

# PROJECT IMPACTS

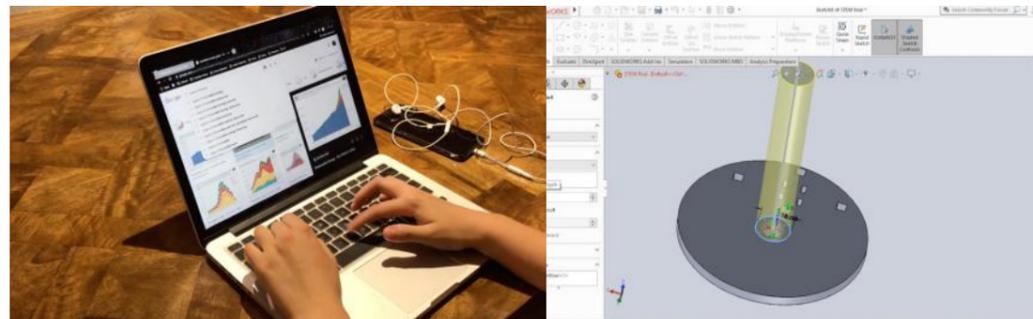
## During Design

### Positive Aspects:

During the design of the Sunflower Solar Tracker, I was able to accrue vital skills and knowledge through online resources such as Google, Virtual Classroom and YouTube. These resources enabled me to devise an actions plan and areas of investigation as well as Consideration of Design Factors. Throughout the design process, these factors enabled me to reassess and reevaluate my design repeatedly to make it as suitable to the needs as possible, especially for Evidence of Creativity and Idea Generation, I was able to use concept sketches and research, to further developed my critical evaluation, creativity and organisation skills, which contributed greatly to the overall success of the product. Using Solidworks to CAD my designs enabled me to be more flexible to create various prototypes for testing and have more room to work with testing the product virtually regarding its dimensions and fit without wasting too many materials. By accumulating and experimenting with different practical techniques such as Linear Sketch and Flex on Solidworks, I was able to enhance my design skills on CAD and create more complex structures such as the Motor Mounts for my Major Work. In addition, talking to industry and engineering professionals from UNSW has further enhanced my organisation, communication and note-taking skills. The process of experimentation has also allowed me to develop my problem solving, conceptualisation, virtual sketching skills and techniques, which have all proven to be a valuable tool for me to benefit as an individual during the design of my Major work and inspired me to follow a similar career path in my tertiary education.

### Negative Aspects:

Although the Design development was a rewarding process that has enhanced my work ethic in many ways, the tight schedule and deadlines meant that I have to be constantly on top of each aspect of the design process, which was slightly unrealistic due to my other school studies, thus as more time is spent on other subjects, some sections of the design factors were compromised. Furthermore, I drew and researched a lot of concept sketches and became fixated in the design process that I was behind schedule on practical experimentations. Nevertheless, despite the impact on the individual regarding time management, prioritisation and organisation, these were outweighed by the positive aspects of the individual's design process.



## INDIVIDUAL



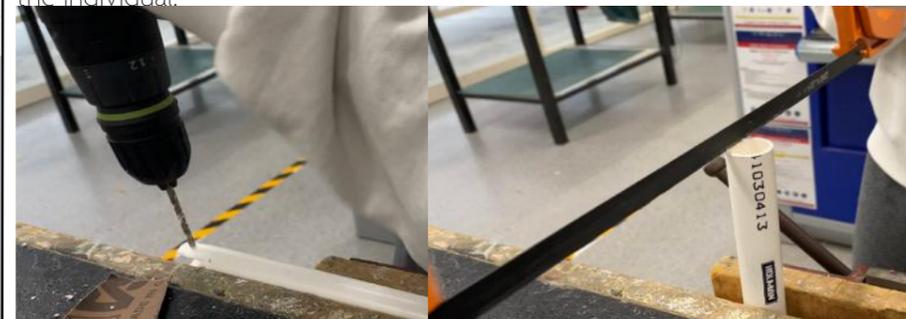
## During Production

### Positive Aspects:

I have further extended my development and knowledge of machines, tools and materials through the production of the tracker. During production, I was able to constantly train and attain vital skills in regards to the application and use of the 3D printer, laser cutter and tools such as the solder, glue gun and sander, which enabled me to demonstrate a range of techniques and concepts in the Experimentation and Testing component of my Major work. By using these machines during the production not only ensured the functionality of my product but also increased the accuracy and precision of my design, allowing maximum efficiency. Electronic parts such as the servo motor, light sensors and Arduinos enabled me to accrue vital knowledge in regards to the function and coding of these parts to serve its respective sub-systems. Testing a range of solar panels and its power capability have heightened my knowledge on the functionality of solar panels and the importance of using an inverter. Hence, by following and experimenting with the various machines and techniques, I became more efficient and affluent in my practical ability and production process.

### Negative Aspects:

With the heavy social restrictions due to COVID-19, school and the technology workshop were less accessible, which hindered my production process as I was not able to start experimentation and build until Term 3, which added a lot of stress and work overflow due to the heavy workload in other subjects such as Mathematics, therefore I spent a week at school during the Term 3 holidays to finish my major work, meaning that some other subject studies were compromised. Furthermore, while making my design I was exposed to machines and materials that could potentially be dangerous and harmful to the body, thus I implemented safety equipment and strategies such as gloves, safety glasses, ear muffs and masks to prevent myself from getting hurt. Although there were some negative aspects, these were minimal impacts on the individual.



## During Use

### Positive Aspects:

The product is created for the ease of the individual to operate. It is designed so that the individual will only need to plug the product into a battery for it to function. The individual does not need to have a sophisticated knowledge of electronics to be able to use this product which creates a more effective product on the market. The Tracker is also designed ergonomically and safely so that the individual would not be harmed and feels comfortable when handling the object to and from places, this is accomplished through testing various prototypes. Furthermore, as the creator of my design, I, the individual have seen first-hand results of the product and have inspired me to implement more of my design not only in school environments but in the larger community as an effort to further reduce air pollution.

### Negative Aspects:

There have been minimal negativities to the individual during the use of this product, although I was a little disappointing use of the small SG90 servo motors when operating its rotation as there was some lag. However, overall, the use of the product has proven to have more positives than negative aspects.

## During Disposal

### Positive Aspects:

The disposal of the tracker will further create ease and safety to the individual as the product has been tested various times with a range of different materials and highly rated electronics from reliable websites such as Jaycar, to ensure that there will be no current leaks or explosions during the individual's disposal. The materials are made from plastic and wood which does not conduct electricity, thus if the current was leaking during the disposal, the individual handling it would not be harmed.

### Negative Aspects:

Some wires are still exposed to the open environment, thus if there was a leakage during disposal there is still a chance that the individual might be injured, however, this chance is extremely minimal.



# SOCIETY



## During Design

### Positive Aspects:

There are many components during the design which benefits the society, these include the solar tracking motion of the sunflowers to track the light of the sun to make solar energy to charge electronic devices, as well as portable mini power banks that are consistently rechargeable through solar energy. All of these addresses the needs of society in a sustainable market. As biomimicry designs are extremely modernistic in the 21st century, designing a biomimicry solar tracker increases the aesthetic value of Helio +. Design and Technology are not only about making and creating designs but also innovating and inspiring my peers. As I have developed many design skills from technology-related co-curricular activities such as Robotics, I have assisted my peers during their design process by providing them with design concepts and ideas. We collaborate for ideas and further improvements to our designs and I offer my knowledge of CAD to the other peers as a mean to help speed up their design process.



### Negative Aspects:

There are minimal negative aspects of my design that may impact the society, as the project proposal is directed and centred towards creating a beneficial product to the community. One negative aspect that some groups of people in the community may not enjoy the appearance of my design as everyone has their unique aesthetic values. The design process was carefully completed within 4 months, which may be a negative impact on the product and society as the design of the product has not been designed through a long continuous period, meaning that I was exposed to less sustainable materials, concepts and designs which may have benefited the product and society.

## During Production

### Positive Aspects:

During production, I offered skills on the use of the laser cutter and 3D printer to my peers so allow a faster flow and use of these machines so that more peers could complete their experimentations and products. For example, I helped another peer to laser cut her design to speed up her process. My peers and teacher also provided me with tips on the solder and wires, for example, I learnt that by clumping metal wires together would create a short circuit and destroy the product, thus I learnt to use electrical tape to separate metal wires from one another. If my product were to be mass-produced, it would potentially offer more job opportunities to a large community of people with various knowledge and skills in production, these include solder joining, PVC cutting and painting and solar installation. The implementation of PVC would also add an economic growth the PVC industry around the world and would also offer another work opportunity for people working in the Solar industry as solar energy is becoming higher in demand.



### Negative Aspects:

To mass-produce this product a large amount of time and investment must be contributed. And if the sales rate does not surpass the investment and the amount of money contributed to the materials and production process, members of the society who are working will not be able to receive enough pay for their efforts and the product company could potentially go bankrupt. If personal protective equipment were not supplied correctly or enough to all the workers, they could be easily prone to a lot of risks such as the constant exposure to toxins, which could potentially have long-lasting effects such as damage to the eyes and burns.



## During Use

### Positive Aspects:

The use of the Helio + is to address the simple need of reducing air pollution which is commonly produced from sourcing non-sustainable materials such as coal and fossil fuel, emitting carbon emissions and increasing the greenhouse gas. Thus the use of solar panels installed on each solar tracking flower absorbs sustainable light energy and converts into electrical energy to charge electronic devices within the society. Furthermore, the use of mini-power banks are rechargeable through solar energy and are easily accessible to all members of the community with both Apple and Android charging options. As stated in the impact on the individual, the product not only creates ease for function but also allows broadens the age restriction of the use of the product regardless of the knowledge they have about electronics or mechanical parts.



### Negative Aspects:

Due to the limited amount of mini-power banks, it is highly likely that there won't be enough power banks to charge a lot of devices throughout the day. The main concern is the lag time between the servo motors as there seem to be a 3 second lag with light is shone onto the photoresistors, however, this shouldn't be a significant issue as the sun moves quite slowly throughout the day thus this lag within the motor system would not be visible.

## During Disposal

### Positive Aspects:

The disposal of the product will further create a positive impact on society. As the product is designed for maximum durability and use, with PVC tubing and 3D filament materials which are highly water-resistant, thus it is highly unlikely that the community will need to dispose this product within a few years of use. As the main power source is the solar panel, the power source can be easily replaced without disposing of the whole product.

### Negative Aspects:

If the product were to be disposed of as a whole, the rigid shape would take up a lot of room in areas of disposal, thus additional heating and melting are required to dispose of the materials neatly, which can potentially release toxic wastes in the air that can be inhaled by the workers or members of the community, causing respiratory-related discomfort.



# ENVIRONMENT



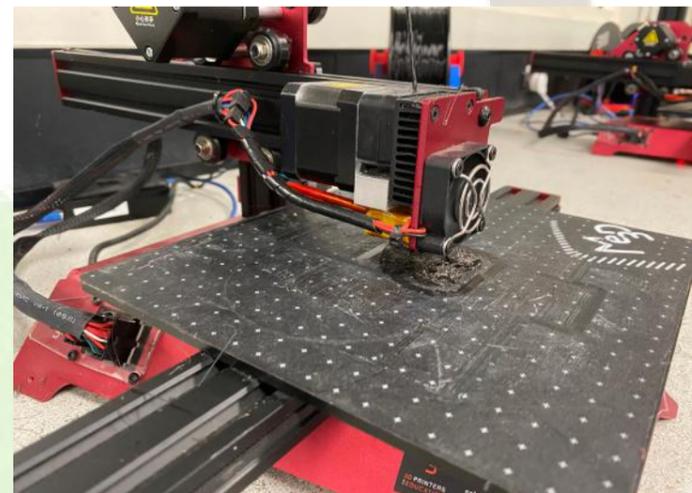
### **During Design**

#### **Positive Aspects:**

The design of the product contributed to creating a positive impact on the environment. This is justified in my need to maintain a highly sustainable product. I achieved this through researching various sustainable recyclable materials such as the PVC tubing that would potentially be used in production as well as conducting a google survey and seeking professional advice on the sustainability of solar energy in regards to pollution, which enabled me to gain further understanding on the various perspectives of pollution and make further modifications to my design such as making a dual-axis solar tracking system for maximum absorption of light energy. Through the design process, I was able to deepen my understanding of other sustainable energy sources such as wind and hydropower as other alternatives for my design. In my Areas of Investigation, I was able to explore a lot of eco-friendly materials and concepts such as pinewood and a solar charging station. Additionally, the design process enabled me to complete various wiring concepts and diagrams that would enable an accurate power system with no connection to external main power, thus decreasing the consumption of electricity which benefits the environment.

#### **Negative Aspects:**

The design process had many factors that would negatively impact the environment, for example during prototyping, a lot of 3D printed filament was used, as the filament is not eco-friendly, the accumulation of using this could potentially harm the environment as more demand of filament is needed to supply my prototypes, which greatly contributes to carbon emission released into the atmosphere, increasing greenhouse gas.



The number of negative impacts was reduced to a minimum as the focus of my design is to reduce pollution through sustainable charging of electronic devices.

### **During Use**

#### **Positive Aspects:**

With Helio+ main power source to be from light energy, which is completely operatable by the dual-axis solar panels implemented on the flowers as well as a large solar panel for additional maximum absorption of light, the use Helio+ will reduce the amount of air pollution such as carbon emission into the atmosphere significantly, as normal electricity is extracted from fossil fuels, which causes land degradation during the harvesting and generating process. Thus over time the use of Helio+ would greatly reduce the amount of air pollution, benefiting both living organisms health as well as the environment. Furthermore, the design of the product is made to be easily detachable and movable, thus the installation process does not require large machines or cranes which also uses a lot of fuel to power, thus ultimately benefiting the environment. Overall, Helio+ is a well-rounded environmentally friendly product, that will improve the environment if it were to be installed in busy metropolitan areas where people can constantly charge their electronic devices.

#### **Negative Aspects:**

As the main focus of my design is to reduce air pollution, the use of Helio+ is designed to be extremely eco and environmentally friendly, the Helio+ has no significant negative impacts on the environment during use. Regarding visual pollution in the social environment, some people might not enjoy the appearance of the sunflower design and hence regard it as visual pollution, other than this, there are no negative impacts that could potentially harm the environment.



### **During Production**

#### **Positive Aspects:**

The production of the product is relatively positive in regards to the impact on the environment. For example, I used pinewood rather than plastic for the dual-axis system of the large solar panel to reduce further production pollution when producing plastic materials, as plastic is mostly made from fossil fuels which have been statistically proven to damage the environment and its living organisms. Furthermore, although experimentation and prototyping are important to the final production process, this process could potentially waste a lot of valuable resources such as wood or plastic, thus through careful organisation and planning before each practical experiment I was able to limit the number of resources used so that most of the materials are used to its fullest potential, this calculated action and finance plan ultimately benefits the environment.

#### **Negative Aspects:**

There is still a few plastic materials utilised that would pose as a negative impact on the environment such as the flower pots as well as the PVC tubing, however, these PVC tubing can be recyclable.

Nevertheless, a few excess plastics and wood were left after 3D printing and laser cutting which is difficult to reuse and therefore are thrown away, this factor creates a negative environment as till this day, there are not a lot of sustainable filament options used for 3D printing.

### **During Disposal**

#### **Positive Aspects:**

When disposing of my product, the pinewood used for the flower head and biodegradable. Furthermore, as stated in society, the product will not be disposed of very frequently as only the solar panels are the things that would need to a few years, however, the structure is durable and have tested to last for a very long time, therefore it is unlikely for people to dispose of it.

#### **Negative Aspects:**

The disposal of the product will create a relatively negative impact to the environment as the 3D filament I have utilised for the stem and pot of the structure is not sustainable. This plastic is not easily recycled and not readily degradable, they also highly flammable will further release toxic gas into the atmosphere.



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