

**Testimony of Dr. Kelvin K. Droegemeier**  
**Professor of Meteorology, University of Oklahoma**  
**Member of the National Science Board and Co-Chair, National Science Board Task Force on Hurricane**  
**Science and Engineering**  
**Submitted to the Subcommittee on Energy and Environment, and Subcommittee on Research and Science**  
**Education**  
**U.S. House of Representatives Committee on Science and Technology**  
**For the joint hearing on the State of Hurricane Research and H.R. 2407, the National Hurricane Research**  
**Initiative Act of 2007**  
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**RHOB 2318**

I thank Chairman Lampson, Chairman Baird, Ranking Members Ehlers and Inglis, and the other Members of the two subcommittees for the opportunity to speak with you today. My name is Kelvin Droegemeier and I am a professor of meteorology at the University of Oklahoma. I also am a member of the National Science Board and am appearing before you today in my role as co-chair of the National Science Board's Task Force on Hurricane Science and Engineering. The final report of this Task Force, published January 12, 2007, served as the blueprint for H.R. 2407. Dr. Kenneth Ford, Director of the Institute for Human and Machine Cognition and fellow NSB member, served as my co-chair.

I needn't tell you that every year, hurricanes pose a threat to life, property, and the very economic vitality of our Nation. Yet impact of hurricanes extends well beyond a given storm, often for many years, as we've seen in recent storms such as Katrina and Rita. Among all weather hazards in the US, hurricanes account for over half the total damage inflicted, and annual economic losses average approximately \$10 billion in constant 2006 dollars. Of course, the 2005 hurricane season was notably destructive, with Katrina losses exceeding \$130 billion. Remarkably, 50% of the US population lives within 50 miles of a coastline and that some 80% of our population resides within 200 miles of a coast. The \$3 trillion of physical infrastructure in the Gulf and Atlantic coastal regions continues to grow at a rapid pace, and thus we as a Nation are increasingly vulnerable to hurricanes. Of particular relevance today is the immense energy infrastructure located in "hurricane alley" -- 33,000 miles of pipeline that transports some 30% of our Nation's domestically-produced oil and gas from offshore wells to onshore refineries. According to the U.S. Department of the Interior, some 3,000 of the Gulf's 4,000 platforms, and 22,000 of the 33,000 miles of the Gulf's pipelines, were in the direct paths of Hurricanes Katrina and Rita. A total of 115 offshore platforms were destroyed, 52 were damaged, and 535 pipeline segments were damaged. Considerable destruction occurred to onshore facilities -- for example, refineries and supporting infrastructures in and around Lake Charles, Louisiana. More than nine months later, 22% of Federal oil production and 13% of natural gas production remained unavailable, resulting in the loss of 150 million barrels of oil and 730 billion cubic feet of gas from domestic supplies.

Motivated in part by recent hurricanes, the National Science Board -- with its independent advisory role to the President and Congress as well as its policy-making responsibility for the National Science Foundation -- undertook an intensive effort to frame the hurricane science and engineering research challenges and recommend a national imperative to address them in a holistic manner. We did so by engaging the academic, government and private sector communities in a series of workshops; by evaluating previous studies of hurricanes and other natural disasters; and by obtaining input from the public on a draft version of the report.

As you well know, we spend billions of dollars on rescue and recovery after hurricanes occur. But can we better anticipate and react to hurricanes ahead of time to avoid loss of life, property, vital infrastructures, and disruptions in our economy? The answer from our study is yes. Are we using existing knowledge effectively? The answer from our study is no. Is the research now being done adequate and properly coordinated? The answer from our study is no. In fact, research in hurricanes is a modest, loosely coordinated enterprise. Although of high quality, this research is conducted within the boundaries of traditional disciplines -- stovepipes like meteorology, hydrology, engineering, computer science and ecology -- with insufficient integration. And the engagement of social, economic, behavioral sciences -- which is foundational to actually turning physical science and engineering research into useful practice -- is woefully inadequate. In short, the hurricane is perhaps one of the best examples

of a problem – absolutely vital to society – which must be studied in a multi-disciplinary fashion of we hope to lessen our vulnerability.

I am very pleased that H.R. 2407 reflects very closely the recommendations made in our report. This truly is a wonderful testimony of Congress responding quickly to recommendations of the broad community and using existing frameworks (such as OSTP and the National Windstorm Impact Reduction Act) to deal with a profoundly important problem. Given that you are familiar with the bill, I wish to highlight just a few key points.

First, strong collaboration between NSF and NOAA is vital to the success of this effort, as is the involvement of other agencies, as articulated in the bill. Second, it is important to note that the hurricane is not a weather problem alone but rather a weather-driven problem that must be studied in a multi-disciplinary fashion. It is for this reason that the components of the research agenda described in the bill – including, for example, hurricane intensity change, assessment and response of structures to wind and waves, ecosystem impacts, and economic and societal impacts – are so important and must be performed in a coordinated manner. Third, the national infrastructure data base is important for hurricanes but also for numerous other uses, ranging from earthquakes to homeland security. Fourth, the National Hurricane Research Model – which in our report was referred to as a Test Bed and involves all relevant disciplines of the research program – is absolutely essential for bringing together the research components and moving them to operational practice.

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On behalf of the National Science Board and our Chairman, Dr. Steven Beering, I want to thank the Committees for the important work they do for U.S. scientific research, education, and training. We understand and appreciate that the nation is undergoing significant budget pressures at this time, but the future strength of the nation depends on the investments we make in science and technology today. We appreciate your attention to the recommendations of the Board concerning H.R. 2407 and stand ready to assist in whatever ways might be most beneficial.