Literature Survey on

GreenHome AI: Personalized Upgrade Planner for Sustainable Irish Homes

Team:
Balpreet Kaur Saluja – 24202918
Akshaykumar Musterya – 24228316

1. Introduction & Problem Statement

Ireland has committed to a 51% reduction in greenhouse gas emissions by 2030. However, individual households often lack access to tools that help them understand their carbon footprint or make data-backed decisions on how to reduce it.

Current tools offer static guides and non-personalized suggestions, often disconnected from real energy use data and lacking an AI-powered advisory system.

2. Existing Tools & Gaps in Literature

🧮 **Carbon Calculators**

Generic tools like WWF

❌ Not Ireland-specific, no local emission factors
🏛️ SEAI Grant Plat

🏛️ **SEAI Grant Platform:**

Lists available grants (e.g., heat pumps)

❌ Static, not personalized, no CO_2 link

🤖 **Recommender Systems:**
AI used in tariffs, smart thermostats

❌ No upgrade planners based on household profile

🧠 **LLMs & Agent AI:**

GPT-4 and LangChain used in advice tasks

❌ Not yet applied to climate grants or home upgrades

3. Project Overview

The System will:

- Collect user data (location, home type, heating, bills, transport).

- Estimate CO_2 emissions using EPA conversion factors and CSO data.

- Use GPT-4 and LangChain for upgrade recommendations.

- Match suggestions to relevant SEAI grant schemes.

- Deliver results in a user-friendly Streamlit or Gradio dashboard with graphical summaries.

4. Objectives of GreenHome AI

- ☁️Estimate household CO_2 using EPA and CSO data

- ➡️Generate personalized upgrade advice via GPT-4

- 🔀 Match upgrades with SEAI grant schemes

- 📊 Visualize CO_2, cost, and savings impact

- 💻 Deliver via an interactive Streamlit dashboard

5. Expected Outcomes

- **Personalized CO_2 report (baseline + reduced)**

- **Suggested upgrades tied to savings + grant**

- **Full agent-based recommendation loop**

- **Option to extend into a SEAI partnership tool**

6. References

- https://www.seai.ie/grants/home-energy-grants/individual-grants

- https://arxiv.org/abs/1906.05433

- https://www.ipcc.ch/report/ar6/wg3/

- https://www.epa.ie/publications/monitoring--assessment/climate-change/eu-emissions-trading-scheme/