



PROJECT: PHASE 3

SECD2523 - DATABASE
SEMESTER I, SESSION 2023/2024

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1.0 Introduction - Hanisah

In the next phase, phase 3 of the Iskandar Puteri City Council's Low Carbon Initiatives Community Monitoring System project, our database project mainly focuses on transitioning the conceptual design into a normalized logical database structure. In the previous phase, we thoroughly analyzed the case study, identified the business rules, and concurrently constructed an ERD. In this phase, our aim is to transform the existing conceptual ERD into a logical ERD in order to make the overall structure become more organized.

The goal for this phase is to ensure that our team not only creates a database capable of storing information, but also be able to provide a user-friendly interface for users to engage with the system. The main idea here is to implement a user interface design that caters to various user requirements, ensuring straightforwardness, clarity, and ease of use to ensure the usability of this system.

Subsequently, this database will contribute to supporting the Iskandar Puteri City Council in addressing some issues regarding the existing system's shortcomings and help them in tracking carbon consumption efficiently.

2.0 Overview of the Project - Hanisah

Goal 1: Database Structure Enhancement

In this project, we aim to achieve the normalization until BCNF structure. First, we are going to determine the logical database structure from the conceptual one. Next, from the achieved logical database structure, we are going to normalize it into the Boyce-Codd Normal Form (BCNF) so that data in this project is maintained to be secured while developing data organization efficiently. In order to do that, we will thoroughly illustrate the transitioning from the conceptual ERD to a normalized one by removing any elements in the existing database design that do not follow the relational database principles.

Goal 2: User-Friendly Interface

Besides that, our goal is to implement a user-friendly interface. This means that throughout this project, we will enhance user experience when engaging with the Low Carbon Initiatives Community Monitoring System. In order to achieve this, a user-friendly and effective user interface must be deployed to enable a smooth data entry process, as well as the data retrieval and navigation of the system. The main reason for this is to increase users' tendency to keep engaged and actively participate with the system while also maintaining a straightforward manner when interacting with the database.

Goal 3: Validation with Transaction Requirements

In pursuit of Goal 3, we are primarily concerned with making sure that the improved database structure and operational requirements are incorporated smoothly by validating the logical ERD with the system's transaction requirement. First of all, in order to ensure that the data dictionary appropriately represents the data items in the system, we plan to update the data dictionary by using normalized relations which will be shown in '4.3 Normalization'. This is one of the crucial steps in keeping a clear grasp of the attributes and contents of the database. The next objective is to validate the interface design with system transaction, ensuring that it satisfies the requirements of system transaction. As part of the validation process, SQL queries are mapped to the interface design, ensuring that both logical ERD and the anticipated system features can work together seamlessly. Lastly for this goal, we are focusing on accomplishing these goals in order to guarantee that the

enhanced database can complies with the specified transaction requirements while also supporting a robust and effective system operation for the Low Carbon Initiatives Community Monitoring System of the Iskandar Puteri City Council.

3.0 Database Conceptual Design - Hanisah

3.1 Updated Business Rule

Entities

1. ResidentialUsers:

- Attributes:
 - i. UserID (PK)
 - ii. TypeOfHouse
 - iii. ElectricityConsumption
 - iv. WaterConsumption
 - v. RecycledCookingOilConsumption

2. Institutions:

- Attributes:
 - i. InstitutionID (PK)
 - ii. EnergyConsumption
 - iii. ResourceConsumption
 - iv. DataFeasibility

3. DivisionsMBIP:

- Attributes:
 - i. DivisionID (PK)
 - ii. DataContribution
 - iii. DigitalCarbonFootprint

4. StaffMBIP:

- Attributes:
 - i. StaffID(PK)
 - ii. DivisionID (FK)
 - iii. PersonalCarbonFootprint
 - iv. CorporateCarbonFootprint

5. AdministrativeUsers:

- Attributes:
 - i. AdminID (PK)
 - ii. AccessControl
 - iii. SystemConfiguration

Relationships

ResidentialUsers - Institutions:

- ResidentialUser will contribute its data to Institutions.
- **Business Rule:**
 - i. Many residential users may contribute their data to many institutions.

DivisionsMBIP - Institutions:

- DivisionsMBIP will contribute its data to Institutions.
- **Business Rule:**
 - i. Many institutions may contribute their data to at most one MBIP division.

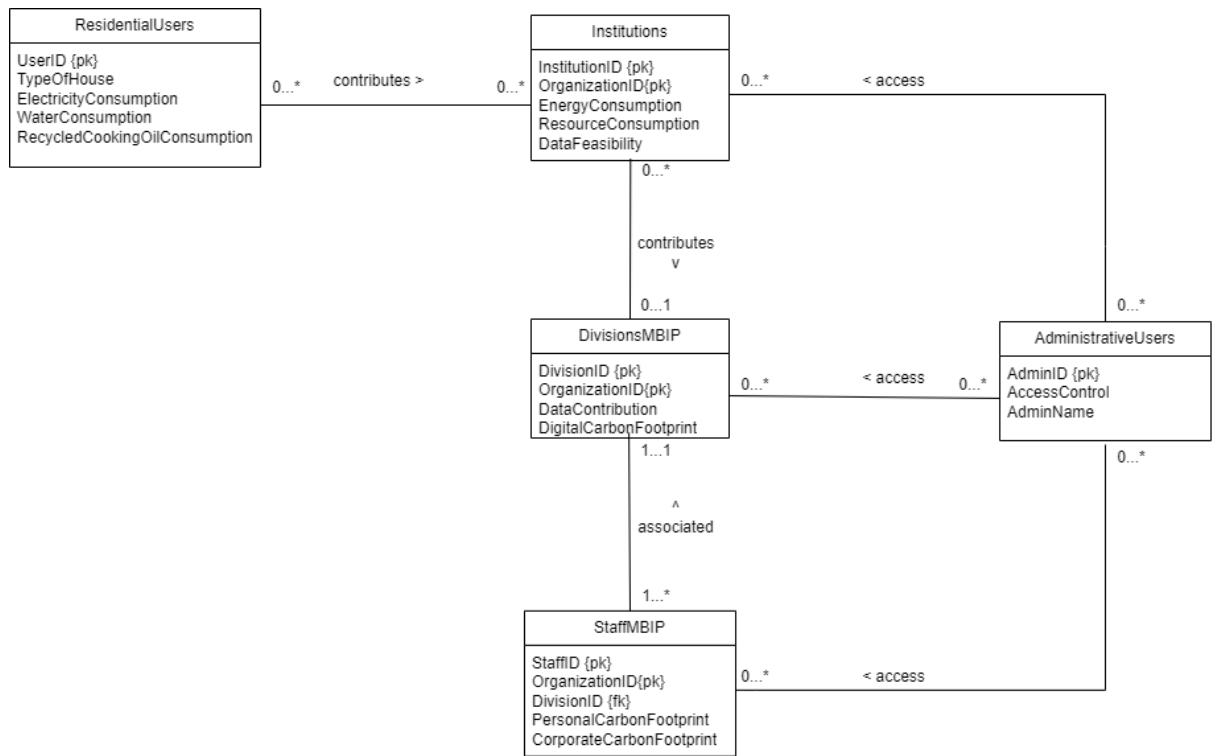
StaffMBIP - DivisionsMBIP:

- Both StaffMBIP are associated with DivisionsMBIP.
- **Business Rule:**
 - i. At least one or more MBIP Staff must be associated with only one MBIP division.

AdministrativeUsers

- Have access to most of the entities which are Institutions, DivisionMBIP, and StaffMBIP.
- **Business Rule:**
 - i. Many administrative users may have access to more than one institution.
 - ii. Many administrative users may have access to more than one MBIP division.
 - iii. Many administrative users may have access to more than one MBIP staff.

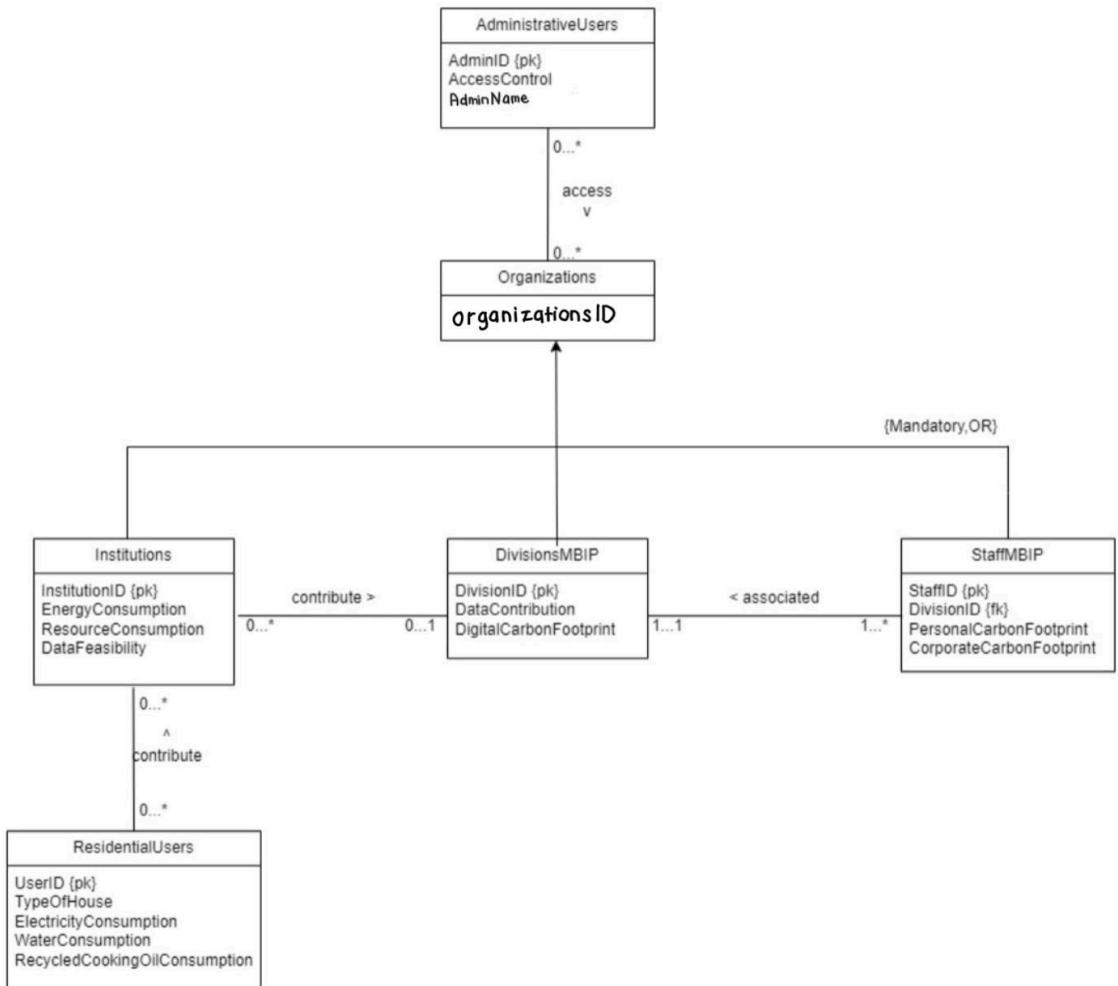
3.2 Conceptual ERD



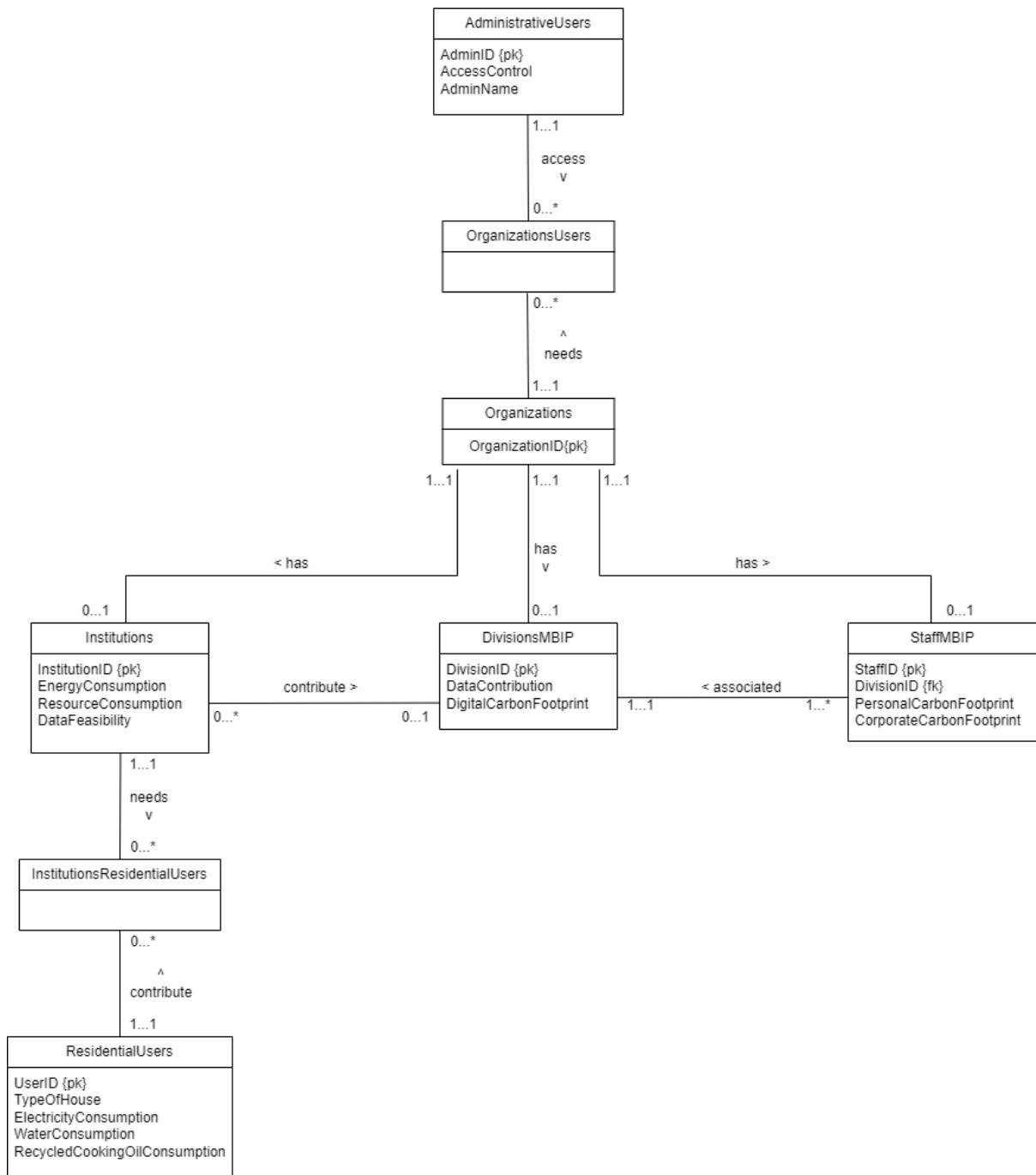
4.0 DB Logical Design

4.1 Logical ERD

4.1.1 Enhanced ERD



4.1.2 Logical ERD



4.2 Updated Data Dictionary - Aqil

4.2.1 Description of Entity

Entity	Description	Occurrence
Institution	Holds institution information	Show all the details about the institution
ResidentialUsers	Holds the residential users information	Users key in the details about their house type and also the total of consumption
DivisionsMBIP	Holds the MBIP details	Contribute in the carbon footprint calculations
StaffMBIP	Holds the staff information	Included in the system and also operate the system
AdministrativeUsers	Holds the admin information	Manage and maintain the system

4.2.2 Description of Relationship

Entity	Multiplicity	Relationship	Multiplicity	Entity
Institution	0...*	contribute	0...1	DivisionsMBIP
	1...1	need	0...*	InstitutionalResidential Users
StaffMBIP	1...*	associated	1...1	DivisionsMBIP
ResidentialUsers	1...1	contribute	0...*	InstitutionalResidential Users
Organization	1...1	has	0...1	Institution
	1...1	has	0...1	DivisionsMBIP
	1...1	has	0...1	StaffMBIP
	1...1	needs	0...*	OrganizationUsers
AdministrativeUsers	1...1	access	0...*	OrganizationUsers

Entity Attributes

Entity	Attribute	Description	Data type & Length	Constraints
ResidentialUsers	UserID	Resident Identification number	VARCHAR2(20)	Primary Key, Not NULL, Unique
	TypeOfHouse	Type of house that the resident stay at	VARCHAR2(20)	Not NULL
	ElectricityConsumption	Total electricity that the resident consume	NUMBER(7)	Not NULL
	WaterConsumption	Total water that the	NUMBER(7)	Not NULL

		resident consume		
	RecycledCookingOilConsumption	Total cooking oil that the resident use	NUMBER(7)	Not NULL
Institution	InstitutionID	Identification number that the institution use	VARCHAR2(20)	Primary Key, Not NULL, Unique
	EnergyConsumption	Total energy use by the institution	NUMBER(7)	Not NULL
	ResourceConsumption	Total resource use by the institution	NUMBER(7)	Not NULL
	DataFeasibility	Relevant data	VARCHAR(8)	Not NULL
DivisionsMBIP	DivisionID	The Identification number for the MBIP division workers	VARCHAR2(20)	Primary Key, Not NULL, Unique
	DataContribution	Identify either the data level	VARCHAR2(20)	Not NULL
	DigitalCarbonFootprint	Calculation for the carbon footprint based on the total consumption	NUMBER(7)	Not NULL
StaffMBIP	StaffID	Staff Identification number	VARCHAR2(20)	Primary Key, Not NULL, Unique
	DivisionID	The Identification number for the MBIP division workers	VARCHAR2(20)	Primary Key, Not NULL, Unique
	PersonalCarbonFootprint	Total carbon footprint that	NUMBER(7)	Not NULL

		have been produce by the staff himself		
Administrative Users	AdminID	Identification number that admin for the system use	VARCHAR2(20)	Primary Key, Not NULL, Unique
	AccessControl	Role that have been distribute among the workers	VARCHAR2(10)	Not NULL
	SystemConfiguration	Hold the settings option, how the system will be operate	VARCHAR2(20)	Not NULL, Unique

4.3 Normalization

First Normal Form (1NF)

Relational Schema
ResidentialUsers (<u>UserID</u> , TypeOfHouse, ElectricityConsumption, WaterConsumption, RecycledCookingOilConsumption) Primary Key : UserID
AdministrativeUsers (<u>AdminID</u> , AccessControl, SystemConfiguration) Primary Key : AdminID
Institutions (<u>InstitutionID</u> , EnergyConsumption, ResourceConsumption, DataFeasibility) Primary Key : InstitutionID
DivisionMBIP (<u>DivisionID</u> , DigitalContribution, DigitalCarbonFootprint) Primary Key : DivisionID
StaffMBIP (<u>StaffID</u> , DivisionID, PersonalCarbonFootprint) Primary Key : StaffID

Second Normal Form (2NF)

Relational Schema
ResidentialUsers (<u>UserID</u> , TypeOfHouse, ElectricityConsumption, WaterConsumption, RecycledCookingOilConsumption) Primary Key : UserID
AdministrativeUsers (<u>AdminID</u> , AccessControl, SystemConfiguration) Primary Key : AdminID
Institutions (<u>InstitutionID</u> , EnergyConsumption, ResourceConsumption, DataFeasibility) Primary Key : InstitutionID
DivisionMBIP

(DivisionID, DigitalContribution, DigitalCarbonFootprint)
Primary Key : DivisionID

StaffMBIP
(StaffID, DivisionID, PersonalCarbonFootprint)

Third Normal Form (3NF)

Relational Schema
ResidentialUsers (<u>UserID</u> , TypeOfHouse, ElectricityConsumption, WaterConsumption, RecycledCookingOilConsumption) Primary Key : UserID
AdministrativeUsers (<u>AdminID</u> , AccessControl, SystemConfiguration) Primary Key : AdminID
Institutions (<u>InstitutionID</u> , EnergyConsumption, ResourceConsumption, DataFeasibility) Primary Key : InstitutionID
DivisionMBIP (<u>DivisionID</u> , DigitalContribution, DigitalCarbonFootprint) Primary Key : DivisionID
StaffMBIP (<u>StaffID</u> , PersonalCarbonFootprint)\nPrimary Key : StaffID

5.0 Relational DB Schemas (After Normalization)

Administrative User

AdminID	AdminName	AccessControl
001	Fahim	System Admin
010	Ali	Database Admin
100	Eden	Network Admin
002	Liv	Security Admin
090	Charles	System Admin
023	Daniel	Network Admin
012	Robert	System Admin
006	Leo	Database Admin
021	Izz	Network Admin
019	Wan	Database Admin

Institutions

InstitutionID	EnergyConsumption	ResourceConsumption	DataFeasibility
A22	20	30	45
A21	14	30	35
A24	14	30	34
A42	10	67	35
A52	36	26	99

A62	37	22	68
A29	83	43	24
A34	37	38	32
A65	24	24	23
A25	25	25	12
A20	45	41	11

ResidentialUsers

UserID	TypeOfHouse	ElectricityConsumption	WaterConsumption	RecycledCookingOilsConsumption
U1	Bungalow	23	46	78
U4	Terrace	34	67	43
U5	Apartment	35	23	32
U7	Terrace	26	26	28
U2	Terrace	34	65	99
U3	Bungalow	35	43	54
U6	Terrace	21	66	43
U9	Apartment	56	76	65

U10	Bungalow	56	74	89
U8	Apartment	45	46	76

DivisionsMBIP

DivisionID	DataContribution	DigitalCarbonFootprint
D1	Low	122
D4	High	142
D2	Too Low	123
D5	Moderate	542
D7	Low	213
D9	High	325
D10	Moderate	335
D3	Low	245
D8	High	100
D6	Low	89
D11	Moderate	78

Staff MBIP

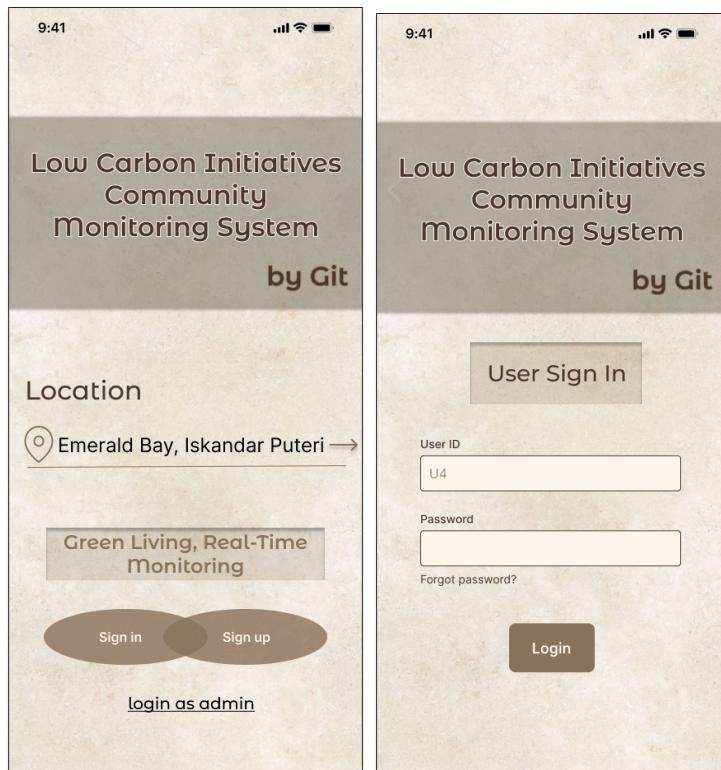
StaffID	DivisionID	PersonalCarbonFootprint	CorporateCarbonFootprint
S2	D11	23	12
S4	D6	45	70
S3	D2	33	22
S5	D11	12	45
S6	D3	24	64

S9	D10	55	16
S7	D7	45	10
S1	D9	31	40
S9	D8	34	22
S8	D6	65	29

Organizations

OrganizationID	AdminID	DivisionID	StaffID	InstitutionID
A22EC0083	001	D1	S2	A22
A22EC0153	010	D4	S4	A21
A22EC0169	100	D2	S3	A24
A22EC0088	002	D5	S5	A42
A22EC0081	090	D7	S6	A52
A22EC0073	023	D9	S9	A62
A22EC0063	012	D10	S7	A29
A22EC0143	006	D3	S1	A34
A22EC0090	021	D8	S9	A65
A22EC0093	019	D6	S8	A25
A22EC0104	010	D11	S8	A20

6.0 Interfaces - Hanisah



Low Carbon Initiatives Community Monitoring System by Git

Welcome back, User 1

Welcome back, Admin

Admin Sign In

Admin ID: 006
Password:

Forgot password?

Login

Competition

Carbon Footprint Data Entry

Other

Data Entry History (Last updated 2 days ago)

Achievement & Recognition (2 new achievements)

< see more >

Admin Dashboard

System Configuration (Last updated 2 days ago)

User Activity Log (Last opened 5 hours ago)

< see more >

Carbon Footprint Data Entry

Please fill in according to the instructions

Enter your water consumption (in liters)

Enter your electricity consumption (in kWh)

Enter your recycled cooking oil usage (in gallons)

Address: Enter your full address

Apply and Submit

Validating the data...

75%
9 seconds left...

Carbon Footprint Result

Water Consumption: 30%
Electricity Consumption: 40%
Recycled Cooking Oil Usage: 25%

Water Consumption	134 liters
Electricity Consumption	120 kWh
Recycled Cooking Oil Usage	89 gallons

Total Carbon Footprint: 275kgCO2

7.0 SQL Statements (DDL & DML) - fahim

```
CREATE TABLE AdministrativeUsers(
    AdminID VARCHAR2(20),
    AdminName VARCHAR2(20),
    AccessControl VARCHAR2(20),
    CONSTRAINT admin_pk PRIMARY KEY (AdminID)
);
```

```
CREATE TABLE DivisionsMBIP(
    DivisionID VARCHAR2(20),
    DataContribution VARCHAR2(20),
    DigitalCarbonFootprint NUMBER(20),
    CONSTRAINT div_pk PRIMARY KEY (DivisionID)
);
```

```
CREATE TABLE Institutions(
    InstitutionID VARCHAR2(20),
    EnergyConsumption NUMBER(15),
    ResourceConsumption NUMBER(15),
    DataFeasibility NUMBER(15),
    CONSTRAINT ins_pk PRIMARY KEY (InstitutionID)
);
```

```
CREATE TABLE StaffMBIP(
    StaffID VARCHAR2(20) NOT NULL,
    DivisionID VARCHAR2(20) NOT NULL,
    PersonalCarbonFootprint NUMBER(12),
    CorporateCarbonFootprint NUMBER(12),
    CONSTRAINT Staff_pk PRIMARY KEY (StaffID),
    CONSTRAINT Staff_fk FOREIGN KEY (DivisionID) REFERENCES DivisionsMBIP
(DivisionID)
);
```

```

CREATE TABLE ResidentialUsers(
    UserID VARCHAR2(20) NOT NULL,
    TypeOfHouse VARCHAR2(20),
    ElectricityConsumption NUMBER(12),
    WaterConsumption NUMBER(12),
    RecycledCookingOilConsumption NUMBER(12),
    CONSTRAINT resident_pk PRIMARY KEY (UserID)
);

```

```

CREATE TABLE Organizations(
    OrganizationID VARCHAR2(20),
    AdminID VARCHAR2(20),
    DivisionID VARCHAR2(20),
    StaffID VARCHAR2(20),
    InstitutionID VARCHAR2(20),
    CONSTRAINT mbip_pk_uniq PRIMARY KEY (OrganizationID),
    CONSTRAINT admin_fk_uniq FOREIGN KEY (AdminID) REFERENCES
AdministrativeUsers(AdminID),
    CONSTRAINT div_fk_uniq FOREIGN KEY (DivisionID) REFERENCES
DivisionsMBIP(DivisionID),
    CONSTRAINT staff_fk_uniq FOREIGN KEY (StaffID) REFERENCES
StaffMBIP(StaffID),
    CONSTRAINT ins_fk_uniq FOREIGN KEY (InstitutionID) REFERENCES
Institutions(InstitutionID)
);

```

```

ALTER TABLE Institutions
ADD CONSTRAINT check_data CHECK (EnergyConsumption >= 0);

```

----- Administrative User

```

INSERT INTO AdministrativeUsers VALUES ('001','Fahim','System Admin');
INSERT INTO AdministrativeUsers VALUES ('010','Ali','Database Admin');
INSERT INTO AdministrativeUsers VALUES ('100','Eden','Network Admin');
INSERT INTO AdministrativeUsers VALUES ('002','Liv','Security Admin');
INSERT INTO AdministrativeUsers VALUES ('090','Charles','System Admin');
INSERT INTO AdministrativeUsers VALUES ('023','Daniel','Network Admin');

```

```
INSERT INTO AdministrativeUsers VALUES ('012','Robert','System Admin');  
INSERT INTO AdministrativeUsers VALUES ('006','Leo','Database Admin');  
INSERT INTO AdministrativeUsers VALUES ('021','Izz','Network Admin');  
INSERT INTO AdministrativeUsers VALUES ('019','Wan','Database Admin');
```

----- Institutions

```
INSERT INTO Institutions VALUES ('A22',20,30,45);  
INSERT INTO Institutions VALUES ('A21',14,30,35);  
INSERT INTO Institutions VALUES ('A24',14,30,34);  
INSERT INTO Institutions VALUES ('A42',10,67,35);  
INSERT INTO Institutions VALUES ('A52',36,26,99);  
INSERT INTO Institutions VALUES ('A62',37,22,68);  
INSERT INTO Institutions VALUES ('A29',83,43,24);  
INSERT INTO Institutions VALUES ('A34',37,38,32);  
INSERT INTO Institutions VALUES ('A65',24,24,23);  
INSERT INTO Institutions VALUES ('A25',25,25,12);  
INSERT INTO Institutions VALUES ('A20',45,41,11);
```

----- DivisionsMBIP

```
INSERT INTO DivisionsMBIP VALUES ('D1','Low',122);  
INSERT INTO DivisionsMBIP VALUES ('D4','High',142);  
INSERT INTO DivisionsMBIP VALUES ('D2','Too low',123);  
INSERT INTO DivisionsMBIP VALUES ('D5','Moderate',542);  
INSERT INTO DivisionsMBIP VALUES ('D7','Low','213');  
INSERT INTO DivisionsMBIP VALUES ('D9','High',325);  
INSERT INTO DivisionsMBIP VALUES ('D10','Moderate',335);  
INSERT INTO DivisionsMBIP VALUES ('D3','Low',245);  
INSERT INTO DivisionsMBIP VALUES ('D8','High',100);  
INSERT INTO DivisionsMBIP VALUES ('D6','Low',89);  
INSERT INTO DivisionsMBIP VALUES ('D11','Moderate',78);
```

----- Staff MBIP

```
INSERT INTO StaffMBIP VALUES ('S2','D11',NULL,45);
```

```
INSERT INTO StaffMBIP VALUES ('S4','D6',45,70);
INSERT INTO StaffMBIP VALUES ('S3','D2',56,22);
INSERT INTO StaffMBIP VALUES ('S5','D11',NULL,45);
INSERT INTO StaffMBIP VALUES ('S6','D3',40,64);
INSERT INTO StaffMBIP VALUES ('S9','D10',NULL,16);
INSERT INTO StaffMBIP VALUES ('S7','D7',19,10);
INSERT INTO StaffMBIP VALUES ('S1','D9',NULL,40);
INSERT INTO StaffMBIP VALUES ('S9','D8',14,22);
INSERT INTO StaffMBIP VALUES ('S8','D6',NULL,29);
```

----- Residential Users

```
INSERT INTO ResidentialUsers VALUES ('U1','Bungalow',23,46,78);
INSERT INTO ResidentialUsers VALUES ('U4','Terrace',34,67,43);
INSERT INTO ResidentialUsers VALUES ('U5','Apartment',35,23,32);
INSERT INTO ResidentialUsers VALUES ('U7','Terrace',26,26,28);
INSERT INTO ResidentialUsers VALUES ('U2','Terrace',34,65,99);
INSERT INTO ResidentialUsers VALUES ('U3','Bungalow',35,43,54);
INSERT INTO ResidentialUsers VALUES ('U6','Terrace',21,66,43);
INSERT INTO ResidentialUsers VALUES ('U9','Apartment',56,76,65);
INSERT INTO ResidentialUsers VALUES ('U10','Bungalow',56,74,89);
INSERT INTO ResidentialUsers VALUES ('U8','Apartment',45,46,76);
```

----- Organizations

```
INSERT INTO Organizations VALUES ('A22EC0083', '001', 'D1', 'S2', 'A22');
INSERT INTO Organizations VALUES ('A22EC0153', '010', 'D4', 'S4', 'A21');
INSERT INTO Organizations VALUES ('A22EC0169', '100', 'D2', 'S3', 'A24');
INSERT INTO Organizations VALUES ('A22EC0088', '002', 'D5', 'S5', 'A42');
INSERT INTO Organizations VALUES ('A22EC0081', '090', 'D7', 'S6', 'A52');
INSERT INTO Organizations VALUES ('A22EC0073', '023', 'D9', 'S9', 'A62');
INSERT INTO Organizations VALUES ('A22EC0063', '012', 'D10', 'S7', 'A29');
INSERT INTO Organizations VALUES ('A22EC0143', '006', 'D3', 'S1', 'A34');
INSERT INTO Organizations VALUES ('A22EC0090', '021', 'D8', 'S9', 'A65');
INSERT INTO Organizations VALUES ('A22EC0093', '019', 'D6', 'S8', 'A25');
INSERT INTO Organizations VALUES ('A22EC0104', '010', 'D11', 'S8', 'A20');
```

```
UPDATE StaffMBIP
```

SET CorporateCarbonFootprint = 45

WHERE StaffID = 'S2';

SELECT *

FROM StaffMBIP;

STAFFID	DIVISIONID	PERSONALCARBONFOOTPRINT	CORPORATECARBONFOOTPRINT
S2	D11	-	50
S4	D6	45	70
S3	D2	56	22
S5	D11	-	45
S6	D3	40	64
S9	D10	-	16
S7	D7	19	10
S1	D9	-	40
S8	D6	-	29

```

SELECT *
FROM AdministrativeUsers
ORDER BY AccessControl ASC;

```

ADMINID	ADMINNAME	ACCESSCONTROL
006	Leo	Database Admin
019	Wan	Database Admin
010	Ali	Database Admin
021	Izz	Network Admin
100	Eden	Network Admin
023	Daniel	Network Admin
002	Liv	Security Admin
012	Robert	System Admin
001	Fahim	System Admin
090	Charles	System Admin

```

SELECT *
FROM DivisionsMBIP;

```

DIVISIONID	DATACONTRIBUTION	DIGITALCARBONFOOTPRINT
1 D1	Low	122
2 D4	High	142
3 D2	Too low	123
4 D5	Moderate	542
5 D10	Moderate	335
6 D3	Low	245
7 D8	High	100
8 D6	Low	89
9 D11	Moderate	78

SELECT *
 FROM Organizations
 ORDER BY OrganizationID ASC;

ORGANIZATIONID	ADMINID	DIVISIONID	STAFFID	INSTITUTIONID
A22EC0063	012	D10	S7	A29
A22EC0073	023	D9	S9	A62
A22EC0081	090	D7	S6	A52
A22EC0083	001	D1	S2	A22
A22EC0088	002	D5	S5	A42
A22EC0090	021	D8	S9	A65
A22EC0093	019	D6	S8	A25
A22EC0104	010	D11	S8	A20
A22EC0143	006	D3	S1	A34
A22EC0153	010	D4	S4	A21
A22EC0169	100	D2	S3	A24

SELECT *
 FROM DivisionsMBIP;

DIVISIONID	DATACONTRIBUTION	DIGITALCARBONFOOTPRINT
D1	Low	122
D4	High	142
D2	Too low	123
D5	Moderate	542
D7	Low	213
D9	High	325
D10	Moderate	335
D3	Low	245
D8	High	100
D6	Low	89
D11	Moderate	78

SELECT *
FROM Institutions;

	INSTITUTIONID	ENERGYCONSUMPTION	RESOURCECONSUMPTION	DATAFEASIBILITY
1	A22	20	30	45
2	A21	14	30	35
3	A24	14	30	34
4	A42	10	67	35
5	A52	36	26	99
6	A62	37	22	68
7	A29	83	43	24
8	A34	37	38	32
9	A65	24	24	23
10	A25	25	25	12
11	A20	45	41	11

SELECT UserID, TypeOfHouse, ElectricityConsumption
FROM ResidentialUsers
WHERE ElectricityConsumption BETWEEN 30 AND 45;

USERID	TYPEOFGHOUSE	ELECTRICITYCONSUMPTION
U4	Terrace	34
U5	Apartment	35
U2	Terrace	34
U3	Bungalow	35
U8	Apartment	45

```

SELECT UserID "User ID",TypeOfHouse "Type of House"
FROM ResidentialUsers
WHERE TypeOfHouse = 'Apartment';

```

User ID	Type of House
U5	Apartment
U9	Apartment
U8	Apartment

```

SELECT AdminID "Admin ID",AdminName "AdminName",AccessControl "Role"
FROM AdministrativeUsers
ORDER BY AccessControl DESC;

```

Admin ID	AdminName	Role
001	Fahim	System Admin
090	Charles	System Admin
012	Robert	System Admin
002	Liv	Security Admin
023	Daniel	Network Admin
021	Izz	Network Admin
100	Eden	Network Admin
019	Wan	Database Admin
006	Leo	Database Admin
010	Ali	Database Admin

```

SELECT UserID "Resident User",TypeOfHouse "Type Of
House",ElectricityConsumption,WaterConsumption,RecycledCookingOilConsumption
FROM ResidentialUsers
WHERE TypeOfHouse = 'Terrace' OR TypeOfHouse = 'Bungalow'
ORDER BY TypeOfHouse ASC;

```

Resident User	Type of House	ELECTRICITYCONSUMPTION	WATERCONSUMPTION	RECYCLEDCOOKINGOILCONSUMPTION
U1	Bungalow	23	46	78
U3	Bungalow	35	43	54
U10	Bungalow	56	74	89
U6	Terrace	21	66	43
U7	Terrace	26	26	28
U4	Terrace	34	67	43
U2	Terrace	34	65	99

```

SELECT ROWNUM AS "Admin Number",AdminName "Admin Name"
FROM (SELECT AdminName FROM AdministrativeUsers)
WHERE ROWNUM <= 10;

```

Admin Number	Admin Name
1	Fahim
2	Ali
3	Eden
4	Liv
5	Charles
6	Daniel
7	Robert
8	Leo
9	Izz
10	Wan

```

SELECT d.DivisionID,d.DataContribution,d.DigitalCarbonFootprint,
       s.StaffID,s.PersonalCarbonFootprint
FROM DivisionsMBIP d JOIN StaffMBIP s
ON d.DivisionID = s.DivisionID;

```

DIVISIONID	DATACONTRIBUTION	DIGITALCARBONFOOTPRINT	STAFFID	PERSONALCARBONFOOTPRINT
D2	Too low	123	S3	56
D7	Low	213	S7	19
D9	High	325	S1	-
D10	Moderate	335	S9	-
D3	Low	245	S6	40
D6	Low	89	S4	45
D6	Low	89	S8	-
D11	Moderate	78	S2	-
D11	Moderate	78	S5	-

```

SELECT o.OrganizationID, o.AdminID, a.AdminName, o.DivisionID
FROM Organizations o
JOIN AdministrativeUsers a ON o.AdminID = a.AdminID
ORDER BY OrganizationID ASC;

```

ORGANIZATIONID	ADMINID	ADMINNAME	DIVISIONID
A22EC0063	012	Robert	D10
A22EC0073	023	Daniel	D9
A22EC0081	090	Charles	D7
A22EC0083	001	Fahim	D1
A22EC0088	002	Liv	D5
A22EC0090	021	Izz	D8
A22EC0093	019	Wan	D6
A22EC0104	010	Ali	D11
A22EC0143	006	Leo	D3
A22EC0153	010	Ali	D4
A22EC0169	100	Eden	D2

```

SELECT o.OrganizationID, o.DivisionID, d.DataContribution
FROM Organizations o
JOIN DivisionsMBIP d ON o.DivisionID = d.DivisionID
ORDER BY DataContribution ASC;

```

ORGANIZATIONID	DIVISIONID	DATACONTRIBUTION
A22EC0073	D9	High
A22EC0090	D8	High
A22EC0153	D4	High
A22EC0081	D7	Low
A22EC0143	D3	Low
A22EC0093	D6	Low
A22EC0083	D1	Low
A22EC0088	D5	Moderate
A22EC0104	D11	Moderate
A22EC0063	D10	Moderate
A22EC0169	D2	Too low

```

SELECT o.OrganizationID,o.AdminID,o.DivisionID,o.StaffID,o.InstitutionID,
d.DataContribution,d.DigitalCarbonFootprint,s.PersonalCarbonFootprint,s.CorporateCarbonFootprint,
i.EnergyConsumption,i.ResourceConsumption,i.DataFeasibility
FROM Organizations o
JOIN DivisionsMBIP d ON o.DivisionID = d.DivisionID
JOIN StaffMBIP s ON o.StaffID = s.StaffID
JOIN Institutions i ON o.InstitutionID = i.InstitutionID;

```

ORGANIZATIONID	ADMINID	DIVISIONID	STAFFID	INSTITUTIONID	DATACONTRIBUTION	DIGITAL	PERSONAL	CORPORATE	ENERGYCON	RESOURCEC	DATAFEASIBILITY
A22EC0083	1	D1	S2	A22	Low	122	-	50	20	30	45
A22EC0153	10	D4	S4	A21	High	142	45	70	14	30	35
A22EC0169	100	D2	S3	A24	Too low	123	56	22	14	30	34
A22EC0088	2	D5	S5	A42	Moderate	542	-	45	10	67	35
A22EC0081	90	D7	S6	A52	Low	213	40	64	36	26	99
A22EC0073	23	D9	S9	A62	High	325	-	16	37	22	68
A22EC0063	12	D10	S7	A29	Moderate	335	19	10	83	43	24
A22EC0143	6	D3	S1	A34	Low	245	-	40	37	38	32
A22EC0090	21	D8	S9	A65	High	100	-	16	24	24	23
A22EC0093	19	D6	S8	A25	Low	89	-	29	25	25	12
A22EC0104	10	D11	S8	A20	Moderate	78	-	29	45	41	11

8.0 Summary

Last but not least, the logical ERD serves as the foundation for the creation of the MBIP's Carbon Reduction and Sustainability Engagement System for this specific phase. The conceptual ERD (EERD) from the earlier phase serves as the basis for the logical ERD.

The entities proceed through the normalization process from the logical ERD, starting with the First Normal Form (1NF) and ending with the Boyce-Codd Normal Form (BCNF). In addition to detecting update anomalies and data redundancy, the normalizing process supports the database design. In addition, this will allow the system to manage the data more effectively without compromising the integrity of the data.

Aside from that, the data dictionary is kept up to date with the normalized relations. This is a critical stage in the phase since it captures information about all entities, properties, and relationships. The system's SQL code statements are then defined using Oracle Developer, and the code is thoroughly documented to clarify its purpose. A prototype is also constructed to clearly demonstrate the system's flow and database functionality.

In a nutshell, we hope that at the end of the phase and project, the system will fulfill its objectives while complying with the MBIP standards. We also hope that our system will make people happy while using it. Other than that, we hope that our stakeholders will be satisfied with the system as it will be more user friendly than the previous system.