

# Disastrous Decision Making

## Teacher's Guide



### Overview

In this activity, students have the opportunity to role-play as a mayor, social advisor, or science advisor to a city experiencing a flood event. Students will research social vulnerability, analyze data from a map, and make decisions about what areas should be protected in the event of a disaster.

### Glossary

Flood- Flooding is a consequence of extreme weather when water overflows or soaks normally dry land. Flooding can happen when there is heavy rainfall or storm surge in a region. (Source: National Geographic)

Hurricane- A hurricane is a type of storm called a tropical cyclone, with winds higher than 74 miles per hour. The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating, or category, based on a hurricane's maximum sustained winds. The higher the category, the greater the hurricane's potential for damage. (Source: NOAA)

Social Vulnerability- Social vulnerability is the susceptibility of social groups to the impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood. (Source: FEMA)

Storm Surge- Storm surge is the unusual rise in seawater levels during a storm, measured as the height of the water above the normal predicted tide. The surge is caused primarily by a storm's winds pushing water onshore. (Source: NOAA)

### Lesson Information

Subject: Science  
Grade Level: Middle School  
NGSS:  
[MS-ESS2-5 Earth's Systems](#)  
[MS-ESS2-6 Earth's Systems](#)  
[MS-ESS3-4 Earth and Human Activity](#)

[Link to Introduction Video](#)

### Learning Objectives

- Students will be able to interpret data from a map (specifically EJ Screen)
- Students will be able to communicate their research results to others
- Students will be able to make decisions based on research results

### Materials Needed

- Activity Presentation
- Computer or Tablet
- EJScreen Map Website
- Paper
- Writing Utensil

# Background Information

## Introduction

The activity should begin with the following discussion questions.

What does it mean to be vulnerable to something?

Teachers can facilitate discussion by asking students what vulnerability means, elaborating on aspects of safety during hazards, and discussing the resources that keep people from being vulnerable.

How can governments help prepare for disasters?

Teachers can facilitate discussion by investigating all of the things that need to happen before a storm hits to make people safe. Teachers can also ask students how they have prepared for storms in the past, and what information was helpful for them and their families.

## Background Information

In 2012, Hurricane Sandy devastated New York City and caused major damage. Over 65 billion dollars in estimated damages occurred in New York and New Jersey. Major flooding exceeded any previous records of peak water levels from any other storm—in some areas storm surge was recorded at 13 feet.

There is evidence that an increase in the global mean temperature (climate change) will impact the frequency and severity of natural disasters, including flood-inducing rainfall.

A 100-year flood has a 1 in 100 chance of hitting in a given year. The term was created to help people assess risk. For example, houses that have been built in a place where a 100-year flood could happen usually need to purchase extra insurance.

## Vulnerability

However, certain regions will not be impacted the same by disasters. There are many demographic factors, like those who are linguistically isolated (do not speak the predominant language), low-income, under age 5, people of color, and over age 64, that increase the risk of negative impacts from disasters.

So, how can governments work to prioritize people or make final decisions to protect vulnerable neighborhoods?

# Activity I: Protecting the City

Time Required:  
45 minutes - 1 hour

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## Making a Team

In groups of 3, the students will divide up the roles of mayor, social advisor, and science advisor. Each role comes with certain responsibilities. The social advisor and science advisor will look at the different layers of the EJScreen maps and pick two areas (or block groups) that they want to protect. They will then come to the mayor and propose the two block groups they think should be protected. If there is a non-consensus between the social and science advisors' proposed block groups, the team will negotiate and come to a compromise.

## The Mayor

The mayor will be in charge of facilitating discussions among the group. Even though they are the "boss", they also need to listen to everyone else in the group, because while a good mayor can make the tough decisions, they were elected by the people.

## The Social Advisor

The social advisor will be in charge of looking at the socioeconomic data of the EJScreen map created by the EPA. There are many demographic variables like linguistically isolated, low-income, under age 5, people of color, and over age 64. The instructor should pick one of the variables to explain why it may make this population more vulnerable. For example, if someone is under age 5, they are reliant on adults to help them in an emergency situation because they are a small child. They cannot read emergency signs, leave on the subway or in a car on their own, or even get to higher ground on. The educator should encourage the social advisors to think about these categories and possibly why these populations are made more vulnerable.

## The Science Advisor

The science advisor will look at flood data on EJScreen map. The instructor should tell the science advisors to focus solely on the 100-Year Floodplain category. Historically, this is the average flood elevation level in feet during intense storms. If the instructor feels that their class needs more of a challenge, they can have the students pick different layers to focus on other than the 100 Year Floodplain.

# Using EJScreen

## Purpose

Both the maps in EJScreen will show the risks facing a block group during a storm but from different perspectives—the science and the social. Most likely, the block groups the social and science advisor focus on will be different, so all three students will work towards seeing the complete picture of what climate and social risks exist in their selected block groups and brainstorm what could be done to help that area. Students will pick a coastal city (for example, New York) and look at both flood and socioeconomic data there.

## Social Advisor

The social advisor is in charge of going through the socioeconomic data and telling the mayor why resources should be given to certain communities or neighborhoods. They will make these decisions based on what they find on the map.

1. Once on the website (<https://ejscreen.epa.gov/mapper/>), in the right-hand corner, students will type in the address, zip code, or name of the neighborhood they would like to look at.
2. Then once they have found their area of interest, they will add layers to their map.
3. Using the demographic indicators, students can pick any of the variables to add to the map. Think about which variables may make a neighborhood more at risk from a flood. Some particular layers that are great to look at are low-income population and “over age 65,” but there are no ‘right’ layers to pick, so students can play around with which ones they want to use!
4. If a student finds a map they really like, they can download or screenshot the map with a legend to describe what different layers are represented.

\*\*\*A note on 'block groups'

Each block group contains roughly the same amount of people, but may not contain the same amount of land. Smaller looking block groups represent densely populated areas.

## Science Advisor

The science advisor will inform the mayor of the scientific evidence available.

1. Once on the website (<https://ejscreen.epa.gov/mapper/>), in the right-hand corner, students will type in the address, zip code, or name of the neighborhood they would like to look at.
2. Then once they have found their area of interest, they can add layers to their map.
3. On the drop-down menu on the left-hand side of the screen, they can select "Climate Change Data". In the menu that appears below, select "100 Year Floodplain"
4. Students can play around with the different map layers to see what sort of flood risks face that area.

# Playing the Game

## Strategy

Students in the social and science advisor positions should identify two block groups within the agreed-upon region to protect. However, the team can only pick one block group to protect, and employ the strategies below. There are visual examples in the Powerpoint of communities that can be protected both due to their social vulnerability and exposure to climate hazards.

Students may consider employing the following protection measures:

- flood barriers (sandbagging)
- distributing supplies like food, baby formula, and clean water
- earmark financial support for evacuation procedures
- deploying National Guard to prepare for rescue operations

Now, the two areas that each of the advisors selected will most likely be different. The mayor should have each student make an argument for why it is important to protect their areas and if there is any overlap, the mayor should highlight that to help make the decision for which one area will be protected. The students should answer the questions on their worksheets as they go through the exercise.

1. Which two areas does the science advisor recommend to protect? Why?
2. Which two areas does the social advisor recommend to protect? Why?

### Subject Connection: SOCIAL STUDIES

This lesson discusses socioeconomic data and what makes certain populations more vulnerable than others.

For the middle school level, the instructor could talk about how scarcity necessitates decision making and how those decisions historically favor certain groups of people over time, identifying the relationships of patterns of continuity and change to larger historical processes and themes, or how the physical environment influences human population distribution, land use, economic activities, and political connections.

# Playing the Game

## Discussion and Wrap Up

The educator should emphasize the importance of proper communication within a team to come to a compromise and the difficulty of arriving at such an agreement.

What area did your group decide to protect?

Teachers can facilitate discussion by asking students to share the location of their protected area, and explain the intersection of scientific data and social vulnerability data that led to their decision.

Why did you choose one demographic variable over another? What influenced this decision?

Teachers can facilitate discussion by asking students to describe their process of coming to a compromise, and how they interpreted the data together as a team.

How would you use your resources to help the people in the area? Will you build storm walls, evacuate them, move them out from flood zone areas so no one is at risk, etc.? (There is no one right answer, get crazy with it!).

Teachers can facilitate discussion by sharing different ways that cities have prepared for storms in the past, and asking the students which strategies they feel are most effective. The teacher can also ask if any students have seen any of these strategies in practice in real life.

How did you feel about only having to pick one area? Frustrated, angry, sad, etc.?

Teachers can facilitate discussion by relating the topic to real-world decision-makers, and decisions made in disasters. Teachers can also ask students what they wish could be different about their task (more resources, choosing additional block groups, different roles) to make it easier to come to a conclusion.