

CLASSROOM ACTIVITY

Making Cities Smarter

OBJECTIVES

Students will be able to:

- **Describe** the characteristics of a “sustainable city” in terms of innovation, technology, and equity.
- **Analyze** data on various aspects of cities, such as resource, energy, and water use.
- **Create** a sustainability plan for a city based on innovation and technology improvements that can be made.

OVERVIEW

In this teacher-led activity, the driving question for students is, “How can communities use information about their location, population, and resource use to make decisions that will make their city more sustainable?” In small groups, students will play the role of a team of sustainability analysts and work together to create a plan to better harvest and use renewable energy in a community to improve the city in terms of resilience, green practices, and smart innovations. They will conduct research on their assigned city to determine the energy, water, sustainability, and equity challenges that the community faces. They will then come up with ideas specific to the community that could improve the facets of sustainability of the city for all people and the planet. The group will then record a short video detailing their plan that encourages citizens and lawmakers to implement their suggestions to increase sustainability and make their city a “smarter” city.

GRADES

5–9

CONNECTION TO THE ENERGY-WATER NEXUS

- Choices we make about our homes, transportation, and lifestyle can have a positive impact on the types and amount of water and energy consumed in a city.
- The energy sources used by cities have an impact on the amounts of water that is consumed, and using renewable energy can conserve water and reduce waste.

NATIONAL STANDARDS

[Next Generation Science Standards](#)

Science

- **MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics**
Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- **MS-ETS1-3 Engineering Design**
Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

BACKGROUND INFO

The world urbanization prospects have predicted that by 2050, around 68% of the global population will live in cities. While cities certainly play an important role in driving economic growth and innovation, it is important to understand that cities also use massive amounts of energy and water, consume natural resources, generate waste, and contribute to large amounts of greenhouse gas emissions. The number of global cities that have pledged to become sustainable has been increasing since the 1970s, as laws and practices are put into place to conserve resources, implement smart technology, and ensure equity in cities for the health and well-being of the citizens. In a sustainability plan, cities outline goals and actions that are aimed at promoting responsible development, environmental protection, social equity, and the implementation of smart technology to minimize energy and water use.

KEY VOCABULARY

- smart city
- sustainability
- equity

MATERIALS

- “How Much Water Does It Take?” Research Sheet
- Sustainability Plan Student Sheet
- Devices with internet access

TEACHER PREPARATION

PROCEDURE

1. The teacher should begin by displaying or asking students the following question: What does “sustainability” mean when describing a city? (This could be written on the front board or displayed on an overhead screen.) Ask students to think about this question and share their ideas with the class. Record their ideas on the front board.
2. Show the following short video clip that defines sustainability in cities and communities. [Creating Sustainable Cities](#) (stopping at 1:48). After viewing, give each student a copy of the “Sustainable Cities

Notes Student Sheet” and ask them to write down what they think each of the actions and goals of sustainable cities means. They can discuss their ideas with those sitting around them, then come up with a class explanation for each as they share it with the whole group.

3. Give students the link to [How Copenhagen is Leading the World in Sustainability—The Urbanist](#) to view on their devices or print a copy of the article for each student. Ask students to read the article and come up with an example for each of the actions on the notes sheet, and if time allows, students can share their examples with each other and the whole group.
4. Ask students to form small groups of 3–4. Explain to students that for this activity they will play the role of sustainability analysts who have been assigned to a U.S. city that wants to improve sustainability and become a smart city.
5. Assign each group of students to one of the following cities:
(All cities are taken from the [Bloomberg Sustainable Cities Initiative](#))
 - Buffalo, New York
 - St. Louis, Missouri
 - Oakland, California
 - Birmingham, Alabama
 - Atlanta, Georgia
 - Nashville, Tennessee
 - Cleveland, Ohio
6. Give each group a copy of the Sustainability Plan Student Sheet. Using their student devices and the links provided, students should work together to learn about their city and create a plan for improvements the city can make to become more sustainable, smart, and equitable.
7. Give student groups 20–25 minutes to complete their research and their sustainability plan for their city.
8. For the remaining time, tell groups that they must take the plan and record a short video that could be viewed by legislators, government officials, business owners, and the people in the city that would outline the ideas in the plan and encourage them to take action to increase sustainability.
9. It is recommended that students use FLIP, a video discussion and video-sharing website and app, to create their videos. Once students have recorded and uploaded their videos, they view, comment on, and like the videos of others to extend their learning and review the plans for all types of cities with various challenges.

EXTENSION

As an extension of the lesson, students can take a closer look at how to inform people about the importance of sustainability and the technologies that make it possible. Have students complete the activity “[Marketing is the second M in STEM](#).” In this activity, they will work together to solve a problem that will help their school conserve energy and water and educate students about possible STEM solutions to reduce the school’s energy and water usage in the future.

SOURCES

<https://www.youtube.com/watch?v=E1CMH-Eoa94&t=32s>

<https://www.theurbanist.org/2024/02/23/how-copenhagen-is-leading-the-world-in-sustainability/>

<https://www.bloomberg.org/environment/supporting-sustainable-cities/bloomberg-american-sustainable-cities/>

<https://www.census.gov/>

<https://www.eia.gov/state/>

[Visualizing water use by region and time](#)

[How Does Your State Make Electricity?—The New York Times](#)

<https://coolclimate.berkeley.edu/maps>

<https://nationalequityatlas.org/>

SUSTAINABLE CITY ACTIONS and GOALS	What does this mean?	Example
Climate Change Mitigation		
Green Economic Development		
Disaster and Climate Change Resilience		
Livability and Social Inclusion		
Smart Technologies		

CITY

LINKS

- General Information about your city: <https://www.census.gov/>
- How energy is used in your city's state: <https://www.eia.gov/state/>
- How water is used in your city's state: [Visualizing water use by region and time](#)
- How the state your city is in makes electricity: [How Does Your State Make Electricity?—The New York Times](#)
- Household Carbon Footprint: <https://coolclimate.berkeley.edu/maps>
- Equity ranking in your city: <https://nationalequityatlas.org/>

INFORMATION ABOUT/INTRODUCTION TO THE CITY:

Give some data and descriptions of the city and the potential issues that it faces in terms of sustainability, energy and water use, and equity.

THE CITY'S GOALS

For each goal, list or outline some ways that your city can meet each goal based on its location, population, resources, and challenges. Use the inspiration links for ideas!

Renewable energy use

Inspiration link: [Renewable Energy](#)

Reducing greenhouse gas emissions

Inspiration link: [GHG Reduction Programs & Strategies | US EPA](#)

Green buildings and businesses

Inspiration link: [What is green building?](#)

Climate change action

Inspiration link: [Seven Ways Cities Can Take Climate Action | UNFCCC](#)

Smart technology for water and energy use

Inspiration link: [Smart Cities Virtual Field Trip](#)

Equity in Sustainability

Inspiration link: [Social Equity | U.S. Climate Resilience Toolkit](#)