

# **Project Lumina**

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## **ABSTRACT**

We are a group of secondary 4 students embarking on a category 4 project which aims to educate students on how to reduce their carbon footprint and at the same time, the consequences of a large carbon footprint on the earth, killing two birds with one stone, through our posters, mobile app and card game. Everyone plays a part in causing climate change due to the activities they do which results in a large carbon footprint. A large carbon footprint has led to dire consequences on the earth and will result in more serious problems, if it is not managed properly. Therefore, we chose to embark on this project.

### **1.0 Rationale**

Climate change is a very urgent issue which could disrupt our daily life drastically, but many people underestimate the problem. Reducing our carbon

footprint is possibly the best way to slow down the rate of climate change but many people do not know how to do so effectively.

## **1.1 Objective**

Our objective is to educate students on different approaches to reduce their carbon footprint in their daily lives and raise awareness of the effects of our large carbon footprint on the climate.

## **1.2 Target Audience**

Our target audience are secondary school students as they are studying the subject of geography, and our project corresponds to what they are learning in geography. Therefore, they are more impressionable and able to better understand how carbon footprint affects climate change

## **1.3 Resource Package**

Our resource package consists of a mobile app, card game and poster. The mobile app and card game helps to carry out our objectives better as they are the products that students can easily access (just in their phones and in their leisure time respectively) while our posters help to publicise the app and card game to our target audience.

## **2. Review**

### **2.1 Existing products**

There are a lot of websites out there to educate people on carbon footprint but most of them are wordy and are mainly US-centric, making it difficult for Singapore students to find resources suitable for them to apply to their lives

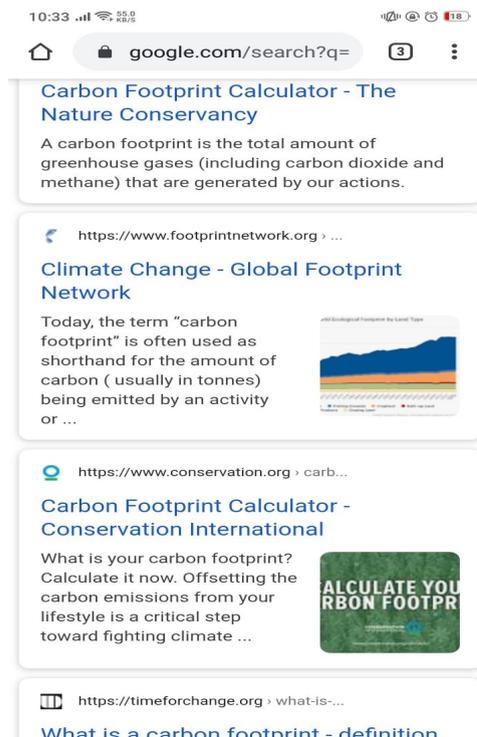
## Solar

Add solar panels to the roof of your home. This costs a little more than the above options, but many providers offer financing options which minimize upfront costs. Two examples are [SolarCity](#) and [SunRun](#). If you live in a state with a [Net Metering](#) law, you could eliminate your electricity bill or even *earn* money by selling electricity back to the grid.

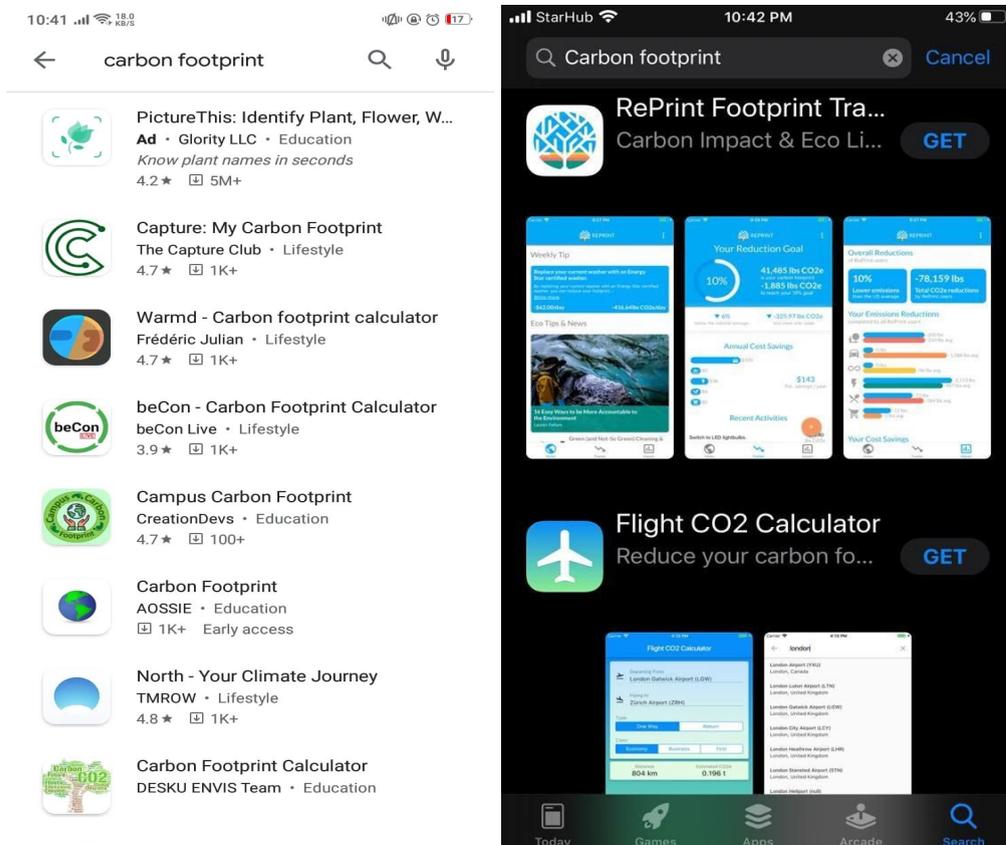
## Eat local, in season

Buying food that has travelled fewer air miles has become a truism in environmentally-conscious circles. But what if this logic was based on a partial fallacy? *Carbon-Smart Food*, a book by David Reay, a climate scientist at Edinburgh University, says it's more complicated than this. According to Reay, some of the products sold in the UK with surprisingly low carbon footprints are bananas imported from the Dominican Republic, apples from New Zealand and oranges from Brazil.

**5. Buy an electric car:** When it comes time to buy a new car, instead of buying a traditional car, why not buy electric? If it's too out of budget, consider buying a used EV or hybrid instead.



There are also some apps regarding carbon footprint but most contained only a carbon footprint calculator and did not contain any information



## 2.2 Our product (more detailed explanation later on)

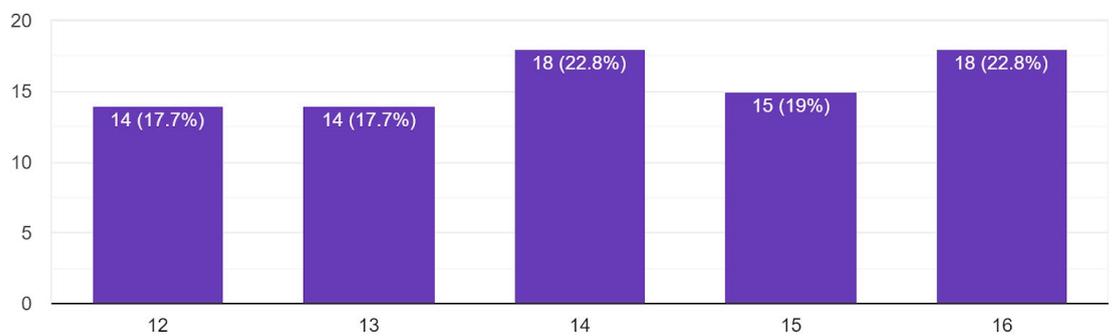
Our products have many features and uses, related to carbon footprint, and are specifically made for students aged 12 to 16 in Singapore. They have many features such as summarised information on climate change and carbon footprint, carbon footprint calculator, and a carbon footprint calendar, all in one. Therefore, making our products better and more suitable for our target audience and addressing our objectives. We did not want to create a website as there were already many available ones online and we find it inconvenient for students to access. No student would just pop open a browser tab to browse a website about climate change or carbon footprint.

### 3. Methodology

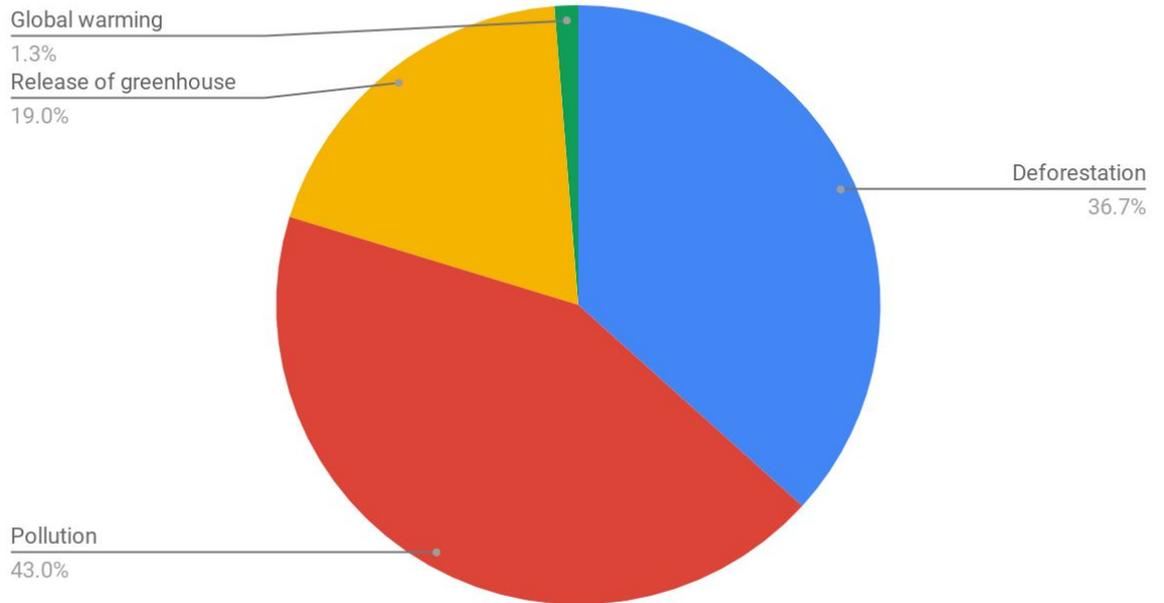
#### 3.1 Needs Analysis

We did an in-depth needs analysis to ascertain the feasibility of the project. We conducted two surveys with sample sizes of 86 and 79 respondents respectively using Google Forms, to find out more on the feasibility of this project.

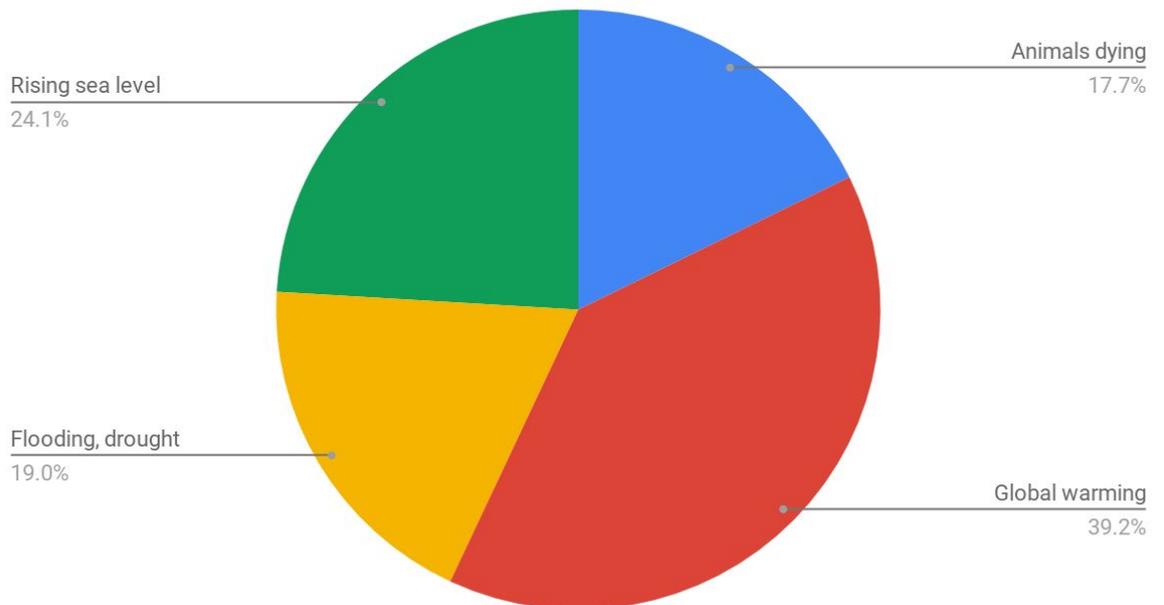
How old are you?  
79 responses



## What are some causes of climate change?

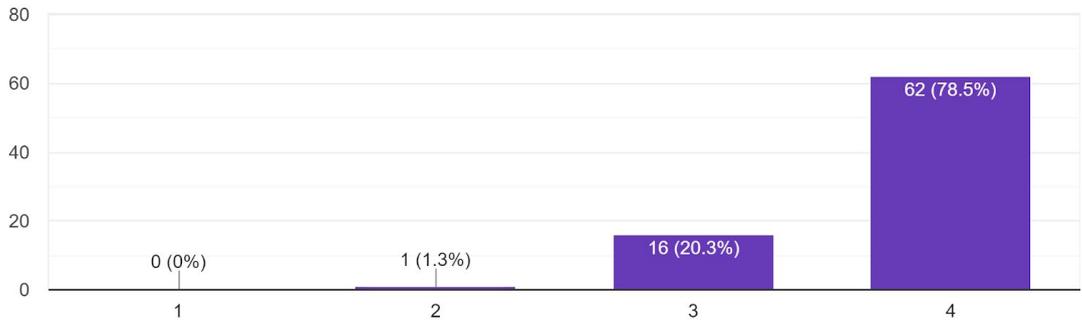


## What are some impacts of climate change?

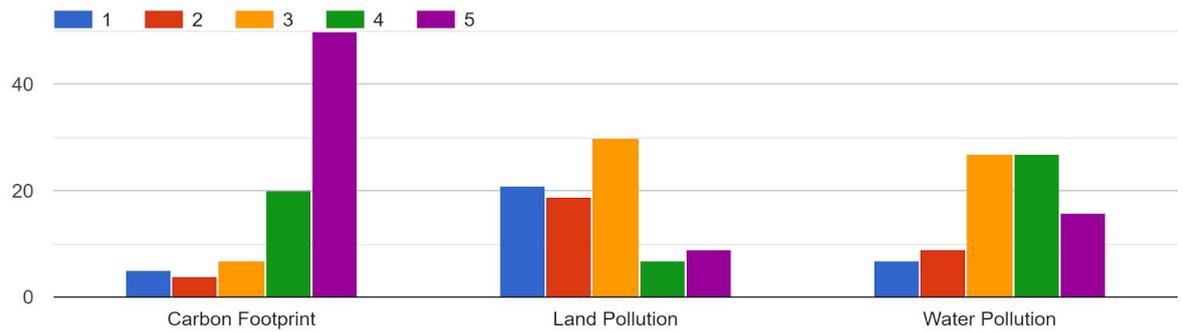


Do you think climate change is a serious problem(1 being not serious)

79 responses

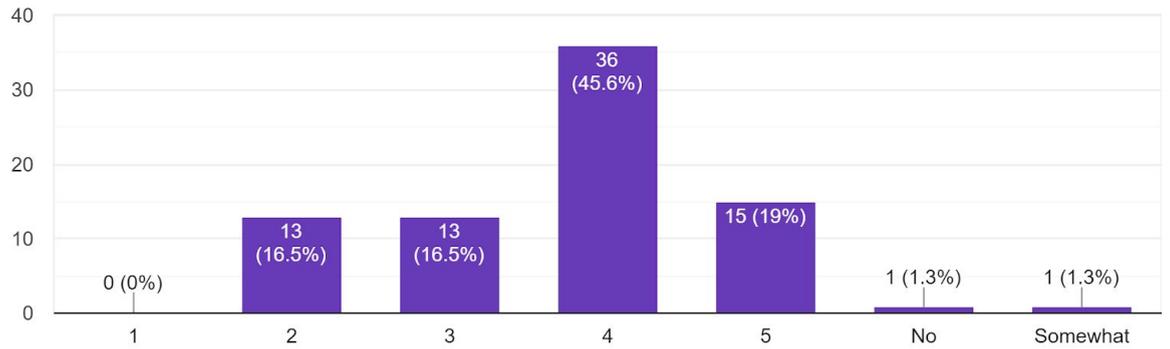


On a scale of 1 to 5(1 being your least favourite, 5 being your best choice), state how much interest do you have in each topic:

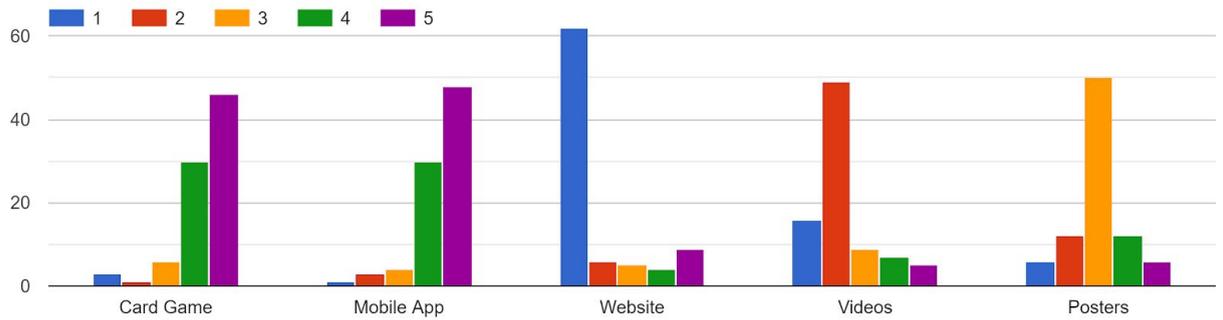


How would you rate your knowledge on reducing carbon footprint?(1 being the most knowledgeable)

79 responses



How would you like to learn more about climate change and carbon footprint?



All our respondents were secondary school students, and most claim to understand the issue but their responses showed otherwise. Majority chose carbon footprint as their topic of interest, and felt that climate change is a serious problem although they do not know how to properly reduce their carbon footprint.

After primary research, we also did secondary research through reading up online to study the severity and impact of a large carbon footprint on climate change. According to Nature.org, carbon footprint is the total amount of greenhouse gas emissions that come from the production, use and end-of-life of a product or service. As a result of deforestation, melting of ice caps and the exploitation of fossil fuel reserves, which serve as carbon sinks, these carbons are released into the atmosphere as CO<sub>2</sub>. The main molecules that can absorb infrared radiation are CO<sub>2</sub> and water vapor, because their atoms are able to vibrate in just the right way to absorb the energy that the Earth gives off. Moreover, according to NASA records, Earth's global surface temperature in 2019 was the second warmest since 1880 and 0.98 degrees Celsius warmer than the average temperature from 1951 to 1980.

After these needs analysis, we can conclude that there is a need for our resource package to educate students on ways to reduce their carbon footprint, because humans' large carbon footprint have resulted in climate change and it will lead to even more dire consequences, if not properly managed.

## **3.2 Construction**

The intended approach was to do comprehensive research to find more articles related to the problem. We used Google Forms to conduct our survey, and turned to online websites to find information, and reviewed available resources to find out what can be improved. For the production of our

package, we used free/cheap ways as much as possible. The posters were self-made using Piktochart, and we printed and laminated it by ourselves too. We wanted to use playmakingcards.com to create our cards, but it was troublesome and inefficient so we ended up designing the cards ourselves. It was printed and laminated by us too. Our app was built from scratch purely using the recommended Android Studio and Flutter. We used Instagram and the poster for marketing our package as they are cheap and suitable to attract our target audience. The pilot-test was conducted on our schoolmates and family members.

### **3.3 Products**

#### **3.3.1 Poster**

The posters contain information about climate change and our carbon footprint, and explain the relationship between them. The poster also provided 5 simple tips for our target audience on how they can reduce their carbon footprint. It is also used to publicise our main products, the Lumina card game as well as the Lumina app. They are already posted on Instagram, a very popular social media platform for students in SG, and shared to our friends and family, thus allowing more people to view it and be encouraged to play their part by reducing their carbon footprint.

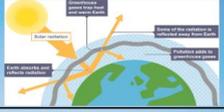
HWA CHONG INSTITUTION



# Project Lumina

Hi there! we are a group of Sec 4 students from Hwa Chong Institution and we form Project Lumina. We hope to help the earth by educating S1 to S4 students on how to reduce your carbon footprint and save the earth with tips of ours. We hope you can support our project and learn of the methods that can mitigate climate change.

**Climate Change**  
Climate change refers to any significant change in the measures of climate lasting for an extended period of time. It is often said to be caused by humans due to our over-reliance on fossil fuels and huge carbon footprint. In other words, human's carbon footprint directly impacts the severity of climate change, and everyone plays a role in causing it.



**Effects of climate change:**

| On the earth                                   | On people and other living organisms   |
|------------------------------------------------|----------------------------------------|
| Glaciers have shrunk                           | Death due to heatwave                  |
| Ice on rivers and lakes is breaking up earlier | Lengthening growing seasons for plants |
| Rising global temperature                      | Loss of habitat                        |
| Droughts                                       | Damage to infrastructure               |
| Accelerated sea level rise                     | Insect outbreak                        |
| More intense hurricane                         | Wildfire                               |
| Longer and more intense heatwave               |                                        |
| More frequent floods                           |                                        |
| Higher precipitate                             |                                        |
| Extreme weather                                |                                        |

**How we cause climate change**

|                                                                                                                                                                           |                                                                                                                                                                    |                                                                                                                                                                                                                           |                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Burning fossil fuels</b><br>eg coal, gas and oil, used to supply energy such as electricity and fuel for human uses- these release carbon dioxide into the atmosphere. | <b>Deforestation</b><br>Trees absorb carbon dioxide during photosynthesis. If they are cut down, there will be higher amounts of carbon dioxide in the atmosphere. | <b>Agricultural purposes</b><br>The operation of machinery requires the burning of fossil fuels. The use of inorganic fertilizers increases the amount of nitros oxide in the soil which is released into the atmosphere. | <b>Urbanization</b><br>The high concentration of cars, buses and other forms of transportation contribute to an increased amount of greenhouse gases emitted from these areas. |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**3 resource package**

App



SCAN CODE TO ACCESS OUR APP!

Carbon Footprint Let us do our part!

projectlumina2020

① **CHANGE YOUR TRANSPORTATION**  
Ride a bike or walk instead of taking the car, thus reducing amount of CO2 released



② **PLANT MORE TREES**  
Plant more trees to promote green living, and trees absorb CO2, thus reducing the amount of CO2 in the atmosphere




## SAVE THE WORLD

Reduce your carbon footprint by following these five easy steps. Help create a healthy environment for us to live in!

③ **Reduce energy use**  
Turn off all electrical appliances when not in use, reducing the amount of fossil fuels burnt



④ **3Rs**  
Reduce the amount of items we buy and consume less meat. Reuse and recycle items so that less waste is generated, which will fill up wastelands and burnt away



⑤ **Use less plastic**  
Bring your own reusable bags when out shopping and say no to use as little plastic as you can. This ensures that less plastic waste is produced which is harmful to the environment



Carbon Footprint Let us do our part!

Project Lumina

powered by PIKTOCHART

EVERY SMALL EFFORT COUNTS



MAKE A DIFFERENCE BY REDUCING YOUR CARBON FOOTPRINT

powered by PIKTOCHART

### 3.3.2 Card Game

Our Lumina Card Game will allow students to learn more about the deleterious effects of climate change and how they can help by reducing their carbon footprint. There are concise explanations about the different factors, impacts and ways to reduce our carbon footprint.



#### Rules of Card Game

It is a game for 2-4 players

The objective is to have the most number of cards paired

There are 3 type of cards

- Causes (C)
- Impacts (I)
- Mitigation(M)

- Each player has 2 cards. After every turn, if the player has less than 2 cards, he has to draw cards from the main deck. If there are less than 3 cards in the middle, it also has to be replenished
- Players must match causes with impacts, and vice versa; mitigations can be matched with both causes and impacts. Players must pair up cards from their hands and the 3 cards in the middle.
- The player who has the most cards wins.

### 3.3.3 Website

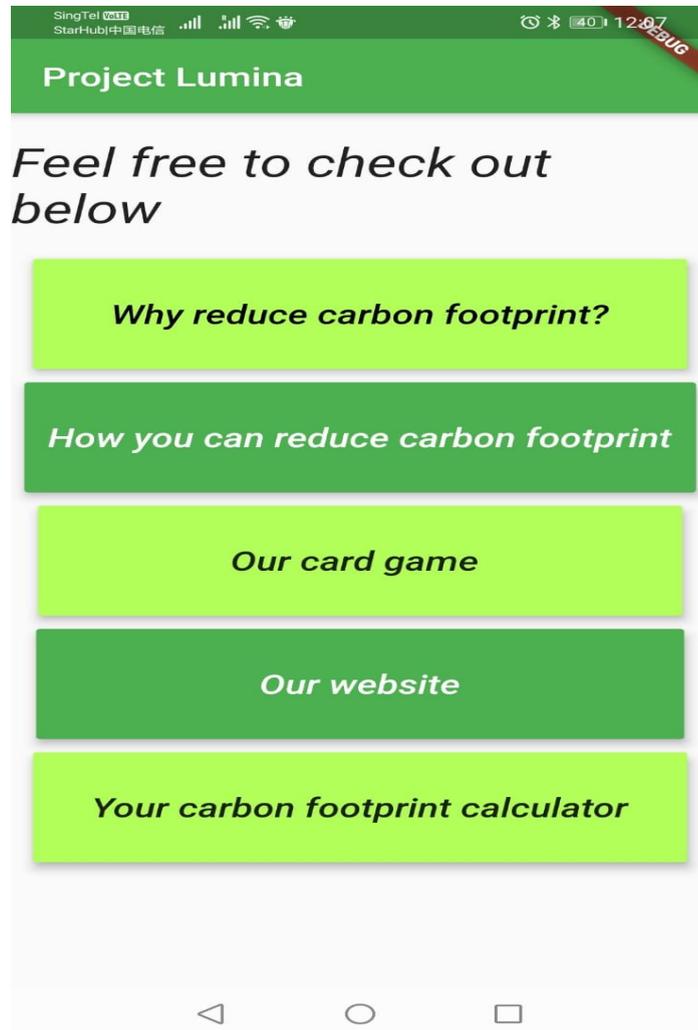
Furthermore, we created a website so that our target audience is able to read the information about the Cause, Mitigations and Effects of Increasing Carbon Footprint if they do not wish to play the card game.

Link to the website: <https://171364x.wixsite.com/mysite>  
<https://171388l.wixsite.com/how-you-can-help>  
<https://171388l.wixsite.com/why-reduce-cb>

### 3.3.4 App

Our mobile app is called The Lumina app. It contains 5 functions. The first function is to allow users to fully understand the impacts of global warming. The content in the first section is specially curated such that the 5 major and most immediate effects would be made known. The second function is to provide practical yet less well known solutions to reduce carbon footprint. These suggestions include refusing tote bags, unplugging idle devices, switching from gas to induction heating and many local examples, like #ChangeMakerSG@Repair Kopitiam to learn basic electronic repair skills. We added a test, with the questions taken from various existing online sources and edited by us to be suitable to be condensed into a 10 question test. The test would award an eco level and assign management recommendations. For our target audience to access our card game, information about it is provided in the app. We also have a feedback page to seek ways to improve our app.

The Lumina App can be downloaded through a Google drive link:  
[https://drive.google.com/open?id=1ZtKKj4qp9ZM1k24mz\\_YAeVmvFUvpp](https://drive.google.com/open?id=1ZtKKj4qp9ZM1k24mz_YAeVmvFUvpp)





Do your part

Spread awareness

# Why reduce carbon footprint ?

To tackle global warming is an important mission for us to create a sustainable earth for future generations. More specifically, in the area of carbon footprint.



Do your part

Take Action

# What you can do.

We could not always depend on governments and corporations to reduce their carbon emissions. Individuals could make a huge difference when united.

Get involved Today!

Examples of our content:

Text

### 3) Refuse Tote Bags

Tote bags may seem to be the reusable alternative to plastic bags, however, businesses are offering these bags like a commonality, because of their ubiquity, tote bags that have been reused very little (or not at all). As it turns out, canvas tote bags might be less eco-friendly than plastic bags because they're often made of cotton, which requires more energy and water to produce. According to one study from 2011, a tote bag's carbon footprint is 598.6 pounds of CO<sub>2</sub>, compared to 3.48 pounds for a standard plastic bag made from high-density polyethylene. Check around the house to see how many tote bags you can find!

### 4) Repair instead of replacing electronic devices.

Over 34 million tons of electronic waste are thrown out worldwide every year.

Stand against the buy-and-throw-away culture and cultivate a second-chance attitude when it comes to dealing with faulty electronics. Many electronics, like fans, irons, phones etc. can work just as well if you know where the faults are and repair them. This can ensure less waste is generated and save you money too.

There are many videos available on YouTube that will show you how to conduct simple repairs and help you understand how to replace parts.

The #ChangeMakerSG partner, Repair Kopitiam, is a great place to learn how to repair your electronics and discover neat tricks to maintaining them. At Repair Kopitiam, you will find 'Repair Coaches' helping Singaporeans fix all kinds of faulty products, from electrical appliances to everyday household items. Geneco

## 3.4 Pilot Test

Due to Covid-19, we were unable to carry out pilot tests on our friends. We seek to carry out the pilot test on social media and our family members. We posted our poster on Instagram and shared it with our friends via Whatsapp, and publicized our app and card game on Instagram. Majority of the feedback

given on the card game and poster were positive, except that it was a little bit wordy. These were some of the comments on the posters and card game

1. The posters are really aesthetically pleasing, and have served its purpose of enlightening us and emphasising on the importance of reducing our own personal carbon footprint. They are able to relay accurate information in a fun and engaging way, such as the methods that individuals can take to reduce our own carbon footprint.
2. The posters are very informative, and the information provided is easy to understand. It has a mixture of good colours which makes them very appealing. However, some of the words are a bit small to read.
3. The poster is colourful, aesthetically pleasing, and most importantly, extremely informative. I like how the 2nd poster makes use of steps to educate the public on how to reduce their carbon footprint.
4. The game rules and method of playing was very unique and fun to play, and at the same time learn more about the ways to reduce my carbon footprint.
5. The card game is quite fun to play. It is definitely something that I would play more often in my free time.
6. It has allowed the family to bond and at the same time allow my youngest child to learn more about the issue.
7. However, some of the cards are too wordy and contain too much information.

Their comments about the card game confirm the usefulness of our card game in educating students about the different causes, impacts of a large carbon footprint and at the same time, allow them to learn some simple tips to reduce their carbon footprint.

#### **4. Outcome and Discussion**

In conclusion, our resource package is successful as a whole as we achieved our objective, successfully being able to educate secondary school students on how to effectively reduce their carbon footprint through unique content

rather than the usual 3Rs, and raising awareness of the serious impacts on climate change through our resource package. However the card game is not very applicable during COVID-19 as it is a social activity, thus it would have limited utility during current times. Thus we have also learnt that digitalisation is the future trend. One area of improvement however could be that the application could have been more interactive with the user and we plan to get help from one of the infocomm teachers to create an in app carbon footprint calculator with inbuilt inputs about the carbon footprint for each transport, air condition and consumption of food carbon footprint values, thus users could get an accurate gauge of their carbon footprint for the day.

## **5. Conclusion**

Project Lumina had been a challenging project to undertake as it required much of our time despite the busy schedule and COVID-19 which led to the circuit breaker. It has resulted in us not being able to be there for each other physically and hampered our work progress. Moreover, it requires rigorous work to design the different resource packages, create them, and collate the information despite not being able to meet up in real life and help out each other. The whole project journey had enabled the group to develop many skills. Critical thinking, creativity were crucial in the early stages of the project. As we had no prior background in app development until now, we also had to learn this new skill to complete the project. We also gained the ability to make use of the Internet to our advantage and reduce our carbon footprint as we made the resource packages and shared the progress of our work. In the end, we were pleased to provide information, a well-constructed resource package to our target audiences. Having teamwork, resilience and communication skills were essential especially during the circuit breaker period. Patience and having faith in one another were the final elements that enabled the completion of the project as these motivated the group to believe that we had made the correct choice, thus relying on each other and going through

hardships as one. These values we learnt will be extremely useful in the future when doing other projects and especially in the working world

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