UNIVERSITI TEKNOLOGI MALAYSIA

Sem.1 2023/2024

SECD 2613 System Analysis and Design

Section 08

PHASE 1: PROJECT PROPOSAL & PLANNING

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

Table of Contents

1. Introduction

In today's rapidly evolving world, organizations must harness technology to effectively meet stakeholder needs. Iskandar Puteri City Council (MBIP) governing Iskandar Puteri district aims to encourage low carbon living through one of its initiatives which is Iskandar Puteri Low Carbon (IPRK). However, IPRK is constrained by inefficient manual processes, scattered data sources and limited residents' engagement in sustainability efforts.

MBIP is the governing authority for Iskandar Puteri. In order to promote low carbon emissions development aligned with national goals, MBIP had launched the IPRK program to mobilize schools, households and other stakeholders to reduce carbon emissions as well as energy consumptions through some activities such as Program LA21, Drive Thru Recycling Program, fabric recycling bin program and others. All of the programs aim to increase social awareness in creating a low carbon society through our daily practices.

When it comes back to IPRK, this huge project aims to develop an improved platform to support the IPRK initiative by MBIP as it plays a pivotal role in tracking carbon emissions activities across communities, households and schools in Iskandar Puteri. As mentioned above, it is constrained by several factors which are manual process, decentralized data and limited engagement from stakeholders. Therefore, this project will analyze current challenges and provide recommendations on new technology solutions that can solve the problems effectively.

To address the gaps stated above, the proposed improved system that meets the clients' expectation aims to provide an automated data ingestion through several technologies such as IoT sensors and mobile apps for conveniences. Next, the system should provide an automated computation of carbon emissions using algorithms instead of manual calculations by humans. Besides, the system must have capability to monitor the status of projects implemented to ensure every single program is going smoothly in Iskandar Puteri.

2. Problem Definition

A) Problem identified in organization

I. 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 across different departments in a systematic way. IPRK has 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.

II. 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. 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.

III. 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. 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.

IV. 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. They need to perform extensive mathematical calculations 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.

V. 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. Without proper knowledge, it seems to be hard for them to contribute effectively to regional decarbonization goals.

B) Opportunities for improvement that possibly solved the problems:

I. Centralized Project Management System

MBIP should implement a centralized project management system to track initiatives across departments in one place. For instance, the system should include the status of the project and estimated time to be completed so the authority can track the progress of each project easily. On top of that, the system should digitize processes with automation for real-time visibility into project timelines as mentioned above so everyone can understand the progress well. After that, the system should generate reports and dashboards for insights into implementation pace.

II. Integrated Data Repository

To gather and analyze all the data collected in a systematic way, MBIP should develop a centralized data repository that needs to be integrated into the system. This is to consolidate sustainability data from various sources. Therefore, building APIs and integrations to ingest data from various systems into a unified platform is essential to reduce the burden of the analysts when analyzing the data. Then, they should provide data models and schemas tailored to IPRK's carbon metrics and calculations.

III. Enhanced Reporting and Visualization

In order to increase the efficiency when analyzing the project progress over time, MBIP should use suitable visualization tools to analyze trends in carbon emission reductions over time. Therefore, they can compare the progress of different initiatives against targets and benchmarks. This is to ensure that they can make decisions on how to fully utilize that particular program to achieve the goal of reducing carbon emission in Iskandar Puteri. Finally, they will be able to forecast future progress based on historical data easily.

IV. Process Automation and AI tools

To reduce the manual computation on carbon emissions, the system should implement carbon calculation algorithms into the platform to replace manual computations. For instance, the data collection process must be fully-automatic that can be detected from different IoT sensors and meters within the area. Then, the data will be sent back to the system for further processing. This method is more preferable as it can reduce human errors and manpowers in completing the task. The processed data can also be represented into historical data patterns.

V. Targeted Engagement Initiatives

To increase the awareness of the residents in sustainability efforts especially in reducing carbon emissions in Iskandar Puteri, MBIP should introduce mobile apps to engage and educate the citizens on carbon footprints. MySejahtera would be one of the proper examples that can keep the users updating with the latest information regarding COVID-19 during the pandemic. Therefore, MBIP should take the application as reference to spread the information about carbon emissions so the residents will notice that. The application will exist as a subsystem for CarbonCutOffPro as it is more easily installed in mobile phones. With this method, the users will always be updated with the latest events or programs related to IPRK.

C) Objectives of the proposed solutions:

1. Implement a centralized project management system to track the project timelines, milestones and completion.

2. Develop an integrated data repository to bring together the carbon emissions data from multiple sources across the region.

3. Incorporate advanced analytics and visualizations for insights into project outcomes and progress over time.

4. Streamline the labor-intensive processes of collecting data and calculating carbon emissions by employing cutting-edge technologies such as AI and IoT.

5. Promote community awareness and involvement in eco-friendly practices through specific digital resources.

3. **Feasibility Study (Economical)**

Cost-benefit analysis (CBA)

Estimated Cost	
Hardware 1. Servers 2. Network devices	 RM80000 RM20000
Software 1. Operating Systems and database 2. Development tools and environment	 RM50000 RM30000
Hosting Service	RM20000(per year)
Training	RM18000
Maintenance	RM15000 (per year)

Assumptions	
Discount rate	10%
Sensitivity factor (cost)	1.1
Sensitivity factor (benefits)	0.9
Annual change in production costs	8%
Annual change in benefits	6%

Estimated Benefits	
Intangible Benefit 1. Improved community engagement 2. Enhance stakeholder communication	 (RM250000 value) (RM200000 value)
Tangible Benefit 1. Savings 2. Optimized resource allocation 3. Carbon credits	 RM70000 per year RM100000 per year RM80000 per year

Costs	Year 0	Year 1	Year 2	Year 3	Year 4
Development Costs					
Servers	88000				
Network Service	22000				
Operating System and database	55000				
Development tools and environment	33000				
Total	198000				
Production Costs					
Hosting Service		22000	23760	25661	27714
Maintenance		16500	17820	19246	20785
Training		19800	21384	23095	24942
Annual Production Costs		58300	62964	68002	73441
(Present Value)		53000	52036	51091	50161
Accumulated Costs		251000	303036	354127	404288

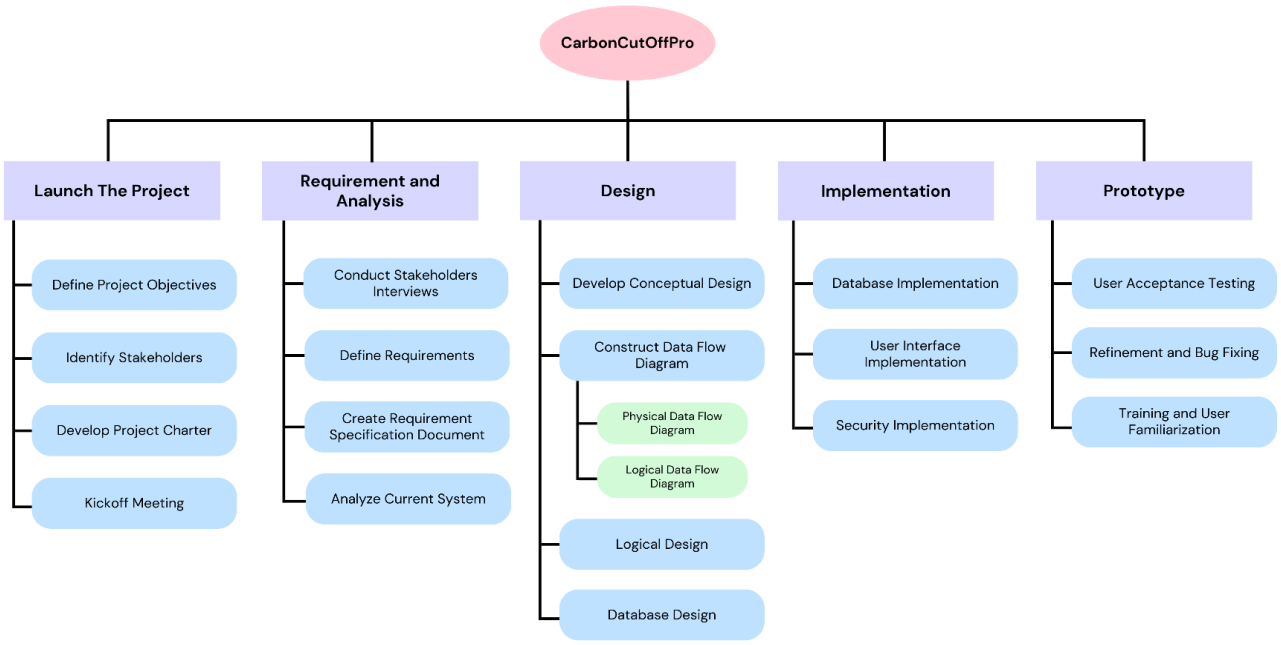
Benefits	Year 0	Year 1	Year 2	Year 3	Year 4
Savings		63000	66780	70787	75034
Optimized resource allocation		90000	95400	101124	107191
Carbon credits		72000	76320	80889	85753
Annual Inventory Costs		225000	238500	252810	267979

(Present Value)		204545	197107	189940	183033
Accumulated Benefits (Present Value)		204545	401653	591593	774626
Gain or Loss		(46455)	98617	237466	370338
Probability Index	1.87				

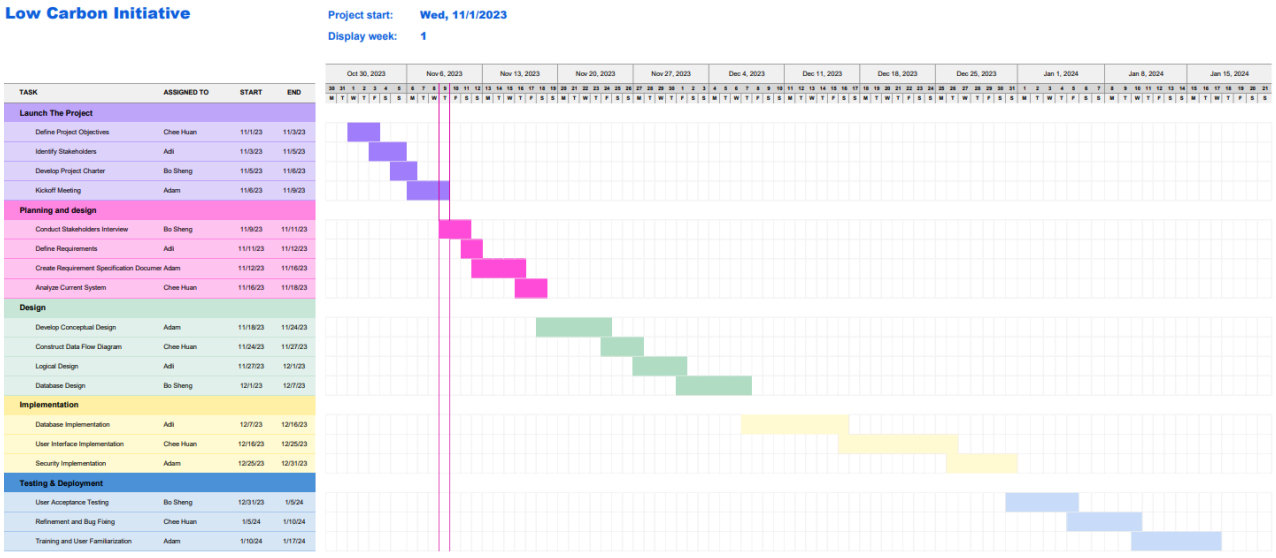
The probability index for the CBA shown above is 1.87, indicating it will be a wise investment because its index is higher than one after four years. From the table above, we can notice that RM46455 will be lost for the first year and earn RM98617 for the next year. The earning will increase up to RM237466 for the third year and RM370338 for the fourth year. Therefore, the initiative is considered as a good project.

4. Project Planning

Work Breakdown Structure (WBS)



Gantt Chart



Launch The Project (Week 1 & Week 2)

On the first week of the project, our team will begin with defining project objectives to ensure that we can outline the frame of the project. In addition, we need to identify the stakeholders such as individuals within MBIP to smoothen the information gathering process later. We also need to develop the project charter so it can record the important details such as objectives, milestones and the goals. Then, our team will have a kickoff meeting for a few days to discuss how to initiate the project including dividing the team into subteams.

Planning and Design (Week 2 & Week 3)

In the second week, we will start to conduct interviews with the stakeholders that we identified earlier. Interviewing stakeholders is an essential process as it can gather all necessary information and requirements for the project later. At the same time, requirements are documented to guide the development process. We also need to analyze the weakness and strength of the current system so we can make improvements to the new system.

Design (Week 3 - Week 5)

In the third week, we will begin the system designing process. First of all, we will develop a conceptual design to help us draw out the overall structure of the system. This is useful to identify various components to be included into the system later. We will also need to draw the data flow diagram to help the team in discovering potential problems. Then, we will develop logical design to support information structure. Last but not least, we will start develop the database system to interrelate and store the data.

Implementation (Week 5 - Week 8)

Starting in the fifth week, we will begin with implementing the database system. By referring to the database design in the previous phase, we will need to come out with a complete database system. Next, we will implement the interface of the system so we can create a

user-friendly UI that enables the user to understand how the whole system is working easily. This can highly increase the usability of the system. At the end of the phase, we will implement the security features so the system can be avoided from DoS or other security issues.

Testing & Deployment (Week 8 - Week 10)

The final phase of the project will focus on user acceptance testing (UAT) to validate that the system meets business needs before go-live. UAT enables end-users to test the software using real-world scenarios and data. Comprehensive testing will be carried out covering aspects like usability, functionality, UI flows, performance, security, and more. Test cases will be designed to evaluate key user journeys and system requirements. Rigorous testing is crucial to identify potential issues early and ensure the system is stable, reliable, and ready for deployment. Multiple iterative cycles of testing and fixes will be conducted until all critical defects are resolved. In addition to testing, user training and familiarization will be completed to support the rollout. Hands-on sessions will be held to familiarize users with the new system and its capabilities prior to launch.

5. Conclusion

In summary, the Iskandar Puteri Low Carbon (IPRK) initiative by the Iskandar Puteri City Council (MBIP) plays a pivotal role in driving low carbon development and reducing carbon emissions across the Iskandar Puteri region. However, IPRK faces a few key challenges today including lack of visibility into project progress, manual carbon data management processes, limited analytics for strategic decisions, inefficient computation of emissions metrics, and low awareness among citizens regarding sustainability.

To address these gaps, the proposed digital platform solution aims to enable automated data collection leveraging IoT sensors and mobile apps. This would minimize manual efforts while enhancing data quality. Additionally, the system would automate carbon emissions calculations using algorithms to improve efficiency. It would also provide customizable dashboards for project status monitoring, giving better visibility across initiatives.

The cost-benefit analysis projects that the platform would deliver a positive return on investment, with a probability index of 1.87. Though initial development requires investment, the benefits in terms of operational efficiency, data-driven decisions, and emissions reduction are expected to accumulate over time. Beyond direct cost savings, the initiative can drive broader environmental and social impact.

The detailed project plan developed using the work breakdown structure and Gantt charts lays out a structured approach to execute the platform implementation through phased releases. Prioritized requirements gathered through workshops inform the rollout roadmap. Following this plan can help manage scope and ensure timely delivery of capabilities.

In conclusion, the IPRK initiative has immense potential to accelerate low carbon transformation in Iskandar Puteri, if equipped with the right technology enablers. The proposed platform aims to arm IPRK with data, insights, and engagement tools needed to overcome present challenges and progress towards its sustainability charter. With careful planning and execution, the project can amplify impact and value.

6. **References**

- Majlis Bandaraya Iskandar Puteri (2023), *Iskandar Puteri Rendah Karbon* [PowerPoint Slides]. https://discordapp.com/channels/1166825126067716179/1166825127669932085/1169489080963305552

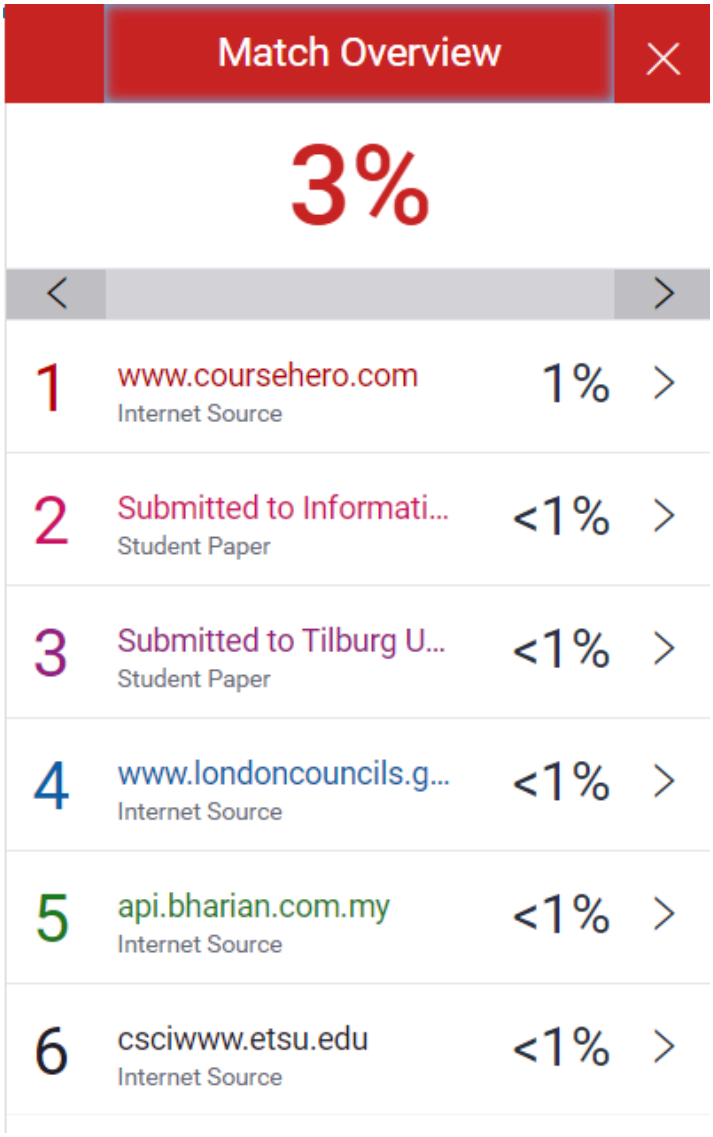
- *Geran Komuniti Iskandar Puteri Rendah Karbon*. Google Sites: Sign-in. (2021). https://sites.google.com/utm.my/iskandarputerirendahkarbon

- Iskandar Puteri Rendah Karbon (n.d.).[Facebook page]. Facebook. Retrieved November 2, 2023, from https://www.facebook.com/IskandarPuteriRendahKarbon

- Omar Ahmed. (2021, November 25). Iskandar Malaysia Berjaya kurangkan 19.7 peratus Pelepasan Karbon https://api.bharian.com.my/berita/nasional/2021/11/891763/iskandar-malaysia-berjaya-kurangkan-197-peratus-pelepasan-karbon

- *IMELC*. Iskandar Malaysia Ecolife Challenge | Home. (n.d.). https://www.imelc.my/

7. **Appendices (Compulsory)**



- ***Evidence of Generative AI tools usage***

  Reference from ChatGPT