University Climate Change Resources:

1. Local Resources (Mid Atlantic):

Role Playing Game: How do we make decisions about climate change and sea level rise in Maryland?

Place your students in the role of mayor, fisherman, community member, businessperson and others as groups work to solve the problem of how to respond to local climate impacts.

http://maryland.coastsmart.org/

Activity: Exploring Regional Differences in Climate Change

Using real climatological data from climate models, students will obtain annual predictions for minimum temperature, maximum temperature, precipitation, and solar radiation for Minnesota and California to explore this regional variability. Students import the data into a spreadsheet application and analyze it to interpret regional differences. Finally, students download data for their state and compare them with other states to answer a series of questions about regional differences in climate change.

http://www.camelclimatechange.org/resources/view/173150/

Economic Impact of Climate Change in Maryland:
http://www.mde.state.md.us/programs/Air/ClimateChange/Pages/Air/climatechange/index.aspx

Maryland-Specific reports on climate change impacts, adaptation, and mitigation strategies and links to policy:
http://www.dnr.state.md.us/climatechange/

Maryland DNR – Coastal Atlas
Explore the potential impacts of sea level rise and storms on coastal communities using the Coastal Atlas mapper.
http://dnr.maryland.gov/ccp/coastalatlas/

NOAA Digital Coast Sea Level Rise Viewer
Digital Coast (soon to be available for the Chesapeake Bay) is a mapping and visualization tool that allows users to explore the impacts of sea level rise and storms on wetlands and communities. Users can also overlay a Social Vulnerability layer to understand which communities are most at risk.

http://www.csc.noaa.gov/digitalcoast/tools/slrviewer/

The Nature Conservancy Climate Wizard

Want to know more about climate models in a user-friendly map? Climate Wizard was developed through a partnership between The Nature Conservancy, The University of Washington, and The University of Southern Mississippi. This web-based platform is designed for both technical and non-technical audiences, and uses visual images to portray past and predicted changes in temperature and precipitation throughout the world. The maps contain Factoid icons that lead to additional pictures and climate impact information about specific locations, such the Appalachian region. The user can customize an analysis by choosing specific countries or regions, climate models, greenhouse gas concentrations, and climate variables (e.g., precipitation, mean monthly temperature). This customized analysis is emailed directly to the user, and users are also given the opportunity to easily download climate change maps.
www.climatewizard.org

2. Games and Decision-making

Role Play: Gulf Stream Heat Budget and Europe's Mild Climate: A Problem-based Learning Activity

In this role-playing activity, learners are presented with a scenario in which they will determine whether the Gulf Stream is responsible for keeping Europe warm. They must also address the potential future of the Gulf Stream if polar ice were to continue melting. The students work in small groups to identify the issue, discuss the problem, and develop a problem statement. They are then asked what they need to know to solve the problem.

http://www.camelclimatechange.org/resources/view/177576/

Game: CEO2: The Climate Business Game

CEO_2 is an interactive game that puts the player in charge of strategic decision making as the CEO of different companies. The game was developed by World Wildlife Federation (WWF) and Allianz (financial services provider). It is based on assessments and interpretation of scientific work and reports or other credible resources. However, the complexity has been reduced to allow an online game platform. (http://knowledge.allianz.com/ceo2/en_ext.html)

What for? Why play the game?

To see if it is really possible to run a green company profitably; to impress stakeholders, environmentalist, researchers and customers all at once; to increase profit enough to satisfy corporate interests while lowering emissions by as close to 100 percent as possible within 20 years from 2010 to 2030; all while maintaining positive image for customers and keeping up with the latest technological trends and innovations.

http://www.camelclimatechange.org/resources/view/175295/

Climate Change, Water and Traditional Ecological Knowledge in the Southwest

This module bridges Western Science and Traditional Ecological Knowledge in the area of climate change—specifically climate change impacts on water resources in the Southwest. Students will be introduced to the concept of traditional ecological knowledge and indigenous perspectives on water. Students will learn about the traditional and modern uses of water by the Tohono O'odham Nation including Traditional Ecological Knowledge of water, climate and the natural world. They will also learn about predicted climate change impacts on water resources of the region and apply that knowledge to identifying potential impacts on water use of the O'odham. Using a model that incorporates elder, water policy, climate change science, students will develop water policy scenarios, adaptation plans and tribal resolutions addressing climate change impacts on the water resources on southwestern tribal lands.

http://www.camelclimatechange.org/resources/view/174754/?topic=71692

Conflict Resolution

Students will be introduced to conflict resolution for climate change adaptation. Guest lecturer Peter T. Coleman, Director of the International Center for Cooperation and Conflict Resolution at Columbia University's Teachers College and Director of the Advanced Consortium for Cooperation, Conflict and Complexity at The Earth Institute at Columbia University, will lead the class in a conceptual model for conflict resolution. The technique applied in class is known as constructive controversy.

http://www.camelclimatechange.org/resources/view/175231/?topic=71696

Evaluating the Effects of Local Energy Resource Development

This is a semester-long jigsaw project in which students work in teams to explore the effects of energy resource development on local water resources, economics, and society. Students are presented with a contemporary energy resource development issue being debated in their community. They research the water, geological, economic, and social impact of the project, and then either defend or support the development proposal.

http://www.camelclimatechange.org/resources/view/206545/?topic=66099

Northwest Passage

In this activity, students use Google Earth and information from several websites to investigate some of the consequences of climate change in polar regions, including the shrinking of the ice cap at the North Pole, disintegration of ice shelves, melting of Greenland, opening of shipping routes, effects on polar bears, and possible secondary effects on climate in other regions due to changes in ocean currents. Students learn to use satellite and aerial imagery, maps, graphs, and statistics to interpret trends accompanying changes in the Earth system.

http://www.camelclimatechange.org/resources/view/177132/

3. **Climate Science**

Climate Change and Extreme Weather

This module discusses how a changing climate can also lead to changes in extreme weather events on the local scale. The role of natural variability is also explained. The module describes how climate change can have both positive and negative effects, depending on the situation, location, and the vulnerability of the population. While research on climate change and extreme events is still relatively new, the module discusses what changes scientists think are likely if greenhouse gas emissions continue to rise.

http://www.camelclimatechange.org/resources/view/183080/?topic=65994

Climate Change and Sea Level Rise - UCAR COMET

This module looks at how increasing temperatures due to climate change have affected sea level rise and what effects scientist expect in the future, given rising greenhouse gas emissions. The various mechanisms of sea level rise are discussed, as well as the tools and research used to study this topic. The module also discusses how countries and communities are preparing for future increases in sea levels.

http://www.camelclimatechange.org/resources/view/183087/?topic=66019

Introduction to Statistics for Climatology - UCAR COMET

The effective use of climate data and products requires an understanding of what the statistical parameters mean and which parameters best summarize the data for particular climate variables.

This module addresses both concerns, taking a two-pronged approach:

1) focusing on the statistical parameters (mean, median, mode, extreme values, percent frequency of occurrence and time, range, standard deviation, and data anomalies), defining what they mean and how they are calculated using climate data as examples, and

2) focusing on weather and climate variables, identifying the statistical parameters that best represent each one. The module concludes with a discussion of data quality and its impact on weather and climate products.

http://www.camelclimatechange.org/resources/view/168918/?topic=65998

Investigating the Effect of Warmer Temperatures on Hurricanes

In this activity learners investigate the link between ocean temperatures and hurricane intensity, analyze instrumental and historical data, and explore possible future changes.

http://www.camelclimatechange.org/resources/view/177617/

4. **Natural Sciences**

Lesson Plan: Mountain Pine Beetles

This lesson plan has students working in small groups to research the Mountain Pine Beetle in Colorado and other inter-mountain Western states. Students identify the factors that control pine beetle population and research how warmer winters and decreasing spring snowpack allow the population of pine beetles to expand.

http://www.camelclimatechange.org/resources/view/179403/?topic=66049

Climate Change and Wine Curriculum Module

In this computer exercise, students will compare and contrast satellite and ground data for temperature in northern California over several decades and extract trends about climatic regions for wine-grape production. The satellite data, which we provide in an Excel spreadsheet, contains four 1° blocks along a longitudinal transect from the coast of California to the mountains. The ground based data in the spreadsheet are from four weather stations (Ft. Bragg, Napa County Hospital, University of California at Davis, and Colfax), each representing one of the blocks along this transect. For each block and

station, we calculated the Winkler Scale, a technique for classifying the climate of wine growing regions in which geographical areas are divided into five climate categories based on degree days. Plotted are changes in the Winkler Scale for the four blocks and stations over time.

Students can use the data provided or go to the NASA sites to choose their own blocks or weather stations plug the numbers into the spreadsheet and calculate the Winkler Scale for other locations. They can plot the Winkler Scale over time and analyze the plots and what they imply about premium wine-grape production.

http://www.camelclimatechange.org/resources/view/170622/

5. **Humanities**

Ethics and Climate Change in Asia and the Pacific (ECCAP) project
United Nations resources on energy and climate change taking into account existing cultural norms and gender.

http://www.unescobkk.org/rushsap/ethics-and-climate-change/energyethics/

Getty Institute Lectures: Climate Change and Preserving Cultural Heritage in the 21st Century

Extreme weather events, changes in patterns of precipitation, desertification, changes in agricultural yields, destruction of habitat and species extinction, and increase in the range of disease vectors are some of the expected effects of global warming and the climate change it has ushered in. These effects are felt not only by natural ecosystems, but also in the communities in which we live, the places that we cherish and that enrich our lives.

http://www.getty.edu/conservation/publications_resources/videos/public_lecture_videos_audio/climate_change.html

History of Climate Change

Anyone seeking to understand climate change and anthropogenic greenhouse warming is well advised to read not only the current literature, but also the key scientific papers of earlier eras. History is particularly relevant since, over timescales of decades and centuries, ideas about the climate have been changing faster than the physical climate system. Thus, students of climate dynamics should also be well read in science dynamics—the change of scientific ideas and practices over time.

http://nsdl.org/sites/classic_articles/GlobalWarming.htm

The Discovery of Global Warming

People have long suspected that human activity could change the local climate. For example, ancient Greeks and 19th-century Americans debated how cutting down forests might bring more rainfall to a region, or perhaps less. But there were larger shifts of climate that happened all by themselves. The discovery of ice ages in the distant past proved that climate could change radically over the entire globe, which seemed vastly beyond anything mere humans could provoke.

http://www.aip.org/history/climate/summary.htm

Archaeology: Climate Change: Sites in Peril

http://archive.archaeology.org/0903/etc/climate_change.html

Bioarchaeology and Climate Change

http://muse.jhu.edu/books/9780813040677

6. **Social and Political Sciences**

Communication, Decision Making, Behavioral Change, and Skeptics

Elke Weber, Professor of International Business in the Columbia Business School and Director of the Center for Research on Environmental Decision Making, facilitates a discussion of the assigned readings on communication, decision-making, and behavioral change. Particular attention will be paid to the climate change skeptics and the psychology behind their skepticism (despite all the scientific evidence to the contrary). At the end of class, students will be asked to provide feedback on the class; what aspects of the experimental course most positively, and negatively, impacted their learning.

http://www.camelclimatechange.org/resources/view/175302/?topic=66175

Climate and Civilization: The Maya Example

This activity uses geophysical and geochemical data to determine climate in Central America during the recent past and to explore the link between climate (wet periods and drought) and population growth/demise among the Maya. Students use ocean drilling data to interpret climate and to consider the influence of climate on the Mayan civilization.
http://www.camelclimatechange.org/resources/view/177386/?topic=65947

Yale Project on Climate Change Communication

The Yale Project on Climate Change Communication (originally the Yale Project on Climate Change) grew out of a groundbreaking conference on "Americans and Climate Change" that the Yale School of Forestry & Environmental Studies convened in 2005 in Aspen, CO. Over 100 national leaders representing science, media, religion, politics, entertainment, education, business, environmentalism, and civil society came together to develop an action plan to engage American society on climate change. The Six Americas Surveys implemented across the U.S. provide insights into knowledge, behavior, and attitudes of the public and policy makers regarding climate change.
http://environment.yale.edu/climate-communication/
Maryland-specific data coming Summer 2013: http://climatemaryland.org/

7. Geography

Exploring NCAR Climate Change Data Using GIS

This Earth Exploration Toolbook chapter uses ArcGIS and climate data from the National Center for Atmospheric Research (NCAR) Climate Change Scenarios GIS Data Portal to help users learn the basics of GIS-based climate modeling. The five-part exercise involves calculating summer average temperatures for the present day and future climate modeled output, visually comparing the temperature differences for the two model runs, and creating a temperature anomaly map to highlight air temperature increases or decreases around the world.

http://www.camelclimatechange.org/resources/view/173635/?topic=65994

8. Engineering

Climate Change, Engineered Systems and Society

Case studies and resources for incorporating climate change into engineering practice.

http://www.onlineethics.org/Topics/Enviro/Climate.aspx

9. Statistics

Climate Statistics for Indigenous Students

This is a scaffold assignment incorporating Climate Change into an Introduction to Statistics class to help students better understand and apply statistical testing techniques, including Regressional Analysis, Hypothesis Testing, and Inference about Differences, consisting of five major modules.

The purpose of the project is to incorporate Climate Change into an Introduction to Statistics class to help students better understand and apply statistical testing techniques, including Regressional Analysis, Hypothesis Testing, and Inference about Differences.

http://www.camelclimatechange.org/resources/view/177327/?topic=71692

Additional Resources

2013 National Climate Assessment

Latest science on regional impacts of climate change as well as thematic impacts such as human health, ecosystems, cultural factors, and decision-making.
http://ncadac.globalchange.gov/

NOAA – Climate.gov
Aggregation of NOAA climate data and resources from across the U.S.
www.climate.gov

COMET
Extensive collection of modules and courses related to climate science.
https://www.meted.ucar.edu/training_detail.php?page=1&topic=2&language=1&orderBy=publishDateDesc

NASA
Visualizations and imagery of climate change and impacts.
Climate.nasa.gov

Skeptical Science *(http://www.skepticalscience.com/)*

Skeptical Science is aimed at countering what Cook and many others see as erroneous climate science claims. For every skeptic argument, Cook offers a peer reviewed science article refuting the claim, and links to graphs, papers, and other sources. You can use the app to report arguments you've heard, and send it all directly to Twitter using a handy 'tweet' button. Additionally a book is available that addresses common misconceptions: http://www.skepticalscience.com/Debunking-Handbook-now-freely-available-download.html

HHMI: Changing Planet: Past, Present, Future

Series of lectures of the long term history of Earth's climate up to today.
http://www.hhmi.org/biointeractive/lectures/index.html