

► UNDERSTANDING CLIMATE CHANGE: BIG IDEAS

The big ideas identify some of the concepts underlying climate change science and create a context for the culminating tasks:

- ▶ the flow of energy on the planet;
- ▶ the role carbon compounds play in changing the flow of energy;
- ▶ the choices that we can make to reduce the impact of carbon compounds on the flow of energy.

To understand these big ideas, several concepts are used to illustrate processes on Earth:

- ▶ the global carbon budget;
- ▶ the global radiation balance;
- ▶ “green” technologies that reduce CO₂ emissions.

The carbon budget consists of *sources* of gaseous carbon emissions and *sinks* where carbon is sequestered from the atmosphere. Within a natural ecosystem, there are many sources and sinks. Some human activities (e.g., fossil fuel based industries, transportation) are sources of carbon emissions while others (e.g., logging, filling in wetlands) destroy or impair the action of carbon sinks.

Energy from the sun drives Earth’s weather and climate. This energy eventually leaves the Earth as heat. Certain atmospheric compounds, such as CO₂, absorb this energy and retain it in the atmosphere. This creates an imbalance, where less energy is released from the Earth than absorbed. New solar radiation continues to arrive on Earth, and the resulting energy imbalance affects global climate patterns.

Connecting CO₂ production to energy flow in the atmosphere and hydrosphere provides students with an understanding of how small changes in the concentration of CO₂ in the atmosphere can have significant consequences. Although weather variation is common in a local area, climate change creates greater potential risks. Climate change can have long-lasting effects on different economic sectors, such as forestry, tourism and agriculture.

Throughout this course, *CO₂ production is linked to changes in energy flow within the planet and the choices we make as individuals and as nations.* Heat transfer that affects the patterns of trade winds and ocean currents can lead to extreme changes in climate on the planet.

All of the big ideas presented link to choices. Choice and action help make the concept of climate change more relevant and meaningful to the adolescent student. In the culminating task, the students use research and analysis to apply what they have learned in the course to a plan of action in a specific context.