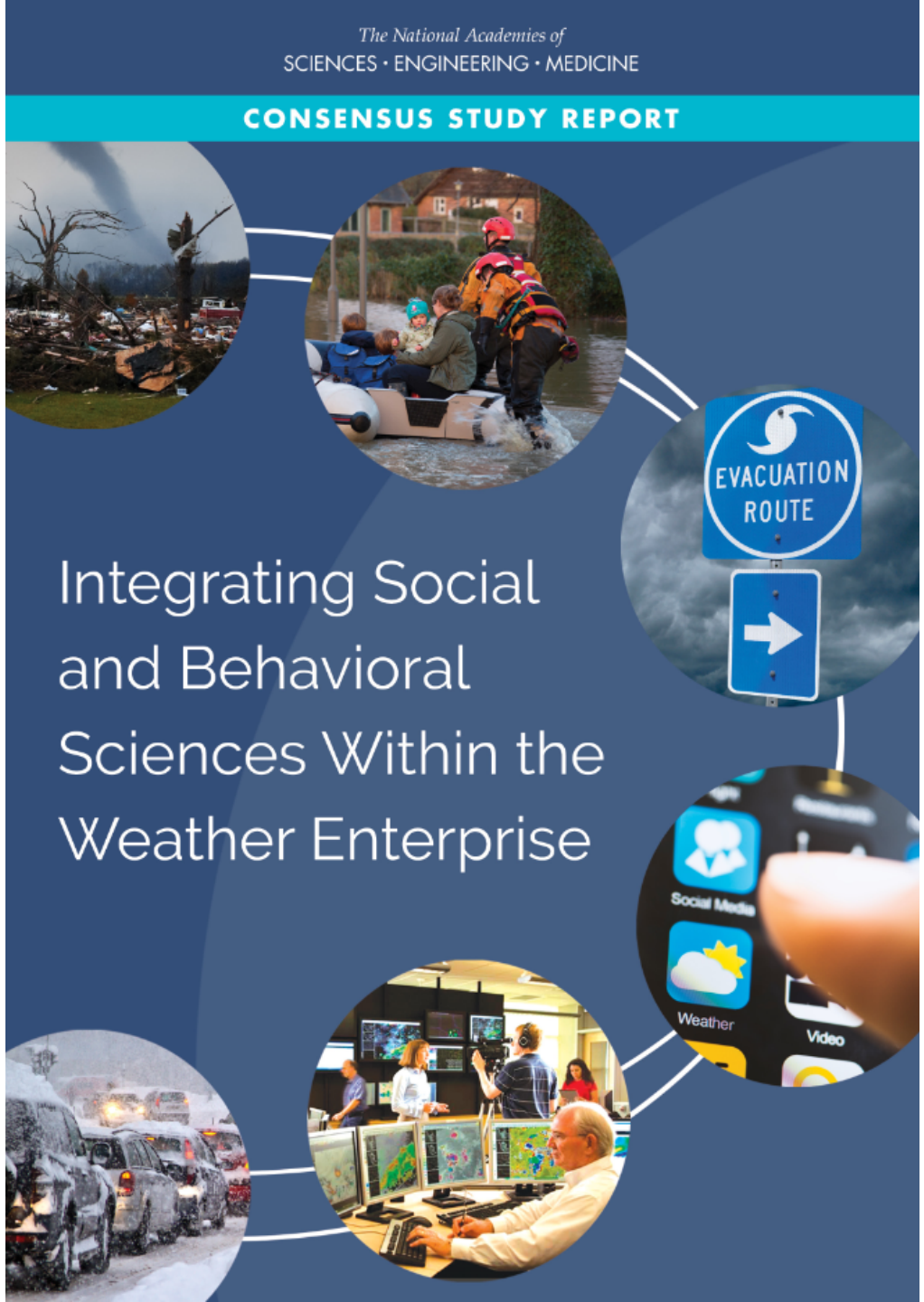
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September 8, 2017

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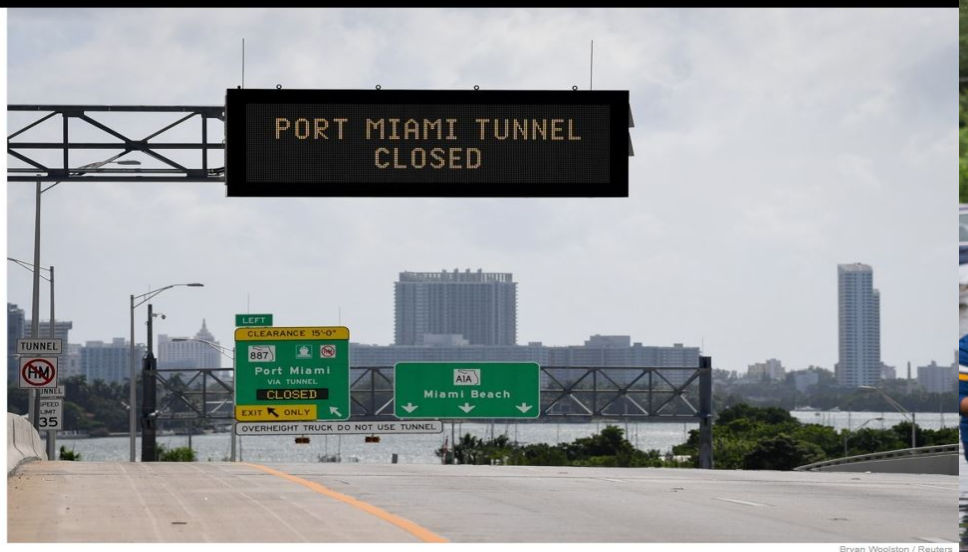

Bryan Woolston / Reuters

When Hurricane Warnings Are Lost in Translation

NEWS / U.S. NEWS

Texans Won't Leave Pets Behind

The massive storm has also disrupted the lives of thousands of pets.

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Disasters and Populations at Risk: Lack of Vehicle Makes Evacuation Difficult

Eric Gay / AP

Why Do Some People Decide to Ride Out Hurricanes?

"I can't say that this is a totally safe thing to do, because it's not. But it's

The Washington Post

National

As Irma approaches, fear is in the water, spreading with new and viral efficiency

The Washington Post

PostEverything • Perspective

We can't leave Florida, but we can't stay either. Help us!

There are no good options for the millions trapped by the storm.

By Darlena Cunha September 8 Follow @parentwin

Darlena Cunha is a former television producer turned stay-at-home mom to twin girls.

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Extreme Weather

Houston knew it was at risk of flooding, so why didn't the city evacuate?

By Dakin Andone, CNN

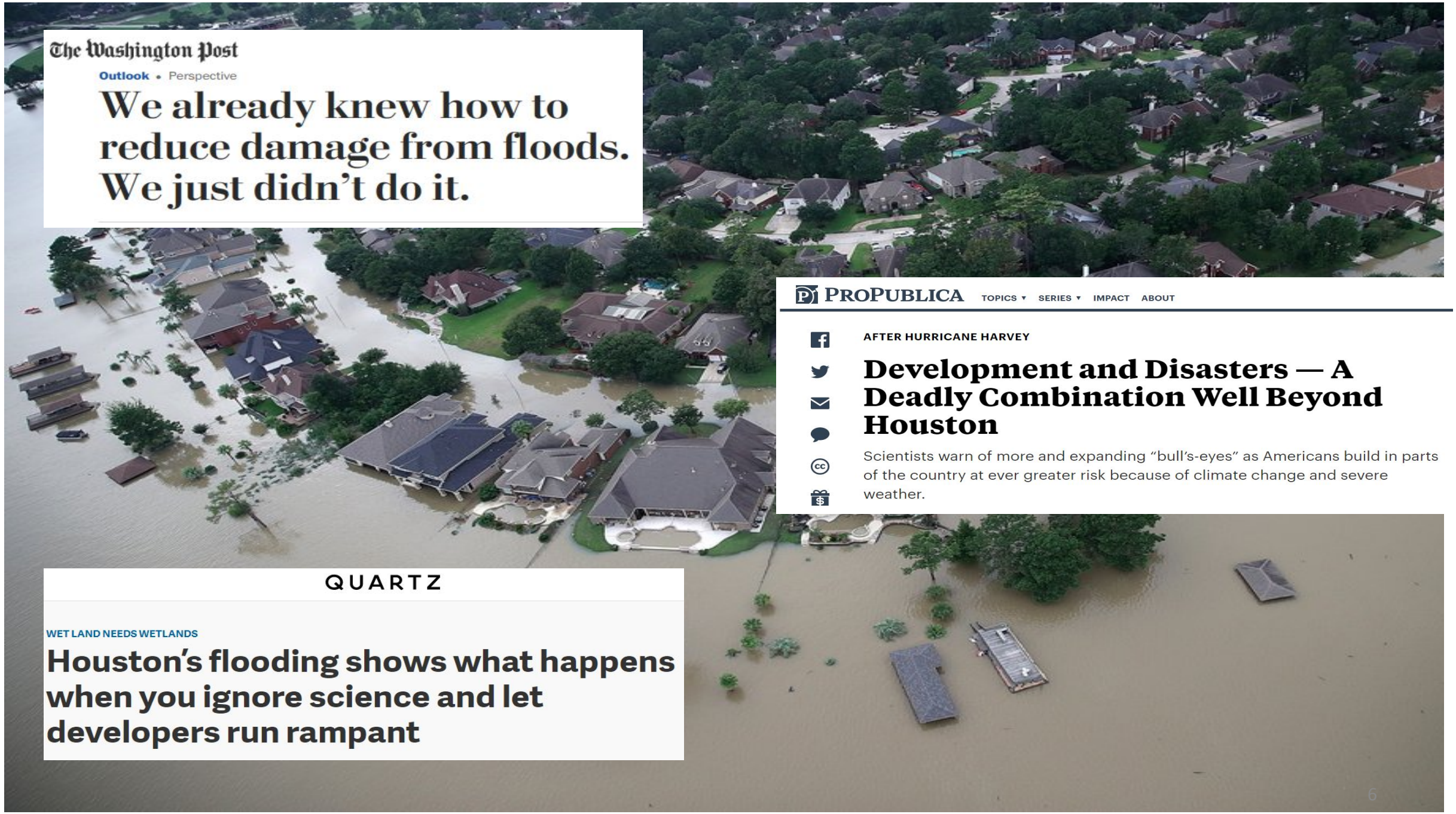
Updated 12:57 AM ET, Tue August 29, 2017

The New York Times | https://nyti.ms/2vEac54

U.S.

Houston Mayor's No-Win Dilemma: Whether to Tell Residents to Stay or Go

By MANNY FERNANDEZ and RICHARD FAUSSET AUG. 28, 2017



The Washington Post

Outlook • Perspective

We already knew how to reduce damage from floods. We just didn't do it.

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AFTER HURRICANE HARVEY

Development and Disasters — A Deadly Combination Well Beyond Houston

Scientists warn of more and expanding "bull's-eyes" as Americans build in parts of the country at ever greater risk because of climate change and severe weather.

QUARTZ

WET LAND NEEDS WETLANDS

Houston's flooding shows what happens when you ignore science and let developers run rampant

Study Charge

Develop a framework for generating and applying social and behavioral science research within the context of meteorology, weather forecasting, and weather preparedness and response.

- Assess current SBS activities and applications within the weather enterprise
- Describe the value of improved integration and identify barriers to better integration.
- Develop a research agenda for advancing the application of social and behavioral sciences
- Identify infrastructural and institutional arrangements necessary to successfully pursue SBS weather research and the transfer of relevant findings to operational setting.

Committee Members

ANN BOSTROM (co-chair), University of Washington, Seattle

WILLIAM HOOKE (co-chair), American Meteorological Society

RAYMOND BAN, Ban and Associates

ELLEN BASS, Drexel University

DAVID BUDESCU, Fordham University

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JOHN TOOHEY-MORALES, WTVJ NBC-6

JOSEPH TRAINOR, University of Delaware

Motivation for Integrating Social and Behavioral Sciences within the Weather Enterprise

Why integrate SBS within the weather enterprise

Weather is shaped by physical processes; its impacts are shaped by how individuals, households, organizations, communities, respond to weather information, and how it informs decisions and behaviors.

Finding: Realizing the greatest return on investment from advancing meteorological research and numerical weather prediction requires fully engaging the social and behavioral sciences across the weather enterprise.

Why now

- NOAA- and NSF-funded research has seeded a research community
- *Weather Research and Forecasting Innovation Act of 2017* : "enhance the integration of social science knowledge into weather forecast and warning processes"
- Initiatives like *Weather Ready Nation* and *Impact Based Decision Support* create new demand for SBS

Other developments that increase the need for SBS research

Proliferation of Weather Information Sources. e.g., How people are affected by differing information from NWS, TV news, social media, websites, apps?

Warn-on-Forecast. e.g., How do longer hazard lead times affect the ways that people react to warnings? How should probabilistic information be displayed for the public ?

GOES-R Satellite Information e.g., How does a new influx of information affect forecasters' decision-making? What is the most useful mix of displays to aid the forecaster?

Hydrometeorological Modeling / Forecasting Advances. e.g. How to best use National Water Model output to create useful products for decision makers?

Automated / Connected Vehicles. e.g. What is the right balance between providing real-time alerts to drivers and encouraging drivers to focus on the road instead of a screen?

Climate Change and Extreme Weather Risks. e.g. How does communication about weather hazards need to adapt when historical weather patterns are changing?

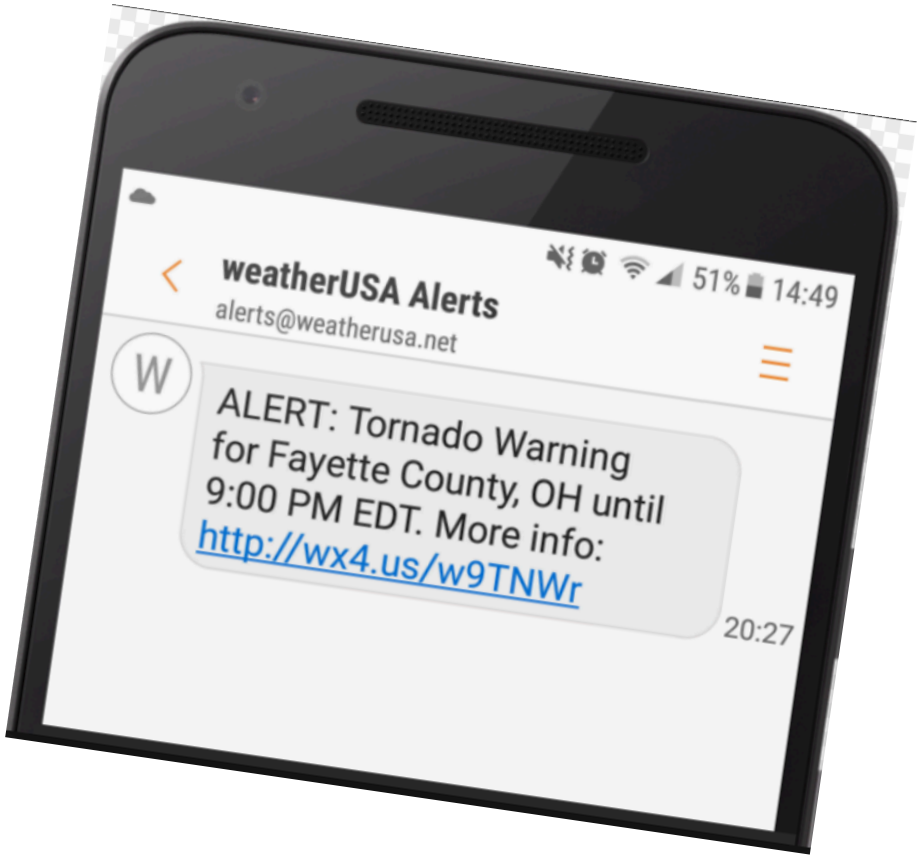
Examples of how SBS research can provide critical insights and understanding in all the stages of action associated with hazardous weather

Finding: SBS research offers great potential for improving:

- preparedness and mitigation for weather risks;
- hazard monitoring, assessment, and forecasting processes;
- communications of hazardous weather warnings;
- emergency management and response
- long-term recovery efforts.

Example of SBS Research Impacts: Improving hazard alerts on mobile devices

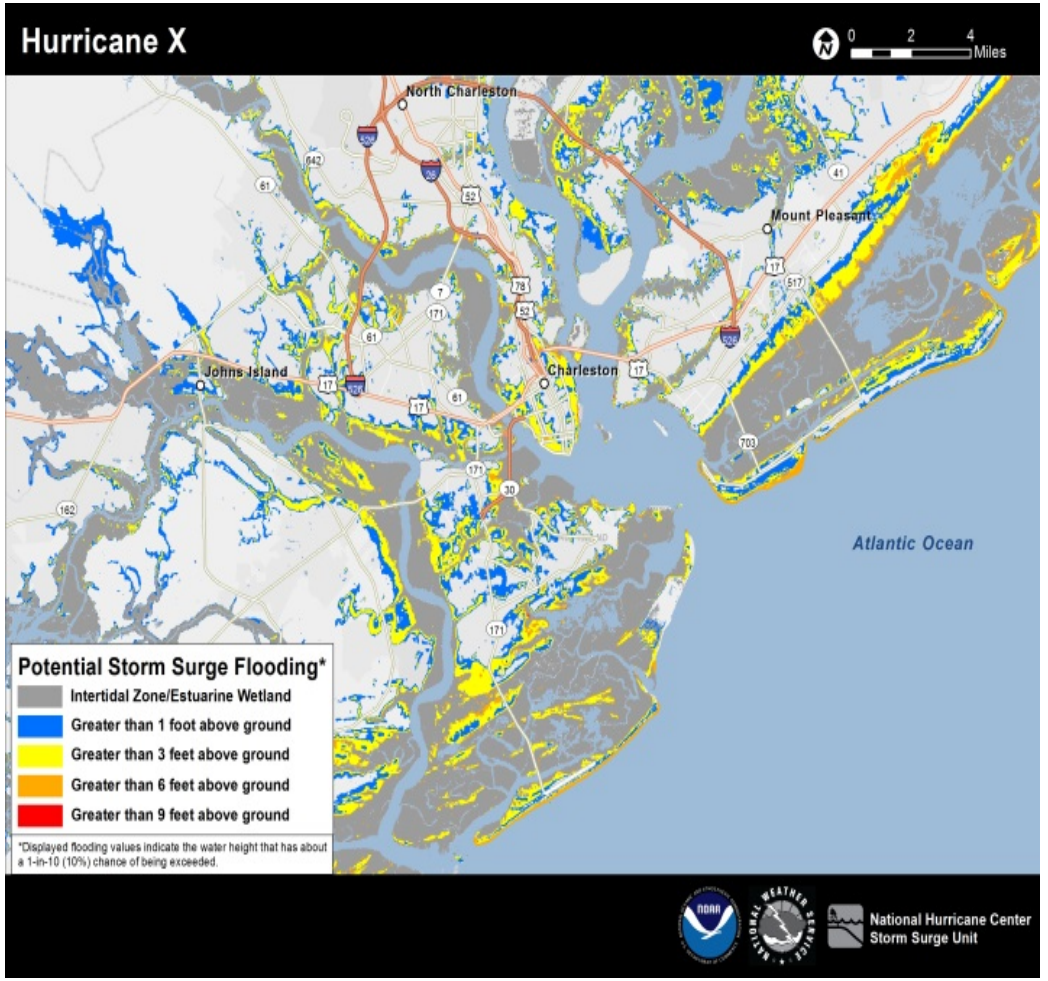
- A 2014 DHS-funded study* looked at ways to optimize Wireless Emergency Alerts (WEA) mobile text messages.
- Key finding: longer messages are more effective at motivating protective actions.
- Result: the FCC updated rules for WEA messages, by lengthening the character limit and adopting other features identified in the study.



*Bean et al., 2014, Comprehensive Testing of Imminent Threat Public Messages for Mobile Devices

Example of SBS Research Impacts: Guiding development of storm surge mapping

- And NWS effort to provide more accurate real-time forecast guidance; to communicate information in a way that people can act upon
- Input from emergency managers, broadcast meteorologists, an interdisciplinary team including a sociologist, economist, meteorologist, and engineer
- Studied stakeholders' reactions, interpretations, and preferences



*Morrow et al., 2015. Improving storm surge risk communication: Stakeholder perspectives. BAMS. *January 2015*

Current State of Social and Behavioral Sciences within Weather Enterprise

Research Activities

Diverse research conducted to date on:

- weather professionals and the weather enterprise system
- social vulnerability to hazards and disasters
- design, interpretations, and effects of forecast and warning messages

Relevant reviews and syntheses, for example:

- risk communication of hazard warnings,
- the scientific base for protective actions
- team science and team performance
- judgment and decision making under uncertainty.

SBS-related Activities in the Private Sector

Focused primarily on expanding viewership and market share [audience surveys, marketing research, product R&D]

Some aspects can contribute to new SBS insights, but insights considered proprietary unlikely to be shared.

Some companies open to new public-private partnerships

- supporting certain types of SBS research
- advancing research agenda-setting, community- and capacity-building, and information-sharing activities.

Examples of SBS-weather agenda setting activities

- NOAA Flash Flood Summit
- Living With Extreme Weather workshop

Examples of community- and capacity-building activities

- WAS*IS (Weather and Society*Integrated Studies)
- Social Science Woven into Meteorology (SSWIM)

Examples of information-sharing venues

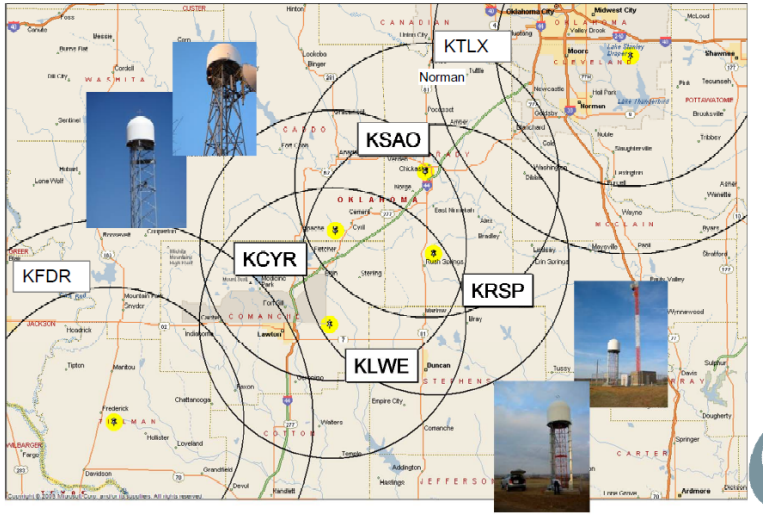
- AMS journals, symposia, conferences
- Natural Hazards Center's *Research and Applications Workshop*

Research to Operations

Examples where notable progress is being made:

- **NOAA testbeds** offer great potential for applying SBS research to investigate how originators and mediators of forecasts and warnings can access, interpret, and utilize new technologies and information.

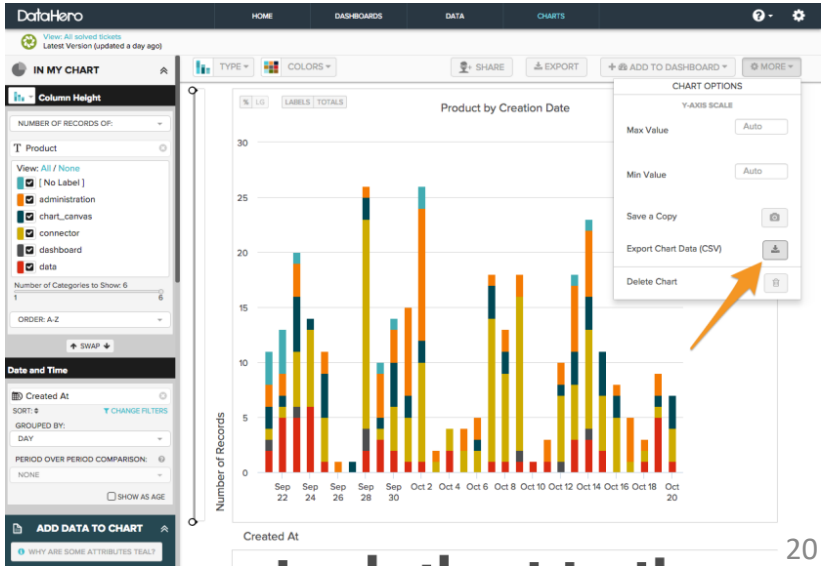
- **“Living Labs”** for testing new systems to collect observations and disseminate forecast information, and for studying the dynamics of Integrated Warning Teams in real-world settings (e.g., the CASA Dallas - Ft. Worth Urban Demonstration Network).



Data Collection Activities

Existing government data collection activities provide opportunities to collect valuable information for SBS-weather research, for example:

- NOAA/NWS Service Assessments
- NOAA Natural Hazard Statistics
- FEMA Mitigation Assessment Team Program
- FEMA National Household Survey
- CDC Public Health Surveillance during Disasters
- CDC Community Assessment for Public Health Emergency Response
- CDC National Center for Health Statistics Mortality and Injury Data



Data Collection Activities *(cont.)*

- More uniform standards for SBS disaster reconnaissance data collection would facilitate inter-comparison among studies, but might compromise the ability to tailor studies to social contexts. Need more transparency and documentation of research.
- Need to advance diverse research methods, from ethnographic to survey research.
- Personal vehicle event data recorders have the potential to be used as a rich source of research information on driving behavior and road weather [*modeling on FAA's use of flight data recorder info*]
- Big Data increasing in SBS weather research, in studies of crowdsourcing of weather reports, social media traffic during weather hazards. Great potential for growth in interdisciplinary *crisis informatics* research.

Funding Support of SBS in the Weather Enterprise

Drew upon information provided by sponsors (for NOAA) and searches of awards in public databases (for NSF and DHS). Found that:

- much SBS weather research is part of interdisciplinary research projects.
- much relevant SBS research is part of broader studies of hazard risk perceptions, attitudes, and behaviors—applicable but not specific to weather.

SBS-related investments:

- highly variable
- relatively small part of overall portfolio of weather related research (~10%)
- increasing trend over the past decade
- with support for a growing variety of subject matter and types of projects.

Examples of Barriers to Progress

- Challenges of interdisciplinary research (e.g., differing languages and research methods; professional reward structures that encourage disciplinary stove-piping
- Identification and framing of research needs driven by physical scientists
- Limited understanding, misconceptions of SBS research by the weather community
- Constrained, inconsistent funding, and a focus on short-term projects, which inhibits high-quality SBS data collection and analysis

FINDINGS

- Innovative SBS research activities have already contributed both to the social and behavioral sciences and to meteorology. Exciting opportunities exist for advancing this research to address important societal needs.
- Existing federal agency data collection activities could, with modest additions and greater interagency coordination, significantly expand our understanding of the social context of hazardous weather.
- The accumulation of knowledge has been hampered by the relatively small scale, intermittency, and inconsistency of investments.
- Meteorologists and others in the weather enterprise need a more realistic understanding of:
  - the diverse disciplines, theories, research methodologies used within SBS;
  - the time and resources needed for robust SBS research; and
  - the inherent limitations in providing simple, universally applicable answers to complex social science questions.

Social and Behavioral Sciences for Road Weather Concerns

The motivation for a special focus on road weather

- Road weather is a particularly suitable case study for profiling the contributions that SBS can make to the weather enterprise.
- Mobility by personal vehicle is a fundamental element of life and of our economy.
- ~445,000 people are injured and ~6,000 are killed annually due to vehicle accidents associated with adverse weather [over 9x the number of all other weather fatalities].
- When drivers encounter dangerous conditions, safe response actions may be limited or unclear, decisions can endanger both the driver and many other people.
- Forecasters and highway operations managers must have good communication and understanding of each other's information needs and response capabilities.

Technological advances in providing road weather information to transportation managers (e.g., Road Weather Information Systems), and to motorists (e.g. Wireless Emergency Alerts; connected vehicles; crowd sourcing and other mobile weather apps.)

But are these developments contributing to road safety as much as they could? With all these advances, why have injuries/deaths not decreased more?

Need studies of motivations, risk perceptions, and decision processes of motorists in adverse weather; and of the working relationships among NWS forecasters, private meteorological companies, and road maintenance managers.

Research Needs and Knowledge Gaps

Previously identified research suggestions reviewed by the Committee

- Bean et al. (2015). *The study of mobile public warning messages: A research review and agenda.*
- Carbin et al. (2013). *Current challenges in tornado forecast and warning*.
- Daipha (2015). *Masters of uncertainty: Weather forecasters and the quest for ground truth*
- Droegemeier et al. (2015). *Living with extreme weather workshop: Summary and path forward.*
- Lindell and Brooks (2013). *Weather ready nation: Science imperatives for severe thunderstorm research.*
- Nigg (1995). *Risk communication and warning systems.*
- NOAA Social Science Committee. (2015). *Vision and strategy: Supporting NOAA's mission and social science.*
- NOAA National Weather Service. (2013). *Weather-Ready Nation roadmap*.
- NRC (1996). *Understanding risk: Informing decisions in a democratic society.*
- NRC (2003). *Fair weather: Effective partnerships in weather and climate services.*
- NRC (2003). *Communicating uncertainties in weather and climate information: A workshop summary*.
- NRC (2005). *Decision making for the environment: Social and behavioral science research priorities*.
- NRC (2006). *Completing the forecast*.
- NRC (2007). *Research and networks for decision support in the NOAA sectoral applications research program*.
- NRC (2012). *Weather services for the nation: Becoming second to none*.
- Sorensen (2000). *Hazard warning systems: Review of 20 years of progress.*
- Sullivan (2013). *Vision and strategies for a Weather-Ready Nation.*

Types and scope of SBS-Weather research needed

- Disciplinarily-focused, interdisciplinary within SBS, and interdisciplinary between social, physical, and engineering sciences.
- Basic, applied, and developmental studies that encompass different scopes and scale (large interdisciplinary projects vs small proof-of-concept studies).
- Studies that examine a given topic or event from multiple methodological, disciplinary, conceptual, sampling perspectives.
- Research that looks across multiple events, populations, or time vs focusing on an immediate problem at hand.
- Research that examines “end to end” dynamics reaching across forecast offices, weather companies, media outlets, public officials and managers, the general public.
- Build on methods and concepts from non-weather research on risks, hazards, and disasters.

Knowledge gaps:

(I) Weather enterprise system-focused research

- How forecasters, broadcast media, emergency and transportation managers, and private weather companies create information and interact and communicate among themselves;
- Forecaster decision making (e.g., what observations and numerical weather prediction guidance forecasters use, and how they use them);
- Assessing the economic value of weather services;
- Team performance and organizational behavior within weather forecast offices and other parts of the weather enterprise.

Knowledge gaps:

(II) Risk assessments and responses, and factors influencing these processes

- How to better reach and inform special-interest populations that have unique needs (e.g., vehicle drivers or others who are particularly vulnerable to hazardous weather due to their location, resources, or capabilities)
- How people's interest in, access to, interpretation of, decisions and actions in response to weather information are affected by their specific social or physical context, prior experiences, cultural background, and personal values.

Knowledge gaps:
(III) Message design, delivery, interpretation, and use

- How communicating forecast uncertainties in different formats influences understanding and action;
- How to balance consistency in messaging with needs for flexibility to suit different geographical, cultural, and use contexts, including warning specificity and impact-based warnings;
- How new communication and information technologies—including the proliferation of different sources, content, and channels of weather information—interact with message design and are changing people's weather information access, interpretations, preparedness, and response.

A Framework to Sustainably Support and Effectively Use Social and Behavioral Science Research in the Weather Enterprise

Key actors:

NOAA

NSF

FEMA

FHWA

Academic institutions

Private sector weather companies

Professional societies

Foundations for a robust, sustained research enterprise:

Mechanisms and partnerships to support SBS/Weather research

Platforms for inter-sectoral dialogue and agenda setting

Platforms for interagency planning and engagement

Education and training

Research-to-operations activities

Routine data collection efforts

Mechanisms for Federal Support of SBS-Weather research

- Create an interdisciplinary research program supported by NOAA and NSF for support of larger-scale proposals.
- Establish a NOAA/OAR Laboratory or Cooperative Institute dedicated to SBS-weather research.
- Develop strong social science programs within one or more existing NOAA Cooperative Institutes.
- Build more connections between NWS Weather Forecast Offices and SBS-related campus departments.
- Develop a UCAR-based program, operating in a distributed fashion across some or all of the member campuses.
- Strengthen SBS research capacity at an existing FFRDC (like UCAR/NCAR), or establish a new FFRDC focused specifically on the application of social sciences.
- Establish a Center of Excellence as a mechanism to directly link research to operational actors.

Public-Private Partnerships for SBS-Weather Research

- Some companies interested to explore cooperative SBS of a general nature that does not delve into the competitive dynamics of any particular market.
- Possible mechanism: Cooperative Research and Development Agreement (CRADA). *NOAA's existing CRADA with IBM [owner of the Weather Channel] presents a great opportunity to gather and mine data of relevance to SBS-weather research.*
- Possible models for joint public/private research planning and funding on issues of importance to public safety [e.g., The Health Effects Institute; The Insurance Institute for Business & Home Safety]

Platforms for Intersectoral Planning and Engagement

- Existing professional society platforms (e.g. AMS *Commission on the Weather, Water and Climate Enterprise; NWA societal impacts committee)*
- For road weather: AASHTO, the TRB standing committee structure
- The new "Alliance for Integrative Approaches to Extreme Environmental Events"

Platforms for Interagency Planning and Engagement

- National Science and Technology Council (NSTC)
  - Committee on Science: Subcommittee on Social & Behavioral Science
  - Committee on the Environment, Natural Resources, and Sustainability: Subcommittee on Disaster Reduction
- Congressionally-authorized interagency working groups (e.g., *The National Windstorm Impact Reduction Program)*

Education and Training

For future professionals:

- university courses focused on study of the social dimensions of weather
- joint degree programs spanning meteorological sciences and SBS disciplines
- Internship opportunities for students in SBS disciplines to work in the weather enterprise

For current professionals:

- Mid-career training opportunities such as semester research sabbaticals
- Short training courses for weather professionals that provide: Basic understanding of SBS disciplines, concepts, and research methods, and of how these can be applied in the weather enterprise [*NOAA's currently-developing educational modules are a good start*]
- And likewise: short courses to introduce social scientists to the basics of weather forecasting and the weather enterprise

FINDINGS

- Organizations across the weather enterprise—federal agencies, private sector weather companies, academic institutions, professional societies—have shared motivations for actively contributing to the integration of SBS within the weather enterprise.
- Numerous previous reports going back many years have highlighted needs and challenges similar to those noted here—yet many of the same challenges remain today. Overcoming these challenges and making progress is not idea limited, but rather, is resource limited.

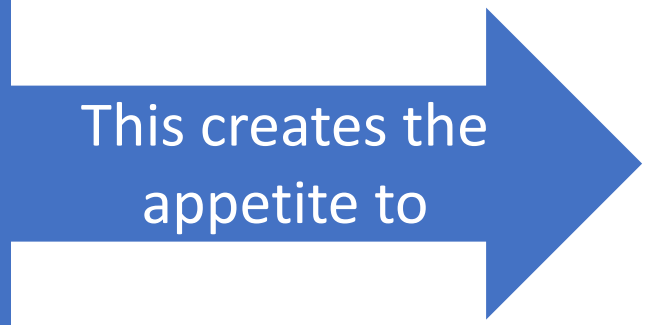
Recommendations

Invest in leadership to build awareness

Recommendation:

Leaders of the weather enterprise should take steps to accelerate the paradigm shift by underscoring the importance of SBS contributions in fulfilling their organizational missions and achieving operational and research goals, by bringing SBS expertise into their leadership teams, and by establishing relevant policies to effect necessary organizational changes.

Invest in leadership to build awareness



Invest in leadership to build awareness

This creates the appetite to

Build capacity throughout the weather enterprise to support and utilize SBS-weather research

Recommendation:

Federal agencies and private sector weather companies should, together with leading SBS scholars with diverse expertise, immediately begin a planning process to identify specific investments and activities that collectively advance research at the SBS-weather interface. This planning process should also address critical supporting activities (research assessment, agenda setting, community building, information sharing) and the development of methods to collectively track funding support for activities at the SBS-weather interface.

Build capacity throughout the weather enterprise to support and utilize SBS-weather research

Recommendation (continued):

NOAA should build more sustainable institutional capacity for research and operations at the SBS-weather interface and should advance cooperative planning to expand SBS research among other federal agencies that play critical roles in weather-related research operations.

In particular, this should include leadership from:

- **NSF** for a strong standing program that supports interdisciplinary research at the SBS-weather interface;
- **FHWA** for research related to weather impacts on driver choices and behaviors; and
- **FEMA** for research on the social and human factors that affect weather readiness, including decisions and actions by individuals, communities and emergency management to prepare for, prevent, respond to, mitigate, and recover from weather hazards.

All parties in the weather enterprise should continue to develop training programs for current and next generation workforces, in order to expand capacity for SBS-weather research and applications in the weather enterprise.

Build capacity throughout the weather enterprise to support and utilize SBS-weather research

Which makes it possible to

Build capacity throughout the weather enterprise to support and utilize SBS-weather research

Which makes it possible to

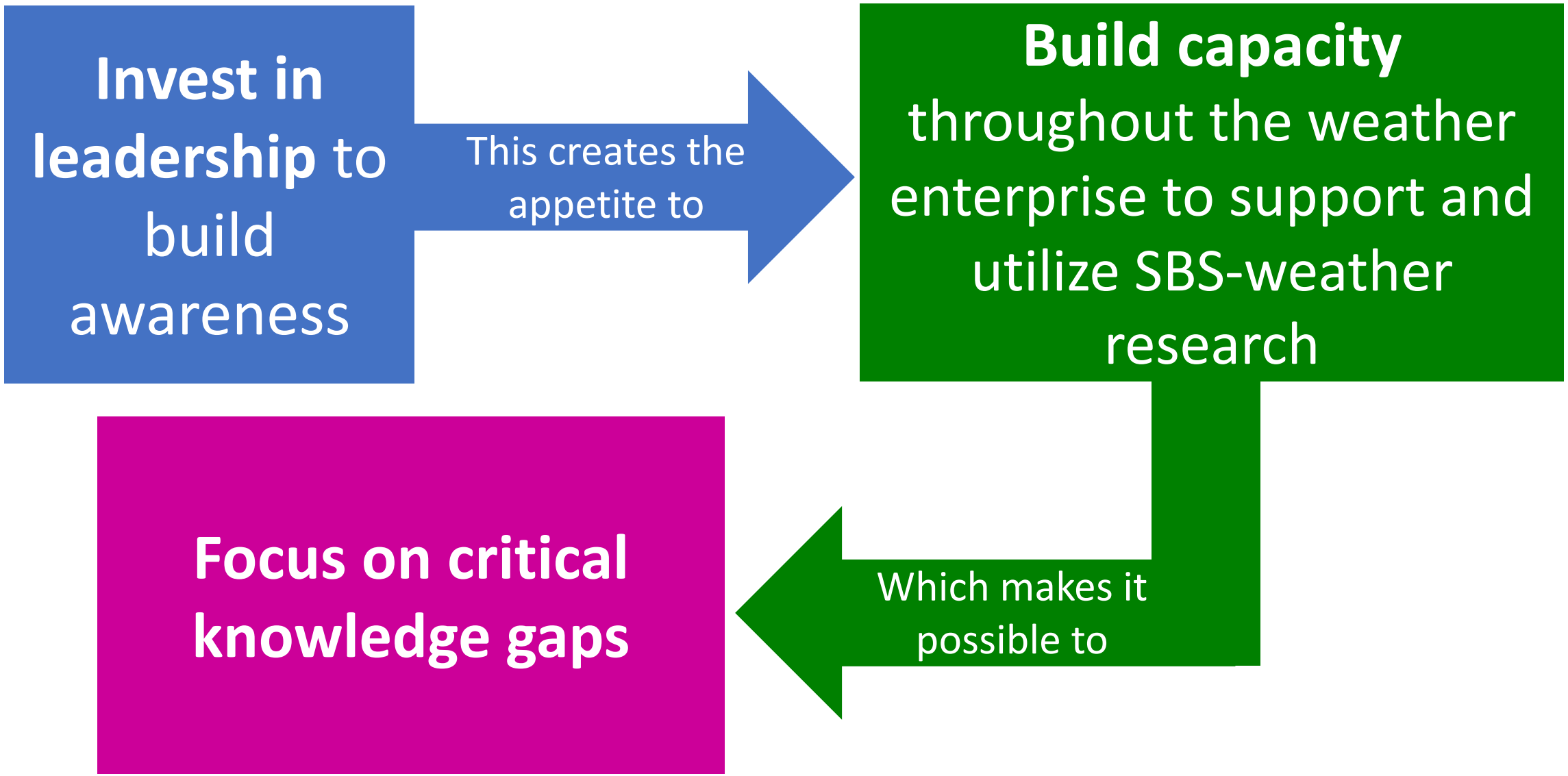
Focus on critical knowledge gaps

Focus on critical knowledge gaps

Recommendation:

The weather enterprise should support research efforts in the following areas:

- **Weather enterprise system-focused research**
- **Risk assessments and responses, and factors influencing these processes**
- **Message design, delivery, interpretation, and use**


Invest in leadership to build awareness
This creates the appetite to
Build capacity throughout the weather enterprise to support and utilize SBS-weather research
Which makes it possible to
Focus on critical knowledge gaps

THANK YOU to NOAA and FHWA for support of this project.

Questions?

Extra Slides

Report Outline

1. Introduction
2. The Motivation for Integrating Social and Behavioral Sciences within the Weather Enterprise
3. Assessing the Current State of Social and Behavioral Sciences within Weather Enterprise
4. Social and Behavioral Sciences for Road Weather Concerns
5. Research Needs for Improving the Nation's Weather Readiness and Advancing Fundamental Social and Behavioral Science Knowledge
6. A Framework to Sustainably Support and Effectively Use Social and Behavioral Science Research in the Weather Enterprise
7. Summary of Key Findings and Recommendation

Definitions: The Weather Enterprise

The set of public, private and academic organizations, institutions and individuals that observe, predict, communicate and provide decision support information related to weather and associated environmental phenomena.

Definitions: Social and Behavioral Sciences (SBS)

- Including but not limited to anthropology, communication, decision sciences, demography, economics, geography, political science, psychology, and sociology.
- Encompasses the systematic study of society at all levels, from influences on individual behaviors, to the roles and dynamics of institutions, cultures, and social movements.
- Focal topics can include beliefs, perceptions, attitudes, emotions, decisions, and actions, as well as interactions with the physical environment and other people, across diverse social and institutional contexts.
- Social and behavioral scientists rely on a variety of rigorous quantitative and qualitative methods such as participant observations, experiments, surveys, individual and focus group interviews, and content analysis to collect data. They use a variety of methods to derive and test general theories and model the behaviors being studied.
- Several other fields of study that may not conventionally be defined as SBS also have important knowledge and methods that can be brought to bear in SBS studies of the weather enterprise, such as human-centered design and engineering, urban planning and public administration, science and technology studies, and the computational and informational sciences.

Participants at the committee meetings

- **J.Cortinas, K.Klockow**, **J.Sprague**, **V.Brown,** NOAA
- **Roemer Alfelor** DOT/ FHWA
- **Robert O'Connor**, NSF,
- **Patrick Harr**, NSF
- **Michael Hand**, White House SBS Team
- **Gina Eosco**, Eastern Research Group, Inc.
- **William Gail**, Global Weather Corporation
- **Baruch Fischhoff**, Carnegie Mellon University
- **Rebecca Morss,** NCAR
- **Jeff Lazo,** NCAR
- **Eve Gruntfest,** Resilient Communities Institute
- **Kathleen Tierney,** CU Boulder
- **Deb Thomas,** CU Denver
- **Heather Lazrus,** NCAR
- **Olga Wilhelmi,** NCAR
- **Liesel Ritchie,** CU Boulder
- **Greg Guibert,** Boulder's Chief Resilience Officer
- **Leysia Palen,** CU Boulder
- **Kate Starbird,** University of Washington
- **Russ Schumacher,** CSU
- **Dave Gochis,** NCAR
- **Kelly Mahoney,** NOAA
- **Mike Chard,** Boulder Emergency Management
- **Bob Glancy,** NWS/ Denver-Boulder WFO
- **Mike Lewis,** Colorado DOT
- **Lori Peek, CU Boulder**
- **Paty Romero-Lankao, CU Boulder**
- **Phaedra Daipha**, Rutgers Univ.
- **Jen Henderson**, Virginia Tech.
- **Steven Zubrick**, LWX Weather Forecast Office
- **Kenneth Wall**, FEMA National Capital Region
- **Nate Johnson**, WRAL-tv. N. Carolina
- **Brenda Philips**, Univ. of MA, Amherst
- **Michael Hinson** , Howard County Emergency Management
- **David Call**, Ball State Univ, Dept. of Geography
- **Greg Carbin**, NWS Forecast Operations Branch
- **Sandra Hawthorn**, OPM, Emergency Management
- **Steve Lund**, Minnesota DOT
- **Eli Jacks**, NWS, Forecast Services Division
- **Bob Ryan, ret**
- **Barry Myers,** Accuweather
- **Krista Rouse,** The Weather Channel
- **Chris Albrecht,** Narwhal Group
- **Keri Lubell,** CDC Office of Public Health Preparedness and Response
- **Brooke Liu**, National Consortium for the Study of Terrorism and Responses to Terrorism
- **Irina Feygina**, Climate Central
- **Edward Maibach**, GMU Center for Climate Change Communication

Others who provided written input to the Committee

Private Sector representatives

- **Barry Lee Meyers**, Accuweather, Chief Executive Officer
- **James Spann**, television meteorologist, Alabama Weather Blog:
- **Bob Baron**, President and CEO, Baron: Critical Weather Intelligence:
- **Brandon Miller**, CNN Meteorologist and Supervising Weather Producer
- **Dave Hennen**, CNN Senior Meteorologist and Executive Producer
- **William Callahan**, Vice President, Federal Programs and **Mark Hoekzema**, Chief Meteorologist, Director of Meteorological Operations. Earth Networks:
- **Kevin Keeshan**, Senior VP, News, Content & Standards, NBC Owned Television Stations:
- **Chris Samsury**, Vice President of Talent, The Weather Channel,
- **Krista Rouse,** The Weather Company:
- **JT Johnson**, Chief Technology Officer, Weather Decision Technologies, Inc

Broadcast Meteorologists

- **Jay Prater,** Managing Meteorologist KAKE, Wichita, Kansas
- **Ryan Phillips**, Morning Meteorologist, Miami / Fort Lauderdale, NBCUniversal, WTVJ
- **Steve Weagle,** Chief Meteorologist, WPTV West Palm Beach FL
- **Jim Gandy** Chief Meteorologist Columbia, SC. WLTX
- **Jay Trobec**, Chief Meteorologist, KELO-TV Sioux Falls, SD
- **Doug Kammerer**, Chief Meteorologist NBCUniversal. Washington, DC

Examples of road weather SBS questions to be explored

- How do motorists evaluate the perceived urgency or desire to make a trip during adverse weather conditions versus the risks? What decision processes take place when someone decides whether to take a trip, and how?
- How realistically do drivers view the capabilities of their vehicles, and their own abilities and skills, in adverse weather conditions?
- How do we most effectively educate drivers about safe driving practices during hazardous weather?
- What are most effective ways to communicate complex risks of road weather impacts to travelers?
- What organizational and cultural barriers impact relationships between forecasters and road maintenance managers?
- Why do some operational personnel such as maintenance managers continue to distrust forecasts that are based on sound science?

Assessing the value of SBS research

Success comes in many forms:

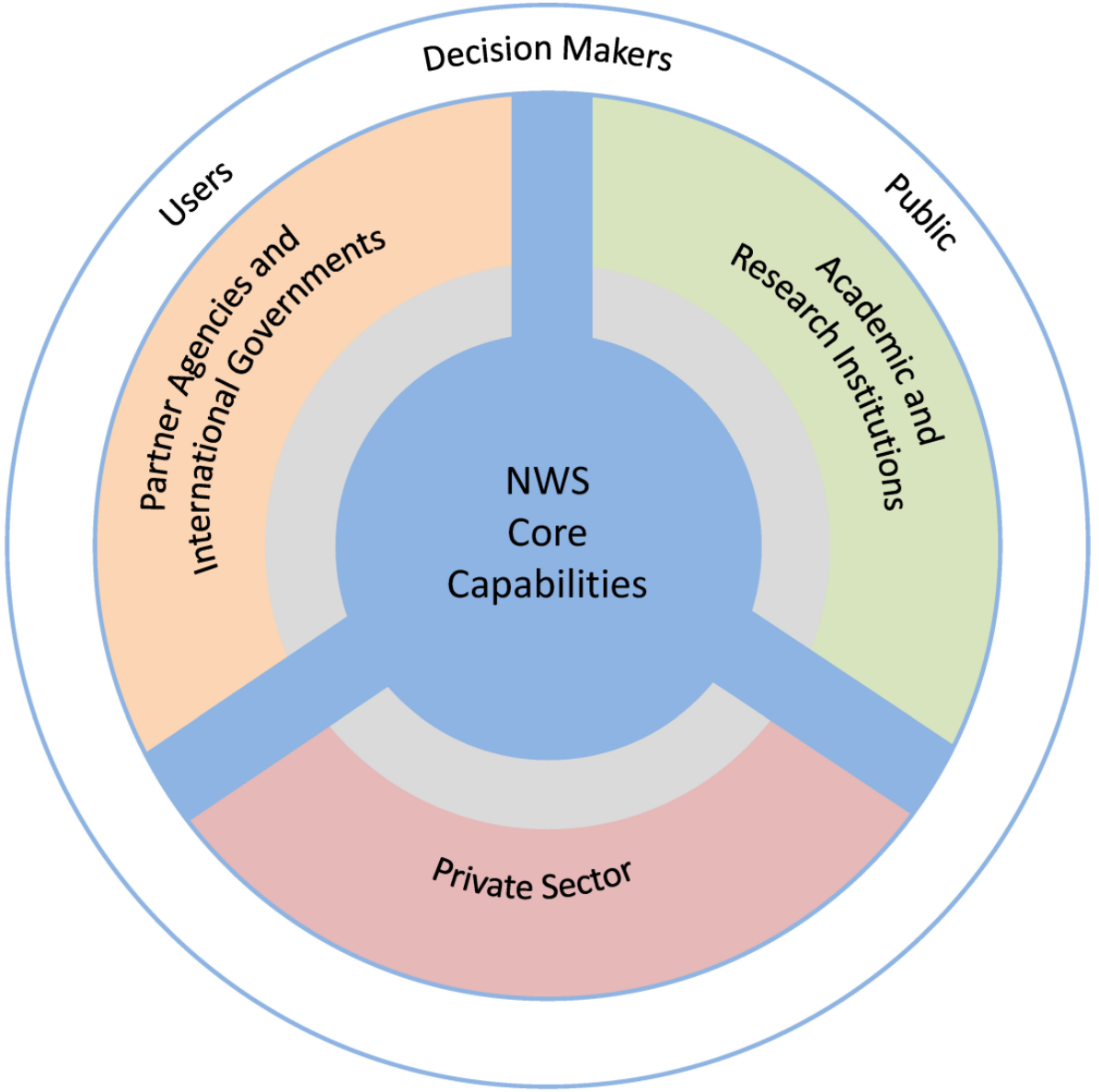
- Saving money, lives, protecting property, enhancing welfare or economic prosperity.
- Developing a new product, display, tool, algorithm, or approach that is developed and transitioned for use in the operational environment.
- Developing new understanding about human cognition, behavior, and culture pertaining to weather.

Weather Services for the Nation: Becoming Second to None (2012)

"Leverage the entire enterprise."

Fair Weather: Effective Partnerships in Weather and Climate Services (2003)

"It is counterproductive and diversionary to establish detailed and rigid boundaries for each sector…. Instead, efforts should focus on improving the processes by which the public and private providers of weather services interact."



Study Process

- 5 committee meetings, including one public workshop and participation at 2017 AMS meeting.
- Input to the committee (in person, written) from more than 40 people, including representatives from federal agencies, academia, private sector weather companies, broadcasters, others.
- Examination of dozens of previous reports from the Academies, NOAA, the research community.
- Rigorous peer review by 15 diverse experts

Lessons learned beyond the weather enterprise

Leadership from senior-level agency officials

- set policies and goals
- help others see the importance of SBS research to the agency's mission

- Congressional interest and support
- High-level SBS coordinating staff
- Engaged core of in-house social scientists
  - grassroots champions
  - provide peer-level support
- Funding support for
  - coordination
  - recruitment
  - professional development

other related Academies studies

[released July 2017]

Emergency Alert and Warning Systems

Current Knowledge and Future Research Directions

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nap.edu/24935

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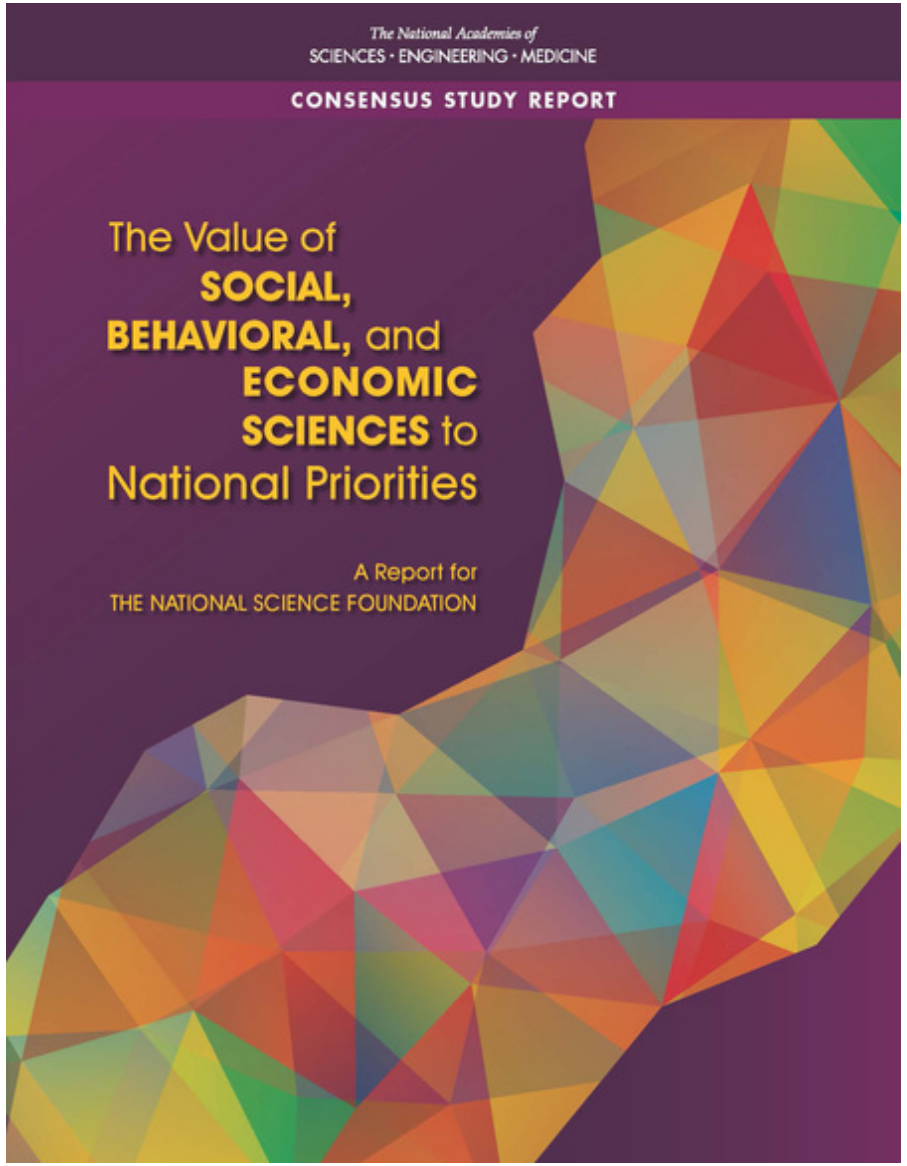
[released July 2017]



[ongoing]
Social and Behavioral Sciences for National Security: A Decadal Survey

Board on Behavioral, Cognitive, and Sensory Sciences (BBCSS)

Intelligence Community Studies Board (ICSB)

Unclassified **decadal survey** sponsored by the Office of the Director of National Intelligence, to identify opportunities in the social and behavioral sciences that can contribute to the analytic responsibilities of the intelligence community.

- Issued calls for white papers and held public workshops in 2016-2017
- Committee meetings planned throughout 2018.

http://sites.nationalacademies.org/dbasse/bbcss/sbs_for_national_security-decadal_survey/index.htm