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Subcommittee on Commerce-Justice-Science
Committee on Appropriations
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Chairman Wolf, Ranking Member Fatah, and Members of the Subcommittee, thank you for this opportunity to voice my appreciation for the support this subcommittee has steadfastly provided for basic science – particularly in the earth and environmental sciences - at the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA). This subcommittee is responsible for at least 75% of the total federal support for earth and environmental sciences and the importance of that investment is both lifesaving and essential from an economic point of view, as I will describe in my testimony. Assuming I can make that case to you and your colleagues, I hope that even as you are confronted with extremely severe budget challenges, you will continue to place a high priority on these basic research activities in the FY 2013 appropriations process.

My focus on basic sciences is not because I am a physical or natural scientist. I am a political scientist, a scholar of public management, and the director of two masters programs at Columbia University–a Masters of Public Administration in environmental science and policy, and a Master of Science in sustainability management. In both programs, students are required to take core courses in environmental science. Why do I require management and policy students to learn science? I do so because there is a fundamental need to understand basic environmental processes in order to effectively manage anything in an increasingly challenging world. Decision makers must have insight into the natural resources and inputs that sustain their organization or business - the energy, water and raw materials needed for production. They must also understand the impact of their production on the natural environment. Ask BP if they think that is important knowledge for management to have. An education that includes basic science allows graduates of these programs to serve as managers and policymakers with the environmental and earth science information that is increasingly necessary to evaluate complex information and make informed decisions.

When I was growing up in the 1960s, there were 3 billion people on the planet; today there are over 7 billion. With a global population that is projected to reach 10 billion by 2050, the crucial question emerges – how do we extract our needs from the planet without destroying it? In an increasingly crowded planet, the scale of production of everything has grown, and with it we see an increased draw on the earth's resources. If we do not develop an economic system less dependent on the one-time use of natural resources, then it is inevitable that energy, water, food and all sorts of critical raw materials will become more and more expensive. The development of a sustainable, renewable resource-based economy has become a necessity. The species that really needs healthy ecosystems is not some endangered sea turtle or polar bear, but the one you and I belong to - the human species. Energy and climate are just some of the first places we see the strain on the global biosphere, but they won't be the last.

In order to maintain and improve our standard of living and those of the aspiring middle class in the developing world, we must create a high throughput economy that manages our planet's resources and maintains the quality of our air, water and land. In the United States and other wealthy nations, we expect our standards of living to continue to rise, enjoying advanced technologies and reaping the benefits of an advanced economy. In order to do this, to grow the global economy in the long-term, we need to manage the planet more effectively. Without a healthy and productive ecosystem, wealth is impossible; environmental protection is a prerequisite to wealth. The stress on our environment has become apparent to those even in the wealthiest nations. The resources of the earth are fixed and finite, and environmental and earth system processes are complex and not yet completely or widely understood. Scientific research is required to continue to advance our knowledge of these systems so that we can ensure our ability to sustainably utilize them in the long-run. We need to advance and invest in the science of earth observation if we are to sustainably manage an economy capable of supporting the planet's population.

The fact is that we know far more about the functioning of our economy than about the environment. The Gross Domestic Product indicator has been around since the 1930s. There is still no such all-encompassing measure for environmental quality and planetary health – yet these may end up being key indicators of global well-being and the ability for individuals, organizations, and nations to prosper. Basic environmental science and earth observations are the prerequisites for such an overall sustainability measure or metric. For these reasons, it is imperative that we expand the collective understanding of natural resources, earth and environmental processes, and biological systems. We must continue to learn about the resources we have at our disposal, the processes that create and sustain them, and, perhaps most importantly, the short-term and long-term impacts we are inflicting on these resources and systems.

The support provided by NOAA's extramural competitive climate change research program, NSF's research programs – especially in the geosciences and biological sciences, and NASA's earth science programs are critical keys to understanding the impacts we are inflicting on our natural resources and our complex environmental systems.

Physical constraints, resource costs, and environmental impacts have become routine inputs to decision-making across sectors and industries. Increasingly, environmental research is needed to drive the understanding behind critical public policy decisions. Basic and applied scientific research can uncover new policy options, lead to cost savings in unexpected ways, and can help make sense of sometimes conflicting data or information. Two examples from New York City illustrate the important role that basic science plays in fundamental policy decisions.

New York City's drinking water is among the best in the world, exceeding stringent Federal and State water quality standards. New Yorkers get their water from three upstate reservoir systems that the City owns and operates – the Catskill, Delaware, and the Croton watersheds. This extensive water system provides over 1 billion gallons of water daily to over nine million New York City residents and residents in the surrounding counties[1]. The Catskill and Delaware watersheds, which together provide 90% of the water to the City, are so pristine that their water does not need to be filtered. This is a significant accomplishment; in fact, there are only four other major American cities that are not required to filter their drinking water: Boston, San Francisco, Seattle and Portland.

To keep the sources of water clean, the city works hard to protect the watershed from activities that can threaten their water quality. New York City actively engages in land acquisition when available and feasible, acquiring more than 78,000 acres since 2002[2]. City ownership guarantees that crucial natural areas remain undeveloped, while eliminating the threat from more damaging uses. The city enforces an array of environmental regulations designed to protect water quality while also encouraging reasonable and responsible development in the watershed communities. New York City also invests in infrastructure—such as wastewater treatment facilities and septic systems—that shield the water supply, while working with its upstate partners to ensure comprehensive land-use best practices that curb pollution at the water's source. While these efforts take significant investments of time and money, the alternative to maintaining these watersheds is far more costly. If the water quality deteriorated, the City would be forced to build a filtration plant that could cost as much as $10 billion to construct, which would mean costs of roughly $1 billion a year to pay the debt service and operate the plant. This would also cause a water rate increase of at least 30% to New Yorkers[3].

Most of New York City's water supply is protected and filtered by the natural processes of upstate ecosystems. To environmental economists, nature's work that protects our water is an "environmental service." Because the price of a filtration plant is known, we can estimate the monetary value of the services provided to filter our water. This comes to $1 billion per year minus the $100 million or so we spend each year to protect the upstate ecosystems. This is $900 million a year of found money that we will lose if we don't protect these fragile ecosystems. It's a graphic illustration of the point that what is good for the environment will often be good for our bank account. However, this is only possible with a strong knowledge of these ecosystem services – we cannot assume nature is doing something and put a value on that service, if our fundamental understanding of the environmental processes involved is flawed or incomplete. This is where basic and applied science research is key- providing the foundation for critical public policy decisions, often involving substantial sums of public dollars. We can see that science is one of many critical inputs that managers and leaders need at their disposal to process complex problems and arrive at the best solution.

I will use my hometown, New York City, to demonstrate once more the influence that informed science can have on public policy problems and the bottom line. The problem of combined sewer overflow remains one of the most difficult water quality issues facing New York City. Combined sewer systems are typical of cities with old infrastructure, where the sewage from your home is combined with sewage from street sewers before it is piped to the local sewage treatment plant. The problem is that if a large amount of rain suddenly sends a high volume of water into street sewers, it can overwhelm treatment plants and push raw sewage into local waterways before it is treated.

The traditional approach to dealing with the combined sewer overflow problem is to build tanks and other facilities to hold storm water during storms and then release it into the sewers once the storm has ended. In September 2010, New York City released its landmark Green Infrastructure Plan, which would make use of vegetation, porous pavements and porous streets, green and blue roofs, and even rain barrels to augment traditional investment in "gray infrastructure." These “green” low-cost techniques reduce the impact of storms on the city's water treatment plants by absorbing or catching water before it can enter the sewer system. Green infrastructure can quickly reduce the flow of wastewater to treatment plants since it takes much less time to plant greenery or put out rain barrels than to site, design, build, and operate a traditional holding tank.

The goal of New York's innovative green infrastructure plan is to reduce sewage overflows into NYC waterways by 40 percent by 2030. The city's plan estimates costs that are $1.5 billion dollars less than the traditional “gray” strategy. Not only is green infrastructure cheaper than traditional infrastructure (and just as effective), but these types of projects provide multiple co-benefits for the city including cleaner air, reduced urban heat island effect, improved energy efficiency, and enhanced quality of life through increased access to green space.

Recently the State and City signed a draft agreement allowing the city to begin implementing its green infrastructure approach. The agreement also included a provision to defer making a decision to construct two Combined Sewer Overflow tunnels until 2017. The rationale behind the postponement is that in five years we will know much more about the effectiveness of the green techniques. These tunnels are estimated to cost approximately $1 billion each, and if we could demonstrate that an ecosystems services approach could save most of these funds, it would be an exciting and important demonstration of the principles of green infrastructure – and the importance of environmental science on policymaking.

Again, we see the importance of utilizing environmental science and research in critical decision-making that impacts significant populations of people. A clear, comprehensive understanding of hydrological, biological, and geochemical processes fuels the decisions to opt for “green” projects versus “gray” projects. Scientific research is not made for the sake of knowledge itself. Important environmental discovery and knowledge form the necessary building blocks to important policies. Neither of these innovative cost-saving public programs would be possible without a solid understanding of science. If we do not make the investment in the basic scientific research needed to make these complex decisions regarding the planet’s finite resources and sensitive services, a reduction in the planet's ability to produce goods and services is only a matter of time. We need to dramatically increase funding for basic and applied science and focus attention on research and development in earth observation, energy, food, water and other key areas.

One of the great strengths of this country is our amazing research universities. In the post-World War II era, the U.S. established an effective partnership between government-funded basic research and private sector application of fundamental research in applied technologies, including computers, cell phones, the internet, and of course a host of breakthroughs in medicine and medical technology. Much of the economic growth of the past century and a half has been the direct result of this type of technological development. Government is especially crucial in funding basic science that is too far from products and profits to generate private R & D investment. Government is also needed to help bridge the sometimes wide gap between basic and applied research.

Support for basic environmental science research should not be seen as a partisan or political issue. It is about the discovery of fundamental knowledge that has allowed us to improve our standard of living and holds the promise of a sustainable planet, free from extreme poverty. Support for basic scientific and engineering research and education – particularly the university-based research that the agencies under the jurisdiction of this subcommittee support - is a fundamental role of government similar to national security, emergency response, infrastructure and criminal justice. Reducing this funding is a threat to our long-term economic growth.

Thank you for this opportunity to appear before the Subcommittee. I would be happy to answer any questions the Members of the Subcommittee may have.

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[1] "PlaNYC: 2030." The City of New York. Apr 2007. Web. 3 Mar 2012. Pg 78
[2] "PlaNYC: 2030." The City of New York. Apr 2007. Web. 3 Mar 2012. Pg 81
[3] "PlaNYC: 2030." The City of New York. Apr 2007. Web. 3 Mar 2012. Pg 78