UTM
UNIVERSITI TEKNOLOGI MALAYSIA

School of Computing
Faculty of Engineering

SECD2523 – DATABASE

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PHASE 2 - DATABASE CONCEPTUAL DESIGN (ERD)

<Carbon Reduction and Sustainability Engagement System>

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1.0 INTRODUCTION

This project explores the sustainability efforts that Malaysia has made, mainly concentrating on the Low Carbon Blueprint for Iskandar Malaysia 2025 and the Low Carbon Cities Framework (LCCF). By 2025, the target is to reduce carbon intensity by 58 percent from the baseline of 2005 levels. To raise awareness and promote the adoption of low carbon emission practices, the Malaysian government, more specifically in the Johor state has launched a number of initiatives. These include the Iskandar Malaysia Ecolife Challenge (IMELC) programme, the Johor Education Department's (JPNJ) e-Lestari system, and the Iskandar Puteri City Council's (MBIP) Iskandar Puteri Low Carbon (IPRK) initiative.

One of the main initiatives supporting the Low Carbon Society (LCS) in the Iskandar region is MBIP's IPRK initiative, which gathers information about community energy-saving activities. Among the projects included in this programme is the Iskandar Puteri Low Carbon Calendar Competition. However, there are issues with the existing data gathering approach, including a laborious entry process, a need for comprehensive participant information, and manual carbon reduction calculations.

The development of an automated data gathering and analysis system akin to the successful e-Lestari system executed by the Johor Education Department (JPNJ) is the most optimal solution that emerges to meet the current quandaries. This method is meant to cover a variety of community groupings, such as individuals who reside in multistory homes or landed property, institutions, MBIP divisions, and MBIP employees. This suggested data gathering and analysis system's main feature is a trustworthy computation process that determines carbon reductions for the usage of water, electricity, garbage, and repurposed frying oil. The ability to detect regions with significant carbon dioxide emissions—which includes a dashboard that allows users to self-monitor their carbon emissions—is another crucial component of the suggested system. Implementing the system in Bahasa Melayu, the national language, will ensure that all local users understand it.

The document highlights the potential for these solutions to enhance the Iskandar Puteri Low Carbon Calendar Competition in addition to providing a thorough outline of them. A self-monitoring dashboard for users is among the new dashboards that offer real-time insights into participants' carbon contributions. The Iskandar Puteri City Council (MBIP) is the client in this instance. They anticipate accurate cost estimates, technical viability, and clarity on suggested solutions. In addition, customers want a clearly defined schedule with quantifiable benchmarks and results, including improved data quality and higher engagement. This document functions as a thorough and complete plan to meet these goals and improve the Iskandar Puteri Low Carbon Calendar Competition's efficacy.

2.0 DFD (TO-BE)

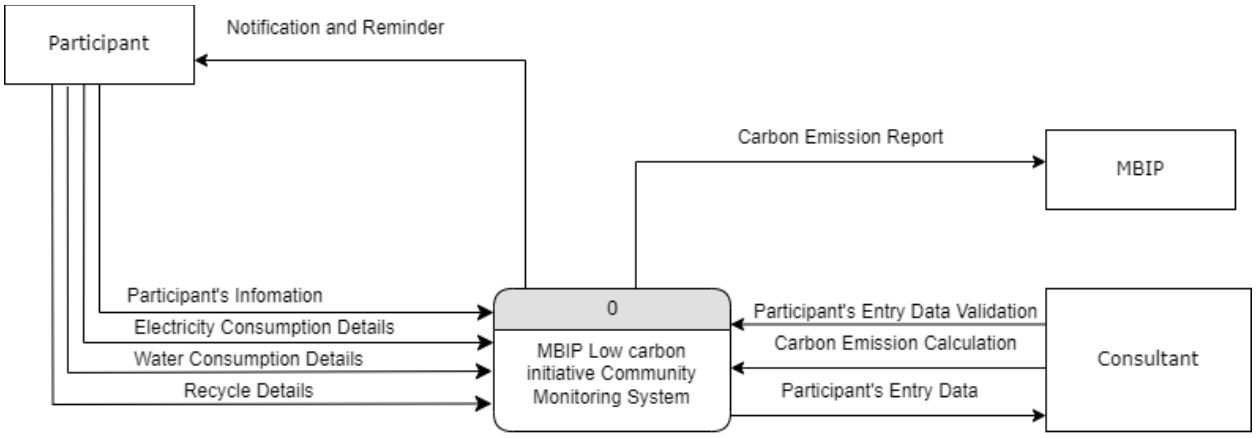


Figure 4.4.1 : Context Diagram of MBIP Low Carbon Initiative Monitoring System

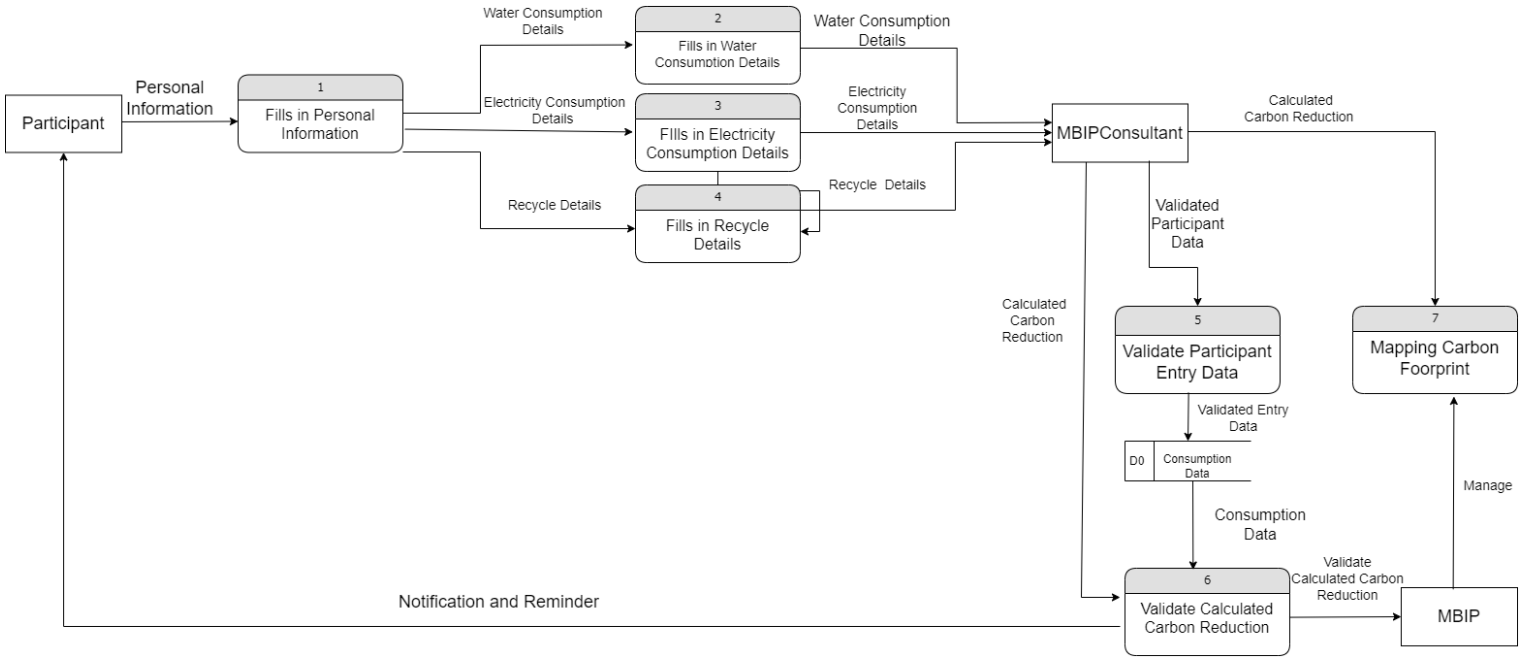


Figure 4.4.2 : Level 0 Diagram of MBIP Low Carbon Initiative Monitoring System

3.0 DATA & TRANSACTION REQUIREMENT

1. **User-unfriendly data entry process**
   When the Iskandar Puteri Low Carbon Calendar Competition was introduced, Majlis Bandaraya Iskandar Putri (MBIP), the stakeholder, found that the data entering process was laborious a

3.1 PROPOSE BUSINESS RULE

The business rule for the Carbon Reduction and Sustainability Engagement System :

1. One participant provides at least one consumption data
2. At least one consumption data are provided at least one participant
3. Each participant receive result of carbon footprint data at least one
4. Each carbon footprint data are receive result of by at least one participant
5. Each consumption data can be converted to one carbon footprint data
6. Each carbon footprint data converted to one consumption data
7. One MBIP town dept manage one CFM mapping
8. Each CFM mapping can be manage by more than one MBIP town dept
9. One MBIP town dept manage one carbon footprint data
10. Each carbon footprint data can be manage more than one by MBIP town dept
11. Each MBIPConsultant can validates one carbon reduction to be used in CFootprintMapping
12. Each CarbonReduction can be validate at least one MBIPConsultant that can be used in CFootprintMapping
13. Each CFootprint that have been validates by at least on MBIPConsultant have at least one CarbonReduction data.

3.2 PROPOSED DATA & TRANSACTIONAL REQUIREMENT

3.2.1 PROPOSED DATA

Participant

The information of participants are participant number, name, telephone number, and address are stored as data.

Electrical Consumption

When a participant fills in their electrical consumption data, the information is stored. The data has a bill reference number, total electrical consumption and price.

Water Consumption

When a participant fills in their water consumption data, the information is stored. The data has a bill reference number, total water consumption and price.

Recycling Collection

When a participant fills in their recycling collection data, the information is stored. The data has a recycling report, recycle details and weight.

Carbon Reduction Result

Carbon reduction result is the calculated carbon emission of a participant. The data of carbon reduction results are total carbon emission and emission rate.

Carbon Reduction Report

Carbon reduction report is the summarized data from the participants' carbon reduction result. The data of the carbon reduction report are total reduction index and emission level.

Winner

After the carbon reduction report is analyzed, the winner is decided. Winner data includes name, reduction index, emission level and rank.

3.2.2 TRANSACTIONAL REQUIREMENT

Data Entry

- Enter the details for participants
- Enter the details for electrical consumption
- Enter the details for water consumption

- Enter the details for recycling collection

Data Update/Deletion

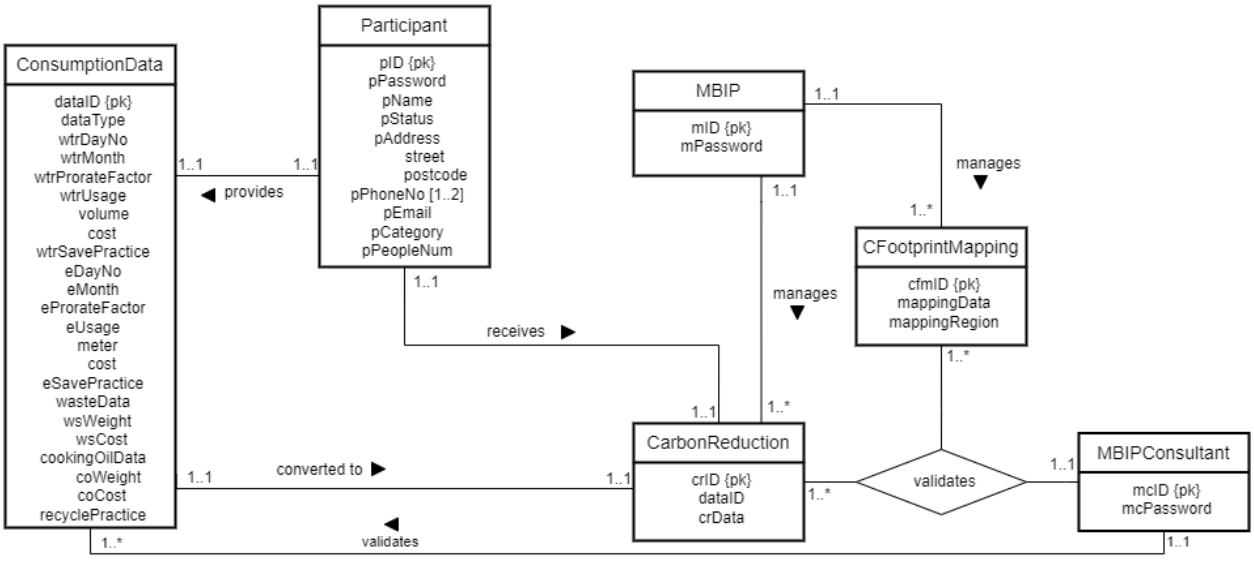
- Update/deletion the details of participants
- Update/deletion the details of electrical consumption
- Update/deletion the water consumption
- Update/deletion the recycling collection
- Update/deletion the winner of competition

Data Queries

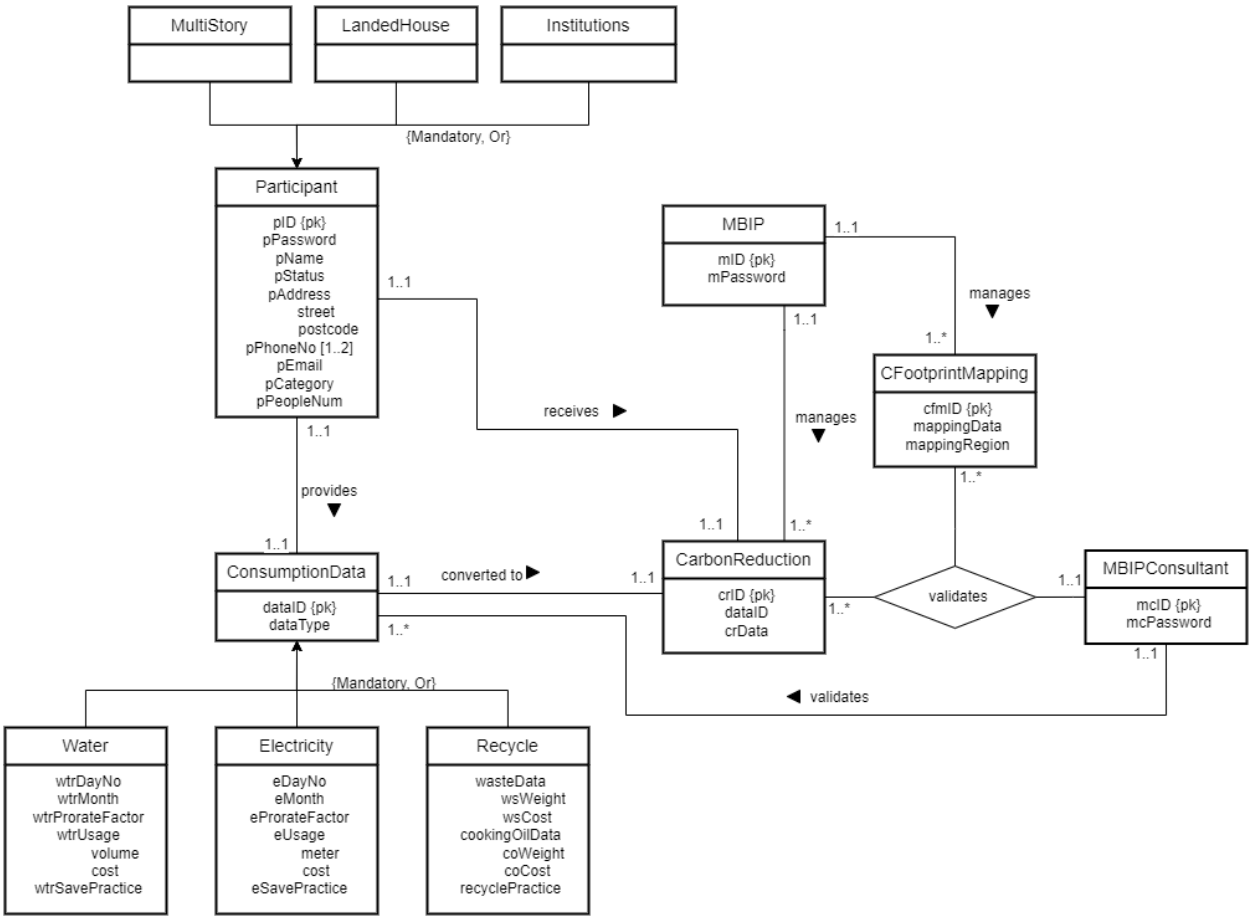
- List details of electrical participant
- List details of electrical consumption
- List details of water consumption
- List details of recycling collection
- Identify the winner of competition
- List details of winner
- Identify the carbon reduction result of a participant
- Identify the carbon reduction report of a participant
- Display the carbon reduction result of a participant
- Display the carbon reduction report of a participant

4.0 DATABASE CONCEPTUAL DESIGN

4.1 CONCEPTUAL ERD



4.2 ENHANCE ERD (EERD)


MultiStory
LandedHouse
Institutions
{Mandatory, Or}
Participant
pID {pk}
pPassword
pName
pStatus
pAddress
street
postcode
pPhoneNo [1..2]
pEmail
pCategory
pPeopleNum
MBIP
mID {pk}
mPassword
manages
CFootprintMapping
cfmID {pk}
mappingData
mappingRegion
receives
provides
ConsumptionData
dataID {pk}
dataType
converted to
CarbonReduction
crID {pk}
dataID
crData
validates
MBIPConsultant
mcID {pk}
mcPassword
{Mandatory, Or}
Water
wtrDayNo
wtrMonth
wtrProrateFactor
wtrUsage
volume
cost
wtrSavePractice
Electricity
eDayNo
eMonth
eProrateFactor
eUsage
meter
cost
eSavePractice
Recycle
wasteData
wsWeight
wsCost
cookingOilData
coWeight
coCost
recyclePractice

5.0 DATA DICTIONARY

Entity Relationship

Entity	Description	Aliases	Occurrence
MultiStory	Participants live a multistorey house	Multi-Storey house	Each multistorey house are live by one participants
LandedHouse	Participants live in a landed house	Land house	Each landed house are live by one participants
Institutions	Participants live in institution	College	Each institution are live by at least one participants
Participant	Holds participant information	Consumer	Participants receive carbon reduction data.Participants provides consumption data
ConsumptionData	Hold consumption data	Data Consumption	Every consumption data are converted to one carbon reduction data
Water	Hold participant water consumption	Water	Every water consumption data from each participants must store at consumption data
Electricity	Holds participant electricity consumption	Electricity	Every electricity consumption data from each participants must store at consumption data
Recycle	Holds participant recycle consumption	Recycled waste and cooking oil	Every recycled waste and cooking oil data

			from each participants must store at consumption data
CarbonReduction	Calculate carbon reduction from the consumption data	Carbon Reduction	Consumption data,participant and MBIP town department are been collected at carbon reduction
MBIP	MBIP manages carbon reduction data and CFootprintMapping	MBIP	MBIP manages carbon reduction data and CFootprint Mapping
CFootprintMapping	CFootprintMapping validates by MBIPConsultant	Carbon Footprint Map	CFootprint Mapping are been validates by carbon reduction data and MBIP consultant
MBIPConsultant	Process on validate the information	MBIP Consultant	MBIP consultant validates Carbon reduction and CFootprint Mapping

Entity Relationship

Entity 1	Multiplicity	Relationship	Entity 2	Multiplicity
Participant	1..1	provides	ConsumptionData	1..1
	1..1	receives	CFootprintMapping	1..1
ConsumptionData	1..1	converted to	CarbonReduction	1..1
MBIPConsultant	1..1	validates	ConsumptionData	1..*
	1..1	validates	CarbonReduction	1..*
			CFootprintMapping	1..*
MBIP	1..1	manages	CarbonReduction	1..*
	1..1	manages	CFootprintMapping	1..*

Entity Attributes

Entity	Attribute	Description	Data Type & Length	Constraint
Participant	pID	Participant's ID	VARCHAR2(15)	PRIMARY KEY
	pPassword	Participant's password	VARCHAR2(20)	NOT NULL
	pName	Participant's full name	VARCHAR2(25)	NOT NULL
	pStatus	Participant's employment status	VARCHAR2(15)	NOT NULL
	pAddress	Participant's address		
	street	Participant's street name for pAddress	VARCHAR2(30)	NOT NULL
	postcode	Participant's postcode for pAddress	VARCHAR2(5)	NOT NULL
	pPhoneNo [1..2]	Participant's phone number(s)	NUMBER(11)	NOT NULL
	pEmail	Particpant's e-mail address	VARCHAR2(20)	NOT NULL
	pCategory	Participant's community category	VARCHAR(20)	NOT NULL
	pPeopleNum	Participant's number of people in the household/building	NUMBER(5)	NOT NULL
Consumption Data	dataID	Consumption data's ID	VARCHAR(15)	PRIMARY KEY

	dataType	Consumption data's type/category	VARCHAR(20)	NOT NULL
Water	wtrDayNo	Water bill's days for the month	NUMBER(2)	NOT NULL
	wtrMonth	Water bill's month	NUMBER(2)	NOT NULL
	wtrProrateFactor	Water bill's prorate factor	NUMBER(4)	NOT NULL
	wtrUsage	Water usage for the month		
	volume	Water usage for the month in volume	NUMBER(5)	NOT NULL
	cost	Water usage for the month in cost	NUMBER(5)	NOT NULL
	wtrSavePractice	Participant's practice to save water usage	VARCHAR2(100)	NOT NULL
Electricity	eDayNo	Electric bill's days for the month	NUMBER(2)	NOT NULL
	eMonth	Electric bill's month	NUMBER(2)	NOT NULL
	eProrateFactor	Electric bill's prorate factor	NUMBER(4)	NOT NULL
	eUsage	Electric usage for the month		NOT NULL
	meter	Electric number for the month in meter	NUMBER(5)	NOT NULL
	cost	Electric usage for the month in cost	NUMBER(5)	NOT NULL
	eSavePractice	Participant's practice to save electricity usage	VARCHAR2(100)	NOT NULL
Recycle	wasteData	Recycled waste data		

	wsWeight	Recycled waste weight	NUMBER(4)	NOT NULL
	wsCost	Recycled waste profit from collected weight	NUMBER(4)	NOT NULL
	cookingOilData	Recycled cooking oil data		
	coWeight	Recycled cooking oil weight	NUMBER(4)	NOT NULL
	coCost	Recycled cooking oil profit from collected weight	NUMBER(4)	NOT NULL
	recyclePractice	Participant's recycle practice	VARCHAR2(100)	NOT NULL
MBIPConsultant	mcID	MBIP Consultant ID	VARCHAR2(15)	PRIMARY KEY
	mcPassword	MBIP Consultant login password	VARCHAR2(20)	NOT NULL
CarbonReduction	crID	Carbon reduction data ID	VARCHAR2(15)	PRIMARY KEY
	dataID	Consumption data's ID	VARCHAR(15)	FOREIGN KEY, NOT NULL
	crData	Carbon reduction calculated data	VARCHAR2(100)	NOT NULL
CFootprintMapping	cfmID	Carbon footprint mapping ID	NUMBER(4)	PRIMARY KEY
	mappingData	Mapping Data	VARCHAR(15)	NOT NULL
	mappingRegion	Mapping region data	VARCHAR(15)	NOT NULL
MBIP	mID	MBIP ID	VARCHAR2(15)	PRIMARY KEY

	mPassword	MBIP login password	VARCHAR2(20)	NOT NULL

6.0 SUMMARY

The MBIP Low Carbon Initiative Monitoring System is a system used to collect data on energy-saving efforts within MBIP community.The system is currently run manually and is inefficient.Those improve system has been proposed which contain seven process: Participants fills in their personal data, Fills in Water Consumption Details, Fills in Electricity Consumption Details, Fills in Recycle Details,Validate Participant Entry Data,Validate Calculated Carbon Emission and Mapping Carbon Footprint. The system is redesigned from the previous system of MBIP Low Carbon Initiative Monitoring system which is more efficient and user-friendly compare the previous system. The steps involve community members filling out their details on Google Form, entering their personal information and energy consumption details and then MBIP consultants validate it. Then, Verified Participant Entry Data is stored and used to validate calculated Carbon Reduction and Participant will be notified of carbon reduction.Lastly,MBIP will mapping Carbon Footprint.

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