

3. Climate Change Solutions

Description

This lesson is designed to provide an overview of the role of climate change mitigation activities at different scales (individual to global) to 'solving' climate change. Learners will additionally review individual actions for home gardeners and participate in several brainstorming/reflection opportunities to explore the role of individual and local-level mitigation.

Objectives

- Define climate change mitigation and adaptation.
- Explain the role of mitigation in solving climate change.
- Provide examples of mitigation activities for gardeners.

Learners

Extension Master Gardener Volunteers and other adults interested in climate change in North Carolina.

Lesson Materials

Slide Deck (see <https://climate.ncsu.edu/learn/climate-change-lessons/>)

Instructor notes (subsequent pages)

Summative Assessment (questions at end of instructor notes)

Lesson Outline

1. Engage

Explore global and statewide greenhouse gas inventories.

2. Present Content

Presentation defining climate change mitigation and resources for understanding mitigation potential.

3. Support Practice

Explore factsheets about climate resilient and climate smart gardening.

4. Assess Learning

Quiz (questions at end of slide deck).

5. Reflection

Reflection activity for learners.

Note: Slide deck was developed with Extension Master Gardener Volunteers in mind, but could be readily adapted to other groups.

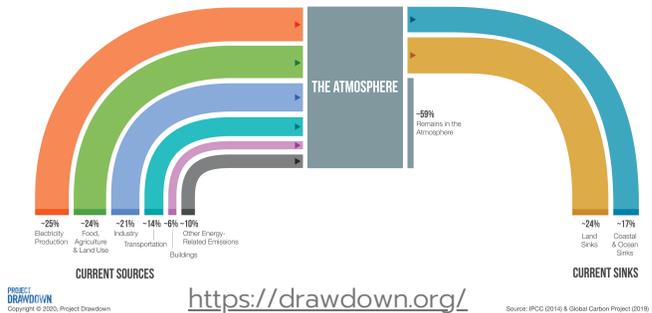
Adapting to North Carolina's Changing Climate

Instructor Materials and Notes

Emissions Sources and Natural Sinks

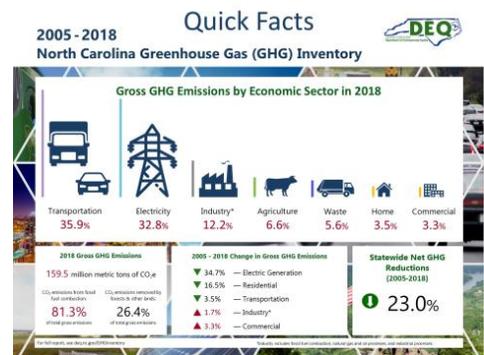
- This graphic shows the different sources for global greenhouse gases from human activities by sector on the left as well as natural sinks (or the ways the planet absorbs carbon dioxide out of the atmosphere and store it) on the right.
- Currently, sources outweigh sinks, leaving about 59% of human-contributed emissions in the atmosphere.
- One way to think about 'solving' climate change is to think of balancing this budget: we need to balance the amount of carbon dioxide, and other greenhouse gases, that is entering the atmosphere with how much is being pulled out of it. We also will need to make sinks larger than sources at some point to pull out the excess carbon dioxide that's already been added to the atmosphere.

EMISSIONS SOURCES & NATURAL SINKS



DEQ Greenhouse Gas Emissions Inventory

- Focusing on a more local level now, the North Carolina Department of Environmental Quality produces a statewide inventory of greenhouse gas emissions that represents North Carolina's "carbon footprint."
- The inventory provides a high-level perspective of GHG emissions resulting from human activity and contains a detailed accounting of GHGs emitted or removed by key source categories. The infographic from this slide covers the period 2005-2018.
- As with the global perspective the previous slide showed, currently sources outweigh sinks in North Carolina, leaving about 59% of human-contributed emissions in the atmosphere.
- Currently, transportation is the greatest contributor of GHG emissions in the state, followed closely by electricity. This is in part because North Carolina's electricity generation has undergone a transformation since 2009, including:
 - the retirement of over 3,000 megawatts (MW) of coal fired power plants, which is 27% of the NC coal fleet;
 - increased use of natural gas combined cycle (NGCC) plants; and
 - North Carolina legislation to promote renewable energy (RE). Solar, hydroelectric and wind power represented 10% of North Carolina's electricity generation in 2018
- Between 2005 and 2018, North Carolina reduced gross GHG emissions by 16% and net GHG emissions by 23%. By 2025, net GHG emissions are projected to decrease by 30% relative to 2005 baseline emissions.



<https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory>

Learn more: NC DEQ Greenhouse Gas Inventory: <https://deq.nc.gov/energy-climate/climate-change/greenhouse-gas-inventory>

Future Warming Depends on Future Emissions

Inventories of greenhouse gas emissions are important because they help us understand past, current, and expected future greenhouse gas emissions. They can also be used as a baseline to evaluate and develop greenhouse gas mitigation options and predict their effect on reducing emissions in future years.

Recall from the previous lesson in this series that future warming, both at the global scale and in North Carolina, as is shown in the figure on this slide, depend on future emissions of greenhouse gases.

Scientists use projections based on different future emissions pathways -- such as the lower and higher emissions pathways shown on the figure on this slide -- to understand how our actions today and tomorrow can influence the global climate. This scientific understanding can then inform policy decisions, such as which specific mitigation actions to take at international, national, state, and even local scales.

Dimensions of Actions

- When actions come up in the context of climate change, there are several dimensions these often take.
- The first is adaptation, and was covered in the previous lesson in this series.
 - Adaptation refers to actions taken at the individual, local, regional, and national levels to reduce risks from changed climate conditions and to prepare for impacts from additional changes projected for the future.. Adaptation therefore focuses on how to be resilient to current and expected climate changes.
- Mitigation refers to activities that are intended to slow or stop climate change by reducing the amount of greenhouse gases in the atmosphere. Mitigation is therefore really focused on "solving" or "stopping" climate change by getting to the origin of the problem -- greenhouse gases. As with adaptation, climate mitigation actions can occur on a range of scales. For instance, individual actions such as installing solar panels on one's home, or national actions such as increased funding for energy infrastructure.
- Often, an action that leads to mitigation also leads to adaptation. For instance, at the local level, an adaptive action such as planting trees to increase shade or help with storm water or water quality also has the mitigative impact of sequestering carbon.

Video: Can You Solve Climate Change?

Many who are interested in learning more about climate change are often concerned with the role they can play and whether any action they take will truly make a difference on the global scale. To help explore the role of individual versus systemic change, we suggest watching the following video "Can YOU Fix Climate Change":

https://www.youtube.com/watch?v=yiw6_JakZFc

This video is approximately 10 minutes long. The next slide contains prompts for reflection.

Instructors: if you do not or cannot watch the video, below are notes for discussing mitigation at individual and systemic levels.

Mitigation refers to activities that are intended to slow or stop climate change by reducing the amount of greenhouse gases in the atmosphere.

Systemic Change

- The current climate change we're experiencing is due to the larger, fossil fuel-based system on which our current global society is built. To truly solve this we need larger systemic change.
- The ways that we have seen this play out on the global stage are through international agreements, such as the Paris Climate Accords, or outcomes from Conference of Parties, the latest of which was in Glasgow, Scotland, and focused on countries setting emissions targets that would limit the amount of future global warming. While these agreements are often non-binding, we do see them play a role and encourage global accountability. We can also observe large-scale necessary changes when climate-focused laws or regulations are passed that focus on changing our system to reduce emissions, things like changes to our energy or transportation infrastructure.

Individual Action

- Individuals can also implement behaviors that lower their personal carbon footprint, such as driving less, buying local produce or installing solar panels.
- Individuals can also band together to implement mitigation at community scales. For example, by installing solar panels on office buildings, or planting trees in parks or sidewalks, passing local bonds to build more sidewalks or for public transportation.
- All of these do have an impact, and it is measurable, but they alone won't be enough to solve global climate change.
- This is why other important actions that individuals can take include talking about climate change to increase awareness and also participating in civic actions, such as voting in local to national elections.
- It's important to note that not every person has the same capacity to implement changes, and there is still much to debate and learn about what will best lead to global climate mitigation.

Video Reflection

Below are several prompts for reflecting on the video. These can be considered individually or in group or full-audience discussions:

1. What are 1-3 words that come to mind that describe how you're feeling about climate change after watching this video?
2. What is your reaction to the last point in the video?
3. What questions do you have after watching this video?

Climate Change Mitigation

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Tools for Exploring Mitigation: En Roads

The next few slides contain links and/or videos to several online tools for exploring mitigation in more detail. While none of these are perfect and each relies on assumptions about the influence of certain actions or activities, they all are useful ways to begin thinking about the practicality of climate change mitigation.

The first of these tools is the En-Roads simulator, which is an interactive tool to explore global climate mitigation. Watch the video on the slide to learn more about this tool.

Instructors: If attendees are interested, after watching the video, you and/or attendees can pull up the tool and spend a few minutes exploring it together, in smaller groups, or individually.

Tools for Exploring Mitigation: iTree

iTree is a tool that estimates the amount of carbon dioxide and pollution a tree removes from the air, as well as the amount of stormwater it can help mitigate. This tool is relatively easy to learn and can be used by individuals or organizations (or groups of individuals) for local mitigation efforts. In addition to storing carbon, trees also offer environmental benefits, such as slowing runoff or shade, that are beneficial for climate adaptation.

Instructors: If attendees are interested, you and/or attendees can pull up the tool and spend a few minutes exploring it together, in smaller groups, or individually. Additionally, the iTree website contains other tools for related purposes that may be of interest for attendees to explore.

Tools for Exploring Mitigation: EPA Household Carbon Footprint Calculator

This tool from the Environmental Protection Agency is designed for individuals to estimate their household carbon footprint. The tool provides calculations in three areas: home energy, transportation and waste. Users input information, such as their monthly electricity usage or number of miles driven in a week and their car(s)'s gas mileage to receive more accurate estimates.

Instructors: If attendees are interested, you and/or attendees can pull up the tool and spend a few minutes exploring it together, in smaller groups, or individually. Attendees can also be encouraged to explore this tool on their own after gathering the needed information to enter in more accurate estimates.

Mitigation Actions for Gardeners

Individuals are often interested in behaviors they can adopt or actions they can take that will have a positive impact on the climate and environment. The next few slides contain resources, mostly pertaining to home gardening and landscaping, that individuals can take and how these mitigate climate change.

Factsheet: Climate Resilient Landscaping, from NC State Extension

This slide contains key points from a factsheet on climate resilient landscaping developed by the Wake County Center for NC Cooperative Extension.

Instructors: review the contents of this factsheet with your attendees. We recommend clicking the link on the slide (and listed below) to bring up the factsheet: https://drive.google.com/file/d/1D0O4RNeqhnGDcKkVX_j1dImrZk73Qsf/view. You can also access this from the Wake County master gardener website: <https://wake.ces.ncsu.edu/emgv-wake/>.

Factsheet: Climate Smart Gardening, from Rutgers University

This slide contains key points from a factsheet on climate gardening from Rutgers University. While the information contained in this factsheet was developed for New Jersey, much of it is relevant for North Carolina.

Instructors: review the contents of this factsheet with your attendees. We recommend clicking the link on the slide (and listed below) to bring up the factsheet:
<https://njclimateresourcecenter.rutgers.edu/wp-content/uploads/2020/08/Climate-Smart-Gardening.pdf>

End of Lesson Reflection

This lesson is the end of a three-part series covering climate change from both the global and local (North Carolina) perspectives, as well as actions to adapt to current and future risks and limit future warming.

This slide contains several prompts for reflecting over what you learned during these three lessons:

- What climate changes in North Carolina are most interesting to you or were you most surprised to learn about?
- How has learning about climate change altered your perception about future climate risks or vulnerabilities (for yourself or others)?
- What actions -- for either climate adaptation or climate mitigation -- have you observed in your community, county, or state?
- Where would you go to find more information about these activities and (if interested and able) become involved?

Instructors: we recommend giving attendees a few moments to reflect on these prompts, either individually or in groups. You can also allow attendees to share their thoughts with the full group.

An assessment follows on the next page.

Assessment

The following four questions can serve as a summative assessment for this lesson. Instructors can give these as a quiz at the end of the lesson (e.g., as handouts or a Zoom poll) to check for understanding.

1. Mitigation refers to activities that are intended to slow or stop climate change by reducing the amount of _____ in the atmosphere.

- a. fossil fuels
- b. oxygen
- c. greenhouse gases
- d. radiation
- e. none of the above

c. greenhouse gases

2. Scientists use projections based on different future emissions pathways to understand how human actions today, tomorrow, and in the future will influence _____.

- a. the global climate
- b. the amount of global warming
- c. regional climate changes
- d. all of the above

d. all of the above

3. Currently, _____ is the greatest contributor of GHG emissions in the state.

- a. Electricity
- b. Transportation
- b. Industry
- c. Agriculture

b. Transportation

4. Reducing how much food and other decomposable waste goes into landfills is important for reducing _____ emissions.

- a. carbon dioxide
- b. methane
- c. nitrous oxide
- d. F-gases

b. methane