National Construction Safety Team Advisory Committee (NCSTAC)
Meeting Summary
National Institute of Standards and Technology (NIST)
Gaithersburg, Maryland
(Public Meeting conducted via web-conference)
June 10-11, 2021

Advisory Committee Members:

Reginald DesRoches, Chair	Rice University
Ross Corotis, Vice Chair	University of Colorado, Boulder
William Holmes	Rutherford + Chekene
Jose Izquierdo-Encarnación	PORTICUS
Kimberley Shoaf	Utah School of Medicine
Jeannette Sutton	University at Albany, State University of New York

NIST Representatives

James Olthoff	Acting Director, NIST
Joannie Chin	Acting Director, Engineering Laboratory
Jason Averill	Chief, Materials & Structural Systems Division
Judith Mitrani-Reiser	Associate Chief, Materials & Structural Systems Division

(listed in alphabetical order)

Benjamin Davis	Designated Federal Officer, NCSTAC
Maria Dillard	Acting Director, Disaster & Failure Studies
Kenneth Harrison	Operations Research Analyst, Community Resilience Group
Jennifer Helgeson	Research Economist, Applied Economics Office
Kathryn "Jo" Johnson	Research Social Scientist, Earthquake Engineering Group
Marc Levitan	Research Engineer, Structures Group
Joseph Main	Research Engineer, Structures Group
Long Phan	Group Leader, Structures Group
Scott Weaver	Director, National Windstorm Impact Reduction Program
DongHun Yeo	Research Engineer, Structures Group

Other Participants

Rebecca Hermanowicz	Senior Attorney, Ethics Law and Programs Division, Office of the General Counsel, US Department of Commerce
Matthew Heyman	Impresa Management Solutions, Inc. (NIST contractor)

I. Welcome and Opening Remarks
Mr. Benjamin Davis, serving as the Designated Federal Officer, called the meeting to order. He introduced the NIST Acting Director, Dr. James Olthoff, who thanked the Committee and stated that the NCSTAC and its reports were very important to NIST. Dr. Olthoff noted that the Hurricane Maria project has made significant progress and will help make communities more resilient. Dr. Olthoff cited the continued impact of NCST recommendations following the 2011 Joplin Tornado investigation, thanked Committee members for their assistance, and encouraged the NCSTAC to continue to provide its input.

Rebecca Hermanowicz of the US Department of Commerce provided an ethics briefing for the Committee members.

II. Meeting Goals & Agenda
Dr. Reginald DesRoches reviewed the meeting's goals:

- Review NIST's response to NCSTAC's 2020 report to Congress
- Review the status of the NCST Investigation of Hurricane Maria's effects on Puerto Rico
- Review progress of prior NCST Investigations of the Joplin tornado and World Trade Center disaster
- Receive updates on the National Windstorm Impact Reduction Program (NWIRP) and the Disaster and Failure Studies (DFS) Program
- Begin to develop the Committee's annual report to Congress.

Dr. Maria Dillard introduced herself as the Acting Director of the DFS Program and Associate Lead Investigator of the Hurricane Maria NCST Investigation. She delivered NIST's response to the NCSTAC's 2020 Report to Congress and reviewed NIST's NCST responsibilities and those of the Advisory Committee. Her presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/16/01_DILLARD_NCSTAC_June2021_Response_to_Annual_Reportv2.pdf

Discussion:
The Committee discussed several points regarding recommendations from the 2020 Report to Congress.

A Committee member said that NIST has been very responsive to the recommendations of the Committee. The Committee proceeded with questions about NIST's follow-up actions on three recommendations. Regarding Recommendation #3, the Committee had been concerned that the public would not understand why there were different tornado design loads for different types of buildings. NIST responded that although most of NIST's outreach has been focused on engineering audiences and the broader resilience practitioner community, this has not been an issue to date. Rather, there appears to be concern around the more basic issue of whether structures should be designed for tornadoes at all; it is frequently assumed that tornado events affecting buildings are rare and that buildings should not be designed for the worst possible event.

Regarding Recommendation #4, the Committee had stated that NIST should be careful about addressing the benefit-cost considerations of shelters. NIST responded that its Applied Economics Office is now involved in this work and there are plans to produce a report by the end of 2021 for recommendations to the IBC regarding conducting analyses of costs and benefits of shelters. NIST also is working with its NIST Community Resilience Center of Excellence as the Center develops tornado modeling techniques; the goal of this work is to further explore the benefits and costs of shelters.

Regarding Recommendation #6, the Committee congratulated NIST on reducing processing time for some administrative requirements but wanted to know if there had been any changes in procedures or concerns about the availability and processing of funds and personnel for NCST studies. NIST responded that its responsibility for the NCST statutory authority activities and related programs and investigations is taken very seriously. Further, NIST had done an incredible job of reprogramming funds and reallocating personnel when needed. As funds for the Hurricane Maria Investigation were initially identified from existing funding resources, the initial team was composed of existing staff. NIST staff working on the Hurricane Maria NCST Investigation have a portion of their time allocated to NCST work and retain a portion on prior projects. NIST will evaluate this practice to understand the strengths and weaknesses of this approach for future investigations. NIST also responded that the Hurricane Maria Investigation has had full support in finding the appropriate resources in spirit and finances at every level of NIST. NIST hopes to have additional resources in the future which would create an opportunity to make changes in how it manages NCST investigations.

The Committee asked about the timeframe for NIST to conduct the work that is cited in the NIST-Federal Emergency Management Agency (FEMA) report on tornado design guidelines on sheltering under Recommendation #4. NIST responded that this work is planned to start in FY 2023.

III. Hurricane Maria NCST Investigation Updates

Dr. Joseph Main reviewed the Hurricane Maria NCST Investigation's goals and progress. His presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/02_MAIN_NCSTAC_June2021_InvestigationProgress.pdf

Discussion:
The Committee asked whether the generic Office of Management and Budget (OMB) approval for data collection is permanent. NIST responded that the approval for generic clearances, such as the one being used with the Hurricane Maria Program, must be sought every 3-5 years.

The Committee asked for clarification about approvals related to investigations versus research. NIST reported that its Institutional Review Board (IRB) office had deemed the activities under the Hurricane Maria NCST Investigation to not meet the definition of research; consequently, the four projects that fall within the NCST Investigation are exempt from human subjects-related

reviews. The separate reviews required by the Paperwork Reduction Act (PRA) seek to minimize the burden on the US public and are required for all federal information collection, whether research or not.

Drs. DongHun Yeo and Scott Weaver updated the Committee on the Hurricane Maria Hazard Characterization Project. Their presentations can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/03_YEO_WEAVER_NCSTAC_June2021_HazardCharacterization.pdf

Discussion:
The Committee asked whether projectiles were taken into account as a hazard. NIST responded that debris impacts are being considered among the building hazards.

The Committee asked whether the Natural Hazard Engineering Research Infrastructure (NHERI) SimCenter at UC Berkeley was involved in the NIST work. NIST responded that the wind tunnel testing was done at a NHERI facility at the University of Florida. When completed, this NCST work could contribute to NHERI-SimCenter models.

The Committee asked why the Mayagüez region was selected for the wind tunnel testing as opposed to the metro area where there would be street-to-street variations or the central areas of the island. NIST responded that its work is focused on the topographic effects of the winds on the buildings and among many candidate hospitals, Hospital Bella Vista was found to experience close to a 1.5 topographic speedup factor compared with wind speeds in areas of flat terrain. Regions other than Mayagüez are being tested by the University of Florida with the Federal Emergency Management Agency (FEMA) and the National Science Foundation (NSF) funding and will provide important data on the wind for other parts of Puerto Rico. .

Dr. Main reviewed the status of the Building Performance Project. His presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/04_MAIN_NCSTAC_June2021_CriticalBuildings.pdf

Discussion:
The Committee asked whether NIST had looked at damage via aerial surveillance. NIST responded by describing its review of aerial photography, including school shelter sites. Additionally, the wireless communications project used aerial photos to see damage to cell towers. NIST also accessed flyover data from Massachusetts Institute of Technology Lincoln Laboratory, particularly in relation to candidate structures for the Building Performance Project.

The Committee asked about the inclusion of recommendations or guidance related to the pandemic as part of the team's investigation of shelter performance. NISTreported that the ICC 500 storm shelter standard incorporates this issue to some extent and would provide more information in the Joplin NCST Investigation update.
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The Committee asked whether the 50% or 80% increases in topographic speedup apply only to hurricanes or relate to all events. NIST cited wind tunnel testing data as the means by which investigators would capture the gust factor. The Applied Research Associates model is intended to capture the peaks, which are of most concern because the peak winds drive building design requirements.

The Committee also asked about data captured from anemometers on cell towers when hurricanes were not occurring. NIST responded that some of the same factors regarding turbulence and gusts are relevant even when not captured at the most extreme wind speeds.

Dr. Katherine (Jo) Johnson offered an update on the Emergency Communications Project. Her presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/05_JOHNSON_NCSTAC_June2021_EmergencyCommunications.pdf

The Committee noted that access to currency was a consequence of the collapse of the communications system. NIST responded that the household survey includes questions about lack of resources and access.

The Committee asked if there were any challenges with data collection on the emergency communications project. NIST responded that the contractors had planned a soft launch with the household survey to test the methodology and response rate. Regarding information provider interviews, the list of potential candidates was identified much earlier, and some of the individuals previously identified for interviews have moved on to new positions. NIST has developed a well thought out plan for interview candidate replacements and persistent follow-up were necessary.

The Committee asked about the impact of respondents who access and complete web-based surveys. NIST acknowledged the potential issue. For those with internet access and phone interviews, web-based surveys may be their preferred method, but it may skew to a younger, more urban population. The team will need to monitor responses to ensure representation across demographic attributes.

Dr. Judith Mitrani-Reiser updated the Committee on the Morbidity and Mortality Project. Her presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/06_MITRANI-REISER_NCSTAC_June2021_Mortality.pdf

Discussion:
The Committee asked whether the team was concerned about being able to attribute deaths to construction failure and how such concerns will be addressed. NIST responded that the team did not have concerns to date and that questions being asked via the verbal autopsy survey should allow linkages between building failures and loss of life. Further, connections across projects offer additional insights.

The Committee inquired about how long verbal autopsies take to complete. NIST responded that each survey lasts about 45 minutes, although NIST has added a 15-minute buffer, allowing up to one hour.

The Committee asked about the extent to which NIST can capture the link between the failure of lifelines and their impact on mortality to assess whether loss of life is due to inaccessibility to a hospital, lack of communications, or other reasons. NIST responded that the team is asking baseline questions about access to lifelines before and after the storm, access to medical services, and other challenges. There is also a separate NWIRP project on the impact and recovery of critical lifeline systems that will provide additional context, enabling the team to confirm what is being heard during an interview with primary data collection from other projects.

The Committee asked whether the team can correlate mortality with socio-economic demographic data. NIST responded that some analyses of this kind can be performed and that NIST expects to see a broad range of demographics in the four regions.

Mr. Davis adjourned the meeting for the day at 3:13 p.m. ET.

He reconvened the meeting on June 11, 2021 at 11:00 a.m. ET.

IV. Progress on Implementation of Prior NCST Investigation Recommendations

Drs. Long Phan and Marc Levitan reported on progress in the implementation of previous NCST investigation recommendations, including the World Trade Center and Joplin Tornado disasters. Their presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/07_PHAN_LEVITAN_NCSTAC_June2021_PastInvestigationUpdates.pdf

Discussion:
The Committee expressed concern about existing housing and asked whether the preparation of guidance specifically for people to improve their houses had been considered. NIST reported that the ICC 500 storm shelter standards cover hurricanes and tornadoes, including residential and larger community shelters. In the new version of the standard, provisions were added for the

installation of shelters in existing buildings and even for existing slabs (small, pre-manufactured, or big box structures). In addition, FEMA updated its corresponding guidance which is even more stringent. FEMA safe room guidance includes prescriptive designs homeowners can use or provide to contractors. The Committee stated that it would be helpful for FEMA to develop publications oriented to homeowners in simple language with graphics, which would improve resilience in tornado areas for greater life safety. NIST recommendations from the Joplin investigation covered options for both in-home and public shelter strategies regarding tornadoes.

The Committee asked about risk category coverage in the ASCE-7 standard and expressed concern about this being a small subset of all buildings. NIST noted that the tornado standards for ASCE-7 applies to structures in categories 3 and 4 east of the Mississippi River and described efforts to develop a reliability analysis to determine what return periods would be needed and said that reliability targets might be reconsidered. Guidance for lower risk category buildings may be developed that take into account cost-benefit analyses. The Committee asked whether the Smart Damage Indicator has been validated in the field. NIST responded that the indicator had been validated and is a more powerful tool for enhanced data collection. The tool can be refined and data can be reanalyzed afterwards, as is done for hurricanes. As modeling approaches are developed for other important damage indicators, the long-term plan is to get more science and engineering into the EF-Scale.

V. Hurricane Maria NWIRP Study Updates

Dr. Kenneth Harrison updated the Committee on the Hurricane Maria Infrastructure Project conducted under the NWIRP authorities. The presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/08_HARRISON_NCSTAC_June2021_Infrastructure.pdf

Discussion:
The Committee asked how difficult it has been to get data on infrastructure and about approaches used by the team. NIST responded that it has been highly variable, describing experience with the Puerto Rico Department of Transportation and Public Works (DTOP), the Puerto Rico Electric Power Authority (PREPA), and the Puerto Rico Aqueduct and Sewer Authority (PRASA). NIST also described the team's experience regarding wireless communications data from the American Tower Corporation and Federal Communications Commission (FCC). NIST noted that the team still had work to do to obtain meaningful damage and restoration information for the telecommunications and other infrastructure systems. At the program level, gathering information has been a huge effort and one that has required substantial outreach. In some cases, the data are public, but in others NIST has set up data sharing and other agreements (e.g., non-disclosure agreements, data transfer agreements).

The Committee asked how data from visual images are being coded in the wireless research and whether it was being coordinated with the social media team's coding. NIST stated that had not yet happened but was planned. The teams have discussed opportunities for collaboration.

The Committee asked whether NIST can identify the timing when towers went down or were impaired, which could be linked to the public's response to emergency communications. NIST responded that more data would be needed from the telecommunication companies to be able to do that. NIST also noted that the FCC has some information on outages over time by municipality, so there is some window into when various parts of Puerto Rico lost cell access and when it came back. In addition, the FCC receives data on a daily basis by municipality for about the first three months and percentages of cell sites in each municipality, but that this data was spatially too coarse for linking to household level data. The Committee expressed interest in the opportunities to link these projects but understands how difficult it is to get the data necessary for this work.

Dr. Jennifer Helgeson updated the Committee on the Hurricane Maria Recovery of Business and Supply Chain Project conducted under NWIRP authorities. The presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/09_HELGESON_NCSTAC_2021_RecoveryBusiness.pdf

Discussion:
The Committee inquired whether there were any relations with local business associations regarding the surveys. NIST replied that there were a variety of connections with those associations and cited several specific interactions. NIST indicated that upward of 15 associations have been kept informed in detail, and that there was a benefit to having the associations be aware of NIST's work since their members may be among those contacted. NIST also cited surveys and information sharing by Puerto Rico Manufacturing Extension (PRiMEX) which will supplement NIST's own data gathering.

The Committee and NIST discussed measurement of risk aversion in surveys as well as the willingness of respondents to respond to surveys declining over time. The Committee asked where NIST expects to be a year from now. NIST stated that COVID-19 impacted plans in place, particularly for data collection, because all data were intended to be collected in person. Current plans include having the business and supply chain data within the year.

Dr. Dillard updated the Committee on the Hurricane Maria Recovery of Social Functions Project conducted under NWIRP authorities. The presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/10_DILLARD_NCSTAC_June2021_RecoverySocialFunctions.pdf

Discussion:
The Committee commented that although it is challenging to have people recall and be willing to quantify and provide data, it still will be useful to have these data. NIST said that in future investigations, if there is a desire to use a similar survey instrument, one would be available,

which would reduce the timeframe for data collection. In this case, the time frames of questions would be shorter. For example, NIST would be asking hospitals about more relevant time periods such as weeks and months versus a year. The study's survey includes questions about community services (e.g., operating food banks, providing training, serving as a space for community meetings). NIST expects to see some variability there, which will offer insights into the recovery process.

The Committee asked if there is any way NIST can affect the OMB process. NIST said that the biggest factor in timing was the contracting process. NIST looked at other agencies' exemptions and more rapid approvals, and met with the National Transportation Safety Board (NTSB), which has experienced similar challenges in their investigative work. NIST needs more solutions like the PRA generic clearance through OMB. Some federal agencies have PRA exemptions granted by Congress.

The Committee suggested NIST explore cooperative agreements like those used by the Centers for Disease Control (CDC). NIST replied that was a tradeoff since NIST wanted to be able to analyze the data directly versus having another organization do that portion of the work, and added that its options are limited by requirements that it incorporate specific NCST investigation clauses into contracts and agreements.

VI. Public Comment Period
There were no requests from the public to comment.

VII. DFS Updates on Enhancing the Readiness of Teams
Dr. Dillard provided DFS updates on enhancing the readiness of teams. Her presentation can be found here:

https://www.nist.gov/system/files/documents/2021/06/15/11_DILLARD_NCSTAC_June2021_DFS_Readiness.pdf

Discussion:
The Committee and NIST representatives had an extended discussion about ways NIST might incorporate social vulnerability as a leading indicator of an event's impact that could be factored into its early scoring for potential investigations. The Committee questioned attempting to associate social vulnerability index (SVI) with mortality or injuries, suggesting it might be reasonable to associate the SVI with impact on humans more broadly. The Committee said that because mortality is so specifically tied to hazards in the built environment, social components are less predictive than the built environment components. NIST noted that its goal was to get an idea about the vulnerability of an area as a storm approaches and solicited the Committee's ideas and suggestions. NIST has been exploring several models to help with predicting physical damage or impacts pre-landfall. The Committee agreed about the importance of adding in the predictive impact on the built environment, pointing to work mapping manufactured housing locations in the US southeast

NIST is seeking ways to automate the scoring of events which could make use of other agencies' resources (e.g., data, forecasts). NIST asked for input from the Committee on the merit of adding a component of automation into the procedures to augment NIST's use of subject matter experts.

VIII. Summary Remarks

Dr. Joannie Chin thanked the NCSTAC members for their time and objective advice and recapped the work NIST presented to the Committee during the two-day meeting. Stating that NIST has heard the Committee's recommendations, NIST continues to implement new practices for efficiency beyond the current Hurricane Maria investigation – such as reducing OMB clearance time via a PRA generic clearance and the development of language on consent and future data use. Other improvement efforts related to data curation and management workflows, data portal development and approval, documenting best practices and lessons learned in DFS standard operating procedures, and engaging other agencies. Recognizing the NCSTAC's concern about long lead times in procurement, EL officials have continued to meet with other NIST officials to expedite acquisition timelines, create efficiencies, and identify special authorities which could be invoked. She stated that NIST has consulted with other agencies and wants to learn from others beyond those already consulted. Dr. Chin said that a recommendation will be made to the NIST director that a secretariat be convened for future investigations to ensure they are prioritized NIST-wide for acquisition, public affairs, congressional and legislative affairs, legal, human subjects protection, privacy, and PRA and Freedom of Information Act (FOIA) processing.

Dr. Chin announced that Dr. Tanya Brown-Giammanco is the new NIST DFS Director and provided a brief biography of Dr. Brown-Giammanco. She thanked Dr. Dillard, who has been the Acting DFS Director and will continue to interact with the NCSTAC as Associate Team Lead for the Hurricane Maria investigation. Dr. Chin thanked the Committee and said that she looks forward to its insights and report to Congress. Dr. DesRoches welcomed Dr. Brown-Giammanco and thanked Dr. Dillard.

IV. NCSTAC Preparation of Annual Report to Congress

The Committee began its working session to discuss key points for the NCSTAC 2020 Annual report to Congress, which included a discussion about issues for which the Committee would like clarification from NIST. Dr. DesRoches led the discussion.

Mr. Holmes asked about NIST's coordination with NSF's Extreme Events Reconnaissance teams (EERs). NIST reported that it always collaborated with EERs and that it has gone up a level because of COVID-19 transmission concerns in communities. NIST provided examples of how the NSF Structural Extreme Events Reconnaissance (StEER) and other entities provided a way for NIST to obtain information that it would not otherwise have been able to collect. This collaboration offers better connections with those already in the field and avoids duplication (e.g., door-to-door information collection, damage surveys).

The Committee discussed the Texas winter storm and the potential value of investigating this event, and whether there is something to be learned regarding information sharing or risk

assessment perception, even if there is nothing new about the overloading of physical systems. NIST said that there is almost always something that could be gained when evaluating the qualitative criteria for event scoring, but that it was not clear that there was much to be learned about building failures or the associated infrastructure. The Committee discussed the scope of NIST's NCST authorities regarding buildings and the links to infrastructure in the Texas storm. The Committee expressed that there was not enough of a correlation to building failures nor new lessons to be learned to justify a NCST investigation.

The Committee asked who does the NCST scoring on these events. NIST described the process, which includes at least two experts across NIST with the potential to assign additional staff based on event and expertise. Part of the motivation in thinking about automating aspects of scoring is to supplement information provided by the experts.

The Committee discussed potential topics for inclusion in the report. One suggestion included commenting on NIST's scoring of potential events. The positive things NIST has been doing to reduce the time to get into the field was noted as worth citing. The Committee asked whether congressional action would be needed to permanently address constraints. NIST said that while it still is seeking ways to reduce the time for acquisition or contracts, congressional action would be needed for items such as an exemption from PRA.

The Committee discussed ways to speed up contracting.

The Committee suggested that NIST should be commended for its success in gaining pre-approval for certain activities, for its reorientation during the pandemic, and its response to the NCSTAC's prior recommendations.

The Committee said that NIST has widely distributed the Hurricane Maria progress report and that there was clear evidence that interest in the investigation remains high.

The Committee expressed disappointment that it takes 10 years to "transfer technology" regarding Joplin, noting that his comment was not directed to NIST. Regarding standards and codes actions which were recommended, the Committees said that risk category #2 (residences) is really where the difference will be made, and encouraged pursuing code changes in that category.

Regarding Hurricane Maria, the Committee said that as NIST gets more familiar with verbal autopsies, development of a standardized methodology is important. They noted that regarding emergency communications, NIST's resumption of the social media content analysis was a positive development.

The Committee expressed concern about code enforcement with the communications systems, which are mostly privately owned. While operators are supposed to reconstruct the infrastructure following codes, there is a concern about oversight of private companies since they were in a rush to restart operations which could affect quality.

The Committee asked about the NIST secretariat, which Dr. Chin cited as a future recommendation for NCST investigations. NIST explained that during the World Trade Center NCST Investigation, it created a centralized coordination body with representatives from NIST offices that are needed to support the activities of the investigation. This body and the support conferred by leadership in its establishment made a significant difference in ensuring prioritization of the investigation.

Dr. DesRoches summarized the agreed upon topics for inclusion in the Committee's report and suggested the Committee members who would be responsible for drafting text. The goal is to develop a draft this summer, preferably within the next month. There will be another meeting in the fall to further discuss and refine the report.

X. Adjournment
Mr. Davis adjourned the meeting at 3:43 p.m. ET.