 1.1: Overall CO_2 reduction summary***



Chapter 2: Literature Survey

2.1 Study of Existing Systems

- In recent years, several tools and platforms have emerged to help individuals track their carbon emissions (e.g., MyClimate, Carbon Trust Calculator).
- On the corporate side, sustainability platforms are often designed for enterprise-level reporting.
- Government and NGO-led initiatives emphasize offsetting emissions rather than encouraging behavioral change.

2.2 Limitations of Existing Systems

A comparison of these systems highlights that while they provide valuable insights, most lack:

- Real-time feedback to users.
- Customization for organizational contexts (e.g., internships).
- Gamification or motivational features to sustain engagement.

2.3 Problem Identification / Need of a System

Despite growing awareness, organizations and individuals face challenges:

- Lack of structured systems to measure individual-level CO_2 reductions.
- Inconsistent participation due to a lack of motivation and real-time feedback.
- Low scalability of current solutions due to cost or complexity.

2.4 Problem Definition

This project seeks to address these challenges by providing a user-friendly, low-cost digital framework to track individual sustainable actions, convert them into measurable CO_2 savings, and present the results.

Chapter 3: Scope and Requirements

3.1 Scope of the Project

- **Participants:** 18 interns from the Computer Engineering Department.
- **Duration:** 14 days (September 8–21, 2025).
- **Habits Tracked:** 15 categories including transportation, food, electricity use, and waste reduction.
- **Tools Used:** Google Forms, Google Sheets, Tableau dashboard.

3.2 Participant Requirements

- An easy and quick method to log daily sustainable habits (taking less than 2 minutes).
- Clear instructions and categories for logging.
- Access to real-time feedback on individual and group progress.
- An engaging and motivating user experience (e.g., leaderboards).

3.3 Project Requirements

- **Functional Requirements:**
    - A data collection system (Google Forms) for daily entries.
    - An automated data processing system (Google Sheets) to calculate CO_2 savings.
    - A data visualization platform (Tableau) to display results.
- **Technical Requirements:**
    - The system must integrate seamlessly between the chosen platforms.
    - Calculations must be based on standardized and verifiable emission factors.
    - Dashboards must update in near real-time to provide immediate feedback.
- **Data Requirements:**
    - Data must be collected consistently from all participants.
    - Data security must be maintained with restricted access.

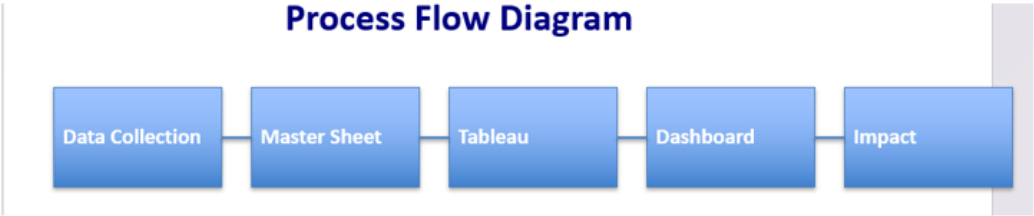
Chapter 4: Methodology

4.1 Proposed Work

The project was designed using a three-layer digital architecture that ensured seamless data flow from user input to impact visualization.

1. **Data Collection Layer (Google Forms):** Allowed interns to log daily sustainable actions.
2. **Processing Layer (Google Sheets):** Automated formulas converted each logged habit into CO_2 savings (kg).
3. **Visualization Layer (Tableau):** Interactive dashboards displayed total savings, leaderboards, and daily trends.

Figure 3.1: End-to-end system architecture diagram



4.2 Proposed Design (CO_2 Calculation Framework)

The most critical component was converting logged actions into quantifiable CO_2 savings.

- **Standard Emission Factors:** Sourced from the EPA (Environmental Protection Agency) and verified sustainability databases.

- **Calculation Approach:** Each habit was mapped to a conversion value representing CO_2 savings per unit (e.g., 0.25 kg CO_2 saved per km cycled).

- **Real-time Automation:** Google Sheets computed total savings, and Tableau visuals updated dynamically.

Figure 3.2: Sample mapping of habits to CO_2 savings values

A	B	C
Habits	**Unit**	**CO2 Per Unit Kg**
Use bicycle instead of private vehicle	per kilometer (km)	0.19
Use public transportation instead of private vehicle	per kilometer (km)	0.12
Carpool/shared ride instead of solo commute	per kilometer (km)	0.09
Walking instead of motorized transport	per kilometer (km)	0.21
Consume plant-based meal instead of meat-based meal	per meal	2.5
Choose local/seasonal produce instead of imported produce	per meal	0.5
Avoid food waste (proper portioning/leftover utilization)	per meal	0.3
Switch off electrical appliances (fans/lights) when not in use	per hour	0.06
Disconnect idle chargers/devices to prevent phantom load	per hour	0.02
Air-dry laundry instead of using an electric dryer	per laundry load	1.5
Use reusable water bottle instead of single-use PET bottle	per day	0.05
Use cloth/jute bag instead of plastic carry bag	per item	0.01
Avoid disposable cutlery (plastic spoons, forks, straws)	per item	0.02
Reuse/refill notebooks or paper instead of new purchase	per notebook	0.2
Planting of tree/sapling (annual carbon sequestration potential)	per tree planted	20

Chapter 5: Details of Designs, Working and Processes

This chapter details the implementation of the project from technical development to the data collection phase.

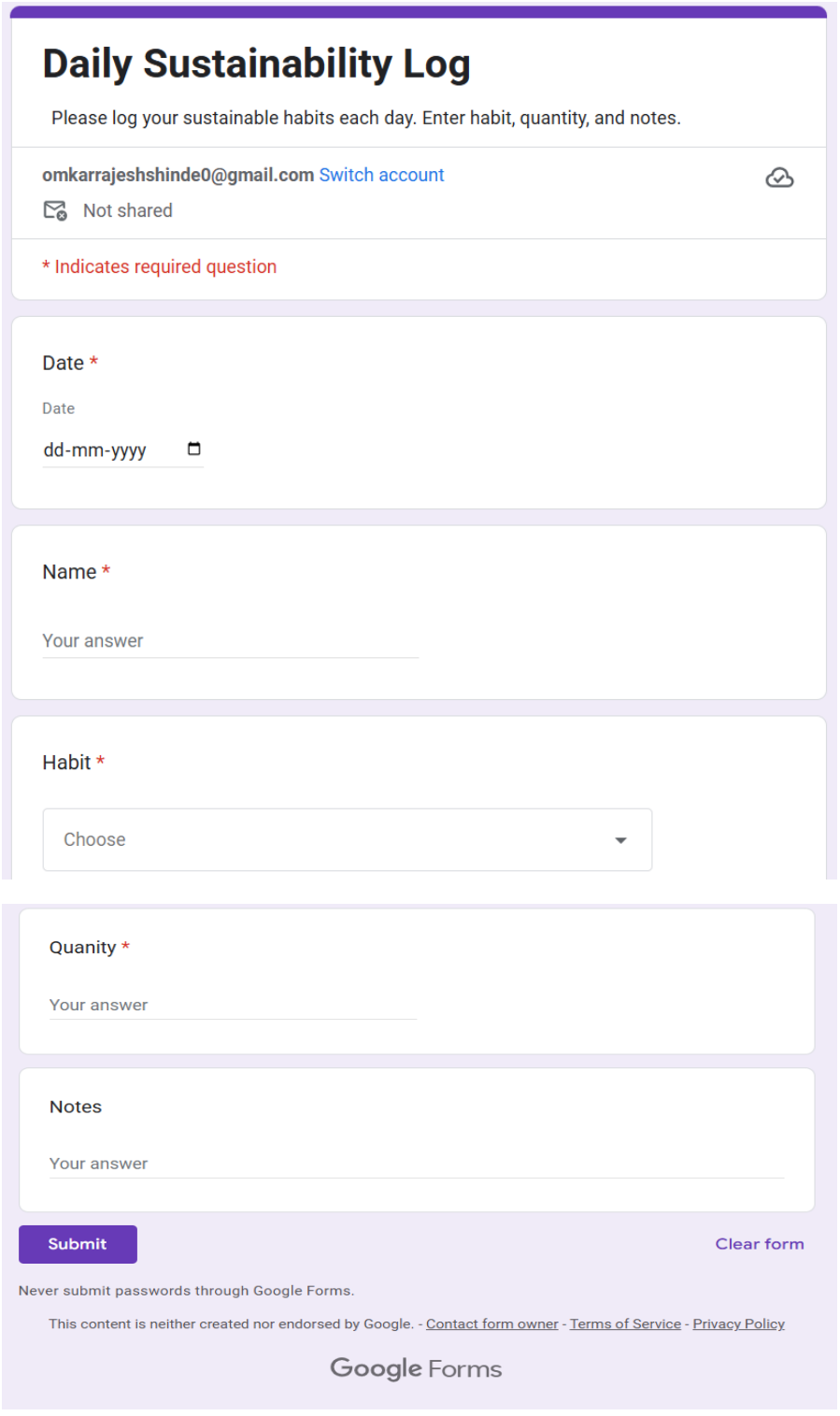
5.1 Technical Development

- **Google Forms Configuration:** A custom form was created with standardized fields (Date, Name, Habit, Quantity).
- **Google Sheets Automation:** Form responses were linked to a master sheet with pre-coded formulas for CO_2 conversion.
- **Tableau Dashboard Development:** Data was imported into Tableau Public to create an Overall Summary, Leaderboard, and Trend Analysis.
- **Testing and Validation:** Dummy entries were used to ensure calculation accuracy.

5.1.1 Google Sheets Automation

- **Data Structure:** The Google Sheet was organized into three main tabs:
- **'Raw Data'**: This sheet was directly linked to the Google Form and automatically populated with new entries in real time. No manual editing was done here to preserve data integrity.
- **'Calculation Engine'**: This sheet used formulas to process the raw data. A VLOOKUP function matched each submitted habit with its corresponding CO_2 conversion factor from a reference table. The logged quantity was then multiplied by this factor to calculate the CO_2 Saved for each entry.
- **'Master Dashboard Data'**: This sheet aggregated the processed data into a clean, summarized format suitable for Tableau. Formulas like SUMIFS were used to calculate total savings per participant, per day, and per habit category. This pre-processing made the Tableau connection highly efficient.

Figure 1.2: Google Form interface for daily logging



5.2 User Onboarding and Training

- **Orientation Session:** A virtual session covered project goals, tools, and logging procedures.
- **Support Channels:** A WhatsApp group was created for quick queries and regular reminders.
- **Motivation Techniques:** The leaderboard and weekly recognition of top contributors maintained enthusiasm.

5.3 Data Collection Phase

- The main activity spanned 14 days with consistent daily logging from all 18 interns.
- Project coordinators monitored entries in real-time to ensure data quality and resolve any issues promptly.
- Weekly mini-reports and shared dashboards kept interns informed and engaged.

5.4 Data Management

Active management during the 14-day collection period was essential to maintain momentum and ensure the credibility of the results.

- Daily Monitoring: The project coordinator spent 15-20 minutes each day reviewing the new entries in the 'Raw Data' sheet to check for completeness and consistency.
- Data Validation and Cleaning: Any anomalies, such as duplicate entries or unusually high quantities, were immediately flagged. The coordinator would then follow up with the respective intern via the WhatsApp group to clarify the entry. This proactive approach ensured the dataset remained clean and accurate throughout the project.

Chapter 6: Results and Applications

6.1 Results

The project surpassed expectations by achieving results far above the original goal.

- **Target Goal:** 150 kg CO_2 reduction.
- **Actual Achievement:** 585.2 kg CO_2 saved (390% of target).
- **Average Contribution:** 32.5 kg CO_2 saved per intern.
- **Engagement:** 100% daily participation with over 200 data entries.

Figure 5.1: Intern's Leaderboard Performance Ranking

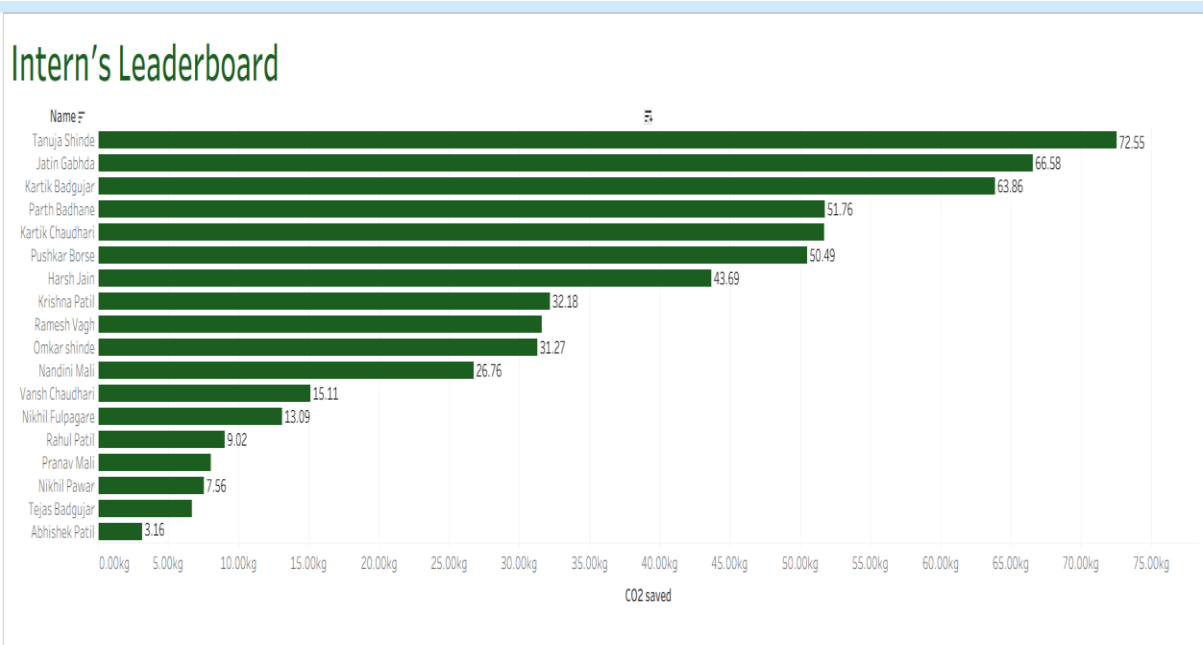
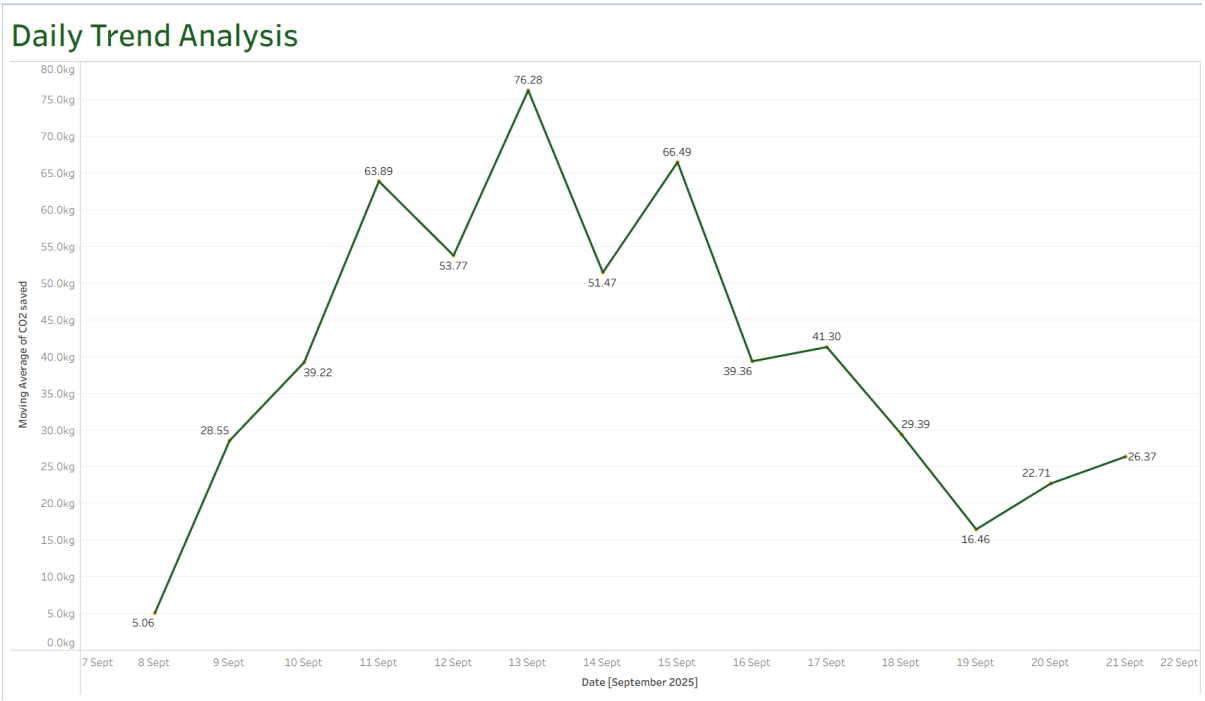


Figure 5.2: Daily Trend Analysis Chart



Habit Analysis:

- **Most Popular Habits:** Simple actions like avoiding laundry cycles and switching off unused devices.

- **Most Impactful Habits:** Diet and transport changes (eliminating red meat, cycling) contributed the highest overall savings.

Figure 5.3: Most Popular Habits Distribution

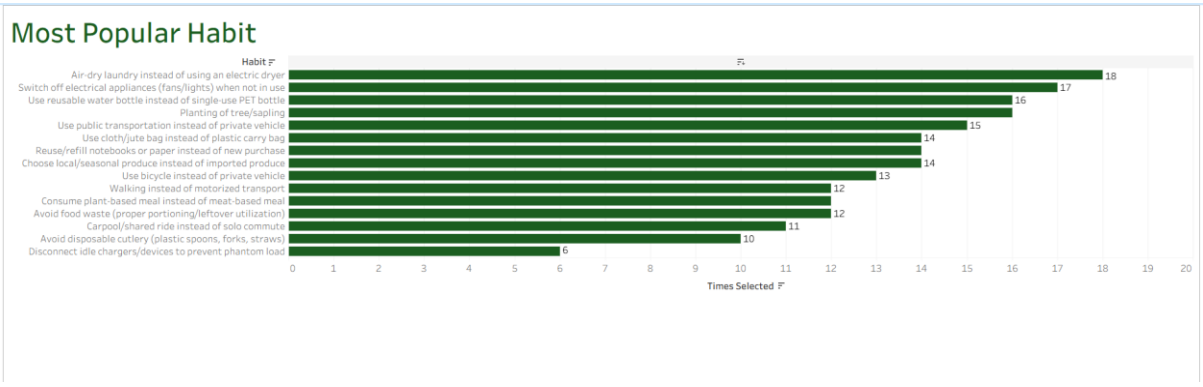


Figure 5.4: Most Impactful Habits by CO_2 Reduction

6.2 Applications

The project demonstrated value for multiple stakeholders and has wide-ranging applications:

- **For Organizations:** A measurable, scalable, and low-cost model for corporate ESG initiatives and enhancing employer branding.
- **For Academia:** A replicable framework for educational programs to engage students with sustainability in a practical, data-driven way.
- **For Broader Community:** A proof of concept for citizen science activities in schools, universities, and local communities to show that collective small actions lead to significant impact.

Chapter 7: Participant Feedback and Testimonials

To gather qualitative insights, a voluntary anonymous feedback survey was conducted after the challenge.

Positive Feedback: 94% of participants reported an increased awareness of their daily environmental impact. 88% found the Tableau dashboard and leaderboard to be "highly motivating."

Testimonials:

- *Seeing the numbers go up every day on the dashboard made me realize that my small actions actually matter. It was a real eye-opener.*
- *The competitive aspect of the leaderboard was fun and pushed me to do more. I've continued some of the habits even after the challenge ended.*
- *The system was so simple to use. It took less than a minute each day, which made it easy to stick with.*

Chapter 8: Challenges and Lessons Learned

This chapter provides a reflective analysis of the obstacles encountered during the project and the key strategic insights gained from the experience.

8.1 Challenges Encountered

While the project was a success, its execution was not without challenges. Acknowledging these provides a realistic perspective and valuable information for future iterations.

- **Initial Data Inconsistency and Ambiguity:** During the first 2-3 days, a primary hurdle was ensuring uniform data entry. For example, some interns logged "1" for the habit "avoiding a laundry cycle," which was ambiguous. This required immediate follow-up to clarify whether this meant one load or one day. To resolve this, we updated the form's helper text to specify units more clearly (e.g., "Enter number of loads").
- **Addressing Self-Reporting Bias:** The project's reliance on self-reported data is an inherent limitation. While there was no indication of deliberate misreporting, the possibility of minor inaccuracies or estimations exists. This was mitigated by fostering a collaborative, educational environment rather than a purely competitive one, but for a more scientifically rigorous study, a more robust verification method would be needed.
- **Maintaining Engagement Over Weekends:** The daily trend analysis clearly showed a dip in participation and CO_2 savings on weekends. This was likely due to different routines and fewer commuting-related activities. Maintaining momentum required targeted reminders and framing the weekend as an opportunity to focus on different habits, such as plant-based meals.
- **Minor Technical Hurdles:** While the Google and Tableau integration was largely seamless, there were occasional lags in the 15-minute data refresh cycle of Tableau Public. This sometimes resulted in a slight delay between an intern logging an action and seeing their score update on the leaderboard. This required transparent communication to manage participant expectations.

8.2 Lessons Learned

The challenges encountered provided powerful learning opportunities that were instrumental to the project's success and offer a blueprint for future initiatives.

- **Simplicity and Accessibility are Non-Negotiable:** The single most critical success factor was the use of simple, familiar, and universally accessible tools. The near-100% daily participation rate is a direct testament to this principle. By eliminating any learning curve, we allowed participants to focus entirely on the habits, not the technology.
- **Gamification is a Powerful Motivator, But Community is the Goal:** The leaderboard was highly effective in sparking initial interest and friendly competition. However, its true value was in building a sense of community. It started conversations, with interns sharing tips and encouraging each other. The lesson is that gamification should be used not just to create winners, but to foster a shared sense of purpose.
- **Real-time Visual Feedback Creates a Powerful Reinforcement Loop:** The ability for interns to see the impact of their actions almost instantly is a core principle of behavioral science. This immediate visual confirmation (seeing their name move up the leaderboard or the total CO_2 saved increase) created a powerful positive feedback loop that made the abstract concept of "sustainability" tangible and rewarding.
- **Balance "Easy Wins" with "High-Impact" Actions:** The data showed that while simple habits were crucial for daily engagement, a few high-impact actions (like tree planting) were responsible for a significant portion of the total CO_2 savings. A key lesson for future projects is to design the system to actively encourage both: easy "gateway" habits to build momentum and targeted campaigns to promote high-impact actions.

Chapter 9: Conclusion and Future Scope

9.1 Conclusion

- The Individual CO_2 Footprint Reduction Challenge proved to be a highly successful pilot.
- It validated that a simple, gamified, and technology-driven approach can effectively motivate individuals to adopt sustainable habits and produce measurable environmental benefits.
- The seamless integration of accessible tools like Google Forms, Sheets, and Tableau demonstrates a scalable model for fostering a culture of sustainability.

9.2 Future Scope

While successful, the project identified opportunities for future enhancement:

- **Mobile Application:** A dedicated app could simplify data logging and improve convenience.
- **AI Integration:** Machine learning models could recommend personalized habits for maximum impact.
- **Long-term Tracking:** Extending the challenge duration would help measure long-term habit retention.
- **Broader Implementation:** The model could be scaled and expanded to entire organizations, universities, or corporate partners for greater collective impact.

Chapter 10 : References and Bibliography

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