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Section 06

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PHASE 1: PROJECT PROPOSAL & PLANNING

Low Carbon Initiatives Community Monitoring System[Bot]

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1.0 Introduction

Nowadays, Malaysia has become a forward-thinking leader in the fight for a sustainable future, launching a number of ground-breaking programmes to address social, economic, and environmental issues. The Low Carbon Cities Framework (LCCF), a strategic plan that directs cities towards low-carbon development, has been widely adopted by the country. The ambitious Low Carbon Blueprint for Iskandar Malaysia 2025, which outlines 281 policies aimed at achieving a remarkable 58 percent reduction in carbon intensity by 2025, is a beacon of this commitment from the Johor government. Innovative initiatives like the Iskandar Malaysia Ecolife Challenge, the e-Lestari system developed by the Johor Education Department, and the Iskandar Puteri Low Carbon Calendar Competition help to actualize this commitment. These programmes aim to engage communities, raise awareness, and provide both concrete and intangible benefits for a resilient and sustainable Malaysia in addition to reducing carbon emissions in a quantifiable manner. Malaysia is moving towards a greener, more sustainable future in this dynamic environment through the convergence of technological innovation, community engagement, and governmental vision.

This project focuses on the development of a new data collection and analysis system to monitor and assess current levels of carbon dioxide in Malaysia, particularly in the area of Johor, with the aim to achieve Low Carbon Society (LCS). This system aims to overcome various conundrums faced by the Iskandar Puteri City Council (MBIP) where their prior endeavors to achieve LCS has yet to be accomplished. The primary scope of this new system-in-planning covers data gathering, and reporting processes which ultimately comes down to a key goal of promoting more effective carbon reduction initiatives.

2.0 Background Study

The primary stakeholder of this project is the Iskandar Puteri City Council (Majlis Bandaraya Iskandar Putri) also known as MBIP. MBIP is a city council which administrates Iskandar Puteri City in Johor, Malaysia. MBIP is responsible for public health and sanitation, waste removal and management, town planning, environmental protection and building control, social and economic development and general maintenance functions of urban infrastructure (Wikipedia contributors, 2023). MBIP has always been keen on initiating energy-saving efforts within its community, covering schools, residences, factories and so forth. One of their honorable mention initiatives is the launching of the Iskandar Puteri Low Carbon Calendar Competition, which emphasizes on decreasing the usage of electricity, reducing energy consumption and managing waste the proper way. Despite the endeavors of the organization, countless obstacles have been faced including time-consuming and user-unfriendliness and so on, which leads to this idea of development of a new system to overcome them.

3.0 Problem Statement

1. **Limited Data Analysis Capabilities in Sustainability Initiatives**

   Lack of strong data analysis capabilities presented challenges for the Iskandar Puteri Low Carbon Calendar Competition. Manual carbon reduction calculations, extensive participant information requirements, and a user-unfriendly data entry process hindered efficient assessment and analysis of community efforts. Without a more robust data analysis framework, it becomes difficult to derive meaningful insights and track the progress of carbon reduction initiatives effectively.

2. **Manual Data Entry and Calculation takes too long**

   One of the main issues in the past was that participants' data entry for the Iskandar Puteri Low Carbon Calendar Competition took far too long. The manual method of calculating carbon reduction may have resulted in significant uncertainties and inaccurate calculations in addition to its lack of user-friendliness. Difficult data entry methods can make it more difficult for sustainability programmes to grow and discourage active participation. The efficiency of these initiatives could be improved and community

involvement could be streamlined by utilizing technology to automate calculations and data entry

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3. **Challenges in Community Categorization and Targeting**

As mentioned in the third paragraph, MBIP serves a diverse user group, including residents, institutions, divisions, and staff. The planned data collection platform aims to target different community categories, including residents in multi-story and landed houses, institutions, MBIP divisions, and staff. However, challenges may arise in effectively categorizing and engaging these diverse groups, potentially impacting the accuracy of data collection and analysis. A lack of clear categorization could lead to biased data and make it more difficult to accurately analyze carbon emissions within particular community segments. So, refining categorization methods and outreach strategies is essential for obtaining comprehensive and accurate data.

4. **User Unfamiliarity with Data Platforms**

The issue of user unfamiliarity with data platforms refers to participants' lack of knowledge or experience with digital tools and forms for data submission. In the case of the Iskandar Puteri Low Carbon Calendar Competition, the use of a Google Form as a data entry mechanism proved difficult because some participants were unfamiliar with or uncomfortable with this technology. For example, Users that are unfamiliar with the data platform may make errors during the data entry process, leading to inaccuracies in the submitted information. Inconsistent or incorrect data can compromise the reliability of the collected data and impede the accurate assessment of carbon reduction efforts. The complexity or unfamiliarity of the data platform may lead to disengagement from participants. Individuals may find the data entry process time-consuming or confusing, diminishing the overall effectiveness of community involvement in the sustainability initiative.

4.0 Proposed Solution

The Low Carbon Initiatives Community Monitoring System is mainly designed to create a systematic database that enhances the data gathering and analyzing process regarding carbon emissions. This system will streamline information entry by eliminating the manual methods that were used in the previous system. This system will also introduce a user-friendly and comprehensive data-entry process to encourage community participation in these low-carbon initiatives.

To solve the limited data analysis capabilities in sustainability initiatives, the advanced analytics tools, such as machine learning algorithms or statistical models will be integrated into the data analysis system. These algorithms and tools can help MBIP to connect carbon emissions data to geographical locations and identify areas with high and low carbon emissions. On the other hand, real time information and data about the carbon emissions of its installed location will be provided by the dashboard by uploading its data to the new system database and later being observed by MBIP staff. This system will also apply a self-monitor dashboard that is implemented by machine learning algorithm and statistical model. So that it can provide staff relevant data and predict the future insights of the carbon emissions by analyzing the data that collected by the algorithm. This method will further improve the reduction of carbon emissions. Therefore, the community can easily make data-driven decisions to reduce carbon emissions more efficiently by using data visualization and analysis which is easy to understand and reduce the carbon emissions gradually and indirectly. As a result, this will allow for automated and more sophisticated analysis of carbon emissions data, enabling better decision-making and strategic planning. Besides, a cloud-based data storage system will also be implemented to facilitate efficient handling of large datasets as the cloud platforms offer scalability, accessibility, and collaboration features, ensuring that data is readily available for analysis and reporting.

Apart from that, considering the manual data entry and calculation takes too long to process, an automated data entry process within the system is introduced to reduce the time required for participants to submit information. The automation includes features such as dropdown menus, auto-population of fields, and data validation checks. All of these features are to improve efficiency. On the other hand, a mobile app that integrates with the system also will be developed to allow participants to enter data from their mobile devices. This platform accept all of the user information, such as IC number and name to automatically retrieve relevant information, such as electricity and water bills, and automatically extract necessary information, including bill amount, total number of date, etc., through Optical Character Recognition (OCR) technology, without the need for manual input by users. This method can improve accessibility while also encouraging more frequent and timely data submissions. After that, implementing a

real-time calculation engine within the system is definitely a good idea to automatically compute carbon reduction metrics as data is entered. It is because this not only can accelerate the calculation process but also ensures accuracy and reduces the likelihood of errors.

Then, a dynamic categorization module within the system will be designed to adapt to changes in community demographics. This allows for flexibility in categorizing diverse community groups based on evolving criteria. With the trend of artificial intelligence(AI), artificial intelligence (AI) algorithms also should be utilized to enhance the targeting of different community categories because AI can analyze patterns and behaviors to optimize outreach strategies for improved engagement. This system will also have a community feedback mechanism to allow users to provide comments on their categorization and engagement experiences. This feedback loop will contribute to the continuous improvement of categorization methods.

To deal with the user unfamiliarity with data platforms, an interactive onboarding process within the system will be developed to guide users through the data entry platform, including step-by-step tutorials, tooltips, and FAQs to assist users in becoming familiar with the system. Besides, this system also supports multilingualism to cater to users who may not be proficient in the primary language. This can ensure inclusivity and encourages a broader range of participants to engage with the platform. This system will also have an in-app help center or knowledge base that users can access directly from the system. This resource will provide detailed information and troubleshooting guides to address user concerns and challenges. The system will operate primarily in Bahasa Melayu to enhance accessibility and familiarity for the local residents.

Technical Feasibility

This platform requires only the Internet and one of the devices, such as a cell phone, laptop, tablet, and so on, to access the system via a browser. For the mobile application of this system, it was simple and applicable everywhere because this system aims to assist stakeholders in keeping things simple and avoiding the dizziness caused by too many cluttered interface buttons and coloured use. This system is linked directly to the database system. As a result, it enables the stakeholder to store a large amount of data and record it in an organized and structured manner. This system and the database system are aimed to improve the efficiency and the user unfamiliarity so that it is beginner friendly to everyone.

Operational Feasibility

The proposed sustainability data platform appears to have a high operational feasibility in Iskandar Puteri. The system aims to improve user engagement and operational efficiency by emphasizing user-friendly features, streamlined data entry, and adaptability to diverse community needs. The platform is positioned to seamlessly integrate into the operational landscape by aligning with existing initiatives and prioritizing regulatory compliance, fostering more effective and inclusive carbon reduction efforts in the region.

5.0 Objectives

In order to help MBIP reduce the workload and increase efficiency, while improving the user experience for participants of the Iskandar Puteri Low Carbon Calendar Competition, and attracting more participants to maximize the benefits of the competition, we have set several objectives for this.

- To provide a system which can collect data efficiently from a wide range of community categories including residents in multi-story and landed houses, institutions, MBIP divisions, and MBIP staff.
- To provide a system with advanced data analytics capabilities to help MBIP calculate carbon emissions reductions and generate reports.
- To realize automated data entry process, reduce the time-consuming of manual input, and facilitate community engagement.
- To provide a system with self monitoring dashboard which allowing participants to track and visualize their carbon emissions .
- To help MBIP conduct the carbon footprint mapping and identify the area with high carbon emissions level.

6.0 Scope

For participants:

The system aims to engage participants in a user-friendly platform enabling effortless data entry. Users can quickly fill in the required information through drop-down menus and auto-fill fields, and every filled-in information will be validated real time, helping participants save time on error troubleshooting. By registering with the identification card, the system can directly retrieve relevant information, such as electricity and water bills, and automatically extract the necessary information, including bill amount, date total, etc., through Optical Character Recognition (OCR) technology, thereby reducing manual input of information and upload files. Furthermore, participants can access to the self monitoring dashboards that promote transparency and tracking of progress towards emission reduction targets. The system's functionality prioritizes user accessibility and usability to encourage participants to contribute to a low-carbon society.

For MBIP:

The scope entails the development and implementation of a data-centric platform dedicated to monitoring and managing carbon emissions in the Iskandar Puteri region. The system focuses on comprehensive data analysis and automated calculation of carbon emissions, helping MBIP reduce their burden of manual calculations. Artificial intelligence algorithms will be used to refine and optimize targets for different community categories, improving the accuracy of the system in implementing tailored carbon emission reduction strategies in the Iskandar Puteri region. In addition, the system's ability to automatically generate detailed reports from the analysis result provides MBIP with valuable insights to develop informed policies and strategic planning for sustainable environmental initiatives in the region. The system is also equipped with advanced algorithms and mapping mechanisms to help identify communities areas with high carbon emissions which can help MBIP designate different policies for areas.

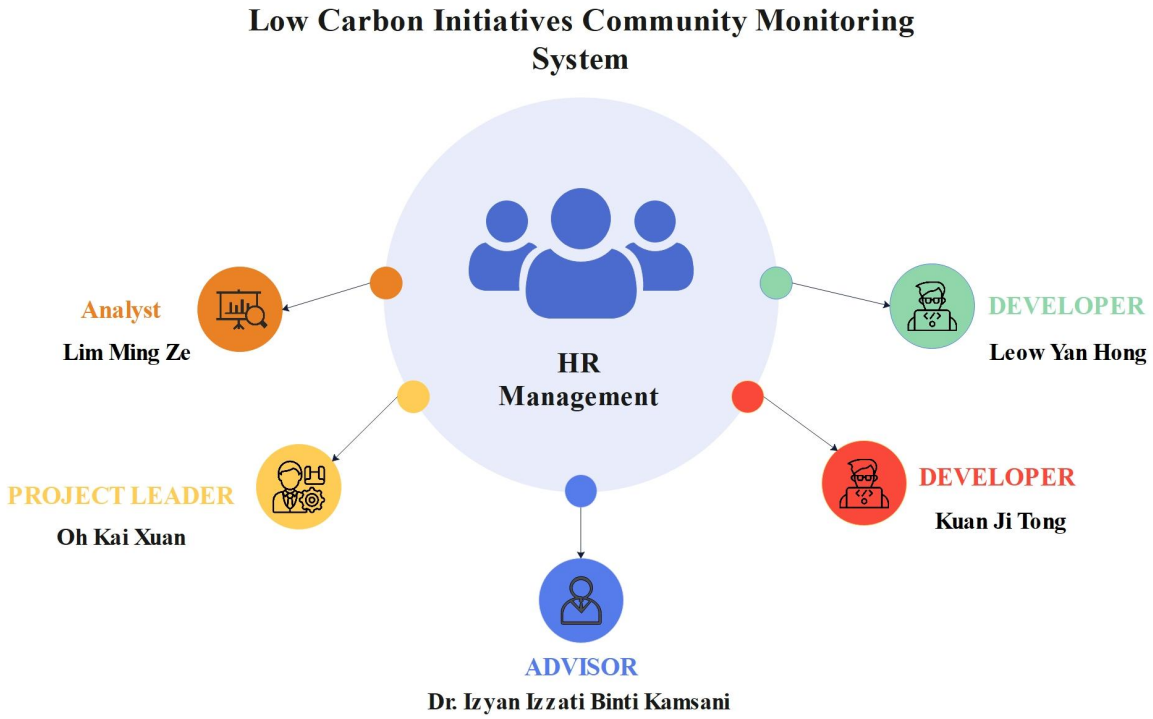
System Boundaries:

The proposed system encompasses the capability to initiate data collection from participants, conduct automated data analysis utilizing calculation algorithms, and generate comprehensive reports. Participants residing outside the Iskandar Puteri region will be restricted from registering

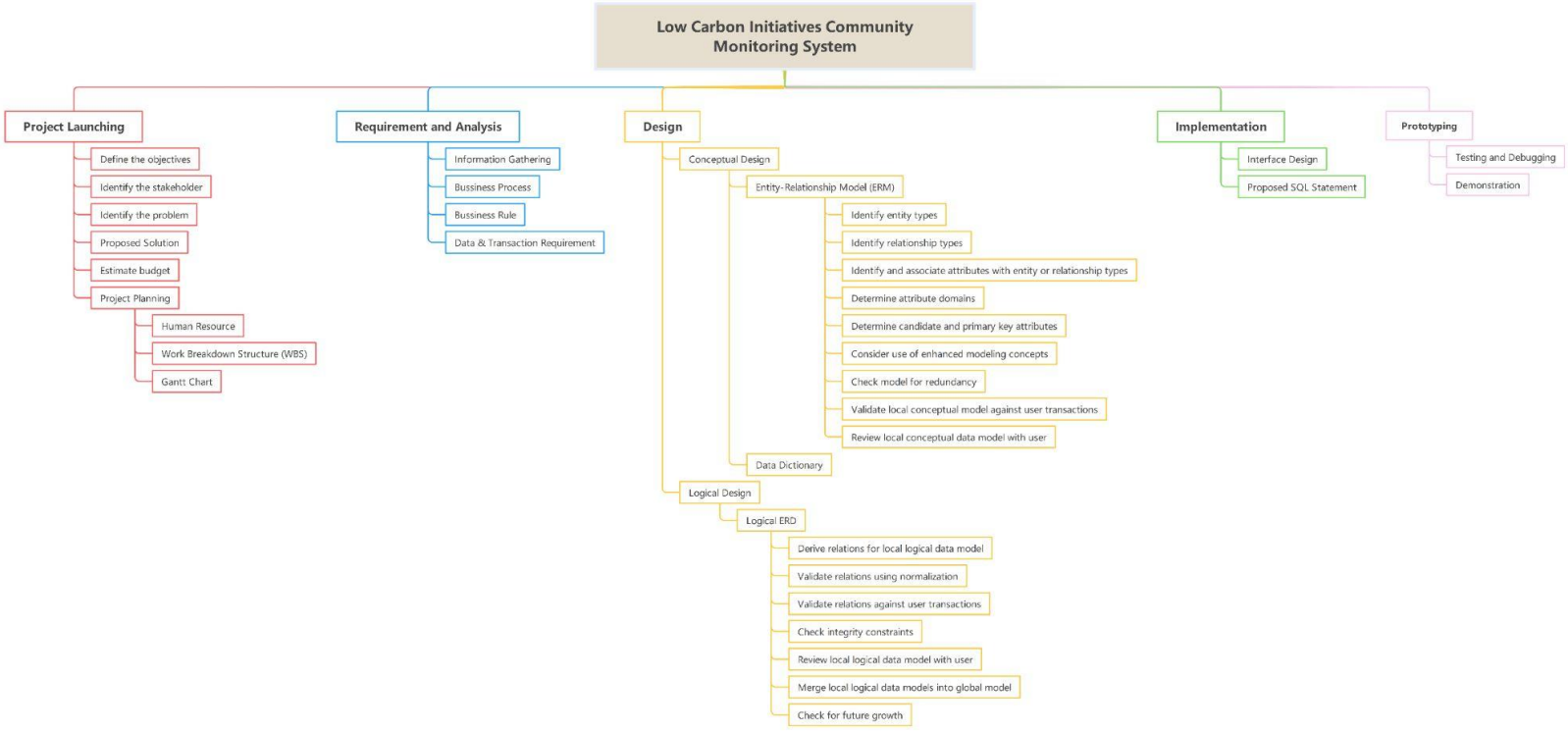
within the system. Furthermore, the system is capable of conducting carbon footprint mapping to identify areas and communities with high carbon emissions. The system will offer a simple and attractive user interface, ensuring a pleasant user experience and enabling user complete the task efficiently. The system's boundaries include operations and interactions in Malay to make it easier for local users to use the system.

7.0 Project Planning

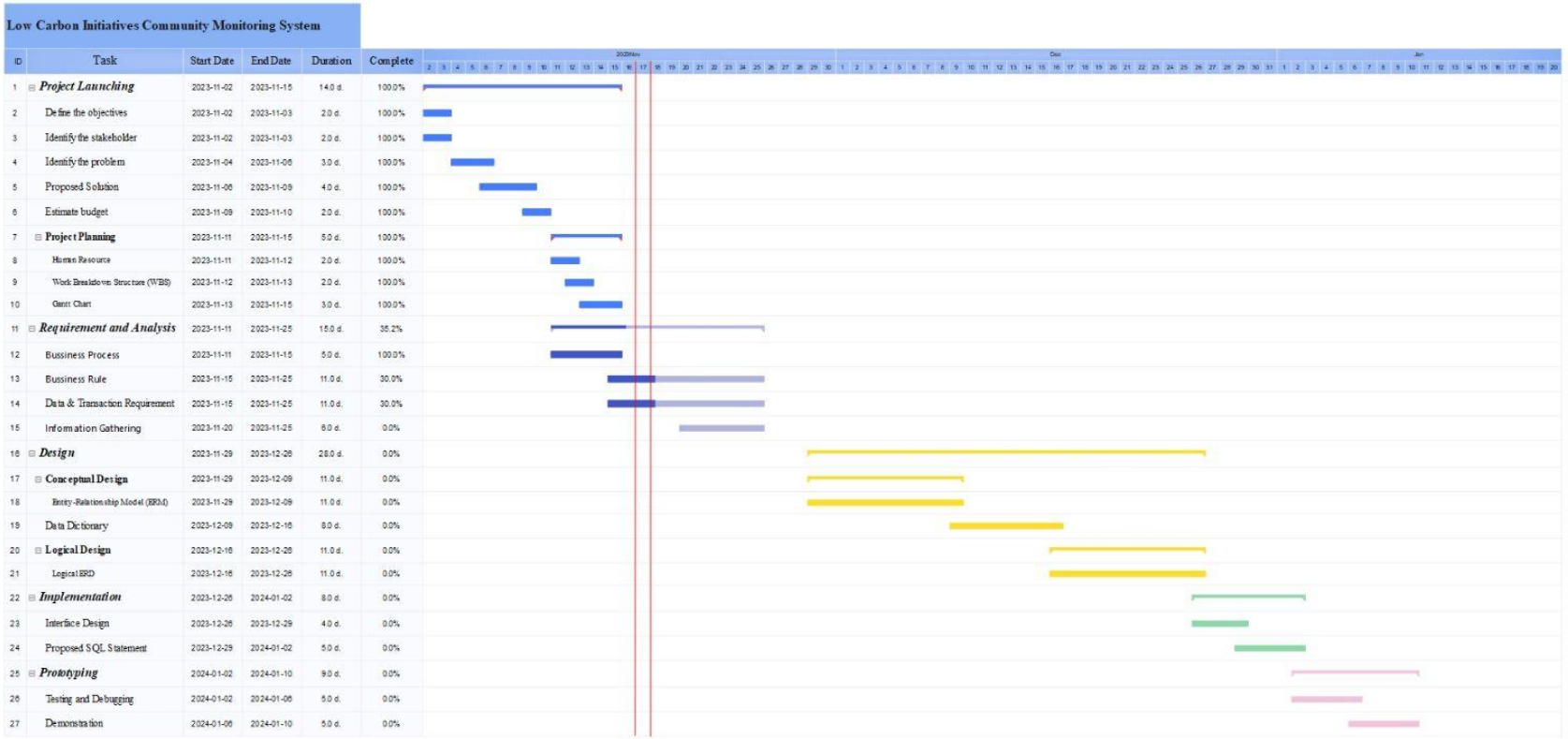
7.1 Human Resource



7.2 Work Breakdown Structure (WBS)



7.3 Gantt Chart



8.0 Requirement Analysis

8.1 Current Business Process

The scenario of current business process on how the MBIP collect the data through Google Form is shown below:

1. Display details and requirements of Low Carbon Competition.
2. Collect the personal information of participants.
    a. Name
    b. Identity Card Number
    c. Phone Number
    d. Occupation Status
    e. Name of Participation Area: [Name of Residential Area/Institution/School/Office]
    f. Working Institute Category: [Private/Public/Others]
    g. Category of Participation Area: [e.g., Multi-story Residential Building in MBIP, Land Residential Area in MBIP]
    h. Address of Participation Area
    i. Number of People in Participation Area

3. Collect Information of Water Consumption for each month from January until June (A participation can fill in the information for a Water Consumption part)
    a. For each month (Jan - June):
        i. Number of Days: [Number of Days in the Month]
        ii. Prorate factor: [Proportion of Days Participant was Present]
        iii. Current Water Usage: [Volume of Water Used]
        iv. Cost of Current Water Usage: [Cost Associated with Water Usage]
    b. Method of Water Saving: [State Water Saving Method Applied]
    c. Explanation of the method.

4. Collect Information of Electricity Consumption for each month from January until June (A participation can fill in the information for a Electricity Consumption part)
    a. For each month (Jan - June):

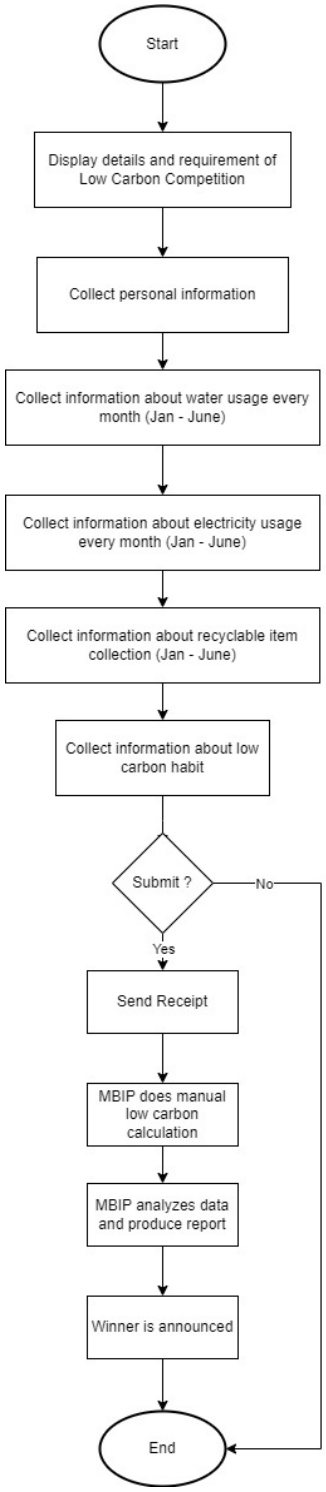
i. Number of Days: [Number of Days in the Month]
ii. Prorate factor
iii. Current Electricity Usage: [Electricity Consumption]
iv. Cost of Electricity Usage: [Cost Associated with Electricity Usage]

b. Habit: [Electricity-Saving Habit]
c. Method of Electricity Saving: [Electricity Saving Method]

5. Collect Information about Recyclable Items Collection from January until June (A participation can fill in the information for a Recyclable Item Collection part)
    a. Recyclable Items Collection:
        i. Weight of Items: [Weight of Recyclable Items Collected]
        ii. Price Earned or Points: [Value Earned from Recyclable Items]
    b. Oil Collection:
        i. Weight of Oil Collected: [Weight of Recycled Cooking Oil]
        ii. Price Earned: [Value Earned from Oil Collection]
    c. Recycling habit
    d. Recycling method [Description of Recycling Method]

6. Collect information about Low Carbon Habit (A participation can fill in the information for a Low Carbon Habit part)
    a. State Low Carbon Habit that has been done
    b. Evidence: [Evidence or Documentation Supporting all the data given]
7. Google form is submitted by participants.
8. Receipt is sent to the participant.
9. MBIP does manual carbon reduction calculations.
10. MBIP analyzes the data and produces a report. (A report associates with many participants based on catogory of participation area, A report analyzes many data about Water Consumption, Electricity Consumption, Recyclable Items Collection and Low Carbon Habit filled by participants)
11. Winner is announced.

Workflow


Start
Display details and requirement of Low Carbon Competition
Collect personal information
Collect information about water usage every month (Jan - June)
Collect information about electricity usage every month (Jan - June)
Collect information about recyclable item collection (Jan - June)
Collect information about low carbon habit
Submit ?
No
Yes
Send Receipt
MBIP does manual low carbon calculation
MBIP analyzes data and produce report
Winner is announced
End

Data Requirement

Participant

The data stored for each participant include: Name,Identity Card Number,Phone Number, Occupation Status, Name of Participation Area, it can be name of Residential Area/Institution/School/Office, Working Institute Category (e.g, Private/Public/Others), Category of Participation Area (e.g., Multi-story Residential Building in MBIP, Land Residential Area in MBIP), Address of Participation Area, Number of People in Participation Area. Each participant should give the information about Water Consumption, Electricity Consumption for every month. Each of them should also give information about a Recyclable Items Collection and Low Carbon Habit. Each participant is associated with many reports. The data type for all the attributes is varchar2 with suitable size.

Water Consumption

The water consumption contains month, number of days, prorate factor, volume of water used and cost associated with the water usage, water saving method and explanation which is applied by the participants. Each water consumption should be filled by a participant. Each Water Consumption should be analyzed by many reports. The data type for all the attributes is number with suitable size except method and explanation which uses varchar2.

Electricity Consumption

The Electricity Consumption contains month, number of days, prorate factor, electricity used and cost associated with the electricity usage, electricity saving habit that participants have and the method which is applied by the participants. Each electricity consumption should be filled by a participant. Each Electricity Consumption should be analyzed by many reports. The data type for all the attributes is number with suitable size except habit and method which uses varchar2.

Recyclable Items Collection

The Recyclable Items Collection includes weight of recyclable items collected, price earned or points earned for recyclable items, weight of oil collected and price earned, recycling habits that participants have and the method which is applied by the participants. Each Recyclable Item Collection should be filled by a participant. Each Recyclable Item Collection should be analyzed by many reports. The data type for all the attributes is number with suitable size except habit and method which uses varchar2.

Low Carbon Habit

Low Carbon Habit includes the low carbon habit done, followed by evidence. Each Low Carbon Habit should be filled by a participant. Each Low Carbon Habit should be analyzed by many reports. The data type for all the attributes is varchar2 with suitable size.

Report

Report contains results of low carbon calculation based on the category of participation area. Different categories of participation will have different reports. Each report should be associated with many participants. Each report should analyze many data in Water Consumption, Electricity Consumption, Recyclable Item Collection and Low Carbon Habit. The data type for all the attributes is varchar2 with suitable size.

9.0 Transaction Requirement

Data Entry

Enter the details for participants

Enter the details for water consumption every month

Enter the details for electricity consumption every month

Enter the details for recyclable items collection

Enter the details for low carbon habit

Enter the details for report

Data Update/Deletion

Update/deletion the details of participants

Update/deletion the details of water consumptions every month

Update/deletion the details of electricity consumption every month

Update/deletion the details of recyclable items collection

Update/deletion the details of low carbon habit

Update/deletion the details of report

Data Queries

Retrieve details of participants

Retrieve details of water consumption of participants

Retrieve details of electricity consumption of participants

Retrieve details of recyclable items collection of participants

Retrieve details of low carbon habit of participants

Retrieve details of report

10.0 Benefits of Proposed System

The proposed system is a comprehensive platform designed to collect, analyze, and generate reports of the carbon emissions within the Iskandar Puteri. The reason that we designed this system because MBIP encountered some challenges when launching the Iskandar Puteri Low Carbon Calendar Competition including a time-consuming and user-unfriendly data entry process, extensive participant information requirements, manual carbon reduction calculations and reporting, a lack of data analysis capabilities, varied user profiles, and participants' unfamiliarity with the Google Form. Thus, this system was developed to solve these problems.

This proposed system has higher learnability and usability, and provides participants with a series of assistance when entering data, such as automated data entry, allowing participants to easily provide relevant information, eliminating a lot of manual input processes. Under MBIP's recommendations, the system also provides participants with a self-monitoring dashboard function, allowing them to understand their carbon emission data in real time, thereby motivating participants and improving the efficiency of carbon emission reduction.

Furthermore, this system will use artificial intelligence algorithms to refine and optimize the goals of different community categories, and then use advanced data analytics capabilities to perform automated carbon emission reduction calculations and analysis, and then generate reports from the analysis results. The entire process is automated, which can reduce the burden of MBIP while increasing the efficiency and accuracy of analyzing data. Finally, the system can draw carbon footprint maps based on the analyzed data, assist MBIP in identifying carbon emission levels in various areas, provide MBIP with in-depth insights, and accurately formulate targeted emission reduction strategies.

11.0 Summary

Our team gained a lot during this project phase. First and foremost, we learned how to identify existing system problems from case studies and set project goals to address potential problems. We have studied the challenges faced by the Malaysian Iskandar Puteri Municipal Council (MBIP), when launching the Iskandar Puteri Low Carbon Calendar Competition including limited data analysis capabilities in sustainability initiatives, time-consuming and user-unfriendly data entry process, challenges in community categorization and targeting, and user unfamiliarity with data platforms.

In addition, our team also deeply understands the importance of teamwork and communication. When thinking of possible solutions, we conducted a brainstorming session where all team members actively contributed ideas and solutions to solve the defined problems which greatly increased the efficiency of the solving process.

By analyzing current business processes, we understand the workflow and know how to identify bottlenecks of a system. This understanding can help us optimize processes and workflows in the new system. Furthermore, studying transaction requirements such as data entry, update/deletion, and query, our team can understand the complexity of data processing within the system and design an efficient and user-friendly data management system.

Overall, this project is at phase 1 initial stage and we have set the project direction and determined that its feasible for a good investment in terms of the costs spent and benefits gained over the future years.