



2020 Minor Challenge Set #1

STEM Field: Environmental Engineering

Level: Senior

Challenge Name: My Sustainable Home

Materials required:

- Planning
 - Paper and sticky notes
 - Pens and markers
 - Ruler
- Building
 - Various pieces of cardboard
 - Masking tape
 - Scissors or craft knife

Safety: Be careful when cutting material with scissors or craft knives; ask an adult to assist as necessary.

Introduction:

Sustainability can refer to a group of systems aimed at reducing our impact on the environment, while promoting innovation to further improve our way of life¹.

We can think about sustainability in terms of **inputs** and **outputs**. What are the inputs required to begin a certain process, and how can we ensure that these are plentiful and renewable? What are the outputs at the end of a process, and how can these be safely dealt with? Are there any ways to turn these outputs into inputs for other processes?

¹ (Environmentalscience.org, 2019)

A greater focus is being placed on building houses with a sustainability focus in mind. In this experiment, we will research, plan and then build a model to showcase our idea of a sustainable home.

Instructions:

- 1) Draw on paper a basic floor-plan for a home, and label the rooms accordingly. Include a separate area for a front yard, back yard, roof and basement.

- 2) Using sticky notes, annotate each room/area on your plan with its expected inputs and outputs. These can include:
 - raw or processed materials
 - amounts of water
 - energy (e.g. electrical or heat)

- 3) Research and consider:
 - Will the direction of where the sun rises and sets impact your planning? If so, where?

 - What kinds of plants do you want to have indoors/outdoors, and what features will they have?

 - Which room/area will consume the most amount of energy? How can this be minimised?

 - Which room/area will consume the most amount of water? How can this be minimised?

 - Where can renewable inputs be used? Where can outputs be recycled, reused, or transformed into other inputs?

Extension - Build a model of your plan

Using your plan, build a model with cardboard and craft material to illustrate your sustainable home in 3D. Be sure to annotate your model with notecards/labels, or provide an accompanying paragraph, to highlight the thought process behind each feature.

Reflection Questions:

- What were the problems associated with the challenge? Are there any improvements you could suggest?
- What are the key concepts of science and engineering that relate to this challenge?
- Given your sustainable home, what might be some of the cost estimates for some of the features you have installed? How do you predict this will impact other people using this feature in their own homes?
- How might the climate affect your sustainable home? Is your sustainable home more suited to a wet/dry or cold/hot environment, and why?
- You may have included animals as part of your planning. How might animals help contribute to a sustainable household?

Submission Guidelines:

- Submit a photo of the experiment setup. Include a short summary that addresses the Reflection Questions.
- In 2020 we have changed our submission guidelines compared to 2019. To submit fill out the form here:
<https://forms.gle/ChrCXLud97E4x3AT9>

Learn More! Resources:

- Australian Government - Your Home
<http://www.yourhome.gov.au>
- Wellington City Council - Make your home more sustainable
<https://wellington.govt.nz/services/environment-and-waste/sustainability/homes/make-your-home-more-sustainable>
- Queensland Government - Smart and sustainable homes
<http://www.hpw.qld.gov.au/construction/Sustainability/SmartSustainableHomes/Pages/Default.aspx>