

Local Warming:
Consequences of Climate Change for Atlanta

By Judith Curry

Atlanta is no stranger to weather disasters. In 2004, the remnants of Hurricane Frances caused \$41 million dollars damage in Atlanta, mostly from flooding owing to overburdened and outdated storm sewer systems. During 2007, Georgia has seen the worst drought and largest forest fire in over 100 years, with damage estimated at over \$1 billion. No single weather event can be directly attributed to global warming; however, we can expect the frequency and severity of flooding, droughts and forest fires to increase in the coming decades owing to global climate change. But the costs to the region inflicted by global warming could be far more extensive and complex than simply adding the cost of increasingly frequent and severe weather disasters.

The earth is getting warmer, and scientists conducting research on global climate change overwhelmingly agree: most of the warming since the mid 20th century has been caused by humans, primarily through burning fossil fuels such as coal and petroleum. Climate model projections suggest that average global temperatures could increase from 3 to 10 degrees Fahrenheit by 2100, the range reflecting the amount of carbon dioxide and other greenhouse gases that might actually be put into the air, plus uncertainties in the climate models. Georgia can expect warmer temperatures to be accompanied by more severe heat waves, increased heavy rainfall events, and more severe and longer droughts.

While we need to continue with aggressive efforts to reduce carbon emissions, it has been difficult to obtain the requisite international agreements and actually implement strategies to reduce emissions quickly enough to avert changes in climate. We need to pay more attention to how the world will actually cope with the consequences of global warming. The problem of increasing carbon dioxide in the air is global, but the consequences of climate change are entirely local. Communities and local and state governments are giving increasing attention to adaptation strategies. Adaptation refers to changes in natural or human systems that moderate harm or exploit opportunities.

Most of global warming's local perils are familiar problems, though with a considerable magnification factor. National assessment reports and studies by Georgia's scientists have examined the impacts of global warming on our region. Specifically, the impacts described here for Atlanta focus on human health, water resources, agriculture and forestry, air and water quality.

Heat waves. In the 2080s, the average summer high will probably be 96 degrees in Atlanta, with extreme temperatures reaching 115 degrees. Conditions seen in the 1998 southern heat wave and drought – damages in excess of \$6 billion and at least 200 deaths – would become commonplace. Human health concerns are greatest for lower income households that lack sufficient resources to improve insulation and install and operate air conditioning systems. With a warming of only 2 degrees (which is likely over the next

few decades), heat related deaths in Atlanta are expected to increase from 78 annually now to anywhere from 96 to 247 people per year, with major heat waves associated with even greater loss of life.

Water. Georgia's warmer climate would mean more intense thunderstorms and episodes of heavy rainfall, as well as more intense and prolonged droughts. While the prospect of heavier rainfalls from thunderstorms and landfalling hurricanes seems like blessed relief during this period of severe drought, the associated flooding can cause substantial property damage, loss of life, ecosystem damage, and environmental damage. Atlanta's storm sewer system is inadequate to handle the rainfall from severe thunderstorms and tropical cyclones. Besides the threat to property, floodwater can be tainted with raw sewage, pesticides, petroleum products, animal waste, and dead animals.

The far more serious issue for the region is drought. The economic impact in North Georgia of the current drought has been estimated at \$1.3 billion. Such droughts with greater severity are expected to become more commonplace. Compounding the issue of drought is rapidly growing population: water demand in the greater metropolitan Atlanta region in 2020 is expected to increase by approximately 60%. We are currently in the midst of a water crisis; we are facing the prospect of future water catastrophes. A first step in adapting to drought should be the adoption of the Georgia statewide water management plan, *Georgia's Water Resources: A Blueprint for the Future*.

The projected increase in Atlantic hurricane activity is a two-edged sword for Atlanta: while heavy rains and tornadoes from Gulf landfalling hurricanes can cause substantial damage in Georgia, these same heavy rains provide critical replenishment of our reservoirs and relief from drought.

Air quality. The current pace of global warming means that the number of unhealthy, "red alert" days for Atlanta's air quality could double within the next three decades, if smog-forming pollution remains unchanged. The projected population increase in the region is 40% by 2030; if nothing is done to change the per capita burning of fossil fuels and the associated pollution increase, the air quality problems will worsen substantially. The adoption of readily available measures to lower emissions from power plants and automobiles would provide major public health benefits by improving air quality.

Infectious diseases. Increasing temperatures and humidity bring an increased risk of mosquito borne diseases that are more commonly associated with tropical climates. The greatest threats to a warmer southeast U.S. are yellow fever and dengue, both serious diseases with significant fatality rates. West Nile Virus outbreaks are also expected to become more common in the southeast U.S. The only defense is control of mosquitoes.

Agriculture. Longer growing seasons and increased carbon dioxide in the air could mean greater near-term yields for crops such as peanuts, soybeans and cotton – although such benefits would subside as temperatures continue to rise. With prolonged droughts, the state's agricultural productivity will become more dependent on irrigation. Adaptation in the agricultural sector should be relatively easy: farmers can switch crops or vary

planting dates, patterns of water usage, crop rotations, and the application of fertilizers and pesticides. Improvements in forecasting weather on monthly to seasonal time scales would enhance the ability of farmers to manage their crops.

Forests. Increasing carbon dioxide, taken by itself, could stimulate the productivity of Georgia's forests. This past year, 80-90% of last winter's regeneration planting fell victim to the drought and the pine beetle is spreading and damaging drought-weakened trees. The long-term stress from prolonged droughts, fires and changing insect populations could substantially diminish the forests particularly in the southern part of the state. Commercial forestry adaptations could include salvaging dead and dying timber and replanting species appropriate to a new climate. An aggressive fire management strategy will be needed.

The risks from global warming exist in a broader context of natural climate variability, resource depletion, environmental degradation, and population increase. The greatest economic loss to Atlanta and Fulton County could result from increasing water shortages and further degrading air quality, as businesses and industries decide that Atlanta's environment cannot sustain long term operations for their companies nor provide a desirable quality of life for its employees. Atlanta's "brand" as economic and cultural center of the southeast is currently qualified by poor air quality and massive traffic jams. Add unreliable water supply and unsustainable growth with lack of planning, and Atlanta could look much less attractive for future economic development.

We can change Atlanta's brand to become the model of how a city can grow prosperous, secure, innovative and healthy by managing our natural resources sustainably and confronting climate change. The forward looking planning required to develop a strategy for adaptation to climate change can be used as an opportunity to plan broadly for a sustainable prosperity, by doing planning for land use, transportation systems, disaster management, and reducing our carbon footprint.

Dealing with climate change is both necessary and feasible. The best climate change strategies combine adaptation with reducing our carbon footprint and protecting our natural resources, since it will be much more difficult to adapt to faster warming rates. Several cities and states are leading the way: Seattle, King County and the state of Washington; Chicago and Illinois; the state of California; and the state of Florida.

So what should Atlanta and Fulton County be doing? We need to start engaging in serious long-term planning on the issues of sustainable development that includes land use, transportation systems, water systems, and reducing emissions and build climate change risks into the policy development process. Here is what we can start doing right now:

- Assess our water resources, future needs, and the engineering and policies required for a sustainable water supply.
- Improve Atlanta's storm water management and sewer system. This will not only diminish the damage from floods, but will also support Atlanta's overall water management and help control mosquito borne diseases.

- Aggressively protect our trees. Besides the direct economic value of our forests, trees are our front line for a livable climate by moderating the temperature and retaining moisture in our soils. Further, trees remove carbon dioxide from the air.
- Enhance our public transportation system. Plans are already on the table for an enhanced regional transit system and the so-called “brain train”. In addition to reducing our carbon footprint, the reduced emissions from an enhanced public transportation system will have a dramatic impact on our air quality (not to mention our traffic problem).
- Implement energy conservation and efficiency strategies. The up-front investment will provide payback within a few years in terms of substantially reduced energy costs. In addition to reducing our carbon footprint, the emission reductions will have a substantial beneficial effect on our air and water quality.
- Further reduction in carbon emissions will require clean energy technologies. The single most effective thing we can do in the short term is not to build any more coal burning power plants until clean coal technologies are available.

The perception that any serious emissions reduction threatens the U.S. economy and our way of life is incorrect: reducing our energy consumption can be done, with financial benefits. Georgia Tech, the largest consumer of electricity in Atlanta, has begun implementing an aggressive plan to reduce energy consumption and its carbon footprint. During the period 1995-2004, Georgia Tech reduced its energy consumption by 11% in spite of substantial campus growth, and avoided \$7.3 million dollars in energy costs.

All of the measures recommended for adapting to climate change and reducing emissions will further benefit the region through improved air and water quality, improvements to the region’s traffic problems, more reliable water supply, greater resilience to weather disasters, and lower energy costs. Further, our national political leaders have made reducing our dependence on foreign oil a national imperative. The global need to reduce greenhouse gas emissions is arguably the biggest entrepreneurial opportunity the United States has known. Surely this is an opportunity for Atlanta, particularly given the existing technological base in our universities and industries. Investments made in a more sustainable environment and reducing our vulnerability from climate change are investments in sustainable prosperity and economic growth for the region.