# Carbon Savings Calculation Methodology

## 1. Introduction

Carbon Wallet aims to make green lifestyle count. It empowers users to track their carbon savings based on their green actions in two areas namely recycling and green dining.

To ensure robustness, an independent consultant, RESET Carbon, has been appointed to develop the calculation methodology of carbon savings based on scientific research studies and their professional expertise.

This document provides the methodology and references for the calculation of the carbon savings for items covered in the Carbon Wallet App.

## 2. Definition of Carbon Savings

Carbon savings represent carbon emissions avoided by practising a green action when compared with its baseline action (e.g. consume a vegetarian meal vs a non-vegetarian meal, recycle a plastic bottle vs disposal at landfill).

Carbon savings are calculated by comparing carbon emissions of a green action with its respective baseline action:

$$Carbon\ Savings = Carbon\ Emissions_{Baseline} - Carbon\ Emissions_{Green\ Actions}$$

## 3. Design Considerations and Limitations of the Methodology

### 3.1. Design Considerations

There are two key considerations when developing the calculation methodology:

- Accuracy – accurate measurement of carbon savings from practising green actions; and
- User-friendliness – ease of use and granularity of data input by users.

There is a potential trade-off between the two considerations – while the methodology aims to accurately capture carbon emissions from green actions, there are limitations to the granularity of data input. For example, it is not feasible for user to record every ingredient that was consumed in a meal.

In order to strike a balance between the two considerations, appropriate assumptions are made when developing the calculation methodology.

## 3.2. Limitations

### 3.2.1. Use of Life Cycle Assessment

Life cycle assessment (LCA) is typically used to estimate the total environmental impact of a product. It may involve a range of assumptions (e.g. energy input, transportation requirements) in the assessment, which could vary amongst studies performed by different parties, leading to a different result.

### 3.2.2. Data Availability

There is currently lack of comprehensive studies on lifecycle carbon emissions for most of the products. This limits the availability of data that are specific to the items covered in the calculation methodology.

### 3.2.3. Data Locality

Data from local academic studies or government publications are prioritised to estimate carbon emissions specific to local context in the calculation. If only international sources are available, sense-check and assumption reviews are performed to ensure the data applicability prior to adopting in the methodology.

# 4. Calculation Methodology

## 4.1. Overview

The following table presents the Green and Baseline Actions for respective area based on which carbon savings are calculated.

| Areas | Green Actions | Baseline Actions |
|---|---|---|
| Recycling | Recycling of plastic beverage bottle | Disposal at landfill |
| | Recycling of plastic personal care / household container | |
| | Recycling of glass bottle | |
| | Recycling of aluminium can | |
| | Recycling of Tetra Pak carton | |
| Green Dining | Consuming a vegetarian meal | Consuming a non-vegetarian meal |

## 4.2. Recycling

Carbon savings are calculated by comparing the emissions associated with the green action of recycling a container against the baseline action of disposing the item at landfill. The emissions from both actions are based on the LCA results published in a European Study of liquid containers [1] and an evaluation of emission reductions associated with recycling [2].

Carbon savings for recycling are calculated on a per-unit basis. A standard volume has been selected as the "representative volume" for each type of container for the calculation. Selection of the representative volume for each container type is based on a review of local usage statistics and is presented below:

| Containers (materials) | Representative Volume (mL) |
|---|---|
| **Plastic bottle (PET)** | 500 |

| Containers (materials) | Representative Volume (mL) |
|---|---|
| **Glass bottle** | 330 |
| **Aluminium can** | 330 |
| **Paper carton / Tetra Pak** | 250 |
| **Plastic personal care / household container (HDPE)** | 1,000 |

### 4.3. Green Dining

Carbon savings are calculated by comparing the carbon emissions associated with the green action of having a vegetarian meal [3,4,5,6] to the baseline action of having an average non-vegetarian meal. The calculation follows an ingredient composition defined by a study conducted by The University of Hong Kong [7].

Carbon emissions of different meals are derived from the summation of carbon emissions of all ingredients according to the composition of the respective meal types. For a vegetarian meal, meat is replaced by other ingredients such as grains, vegetables and fruits.

## 5. Carbon Saving Equivalencies

In the homepage of the Carbon Wallet App, users' carbon savings are illustrated by linking with different activities (or "equivalencies") to help them easily understand their contribution to reducing carbon footprint. The table below presents the carbon emissions associated with these equivalencies.

| Carbon Saving Equivalencies | Definitions | Carbon Emissions (kgCO2e) |
|---|---|---|
| Per smartphone charged | Carbon emissions generated per smartphone charged | 0.0077 |
| Per Km travelled by private car | Carbon emissions generated per kilometer travelled by a private car[1] | 0.2736 |
| Per serving of an 8oz steak | Carbon emissions generated per serving of an 8oz steak | 4.84 |
| Emissions absorbed by a tree per year | Carbon emissions absorbed by a tree per year | 23 |
| Per one-way flight between Hong Kong and Taipei | Carbon emissions generated per one-way flight between Hong Kong and Taipei | 70 |
| Per one-way flight between Hong Kong and Tokyo | Carbon emissions generated per one-way flight between Hong Kong and Tokyo | 270 |
| Household electricity usage per month | Carbon emissions generated per a 3-person household electricity usage per month | 274 |
| Per one-way flight between Hong Kong and New York | Carbon emissions generated per one-way flight between Hong Kong and New York | 1,120 |

[1] The average emission factor for private vehicles is estimated by taking into account the distribution and fuel consumption associated with each category of private vehicles (ranging from motorcycles to private cars of different engine displacements), utilising vehicle registration data published by the Transport Department, fuel economy data from Electrical and Mechanical Services Department (EMSD), along with fuel emission factors from the Environmental Protection Department (EPD).

## 6. Glossary of Key Terms

Greenhouse gases: Gases in the Earth's atmosphere that trap heat and contribute to the greenhouse effect. These include, for example, carbon dioxide, methane and nitrous oxide, and fluorinated gases. [8]

Carbon dioxide equivalent (CO2e): A measure for comparing or consolidating emissions of various greenhouse gases on the basis of their global warming potential (GWP), by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global warming potential. [99]

Global warming potential: The relative potency of a greenhouse gas in the atmosphere as compared to the impact of carbon dioxide over a 100 year period. [10]

Life Cycle Analysis: Life cycle analysis (LCA) is a systematic method used to evaluate the environmental impact of a product or activity throughout its entire life cycle, covering material acquisition, production, transportation, operation and finally end-of-life disposal. [11]

## 7. Key References


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