



# Climate Hope: From Knowledge to Action

Tools for Teaching Climate Change to New Mexico Middle Schoolers

## Lesson Descriptions

### **Lesson 1: Climate Weirding: Impacts in New Mexico and Beyond**

- Explore climate change impacts including heat, drought and aridification; snowpack, water availability, and wildfires.
- Learn how these impacts affect local forests, animals, and humans
- Impactful Videos activity: students watch videos of people talking about climate impacts to them and in their communities, take notes and discuss their thoughts and feelings, and present to the class

### **Lesson 2: Causes of Climate Change and the Science Behind It**

- Understand what fossil fuels are, how we use them, how burning them releases CO<sub>2</sub>, and how this causes an enhanced greenhouse effect
- See how industries in New Mexico contribute to greenhouse gas emissions
- Extension: students do a scientific modeling activity of the enhanced greenhouse effect

### **Lesson 3: Climate Solutions Are All Around Us!**

- Recognize that to curb climate change, fossil fuel use must go down while renewable energy use goes up
- Discuss use of solar, wind, and geothermal energy in New Mexico
- Students brainstorm and organize solutions ideas
- Use the leaky boat problem to understand the difference between adaptation solutions and those that fix climate change
- Fossil Fuels to Renewables game: students strategize solutions and use cards to replace more fossil fuel-heavy and less efficient ways of doing things with more efficient, cleaner renewable energy options

### **Lesson 4: Students Take Action On Climate and Climate Justice**

- Tackle the concept of climate justice, how those doing the least to contribute to climate change are often impacted the most
- Introduce methods of group action being used by young people in New Mexico
- Climate Justice game: students take on a character, and assess how they are affected by climate change and compare with the rest of their classmates

## Phenomena

Why is climate change happening on Earth?

What impacts does climate change have on New Mexico and around the world?

What impacts does climate change have on humans?

## Key Vocabulary

- **Climate Adaptation** - Taking actions to help reduce how much harm is caused by the impacts of climate change. Adaptations won't fix the problem, but rather can help adjust to it and reduce risk from the effects.
- **Climate Change** - Change to the long-term patterns of Earth's atmospheric, oceanic, land, heat, and chemical cycles. Climate change is having large and global impacts on ecosystems, wildlife, and many aspects of human life. The climate is changing now mostly due to human actions.
- **Climate Justice** - Actions that are needed to help communities of people who are being most affected by climate change impacts but have often contributed least to causing and worsening it.
- **Climate Mitigation** - Taking actions to reduce or eliminate greenhouse gas emissions by slowing and stopping the burning of fossil fuels and replacing them with clean, renewable energy, in order to slow down or stop climate change.
- **Fossil Fuels** - Sources of energy mined from inside the Earth that originate from ancient fossilized plants and animals. They are non-renewable because they are being used much more quickly than they are formed. They lead to climate change when burned because they release extra carbon into the atmosphere.
- **Greenhouse Effect (Enhanced)** - The process by which more of the heat from Earth is trapped in the planet's atmosphere close to the surface instead of escaping into space because of increased amounts of greenhouse gases in the atmosphere. This causes average global temperatures to increase.
- **Greenhouse Effect (Natural)** - A natural planet-warming process in which heat that goes back into the atmosphere from the surface of the earth is captured by gases that hold it on the planet's surface instead of it being able to escape into space. This effect is what allows Earth to be warm enough to be liveable.
- **Greenhouse Gases** - Gases in Earth's atmosphere that trap heat, including carbon dioxide, water vapor, ozone, methane, nitrous oxide, and fluorinated gases. Too much of them in the atmosphere is the root cause of climate change.
- **Renewable Energy** - Sources of energy that are continuously available. Solar energy, wind energy, and geothermal energy are all renewable sources.

# **Common Core NM State Standards**

## **English Language Arts**

### ***ELA-Literacy***

- RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
- RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
- RST.6.7 Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
- SL.6-8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade [level] topics, texts, and issues, building on others' ideas and expressing their own clearly.
- SL.6-7.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
  - 7- Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- WHST.6-8.1.B Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

## **Social Studies**

- ECI.6.20.19 - Identify how differences and similarities between diverse groups impact perspectives.
- IKI.6-8.7 - Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
- Inquiry.26.8.13 - Engage in discussion, debate, or academic conversation analyzing multiple viewpoints on public issues. Communicate and Critique Conclusions
- Geography 6.14 - Describe how people impact the local environment.
- Geography 7.19.14 - Describe how environmental factors affect human activities and resource use.

## **Mathematics**

### ***Statistics & Probability***

- Grade 6: Represent and analyze quantitative relationships between dependent and independent variables.
- Grade 7: Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Grade 8: Understand the connections between proportional relationships, lines, and linear equations.

## Next Generation Science Standards

- MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-ESS3-3 NM. Describe the advantages and disadvantages associated with technologies related to local industries and energy production.
- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- MS-ESS3-5. Ask questions and clarify evidence of the factors that have caused the rise in global temperatures over the past century.
- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

This unit is aligned with the three-dimensional learning model of the Next Generation Science Standards.

<b>Science and Engineering Practices</b>	<b>Disciplinary Core Ideas</b>	<b>Cross Cutting Concepts</b>
<ul style="list-style-type: none"> <li>● Asking questions and defining problems</li> <li>● Developing and using models</li> <li>● Analyzing and interpreting data</li> <li>● Constructing explanations and designing solutions</li> <li>● Obtaining, evaluating, and communicating information</li> </ul>	<ul style="list-style-type: none"> <li>● PS1: Matter and Its Interactions</li> <li>● LS2.C: Ecosystem Dynamics, Functioning, and Resilience</li> <li>● ESS3.A: Natural Resources</li> <li>● ESS3.C: Human Impacts on Earth Systems</li> <li>● ESS3.D: Global Climate Change</li> <li>● ETS1.A: Defining and Delimiting Engineering Problems</li> <li>● ETS1.B Developing Possible Solutions</li> </ul>	<ul style="list-style-type: none"> <li>● Patterns</li> <li>● Cause and Effect</li> <li>● Scale, Proportion, and Quantity</li> <li>● Systems and System Models</li> <li>● Energy and Matter</li> <li>● Stability and change</li> </ul>