UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

PROJECT PHASE 2

SECD2523 - DATABASE

SEMESTER I - SESSION 2023/2024

LECTURER : DR. IZYAN IZZATI BINTI KAMSANI

SECTION : 06

GROUP NAME : NPC

< SUSTAINCONNECT.JOHORDB >

NAME	MATRIC NUMBER
Kew Jian Heng	A22EC0058
Kwek Jia Cong	A22EC0122
Wong Ding Jiu	A22EC5028
Edwin Koh Wei Shan	A22EC5003
Md Faridul Islam	A20EC4030

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1.0 Introduction

In response to the pressing global challenges posed by climate change and environmental degradation, numerous nations across the world have increased their efforts towards sustainable development. Malaysia has actively engaged in a few sustainable initiatives, such as the Low Carbon Cities Framework (LCCF), which helps Malaysian cities implement strategies for low-carbon development.

The Johor government has also formulated its own plan to foster low-carbon societies through a series of strategic initiatives and comprehensive plans. Its commitment to sustainability is proven through the Iskandar Malaysia 2025 Low Carbon Blueprint. These frameworks act as a set of guidelines that communities, educational institutions, and local government bodies can use to coordinate their efforts in the direction of lowering carbon intensity and advancing sustainable practices. Iskandar Puteri City Council (MBIP) targets to reduce carbon intensity by 58% by the year 2025 as compared with the baseline of 2005.

MBIP, which is the key stakeholder in Iskandar Puteri Low Carbon (IPRK), seeks to collect energy-savings data within different communities, such as residential areas, schools, factories, and more. The Iskandar Puteri Low Carbon Calendar Competition is one of the initiatives established with the aim of reducing electricity and energy consumption within the Iskandar Puteri region. A new data collection and analysis platform is proposed to map the carbon footprint within the MBIP region, calculating carbon reductions for electricity, water, waste, and recycled cooking oil consumption and identifying communities with high CO2 emissions.

This document proposes a detailed plan for the implementation of the database system using data flow diagrams (DFDs), which encompass context diagrams, level 0 diagrams, and level 1 diagrams. Data flow diagrams (DFDs) are schematic illustrations that illustrate the flow of data through a system. These diagrams show data sources, data manipulation processes, storage locations, and information flow between them, simplifying complex systems. DFDs aid in the comprehension, analysis, and design of systems while pointing out any possible errors or inefficiencies in the data flow.

Moreover, this proposal discusses the proposed business rule, which establishes limits or guidelines for how business operations should be carried out inside an organization. It establishes guidelines for procedures, attitudes, or actions. On the other hand, transaction requirements specify the actions or duties that the system has to carry out on that data, including creating, reading, updating, and deleting data. In addition, a data dictionary is proposed, which serves as a centralized reference source that offers thorough explanations of the data elements that are utilized in a system or organization.

2.0 DFD (TO-BE SYSTEM)

2.1 Context Diagram

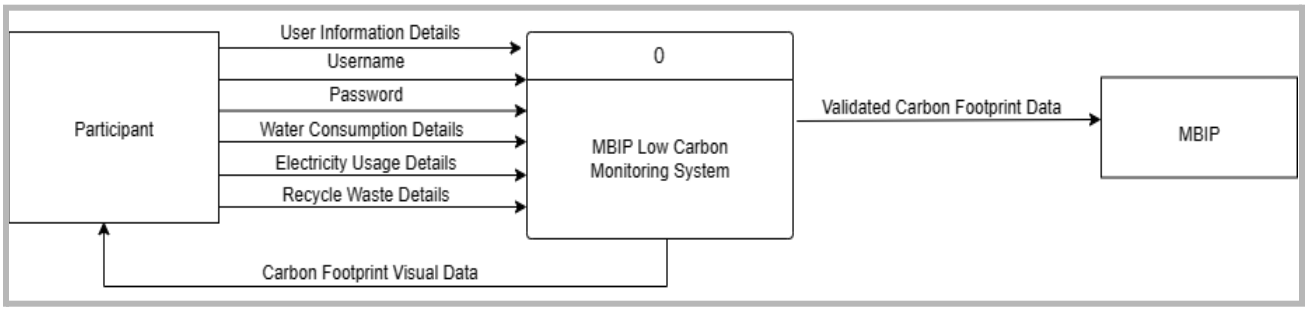

Figure 2.1 Context Diagram

2.2 Level 0 Diagram

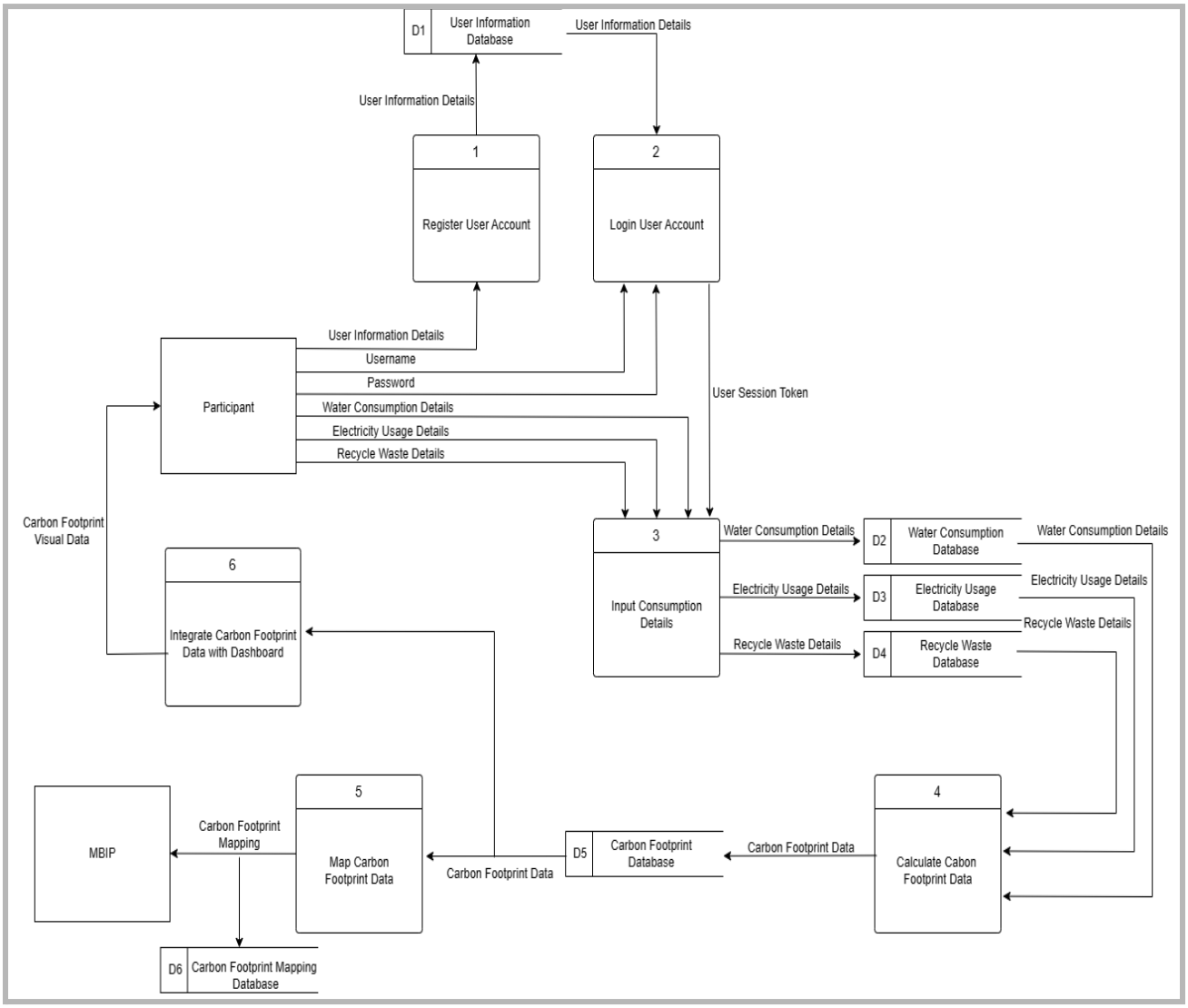

Figure 2.2 Level 0 Diagram

2.3 Level 1 Diagram

2.3.1 Process 1 : Register User Account

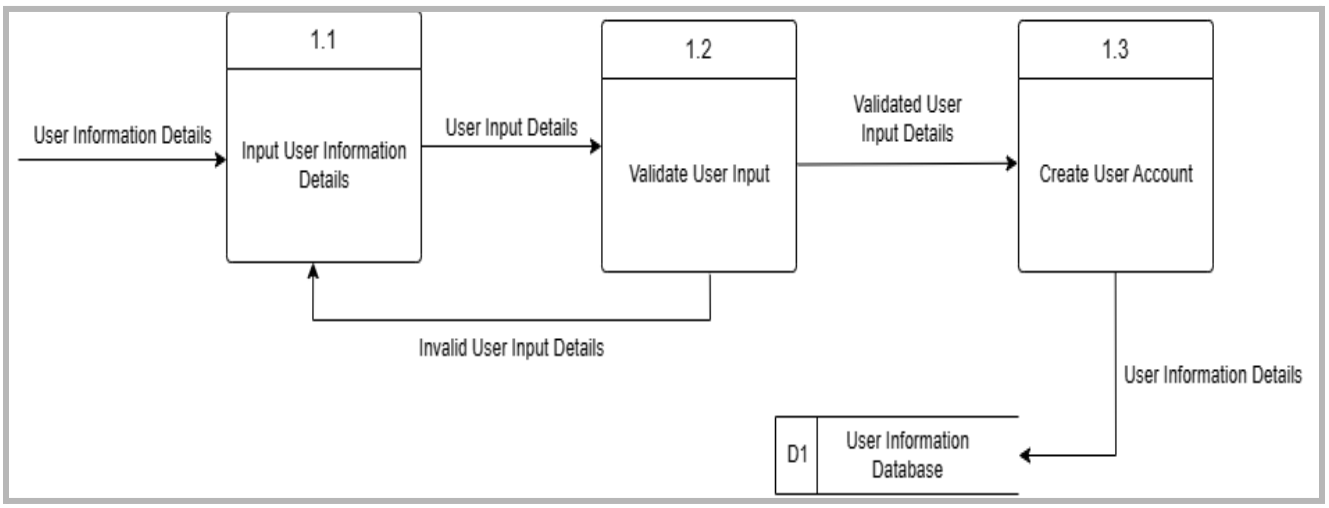

Figure 2.3.1 Level 1 Diagram Process 1 : Register User Account

2.3.2 Process 2 : Login User Account

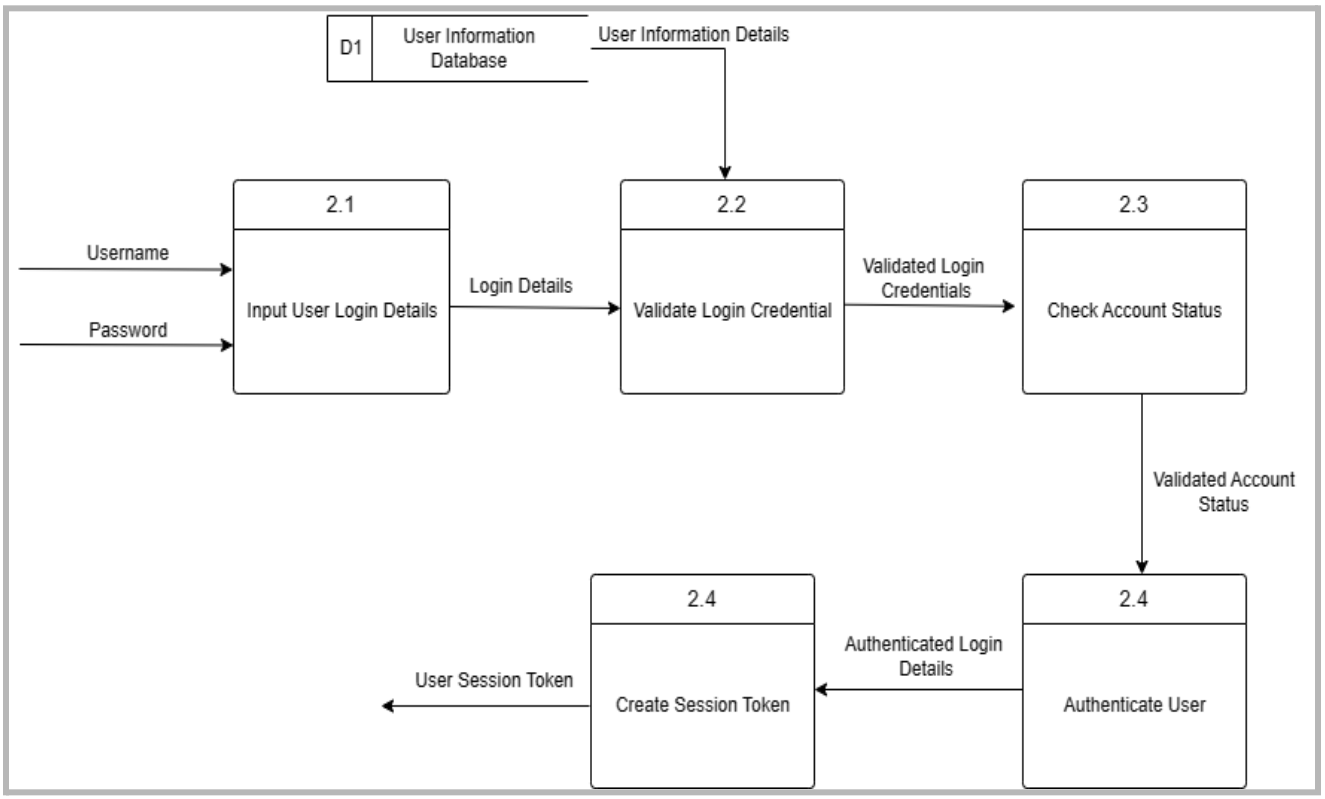

Figure 2.3.2 Level 1 Diagram Process 2 : Login User Account

2.3.3 Process 3 : Input Consumption Details

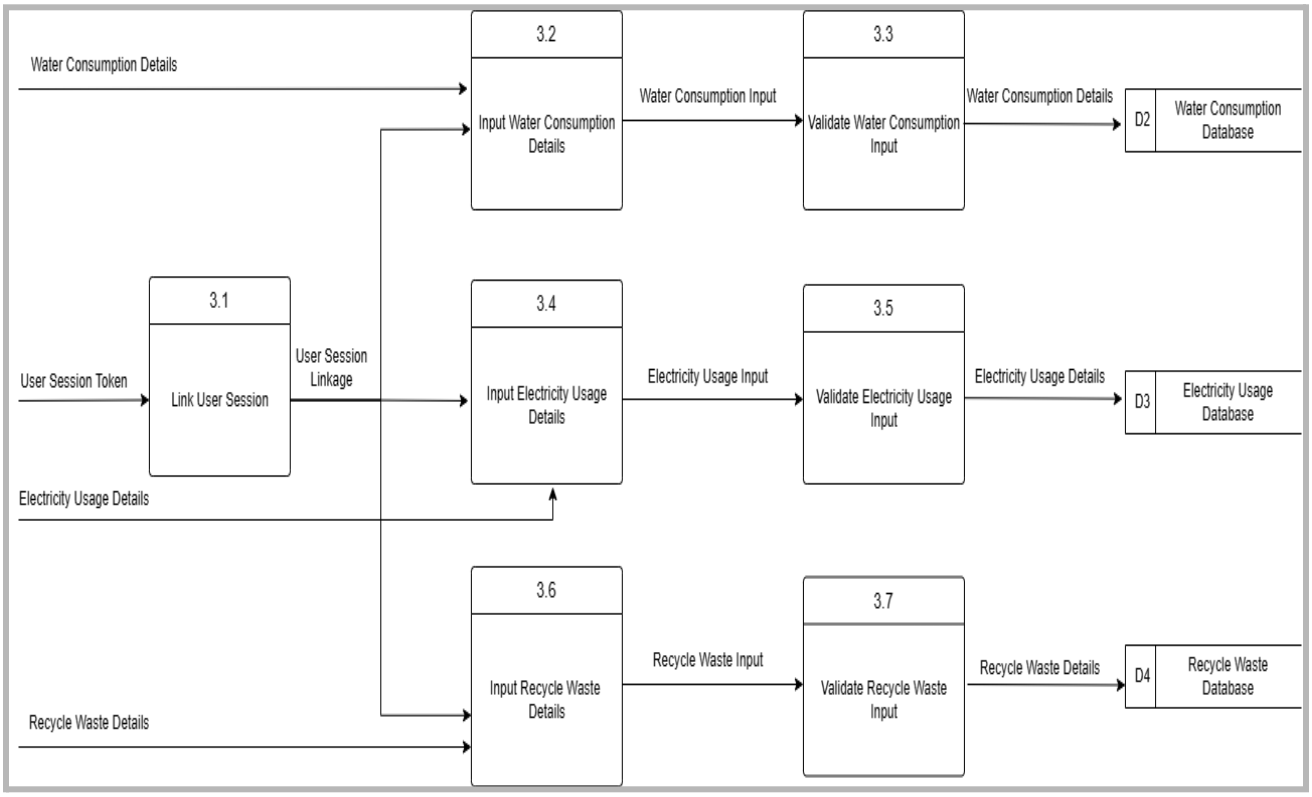

Figure 2.3.3 Level 1 Diagram Process 3 : Input Consumption Details

2.3.4 Process 4 : Calculate Carbon Footprint Data

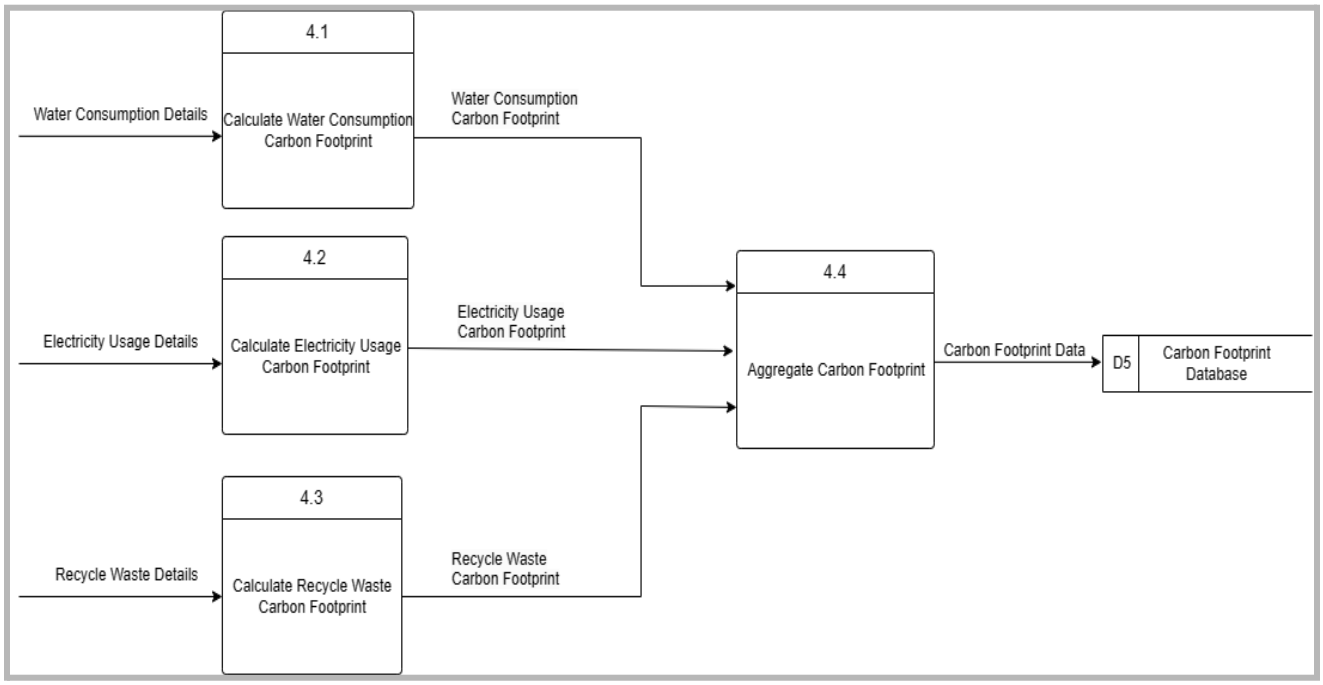

Figure 2.3.4 Level 1 Diagram Process 4 : Calculate Carbon Footprint Data

2.3.5 Process 5 : Map Carbon Footprint Data

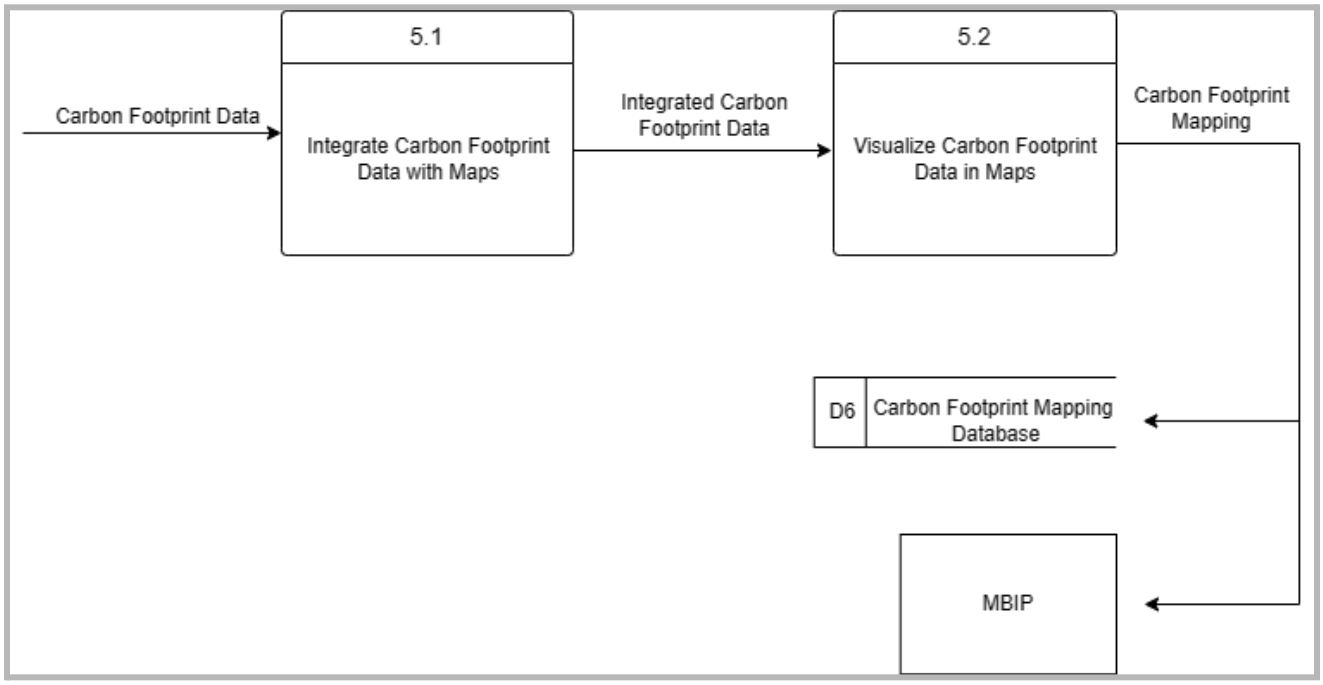

Figure 2.3.5 Level 1 Diagram Process 5 : Map Carbon Footprint Data

2.3.6 Process 6 : Summarize Carbon Footprint Data

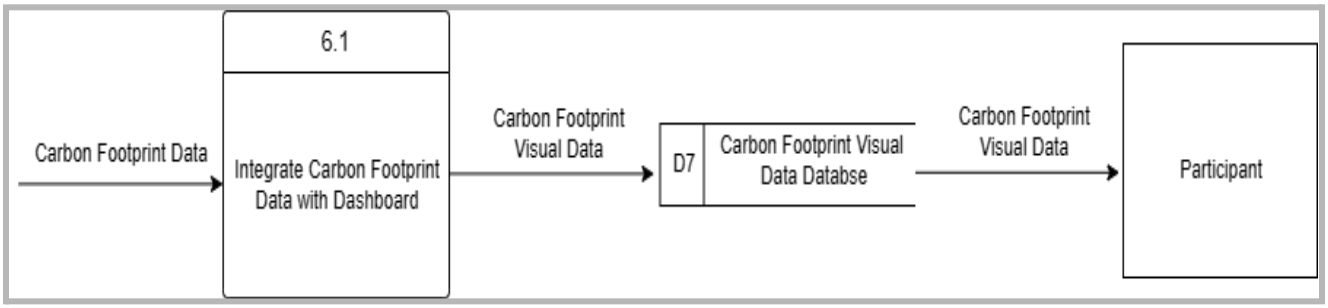

Figure 2.3.6 Level 1 Diagram Process 6 :Summarize Carbon Footprint Data

3.0 Data & Transaction Requirement

3.1 Proposed Business Rule

1. The system is working during government operating hours, which are Monday to Friday, 09:00 a.m. to 05:00 p.m.
2. Users learned about the Iskandar Puteri Low Carbon Calendar Competition and decided to participate.
3. Users can be MBIP or participants.
4. Users must log in or register an account before using the system.
5. Users can provide consumption details, such as water consumption details, electricity usage details, and recycle waste details, each time.
6. The system will calculate and generate carbon footprint data based on the data entered by the user.
7. The system will summarize the carbon footprint data based on the calculated data and provide it to the participant for review.
8. The system will map carbon footprint data based on the calculated data.
9. This map of carbon footprints will be sent to MBIP for review.

3.2 Proposed Data & Transactional

3.2.1 Proposed Data Requirement

Participant
The participant data includes participant ID, IC number, name, participant birth date, participant gender, participant address, user name, password, email, telephone number. The participant ID is the unique primary key and the user name is foreign key.

User
All users participating in this Iskandar Puteri Low Carbon Calendar Competition will need to provide their information such as user ID, name, email, telephone number. The user ID is the unique primary key. All this information will be stored as data.

Registration
The registration data includes user ID, password, registration reference number, registration date, and register time. The user ID is the unique primary key.

MBIP
The data stored includes staff ID, staff name, staff email, staff phone number. The staff ID is the primary key.

WaterData
The data stored includes ID for Water consumption data (WaterId), participant ID, submission date, number of days, prorate factor, usage value, and current charge. The WaterId is the primary key while participant ID is the foreign key.

ElectricData
The data stored includes ID for Electric consumption data (ElectricId), participant ID, submission date, numbers of days, prorate factor, usage value, and current charge (RM). The ElectricId is the primary key while participant ID is the foreign key.

WasteData
The data stored includes ID for Waste consumption data (WasteId), participant ID, mass of waste, mass of oil, submission date, and current charge(RM). The WasteId is the primary key while participant ID is the foreign key.

3.2.2 Proposed Transactional Requirement

Data Entry

- Enter user's registration information
- Enter the user's login information
- Enter the water consumption details
- Enter the electricity usage details
- Enter the recycle waste details

Data Update/Delete

- Update/Delete user's registration information data
- Update/Delete user's login information data
- Update/Delete water consumption details
- Update/Delete electricity usage details
- Update/Delete recycle waste details
- Update/Delete calculated carbon footprint data
- Update/Delete carbon footprint mapping data

Data Queries

- List of details of users
- List of water consumption details
- List of electricity usage details
- List of recycle waste details
- List of details of carbon footprint data
- List of carbon footprint mapping

4.0 Database Conceptual Design

4.1 Conceptual ERD

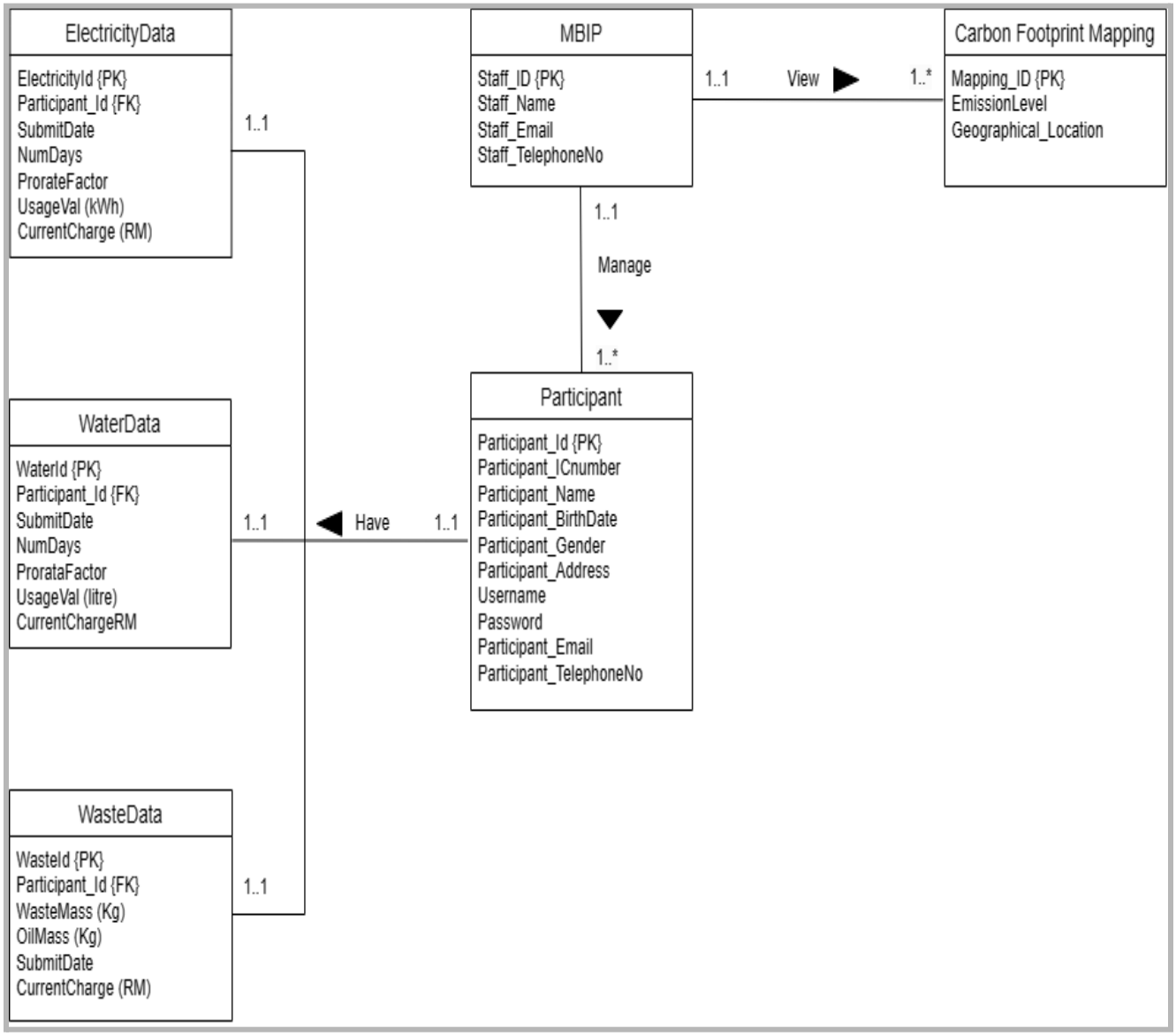

Figure 4.1 Entity Relationship Diagram (ERD)

4.2 Enhanced ERD (EERD)

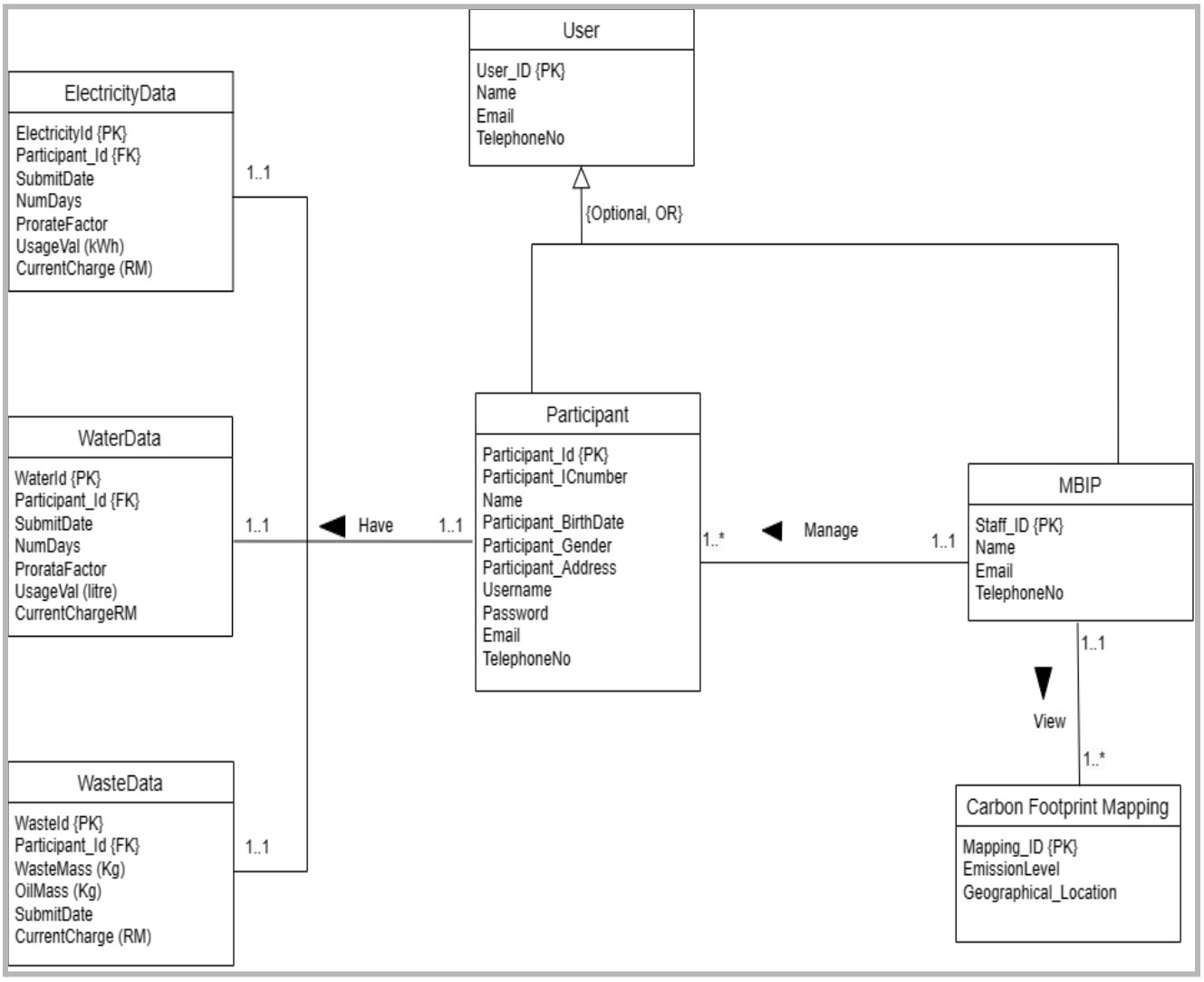

Figure 4.2 Enhanced Entity Relationship Diagram (EERD)

5.0 Data dictionary

5.1 Description of Entities

Entity	Description	Occurrence
Participant	Holds data of participants.	Users register as participants and fill in relevant personal information.
User	Holds personal information of system users.	Users create their account by filling in personal information.
MBIP	Holds data of staff id and staff personal information.	MBIP staff are given staff id.
WaterData	Holds data of water consumption data.	User enters water consumption into SUSTAINCONNECT. JOHORDB system for carbon footprint calculation.
ElectricData	Holds data of electric consumption data.	User enters electric consumption into SUSTAINCONNECT. JOHORDB system for carbon footprint calculation.
WasteData	Holds data of waste consumption data.	User enters the waste collection into SUSTAINCONNECT. JOHORDB system for carbon footprint calculation.
Carbon Footprint Mapping	Holds data of carbon footprint mapping and area.	Carbon footprint data entered by users are analyzed and the area is determine for carbon footprint mapping.

5.2 Description of Relationship

Entity	Multiplicity	Relationship	Multiplicity	Entity
Participant	1..1	Have	1..1	WaterData
	1..1	Have	1..1	ElectricData
	1..1	Have	1..1	WasteData
MBIP	1..*	View	1..*	Carbon Footprint Mapping
	1..*	Manage	1..*	Participant

5.3 Description of Attributes

Entity	Attribute	Description	Data Type	Constraint
User	UserID	User' id	VARCHAR2(10)	PRIMARY KEY
	Name	User's name	VARCHAR2(30)	NOT NULL
	Email	User's email	VARCHAR2(25)	NOT NULL
	TelephoneNo	User's telephone number	NUMBER(12)	NOT NULL
Participant	Participant_Id	Registered participant id	VARCHAR2(15)	PRIMARY KEY
	Participant_ICnumber	User's IC number	NUMBER(15)	NOT NULL
	Name	User's full name based on IC	VARCHAR2(14)	NOT NULL
	Participant_BirthDate	Participant's date of birth	DATE	NOT NULL
	Participant_Gender	Participant's gender	VARCHAR2(5)	NOT NULL
	Participant_Address	User's address	VARCHAR2(25)	NOT NULL
	Username	User's ID	VARCHAR2(30)	FOREIGN KEY
	Password	User's account password	VARCHAR2(20)	NOT NULL
	Email	User's personal email	VARCHAR2(25)	NOT NULL
	TelephoneNo	User's telephone number	NUMBER(12)	NOT NULL
MBIP	StaffID	Staff's ID	VARCHAR2(10)	PRIMARY KEY
	Name	Staff's name	VARCHAR2(30)	NOT NULL
	Email	Staff's email	VARCHAR2(25)	NOT NULL
	TelephoneNo	Staff's phone number	NUMBER(12)	NOT NULL

WaterData	WaterId	Water consumption data id	VARCHAR2(10)	PRIMARY KEY
	Participant_Id	Registered participant id	VARCHAR2(10)	FOREIGN KEY
	SubmitDate	Submission date	DATE	NOT NULL
	NumDays	Number of days	NUMBER(3)	NOT NULL
	ProfateFactor	Prorate Factor	NUMBER(15)	NOT NULL
	UsageVal	Usage Value	NUMBER(15)	NOT NULL
	CurrentCharge	Current Charge	NUMBER(15)	NOT NULL
ElectricData	ElectricityId	Electric consumption data id	VARCHAR2(10)	PRIMARY KEY
	Participant_Id	Registered participant id	VARCHAR2(10)	FOREIGN KEY
	SubmitDate	Submission date	DATE	NOT NULL
	NumDays	Number of days	NUMBER(3)	NOT NULL
	ProfateFactor	Prorate Factor	NUMBER(15)	NOT NULL
	UsageVal	Usage Value	NUMBER(15)	NOT NULL
	CurrentCharge	Current Charge (RM)	NUMBER(15)	NOT NULL
WasteData	WasteId	Waste consumption data id	VARCHAR2(10)	PRIMARY KEY
	Participant_Id	Registered participant id	VARCHAR2(10)	FOREIGN KEY
	WasteMass	Mass of waste collected	NUMBER(5)	NOT NULL
	OilMass	Mass of oil collected	NUMBER(5)	NOT NULL
	SubmitDate	Submission date	DATE	NOT NULL
	CurrentCharge	Current Charge (RM)	NUMBER(15)	NOT NULL

Carbon Footprint Mapping	Mapping_ID	Carbon mapping id	VARCHAR2(10)	PRIMARY KEY
	EmissionLevel	Carbon emission level	VARCHAR2(10)	NOT NULL
	Geographical_Location	Geographical location of carbon location	VARCHAR2(30)	NOT NULL

6.0 Summary

This proposed MBIP Low Carbon Monitoring System is to solve the problems faced by the current MBIP system and create a comprehensive and well-structured data model to support the functionality of the system. This system provides simplified user registration so when a new user wants to use the system will require the user to provide personal information in order to create a new account. While old users only need to provide their personal information to enter the system. After that, they will be able to provide their respective consumption details including water consumption details, electricity usage details, and recycling waste details. The system will calculate and generate carbon footprint data for the user based on the information provided by the user. Therefore, users will be able to see this part of the data in their respective accounts.

In this phase 2 project, we used the To-Be Data Flow Diagram (DFD) to describe and explain our recommendations for system changes. This DFD includes a Context Diagram, a Level-0 Parent Diagram, and a Level-1 Child Diagram. In order to strengthen the entire system process, it includes user registration or login, input consumption details data, generates a summary of the carbon footprint data, and maps carbon footprint data. Therefore, in order to ensure that all processes are error-free and smooth, this report also lists proposed data and transactional, and business rules.

In addition, this report also provides the Conceptual Entity-Relationship Diagram (ERD) and Enhanced Entity-Relationship Diagram (EERD) in order to more clearly demonstrate the overall layout and conceptual database design of the MBIP Low Carbon Monitoring System). So, after this design phase, the system will be able to perform operations or responsibilities on the user's data, including creating, reading, updating, and deleting data.