UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SECD2523 DATABASE
SECTION 5 (SECJH)

PROJECT PHASE 1: PROPOSAL

SYSTEM NAME:
LOW CARBON INITIATIVES COMMUNITY MONITORING SYSTEM

TEAM: CLOUD DB

LECTURER: DR HASLINA HASHIM

Prepared by:

GROUP MEMBERS	MATRIC NUMBER
IZZATI ATHIRAH BINTI ISA	A22EC0169
ABDUL ROHMAN BIN MAHMOOD	A22EC0131
XING QINHAO	A22EC4015
MOHANED MOHAMED SALEH ALTATER	A22EC0019
ZHAO YING	X23EC0001

DATE OF SUBMISSION: 25 NOVEMBER 2023

1.0 Introduction

Malaysia has developed a number of sustainability projects aiming at addressing three issues: environmental, social, and economic concerns. One significant attempt is the Low Carbon Cities Framework (LCCF), which aims to combat global warming and climate change. It is a vital step

to monitor and minimize carbon dioxide emissions in real time. The Low Carbon Blueprint for Iskandar Malaysia 2025 covers five local authorities, including the entire Johor Bahru and Kulai Jaya districts, and proposes a set of 281 strategic policies with the goal of achieving a 58 percent reduction in carbon intensity by 2025.

The Iskandar Puteri City Council (Majlis Bandaraya Iskandar Putri - MBIP) is one among the organizations engaged in promoting the Low Carbon Society (LCS) through the Iskandar Puteri Low Carbon (IPRK) program. The purpose is to collect information on energy-saving measures in the community, schools, residential areas, higher education institutions, factories, and other locations.

MBIP organized a competition in 2019 to minimize electricity and energy consumption, but unfortunately, the competition experienced various hurdles. To solve the concerns, MBIP intends to create a data collecting and analysis system similar to the e-Lestari system. However, this time the platform will target a fresh demographic, including occupants of multi-story and landed houses, institutions, MBIP divisions, and MBIP staff. Maps of the carbon footprint within the MBIP region, carbon reductions for waste, water, electricity, and recycled cooking oil consumption, identification of high CO2 community areas, and the development of a user-monitoring dashboard for carbon emissions are among the anticipated data and analysis requirements for MBIP. This new system's primary language will be Bahasa Malaysia.

2.0 Background Study

One of Malaysia's most important regions, Iskandar Puteri, is actively working towards sustainability by supporting Low Carbon Society (LCS) programmes. One of the programmes the Iskandar Puteri City Council (MBIP) created to encourage community engagement in cutting back on carbon emissions, energy use, and waste generation is the Iskandar Puteri Low Carbon Calendar Competition. But the competition ran into difficulties, which were indicative of more general problems with the way the region's low-carbon programmes are now managed.

One of the issues noted is that the current system collects data in a laborious and error-prone manner due to its heavy reliance on manual data entry procedures. Accurate evaluation and monitoring of carbon reduction initiatives across different population segments is hampered by this.

Other than that, the inability to extract significant insights from the gathered data is hampered by the lack of strong analytical tools. Emission patterns and high-emission zones cannot be effectively identified by manual carbon reduction estimates.

Additionally, the system's interface's complexity makes it less user-friendly, which lowers community engagement. In addition, the lack of linguistic assistance in Bahasa Melayu makes it difficult for the local populace to comprehend and take part.

The creation of an extensive database system specifically designed to meet the demands of Iskandar Puteri's Low Carbon projects will be essential to overcoming current obstacles. Effective data management, analysis, and participation will be made possible by it, promoting a more participative and sustainable Low Carbon Society in the area.

3.0 Problem Statement

1. **Inefficient Data Collection**

   The low carbon monitoring system currently in place simply uses data from Google Forms. The fact that the system solely uses manual data entry procedures makes it very challenging to gather data efficiently. As a result, gathering data will be extremely time-consuming and prone to errors. People might have encountered a lot of trouble filling out the lengthy Google forms. Low participation and incomplete data sets will result from that.

2. **Difficult to analyze data**

   It is challenging to perform the computations in the current system. Carbon reduction calculations must be done by hand. It will be more labor-intensive and prone to human mistake if it is calculated manually. Ultimately, this will result in inaccurate assessments of the projects' true effects. It is difficult to effectively estimate and track the reduction in carbon emissions across diverse communities without an automated calculator.

3. **Unable to give feedback**

   Users cannot provide input on how well the existing system is performing or how user-friendly it is. Users will become dissatisfied as a result, which will result to lower participation. Because there are insufficient participant numbers, the data sets are not precise enough.

4. **Limited Reported and Visualization**

   The inability to display data in an efficient manner prevents informed decision-making and the tracking of progress towards carbon reduction targets. This is due to the lack of a complete reporting system and visualisation tools.

4.0 Proposed Solution (include Feasibility Study)

Every issue needs to have a solution. The solutions are necessary to guarantee user comfort and ease of usage.

Firstly, we can create automated data gathering methods and include them into the database system to address the issue of wasteful data collection. In order to make sure that the data collected are accurate and come from reliable sources, the interface needs to have built-in validations. To expedite data entry, for instance, it will use mobile applications or online forms designed for the various user categories—residents, institutions, and MBIP staff—as mentioned above.

The second feature is that we can incorporate advanced analytics tools into the database system. These tools include developing analytical modules for trend analysis, predictive modeling, and carbon footprint assessment, as well as integrating an algorithm for automated carbon reduction calculations. This will map the carbon footprint, compute carbon reductions, and produce user-monitoring dashboards for carbon emissions in accordance with the MBIP's goals.

Thirdly, creating extensive reporting modules and database system visualisation tools. Provide individualised dashboards that provide data in real-time so that stakeholders can efficiently track advancement. Use interactive features and graphical representations to make statistics on waste management, energy use, and carbon emission trends easier to understand. This is in line with MBIP's goals to enhance data analytic skills and provide a dashboard that monitors itself.

Finally, a feedback system will be provided by the low carbon monitoring system. Every time a user visits the website, they can customise it to suit their preferences. With this feedback mechanism in place, we can enhance the system's functionality to increase its effectiveness and draw in users from various communities who will utilise it responsibly without suffering negative repercussions.

4.1 Technical Feasibility

Mobile devices and PCs can access the Low Carbon Monitoring System website. This application needs access to a device, server, and the internet. Apart from that, a database system is needed for this system to function in order to store user data and determine carbon emissions. In the context of MBIP's projects, a single database would be created by combining data from multiple sources, such as waste management from residential areas and data from different communities. To set up, maintain, and guarantee data integrity for this system, a competent database administrator would be needed.

4.2 Operational Feasibility

Operating the proposed database system in a way that will support MBIP's low-carbon initiatives will require analysing how well it integrates with current procedures, gauging stakeholder acceptability and the need for training, guaranteeing resource availability and system management capacity, preserving data accuracy and dependability, successfully managing change, and guaranteeing the long-term viability of operations. It calls for coordinating the system with existing workflows, offering thorough user training, obtaining the required funding and technical assistance, ensuring data integrity, handling organisational change, and making sure the system is flexible and scalable in order to support current and upcoming low-carbon initiatives. Thus, operational feasibility refers to the viability and practicality of integrating the database system into MBIP's operations while preserving effectiveness and efficiency in reaching their sustainability objectives.

4.3 Economic Feasibility

The following feasibility studies draw upon data from a variety of reputable sources, with the assumptions meticulously extracted from the reference, 'System Analysis and Design Ninth Edition' by Kendall & Kendall.[11]

The cost for the software is derived from a local software development company known

as CoolCode[4], located in Universiti Teknologi Malaysia (UTM), which specializes in developing software with project budgets ranging from RM 10,000 to RM 100,000. As a precaution, we have chosen a budget of RM 100,000 to ensure that we have sufficient resources to support this project.The maintenance should cost about 20% of the software development cost according to
Michael Georgiou in his article[5]. For our cloud hosting needs, we are considering the Heroku Cloud Application Platform[6]. The advanced tier, priced at $250 USD, is our reference point. As a precautionary measure, we have doubled that amount, setting our budget at $500 USD, which roughly translates to about RM 2,300 per month.

The estimated benefits have been thoughtfully derived from the data presented in last year's 'Final Report IMELC 2022.[3] We anticipate that the benefits achievable after the system's development will surpass those of the previous year, although we have taken a conservative approach in our estimations.

Assumptions	
Discount rate	10%
Sensitivity factor(cost)	1.1
Sensitivity factor(benefits)	0.9
Annual change in production costs	7%
Annual change in production benefits	5%

Estimated Costs	
Software	RM 100,000.00
Training	RM 15,000.00
Cloud Hosting	RM 2,300.00 per month
Maintenance	RM 20,000.00 per year
Marketing	RM 1,500.00 per month

Estimated Benefits	
Water Savings	RM 185,000.00 per year
Energy savings	RM 100,000.00 per year
Recycle Profit	RM 150,000.00 per year

Estimated Costs	
Software	RM 100,000.00
Training	RM 15,000.00
Cloud Hosting	RM 2,300.00 per month
Maintenance	RM 20,000.00 per year
Marketing	RM 1,500.00 per month

Estimated Benefits	
Water Savings	RM 185,000.00 per year
Energy savings	RM 100,000.00 per year
Recycle Profit	RM 150,000.00 per year

Costs	Year 0	Year 1	Year 2	Year 3	Year 4
Development					
Software	110,000				
Training	16,500				
Total	126,500				
Production					
Cloud Hosting		30,360	32,485	34,759	37,192
Maintenance		22,000	23,540	25,188	26,951
Marketing		18,000	19,260	20,608	22,051
Annual Prod.Costs		70,360	75,285	80,555	86,194
Present Value		63,964	62,219	60,522	58,872
Accumulated Costs		63,964	126,183	186,705	245,577

Benefits	Year 0	Year 1	Year 2	Year 3	Year 4
Water Savings		166,500	174,825	183,566	192,744
Energy savings		90,000	94,500	99,225	104,186

Recycle Profit		135,000	141,750	148,838	156,280
Annual Benefits		391,500	411,075	431,629	453,210
Present Value		355,909	339,731	324,289	309,549
Accumulated Benefits		355,909	695,640	1,019,929	1,329,478
Gain/Loss		291,945	569,457,	833,224	1,083,901
Profitability Index	8.57				

After conducting a comprehensive Cost-Benefit Analysis, the resulting profitability index of 8.57 strongly suggests both the feasibility and profitability of this project

5.0 Objectives

1. Design and implement a robust database system to efficiently store and manage data related to energy consumption, carbon emissions, and sustainability initiatives.

2. EnablesTrack energy use, and emissions, aiding agile strategy.

3. Integrate and track 281 policies for 2025 goals.

4. Centralized platform for stakeholder carbon tracking.

5. Designed for future data expansion and sustainability needs.

6.0 Scope

6.1 System

- User Authentication:

Allow users, including occupants of multi-story and landed houses, institutions, MBIP divisions, and MBIP staff, to register and log in to their accounts.

- Data Viewing:

Enable users to view detailed maps of the carbon footprint within the MBIP region.

- Analysis Tools:

Provide tools for analyzing carbon reductions in waste, water, electricity, and recycled cooking oil consumption.

- Community Identification:

Identify high CO2 emission areas within the community.

- User Monitoring Dashboard:

Develop a user-friendly monitoring dashboard for real-time tracking of individual and collective carbon emissions.

6.2 User

- User Registration:

Develop a user-friendly registration process for individuals, institutions, MBIP divisions, and MBIP staff. Collect necessary information for personalized engagement.

- Authentication:

Implement a secure authentication system to protect user data. Allow users to securely log in using unique credentials.

6.2 Feasibility study

1. Technical Feasibility:

Application Platform:

- Viability: Assess the technical feasibility of developing the platform for various devices, ensuring compatibility with different operating systems.

Data Collection and Analysis System:

- Viability: Examine the technical feasibility of implementing a robust system for real-time data collection and analysis.
- Considerations: Ensure the system can handle diverse data types related to carbon emissions and energy consumption.

2. Operational Feasibility:

- Provide maintenance for the website if there is any bug to fix or update it from time to time.
- Create human resources.
- Ensure that the system is efficient enough to handle.

2. Economic Feasibility:

Cost Analysis:

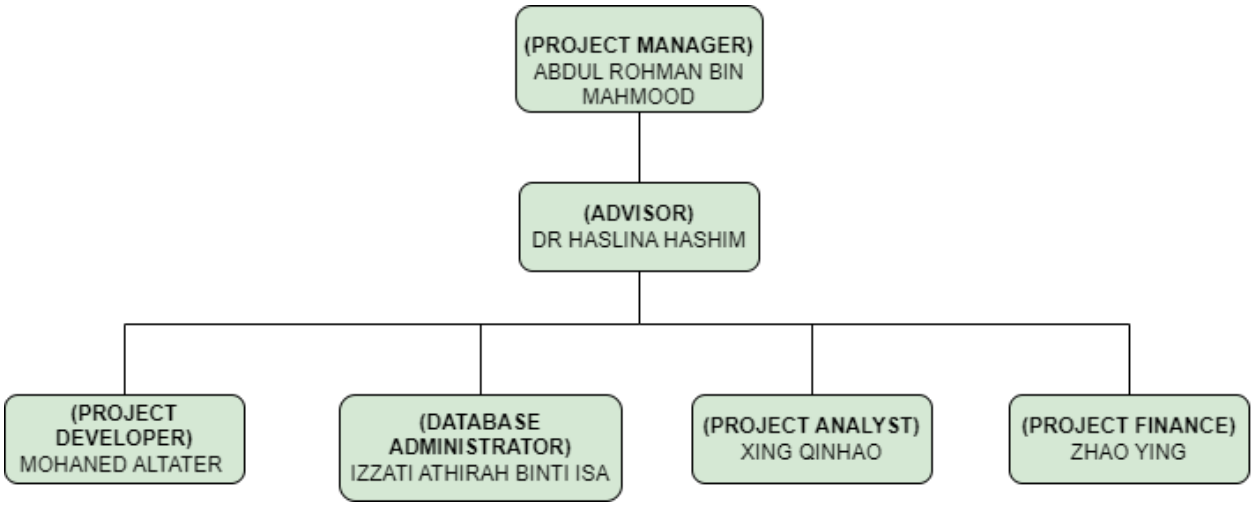
- Viability: Conduct a comprehensive analysis of development, implementation, and maintenance costs.
- Considerations: Assess the financial feasibility of the proposed system against expected benefits.

Time Considerations:

- Viability: Estimate the time required for design, development, and testing phases.

7.0 Project Planning

7.1 Human Resource



1. Project Manager

   Role:

- Oversees the project's alignment with organizational goals.
- Manages timelines, milestones, and resource allocation.
- Acts as a liaison between the development team and stakeholders.

2. Developers (Front-end, Back-end)

   Front-end Developer:

   Role:

   - Designs and implements the user interface and experience.
   - Ensures responsiveness and performance.
   - Collaborates with UI/UX designers.

   Back-end Developer:

   Role:

   - Manages server, application, and database.
   - Develops server-side logic and architecture.

- Ensures security and scalability.

3. Database Administrator

   Role:

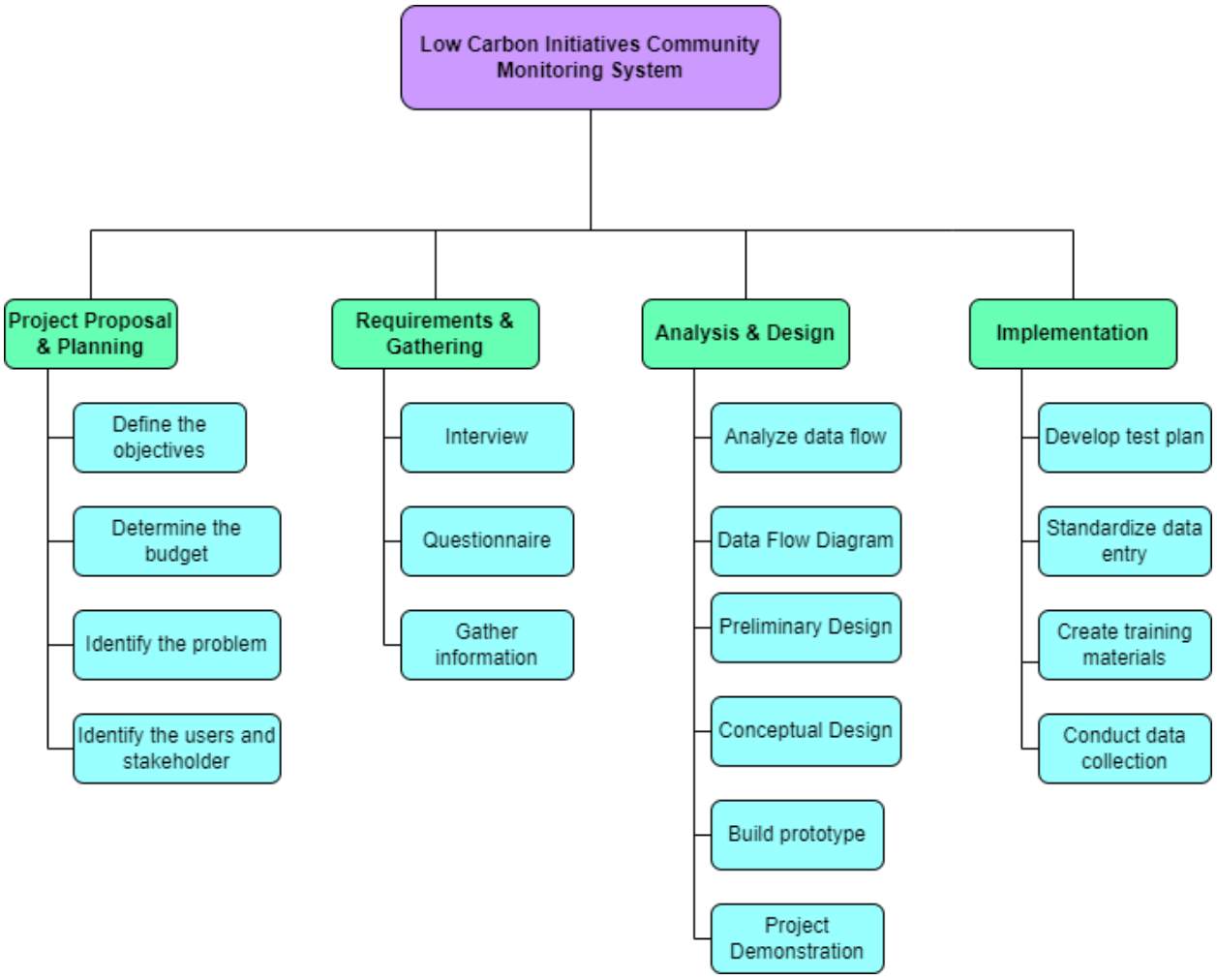
   - Manages and maintains the database system.
   - Designs, implements, and updates database structures.
   - Ensures data security and integrity.

4. UI/UX Designer

   Role:

   - Designs user interface and experience.
   - Creates wireframes and visual design elements.
   - Collaborates with developers.

7.2 Work Breakdown Structure (WBS)

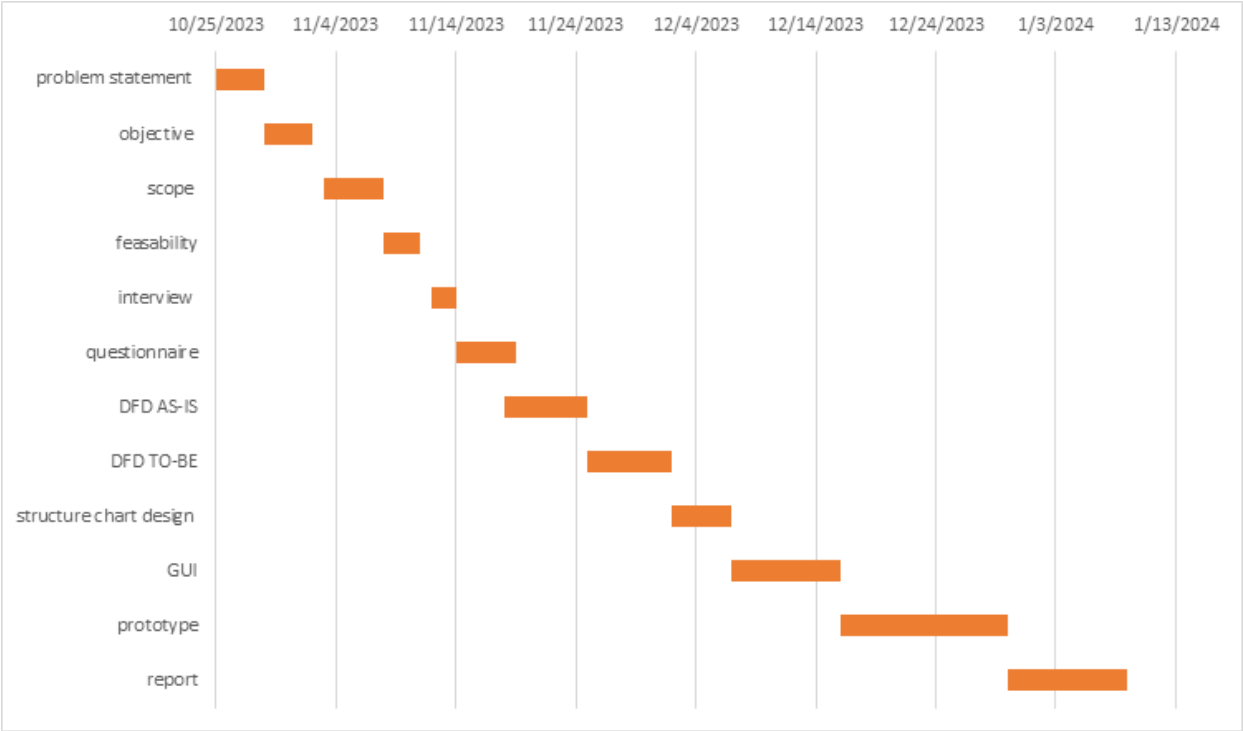


7.3 Gantt Chart

A Gantt chart is a project management tool that illustrates work completed over a period of time in relation to the time planned for the work,where the phases are broken down into tasks displayed on a chart which make it easy to understand and interpret.

Phases	Tasks	Duration	Date start	Date end
Project proposal and planning	Problem statement	4	25/10/2023	29/10/2023
	Objective	4	29/10/2023	3/11/2023
	Scope	5	3/11/2023	8/11//2023
	Feasibility	3	8/11/2023	11/11/2023
Requirement gathering	Interview	2	12/11/2023	14/11/2023
	Questionnaire	5	14/11/2023	18/11/2023
	DFD AS-IS	7	18/11/2023	25/11/2023
Analysis and Design	DFD TO-BE	7	25/11/2023	2/12/2023
	Structure chart design	5	2/12/2023	7/12/2023
	Interface design (GUI)	9	7/12/2023	16/12/2023
High-Fidelity mockup	System prototype	14	16/12/2023	30/12/2023
	Final report	10	30/12/2023	9/1/2023

Start Date	End date	Total Days	Total weeks
25/10/2023	9/1/2023	76	11



8.0 Requirement Analysis (based from AS-IS analysis)

8.1 Current Business Process (scenarios, workflow)

1-User registers

2- Provide the self-information

3- Submits the information

4- List of types of data

5-Select one type of data

6-Display the guidelines to fill the information

7-Fill the information for the chosen data, if the data is complete the process continues else move back to fill information page

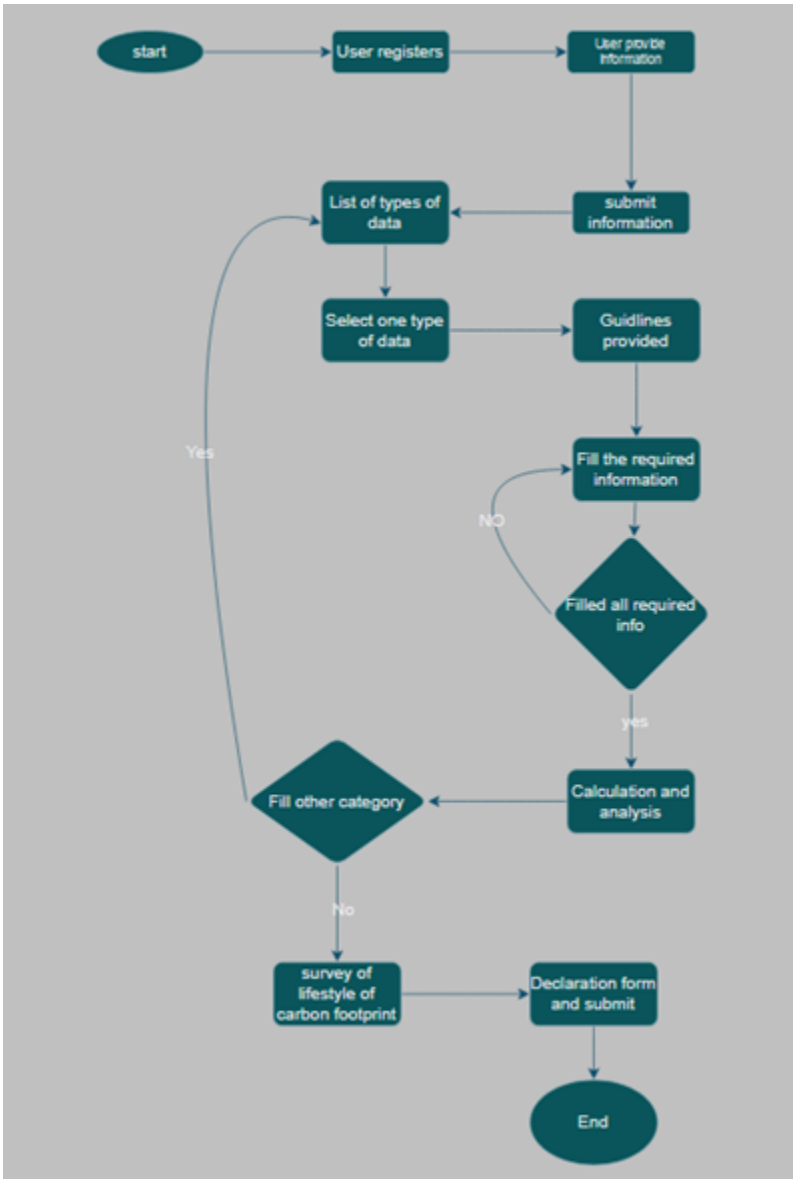
8-Auto calculation and analysis

9-Fill other category if yes back to choose type of data else

10-Validate submission

11-Fill survey of lifestyle for carbon footprint

12-Declaration form and submit.



9.0 Transaction Requirement (data entry, data update/delete, data queries)

The following transactions are referencing the current system for Low Carbon Monitoring System by MBIP. The current system for data collection can be found on http://bit.ly/mbiprendahkarbon .

Participants Profiling

- participants are asked to enter a valid email address (mandatory)
- participants are asked to enter Full Name as per IC (mandatory)
- participants are asked to enter Identity Card (mandatory)
- participants are asked to enter phone Number (mandatory)
- participants are asked to enter current status (working/student/housewife/others) (optional)
- participants are asked to enter Neighborhood name ,or institution, or school, or workplace name (mandatory)
- participants are asked to enter type of workplace institution (Government / Private / Others) (mandatory)
- participants are asked to enter House Category (A1,A2,B1,B2 or other) (mandatory)
    - A1 : High-rise House
    - A2 : Landed House
    - B1 : institution within MBIP (<2000 population)
    - B2 : intuition within MBIP (>2000 population)
    - Other : *write the type of housing*
- participants are asked to enter current Full Address based on House category (mandatory)
- participants are asked to enter House/Institution/School Size (mandatory)
- participants are asked to clarify and agree for the data to be used by MBIP (agree/disagree) (mandatory)

Water Usage

The following information should be entered according to Monthly Water Bill.

- participants are asked to enter total days of January's bill (Mandatory)
- participants are asked to enter Pro Rata Factor for January's bill (Mandatory)
- participants are asked to enter Water usage in January (m^3) (Mandatory)
- participants are asked to enter water usage in January (RM) (Mandatory)

All 4 data above are asked to be entered again for the February,March,April,May,June

- participants are asked what they do to save water (Mandatory)
- participants are asked how they save water (Mandatory)

Electric Usage

The following information should be entered according to the Monthly Electric Bill.

- participants are asked to enter total days of January's bill (Mandatory)
- participants are asked to enter Pro Rata Factor for January's bill (Mandatory)
- participants are asked to enter Electric usage in January (kWh) (Mandatory)
- participants are asked to enter water usage in January (RM) (Mandatory)

All 4 data above are asked to be entered again for the February,March,April,May,June

- participants are asked what they do to save Electric(Mandatory)
- participants are asked how they save Electric(Mandatory)

Recycles and Oil

- participants are asked to enter Total Amount of Recycles in Kilogram for January-June(Mandatory)
- participants are asked to enter Total Amount of Recycles in RM or "Collect Point" for January-June(Mandatory)
- participants are asked to enter Total Amount of Oils in Kilogram for January-June(Mandatory)

- participants are asked to enter Total Amount of Oils in RM for January-June(Mandatory)
- participants are asked what their recycle habits(Mandatory)
- participants are asked how do they recycle(Mandatory)

Extra marks

- participants are asked to select their Low carbon habits habits based on 7 options or the “Other” option (Optional)
- participants are asked to upload proof of their Low carbon habits (Optional)
- participants are asked to enter their social media (Optional)
- participants are asked to upload proof(Mandatory)
- participants are asked to enter a reason why they are interested in Low carbon habits

Carbon Savings calculations

Based on the data that the participants have provided, their carbon savings are calculated.

Annual Report

The participants with top carbon savings are then published in the annual report. Aside from that, the data for total water savings,electric saving,and recycle wastes are also published along with potential money saved from carbon reductions. The annual report can be found on https://www.imelc.my/

10.0 Benefit and Summary of Proposed System

The proposed system for Iskandar Puteri City Council (MBIP) presents a comprehensive solution with a myriad of benefits. It efficiently tackles the current challenges in data collection, replacing the cumbersome Google Forms approach with streamlined processes, thereby reducing time consumption and errors. Real-time monitoring capabilities ensure timely and accurate insights into carbon emissions, water and electricity usage, and recycling efforts. The system's user-friendly interface, designed for a diverse demographic, aims to boost participation levels, overcoming past hurdles. Through detailed analysis tools and mapping features, MBIP gains valuable data for strategic decision-making in achieving a 58 percent reduction in carbon intensity by 2025. The inclusion of a user monitoring dashboard fosters individual and collective responsibility, while the system's accessibility in Bahasa Malaysia ensures inclusivity. Overall, the proposed system aligns with MBIP's objectives and Malaysia's sustainability initiatives, offering a holistic approach to carbon monitoring and environmental responsibility.

11.0 Summary

The proposal aims to create a comprehensive low-carbon monitoring system for Iskandar Puteri Municipal Council (MBIP) to promote Malaysia's sustainable development goals. Through support for the Low Carbon Cities Framework (LCCF) and Iskandar Puteri Low Carbon (IPRK) schemes, the system is designed to cover a wide range of people including multi-storey and single-family homes, institutions, MBIP sectors and employees. The system is designed to solve the challenge of inefficient data collection via Google Forms and provides solutions through a comprehensive study of technical, operational and economic feasibility. A cost-benefit analysis showed the project has strong profit potential, with goals including designing a robust database system, tracking energy use, integrating 281 policies, developing a centralized platform for carbon emissions, and having designs for future expansion. The project plan identifies key roles, task organization, and timelines, while the requirements analysis details the business processes and transactional requirements of the system. Overall, the proposal provides clear guidance for the efficient development and implementation of a system that addresses carbon monitoring challenges, is aligned with the Sustainable Development Goals, and is fully analyzed to demonstrate feasibility and profitability.