4-12-2022

Sustainability

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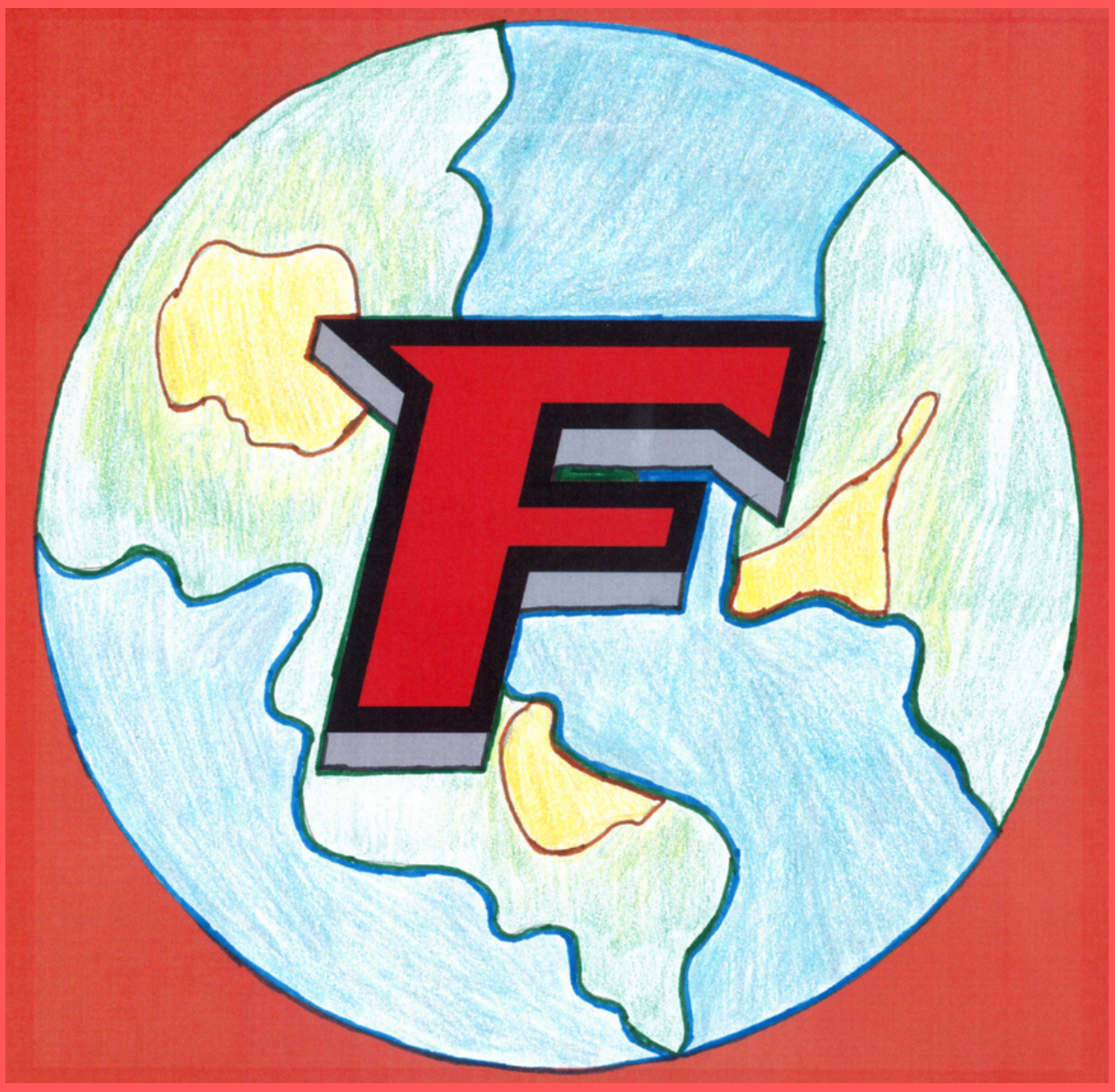
FAIRFIELD UNIVERSITY
SCHOOL OF ENGINEERING



SUSTAINABILITY

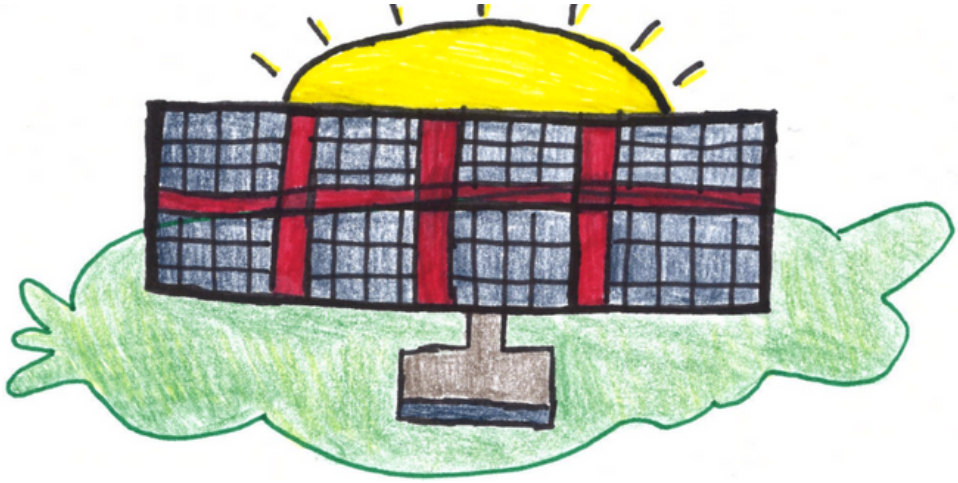
WHAT IS SUSTAINABILITY?

In the world around us, nothing is limitless. Just as there are only so many iphones and so many cars, there is only so much energy and many resources that our earth can give us. Sustainability is the idea of using our resources wisely now so that our generation and future generations can still have resources to use in the future (United States Enviornmental Protection Agency [EPA], 2021).

WHAT IS RENEWABLE ENERGY?

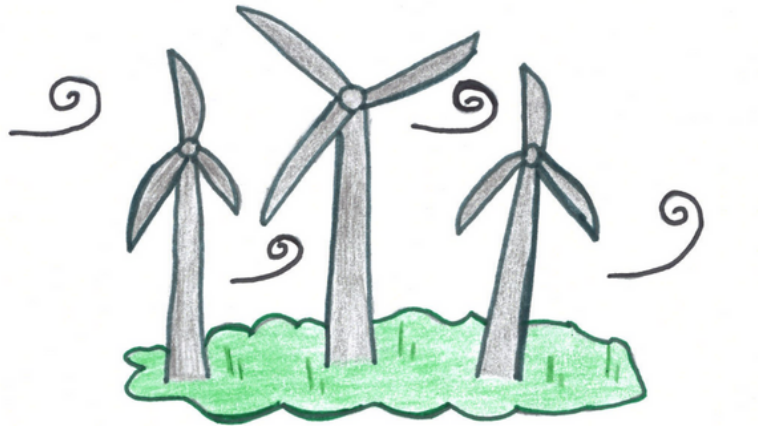
Renewable energy is the energy that is collected from renewable resources that are naturally replenished. It includes sources such as sunlight, wind, rain, tides, waves, and geothermal heat. Let's look at some examples!

EXAMPLE 1: SOLAR ENERGY



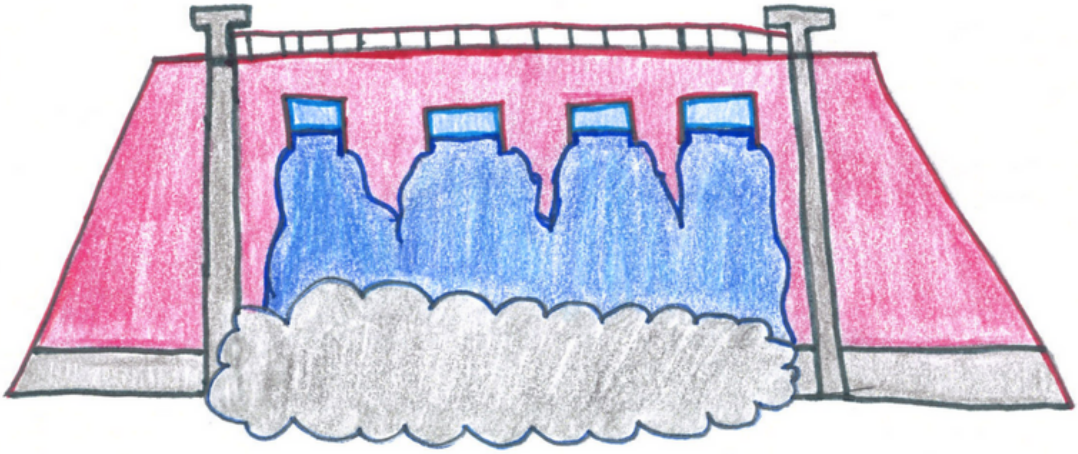
Did you know that sunlight can power things? Energy from the sun, also known as solar energy, is one type of renewable energy. To capture this energy, you need a photovoltaic cell to absorb the sunlight or mirrors to concentrate the sunlight. Photovoltaic cells are what are often used to make solar panels. When sunlight is absorbed into the photovoltaic cell it is turned into electrical energy, which can then be used to power things, such as a small car (Office of Energy Efficiency & Renewable Energy [EERE], n.d.). The downside to this is that for your panels to work, you often have to be in a place where it is very sunny. In addition, harnessing solar energy is very expensive (E. Kongar, personal communication, April 12, 2022). Can you think of ways to make solar energy more affordable and easy to harness?

EXAMPLE 2: WIND ENERGY



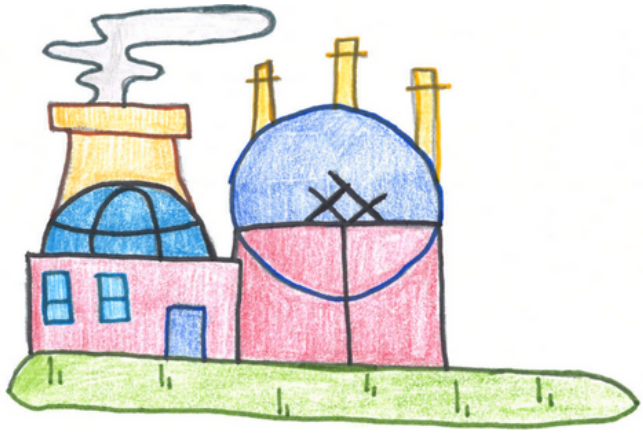
Did you know that wind can power things? Wind is formed by the sun unevenly heating the earth and the rotation of the earth. This energy can be captured by using wind turbines. Basically, the mechanical energy that the wind produces by moving the blades of the turbine is converted to electrical energy using a generator (EERE, n.d.). Wind turbines can be placed both on land and in large bodies of water like the ocean. The only problems for these turbines is that they need to be in a place with lots of space and wind and that they can be very big, some even bigger than the Statue of Liberty (EERE, 2021)! Can you think of a way to make these wind turbines smaller and lighter?

EXAMPLE 3: WATER ENERGY



Did you know that water can power things? There are two main types of water energy that can be harnessed: hydropower and marine energy. Both forms of energy capture this energy using the natural movement of water to change mechanical energy into electrical energy (EERE, n.d.). The difference between them is that hydropower normally refers to the movement of freshwater sources while marine energy, a sort of special type of hydropower, refers to the movement of tides, waves, and ocean currents (EERE, n.d.). The downside to this type of energy is that it can disturb aquatic habitats and hurt animals in the water (E. Kongar, personal communication, April 12, 2022). Can you think of a way to harness this type of energy without hurting aquatic habitats?

EXAMPLE 4: GEOTHERMAL ENERGY



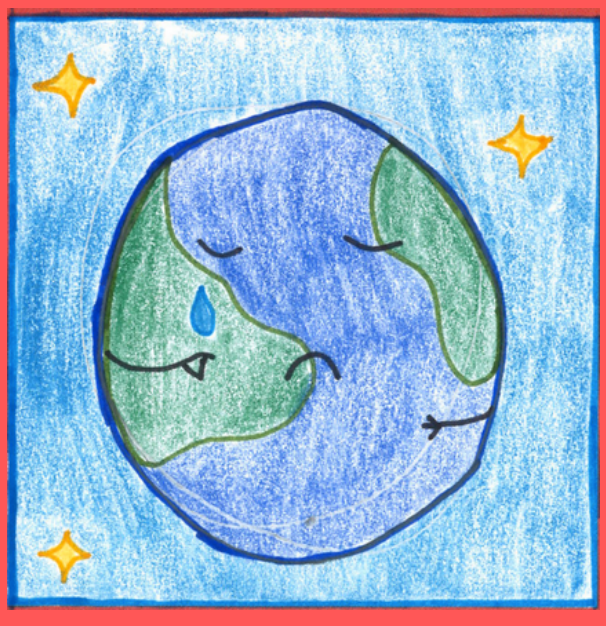
Did you know that "heat from the earth" can power things (EERE, n.d.)? Geothermal energy is energy made from the "heat ['thermal'] of the earth ['geo']" (EERE, n.d.). Below the surface of the Earth, there are reservoirs of hot water (EERE, n.d). The most common type of geothermal system, known as a flash stream, pumps up the hot water under very high pressures. Then, the hot water is introduced to a lower pressure, and it becomes steam, which can turn a turbine and create electrical energy (EERE, n.d.). Unfortunately, to make geothermal energy plants, we have to dig deep into the earth. Digging into the earth like this can accidentally release greenhouse gasses and cause earthquakes (E. Kongar, personal communication, April 12, 2022). Can you think of a better way to dig into the earth and harness geothermal energy?

WHY IS SUSTAINABILITY IMPORTANT?

A lot of the energy we use now is not renewable energy. Instead, we get our energy through using natural gas and burning fossil fuels. But, there is a limit to how much natural gas and fossil fuels exist in the world.

In addition, every time you travel in a vehicle or enter a heated building, you participate in activities that send pollution into our environment. Pollution is basically when we put "harmful materials into our environment" ("Pollution", 2022). These harmful materials come from runoff from factories, the burning of fossil fuels, and littering. Pollution can hurt the earth by allowing plastics to accumulate in water sources, making holes in our atmosphere, and causing climate changes that lead to more natural disasters ("Pollution", 2022).

So, sustainability is important because it will help spread out our resources so that we can use them for a long time (EPA, 2021). In addition, sustainability through renewable energy will help us reduce the amount of pollution that we create ("Pollution", 2022).



WHAT CAN YOU DO?

Here are somethings that you can do to help our Earth (Fairfield University, 2022):

- Reduce/eliminate food waste
- Use rooftop solar panels
- Reusing single-use plastics
- Compost instead of throwing things away
- Use mass transit instead of driving
- Participate in residential recycling
- Plant and protect urban trees
- Bike or walk instead of driving

Do you have other ideas? Write them here!

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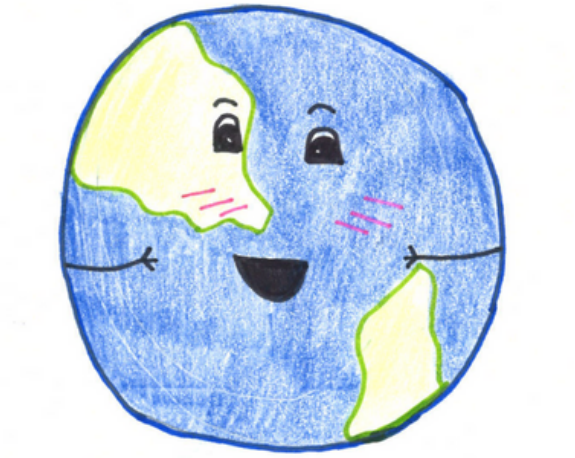
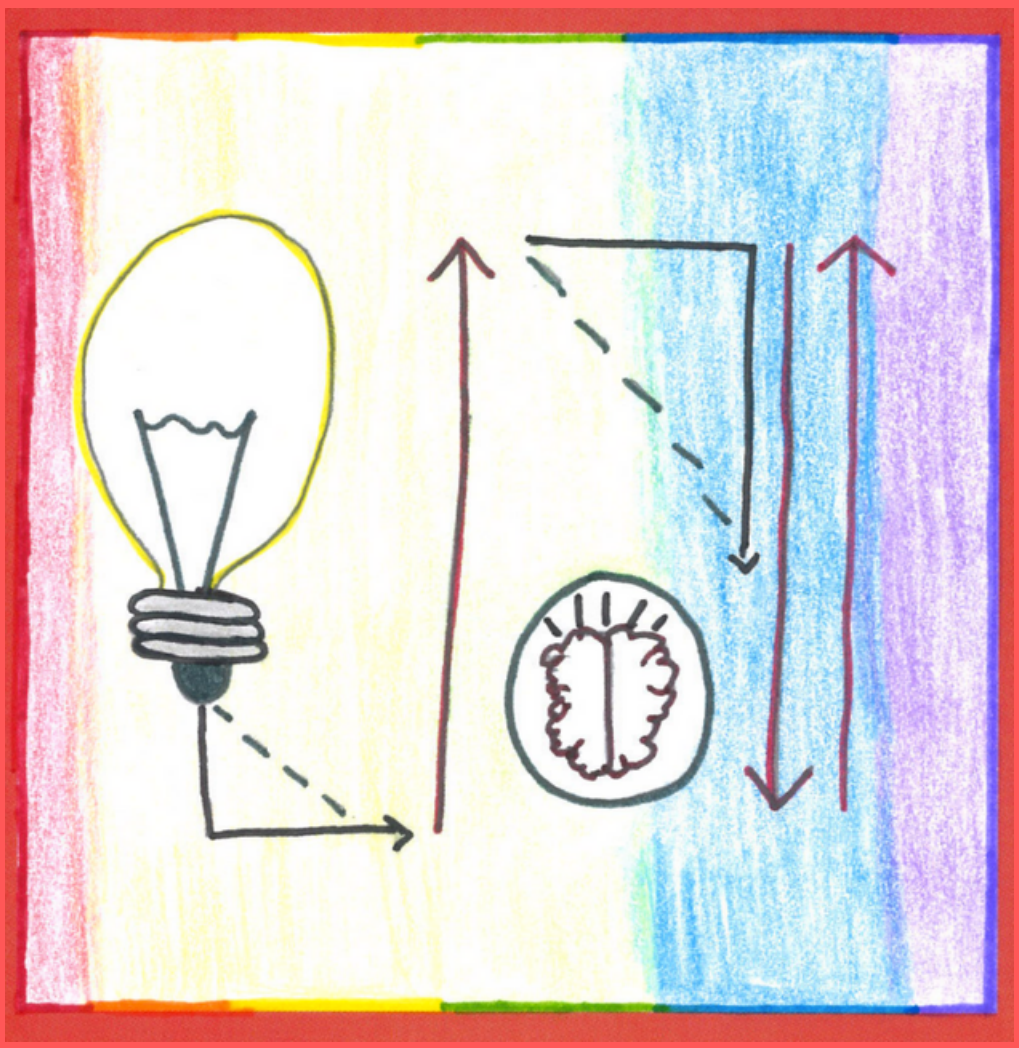


WAIT! HOW DOES ENGINEERING RELATE TO SUSTAINABILITY?



Engineers are problem solvers. When they see a problem, they want to take actions to use science to try to find a solution. Solar panels, wind turbines, hydroelectric power, and geothermal energy are all examples of how problem solvers like engineers can use science in order to help promote sustainability!

HOW TO RUN YOUR OWN EXPERIMENT ON SUSTAINABILITY:

Do you want to run your own sustainability experiment? Follow the Engineering Design Process (Fairfield University, 2022)!

ASK:

1. What are you trying to fix or improve?
2. What are the conditions and limitations of a project that you can make to investigate your topic of study?
3. Are there any completed projects that are similar to yours? If so, what were the results?

IMAGINE:

1. Come up with some solutions or improvements for your topic of study.
2. During the IMAGINE step of the Engineering Design Process, don't think about your limitations.
3. Think outside the box.

PLAN:

1. Choose the improvement or solution that you want to try based on your conditions and limitations.
2. Make a drawing.
3. Identify what materials you need for your project.

CREATE:

1. Make a first model or a rough draft of your project.
2. Run tests on your first model or draft.

IMPROVE:

1. Come up with other conditions, limitations, and improvements to your project.
2. Repeat the process and make an even better product!

REFERENCES

(Because it's always important to recognize your sources!)

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This book was made using Canva.

The images within this book were hand drawn by Abigail Diltz.