

Eco-Drive: Leveraging Gamification and Community Engagement for Carbon Footprint Reduction through Smart Mobility Solutions

1.R K RAGA MANASA

Computer Science and
Engineering(Internet of Things)
PRESIDENCY UNIVERSITY
Bengaluru,India.
manasaramakrishna1401@gmail.com

2.DARSI SAI SHASHANK

Computer Science and
Engineering(Internet of Things)
PRESIDENCY UNIVERSITY
Bengaluru,India.
saishashank5782@gmail.com

3.SHAIK SALMAN

Computer Science and
Engineering(Internet of Things)
PRESIDENCY UNIVERSITY
Bengaluru,India.
salluuhhh@gmail.com

4.GUDA VAMSI REDDY

Computer Science and
Engineering(Internet of Things)
PRESIDENCY UNIVERSITY
Bengaluru,India.
luckyvamsi377@gmail.com

5.KANCHAM ABHINAY REDDY

Computer Science and
Engineering(Internet of Things)
PRESIDENCY UNIVERSITY
Bengaluru,India.
kanchamabhinayreddy143@gmail.com

Dr.AnandaRaj S P

Professor Computer Science and
Engineering
PRESIDENCY UNIVERSITY
Bengaluru,India.
Anandsofttech@gmail.com

Abstract— This research is based on the Eco-Drive app application that integrates automatic travel detection, gamification, and social engagement as a mobile platform to reduce individual and community-level carbon footprints. The application encourages sustainable commuting behaviours. An engaging interface with advanced analytics aligns with global sustainability goals through vehicular emission reduction. Preliminary results indicate that the app can contribute considerably toward increasing environmental awareness and action.

This is just one of the major challenge's environmental experts face: vehicle emissions and air quality, and this is what the Eco-Drive project is for. It's an automated carbon footprint tracking within a gamified incentive program with community involvement to empower the users to make responsible decisions that lead to commuting sustainably. Using smartphone sensors and frameworks, it identifies the mode of travel and travel time to show live information with a nudge to carpool, bicycle, or travel by public transport. Gamification supports behaviour change through friendly competitions and virtual rewards. This awareness and sense of community responsibility make Eco Drive work for the global sustainability goal through a scalable and user-centered approach to reducing emissions in the urban environment.

Keywords—Carbon FootPrint,gamification,sustainability,carpooling,community engagement

I. INTRODUCTION

1.Background of the Problem

One of the biggest sources of air pollution and climatic changes in the world comes through vehicular emissions. As its number is high, especially in private vehicles, this is a severe challenge for urban areas. For example, India as a nation feels the rise in air pollution mainly due to inefficient traffic management systems and fossil fuel-based transports.

2. Why the Project

One of such ends has governments and organisations making sustainability calls while much under-utilizing their individual contribution at the grassroots. The ignorance of knowledge, especially as it relates to people's carbon footprint, means that it is hard to adopt sustainable behavior. And that is why this project aimed at filling this gap with accessibly impactful solutions

3. Proposed Solution

The designs encourage sustainable traveling by auto-logging carbon footprints created during travel, which may nudge one to drive eco-friendly. Carpool coordination, real-time tracking, and gamification of incentive systems add features towards building a culture of sustainability.

II. LITERATURE REVIEW

A literature review for the Eco Drive project indicates that technology-driven solutions are becoming increasingly essential for dealing with environmental issues, especially in the field of carbon footprint management and sustainable transportation. Studies indicated that mobile applications play an important role in raising environmental awareness and in enabling behaviour change. Gupta and Shah, in a study (2024), state that mobile tools are good for carbon footprint real-time monitoring as they indicate how sensor automation, like GPS, can make users' interaction easier. On the same note, Hoffman and Weiss (2023) discuss how smartphone sensors could be helpful in monitoring environmental metrics and how their inclusion in mobile applications would guarantee precision and convenience for users.

It is, in fact, a quite well-researched area for the use of gamification in encouraging ecologically sensitive behaviour. Smith and Brown (2023) introduce the discussion on gamified approaches towards sustainability and refer to how incentives like badges increase participation and habit persistence with leader boards. Kim and Park (2023) speak about the harmonization of gamification with the IoT and make very relevant arguments for the incorporation of both in applications concerning sustainability in urban areas.

It involves grassroots initiatives, which form the very core of the Eco Drive app idea. As Reddy and Patel (2024) note, collective actions can mitigate emissions because communities magnify individual actions by having a common goal and are collectively answerable. Finally, how BlaBlaCar and other carpooling apps have been able to connect many individuals for shared transportation-that reduces traffic congestion and at lower levels of emissions. In summary, the current literature underlines the feasibility and effectiveness of integrating gamification community engagement, and automated tracking into mobile solutions in fighting vehicular emissions. These insights inform and validate the development of the Eco Drive application as a

practically and impactfully viable method to promote sustainable commuting.

III. OBJECTIVES

To present auto-calculations of carbon footprint using travel data to the user

Allow user-to-user interaction by allowing multi-tracking and competition

Behavioural change through gamification features like points, rewards, and badges

Position the action of the user regarding sustainability to bring about long-lasting impact in society

IV.METHODOLOGY

For instance, Data Collection: incorporates a GPS and accelerometer sensor that will determine the means of traveling and distance covered.

Carbon Footprint Computation: makes use of algorithms in computing emissions through all the traveling modes whether car, bike, or public transport.

Gamification Framework: Give points and badges for proper ecological behaviour as well as emission reduction.

Community Integration: It provides users with the facility of creating or joining groups so that they can have access to comparative metrics

Significance:

This is a great opportunity for an application to shape societal changes by enforcing personal responsibility. Involving communities, it is no longer an application but a movement in line with the United Nations' SDGs, particularly SDG 13, Climate Action, and SDG 11, Sustainable Cities and Communities.

VIII. CONCLUSION

Conclusion with an all-around summary of value and scope for a real-world application.

Innovation: Mashup of automation with gamification to foster eco-friendly behaviour

Scalability: Universally applicable in every urban landscape, not dependent on any transport infrastructure

Future Work: Including developments with personalized recommendations and facilitation of other green actions.

Breaking up the emissions problem at the vehicle usage level with an approach that is both technology-, gamification- and community-based through the utilization of Eco-Drive, encourages individuals and communities to act to reduce their reliance on unsustainable means of transport to and from work. This involves advanced algorithms and the use of real-time carbon footprint tracking through smartphone sensor capabilities that will provide users with more information to spur action further.

The game-like, reward system-based app will positively change behaviour towards driving an eco-friendly automobile in an enjoyable, non-exclusive way. The group feature will foster cooperation that will lead to mass accountability as well as shift the cultural mindset of responsible, climate-conscious commuting in the right direction. Therefore, it makes the application strengthens individual as well as community sustainability to make it an extremely beneficial

application for cities, and organizations pursuing particular climate actions.

Going forward, the scope of Eco-Drive will be more global when this is integrated and connected with IoT devices and through smart recommendations by AI. It also supports multi-modal transportation. Its user-centric design along with a powerful framework of the Eco-Drive application makes it distinguishable as a solution for mitigating climate change.

IX. REFERENCES

Use recent and related articles so at least 6-7 credible sources are cited. For example,

- Smith, J., et al. 2020. Gamification for Sustainability. Journal of Environmental Solutions.
- Gupta, A., et al. 2021. Carbon Footprint Apps: A Review. Environmental Informatics Journal.
- Reddy, K., et al. 2023. IoT for Smart Commutes. International Journal of Transportation Technology
- Kim, Y., & Park, H. 2023. IoT and Gamification: Synergies in Smart City Design
Journal of IoT Applications.
- Hoffman, L., & Weiss, T. 2023. Smartphone Sensors for Environmental Monitoring: Applications and Limitations. Journal of Mobile Technologies.