

# **Creating a Carbon-Free Community**

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# 1 Introduction

# 1.1 The Phenomenon & its Significance

Our project aims to mitigate the phenomenon of increased air-conditioning usage in households in Singapore.

From 2007 to 2017, Singapore’s household electricity consumption increased by 17%, and 24% of it is contributed by air-conditioning usage (Abdullah, 2018). Figure 1.1 shows household energy usage in 2017.

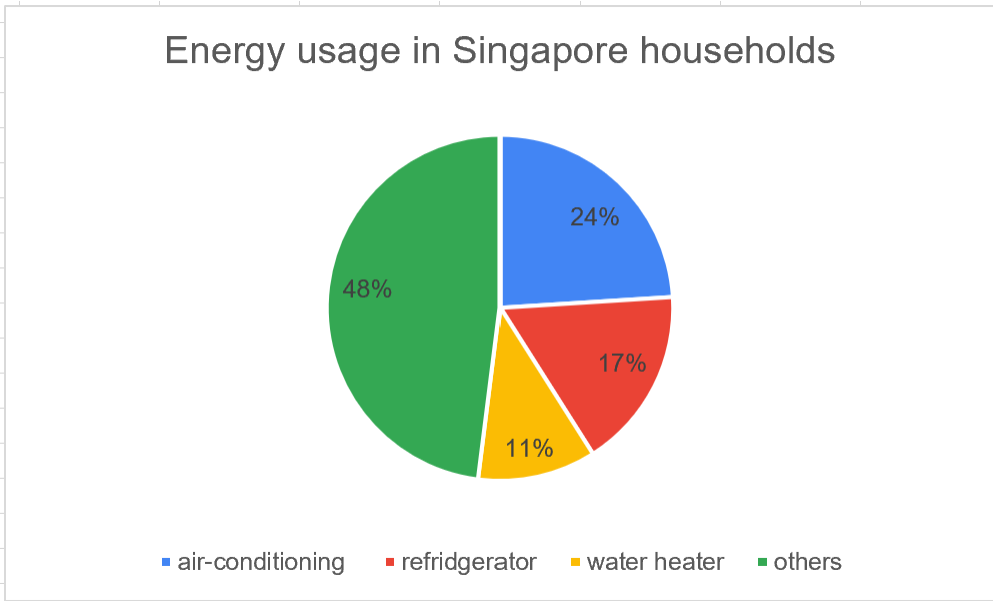


Figure 1.1: Energy consumption by Singapore households in 2017

According to Professor Lee Poh Seng, National University of Singapore, the number of air-conditioning installations in both residential and commercial areas is predicted to rise by 73 per cent from 2010 to 2030 (Kavickumar, 2020). The rise of air-conditioning usage will not slow down in the foreseeable future.

## 1.2 Positive Outcomes of Increased Air-conditioning Usage

Air-conditioning allows for cooling and enjoyment in tropical climates and has helped in the rise of cities in the tropics like Singapore and Dubai to become economic, trade and financial hubs by providing autumn or winter weather to the otherwise permanent summer (Harford, 2017), bringing greater comfort (Air Conditioners Considered as Basic Need for Singapore, n.d.). This is because human productivity is found to be peaking at lower temperatures of 20 to 22 degrees Celsius (Hot Temperatures Decrease Worker Productivity, Economic Output, 2018).

### 1.3 Negative Outcomes of Increased Air-Conditioning Usage

Firstly, air-conditioning contributes to climate change through high energy usage as Singapore's energy does not originate from green sources (Largue, 2021).

Secondly, Singapore is vulnerable to the effects of climate change, which are: rising sea levels, potential water and food security issues and loss of biodiversity (Impact of Climate Change on Singapore, 2021).

Air-conditioning releases excess heat into the surroundings (Wessels, 2016). In dense cities such as Singapore, surrounding temperatures spike, forcing people to use more air-conditioning, creating a vicious cycle. In Singapore alone, urban and forested areas can differ in temperatures by as much as 7 degree Celsius (Lin, 2016).

Although air-conditioning brings much comfort, its negative effects outweigh its positive ones. If this trend continues, the problems caused by high energy usage would only worsen, contributing more to climate change and risking Singapore's future. Hence, it is important to tackle this issue urgently.

## 1.4 Target Group

Our target audience is teenagers, aged 15 to 19, with air-conditioning in their households.

Households account for 20% of Singapore's carbon emissions (Kavickumar, 2020), the second largest contributor to carbon footprint, the amount of carbon compounds emitted due to the use of fossil fuels, in Singapore.

Targeting teenagers in households is effective. A research paper suggests that younger people are more active in the cause against climate change because it directly affects their future (Yang, Wei, Su, 2020). Teenagers are much more tech-savvy, making them the best audience as our solutions create an immersive experience for them through technology.

## 1.5 Current Measures

Many ideas have been thought of to address the problems of high air-conditioning usage. These include using water-based instead of refrigerant-based air coolers in homes (Hicks, 2018). There are also existing solutions in place such as the use of Artificial Intelligence (A.I.) systems that can cut energy use of air-conditioning by more than 20 per cent (A.I. technology that cuts energy use by more than 20%, wins top prize at inaugural innovation challenge by ENGIE, NTU Singapore and Jurong Health Campus, 2020).

There are also efforts by the National Environment Agency (NEA) such as the second annual Energy-Saving Challenge to encourage people to save energy (Abdullah, 2018) by setting their air-conditioning temperature to 25 degree Celsius and above (From Sustainable Gallery @ Marina Barrage, 2021).

## 1.6 Limitations of Current Measures

There are limitations with the existing solutions. Firstly, the measures mentioned above aimed at the general residential population do not tackle the root causes, habit and addiction, to air-conditioning usage.

The mentioned measures only improve technology and efficiency of air-conditioning, justifying people's use of air-conditioning to satisfy their addiction.

These solutions may not have much effect on household residents. Measures such as encouraging people to save energy or campaigns that simply raise awareness do not instil change among them. Hence, they may not actually use less air-conditioning (Neimand, Christiano, 2017).

## 1.7 Solutions Overview

We would use the Educate, Encourage and Enrich framework to address our target group aged 15 to 19 to solve the problem of increasing air-conditioning usage (Figure 1.2).

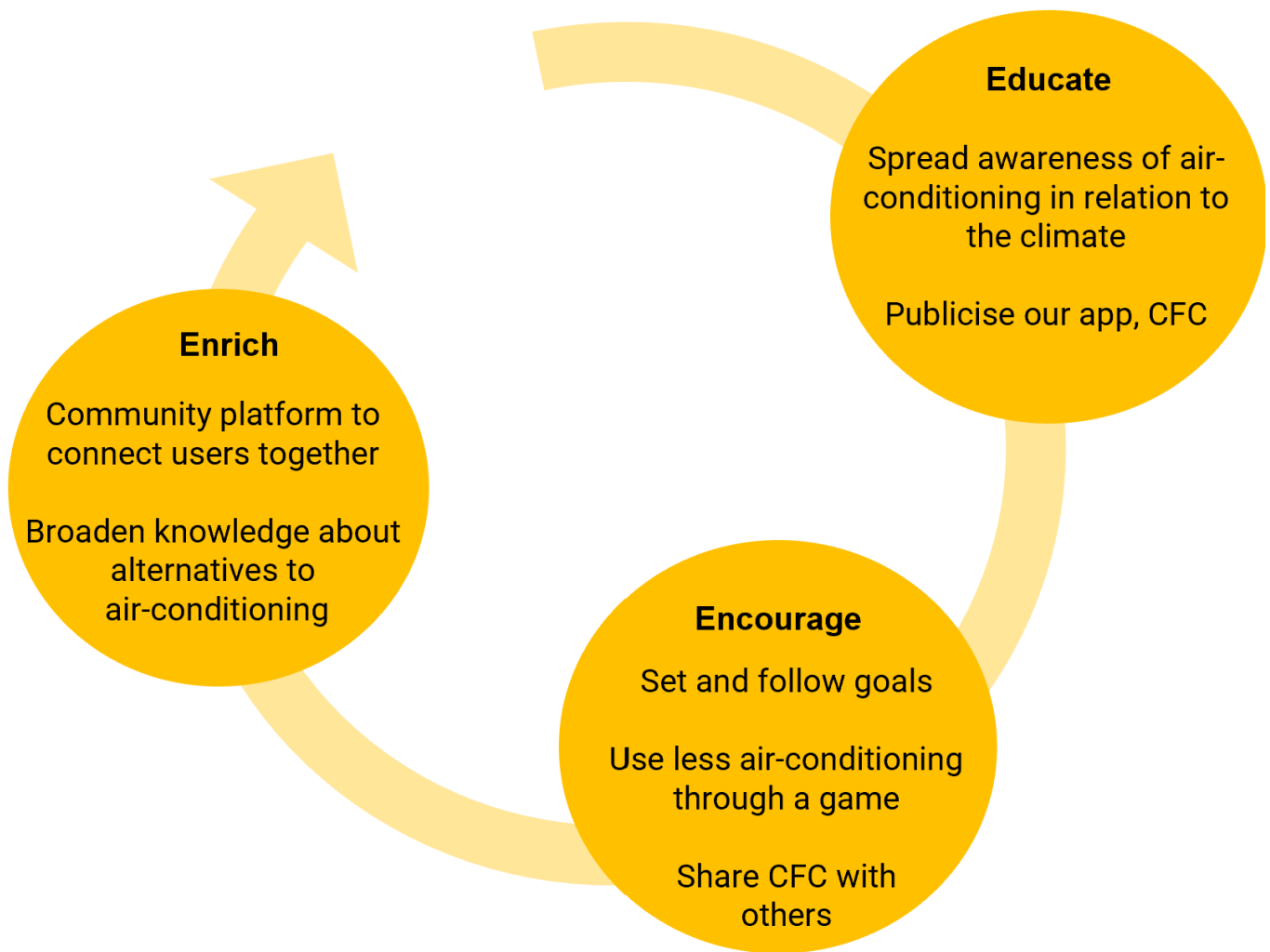


Figure 1.2: The Educate, Encourage, Enrich framework

## **2 Instagram Awareness & Publicity (Educate)**

## 2.1 Overview

To decrease the negative outcomes of high energy consumption, we wish to educate teenagers on the harmful effects of air-conditioning, hoping to be the first step for teenagers to change their mindset about air-conditioning usage.

Through the use of Instagram stories, we will promote the app to teenagers which will help to decrease the impacts on the climate via the reduction of air-conditioning usage.

## 2.2 Elaboration

Teenagers use social media platforms regularly, with 40% spending two to four hours daily (Teng, 2021). Thus, we use social media as a way to educate teenagers on the harmful impacts of air-conditioning on the climate. Specifically, we aim to tap into the fast speed of Instagram, a popular social media app, to aid in the fast spread of our education.

We use Instagram stories advertisements to raise awareness on increased air-conditioning usage. We designed the stories with local images showing unfavourable climate situations and huge words in the middle of the Instagram story to immediately capture teenagers' attention since Instagram is extremely fast scrolling (Landsberg, 2019) (Figure 2.1).



Figure 2.1: Instagram story on climate change

Teenagers would then wonder how they are destroying the climate. Hence, we immediately provide them with another Instagram story to show them that it is because of their air-conditioning usage that contributes to climate change (Figure 2.2).

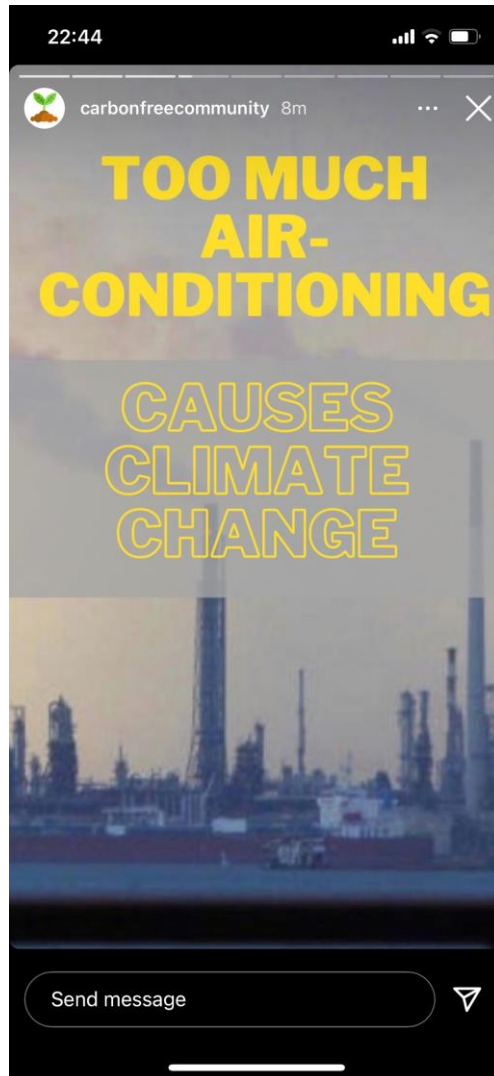


Figure 2.2: Follow-up Instagram story on how air-conditioning causes climate change

Next, teenagers are provided with another Instagram story to show that air conditioning constitutes 24% of energy usage in households, making air-conditioning a huge factor in contributing to climate change (Erskine, 2018) (Figure 2.3).

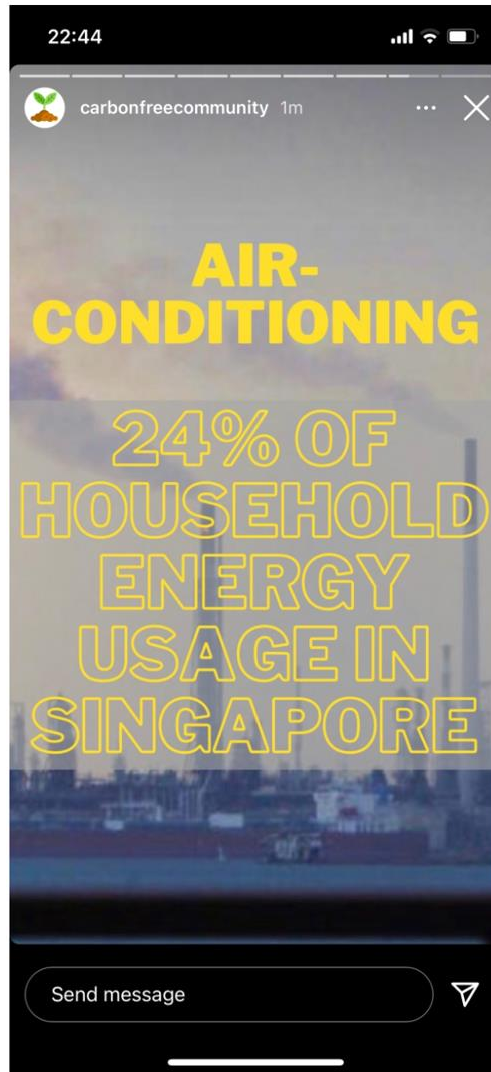


Figure 2.3: Instagram story on high energy consumption of air-conditioning

The next Instagram story prompts teenagers to find out more about this matter and download our app, Carbon-Free Community (CFC). It is deliberately kept short so that teenagers can read it quickly.

Mattias, a 17-year-old teenager who uses Instagram frequently, mentioned that teenagers preferred to do things that are convenient (Annex A). Thus, we make use of Instagram's swipe up function, to download the app straightaway (Figure 2.4). The background shows a dried-up nature reserve in Singapore, increasing the urgency that teenagers feel when they view the story, making them want to take action and download the CFC app.



Figure 2.4: Swipe up function to download the CFC app

Traditionally, the swipe up function allows businesses to make it easier for users to view the business' product site and boost sales (Droesch, 2019). Applying that to spreading awareness and promoting CFC thus brings about huge benefits.

Therefore, with the combination of these aspects of our Instagram stories, we hope to send a message to teenagers to decrease their air-conditioning usage and download CFC.

## 2.3 Strengths

Firstly, Instagram stories are extremely catered to teenagers as teenagers frequently read and watch Instagram stories (How Many People Use Instagram Stories [User Growth Chart], 2019). Mattias said that “stories are usually the main thing [he looks at ...on Instagram] so if [he sees] an advertisement it is most likely on Instagram stories.” (Annex A)

Secondly, the use of localised photos in the background of our Instagram stories are extremely effective as it makes people recall the effects that they experienced first-hand. This way, they relate it on a more personal level (Peters, 2015). Sanjjeev, a teenager who frequently uses air-conditioning, said that “local background images [give] me a sense of realisation that [...] I myself am affecting the climate and make me want to enact change so the scenes in the background won’t happen again.” (Annex A)

## 2.4 Limitations and Modifications

Pranav, a teenager who uses Instagram frequently, said we cannot fit everything that we have to say in the Instagram story due to lack of word space (Annex A).

To solve this, we used Instagram posts which allows us to add more words and help us to effectively deliver our message across. This way users are able to find out more about the cause we are fighting for as well as the CFC app. Figure 2.5 are examples of the first two slides of a post, showing the cause we are fighting for.

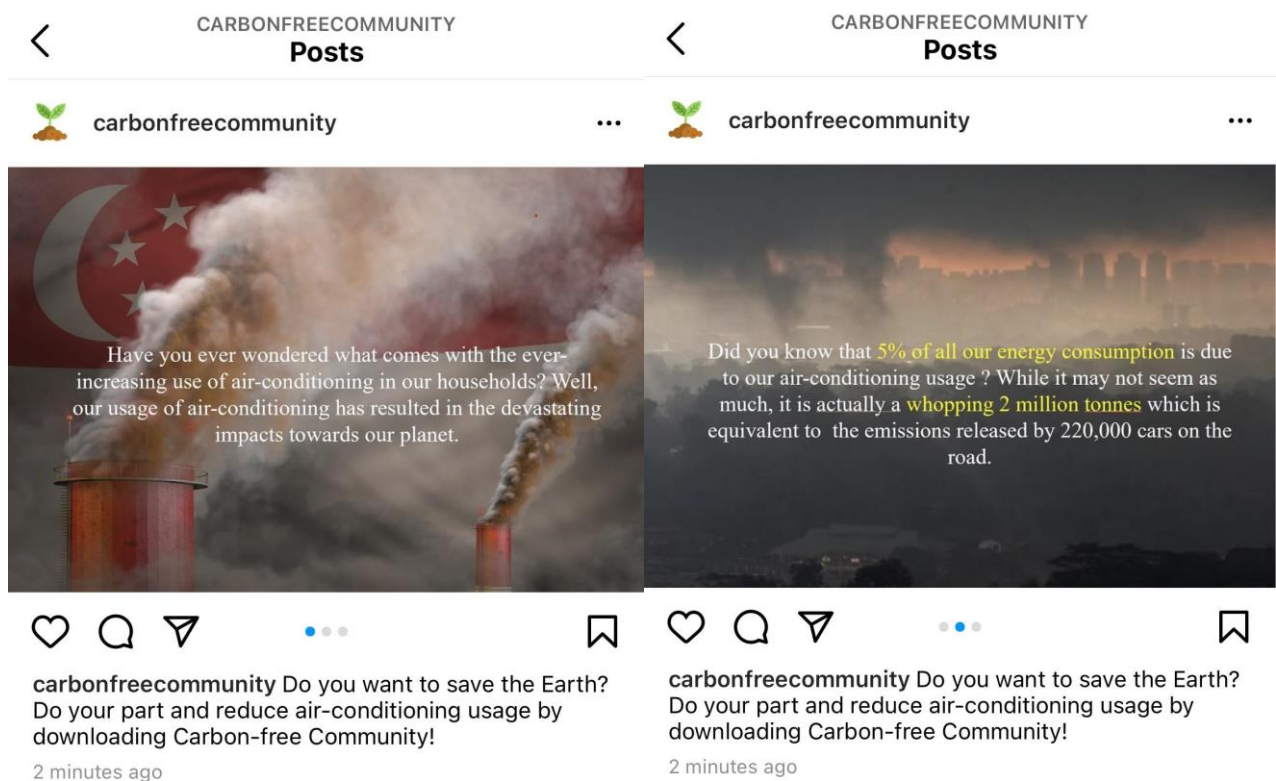


Figure 2.5: Instagram post on the effects of increased air-conditioning usage

Figure 2.6 shows the reason to download the CFC app: to do our part to reduce our air-conditioning usage to fight climate change.



Figure 2.6: The reason for downloading CFC app

A survey that we conducted, with respondents aged 15 to 19 (Annex G), showed that Instagram posts are a good modification (Figure 2.7).

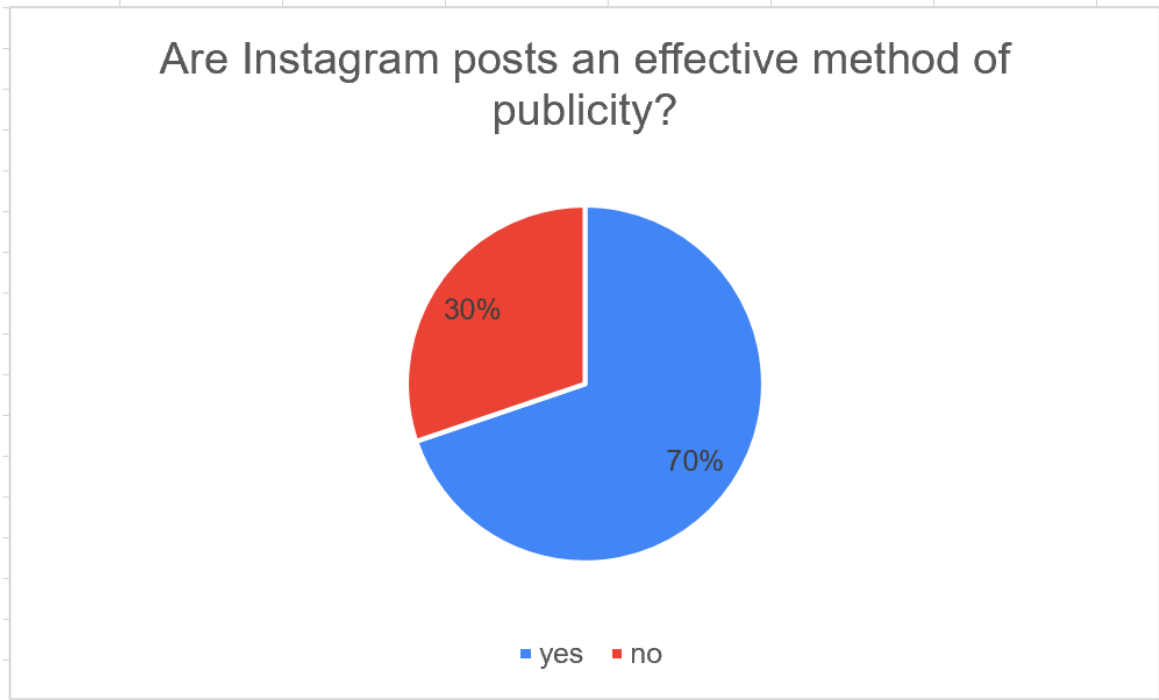


Figure 2.7: Survey results on the effectiveness of Instagram posts

### **3 Goal Setter & Game (Encourage)**

## 3.1 Overview

The Carbon-Free Community or CFC app seeks to decrease the negative outcomes of high energy consumption from air-conditioning usage. It has two main features: a Goal Setter and a Game.

We have two methods to sync our app with air-conditioning in households. Firstly, if the teenager lives in a smart home, the app and the air-conditioning can be directly connected via wireless.

If the teenager does not live in a smart home, they can purchase a simple gadget which will help them to measure their air-conditioning usage (Figure 3.1). The gadget directly links their phone app and air-conditioning via infrared and wireless (technical explanation in Annex I). From there, CFC app can directly measure air-conditioning usage.



Figure 3.1: How the gadget connects the app to the air-conditioning

## 3.2 Elaboration

### 3.2.1 Goal Setter

The Goal Setter helps teenagers keep track of their air-conditioning usage. An overview of their weekly air-conditioning usage would be shown (Figure 3.2).

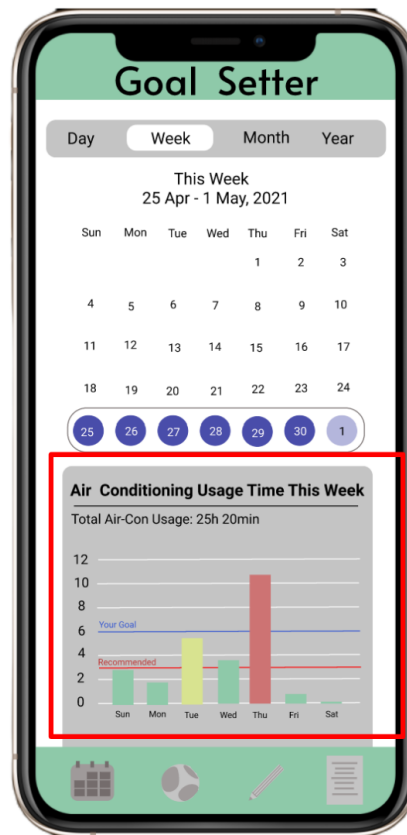


Figure 3.2: The Goal Setter

Teenagers can set simple targets on the number of hours of air-conditioning they intend to use by sliding the button around (Figure 3.3). When they meet their targets, they are rewarded with in-game credits (another word for coins) (Annex H).

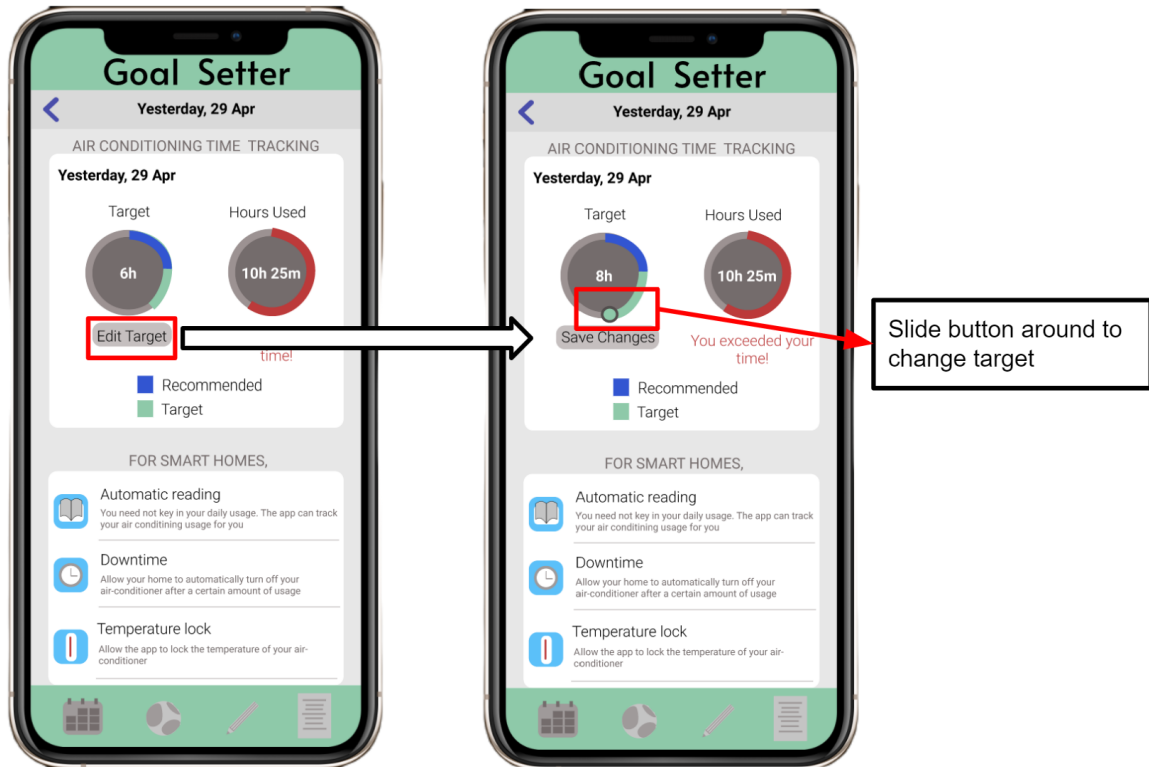


Figure 3.3 Editing targets on the number of hours of air-conditioning usage

### 3.2.2 Game

The Game consists of many features. These include simulations, Quests, Friends' worlds, and "Invite a friend". Teenagers have to take care of a virtual simulation. Their real-life air-conditioning usage impacts how healthy their simulation is.

There are two simulations, namely Ecosystem and Earth, that teenagers can choose from (Figure 3.4).

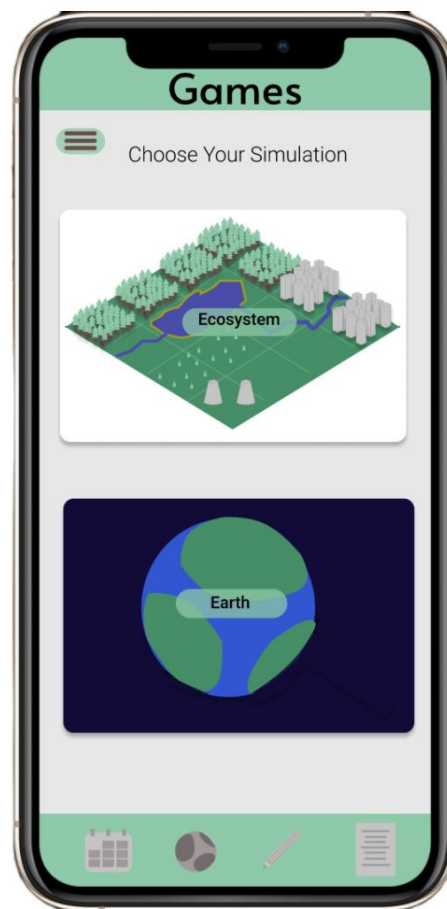


Figure 3.4: The two simulations, Ecosystem and Earth, in the Game

If teenagers exceed the recommended limit in the Goal Setter, the simulation will start degrading. On the other hand, if they use less than the recommended limit, the simulation will flourish. These help to discourage teenagers from using too much air-conditioning, by making them guilty of their usage.

Our first simulation is the Ecosystem (Figure 3.5). The degrading simulation on the left in Figure 3.5 shows forests dying, rivers and lakes going dry, while the simulation on the right shows forests flourishing, rivers forming, a more diverse ecosystem and city population increasing. The health bars of the respective simulations decrease and increase respectively.

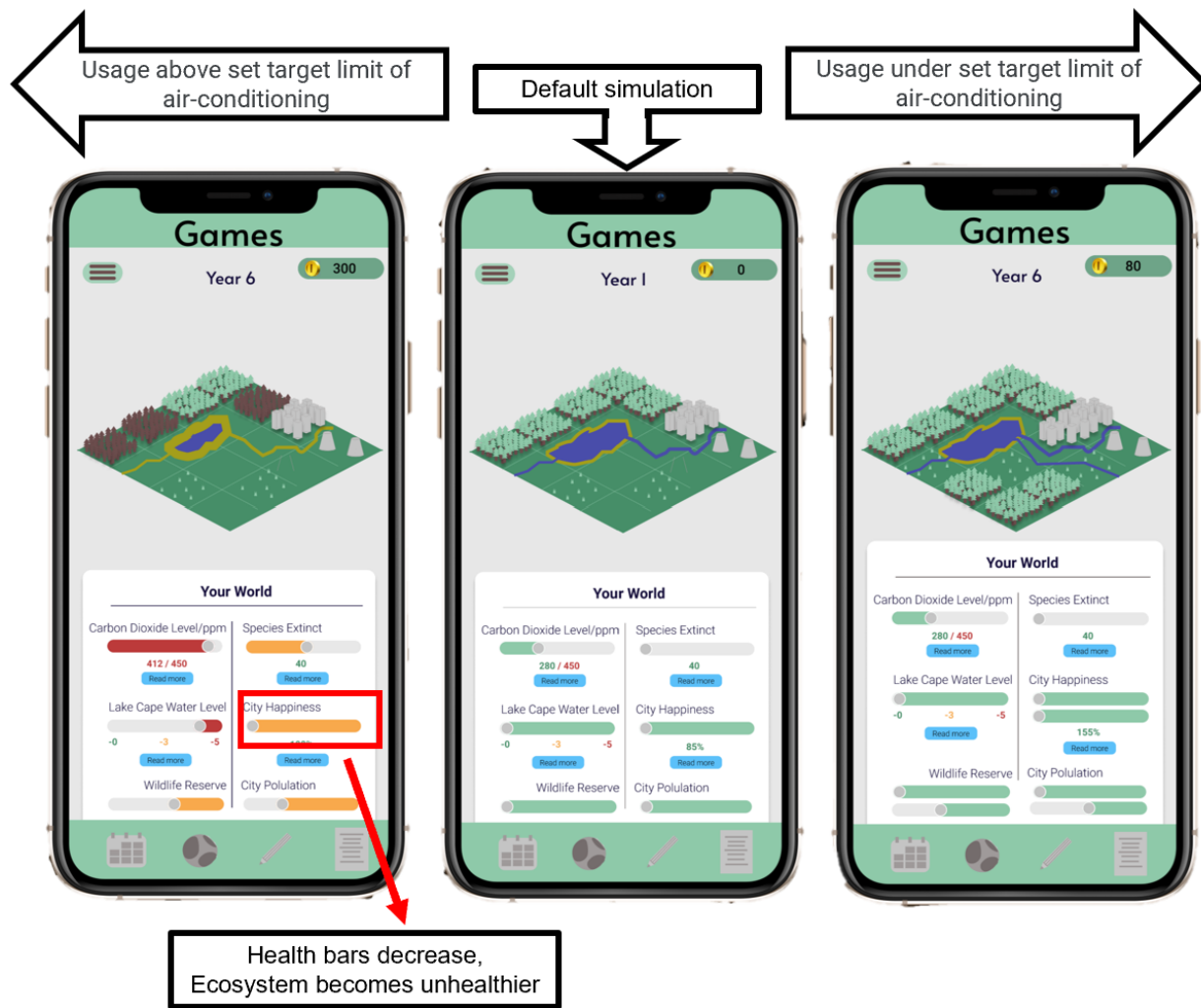


Figure 3.5: Examples of unhealthy (left), default (centre), and healthy (right) Ecosystem simulation

Similarly, this concept applies for the other simulation, Earth (Figure 3.6).



Figure 3.6 Examples of unhealthy (left), default (centre), and healthy (right) Earth simulation

The Game has Quests, such as not using air-conditioning for a week, that the teenagers can complete and receive more rewards, like in-game credits and forest. After completing enough Quests, teenagers can claim a “Real-life Plant” token. Teenagers can use this token to plant a tree in the real world, to have a real-life impact to fight against climate change (Figure 3.7). The system will digitally update the number of tokens used by teenagers, and organisations, such as our local Garden City Fund’s “Plant-A-Tree Programme” (Plant-A-Tree Programme, 2020), that we collaborate with, will plant that number of trees in local communities. Teenagers can also choose to volunteer and plant a tree in those local communities, allowing them to feel more involved in this fight against climate change.

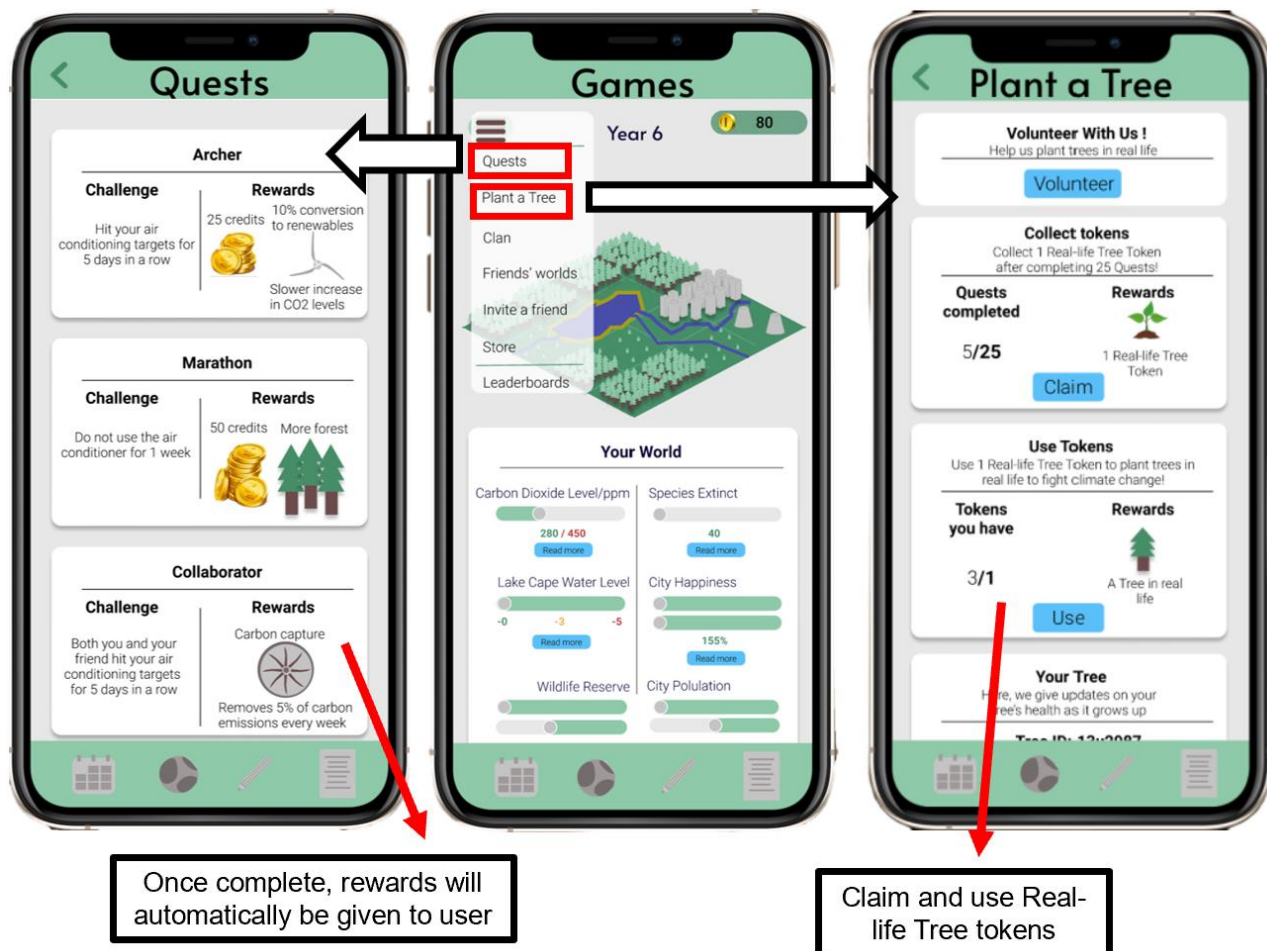


Figure 3.7: Quests and plant a tree in real life

Teenagers can access friends' simulations and check their progress. By tapping the plus sign, teenagers would be able to search for online friends, to give and accept friend requests. They can also see their friends' hours of air-conditioning usage (Figure 3.8). This provides an even stronger competitive environment because teenagers can compare their own progress with their online friends'.

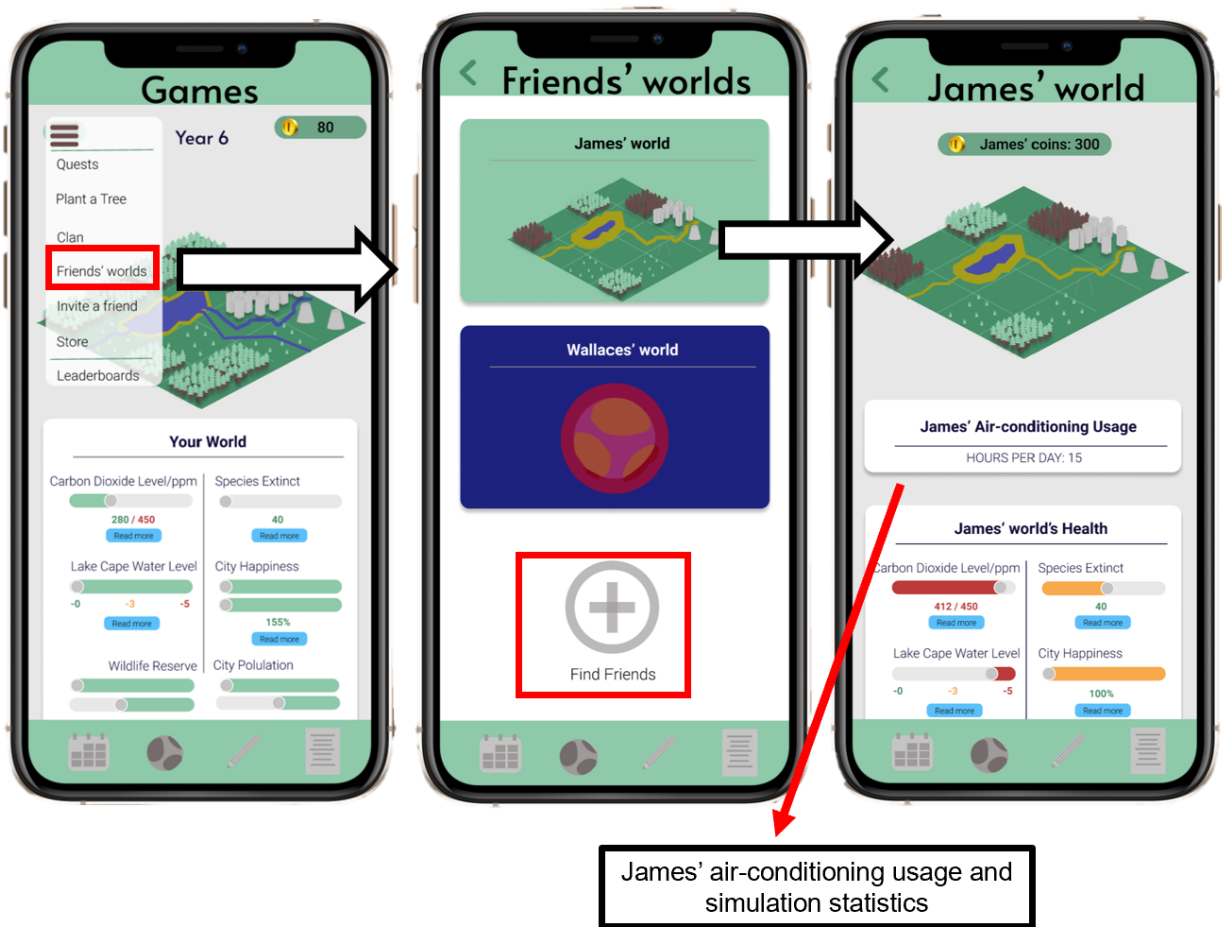


Figure 3.8: Access to friends' simulations

“Invite a Friend” is a part of the Game that further builds on our publicity method. Teenagers can invite their friends to download CFC and play the Game. Incentives for them to recommend CFC to others include more in-game credits and nutrients for their plants in the Game (Figure 3.9). This feature increases their competitiveness because they give teenagers an advantage over their peers in the Game.

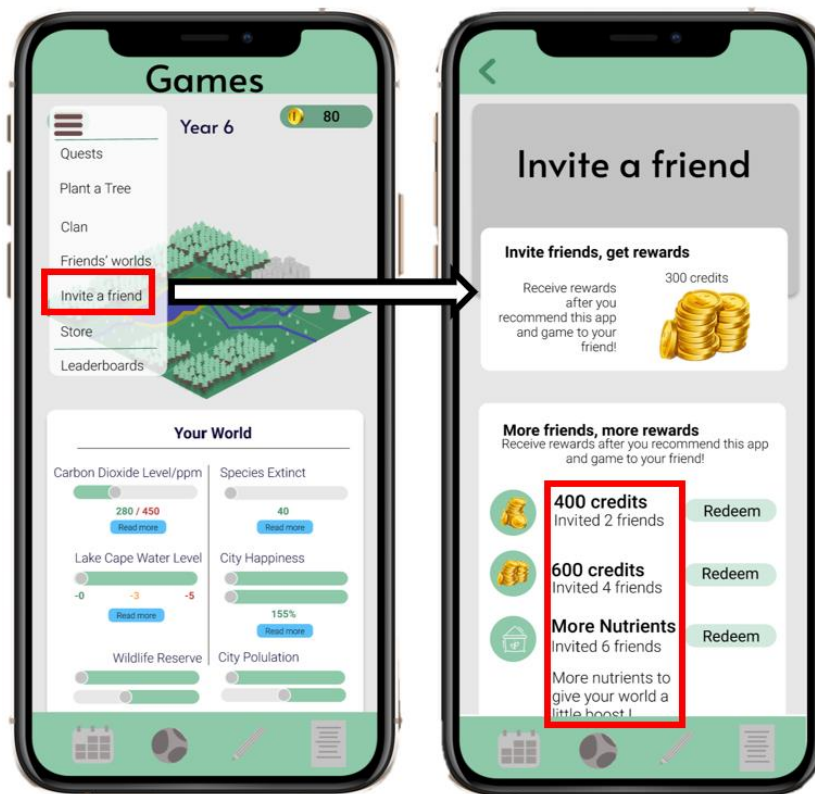


Figure 3.9: Invite a friend to get in-game credits and more nutrients

### 3.3 Strengths

Sanjeev said that the Game's simulations, Ecosystem and Earth, are "good because [they make] you take some sense of responsibility." They "[make] you feel disheartened when your earth and ecosystem die." (Annex C) It is shown that simulations that invoke a sense of responsibility in teenagers are effective (Stay Focused and Increase Productivity with the Forest App, 2021). The same concept can be applied to our CFC app.

The Game has a tangible contribution to the real world in "Real-life Plant" tokens. Mattias said that planting real trees in the real world to fight climate change "is very meaningful" (Annex C).

A research paper explored youths' increasing sense of responsibility when given the opportunity to create real change in their health. We can apply the same concept to the use of air-conditioning (Cargo, Grams, Ottoson, Ward, Green, 2003). Thus, youths being motivated to make a real impact to fight climate change makes them have a greater sense of responsibility, improving the efficiency of the Game.

### 3.4 Limitations and Modifications

Sanjeev said “some people may not [consistently] check the app, they may not know how much time that they have left.” (Annex B) They might accidentally burst their target. We can add a notification system which informs them when they are reaching the threshold of their air-conditioning usage. Notification systems help to increase their effectiveness of the app by giving them reminders (Push Notifications Statistics, 2021).

The Game might get boring if the app is the same throughout their user experience. In response to this, we can add variations to the simulations present, also having the simulations change according to the weather in Singapore, like hazy, rainy, etc. This reduces the boredom that teenagers might feel, encouraging teenagers to continue using the app (What Makes a Good Video Game? 4 Key Elements, 2014).

## **4 Feed Page and Design Page (Enrich)**

## 4.1 Overview

To enhance or maintain the positive outcomes of the comfort and productivity that air-conditioning brings, we integrate more features into our CFC app.

The Design Page seeks to help users to learn how to use alternative methods of cooling down such as using fans and cross ventilation through suggestions and tutorials. The Feed Page is a community platform that allows teenagers to share the ways they cool their homes down.

## 4.2 Elaboration

### 4.2.1 Design Page

The Design Page gives general information and tips on how to cool the house down using alternatives to air-conditioning (Figure 4.1).

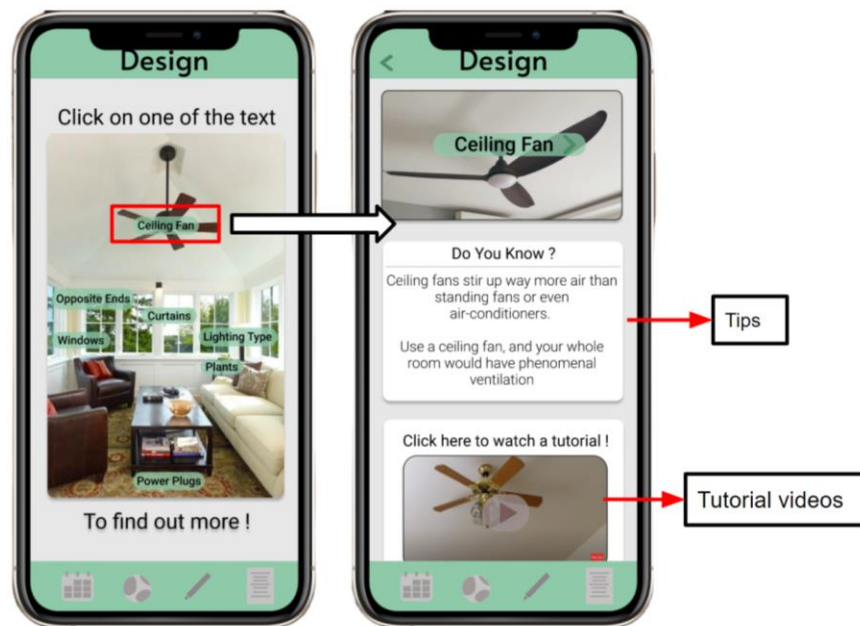


Figure 4.1: Tutorials and Tips for alternative home cooling methods

## 4.2.2 Feed Page

The idea behind the Feed Page is to have posts by teenagers on decreasing air-conditioning usage or using alternative solutions to air-conditioning shared using the app. The posts have a like, comment and save button where users can choose which posts they would like to visit again (Figure 4.2).

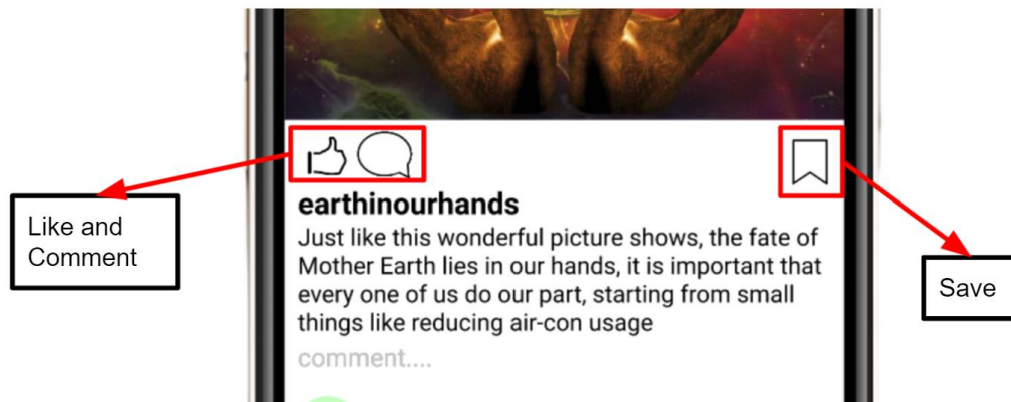


Figure 4.2: Like, comment and save buttons on the Feed page

The Feed Page emulates the Instagram layout, which makes it easy to navigate for teenagers since Instagram is widely used (Teng, 2021). Teenagers can use this post function to share methods they use to cool their homes or rooms down.

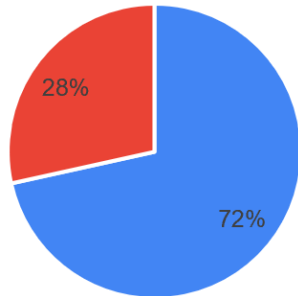
Everyone's home layout is different, and it is impossible to predict everyone's home layout. When users post about their alternative cooling methods, there will be many different layouts shared. The concept behind this is that when there is a huge sample size of home layouts, the chances of two people having the same home layout is higher than just CFC giving tutorials and general alternative methods as recommendations in the Design Page. We face this challenge as a community, not an individual.

## 4.3 Strengths

The Design Page allows teenagers to broaden their knowledge on how to reduce air-conditioning by exploring alternatives to air-conditioning. Darshni, a 17-year-old, said “the tutorials in this page are clear on how the users can reduce the amount of air-conditioning used.” (Annex E)

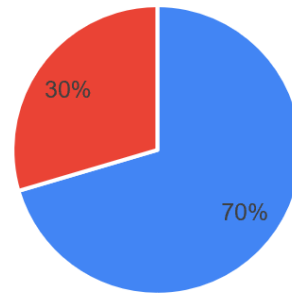
The Feed Page allows teenagers to share and build upon each other’s ideas which caters to each teenager individually and allows them to use the suggested layouts effectively. Sanjeev mentioned that “it acts as a site for people to come up with new innovative ideas. This is because these ideas are rebounded off of one another.”(Annex F) Figure 4.3 shows our survey respondents, from the same survey as before, think positively about the Design Page and Feed Page.

Is the Design Page an effective solution to reduce air-conditioning usage?



■ yes ■ no

Is the Feed Page an effective solution to reduce air-conditioning usage?



■ yes ■ no

Figure 4.3: Survey results on the effectiveness of the Design Page and Feed Page

A research paper found that social media community platforms allow for levels of cooperation and collaboration never seen before (Moore, Chuang, 2017). This makes them great platforms for the whole community to solve issues together, one such being high air-conditioning usage.

## 4.4 Limitations and Modifications

Cadee, another 17-year-old teenager, said that “teenagers might not have full control over the whole house.” (Annex E) They would only be able to at least change their room layout, and cannot apply all the concepts in the Design Page.

While this would partly be true for a short period, it is more likely that whole families would also incorporate similar habits throughout the entire house if the teenager proactively raises such ideas to them because these design features are effective.

We know this because Shirley Ho, mother to a teenager, said that she “will adopt [my child’s] idea if I think it is a feasible solution to a problem that affects all the family members.” (Annex E)

We can modify the Feed Page to an even stronger community page, which emulates Reddit more than Instagram. Reddit is a community interactive platform while Instagram is a posting-and-viewing platform. This was suggested by Mattias (Annex F). The main part of this page will be the “Forum” instead of the posts. This interactiveness causes users to be more likely to start using or recommend the app (Shetty, 2019), and therefore allow our cause to expand and mitigate the phenomenon at hand.

## **5 Conclusion**

Through the CFC app, our aim is to promote the decrease in air-conditioning usage at the same time maintaining its positive effect, comfort, through alternative sources of cooling.

We can expand on the project by looking at other target groups such as other household members like adults. We can delve into different products to enhance the air-conditioning-lite experience, such as an all-in-one product that encompasses: a meter to measure air-conditioning usage, air-quality index, and air-purifier that links with our app. This makes the transition to an air-conditioning-free Singapore an easier task.

**(Word count: 2983 words)**

## **6 Annex**

## Annex A: Feedback on Instagram

“Instagram ads are a great idea but sometimes I tend to just skip pass them because I’m so used to tapping the screen, so unless it’s like very unique or eye-catching then like I’ll go back but if it’s just a normal and then I’ll just scroll pass” ~Cadee

“Honestly I think Instagram is my most used app and I spend a lot of time on it. I also spend majority of that time on stories as they are the most interesting and entertaining.”  
~Sanjeev

“I feel that Instagram is a great way to get exposure to new products and items. When I am watching some Instagram stories, sometimes some products like shoes or wallets pop up, and sometimes I am attracted to these products. Furthermore, the swipe up feature is super convenient as it allows me to immediately go to the website of these products.  
~Sanjeev

“I use Instagram a lot, and stories are usually the main thing I look at in Instagram when I am bored or I just want to kill time by scrolling Instagram quickly, so if I see an advertisement it is most likely on Instagram stories and since teenagers nowadays always find the easy way to everything, the swipe-up feature will be of easy-use for them”  
~Mattias

“However, I feel that you would not be able to put in a lot of information in one Instagram story as there is not much space and hence it won’t be able to raise awareness as much.”

~Pranav

“The use of local background images give me a sense of realisation that we are also experiencing the negative impacts of climate change right here in Singapore, and I myself am affecting the climate and makes me want to enact change so the scenes in the background won’t happen again.” ~Sanjjeev

## Annex B: Feedback on Goal Setter

“It’ll help users to track their aircon usage because most of the time when you don’t have all these tracking you’ll leave it on without knowing how long you leave it for so the app will be a way for us to record our usage and then it’ll let us be more aware of how long we are using it for” ~Cadee

“I feel like the Goal Setter is something that can be translated into real life. It would really be useful as a step that every individual can take to prevent them from over using the air con. People may not really be able to keep track of how much air-conditioning they use, hence this Goal Setter will allow them to take note and use them limitedly when it pops off notification reminding you on how much air conditioning you have already used.”  
~Darshni

“About the app, in order to make it work, there are only two ways to track the air-conditioner usage: first is to have the app directly connect to the air conditioner which automatically tracks air-conditioner usage, and second is to key into the app itself how much one used. For me, I would be either too lazy to key in or I would forget about it and we have to look at the reality that most people, or at least those around me, and me included, do not use a smart home system.” ~Mattias

“The Goal Setter is a really good idea as when I see the notification come to us saying that i have 5 mins left i stop using the app so as to save the time and I also try to go under the limit because it’s a personal sense of satisfaction. What you guys can do is link your Goal Setter idea to a notification system so that people can see if they have time left. Because some people may not check the app, they may not know how much time that they have left. So they may end up checking the app only at the end of the day.” ~Sanjeev

## Annex C: Feedback on Game

“Okay the first one (the ecosystem) the colour scheme is better than the second one (the globe). The colour (for the globe) is like it’s very dark like the contrast of the green and the blue is not very aesthetically pleasing yea” ~Cadee

“I think definitely yes if we all like use the app to track the aircon usage then personally I’ll be more inclined to be more aware of my aircon usage, but I can’t say the same for other people, it’s more of an individual responsibility kind of thing but I think for me personally it’s definitely help” ~Cadee

“Yea overall its quite a good idea i would say and quite interesting because you usually wouldn't think about aircon consumption which i think pretty good like I would try to if I use the app i would probably try to reduce my consumption more lah. But also cause like maybe like if there any incentives for people who for example like in a week save the most or use the least air con or something like that” ~Cadee

“Ah maybe that’s something you can think about cause like if for some people maybe they wouldn't be so inclined to reading their aircon usage if there isn't really a real incentive rather than just like the virtual kind of coins or reward system yea, such as vouchers”  
~Cadee

“I think with enough publicity should be okay like because your target group is teenagers and I think with enough publicity they would go and try if they are curious about it” ~Cadee

“I honestly feel like the app is great. It encourages people to become more eco-friendly and also to think about the earth. It also links a lot to reality like how the ecosystems die in this case, therefore users will be able to empathise with the effects. We don't really see the impacts obviously in Singapore but elsewhere, this is something that is really occurring. The way the app has been incentivised through Quests and challenges will also make the app very sustainable in the long run. This app has more features than just 1 feature that a typical app would have and hence, this app would be a good all-rounder.”

~Darshni

“In terms of the Game, it is good. Cannot think of any flaws that may arise because it is quite comprehensive. It is simple enough that people will understand how to use it very easily. Also, your inspiration is from forest, which is a quite popular app that many people know about, so it should be okay.” ~Mattias

“The part about planting a tree, it is very good, and because it is really meaningful and “big brain”. At the start, when your Game was mentioned, I was thinking why would people want to get coins and in Game stuff that had no meaning in real life as they would rather get real money. But when you mentioned the plant a tree in real life and maybe work with other companies to clean up ocean, maybe plant corals, is very meaningful.” ~Mattias

“The ecosystem and earth idea is really good because it makes you take some sense of responsibility because you are responsible for your ecosystem living or dying or your trees dying. So obviously because you don't want your app to die then you would then take some action towards it. It thus helps them to regulate and reduce their air-con usage. It may make you feel disheartened when your earth and ecosystem die. I think the pet idea is really good because it gives them an incentive to try to get these tokens. The main feedback that i do have is that your app must have variety because without it your app will end up dying because people get bored of it. While they may look different, you need to apply the same fundamentals, like earning tokens by reducing air-con usage.”~Sanjeev

## Annex D: Feedback on Spread the Word Incentive

“For the “Invite a friend” I feel it is very good because it ties in with the app.” ~Mattias

“This incentive is very effective and we already have evidence of it in most day to day Games and life. For example, most Games already have this mechanism and even tuition centres for example offer this kind of incentive.” ~Sanjjeev

“The main suggestion that I have is that the amount of credits that you get must be equal to the amount of credits to get something. For example it should be equal to the number of credits to get a pet bird or a new ecosystem. This way it creates a direct incentive for users because it makes them want to invite friends even more. This way it has a direct impact or direct sense of satisfaction that you get from inviting a friend which makes it more effective.” ~Sanjjeev

## Annex E: Feedback on Design Page

“I think it’s quite creative because usually when you think about reducing aircon usage you’ll think about the only way is to use less aircon but actually there are other ways you can use so your second solution shared all these, which is quite creative and out of the box yea so I think that’ll be the strength” ~Cadee

“I feel that the Design Page is effective because we wouldn't have known that these products in our house could be used for another purpose, and will be good to increase our knowledge about them” ~Darshni

“I like the way that the Design Page has been designed as it is very interactive, instead of just being exposed to a whole mass of facts that people would not really want to read, the tutorials in this page are clear on how the users can reduce the amount of air-con used through the usage of alternatives. It is a very quick way for users to refer to alternatives to air-con as well.” ~Darshni

“This app cannot be used for too long as once people have read up on all the alternatives, they will not be equipped with more knowledge as the app only has limited advice and it is not something that is updated regularly. Hence, they might even end up deleting the app and therefore, it may not be as successful as the Games app. You would also have to make sure that the alternatives found in the Design Page can be commonly found in all households if not users would not be able to relate as much and would be ineffective”

~Darshni

“Okay, that idea is good. However, I have a suggestion. Basic things such as opening the window, using ceiling fan, etc, might not need a dedicated page for it. As a user I would want to hear from other people too. If everyone’s homes are different, and if everyone posts on this app to show how they cool their homes down, a user can take inspiration from this whole pool of people.” ~Mattias

“Some features that your Design Page has while generic will be extremely effective because it is seen in most if not all homes. For example, it is pretty obvious that the ceiling fan is something that is seen in all homes so when you have it in your Design Page it is very applicable which will make it much more effective.” ~Sanjjeev

“It is a risk that you have to take, so with this kind of situation, you will have to kind of neglect some of the minorities that might not have the feature in their households. Obviously, on your part it is important that you do sufficient research to make sure that the features that you include in the Design Page are relevant to the majority of the people. So my main feedback that I do have is that for some features that you have, for example the plant, I feel in Singapore potted plants in households are not really not seen often at least in abundance, because when you do see plants you usually only see 1 or 2 which is not really effective at all. So maybe for these kinds of features maybe you don't really need them because they are not seen in the majority of households. So basically, what you have to do is make sure that your feature is relevant. For example, during the haze period you may switch the feature from cross-ventilation to an air-purifier.” ~Sanjjeev

“It provides a means for teenagers to be able to conserve energy. It is obvious that teenagers are passionate towards conserving energy as they are willing to fight against climate change because it is their future at stake.” ~Sanjjeev

“Teenagers might not have full control over the whole house.”~Cadee

“I will adopt your idea if I think it is a feasible solution to a problem that affects all the family members. For example if you want to shift the sofa to another position, and it does not affect my daily operations, then I will agree.” ~Shirley Ho

## Annex F: Feedback on Feed Page

“It’s quite a good idea, because it will be more convenient for users since their feeds would be customised for them and they will be more willing to try as they don't need to go through the trouble of finding something suitable for them” ~Cadee

“I feel like this initiative might not be the best especially if the app uses the algorithm for the person to receive feed that they want to as it does not really provide the user a lot of diverse information. The user might hence end up receiving the same time of information over and over again. Since this is not something where you can follow others too, the information that the user gets exposed to gets very narrow as they would only receive facts and not opinions from others. It would be better if it was like an actual online platform, where others can also have an input on it instead of just the individual using the page.”  
~Darshni

“The Feed Page is good because it allows teenagers to match their home layouts with others’, which allows them to obtain more effective solutions and the save function also helps us to collect a bunch of alternatives that we can look upon later and we don't have to search for the particular layout all over again” ~Darshni

“About the Design Page, one potential problem is that the blueprints and the tutorials might not fit each and every household because each and every household might be unique. Even in HDBs, although there are similarities across the board in the basic layout, because of renovations there can be many variations in the final layout of everyone’s homes. So it may be quite tough for users to follow the suggestions that you give due to the layout that their homes have.” ~Mattias

“Like a reddit or an experience sharing page. This is like when everyone pools their knowledge together, it compounds up instead of your own Design Page telling people what to do. The main idea behind this is to face the problem as a community, not face it yourself, or face it with some simple tutorials. Because the problem is that the Design Page right now uses either the generic layout of one home, or just basic things that can be applied to all homes, which might not cover everything. It is also very tedious to for example come up with 1000 house layouts. With this “aircon reddit” or “aircon Instagram”, you’re able to tap on everyone’s unique layouts and everyone’s unique experiences. This is better than a simple Design Page because the chances of two people having the same layout or being in about the same situation is higher. So when one of the users has already solved the problem and has already managed to cool the house down in that layout, the other people that see these posts will be able to implement that exact thing in their own homes.” ~Mattias

“The Home Page is good because it allows people to see how much air-con other people are cutting down and it creates some sense of competition. It is also cool to have companies and NGO’s on the site which may help people to get better tips on how to cut down on their air-con. It is cool to create a space that allows people to learn on how to cut down on air-con. Furthermore, maybe some of the solutions provided on the Home Page can be translated onto the Design Page that you have.” ~Sanjjeev

“I think the best part or reason why the Feed Page is so strong is because it acts as a site for people to come up with new innovative ideas. This is because these ideas are rebounded off of one another.” ~Sanjjeev

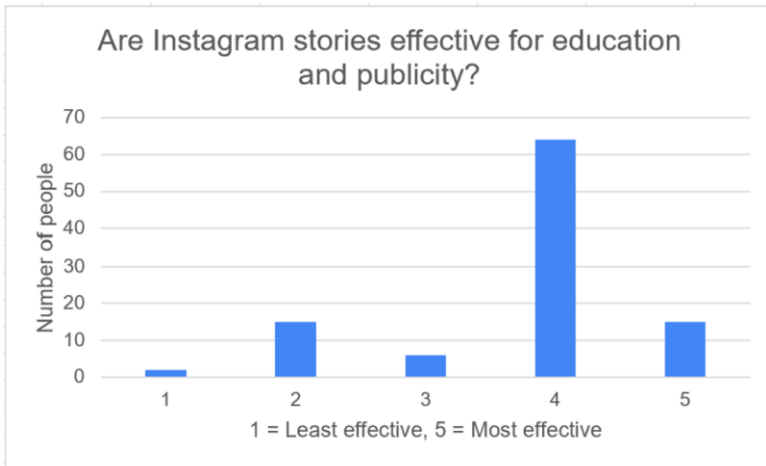
“Another strength is that the Instagram-like page allows for a sense of competition as when people see each other saving energy it makes them more motivated to save energy”  
~Sanjjeev

## Annex G: Survey Results (Polls)

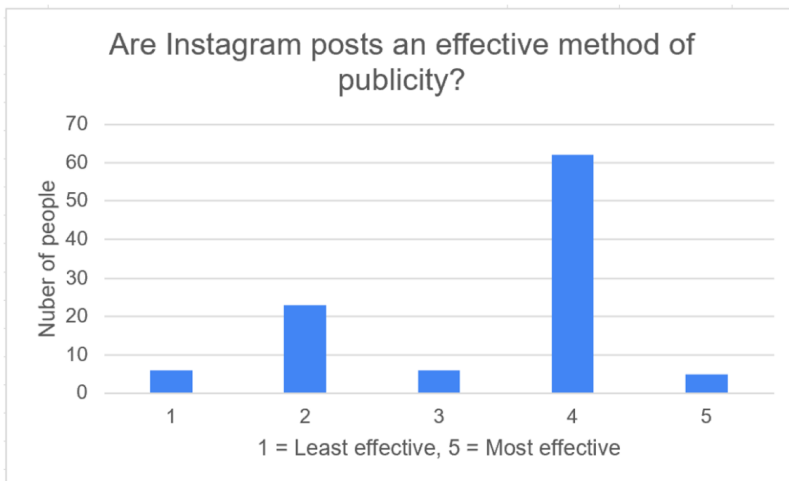
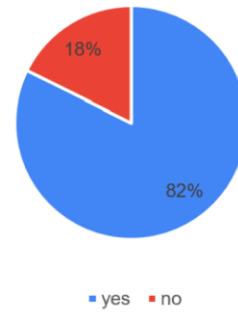
Our group conducted two surveys with sample sizes of 186 and 124 respondents respectively. For our first survey, 162 out of the 186 respondents were from an age group of 15 to 19 years old while for our second survey, 102 out of the 124 respondents were from this age group, in line with our target group of teenagers

We are including our bar charts within the survey results, because the pie charts do not show those who selected “neutral” (or option number 3) in the survey, for simplification’s sake. Moreover, the pie chart does not show the breakdown of those who put option 5 or 4 for “yes”, and 2 or 1 for “no”. We are including them here for more comprehensive data results.

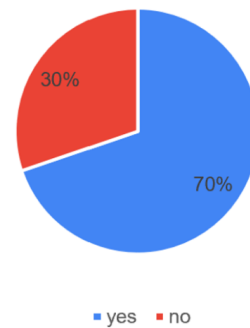
## Annex G (I) Instagram Stories



Are Instagram stories effective for education and publicity?

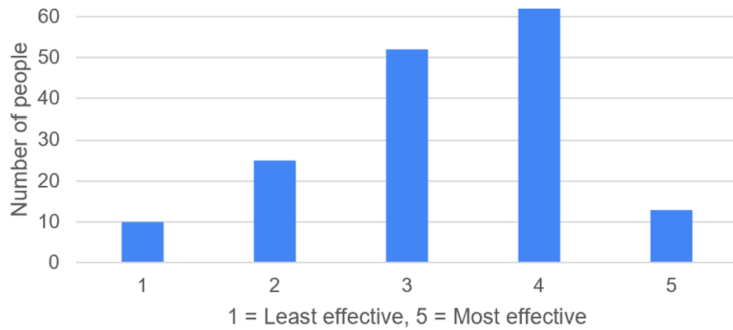


Are Instagram posts an effective method of publicity?

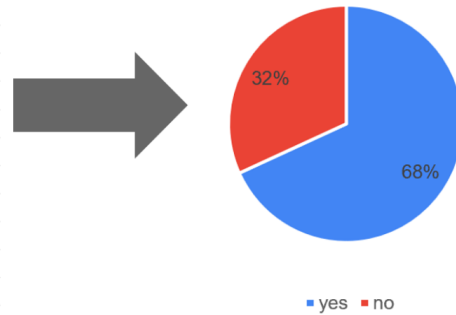


## Annex G (II) Goal Setter, Game, Spread the Word Incentive

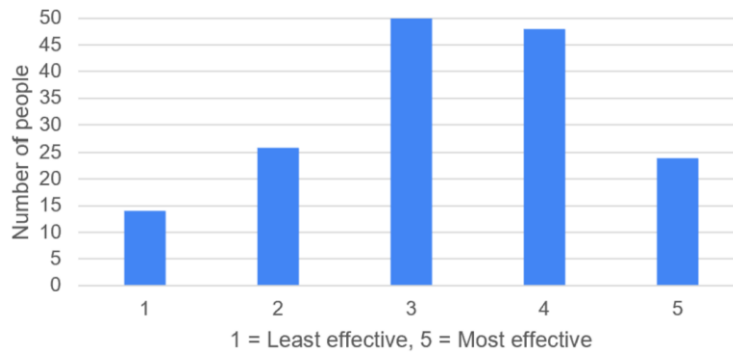
Is Goal Setting an effective solution to reduce air-conditioning usage?



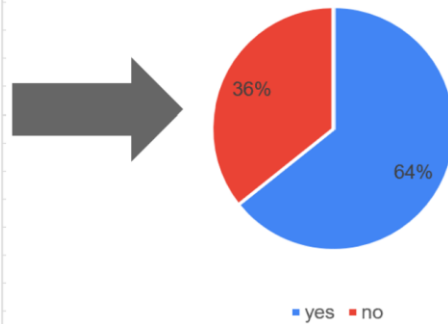
Is Goal Setting an effective solution to reduce air-conditioning usage?



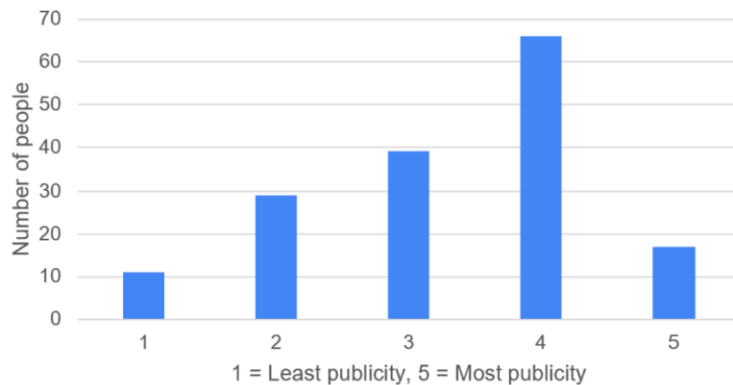
Is the Game an effective solution to reduce air-conditioning usage?



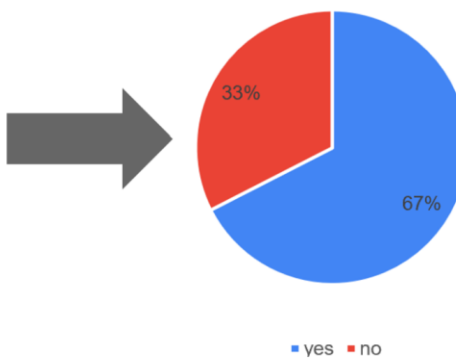
Is the Game an effective solution to reduce air-conditioning usage?



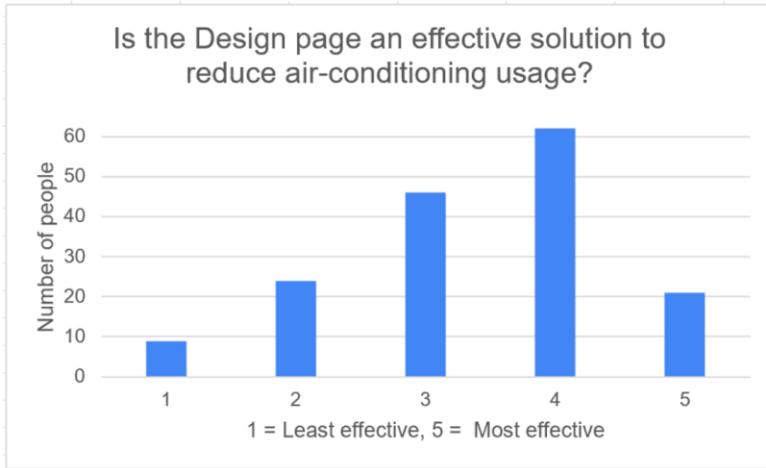
Will Invite a Friend help publicise CFC?



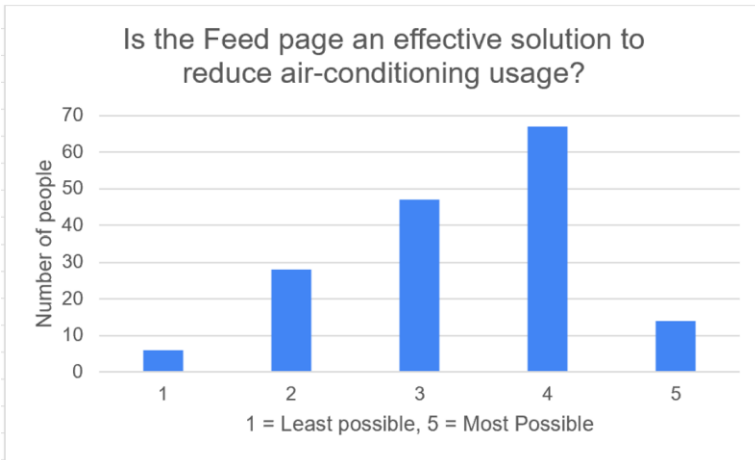
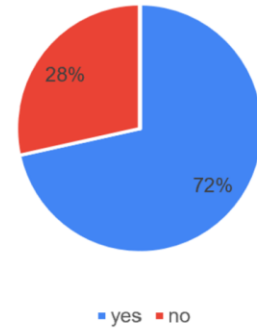
Will Invite a Friend help publicise CFC?



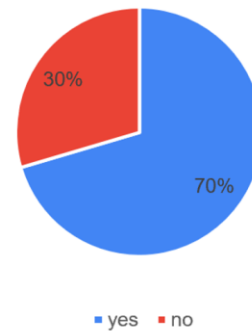
### Annex G (III) Design page & Feed page



Is the Design Page an effective solution to reduce air-conditioning usage?



Is the Feed Page an effective solution to reduce air-conditioning usage?



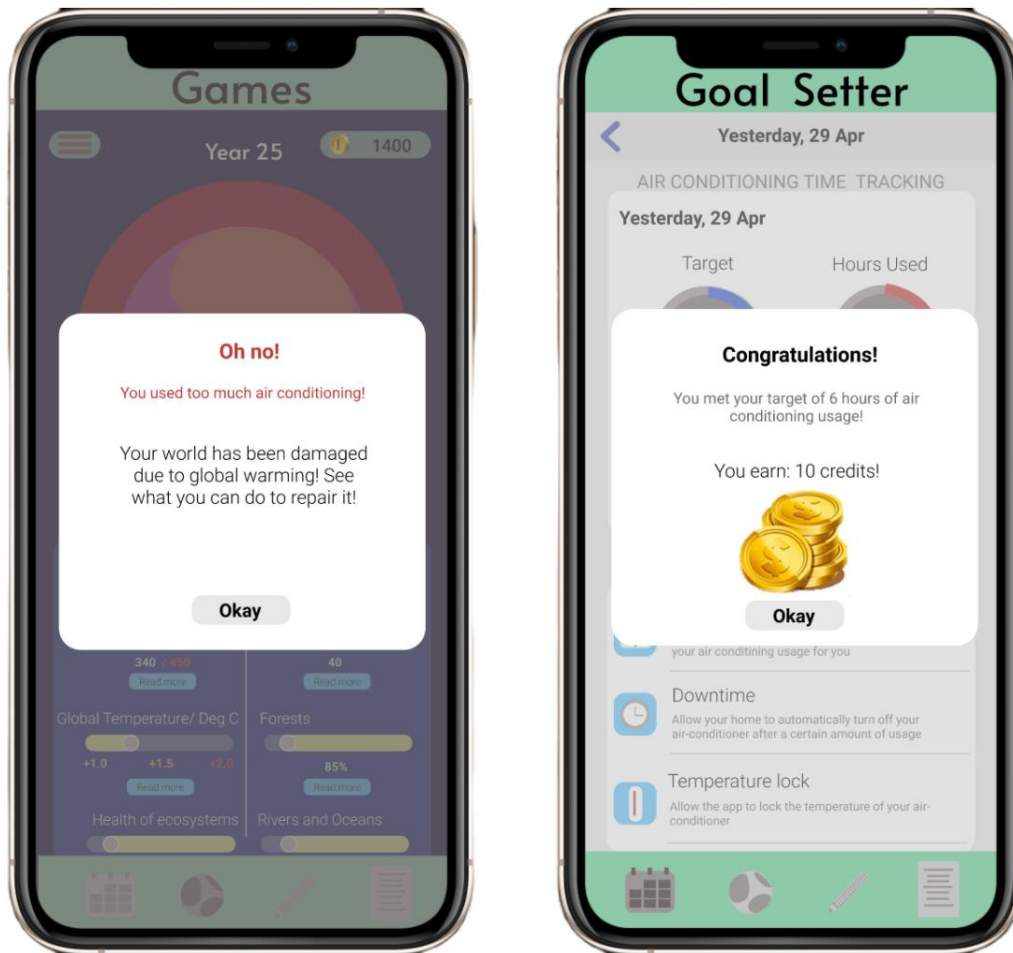
## Annex H: Supplementary Information Regarding Solutions

These are extra information about our solutions.

### Annex H (I) Solution 2 : Goal Setter and Game

1. Receiving penalties for using too much air-conditioning or receiving rewards for meeting air-conditioning targets

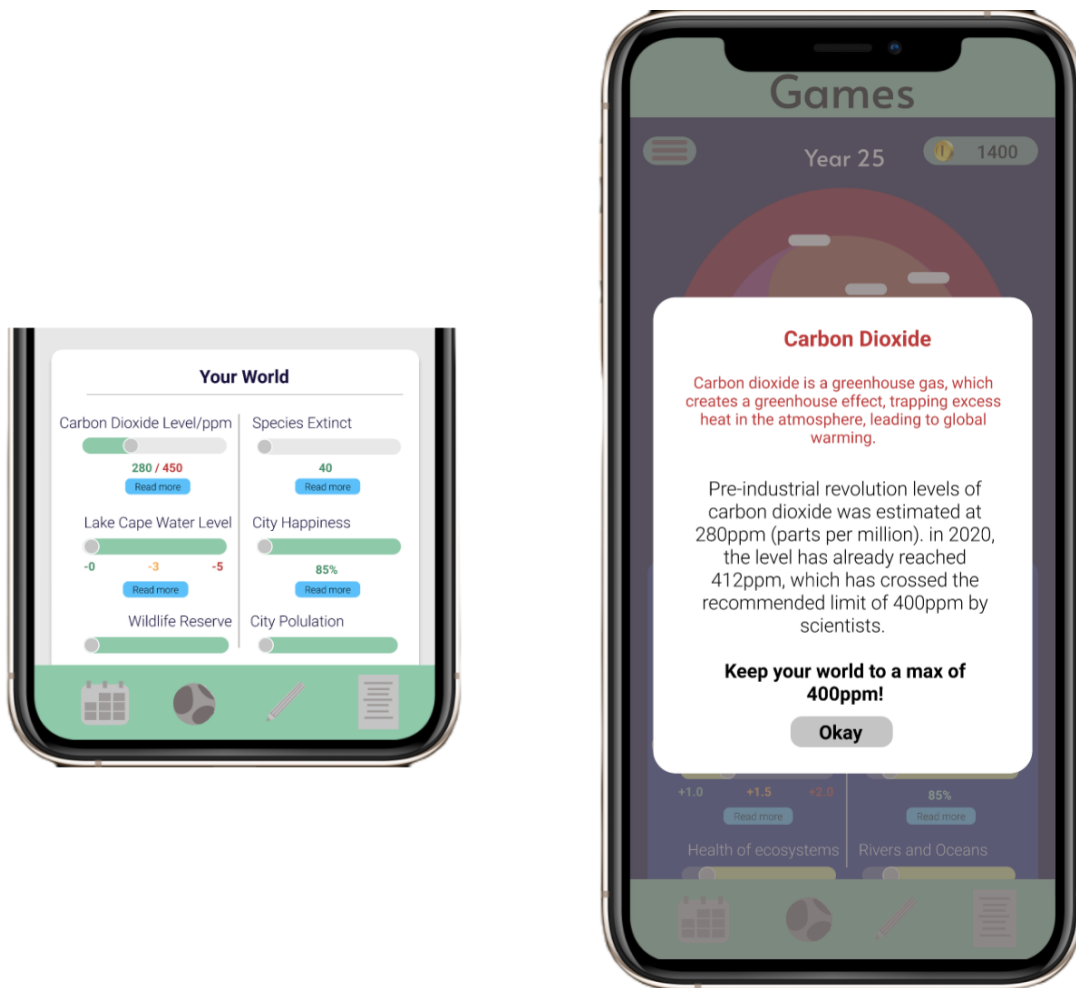
When too much air-conditioning is used, a warning sign would pop out to inform users, and the world would start to degrade and die-off. The left figure below shows the warning sign. When users reach their target for their goals, they would get rewarded with in-game credits. In this case, the coins are received from the Goal Setter page, when the teenager has completed their targets, and has been rewarded with gifts (See figure below).



(Left) Extra information for penalty mechanism: receiving warning signs due to overconsumption of air-conditioning. (Right) Extra information for reward mechanism: in-game credits received when meeting own target

## 2. More educational aspects of CFC

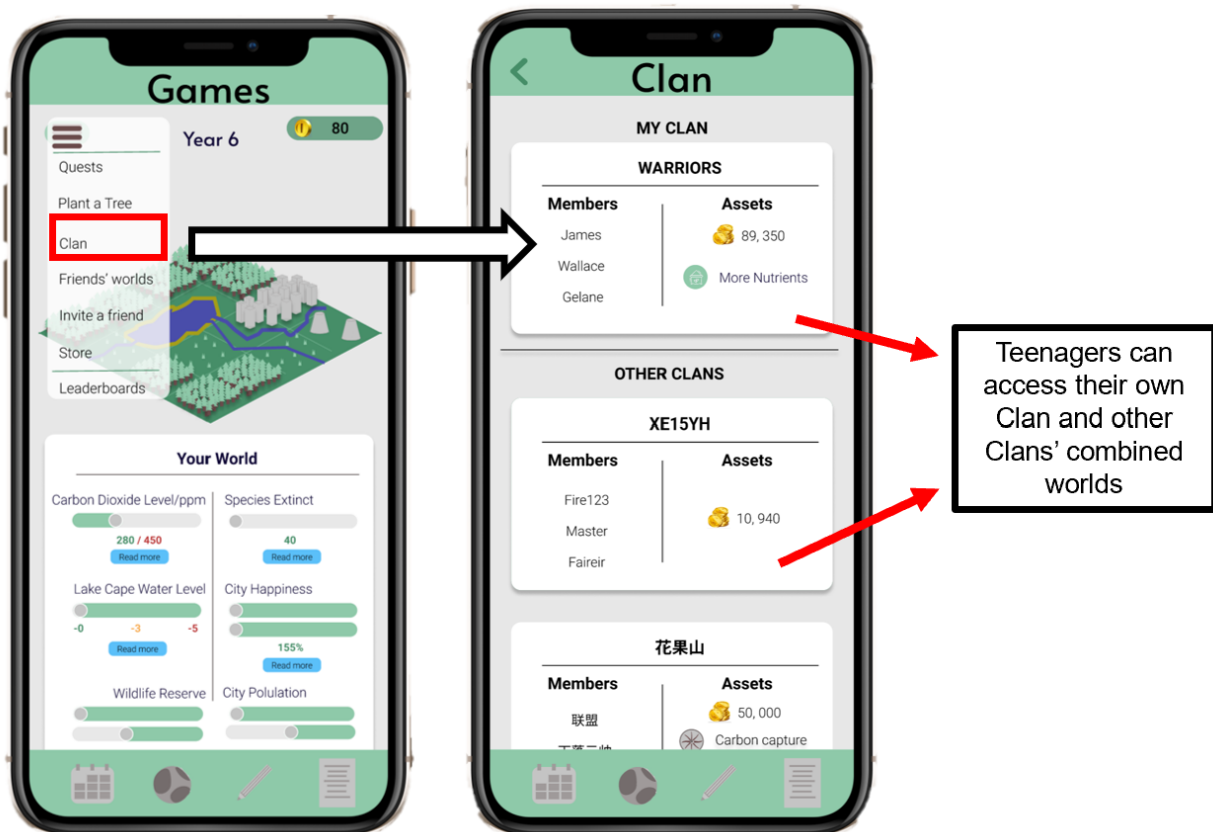
Clicking on the “read more” buttons under the health bars (left) will allow users to understand why keeping the environmental factor in mind is very important (right), especially when using their air conditioners at home.



Extra information for 3.2.2 in the report - Clicking on the “read more” blue buttons under the health bars (left) will allow users to understand why keeping the environmental factor in mind is very important (right), especially when using their air conditioners at home.

### 3. Clan, Store and Leaderboard

Our Clan, Store and Leaderboard features all serve to boost the excitement of the Game when playing it. This is because it adds more computer-game-like aspects into CFC. The Clan feature brings people together, and brings about more competition between groups of people. People can see other Clans' members' worlds (see figure below). Other parts of the Clan feature, not shown in the figure, include Clan boosters, special gifts and rewards that only people who join Clans can receive.



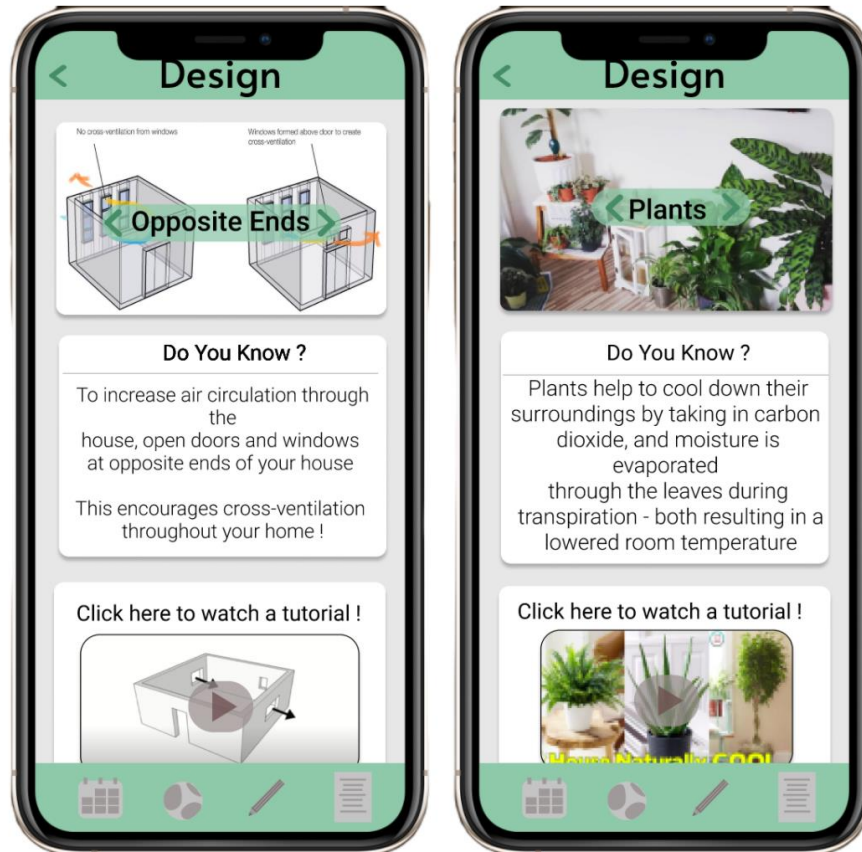
Extra information about the Clan feature

The Store is a place where teenagers can buy various things using in-game credits. These things include boosters and power-ups that will be activated once bought. These help the teenager improve the condition of their simulation. Using this mechanism, teenagers who keep within their set targets will get more in-game credits and can buy more boosters to improve their simulation. Those teenagers who use too much air-conditioning will not have enough coins to buy boosters, and their simulations thus cannot improve as much as others.

The Leaderboards is a feature that allows teenagers to look at the top players within the whole CFC app. This also increases competitiveness.

## Solution H (II): Feed Page and Design Page

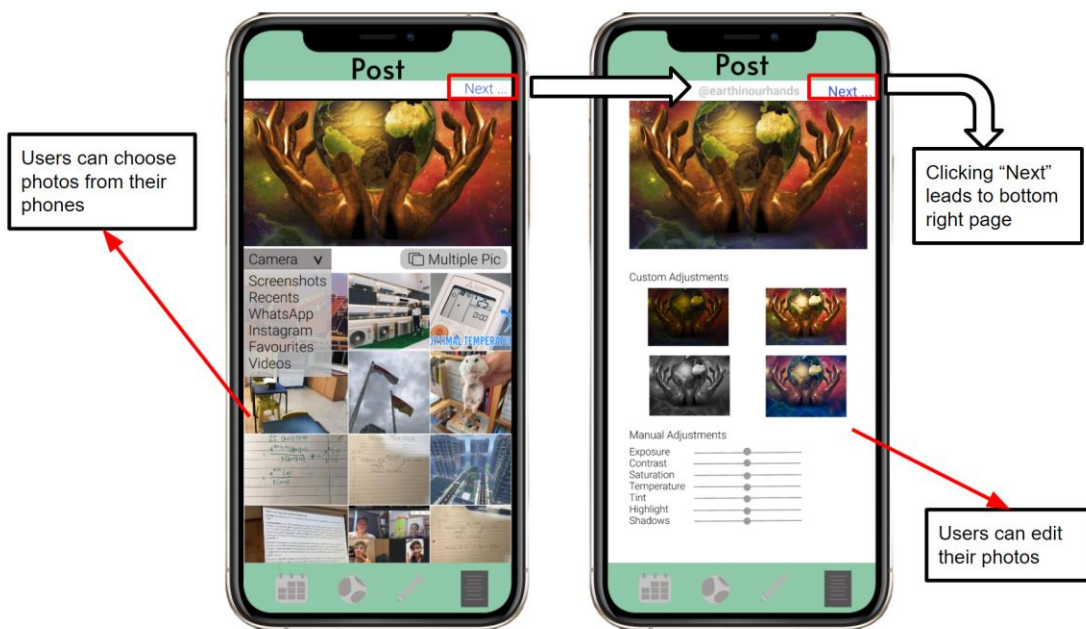
### 1. Other tutorial samples within the Design Page



Extra information for 4.2.1 - these are two other alternatives that users could take a look at through the app

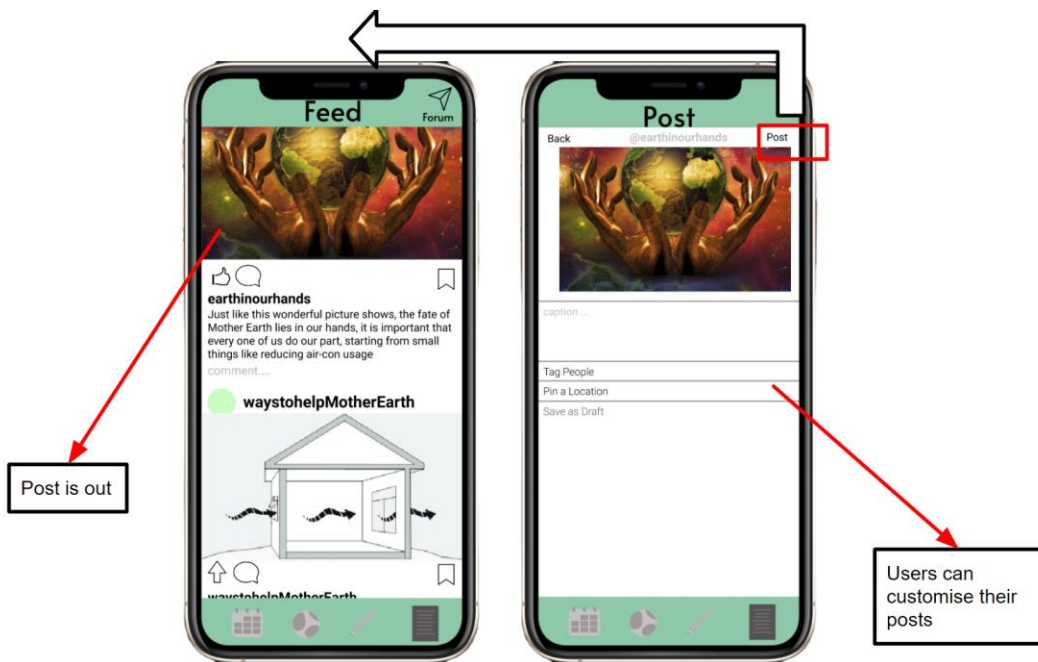
2. User interface for posting feature in the Feed page: how teenagers will post their pictures online

In picture 1 below, users can choose pictures to share online from their photo gallery. Clicking “Next” would lead them to a screen shown on the right side of picture 1, where they can edit their chosen picture to their preference.



Picture 1

Clicking “Next” again would bring them to a screen shown on the left of picture 2, where they can add what they wish to convey to others in the caption, tag others involved in the photo, give their location, or save it as a draft for future posts. Clicking “Post” would then publish the post for their followers to see. The post will go on top of the most current post.



Picture 2

## Annex I: Information about gadget used to link air-conditioning to phone apps

See the figure below (KylaSmart Station, n.d.). The figure shows an amazon site where the gadget can be found. The gadget connects to users' phones through wireless (WiFi) and uses infrared transmitters (just like those on traditional air-conditioning controllers) to communicate with the air-conditioner. The gadget thus cannot be placed too far from the air-conditioner, but can be as far from the phone as the user wants. The same technology using that similar gadget can be used in our gadget, and our app can tap into the Bluetooth connection to read the hours of air-conditioning usage, just like a smart home.

The screenshot displays the Amazon.sg product page for the Kyla Smart Station. The page features a navigation bar at the top with the Amazon logo, a search bar, and links for account and orders. Below the navigation bar, there is a promotional banner for a 'Payday Sale' from August 25-31. The main content area shows the product image, title, price, and a list of features. The product is titled 'Kyla Smart Station (Infrared Remote Control, WiFi, Control TV Aircon Fans, Works with Alexa and Google Home)'. The price is listed as S\$69.90. The product is currently in stock and available for delivery on Friday, 3 Sep. The page also includes a 'Buy Now' button and a 'Secure transaction' badge.


amazon.sg Hello, Sign in Account & Lists Returns & Orders Cart

Customer Service Best Sellers New Releases Prime Electronics Books Home Food & Grocery Free International Delivery amazon prime

Electronics TV & Video Camera & Photo Batteries & Chargers Speakers Headphones & Earphones Mobile Phones & Accessories Tablets GPS & Navigation Wearable Technology

payday Sale Treat yourself for less Aug 25-31 Shop now

Electronics > Home Cinema, TV & Video > Accessories > Remote Controls



Roll over image to zoom in

**Kyla Smart Station (Infrared Remote Control, WiFi, Control TV Aircon Fans, Works with Alexa and Google Home)**  
by KYLA  
★★★★☆ 2 ratings

Price: **S\$69.90**

Secure transaction Returns Policy Amazon Delivered

- UNIVERSAL REMOTE - Controls all your IR appliances through the Kyla app, such as turning it on/off and setting temperatures and volumes.
- REAL TIME MONITORING - To get the most updated data on air quality, temperature and humidity values on the app
- EASY SET UP - Connect the Smart Station to a power point and pair with your smartphone via the Kyla app
- REMOTELY/VOICE CONTROL - Control, automate, and schedule via Kyla app on smartphone. Also compatible with Google Assistant and Amazon Alexa for voice control command
- NO HUB REQUIRED - Connects directly to existing Wi-Fi network without the need for Hub

S\$69.90

FREE delivery: Friday, 3 Sep. Details

Fastest delivery: Thursday, 2 Sep. Details

Select delivery location

In stock.

Quantity: 1

Add to Cart

Buy Now

Secure transaction

Ships from Amazon  
Sold by Kyla SG  
Support Customer service is pr...

DetailsDetails

Yes, I want FREE Delivery

Enjoy FREE & FAST delivery with Amazon Prime

The gadget connects products within homes into a smart system, making it easier for people who have no smart homes to make their lives more convenient by purchasing these gadgets.

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