Health Problems After Natural Disasters

When a natural disaster happens, diseases can spread. Here are a few examples:

Tsunami

1. Tsunami happens.
2. Houses are destroyed.
3. People don't have housing.
4. People are crowded into temporary shelters.
5. Measles outbreak occurs.

Earthquakes

1. Earthquake happens.
2. Cities are destroyed.
3. There is no clean water.
4. People get cholera.
5. People die from cholera.
6. Dead bodies are left in streets .
7. Feces leak from the dead bodies and goes into the water.
8. Even more people get sick.

Volcanoes

1. Volcano erupts.
2. Homes are destroyed.
3. Ash and dust are blown into the air.
4. People don't have homes and have trouble breathing.
5. People who already have lung diseases can die.

Current Technology Available

Satellites

Satellites orbit the Earth using cameras and sensors to see what is happening. Here are some reasons why scientists use satellites:

- Can collect real-time data, meaning they can let emergency people know what is happening during a disaster.
- Can be used to predict natural disasters before they happen. For example, they can see if the area around a volcano is changing right before it erupts.
- Can be used to see what is happening during a natural disaster. For example, they can see how many wildfires have started and what direction they are moving.
- Can be used to see how the Earth has changed after a natural disaster. For example, they can see how the Earth has shifted after an earthquake.

Drones

Drones are unmanned vehicles that fly in the air and collect data. Here are some reasons why scientists use drones:

- Can travel to dangerous areas that have recently been hit by a natural disaster.
- Can deliver supplies to people who are trapped in places that cars or trucks can't reach.
- Can collect real-time data, meaning they can let emergency people know what is happening during a disaster.
- Can identify survivors that are trapped under rubble after a natural disaster occurs.

Universal Text Messaging System

A universal text messaging system are symbols and pictures that are texted to people before or during, or after an emergency. Her are some reasons why scientists use text messaging systems:

- People will receive instructions before a natural disaster to know whether to evacuate or stay in place.
- People will be able to "read" the instructions no matter what language they speak because emojis will be used to help them understand what to do.
- People will be able to get alerts for when emergency supplies, like bottled water, are being handed out in their area.

Computer Models

Computer models are made using computer programs. They can take huge amounts of data and use it to create things, like animations, to help people understand a concept or an event. Here are why scientists use computer models:

- To create 3D pictures or animations that represent what is really happening during a natural disaster.
- Scientists can see:
  - How an earthquake is causing a tsunami wave to form.
  - Where the lava from a volcano is going to flow.
  - What areas got hit the hardest from an earthquake and how big the waves were.

Steps to Create a New Piece of Technology

Step 1: Choose a Natural Disaster and Related Disease

Option 1:

Natural Disaster: Flooding

Related Disease: Cholera

Important Information:

- Cholera is a disease caused by bacteria that attacks peoples intestines. People's intestines move food through their bodies and take in nutrients so that they can enter the person's bloodstream. Cholera is typically caused by food or water that is contaminated with poop.
- When flooding occurs, contaminated water flow into water that is flooding people's homes or into people's water for drinking and showering. If the contaminated water gets into people's mouths, they can get cholera.
- Symptoms of cholera include: severe diarrhea, vomiting, and leg cramps. If people vomit and poop too much, people can become dehydrated, making them very sick, and even, die.
- In some places, like Bangladesh, flooding occurs often. This is because places like Bangladesh are hot and dry in the summer and then have very rainy seasons during the winter. The hot weather during the summer helps cholera bacteria grow in ponds and rivers. Then, the heavy rains make rivers overflow to flood the land, filling peoples homes with contaminated water.
- Information on current technology that track flooding and cholera:
    - A lot of different organizations collect data. For example, NASA collects data through satellites. The satellites collect data on rain and temperature. They can use the data to predict cholera outbreaks. The WHO (World Health Organization) collects data on cholera. Other organizations test water to see if it is contaminated after a flood occurs.
    - No technology tracks BOTH flooding and cholera outbreaks simultaneously.

Option 2:

Natural Disaster: Earthquake

Related Disease: Hepatitis A

Important Information:

- Hepatitis A is a disease that attacks people's livers. People need their liver because it cleans poisons out of their blood. Hepatitis A is typically caused by food or water that is contaminated by poop.
- Earthquakes can wreck peoples homes, and, sometimes, they have to find another place to live until their homes are safe.
- Right after the earthquake, people might need to live in a temporary place, like a tent. They might need to drink water from a stream and dig a hole to use as a toilet. If there are a lot of people in one area popping near a stream, human waste can end up in the stream water, contaminating it. If this happens, people could get diseases like Hepatitis A.
- Symptoms of Hepatitis A include: fever, vomiting, dark urine, and yellow skin.
- People in some cities do not always have access to clean water. After an earthquake occurs, people in these cities are more likely to get Hepatitis A. For example, Pakistan is very hot and dry with very little water. They also have cities packed with people and human waste contaminating water supplies.
- After an earthquake happened in Pakistan, the water became so contaminated that over 1,000 people got Hepatitis A from drinking dirty water.
- Problems with current technology that track earthquakes and Hepatitis A:
    - No technology tracks simultaneously BOTH Hepatitis A outbreaks and earthquakes.
    - The USGS (United States Geological Survey) has huge databases about earthquakes, but most people don't know about it.
    - WHO (World Health Organization) collects data on Hepatitis A. However, not all cities report information to the WHO about how many people have Hepatitis A.
    - There are tests to see if drinking water is contaminated, but many people can't afford to test their water after an earthquake. If a test shows Hepatitis A, the water can be boiled or chemicals can be added to make the water safe.

Option 3:

Natural Disaster: Tsunami

Related Disease: Measles

Important Information:

- Measles is a disease that starts in a person's nose and lungs and then spreads to many different parts of the body. Measles is spread from one person to another when the infected person coughs or sneezes out mucus with the measles virus. This mucus is also called measles droplets. Other people get the virus into their nose when they breathe in the droplets or get the droplets on their hands and then touch their nose.
- Tsunamis are huge waves that can happen after an earthquake. People who live near the shore need to leave their homes and find someplace to stay until their homes are safe.
- After a tsunami, people often need to stay in crowded buildings with many other people. When people need to live in crowded conditions, they are more likely to breathe in infected droplets after someone sneezes. If one person in the building has the measles, pretty soon everybody in the building will have breathed in the droplets and could get the measles.
- Symptoms of measles include: fever, coughing and sneezing, and a rash all over the body. Serious cases of the measles can cause a person's brain to swell, which can lead to death.
- There is a vaccination that can keep people from getting measles, but there are many places where people have not gotten their shots. Some countries do not have enough doctors or money to give everyone a shot. For example, Aceh, located in the Indian Ocean, had only given shots to some of the people who live their when a huge tsunami hit. After the tsunami, many people caught the measles because of the overcrowding, and many died because they could not see a doctor.
- Problems with current technology that track tsunamis and measles:
    - No technology tracks simultaneously BOTH tsunamis and measles outbreaks.
    - The USGS (United States Geological Survey) has huge databases about tsunamis, but most people don't know about it.
    - WHO (World Health Organization) collects data on measles and measles vaccinations. However, not all cities report information to the WHO about how many people have the measles.
    - There is no way to stop the spread of measles once a person has the disease. Making sure every person has gotten a measles shot is the only way to stop outbreaks of measles.

Step 2: Read about Requirements for Your Device

You should design a "super device" that performs multiple tasks to aid in keeping people healthy after a natural disaster. Requirements for you device include:

- Requirement #1: Combines a minimum of two types of technologies from Handout: Current Technology Available.

- Requirement #2: Collects data on how the natural disease impacts human health.
  Examples:
  - Can collect data on how a natural disaster can lead to more people getting a disease.
  - Can track how many people have the disease. For example, a text message feature that lets doctors and regular people input how many people are sick in an area.
  - Takes pictures and videos of the impacted area that can be sent to people who are organizing relief efforts.

- Requirement #3: Can predict future natural disasters.
  Examples:
  - Monitors locations where a natural disaster is likely to happen. For example, if there is an earthquake under the ocean, use a drone to monitor the coastline near the earthquake.

Step 3: Choose a Type of Technology

Choose two (or more) of the following types of technology below that you want to combine to create your super piece of technology. Look at Handout: Current Technology Available to read more about the different options.

Circle your 2 choices below:

- Satellite
- Drone
- Computer Model
- Universal Text Messaging System
- Other- ask your teacher for permission if you have another idea

Step 4: Understand Budget and Cost of Supplies

You will have $1,500 to build your prototype. Look at the cost of the supplies you can use below so you can plan out what materials you want to use.

Item	Cost per item
6 inch piece of tape	$50
Use of scissors	$250
Small piece of cardboard	$40
1 pipe cleaner	$30

Item	Cost per item
Popsicle stick	$10
1 Straw	$25
1 Paper towel tube	$75
1 foot of string	$50

Step 5: Brainstorm and Plan

You will brainstorm ideas for your device below. Make sure to label all important parts of your device. Use the next page if needed.

Natural Disasters

SCIENCE CAREER ADVENTURES

More room to brainstorm about your device:

Then, answer the questions below about how your device will work:

- What can your device do?

- How does it work?

- Why will this device be helpful after a natural disaster?

- What is at least one cool feature of the device?

Step 6: Build a Prototype and Track Expenses

Build a prototype of your device. Make sure to track your expenses using the chart below.

Hint: Multiply the quantity times the cost per item to get the total cost of that purchase

Supply	Quantity	Cost per item	Total Cost

Total Cost of Device: _____