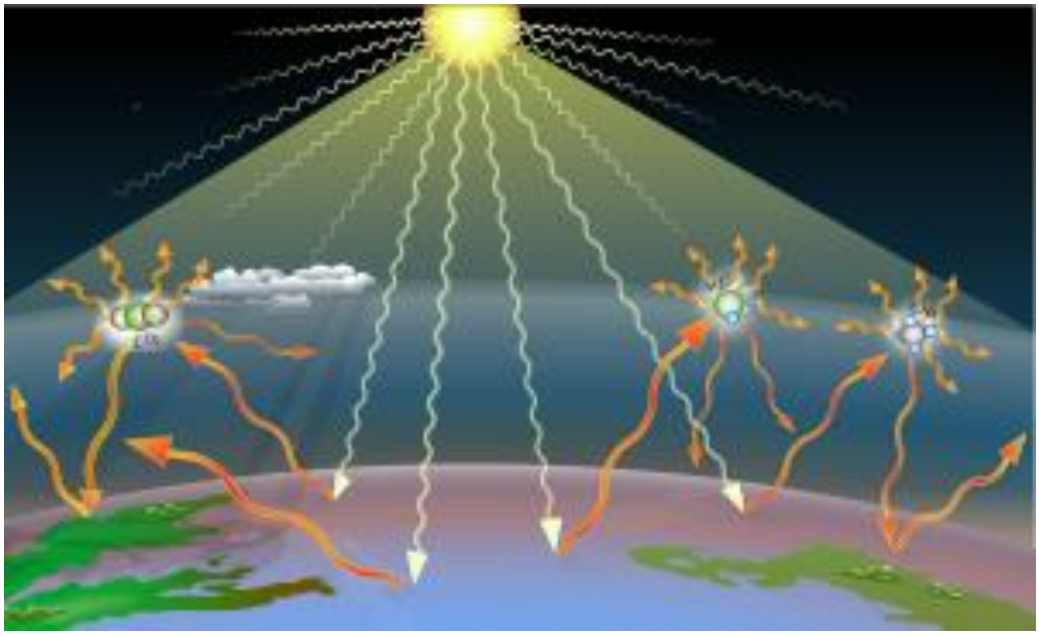
Idea Bank of Climate Change Project Activities



Background: Understanding Rising Temperatures

Earth's average temperature has risen at increasingly and will continue to do so between now and 2100, climate scientists tell us. Even a rise of 1 to 5 degrees Celsius or 2 to 9 degrees Fahrenheit will change our weather patterns in dramatic ways. View the image to understand this effect.

What has caused the increase in temperatures? As gravity brings heat from the sun, heat also rises. (To test this principle, put an ice cube in a cup on the ground. Put another one on a higher surface, in the sun, covered by a glass. Ask students to check them both in ten minutes to see which one is melting.) View the image to understand this effect.

As the sun sends its UV rays to the earth, some bounce back, only to stop again at the top of earth's upper atmosphere. The earth's atmosphere, or umbrella, creates this greenhouse effect, trapping the gases and preventing the earth from cooling. This "greenhouse gas effect" raises temperatures, redirecting winds, shifting condensation and transpiration patterns, and interrupting weather cycles and systems. As a result:

1. We see pattern shifts all over the earth, in the form of more hot days, more severe storms, longer droughts and more deforestation.
2. Polar countries see melting glaciers, leading to sea rise and shrinking islands.
3. Animal habitats change faster than some animals can adapt, and biodiversity suffers.

4. Because some areas become hotter and more humid, we see an increased likelihood that bacteria, disease-carrying mosquitos, and garbage-eating rodents will thrive, impairing human health.
5. Floodwaters rise in swollen rivers as weather systems collide and clouds burst suddenly. If the water becomes contaminated, the people become ill.
6. We see shifting growing seasons. Some regions face unseasonal heat waves or cold snaps, and the crops cannot be pollinated on schedule. Fruit-bearing, nut-bearing trees also fall under the weight of snow where it never fell before. Farmers cannot consistently grow foods that once grew in a region.
7. As plants, animals and humans struggle to stay in their homelands and escape these challenges, we may see forced migration.

Scientists are learning more each day about how we can educate the next generation to reduce the future impacts of climate change. Delve more deeply into the strategies that will shape their thinking as they inherit a changing world, using the tools you've developed in the previous lessons and the ideas you're about to acquire.

What causes the increase in temperatures? Seven greenhouse gases in the air, such as methane and especially carbon dioxide or CO2, trap the heat under the ozone layer.

A greenhouse gas (GHG) absorbs and emits radiant energy, causing the greenhouse effect. The primary greenhouse gases in Earth's atmosphere include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). Without these gases, the temperature of Earth's surface would be much lower, as much as 18 degrees lower or 59 degrees lower in Fahrenheit.

Carbon and methane drive the rapid rise of climate change more than any other greenhouse gases. Carbon emissions have increased ever since people began to drive cars and buses and as factories began to operate using coal. Petroleum products, such as gasoline, oil, and even plastics all come from fossil fuels, named for the creatures whose bones liquified far beneath the earth to create these substances. If we leave the fossil fuels there where nature put them; in other words, if we "sequester" them underground, we may be able to stop emitting carbon and slow down the effects of climate change. That would make life easier for our human species and for the family of all living beings.

To introduce the subject of the greenhouse effect to students in primary or even secondary school, imagine a metaphor that more simply explains this scientific concept.

Korto School children in Liberia used a parachute to understand the greenhouse effect. In another photo, climate change camp students participated in a game of ball to understand the concept. (These ideas come courtesy of Mr. Christopher Swen.)

Other teachers have presented the lid over a pan of hot, steaming food to demonstrate the contrast between the dry upper surface of the lid and the condensation on its underside as heat and water vapor collect there.

You are limited only by your own imagination and your available materials in determining what will help your students understand the causes and effects of climate change and its role in changing life on the planet.

What do Nations see as Sustainable Development Goals

The “sustainable development” goals for the United Nations ask people to think about how to sustain life—by ensuring that everyone has enough to eat, ample health care to feel comfortable, basic education to live a meaningful life, and tje equality that helps women share work and leadership opportunities with men, to contribute to happiness and economic viability with a community.

Think about how climate change affects these goals. Today, some scientists talk about regenerating the earth. They, along with social scientists, believe we can only halt the rise of temperatures and reverse the impacts of weather disasters to the extent that we work with integrity, generate innovative ideas, and promote caring from one sector of society to the next.

Learners in the 21st century will need to act on their convictions—to learn all we can about the impacts of climate change and then imagine the ways to adapt to them, while preventing greater rises in temperature.

Each nation and generation will benefit as we:

1. Learn the science of climate change and advance its innovations.
2. Recycle, reimagine, and reduce practices that cause climate change.
3. Expand regenerative farming techniques.
4. Teach prevention of diseases brought on by climate change.
5. Restore habitats.

6. Protect carbon sinks (forests, grasslands, and oceans).
7. Reduce fossil-fuels in energy plans and transportation systems.
8. Advocate for the vulnerable.
9. Make personal and career choices that protect life for the human family and for all living beings.

*The **Climate Change Unit Plan on the Habit of Oneness** offers an example of how to incorporate these principles into your integrated unit plan. Review it as an example. Then, using the sample academic requirements and your selected habit-of-heart, you can then tap the project ideas below to customize your own unit plan.*

Consider how you will introduce climate change concepts to your students.

What observations outside your school door illustrate the impacts of climate change and attempts to curb its influence? What quality of life do learners experience in the local systems where you live and teach? Does climate change play a role in those systems? Where is energy lacking? Where have renewable energies been researched and applied? What aspects of the systems are shaped by humans? What aspects can be *improved* by humans?

1. Choose an introductory activity to build a sense of conviction in your students, followed by a demonstration of how greenhouse gases affect the ozone layer. Some have used a pot or pan of hot food with condensation on the underside of the lid. Some have used dodge ball or a toy parachute or a tree on life support to represent the message. Plan based on available materials and the ages of your students.
2. Greenhouse gas levels before the Industrial Revolution were at 280 parts per million. Challenge students to guess what they were they after the Industrial Revolution. [380 parts per million] Draw a graph on the board to convey the ratios.
3. Provide materials for a graph your students can make to show the impact of fossil-fuels on a healthy environment. (List local sources of emissions sources to compare human and natural greenhouse gases.
4. Discuss the carbon in smoke emissions. Smoke contains carbon and at least 20 other chemicals, depending on what is being burned. Combustion requires the rapid release of energy, which releases carbon dioxide, carbon monoxide and particulate matter during the ignition, burning and smoldering phases. This can contribute to heart and lung disease. Identify local practices that release greenhouse gases. Ask them to draw a picture of the healthy landscape that limits these gases in the atmosphere.
5. List five extreme outcomes of warmer surface temperatures on earth. Which of these does your region experience? What comforts could your students offer the community during such a weather extreme? What preventions could they teach that community? For example, one girl, Bendu, created two innovations: a water

filtration system using sand and rice bags after flooding affected the water system; and a crab trap to add protein to local diets.

6. Discuss the relationship of what occurs below the ground, on the ground, and in the atmosphere. In each section introduce a hypothetical conflict bridge challenge—for example a role play between two farmers debating slash and burn policies. Determine how you will introduce your selected habit-of-heart challenges into each concept you teach.

Familiarize yourself with the concepts that follow before as you adapt or design projects appropriate for your region, school and grade level.

Agroforestry and Climate Change

Paul Hawkins offers many suggestions for change in his book, *Regeneration: Ending the climate crisis in one Generation*. (3) For example, he explains that in Niger, farmers now make a concerted effort to restore stumps, roots, and seeds, to prevent desertification in areas where land was previously cleared.

In other areas, forest farmers plant trees on farms, to sequester carbon in the ground, reducing wind and water erosion and increasing organic soils carbon by 34 percent.

On some farms, farmers plant trees in the alleyways between crops, to create timer or fruit and to add microbes and keep carbon in the ground without tilling. Tree shade anchors the soil and mulch and increases the fungi that exchanged carbon underground rather than releasing it to the air.

Similarly, migrating grazers can help keep the grassland compacted and fertilized, improving their health by 43 percent.

Sample Action: Keeping Carbon in the Ground

1. Interview local families or shareholder farmers about their practices.
2. In small groups, students draw the farm landscapes. Do any have grazing animals or trees planted to prevent erosion and create shade? These regenerative farming practices can help reduce the warming of the atmosphere.
3. Have the students draw pictures of the possibilities for thoughtful farm design and give their picture book as a gift to landowners.

Sample Action: Invite the Animals to the Farm

Farmers in some parts of the world are bringing their animals back to the cropland. As they mingle grazing, fertilizing, crops, and orchards, the soil improves. Studies show that integrating cereal production and livestock improves the habitat for wildlife, stores carbon more efficiently, and improves productivity.

1. Some farmers who had no animals borrowed their neighbors' goats to tromp around on their fields, once harvested, and recycle the biomass there. When the goats were not available, some young change agents showed up to help out with

the “mob grazing” technique, stomping on the fields and making animal noises to help the farmer.

2. By adding livestock to farmland in general, famers engage in practice known as silvopasture. Grazing animals can keep weeds under control without burning and releasing greenhouse gases.
3. If a local farmer needs the nitrogen mashed into the soil and doesn’t have animals, could your students conduct a survey to see how many farms would benefit from an experiment where cows work in thick groups as “mob grazers” to press the nitrogen and carbon into the soil? They could compare the results among farms or on two parts of one farm to see the effects of not disturbing the ground but sequestering carbon.

Keep it Cool by Keeping the Trees

Cloud-seeding bacteria evaporate with water droplets to form rain clouds that hydrate the earth. Only 40-50 percent of our irrigation comes from ocean. Much of it comes from the plants and small water bodies in a region. In West Africa, as tropical forests are cut down, we invite drought and depletion, but as we encourage greening, we welcome regeneration and cooler temperatures.

Sample Action: Allowing Leaves to Do their Part

1. Observe transpiration on a plant grown on the schoolgrounds. Conduct experiments to measure how much dew falls and how damp the ground underneath feels compared to an adjacent patch of ground.
2. Draw a map on the board of the areas near you where trees have been cut. Invite students to fill in, with chalk, places that need greening. (If a grassland is naturally barren of trees, do not fill it in, as it is a natural ecosystem.)
3. Ask an arborist to visit, to discuss the indigenous trees that would grow in the chalked-in space. Arrange for contributions of trees the children can plant on a visit to one of those spaces.

Energy

With electricity still lacking in many homes, the future poses questions about what kind of energy to produce. Liberia has relied mostly on biomass and hydropower. Low-cost renewable energies will help supply electricity for everyone. (A renewable energy regenerates power through natural means.)

Globally, coal, gas and oil still constitute 84 percent of all energy use, and renewables have only reached 5 percent of the total. International agencies hope that wind and solar will account for at least 50 percent of all energy use by the year 2050.

Large countries are gradually shutting down coal-fired power plants. Some smaller countries whose homes still lack electricity may decide not to use fossil fuels at all but to move directly to wind and solar instead of transitioning slowly, as the cost of these

renewable energies has finally fallen lower than the cost. In one African community, for example, the school children had not heard of solar power a few years ago. Today, it powers many schools in their city.

Sample Action: Sending Solar Gifts

1. Help students build homemade solar ovens with recycled cardboard and foil. They can first experiment with several vegetables or stews to discover the easiest item to cook during school hours, then present the ovens to elders in need, with food enough for a first meal or two and instructions on how to use the ovens.
2. Take the class to visit a nearby factory to observe the creation of solar panels or devices. Give the gift of song to the workers in exchange for the opportunity to help.
3. Challenge students to draw their own solar designs or solar inventions to send to the factory. Also send them to a wisdom exchange partner.

Bringing Backup Storage to All

What do you do when the power goes out? Hydroelectric power plants have been used to accommodate power spikes, but today, lithium-ion batteries reduce the time spent without power. As a backup storage option, they have reduced in cost 90% in a decade. Scientists continue to experiment with new materials that simulate nature and will store power even longer. For example, some are exploring “Green hydrogen.”

Sample Action: Weather Watching

Read page 45 of the Climate Change Agents curriculum. Imagine how you will adapt this text, to help each class teach another class how to observe shifting patterns in the weather. For example:

1. Early learners can make weathervanes out of recycled tin cans, straws and paper or plastic.
2. Middle grades can make rain barometers, marking clear glasses with measurements and placing them at varying heights and exposures near the school building.
3. Upper grades can measure transpiration by checking the dew under plant leaves when conditions are windy, sunny, rainy or stormy, to determine how much water is being recycled locally back to earth. Each class can teach the other these observations and chart the differences over a season. They can leave their notations in a book for the next year’s classes, underscoring the value of long-term research, and can interview farmers about the impact of climate on crops over time.

Regenerative Farming Approaches

Agriculture plays a big role in climate change. As we keep the soil fertile without extra chemicals and without tilling, we leave carbon dioxide in the ground and we create healthy plants that contribute oxygen to the air and water vapor to the uptake of clouds, to prevent drought.

West African farmers of many generations ago used their green waste and charcoal from fires to fertilize crops. The “dark earths” were so rich in nutrients that George Washington Carver later brought some to explore under a microscope. He saw the microbes that ferment and break down the soil and enrich it with their nutrients, fixing nitrogen and carbon dioxide there to feed the plant roots.

The complex interactions of these microbes outweighs the economic usefulness of farm experiments with hybrid plants, chemical fertilizers, or disturbing the topsoil with equipment or tillers. The more regenerative the practices, the greater the crop yield. Even important to this discussion, the dark earth sequesters (traps) the fossil fuels in the soil instead of releasing them into the air to heat up the planet. Sometimes the first idea was the best idea after all! Thank you to our ancestral farmers.

Sample Action: Soil Experiment on a School Farm

Try an experiment on a local farm.

1. Using a shallow pan of water, scoop a handful of soil from a regenerative patch of farmland. Swish it around. Have them observe the results.
2. Obtain a second fresh pan of water. Move to a patch of land that has not experienced the benefits of regenerative agriculture. This time, as a handful of dry dirt enters the water, it will most likely swirl into the water, creating either reluctant mud or streams of light brown on the water’s surface.
3. In the first pan, the soil should have been less likely to mix, holding its moist “dark earth” microbial structure intact rather than eroding when faced with an onslaught of water.
4. Challenge students to create a hypothesis about soil’s resiliency to flood, storms and drought with the benefits of regenerative agriculture. They may share their observations of what farming strategies were most effective, so both farmers can shift their practices in a regenerative direction.

Plants as Communities

Present the world underground as a community. The topsoil, about six inches high, contains carbon that rotates in and out of the air with the seasons. The plant roots release carbon-packed sugars into the soil, then eaten by microorganisms. An underground neighborhood of fungi, algae, ants, insects, worms and other creatures eats, reproduces, and metabolizes waste, recycling the carbon and other nutrients that plants need to grow and to produce the oxygen that humans breathe.

Regenerative land also prevents erosion and holds up to 30 percent more water, improving the productivity of farmland. Remember the texture of the soil in the experiment? You may have noticed that the fungi had created a substance called glomalin, rich in carbon, which remains in the soil for centuries.

If a tiller, a plow, or shovel crashes into the community of underground life, it disturbs this community. The more we leave it alone, the greater the chances the carbon will be stored underground in what we call a carbon sink, not above ground in the air we breathe and the air that disrupts the climate.

Some movements around the world also suggest giving the garden back to the animals that live above ground—allowing biodiversity to thrive. Rather than digging a garden, allowing the indigenous creatures to run through it restores the balance of nature through fertilization.

Sample Action: Animals All Around

1. Take a walk outside and ask students to imagine and list the creatures that live above ground where they live and think of ways to give some of the land back to these animals. For example, they may want to observe the number of roads that interfere with the animals' habitat. Digging pits also disrupts the soil and unleashes carbon. Fewer roads and car trips and construction sites would reduce carbon emissions while also allowing the animals to live in their homes.
2. Back inside, have one group of students draw the area around the school as it looks today.
3. Ask another group to draw it as it once looked, with fewer roads and cars and interruptions in the animals' homes.
4. Post the pictures side by side. As a class, brainstorm ways to protect life and protect the air for living things.

Save and Serve Every Bite

We can reduce climate change by making sure everything grown is eaten. For example, on one African nation, the food chain became a problem. Food could not be transported to the market before spoiling. A company developed solar-powered cold-storage systems with walk-in stations that could be place anywhere, without a power grid, to keep food cold.

Other companies have placed anaerobic digesters on farms, to turn spoiling crops and their methane into energy for the local power grid or natural fertilizer for the farm.

Students around the world have also learned the value of sharing their yield first with the most vulnerable people, such as the ill, the elderly, and the orphans. In one school, produce from the school farm was sold to buy chalk for the teachers. A Girls United

Club is raising chickens and sheep to sell in the marketplace in order to raise money for those vulnerable groups.

Sample Action: Food for Thought

Challenge students to identify ways they can regenerate the land while also supplying food security with integrity, ingenuity, and innovation. Ideas for the class include:

1. Teach farmers the value of letting the animals into the garden
2. Teach students to gather extra farm food to avoid waste and feed the hungry
3. Teach new mothers about nutrition and teach them home gardening techniques

A New Look at Familiar Foods

A comedian quipped, “Rice is the best food, because you can eat a thousand pieces of it in one meal.”

Indeed, rice serves as a staple food in Liberia and around the world, requires massive amounts of water. However, it also emits methane, a potent greenhouse gas.

Replacing rice with another main crop at a time when Covd-19 threatened food security seemed too big a challenge. Instead, finding a new strain of rice seemed the ideal solution in some regions. To address the problem the United Nations Environment Programme (UNEP) began a study, funded by China. The researchers experimented on plots in Ghana and Kenya to find rice varieties that would grow at varying elevations without the need for flooded paddies.

If they could find a way to grow rice on dry land, they would reduce the number of malaria-carrying mosquitoes and the need for monocropping and could instead invite other animals and wildlife back to the farm. By turning these areas into regenerative farms, they would reduce up to 20 of the rice greenhouse gas emissions created by rice paddies!

Liberians are also sharing the value of other traditional foods, such as honey and moringa tree leaves, to bring protein and vitamins to the people. Used fresh, cooked or died, the moringa plant Is known for its anti-inflammatory properties. As a perennial crop, it can be harvested each year, while sequestering carbon from the atmosphere in its trunk and roots without tilling the soil.

Gathering what the food forests offer allows people with land to share their harvests without disrupting the landscape.

Innovation stirs these ideas. Inspire your students to think of a local plant they could gather, experiment with or share with an altruistic purpose.

Sample Action: Eating Sustainably

1. Allow students to taste moringa and see if they recognize the taste.
2. Discuss the differences between growing rice and harvesting moringa. Which one uses up more water and gives off more greenhouse gas? Which one allows you to harvest without disrupting the soil?
3. If you have access to moringa or another sustainable plant, hold a food fare. Challenge the community cooks or parents to come to school and help devise recipes using the item.
4. Have students practice writing by creating a cookbook with the recipes or recipe cards to give away. They could write the recipes on the backs of recycled paper food labels or bags.
5. Grow a sample moringa plant or another sustainable food at the school.
6. Note that they need not eliminate rice from their diets but, rather, help their region gradually reduce the amount of land devoted to greenhouse gas-producing crops and increase food sources with regenerative benefits as well as nutrition value.

Protect Grasslands

Grasslands store 91 percent of their carbon below ground, safe from fire, whereas; forests store it in trees, where it can be released in fires. This makes grassland carbon a valuable carbon sink.

The wildebeests, cattle, elephants, or other large animals that trampled and fertilized these vast landscapes created valuable biomass. Charcoal fires also enriched the soil. The long underground roots beneath grasslands allow them to resprout after a disruption such as drought or fire. Whether tropical or temperate, grasslands store many hectares of organic carbon per hectare.

Conserving these lands protects their species and their carbon storage systems. In the past, some conservationists assumed that trees planted in grasslands could help the earth store more carbon. Today, they realize that the forest canopies absorb more heat than the reflective grasslands, which actually help mitigate climate change. Pastoralists rely on these lands, along with the underground species who protect the carbon sink.

Challenge students to rethink the preservation of the grasslands and consider the value and complexity of each system before planting trees in a carbon sink already rich with biodiversity.

If you are planning a tree planting project, carefully check the location. What species already grow there? What animal species do they support?

Sample Action: Understanding the Land

1. Show the class a plate of loose, light grain, tilted toward the sunlight or an electric light. Ask, What does the light do? (Reflects and intensifies the light color.) Next, put a rice bag over the plate. Ask, What does this filter do? (Lets sunlight in but keeps the grain intact.)
2. Explain that if this were a grassland, the fossil fuels would remain underground as the heat intensifies and rises and as the grassland reflects the heat. We call it a carbon sink, like oceans and forests, because there is nothing to cut into the soil, so the fossil fuels and their carbon remain sunken underground.
3. Discuss your experience with grasslands, as a class. Identify the animals that use your region's grasslands, near or far. Which plants do you think they eat? Where, on the map, do they go? Have you seen a pastoralist collecting plants? Which plants do they rely on?
4. Draw a grasslands food chain on the board, showing which species depend on one another. Think about the nutrients in the soil and the indigenous plans and animals and describe the difference between a deforested area and a true grassland.

Honor Biodiversity

We limit climate change when we honor biodiversity. Liberia hosts at least seven endangered plants, three endangered birds, and at least 15 endangered animals. Because of its diverse family of creatures, the country has more to lose than most other regions.

The African pine, the Roundleaf Bat, the Gray Parrot, the African True Toad, the African Wedgewood, Allen's River Frog, the Atlantic Humpbacked Dolphin, the Golden Cat and African Elephant each play vital roles in the ecosystem, although their numbers have dwindled. Identify an endangered species associated with nearby life zones.

If you teach younger grade levels, a learning unit on appreciation of diversity might help them understand and advocate for each species, just as they would for children with diverse capacities in the classroom.

Loss of diversity is a relevant conversation in every region. Half the world's grasslands have given way to factories and farms, and tropical forests have reduced their landmass by fifty percent. Migratory animals have to travel increasingly farther to find their food as climates change. Marine habitats, now choked by trash, petroleum-based plastics and freighters, have thwarted sea life.

Sample Action: Marching in a Poster Parade

1. Allow each child to pick a favorite endangered species, draw it, and draw the threats to its existence.
2. In a poster parade, they walk about the community removing threats (picking up plastic, for example.
3. At their destination, perhaps a public square, they sing “Be Kind,” a song about being kind to animals, to remind the public that actions have consequences for precious living beings.

Forestry Care for the Elders

Over the past century, reforestation movements have focused on planting new trees where none existed. Today, climate scientists see preservation of existing old-growth trees as an even higher priority.

Sometimes a degraded forest just needs to grow. At other times, an existing forest needs protection. If a tree is cut down to create wood pellets, for example, the biomass burned releases toxins that increase asthma and lung disease, while the young tree planted in its place takes many years to grow and to store carbon.

This concept supports the idea of regeneration and balance to enhance sustainability. Ask students to think of the wisdom stored in the minds of the elders, who teach valuable lessons to the young. If they suddenly were all replaced with infants, society could not function well.

Similarly, scientists predict that pro-forestation (protecting and nurturing older trees) could bring forty times greater impact in carbon sequestration by the year 2100 than could tree planting alone.

Sample Action: Evaluating a Forest

1. Tour a nearby forested area. Ask students to survey (or count) the number of new trees and old trees and to give the forest an assessment. How many stumps could show signs of regrowth? Are some areas unprotected or are they affected by slash and burn policies? Have some areas been clear cut and later seeded with new trees? Have students give each section of the land a “report card,” rating the biodiversity, soil quality and evidence of the value of that patch as a carbon sink.
2. Challenge advanced students to apply the lesson using clinometers to measure the carbon in one tree and multiply it to estimate the carbon in the forest. (This requires trigonometry skills, a protractor, a pencil and a string.)
3. Based on their findings, students may visit and write to the official who manages the land, advocating specific suggestions for proforesation.

Still Waters Run Deep

Wetlands or marshes also store carbon and host diversity. Mudflats, mangroves, peatlands, and floodplains each offer their own grasses, trees, and animals. They can help prevent flooding and soil erosion in an area ideal for amphibians, reptiles, birds, insects, fish and other diverse life forms. The richer the diversity, the more carbon the soil contains.

Challenge the class to think of oceans not only as a single system but as a part of our larger global system. Sea animals cycle carbon in their bodies and release it into the water when they breathe and when they die and go to rest on the ocean floor. The coldest oceans process and store the carbon in deep waters where phytoplankton consume it, process it, and use sunlight to produce ocean food for larger fish.

Oceans contain twelve times more carbon than land and absorb 93 percent of the increased atmospheric heating. This means a warmer ocean, which affects sea life, acidification, the stability of shellfish, and even heat waves that lead to beached animals and sea birds. Add to that the human pollution, overfishing, drilling, and mining, and the oceans become degraded instead of regenerated.

Meanwhile, plastics, made from the fossil fuels in petroleum, litter the beaches and land of many coastlines, ceaselessly cluttering the solutions to a pollution-free future.

Sample Action: Conserving Coastal Communities

Students in Liberia have united in field trips to the beach, to collect plastic bottles, trash and to promote the concept of one ocean, one planet, one future. Taking it one step further, they could make these efforts a prevention project by sharing their learning with the polluters.

1. On a trip to a polluted area, challenge students to categorize each piece of trash to determine its origin. Was it introduced, most likely, by beach goers? Did it float in after being tossed overboard from a freighter or passenger ship? Did it blow in from the trash heap of a local factory or business? Is it medical waste from a clinic?
2. Assign the small student groups to collaborate, discuss their findings, generate statistics, and share their collective wisdom with agencies that can influence policies and protections. For example:
3. One group of students can write to each likely polluter to document the types of trash found.
4. Another group can document the number of lives spotted on the trip (e.g., seabirds, fish, humans, shellfish), to explain the lives affected by pollution. The letter can include information about the relationship of these species (for example, the community that relied on crabs in the marsh as a protein source.)
5. Another group can write a letter about climate change and its impact on coastal regions.

6. The letters can be sent to a newspaper, a company, a shipping company, a government agency or all three.

General Collaboration

High school students may enjoy a chance to find parallels between nature's systems and human systems. These activities allow for such possibilities:

Sample Action: Mastering Global Greed

Role play the environmental leadership council of West Africa. Count off by 12 and divide the class into groups. with members representing 12 countries: Liberia, Senegal, Cameroon, Nigeria, Ghana, Benin, Toto, Ivory Coast, Guinea. Sierra Leone, Gambia and Guinea Bissau.

Each country group will study an industry map to guess whether their country supports agriculture, forestry, mining, fishery, manufacture, tourism, or all of the above.

They form alliances with countries that share similar climactic conditions and industrial strengths, sitting on subcommittees to talk about ways that industry could reduce negative environmental impact.

Each small group lists at least three ideas and draws a diagram to share with the whole group. Those working in the industry will want to continue providing jobs and goods, and yet they will commit to master their own desire for personal profit in order to do what is best for the people.

Sample Action: Inspiring Interest

Showing how the science and social themes relate, the high school students may also want to practice their literacy requirements to write essays, poems and songs, then put on educational performances to inspire community members and younger learners.