UNIVERSITI TEKNOLOGI MALAYSIA

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SECD 2613 System Analysis and Design
Section 08

PHASE 2:
INFORMATION GATHERING AND REQUIREMENT ANALYSIS

Low Carbon Initiatives Community Monitoring System
<CarbonCutOffPro>

To_Be_Continued (Team 7)

Team Members:

No	Name	Matric No
1.	Loh Chee Huan	A22EC0186
2.	HUANG BOSHENG	A22EC4032
3.	Muhammad Mujahidul Adli	A22EC4037
4.	Adam Ismail Hassan Amer Abouraya	A22EC0002

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1. INTRODUCTION

In Phase 2, our focus is on analyzing the existing MBIP system based on the previously defined problems. Our goal is to gather information requirements and establish the system requirements for our project. By doing so, we aim to uncover the essential details that will help us understand the current system's 4W1H. We plan to use methods like Google Form to gather responses from different people.

Several key objectives need to be achieved in Phase 2. Firstly, we will determine the methods employed to gather information from our target stakeholders or other relevant respondents. This document will list out the chosen method, the reason behind its selection, and how it will be implemented. Following this, we will conduct an analysis of the existing IPRK system, known as the AS-IS system. This analysis is crucial for gaining a clear overview on how the current system operates. After that, we will create a context diagram illustrating the business flow of the AS-IS system, highlighting entities and data flow between them.

Subsequently, we will develop data flow diagrams, including parent and child diagrams, to illustrate external entities, data flows, data stores, and procedures after establishing the context diagram. The parent diagram (level 0 diagram) will include all external entities and necessary data storage for each process. Each process in the parent diagram will be systematically extracted to generate corresponding child diagrams, maintaining the same number of inputs and outputs.

Upon completing the diagrams above, our tasks for this phase will be considered accomplished. The use of data flow diagrams has allowed us to thoroughly analyze the current system, providing a clear understanding of information requirements.

2. PROBLEM DEFINITION

a. Inadequate monitoring of project implementation status

The Iskandar Puteri Low Carbon (IPRK) initiative currently lacks an effective system to monitor the implementation status of its various projects and activities on reducing carbon emission within the area. However, there is no centralized platform to track the progress of initiatives by the MBIP planning department in a systematic way. MBIP does not have visibility on whether planned environmental projects have actually been executed, are on track or delayed. Without tracking of project timelines, IPRK cannot gauge implementation rates and identify the potential bottlenecks to be addressed.

b. No centralized platform for carbon data

IPRK has limitations to store project data and outcomes in a centralized or easily accessible system. Currently, data on emissions reductions or other metrics from implemented initiatives is siloed and scattered. For instance, the data collected are all stored in separate Excel files for further analysis. There is no unified platform to gather the data from multiple sources and projects to display the outcomes. This will highly restrict the ability to demonstrate tangible processes and results to stakeholders as well as the public.

c. Limited analytics on project progress over time

While IPRK undertakes different projects aimed at reducing carbon emission, the initiative still lacks a robust system to analyze project outcomes over time. This is because the project timeline will not update in a centralized system. The project progress will only be updated based on the report and documentation from the project manager. Therefore, quantifying results from the initiatives are required to identify trends. However, the current system is unable to generate such insights by analyzing data annually. Failure to analyze the data annually will be hard in revealing progress rates and planning future strategy.

d. Labor-Intensive Carbon Emissions Computations

The IPRK initiative currently involves manual computations to derive carbon emissions reductions from various projects. Calculation of carbon emissions metrics based on the water bill and electrical bill relies on manual aggregation of data points on water and waste. This will involve manual calculation based on a large quantity of data collected. They need to perform extensive mathematical calculations by using the formula in order to quantify carbon impacts. This hands-on computations process is time-consuming, inefficient and prone to human errors that might influence the data accuracy.

e. Limited User Awareness in Sustainability Efforts

While IPRK aims to promote low carbon practices across communities, there appears to be limited awareness and engagement among end users. For instance, the residents's unfamiliarity with using tools like Google Forms to participate in data collection. This indicates that many of them lack understanding of how to track their own carbon footprints in their household. Some of them might make some mistakes when filling up some important information in the Google Form due to there being no restriction in limiting the answer from the residents. Without proper knowledge, it seems to be hard for them, especially the senior citizens, to contribute effectively to regional decarbonization goals.

3. INFORMATION GATHERING PROCESS

3.1 METHOD 1 : Interview (Using pyramid)

Description:

We will conduct a comprehensive assessment of the project and carbon reduction efforts by combining surveys and in-depth interviews. The survey will collect feedback from stakeholders, while the interviews will provide deeper insights. The results of both methods will be combined to provide a complete picture of the project's progress and effectiveness.

Implementation:

To gather in-depth feedback and insights, we conducted semi-structured interviews with key stakeholders involved in the IPRK program. The stakeholder that we choose is MBIP Planning Department Staff who is responsible for designing and implementing carbon reduction policies and measures.

Interview Process:

Duration: 15-20 minutes.

Format: Combination of open-ended and closed-ended questions.

Close-Ended Questions

Question 1 : How would you rate the current effectiveness of the existing system in monitoring project implementation status on a scale of 1 to 5, with 1 being highly ineffective and 5 being highly effective?

Answer :

I think the scale might be 2. (less effective)

Question 2 : Do you currently have a centralized platform to track the progress of environmental projects within the IPRK initiative?

Answer :

No. I handle the progress manually by receiving the report from the consultant

Question 3 : On a scale of 1 to 5, how would you rate the accessibility and organization of the current system for storing project data and outcomes, with 1 being very disorganized and 5 being very organized?

Answer :

I will give it 2 out of 5 which is quite disorganized as we use separate excel files to store the data obtained from the competition.

Open-Ended Questions:

Question 4 : What is your broad vision on how a sustainability platform can accelerate carbon reduction efforts within Iskandar Puteri?

Answer :

We aim to create a city-wide sustainability platform that brings together data from various sources, offering a unified view of efforts to reduce carbon emissions across the Iskandar Puteri area.

Question 5 : What are some practical difficulties faced by your department in quantifying the environmental impact of current initiatives?

Answer :

We currently face some difficulties in centralizing dispersed Excel-based emissions data, as well as manually computing complex footprint formulas which consumes resources. Moreover, it takes us a lot of time to categorize and analyze the carbon consumption data before preparing a full report for each of the competitions.

Question 6 : What kind of visibility do you expect on project status tracking that would significantly improve oversight?

Answer :

We want to stay on top of project progress in real-time. In this case, we want to track whether each of the programs that we run in different areas are under our expectations or it might be delayed due to different uncertainties. Therefore, we hope to get immediate alerts if there are unexpected delays, so we can act quickly to keep things on track.

Question 7 : Is replacing formula-based carbon calculations with a rules engine a key expectation?

Answer :

Yes, we expect the new system can help us to eliminate the process of calculating the carbon consumption manually. Therefore, we need the new system to provide us with a standardized algorithm that can help us to compute the data efficiently and minimize the errors.

3.2 METHOD 2 : STROBE(Structured Observation of the Environment)

Description:

The evaluation of carbon reduction projects within the Iskandar Puteri Low Carbon (IPRK) initiative will be conducted using an unobstructive method, which is the STROBE (Structured Observation of the Environment). This method is used to observe the decision-maker's physical environment. Usually, it is possible to observe the particulars of the surroundings that will confirm or negate the organizational narrative. By applying the STROBE, there are five symbols used to evaluate the observation of the elements compared with interview results which are checkmarks, 'X', oval or eye-shaped symbol, square and circle.

Implementation:

To implement the STROBE method, we had performed an in-depth observation in the competitions that have been organized in Iskandar Puteri Rendah Karbon for about three weeks. Here are the activities that we conducted during the observation:

1. Observing resident behavior:
    - How do the residents take part in the carbon reducing competition such as can they find the booth easily and can they complete the task effortlessly?
    - Analyze to identify high carbon consumption activities to target.

2. Evaluating competition participation:
    - Station trained observers at registration booths during registration.
    - How the helpers at booths assist the senior citizens in completing the form.

3. Reviewing community events:
    - Track attendance and engagement of Iskandar Puteri community for the competitions.
    - Track the time taken to key in the data into the system including analyzing the data.

Result gained from STROBE:

- Most of the residents, especially the senior citizens, need assistance from the helpers to complete the Google Form.
- Residents will take a long time to fill up the Google Form as they are unfamiliar with the Google Form.
- Calculation on carbon consumption using the formula is time-consuming and easy to get errors.
- Data entry process is slow because there will be a huge amount of data to be processed before it can key in into the system.

3.3 SUMMARY

Through the interview session, we have gained a deep understanding of the problems and challenges that the MBIP planning department faced when running the IPRK programs. We had prepared a bunch of questions which include open-ended and closed-ended questions which can help us to identify the requirements of the department. We are using the pyramid structure method when interviewing our stakeholders. The reason behind this is it will break down the questions into several parts. We will begin by asking detailed questions followed by open-ended questions and more generalized responses. This will be useful to help the stakeholders to be warmed up to the topic or seem reluctant to address the topic.

The Structured Observation of Environment (STROBE) technique was used to evaluate Iskandar Puteri's low carbon competition initiatives. Residents participating in the competitions were observed over 2 weeks across areas such as ease of accessing registration booths, completing competition forms, computing carbon footprints and tracking participation. Some key observations obtained from STROBE are that senior citizens struggled with the Google forms used in competitions, manual data entry and calculations were time consuming, error-prone carbon computations using complex formulas and delays due to large data processing. By using STROBE, it identifies challenges that the residents faced with using the Google Form and current process gaps resulting in delays.

4. REQUIREMENTS ANALYSIS (AS-IS SYSTEM)

This section will describe current business processes such as the scenarios and workflow of the system. Then, we will determine the functional requirement and non-functional requirements of the current system to construct the data flow diagram later. There are several items need to be included in functional and non-functional requirement such as input, process and output.

4.1 CURRENT BUSINESS PROCESS

This section will discuss the scenarios and workflow of the current business process:

a. Iskandar Puteri Residents

1. Registration of users based on categories such as participants.
2. Select type of users.
3. Fill in personal details such as full name, phone number, address and others.
4. Select type of data to be inserted. (Electricity, Water, Waste, Recycle Cooking Oil)
5. Follow the guideline to follow the data by months.
6. Fill all required information and click submit.
7. Repeat steps 4-6 for other categories.
8. Do a survey of lifestyle for carbon footprint.
9. Declaration form and submit the form.

b. MBIP Consultant

1. Registration of users based on categories such as participants.
2. Select type of users.
3. Fill in the details.
4. Validate the submission of participants for final competition.

c. MBIP Planning Department

1. Prepare question banks to be asked.
2. Construct a Google Form with the questions.
3. Distribute Google Form to participants through competition.
4. Collect data from participants.
5. Compile data and save into different Excel files.

6. Analyze the data.
7. Generate reports based on the data.

4.2 FUNCTIONAL REQUIREMENT

4.2.1 Context Diagram

Process	Input	Output
IPRK System	Question bank Carbon consumption data Resident detail Energy consumption data Raw data	Spreadsheet report Participation report Competition data Google Form Competition guideline Registration data

4.2.2 Level 0 Diagram

Process	Input	Output
Submit Data	Energy consumption detail Resident detail	Competition data Resident data
Prepare Google Form	Question Bank	Google Form Question
Validate Data	Raw data	Resident detail Competition detail Participation report Raw competition data
Analyze Data	Carbon consumption data	Categorized data
Generate report	Categorized data	Spreadsheet report

4.2.3 Level 1 Diagram

4.2.3.1 Process 1 : Submit Data

Process	Input	Output
Select type of user	Menu choice	User type
Fill in personal detail	Resident data User type	Resident
Select data type	User type	Data type
Fill in energy consumption data	Data type Energy consumption detail	Form completion
Click complete and auto-submit	Form completion	Competition data

4.2.3.2 Process 2 : Prepare Google Form

Process	Input	Output
Select the questions	Question bank	Selected question
Design the form	Selected question	Completed form
Check and test form	Completed form	Extra questions Complete Google Form
Modify the form	Extra questions	Google Form questions
Publish form	Complete Google Form	Google Form questions

4.2.3.3 Process 3 : Validate Community Data

Process	Input	Output
Receive data	Raw community data	Raw community data
Check data quality	Raw community data	Master
Standardize data	Master data	Resident detail Compiled data Competition detail Raw competition data
Report findings	Compiled data	Participation report

4.2.3.4 Process 4 : Analyze Carbon Consumption Data

Process	Input	Output
Receive data	Carbon consumption data	Carbon consumption data
Analyze carbon footprint	Carbon consumption data	Categorized data Carbon data pattern
Organize data	Categorized data Carbon data pattern	Categorized data

4.2.3.5 Process 5 : Generate Competition Report

Process	Input	Output
Receive data	Categorized data	Categorized
Analyze trends	Categorized data	Visualized data Flagged anomalies
Create a full report	Visualized data Flagged anomalies	Spreadsheet report Program report

4.3 NON-FUNCTIONAL REQUIREMENT

4.3.1 Performance and Control

- Response time - The system should have an average response time of less than 3 seconds for data entry and analysis operations.
- Scalability - The system can handle an increasing amount of data and user activity without significant degradation in performance.
- Hardware utilization - Use larger memory storage and faster processor to prevent bottlenecks and ensure optimal performance.

4.3.2 Security

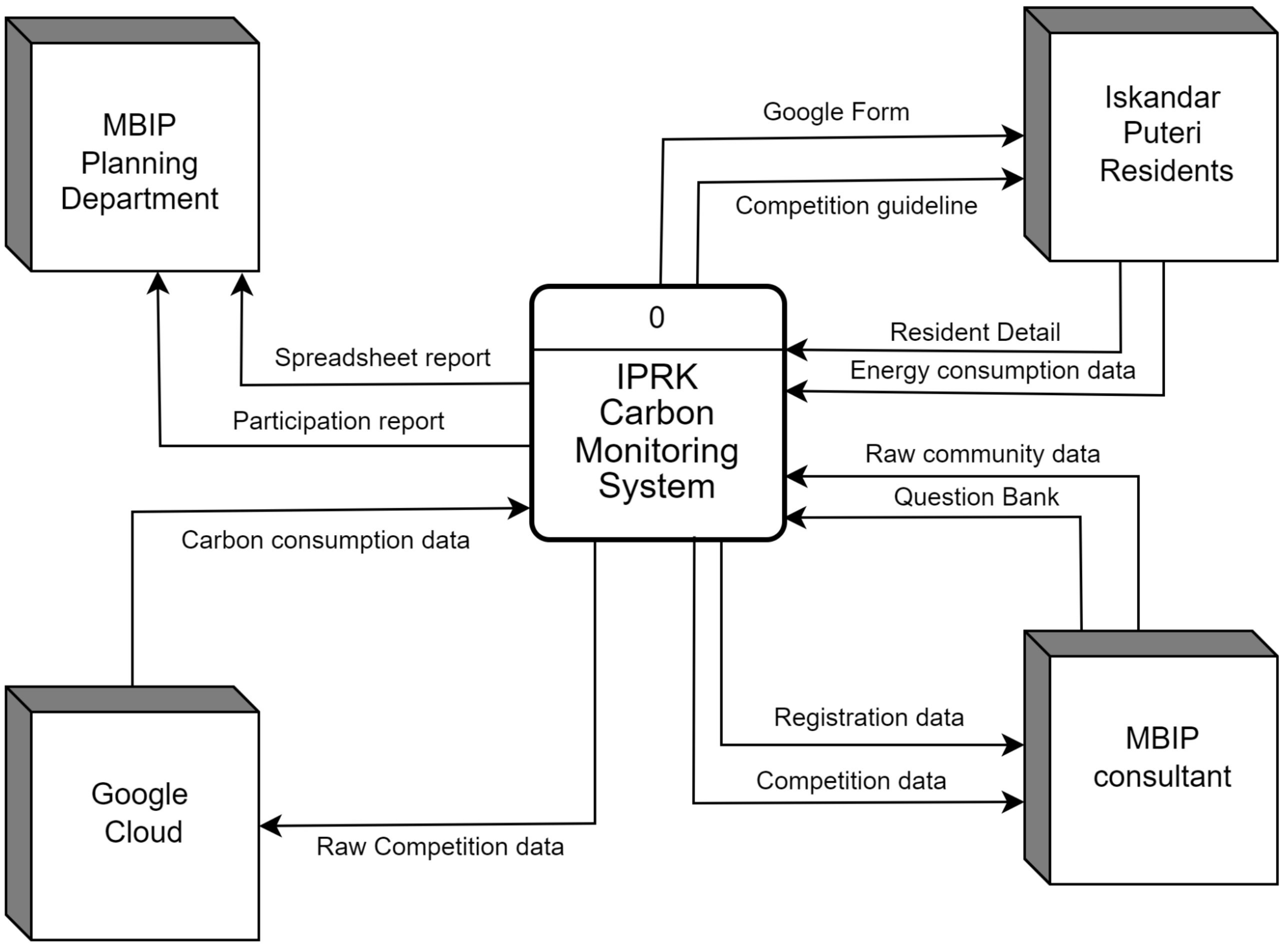
- Data encryption - All sensitive data including resident personal details and carbon footprint calculations should be encrypted to prevent unauthorized access.
- User authentication - A multi-factor authentication should be implemented to verify the identity of users.
- Access Controls - Role-based access controls should be implemented to restrict data access and system functionalities based on various users' roles.

4.3.3 Safety

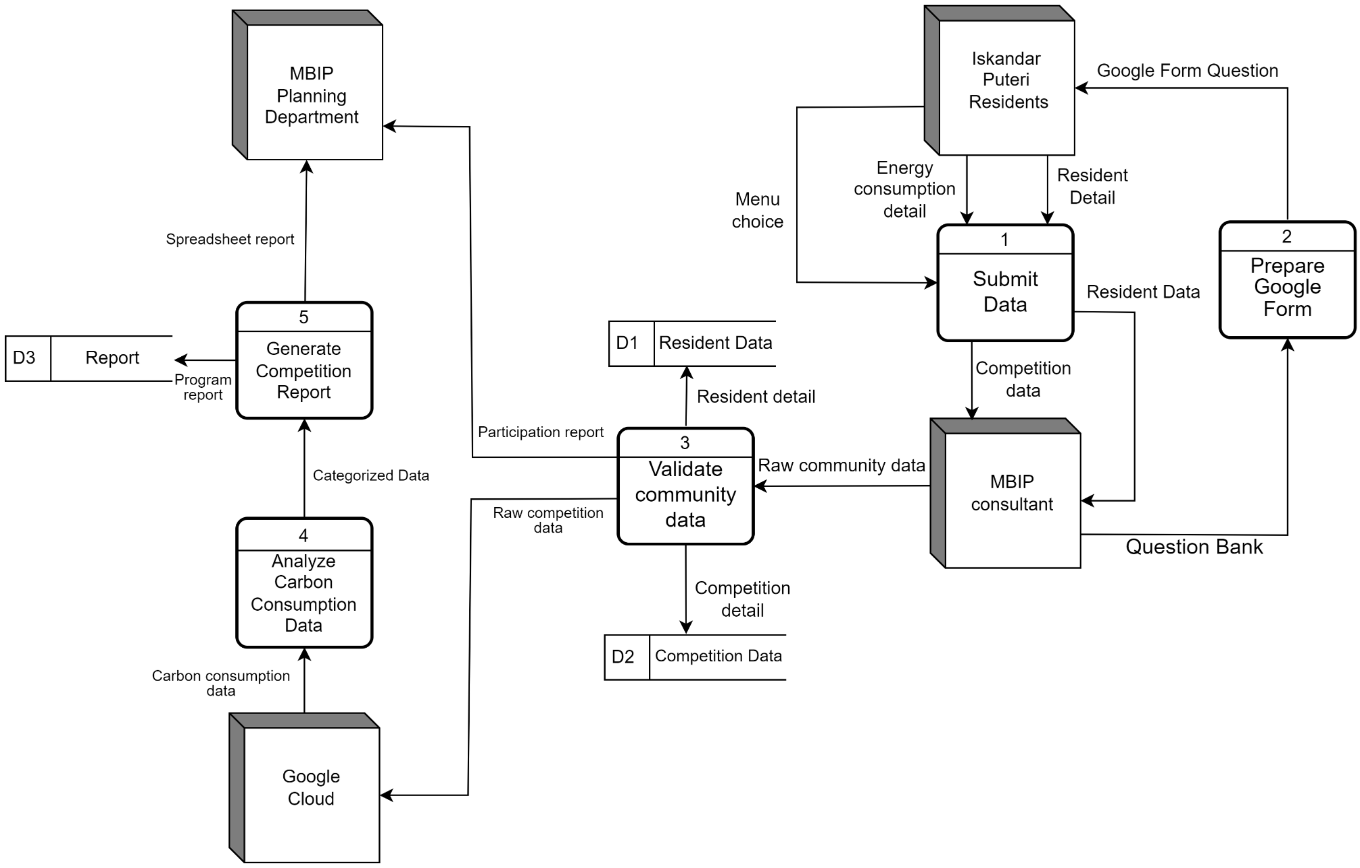
- Data backup and recovery - Regular automated backup of the system to prevent data loss due to system failure.
- Error handling - Verify that user-provided data is in the proper format by implementing input validation checks to stop users from providing harmful or incorrect data.

4.4 LOGICAL DFD AS-IS SYSTEM

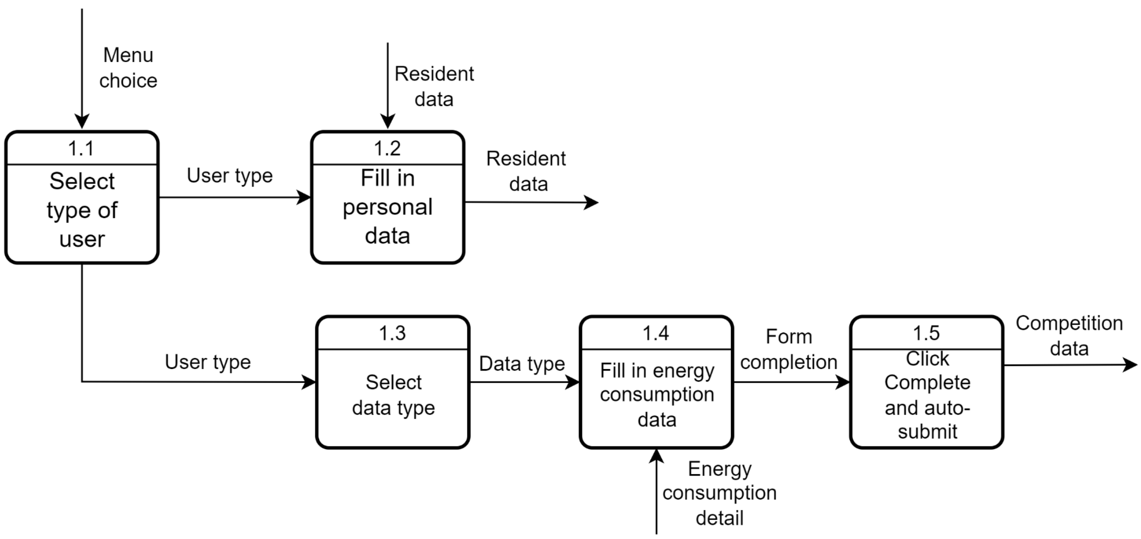
4.4.1 CONTEXT DIAGRAM



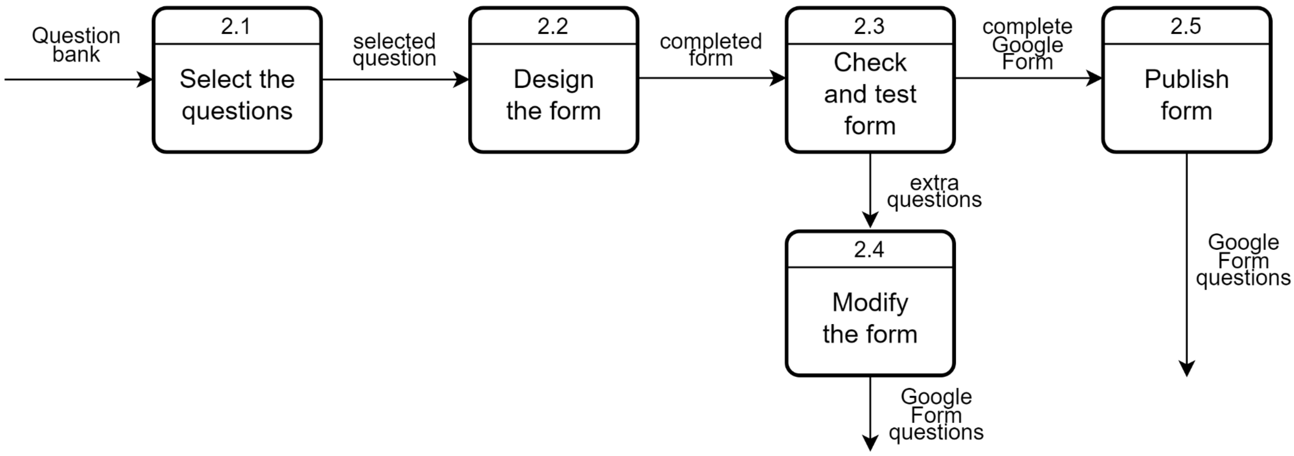
4.4.2 PARENT DIAGRAM DFD LEVEL-0



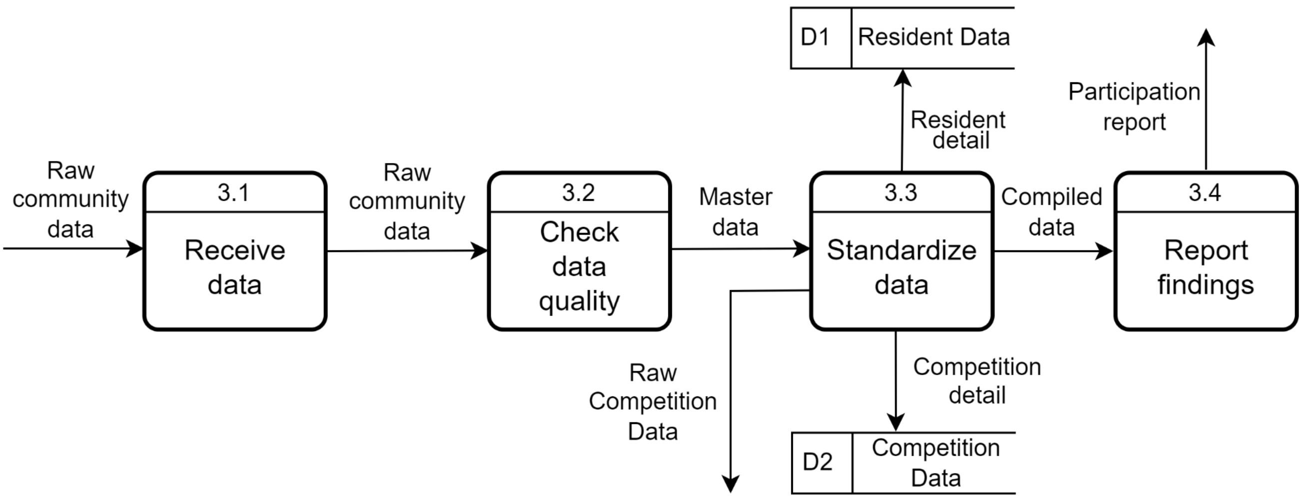
4.4.3 CHILD DIAGRAM DFD LEVEL-1 FOR PROCESS 1 : Submit Data



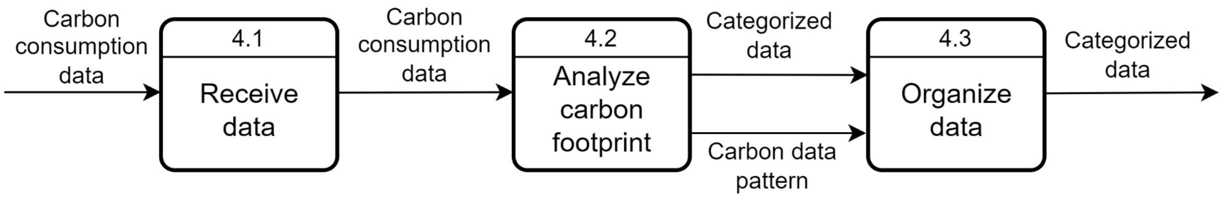
4.4.4 CHILD DIAGRAM DFD LEVEL-1 FOR PROCESS 2 : Prepare Google Form



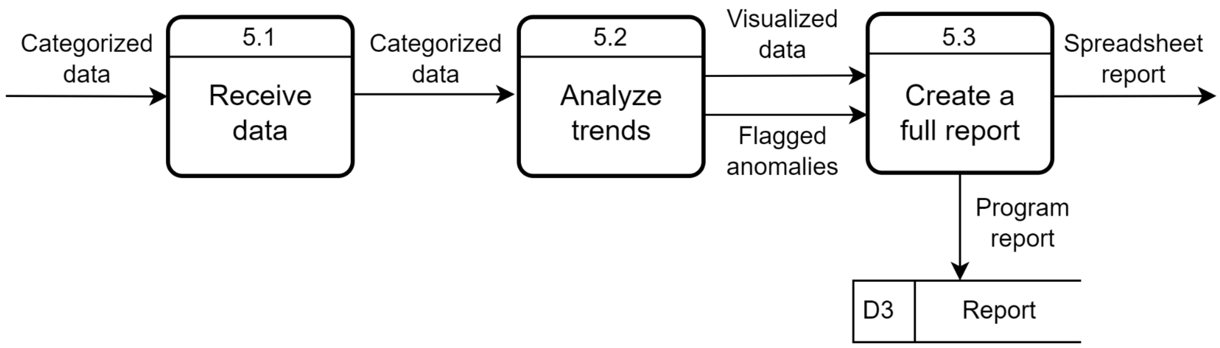
4.4.5 CHILD DIAGRAM DFD LEVEL-1 FOR PROCESS 3 : Validate Community Data



4.4.6 CHILD DIAGRAM DFD LEVEL-1 FOR PROCESS 4 : Analyze Carbon Consumption Data



4.4.7 CHILD DIAGRAM DFD LEVEL-1 FOR PROCESS 5 : Generate Competition Report



4.5 SUMMARY

In conclusion, there are few problems that exist in the current system that should be improved or modified. By analyzing the current AS-IS process using two methods which are interview and STROBE, we know that the main problem of the current system is that most of the process will be handled manually. Starting from preparing the questions, they should create the Google Form questions one-by-one and distribute them to the community by organizing some competitions. Moreover, the residents should fill in their carbon consumption manually using the Google Form. The process is time-consuming and easy to send error data as there is no limitation in filling the form. After submitting the form, the MBIP side should analyze and calculate the carbon consumption manually using the formula. This process surely will cause quite a number of problems when calculating the value using the formula. Therefore, the data obtained might be inaccurate. To illustrate more, they should analyze manually to detect which aspects should be concerned more and generate a complete report for the MBIP planning department. All these processes should be handled manually which might cause lack of manpower in completing all the tasks within the time scheduled.

Therefore, phase 2 of our project had to list out the problems and list out the weakness of the current system. We analyzed the current system and developed a data flow diagram to give us a clear understanding regarding the system. We listed out the functional requirements which help us to determine the processes involved, input and output of the process. Next, we developed a context diagram which will show the overview of the current carbon monitoring system. Then, we developed the Level 0 diagram and Level 1 diagram which give us a detailed overview of the sub processes involved in the system. By constructing the diagrams, we can analyze the system better and have a complete solution for the improved version.

To sum up, the current system is inefficient in collecting the community data as well as analyzing the carbon consumption data. Therefore, we should focus on the problems mentioned above and provide solutions toward those problems.

5. REFERENCES

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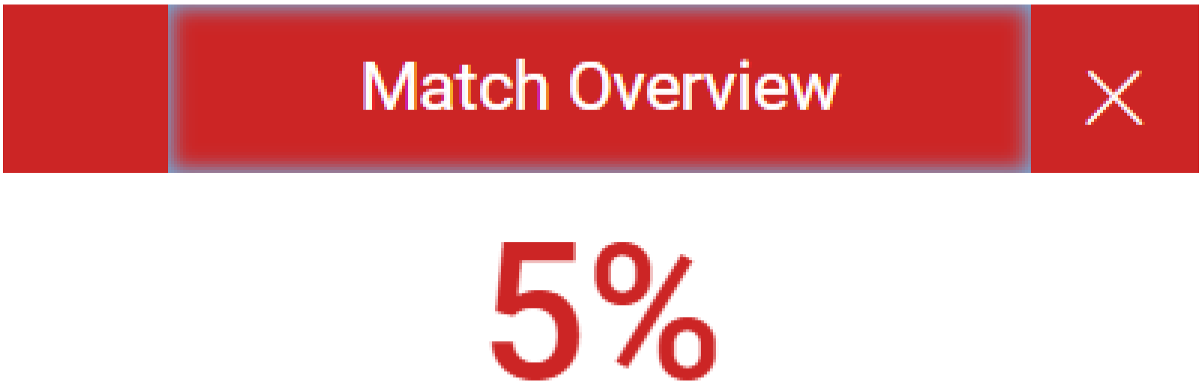
6. Appendices (Compulsory)

- ***Appendix A: Originality/Similarity Report***
    - *Attach the originality/ similarity report (.pdf file) from Turnitin checking.*
    - *UTM teaching and learning best practice for plagiarism policy is similarity index must less than (=<) 20%*



- ***Appendix B: Evidence of Generative AI tools usage***

    Claude

    ChatGPT link