Let's go to the Beach!

THE CHALLENGE

Build a tool for beach-goers to monitor for hazards and to alert them of precautionary measures for protection on their swim- and surf-filled adventures!

Background:

The salty smell of the ocean, the sand beneath your feet, the breeze in your hair, and the warmth of the sun– who doesn't love going to the beach?

But before we jump in our swimsuits, let's make sure we are well prepared!

According to the World Health Organization [1], overexposure to sunlight can cause harm to our skin, our eyes, and our immune systems. In fact, protecting ourselves from UV damage, for example by using hats, sunglasses, and sunscreen, can prevent four out of five cases of skin cancer.

Additionally, harmful algal blooms (HABs) can also pose a threat at your next beach trip. According to the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce, HABs occur when colonies of algae in the sea and in freshwater grow out of control [2]. They can produce toxins that cause rashes, breathing problems, and liver damage [3]. Satellite-based images of ocean color can help forecast the presence of HABs in water bodies, and can direct you to HAB-free beach areas near you!

Develop a tool that alerts beach-goers to the precautions they need to take before heading out to the shores.

-Predict their sun exposure based on:

- The time of the day, and thus the distance from the sun, and the angle of the sun's rays
- The location of the beach (latitude, altitude, etc.)
- The month of the year, and thus the position of the Earth relative to the sun
- The cloudiness of the sky

-Suggest alternative times of the day, or days when sun exposure levels are lower.

-Warn users of presence of HABs in local beaches, and direct them to safer regions, where available.

-Add other precautionary and safety alerts as you see fit!

This challenge addresses the following Sustainable Development Goals (SDGs), adopted by the United Nations General Assembly to engage all countries and all stakeholders in a collaborative partnership. The SDGs aim to build a better future for all people by achieving sustainable development in three dimensions – economic, social, and environmental – in the spirit of strengthened global solidarity:

- *Goal 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters.*

- *Goal 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.*

- *Goal 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries*

Considerations:

-Explain the data in easy-to-grasp ways.

- For example, 15 minutes of exposure to the sun between noon and 2 pm is equivalent to X minutes between 2 pm and 5 pm. What kind of recommendation would you give to beach-goers?

-Add informative layers in your tool to explain to users the science behind the data and recommendations.

- For example, how would you caution users that sun exposure is greater at higher altitudes?

-Consider combining sun exposure data with weather forecasting to warn beach-goers of unpredictable and rapidly emerging conditions.

-Consider adding a game component in your tool to encourage the public to take proper precautions before heading out to the beach!

1] “Sun Protection.” Ultraviolet radiation and the INTERSUN Programme. World Health Organization. Website Accessed March 2017. http://www.who.int/uv/sun_protection/en/

2] “Harmful Algal Blooms: Tiny Plants with a Toxic Punch.” National Ocean Service. National Oceanic and Atmospheric Administration, U.S. Department of Commerce. Website Accessed March 2017. http://oceanservice.noaa.gov/hazards/hab/

3] “Nutrient Pollution: The Effects.” United States Environmental Protection Agency. Website Accessed March 2017. https://www.epa.gov/nutrientpollution/effects

You are my Sunshine

THE CHALLENGE

Create a medium to help people understand energy output from a solar panel, and a tool to plan energy consumption based on expected energy output from solar technologies.

Background:

Earth-orbiting spacecrafts, such as the International Space Station (ISS), require a source of power to be able to perform various functions in space. For example, ISS relies on electrical power to allow the crew to live comfortably, operate the station, and perform scientific experiments.

In space, the sun is a readily available source of energy. NASA has, and continues to develop technologies to convert sunlight into power for ISS and satellite missions, including the Orbiting Carbon Observatory 2 (OCO-2). These technologies include photovoltaic systems (such as solar panels) and solar batteries, which are charged during the sunlit part of the spacecraft’s orbit, storing energy to be used when the spacecraft is not in direct sunlight.