

NORTH CAROLINA SCHOOL OF SCIENCE AND MATHEMATICS

A Report on Global Warming

Requested by Senator Marc Basnight

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9/18/2008

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Expertise:

Linda Schmalbeck is an Instructor of Biology at the North Carolina School of Science and Mathematics, where she teaches Advanced Placement Environmental Science. She received her M.S. and a Ph.D. degrees from the Department of Environmental Science and Engineering at the University of North Carolina in Chapel Hill. She was a Research Environmental Scientist at RTI International in Research Triangle Park for eight years where her research focused on the evaluation of environmental and human health effects associated with aerosols – microscopic airborne particles. For the last twenty years Dr. Schmalbeck has been involved in various aspects of science education either as a teacher or in a policy-development role.

Summary:

Global warming has been thoroughly documented by scientists in many fields using a wide variety of techniques. The overwhelming evidence from many different lines of investigation leaves no serious scientific doubt about the existence or the causes of climate change. Quite simply, human activity is responsible for most of the rapid and damaging increase in greenhouse gas emissions. Scientific measurements have documented a substantial increase in carbon dioxide levels in the air since the Industrial Revolution in the mid-1800s. Carbon dioxide and other greenhouse gases trap heat in the atmosphere by reflecting radiated heat back toward the Earth. Even small increases in temperatures are predicted to produce major changes, including the melting of polar icecaps, rising sea levels, flooding of coastal lands, changes in ocean currents, and more frequent and stronger hurricanes and other storms. Many of these changes have already been documented by scientists worldwide.

The precise impact of these global phenomena on a relatively small area like the State of North Carolina (which is of course defined politically rather than by reference to natural geographical or ecological boundaries) is difficult; estimates of impact must accordingly be reported with substantial uncertainties. However, it is clear that our extensive (more than 3,000 miles) and fragile coastline will be negatively affected by rising sea levels. Other expected (and mostly negative) effects include changes in precipitation patterns and surface water flows; rising temperatures; changes in natural ground cover and failures in the current mix of agricultural crops; increased storm frequency and intensity; reduced supplies of safe water (resulting in competition between urban and agricultural regions of the state for this important scarce resource); the loss of biodiversity, and resulting loss of livelihoods in industries like forestry and fishing that depend on abundant natural resources.

The political response to climate change is growing. Notably, presidential candidates from both political parties in 2008 have publicly committed to implementing “cap and trade” systems to monitor and reduce emissions of carbon dioxide and other greenhouse gases.

A quick and technically sound response to these problems requires a well-educated, technically savvy workforce. North Carolina is in an excellent position to take advantage of such a workforce. An early response, consisting of educating a “green” workforce and citizenry, will position the state to face the known and unknown future challenges that climate change will bring.

While there are many areas in which action is necessary to respond to the challenges posed by global climate change, I will, in keeping with my own primary expertise, confine my recommendations below to those that should be taken to begin the process of educating a “green” working force starting in our public schools.

Recommendations:

1. **Teachers should receive current and relevant training to teach Earth and Environmental Science courses.** High school graduation in North Carolina already requires completion of a course in Earth and Environmental Science. However, many of the teachers now responsible for teaching these courses have been trained in other disciplines, and are teaching out-of-field to meet the demand for Earth and Environmental Science teachers.

A carefully designed teacher training program could substantially remedy such deficiencies in background, and is urgently needed. This program should be developed with input from State experts, university scientists, industry experts and teachers’ organizations. Many avenues for the dissemination of formal and informal teacher training exist, and all should be exploited. Specific certification of teachers trained in global climate change would encourage participation in the program and contribute to recognition of the need for scientific rigor. Unlike the environmental education programs that are presently available through state agencies, this program must directly address global climate change responses.

2. **A thorough review of the current curriculum aimed at the development of hands-on, practical experience as a critical part of Earth and Environmental Science course requirements is necessary and should begin immediately.** The current North Carolina Earth and Environmental Science curriculum is out of date and not sufficiently responsive to practical measures to address climate change. New curricular materials that result from this review should be integrated with the teacher training program recommended above. As an example, every student completing this course should be familiar with the working and general installation requirements of solar cells.
3. **Every school in North Carolina should actively participate in the collection of data to define the school’s “carbon footprint”.** Any “cap and trade system” for carbon emissions will require both public and private sector carbon inventory activities. Knowledge of the basic principles of carbon inventory creation and maintenance will be an essential green job skill in the near future. North Carolina is a founding member of The Climate Registry and is committed to the collection and reporting of data relevant to climate change through the mechanism of The Climate Registry http://daq.state.nc.us/news/pr/2008/climate_reg_04232008.shtml.

The State should work directly with The Climate Registry to develop a computer-based tool reflecting their existing inventory toolkit that has been adapted to the collection of information in schools throughout the state. Teacher training on how to collect the data and how to integrate this activity with regular math, science, economics and civics education should be part of the implementation plan.

4. **The state should actively encourage student projects and interaction with their communities to address climate change issues locally.** Students who entered ninth grade in 2006-7 or later are required to complete a Graduation Project. The state should actively encourage projects with an environmental theme. Additional funds to support global climate change-related projects should be made available to schools. Networks of professionals working in climate-change related fields should be encouraged by their employers to mentor high school projects in these areas and state-wide competitions that involve projects in these areas should be promoted through organizations like the North Carolina Student Academy of Sciences.

5. **North Carolina should initiate a Sustainable Schools Program that actively engages and rewards students, teachers, parents and administrators who identify ways to make their schools operate in a more sustainable manner.** Even small changes in behaviors or practices, like the elimination of school bus idling while waiting for students, can have a big impact on both carbon emissions and budgets. A well-conceived and well-publicized program that encourages thoughtful teamwork can have a significant impact and provide leadership in the community to amplify the impact.