



Faculty of Computer Science and Information Technology

***CARBON FOOTPRINT TRACKER IN MOBILE APPLICATION***

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# **CARBON FOOTPRINT TRACKER IN MOBILE APPLICATION**

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This project is submitted in partial fulfilment of the  
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## **ABSTRACT**

Climate change is a global phenomenon on Earth that is caused by the increasing emission of greenhouse gases around the atmosphere. As it continues to impact the lives on earth including human beings, some measures can be taken with calculating personal carbon footprint using a mobile application. By quantifying the carbon emissions, it helps to know if they are reaching the target of their target emission. Developing a mobile application for carbon footprint tracking is useful due to the high accessibility of smartphones for people worldwide. Thus, this application has the potential to reach the wide visibility of smartphone users to help track their carbon footprint. Three similar applications are compared such as Klima, NMF.earth and Capture to analyse their features. This project workflow is through the Agile methodology of Kanban. Moreover, the methodology of calculating carbon footprint is complex and thus need existing solution to assist the problem. The proposed application is utilizing hybrid technology which is React Native to improve development time. To evaluate the application, manual testing and functional testing will be conducted.

## **ABSTRAK**

Perubahan iklim adalah fenomena global di bumi yang disebabkan oleh peningkatan pelepasan gas rumah hijau di atmosfera. Fenomena ini akan terus memberi kesan kepada kehidupan di bumi termasuk manusia, beberapa tindakan boleh diambil dengan mengira jejak karbon peribadi menggunakan aplikasi mudah alih. Dengan mengira pelepasan karbon, ia akan membantu untuk mengetahui sama ada ia mencapai sasaran pelepasan yang telah ditetapkan. Membangunkan aplikasi mudah alih untuk menjejaki jejak karbon sangat berguna kerana kebolehcapaian telefon pintar yang tinggi untuk orang ramai di seluruh dunia. Oleh itu, aplikasi ini berpotensi untuk menjangkau pelbagai pengguna telefon pintar untuk membantu mengesan jejak karbon mereka. Tiga apl serupa telah dibandingkan seperti Klima, NMF.earth dan Capture untuk menganalisis ciri mereka. Aliran kerja projek ini menggunakan metodologi Agile Kanban. Selain itu, metodologi pengiraan jejak karbon adalah agak rumit jadi penyelesaian yang boleh membantu masalah ini diperlukan. Aplikasi yang dicadangkan menggunakan teknologi hibrid iaitu React Native bagi mengurangkan tempoh pembangunan. Untuk menilai aplikasi, ujian manual dan ujian fungsi akan dijalankan.

# TABLE OF CONTENTS

Declaration .....	ii
Acknowledgement.....	iii
Abstract .....	iv
Abstrak .....	v
Table of Contents .....	vi
Table of Figures .....	ix
List of Tables.....	xi
Chapter 1: Introduction .....	1
1.1 Introduction .....	1
1.2 Problem Statement.....	2
1.3 Scope .....	2
1.4 Objectives .....	3
1.5 Methodology.....	3
1.5.1 Backlog.....	4
1.5.2 In Progress.....	4
1.5.3 Testing.....	4
1.6 Project Significance .....	4
1.7 Project Schedule .....	4
1.8 Expected Outcome.....	5
1.9 Summary.....	5
Chapter 2: Literature Review .....	6
2.1 Introduction .....	6
2.2 Similar Applications Review .....	7
2.2.1 Klima.....	7
2.2.2 NMF.earth .....	10
2.2.3 Capture .....	12
2.2.4 Comparison .....	14



2.3	Technology Recommendation for Carbon Footprint Tracker .....	15
2.3.1	Native Framework.....	16
2.3.2	Hybrid.....	16
2.3.3	Web Based.....	16
2.4	Carbon Footprint.....	18
2.4.1	Calculation Methodology .....	20
2.5	Summary.....	21
Chapter 3: Requirement Analysis And Design .....		22
3.1	Introduction .....	22
3.2	Methodology Summary .....	22
3.3	Requirement Gathering and Analysis.....	23
3.3.1	Requirement Analysis .....	23
3.3.2	Functional Requirement .....	26
3.4	Logical Design.....	27
3.4.1	Data Flow Diagram (DFD) .....	27
3.5	User Interface Design .....	28
3.5.1	Landing Page.....	28
Chapter 4: Implementation.....		30
4.1	Introduction .....	30
4.2	Carbon Emission Factor .....	31
4.3	Environment Setup .....	33
4.3.1	Android Emulator.....	33
4.3.2	Android Studio .....	33
4.3.3	Visual Studio Code.....	33
4.3.4	React Native Expo.....	34
4.4	User Interface Design .....	35
4.4.1	Home Page .....	35
4.4.2	Emission Selection Page .....	36
4.4.3	Add Emission Page .....	37
4.4.4	Recurring Emission Page .....	38

4.4.5	Statistic Page .....	39
4.4.6	About Page .....	40
Chapter 5:	Testing .....	42
5.1	Introduction .....	42
5.2	Test Case 1: Home Buttons and Navigations .....	43
5.3	Test Case 2: Emission Selection.....	44
5.4	Test Case 3: Emission Entry.....	45
5.5	Test Case 4: Recurring Emission.....	46
Chapter 6:	Conclusion and Future Work.....	49
6.1	Introduction .....	49
6.2	Objectives Evaluations .....	49
6.3	Strengths and Weaknesses.....	50
6.4	Future Works .....	51
6.4.1	Carbon Factor Accuracy.....	51
6.4.2	In-depth Tracking .....	51
6.4.3	External Data Integration .....	51
6.5	Summary.....	52
References	.....	53
Appendices	.....	55

## TABLE OF FIGURES

Figure 1.1 The phases of agile development cycle .....	3
Figure 2.1 The logos of Klima, NMF.earth and Capture .....	7
Figure 2.2 Landing page of Klima application .....	7
Figure 2.3 Statistic of emissions in Klima .....	8
Figure 2.4 Carbon offset in Klima .....	9
Figure 2.5 Landing page of NMF.earth application.....	10
Figure 2.6 Emission data in NMF.earth .....	11
Figure 2.7 Historical emission data in Capture application .....	12
Figure 2.8 Carbon offset options in Capture .....	13
Figure 3.1 The phases of agile development cycle .....	22
Figure 3.2 Pie chart of the age of respondents .....	24
Figure 3.3 Familiarity of carbon footprint trackers among respondents.....	25
Figure 3.4 Ease of use of carbon footprint tracker among respondents .....	25
Figure 3.5 Context diagram of Carbon Footprint Tracker .....	27
Figure 3.6 Level 0 Data Flow Diagram of Carbon Footprint Tracker .....	27
Figure 3.7 Design of landing page for Carbon Footprint Tracker .....	28
Figure 3.8 Design for adding emission .....	29
Figure 4.1 Visual Studio Code workspace .....	34
Figure 4.2 React native and expo .....	34
Figure 4.3 The implemented home page.....	35
Figure 4.4 Implemented emission selection page .....	36
Figure 4.5 Implemented add emission page.....	37

Figure 4.6 Implemented recurring emission page.....38

Figure 4.7 Implemented statistic page (empty).....39

Figure 4.8 Implemented statistic page.....40

Figure 4.9 Implemented about page .....41

Figure 7.1 Gantt Chart of Final Year Project .....55

## LIST OF TABLES

Table 2.1 Features comparison of Klima, NMF.earth and Capture .....	14
Table 2.2 Advantages and disadvantages of Klima, NMF.earth and Capture .....	15
Table 2.3 Type of carbon emission categorized into three scopes .....	19
Table 3.1 Details of phases in the Agile Development Cycle.....	23
Table 3.2 Functional requirements of the proposed application .....	26
Table 4.1 The categories selected with sources .....	31
Table 5.1 Test Case 1 .....	44
Table 5.2 Test Case 2 .....	45
Table 5.3 Test Case 3 .....	46
Table 5.4 Test Case 4 .....	48
Table 6.1 Objectives evaluations .....	49

# CHAPTER 1: INTRODUCTION

## 1.1 Introduction

As climate change continues to impact our lives, several measures have been initiated by people to reduce the emission of greenhouse gases. In industry, there is already a high demand for carbon management with a forecasted value of \$18.2 billion in 2031 (Md et al., 2022). For an individual, they can also actively participate together to reduce their carbon footprint. By following the goal stated above, the project focuses on building a mobile application to track personal carbon footprint for people that are conscious about their carbon emissions. The application will keep track of all the physical consumption that emits which includes meat consumption, vehicle driving and flights (Koide et al., 2021). The usability of the application will be more emphasized as one of the objectives of this project is to increase efficiency to reduce the number of steps for a user to complete a task.

## **1.2 Problem Statement**

Climate change is a global phenomenon on Earth that is caused by the increasing emission of greenhouse gases (GHGs) around the atmosphere (Sun et al., 2015). As it continues to impact the lives on earth including human beings, some measures can be taken with calculating personal carbon footprint using a mobile application. By quantifying the carbon emissions, it helps to know if they are reaching the target of their target emission. In addition, they can focus on reducing certain types of emissions by identifying which type of emission is the largest.

Developing a mobile application for carbon footprint tracking is useful due to the high accessibility of smartphones for people worldwide. As stated in Oberlo, the number of users of smartphones already reached an estimated 6.6 billion globally in 2022 (Gaubys, 2022). Thus, this application has the potential to reach the wide visibility of smartphone users to help track their carbon footprint. While there are already some applications available on the market, there is a problem on the usability side specifically the efficiency of the application when the user needs to input their emissions manually (Rahman et al., 2011).

## **1.3 Scope**

The scopes of this project are constrained as stated below:

- This platform of this system is focused on mobile applications specifically on the Android operating system.
- This system's purpose is to calculate the carbon footprint emitted by individuals.
- Mainly targeted at individuals that are conscious about their carbon emissions

## 1.4 Objectives

The objectives of this project are:

- To analyse the carbon footprint tracker that currently exists in the market.
- To develop a mobile application for tracking the carbon footprint.
- To implement features that can increase user efficiency of the developed mobile application.

## 1.5 Methodology

The software or tool used for this project is React Native with JavaScript as its main programming language. The framework is selected due to existing technical skills thus translating to fast development time. In addition, the chosen methodology for this project is Agile or more specifically, Kanban.

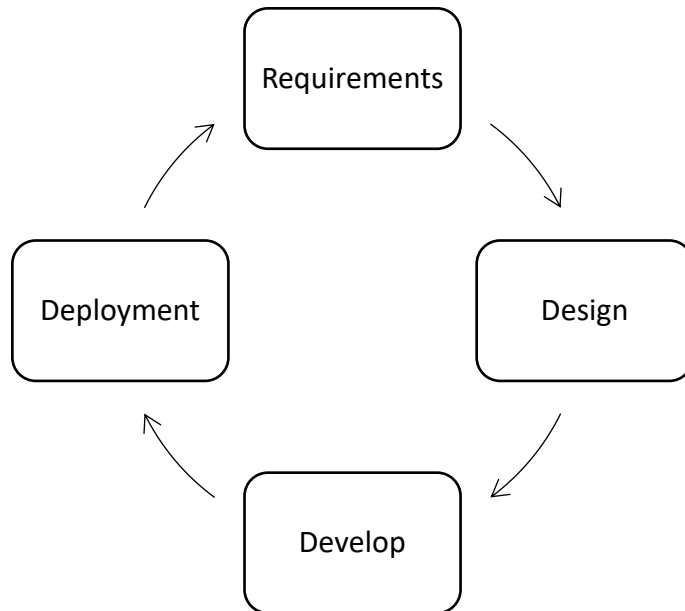


Figure 1.1 The phases of agile development cycle



The flexibility helps to develop multiple features with different priorities. To implements these agile development phase illustrated in Figure 1.1, there are multiple Kanban board stages to represent the work stages to develop the application.

### **1.5.1 Backlog**

This stage contains user stories, bug fixes and features request that may be gathered from questionnaires by using necessary questionnaire platforms such as Google Forms or interviews.

### **1.5.2 In Progress**

The implementation of backlog items will be done in this stage according to their order of priority. A word limit will be applied to focus on completing the current tasks in this Kanban phase.

### **1.5.3 Testing**

For this stage, several testing will be conducted for consistent quality in deployment later. Examples include unit test and end-to-end test that is included in React Native platform. In addition, static analysis such as type checking and linter is also included to improve code quality. Moreover, user testing will be conducted to gather feedback on the application.

## **1.6 Project Significance**

This project improved the usability of existing applications on the market such as Mau Carbon Footprint. Therefore, it will be focused on the efficiency part of Nielsen's usability principle.

## **1.7 Project Schedule**

The project schedule for Final Year Project 1 is attached in the appendix.

## **1.8 Expected Outcome**

This project expects to develop a mobile application for tracking the carbon footprint of individuals. Moreover, it will be improved on the existing mobile application which is Mau Carbon Footprint. Additionally, the usability of the application will be satisfiable based on Nielsen's usability principles.

## **1.9 Summary**

Chapter 1 summarizes the introduction of the project to create a mobile application to track different types of carbon emissions due to the high reach of users. Additionally, it will improve on the applications that are already available on the market such as Mau Carbon Footprint.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1 Introduction**

For this chapter of the literature review, three similar existing applications will be discussed and compared to get started with the proposed mobile application. In detail, this literature review will broadly analyze and determined the notable features of the applications and their advantages and disadvantages of these existing applications. These features will give some insights into the proposed applications later. Furthermore, there are some brief technological discussions regarding which framework or platforms are suitable for the proposed application such as native, hybrid or web-based. Additionally, the background of carbon footprint and the methodology of calculating the carbon footprint will be discussed too.

## 2.2 Similar Applications Review

In the current mobile market, three similar applications can track carbon footprint individually which are Klima, NMF.earth and Capture. Therefore, these applications will be reviewed based on their features in this section.



Figure 2.1 The logos of Klima, NMF.earth and Capture

### 2.2.1 Klima

The figures below show the user interfaces of Klima, which means ‘climate’ in German, a carbon footprint tracker mobile application made by a for-profit business founded by Markus Gilles, Jonas Brandau and Andreas Pursian-Ehrlich in 2019. It tracks users’ carbon footprint annually based on various metrics such as flights, food consumption and electricity usage.

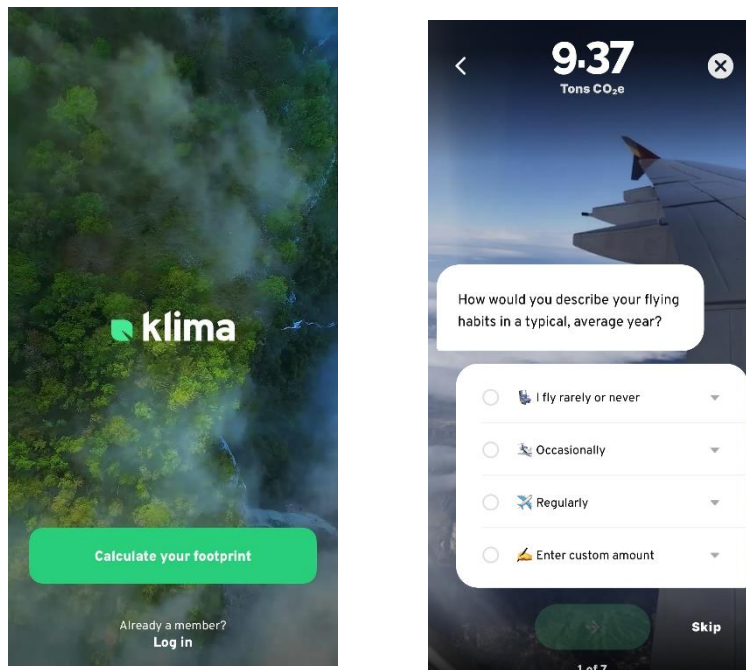


Figure 2.2 Landing page of Klima application

In the application from Figure 2.2, the users are prompted with various queries regarding their carbon footprint to get the estimated annual carbon footprint before required to be signed in. Then, statistics regarding their emission based on the category will be shown in the figures below. Moreover, the users have the option to change their emissions to more detail although it is not as fine-grained as daily emission tracking.

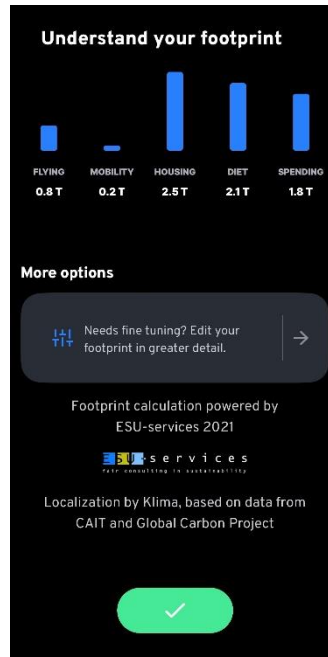


Figure 2.3 Statistic of emissions in Klima

There is a unique prospect regarding Klima, the application offers a service to offset their user's carbon footprint with a subscription. According to Britannica, carbon offset is compensation of own carbon emission through activities that reduce greenhouse gases elsewhere such as reforestation (Selin, 2011).

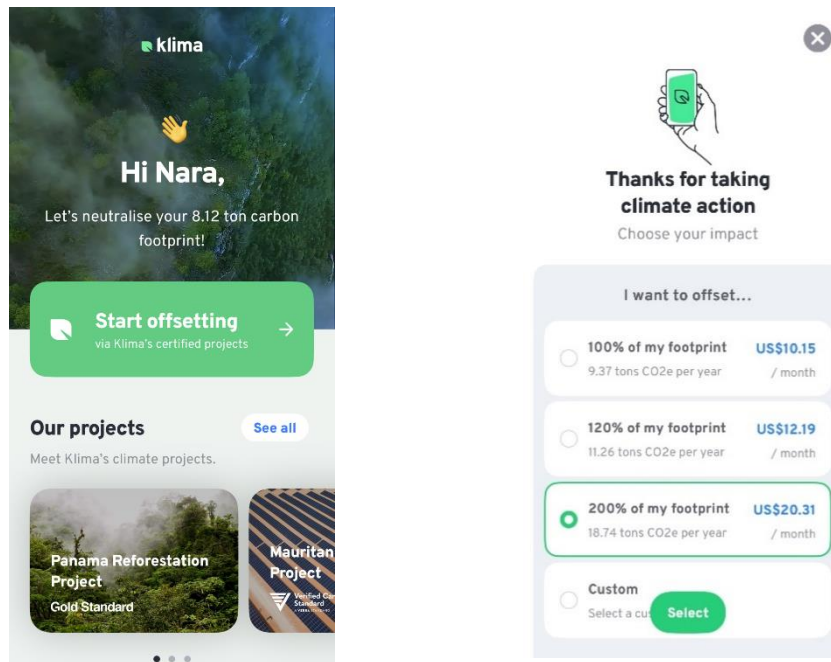


Figure 2.4 Carbon offset in Klima

In the case of Klima, it comes with a subscription that has multiple tiers depending on their level of carbon emissions, the users can offset up to 200% of their footprint at a higher cost. Various offset projects are offered by Klima such as tree planting projects, solar power projects, direct air capture, hydro power projects, clean cook stoves and deforestation prevention.

## 2.2.2 NMF.earth

Founded in 2019, NMF.earth is a simple, open-source project created by Pierre Bresson to track the daily carbon emissions of users. The refined control given to the users can help them to calculate the missions more accurately due to the daily tracking. The figure below shows the landing page of NMF.earth.

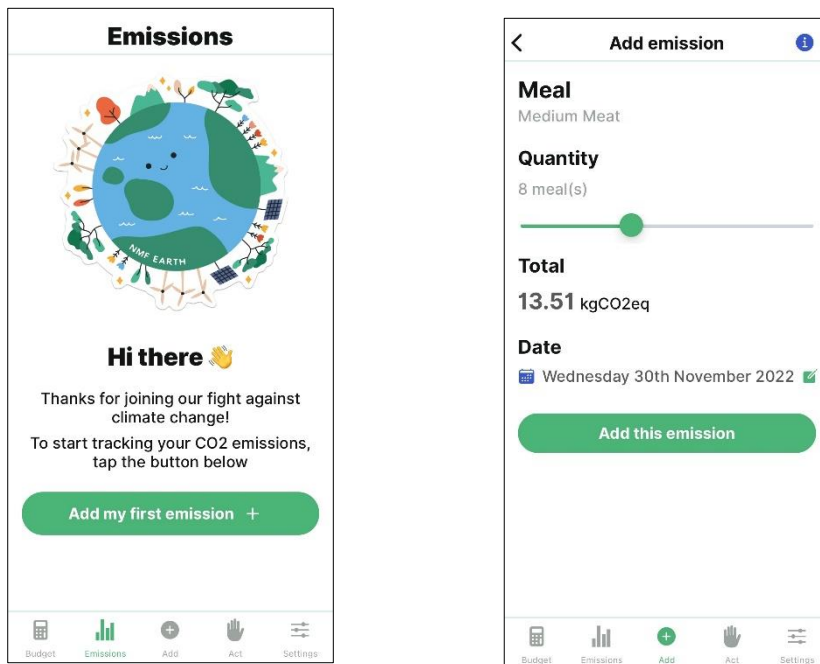


Figure 2.5 Landing page of NMF.earth application

NMF.earth can be used immediately without any registration for the application as it prioritizes users' privacy thus none of the emissions data will be uploaded to their server. Additionally, there is no payment process as the application does not offer any carbon offset subscription as seen in Klima. The users can add emissions manually every day in Figure 2.5 with various categories.

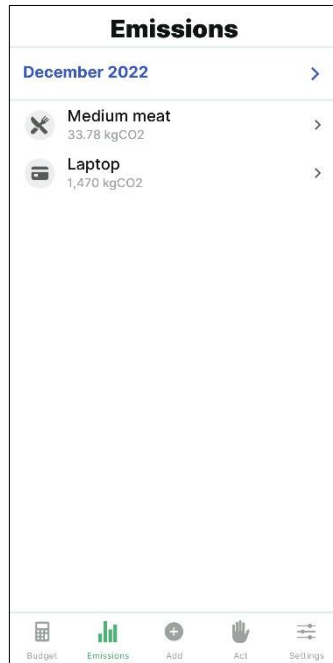


Figure 2.6 Emission data in NMF.earth

As illustrated in Figure 2.6, the emission data will be displayed after the user entered their emission data manually in the application. NMF.earth does not have users' data on its server thus the responsibility of keeping the data is fall on the users. Additionally, NMF.earth has a feature to scan bar codes to identify products bought by the user and estimate the emission from the product.