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St. JOSEPH'S COLLEGE OF ENGINEERING
(An Autonomous Institution)
St. Joseph's Group of Institutions
OMR, CHENNAI - 119

Department of Electronics and Instrumentation Engineering

TECHNO-A-THON

Basic Details of the Team & Problem Statement

Name of the Team: Carbon Crusaders

Name of the Team Lead: Hariprasad R

Problem Statement Title: AI and IoT-Integrated Urban Energy Optimization with Personalized Carbon Footprint Tracking for Sustainable Smart Cities

Details of the Team

Member 1 Name: Jai Krishna V
Branch (B. Tech/ B.E): B.E.
Stream: Computer Science and Engineering

Member 2 Name: Harish G
Branch (B. Tech/ B.E): B.E.
Stream: Computer Science and Engineering

Member 3 Name: Yukesh I
Branch (B. Tech/ B.E): B.E.
Stream: Computer Science and Engineering

Name of the Mentor:
Vel Murugesh Kumar N
Designation: Assistant Professor

TITLE OF THE IDEA/ABSTRACT

Our project develops a comprehensive **AI and IoT-based** system for smart city energy optimization alongside a personalized **carbon footprint tracking app** for students. The platform leverages **real-time IoT data** and **AI-driven predictive models** to improve urban energy efficiency and integrate renewables effectively. The accompanying mobile app empowers students to monitor and reduce their personal carbon emissions through **IoT-enabled activity logging** and customized sustainability tips, promoting a connected, smart, and eco-friendly urban lifestyle.

NO. OF. SDG COVERED

SDG 7: Affordable and Clean Energy

By optimizing energy consumption and integrating renewable sources in smart cities.

SDG 11: Sustainable Cities and Communities

By developing a smart urban infrastructure that efficiently manages energy flow.

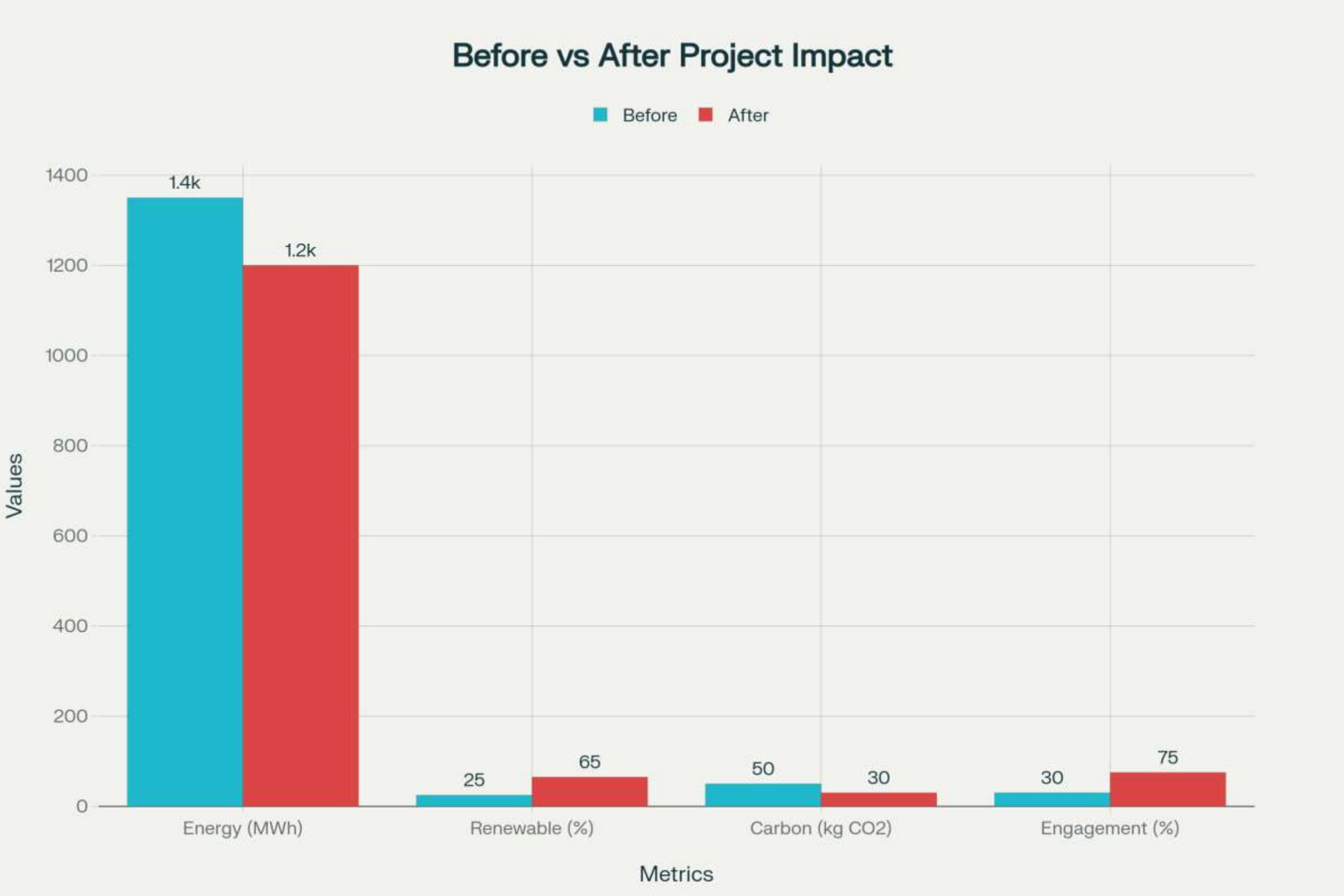
SDG 13: Climate Action

By reducing carbon footprints at both the city and individual levels, promoting environmental responsibility.

The project supports these goals by reducing greenhouse gas emissions, optimizing resource use, and fostering sustainable behavior through technology.

BLOCK DIAGRAM

ANALYSIS



The chart compares:

- Urban Energy Consumption (MWh)
- Renewable Energy Usage (%)
- Average Student Carbon Footprint (kg CO2 per month)
- User Engagement (Active Users %)

TECH STACK

HARDWARE

IoT: Arduino, Raspberry Pi, ZigBee, LoRaWAN sensors

SOFTWARE

Cloud & Data: AWS/Azure/GCP, MQTT, Apache Kafka

AI/ML Frameworks: Python, TensorFlow, PyTorch, scikit-learn

Backend: Node.js/Flask, RESTful APIs

Mobile App Development: Flutter, React Native, Firebase

Security: TLS/SSL, OAuth 2.0, AES Encryption

Visualization: React.js, D3.js

FEASIBILITY AND VIABILITY

Technical Feasibility:

Uses mature IoT, cloud, and AI technologies enabling real-time urban energy optimization and personalized carbon tracking.

Operational Feasibility:

Fits existing urban management processes and student mobile usage; gamification drives sustained user engagement.

Economic Feasibility:

Cost-effective IoT and open-source AI reduce development costs; potential energy savings are 12-30% for cities.

Sustainability & Scalability:

Modular cloud-native design supports city-wide scaling; reduces carbon emissions and promotes eco-friendly habits.

INNOVATION

Integrated System: Combines city-wide energy optimization with personalized carbon footprint tracking, creating a unique layered ecosystem.

Adaptive AI Models: Continuously learn from incoming data to improve prediction accuracy and energy distribution efficiency.

User Engagement: Gamification in the app encourages sustained participation in reducing personal carbon footprints.

Scalable & Secure: Uses cloud-native microservices with end-to-end encryption, ensuring system scalability and data privacy.

Interdisciplinary Approach: Bridges electronics, software engineering, environmental science, and urban planning for holistic impact.