OCBC Bank

in partnership with

Eco-Business

OCBC CLIMATE INDEX
APPROACH AND FRAMEWORK

AUGUST 2021

Introduction

Partnering with Eco-Business, OCBC Bank has launched the OCBC Climate Index, a measurement of the current levels of environmental sustainability awareness and climate action among Singapore residents. This document outlines the research and data analysis conducted by Eco-Business in the development of the approach and framework behind the OCBC Climate Index.

The OCBC Climate Index reveals insights both on the individual and national level. It provides an annual snapshot of sustainability attitudes and climate action in the city-state and aims to be an educational tool to generate greater awareness on climate issues and sustainable living behaviours in the society.

The OCBC Climate Index is derived from a survey which was sent to a nationally representative demographic sample of Singapore residents. The survey is available in English and Mandarin.

This survey is conducted in Singapore, with the potential for a regional survey in the future.

The roles of Eco-Business and OCBC Bank

As Asia Pacific's leading media and business intelligence organisation on sustainable development, Eco-Business has been tasked to provide sustainability expertise to support OCBC Bank to develop a robust approach and framework for the OCBC Climate Index.

Each of the impact scores and weightages provided by Eco-Business are estimated representations of the carbon footprint of individual activities, according to the available data. Eco-Business has worked with OCBC Bank to provide overall estimated weightages and scoring scales for each activity area within the survey. Eco-Business also came up with the survey questions.

With this approach and framework in place, OCBC Bank developed the survey methodology, including finalising the scoring scale. Analysis of the survey results was also conducted by OCBC Bank.

Context

The United Nations releases a report on the Sustainable Development Goals (SDGs) every year. Launched in 2015, the goals set by the United Nations General Assembly act as a roadmap for reaching a sustainable future for all. The UN SDG reporting index tracks the sustainability progress of individual nation states. For 2020, Singapore's SDG Index score was 67 (a score of 100 indicates that all SDGs have been met) and the country is ranked #93 out of all 193 UN member states analysed in the report.

For Singapore, data for SDG 12 (Responsible consumption and production) was marked by the UN as *information unavailable*[1].

In 2017, emissions per capita in Singapore was recorded as an estimated 4,800 kg per person. In 2019 this increased to 6,710 kg per person.[2] The latest data reflected that individual carbon emissions for Singapore

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[1] https://sustainabledevelopment.un.org/content/documents/19439Singapores_Voluntary_National_Review_Report_v2.pdf
[2] https://ourworldindata.org/per-capita-co2

continue to increase — with the average resident generating over 8,000 kg of carbon emissions annually[3], more than twice the world's average, and more than four times higher than the science-based recommended target in alignment with the Paris Agreement, set to maintain a sustainable global footprint[4].

The approach and framework of the OCBC Climate Index is based on an individual's climate action conversion journey across key themes of urban living. There are three pillars in this journey – Awareness (knowledge of environmental issues), Adoption (how much and how often they adopt green practices) and Advocacy (how often they encourage others to adopt green practices). These pillars cut across four key themes of urban living - Transport, Home, Food and Goods.

Overall weightage for each of the pillars was agreed by Eco-Business and OCBC Bank and estimated based on a value-judgement. The assigned weightages for the pillars are:

1. Awareness   20%
2. Adoption   60%
3. Advocacy   20%

As activities under the Adoption pillar have most material impact, Eco-Business and OCBC Bank have assigned a weightage of 60% to this pillar. Awareness and Advocacy have been given 20% each to reflect the importance of Awareness and Advocacy as paving the way for sustainable behaviour and action.

The four themes represent the main aspects of urban living and were weighted based on how they impact an individual's carbon footprint – Transportation (45%), Home (25%), Food (15%) and Goods (15%).

Survey questions within each of the four key themes of urban living are categorised under the specific emissions related to the individual regular activities,

- Carbon,
- Water,
- Material Use,
- Waste.

Individual actions have been classified as high (above 20%), moderate (10-19%), or low (1-9%) impact in relation to the amount of greenhouse gas equivalent emitted. This is in line with available scientific literature[5]. Where data was not clear or information was conflicted, the data was complemented by using Singapore-based carbon calculators to test assumptions[6] (see appendices).

The following paragraphs outline the data-driven approach behind the development of the weightage framework for the survey.

Approach

The four themes were discussed in order of significance to the survey, with justification provided for the sustainability impact of each theme and sub-theme.

i.   **Transport**

[3] https://www.worldometers.info/co2-emissions/singapore-co2-emissions/#:~:text=CO2%20emissions%20per%20capita%20in,in%20CO2%20emissions%20per%20capita
[4] https://www.nature.com/articles/s43247-021-00097-8#Sec1
[5] https://iopscience.iop.org/article/10.1088/1748-9326/aa7541/pdf
[6] https://cfn-live-content-bucket-iop-org.s3.amazonaws.com/journals/1748-9326/12/7/074024/1/ERL_12_7_074024_suppdata.pdf?AWSAccessKeyId=AKIAYDKQL6LTV7YY2HIK&Expires=1619592463&Signature=XrqScYRm5%2BHkkRJkXkPNnoDhMP8%3D

Transport is the largest contributor to an average person's carbon footprint. Transport accounts for higher overall carbon emissions per capita compared with other non-industrial regular individual activity, according to the Energy Market Authority (2019)[7].

The top two actions with the potential to contribute to systemic change and substantially reduce annual personal emissions are living car-free (2,400 kgCO2e saved per year) and avoiding aeroplane travel (1,600 kg CO2e saved per roundtrip transatlantic flight) [8] — in which both are transport-related. These actions have much greater potential to reduce emissions than commonly promoted strategies like comprehensive recycling (four times less effective than a plant-based diet) or changing household lightbulbs (eight times less)[9].

Overseas travel

The average Singaporean takes between 3 - 5 flights per year[10], and according to our world in data national flight statistics, Singapore's average CO2 emissions per person is 1,173kg, among the highest in the world[11]. Flying has been estimated as a high impact activity.

Domestic travel

Table 1:	
Average Singaporean carbon emissions in kilograms	
Average flight emissions	1,173kg
Average emissions from owning a car	2,200kg
Overall Singaporean carbon emissions	*8,000kg*
Average percentage of transport emissions	42%

According to the carbon tracker (within the SP Group app), when changing the variable of owning and using a car compared to only using public transport or a car-free commute, there is a 2,181kg CO2/year reduction of carbon emissions per year which amounts to approximately 25% of a Singaporean's average carbon emission per year. It can be established that personal car ownership and use has a high carbon footprint, whereas using public transport is estimated as a moderate impact activity.

Overall weightage for Transport theme

A conservative estimate for the overall weighting of individual carbon emissions for the theme of transport is between 40%-45%, with approximately 20% of a Singaporean's carbon emissions coming from flights and 25% from internal travel within Singapore (see Table 1). Available data for each individual transport activity[12] consistently showed that carbon emissions from transport were higher than carbon emissions[13] for other individual activities[14]. Assumptions were tested using the SP Group app *My Carbon Footprint* and the OLAM app *Adva.* Various travel-related scenarios were inputted based on varying flight paths and commuting habits. Transport generally accounted for between 40% and 76% of an individual's total carbon footprint.

[7] https://www.ema.gov.sg/singapore-energy-statistics/Ch03/index3#:~:text=Singapore's%20total%20electricity%20consumption%20rose,%25%20or%207.7%20TWh)%20sectors
[8] https://ourworldindata.org/carbon-footprint-flying
[9] https://iopscience.iop.org/article/10.1088/1748-9326/aa7541
[10] https://supertravelme.com/hotels/agoda-singaporeans-3-international-trips-per-year/
https://www.todayonline.com/singapore/sporeans-took-average-52-trips-last-12-months-criteo
[11] https://ourworldindata.org/carbon-footprint-flying
[12] https://www.researchgate.net/publication/264980855_What_can_eco-driving_do_for_sustainable_road_transport_Perspectives_from_a_city_Singapore_eco-driving_programme
[13] https://www.globalfueleconomy.org/transport/gfei/autotool/understanding_the_problem/About_Fuel_Economy.asp
[14] https://www.researchgate.net/publication/264980855_What_can_eco-driving_do_for_sustainable_road_transport_Perspectives_from_a_city_Singapore_eco-driving_programme

High emissions from transport supported the estimation that within the theme of transport, each individual transport question would be given a high impact score[15].

ii. Home

The Singapore residential sector accounts for around 17% of the country's total final energy consumption and the bulk of the energy consumption is in the form of electricity[16]. The breakdown of electricity consumed by Singaporean households by housing type in 2014 is shown below[17].

Table 2:	
Singapore electricity consumption by housing type in 2014	
Housing type	**Energy consumption as a %**
Private apartments and condominiums	25.8%
HDB 4 room	24.2%
5 room flat and executive	22.8%
landed properties	14.8%
HDB 3 room	10.7%
HDB 1 room	1.7%,
others	0.2%

The above data (see Table 2) supported the need for a qualifier question at the start of the survey relating to the type of residential property.

According to a recent study from the National Environment Agency (NEA) of Singapore, air-conditioning accounts for up to 24% of the electric bill for the average household and at the aggregate level, residential energy consumption is affected by socio-economic, climatic, and cultural factors[18].

Table 3:	
NEA Household energy consumption Study 2017	
Household Appliance	**Energy consumption as % of household use**
Air conditioners	24%
Fridge / Freezer	17%
Water Heaters	11%
Lighting	4%
Televisions	3%
Modems/ routers/ entertainments consoles	1%
Washing Machine	1%

Table 4:	
Energy consumption of household electrical appliances (according to (Energy Efficient Singapore government website)[19]	
Electrical appliance	**Electricity consumption per appliance as a %**
Lighting	6%
Fans	4%
Televisions	3%

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[15] https://iopscience.iop.org/article/10.1088/1748-9326/aa7541/pdf

[16] https://www.e2singapore.gov.sg/DATA/0/docs/1-s2.0-S0306261913006193-main.pdf

[17] https://www.eco-business.com/news/plugging-into-green-power-in-singapore/

[18] https://www.e2singapore.gov.sg/overview/households/saving-energy-at-home/households-studies

[19] https://www.e2singapore.gov.sg/overview/households/saving-energy-at-home/energy-saving-tips/more-energy-saving-practices-at-home

Modems/ routers / computers	2%
Other Kitchen appliances	2%
Kettles / Electrics pots	2%
Set-up boxes / entertainment consoles	1%
Washing Machine	1%

The sub-themes within Home have been weighted according to publicly available government data. Questions were chosen based on the highest impact activities within the home (e.g. air-conditioning and shower habits). The impact of individual activities for electricity (see Table 3 and Table 4) and water usage (see Table 6) in the home has been estimated according to the available government data.

Table 5:	
Household water usage [20]	
Water Appliances as categorised by pub.gov.sg	**Water usage per appliance as a %**
Shower	29%
Toilet Flush	17%
Kitchen	16%
Laundry	15%
Bathroom tap	12%
Basin	7%
others	4%

Water and electricity impact scores

Within the impact from Home, scores were given for each recorded activity. Water usages activities were estimated to have an overall high-impact score (see Table 5). Lighting contributes to about 30 percent of the electricity bill for a typical office and household[21]. Research suggested that energy efficient appliances in the home can reduce carbon emissions anywhere between 20% and 80%[22]. Activities relating to electricity have been estimated as high impact.[23]

Recycling impact scores

According to the available data, the materials that make up furniture items (largely wood or composite plastic) account for 21% of Singapore's overall generated waste. Not all of this will be furniture-related, therefore we can estimate this activity at moderate impact.

In Singapore, domestic household recycling for the three major waste streams (food, packaging, and e-waste) was at around 17%, according to the NEA,[24] which further stated Singapore produced 60,000 tonnes of electronic waste annually[25]. We have conservatively estimated that the activity of household recycling has a moderate-impact score.

Overall weightage for Home theme

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[20] https://www.pub.gov.sg/savewater/athome

[21] http://www.greenmax.com.sg/blog/led-lights-how-to-save-your-electricity-bill-in-singapore-7454.html
[22] https://www.e2singapore.gov.sg/overview/households/saving-energy-at-home/energy-saving-tips/more-energy-saving-practices-at-home
[23] http://www.greenmax.com.sg/blog/led-lights-how-to-save-your-electricity-bill-in-singapore-7454.html

[24] https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling
[25] https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/e-waste-management/extended-producer-responsibility-(epr)-system-for-e-waste-management-system

The representative estimated weightage for the overall theme of Home is 20- 25%. The Singapore residential sector accounts for close to 20% of the country's total energy consumption[26], according to the NEA study for Singaporean household consumption.

iii.   Food

Singapore imports around 90% of its food[27]. In terms of the global carbon footprint, food contributes to 19–29% of global greenhouse gas (GHG) emissions[28]. Were Singapore to reach its target of producing 30% of its nutritional needs locally by 2030, the per capita greenhouse gas emissions would reduce by around 5% compared to the current emissions rate for food consumption. The indirect carbon emissions related to the use of transport needed to import food to Singapore and possible reduction of food wastage may significantly increase this percentage. The impact score for sourcing food locally is estimated at moderate impact. The carbon footprint of meat transportation (specifically pork, mutton, and beef) is the most severe.[29] Eating a plant-based diet emits the least carbon (800 kg CO2e per year)[30], hence meat consumption is considered a high-impact activity.

Overall weightage for Food theme

The themes Goods and Food have been given the same weightage. The environmental impact of the theme and individual purchasing habits in relation to other regular activities placed the overall estimated weightage for food at 15%.

iv.   Goods

Unilever estimates that almost 70% of its greenhouse gas footprint depends on which products customers choose and whether they use and dispose of them in a sustainable manner—for example, by conserving water and energy while doing the laundry or recycling containers properly after use, according to Harvard Business review. Using this as a guide, it is estimated that the consumer habits of an individual and the overall minimisation of consumption is a high-impact activity.

Reusing plastic bags, plastic containers or beverage holders was considered a moderate impact activity, based on the most effective individual actions[31]. Reusing items and reducing waste may have occurred, but overall individual consumption may still be high. Carbon offsetting was considered a low-impact activity, as offsetting does not guarantee a reduction in consumption habits[32].

Overall weightage for Goods theme

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[26] https://www.e2singapore.gov.sg/overview/households/saving-energy-at-home/households-studies

[27] https://www.todayonline.com/singapore/explainer-how-food-singaporeans-eat-contribute-climate-change

[28] https://www.ecosperity.sg/content/dam/ecosperity/en/reports/Environmental-Impact-of-Key-Food-Items-in-Singapore_Oct2019.pdf

[29] https://iopscience.iop.org/article/10.1088/1748-9326/aa7541

[30] https://iopscience.iop.org/article/10.1088/1748-9326/aa7541

[31] https://iopscience.iop.org/article/10.1088/1748-9326/aa7541

[32] https://www.eco-business.com/research/carbon-offsetting-in-higher education/#:~:text=One%20part%20of%20the%20solution,there%20in%20the%20first%20place.

https://iopscience.iop.org/article/10.1088/1748-9326/aa7541

The themes Goods and Food have been given the same weightage. A representation of the environmental impact of the theme and individual purchasing habits in relation to other regular activities, estimated Goods at 15% for the overall weightage of the survey.

To conclude

The overall estimated weightages for each theme within the survey are:

1. Transport   45%
2. Home   25%
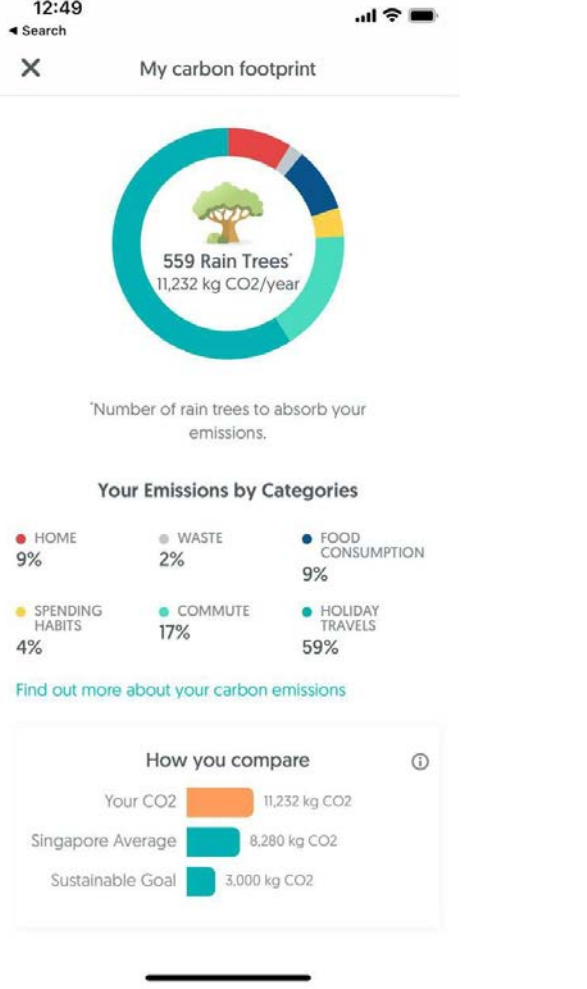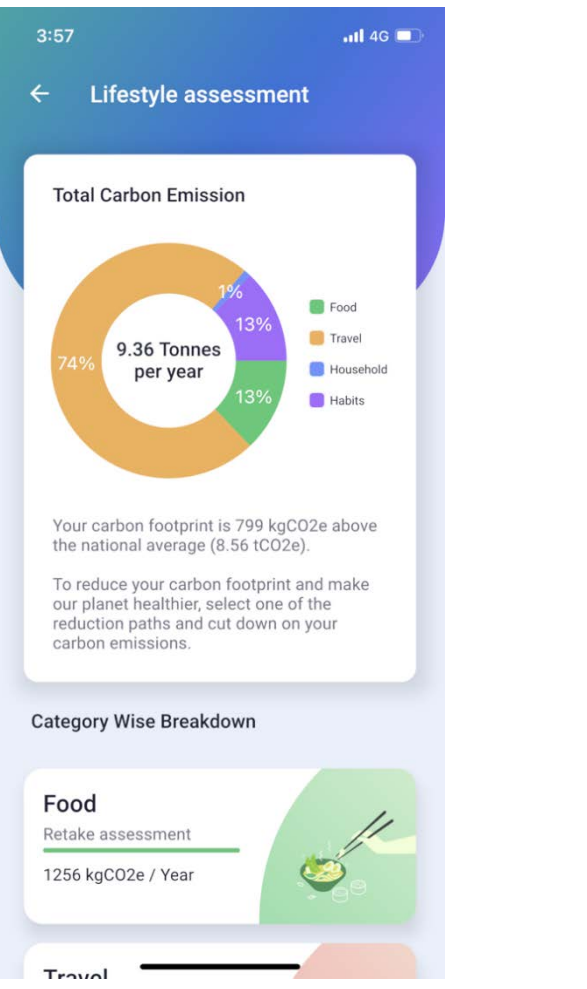3. Food   15%
4. Goods   15%

It is important to note that the environmental impact of individual daily activities is being measured and updated rapidly as the research in the field is expanded and refined. As mentioned on page one of this document, data for Singapore regarding sustainable development goal #12 *responsible consumption and production* was reported by the United Nations as *trend information unavailable*. This is representative of the complexities involved when attempting to assess the consumption habits of a nation.

Each of the impact scores and weightages provided by Eco-Business are estimated representations of the carbon footprint of individual activities, according to available data.

Given its expertise in sustainable development, Eco-Business provided the overall estimated weightages and the scoring scales for each activity area with the survey. OCBC Bank developed the research methodology.
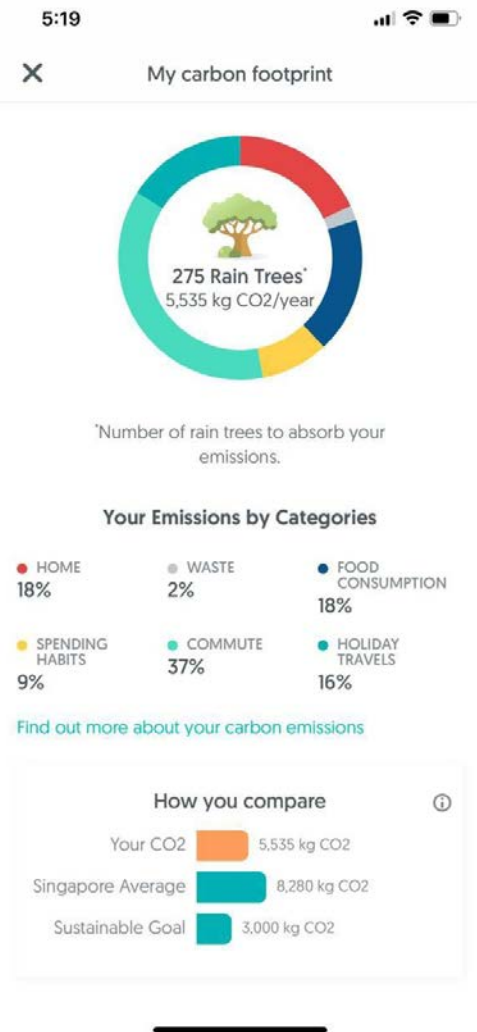
Appendices

SP Group app: *My Carbon Footprint*	Olam app: *Adva*
Assumption 1: Four flights a year, own or use a car regularly Transport: 76% 	Transport: 74%

Assumption 2: Two flights a year, own or use a car regularly.

Transport: 53%

Transport: 68%