

**National Construction Safety Team Advisory Committee (NCSTAC)**  
**Meeting Summary**  
**National Institute of Standards and Technology (NIST)**  
**Gaithersburg, Maryland**  
**(Public Meeting conducted via web-conference)**  
**October 23, 2020**

**Advisory Committee Members:**

Reginald DesRoches, Chair	Rice University
Ross Corotis, Vice-Chair	University of Colorado, Boulder
William Holmes	Rutherford + Chekene
José Izquierdo-Encarnación	PORTICUS
Gary Klein	Wiss, Janney, Elstner Associates, Inc.
Kimberly Shoaf	Utah School of Medicine
Jeannette Sutton	University at Albany

**NIST Representatives**

Howard Harary	Director, Engineering Laboratory (EL)
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 and Failure Studies
Joseph Main	Lead Investigator, Hurricane Maria NCST Investigation

## **I. Welcome and Opening Remarks**

Mr. Benjamin Davis, serving as the Designated Federal Officer, called the meeting to order and introduced the NIST EL Director, Dr. Howard Harary.

Dr. Harary offered opening remarks to the Committee. He welcomed Dr. Reginald DesRoches as the new Chair of the Committee and Dr. Ross Corotis as the Committee's new Vice-Chair. Dr. Harary gave a quick summary of the topics discussed at the NCSTAC Meeting on June 30, 2020. He also welcomed Mr. José Izquierdo-Encarnación as the newest member of the Committee. Dr. Harary noted that NCST investigations are not about finding fault, but instead are focused on fact-finding with the purpose of improving the safety of buildings. Dr. Harary then gave a brief review of the Committee's responsibilities, specifically, the Committee's responsibility to advise the Director of NIST on the composition of the NCST and the Team's efforts to adhere to the NCST Act.

## **II. Meeting Goals & Agenda**

Dr. DesRoches welcomed the new Committee member, Mr. Izquierdo-Encarnación, and thanked the new Vice-Chair, Dr. Corotis, for accepting his new role. He then gave an overview of how the meeting would proceed and the following goals of the meeting:

- Review the Disaster and Failure Studies Program's scoring of events and readiness of teams,
- Review the status of the NCST investigation of Hurricane Maria's effects on Puerto Rico, and
- Further develop the Committee's annual report to Congress.

## **III. DFS scoring of Events and Readiness of Teams**

The presentation provided by Dr. Maria Dillard can be found here:

[DFS Scoring of Events and Readiness of Teams Presentation](#)

Dr. Dillard introduced herself as the Acting Director of the Disaster and Failure Studies Program and the Associate Lead of the Hurricane Maria NCST Investigation. She reminded the Committee that the purpose of the NCST Act is to establish Teams to assess building performance and emergency evacuation procedures in the wake of building failures. Dr. Dillard reviewed the decision process used to recommend establishing a Team for an NCST investigation. There are both qualitative and quantitative aspects of the criteria used to make a decision to deploy a Team. Dr. Dillard showed an example from a previously scored event to demonstrate how all of the aspects of an event are categorized, weighted, and summarized in the evaluation. Events are scored on a scale of zero to five for two categories: 1) Event Consequence and 2) Evacuation & Response. The scoring mechanism also supports the decision on subsequent actions under other NIST authorities, such as the National Windstorm Impact Reduction Program (NWIRP) and the National Earthquake Hazard Reduction Program (NEHRP). Dr. Dillard reviewed a list of events that have been scored from December 2019 to October 2020 and denoted the events where NIST deployed a team or participated as part of a virtual reconnaissance team, as well as events where NIST coordinated with a Disaster Resilience Research Grantees on preliminary reconnaissance deployments.

## **Committee Discussion**

The Committee noted that the table of scored events displayed in the presentation showed multiple events with seemingly high scores and asked how Hurricane Maria scored in 2017 for comparison purposes. NIST responded that the score for Hurricane Maria was 4.7 for Event Consequence and 5.0 for Evacuation and Response and added that the quantitative score is only part of the consideration. Another large part of the decision to deploy a team is determining what lessons may be learned from investigating the event further and assessing how these lessons could be applied to other parts of the U.S. that may experience a similar event. Other qualitative criteria include NIST's authorities, assessment of site conditions and field team safety, and the availability of resources for the deployment. Dr. Dillard also stated that this assessment is used to determine if a preliminary reconnaissance is appropriate. Data gathered in a preliminary reconnaissance are then used to determine if a full investigation is appropriate.

The Committee also asked about the impact of geographic location in determining if NIST should deploy a reconnaissance team. NIST responded that the location is very important. For example, there is an additional quantitative factor that is included for international events to assess if building codes and construction methods are similar to the U.S. The similarities in building design and construction practice are considered to ensure that an investigation pursued in other countries would result in lessons that can be applied in the U.S.

Finally, the Committee asked how NIST would evaluate a flood that resulted in significant building damage. NIST answered that flood and dam failures represent a challenge in that the failure of a dam falls outside of the NCST Act, while the failure of a building that was caused by the flooding following a dam failure may fall within the NCST Act. This nuance is important in determining if an event is within the scope of the NCST Act or if it should be evaluated for further study under another authority.

## **IV. Hurricane Maria NCST Investigation Update & Adaptations for COVID-19**

The presentation provided by Dr. Joseph Main can be found here:

[Hurricane Maria NCST Investigation Update & Adaptions for COVID-19 Presentation](#)

Dr. Main gave a review of the goals of the Hurricane Maria Investigation. It was authorized by the Director of NIST in February of 2018. The goals of the investigation are to characterize:

1. the wind environment and technical conditions associated with deaths and injuries;
2. the performance of representative critical buildings, and designated safe areas in those buildings, including their dependence on lifelines; and
3. the performance of emergency communications systems and the public's response to such communications.

There are three complementary projects that are focused on the recovery which are being carried out under the NWIRP authority.

Several significant updates were presented to the Committee, including the following:

- The progress report on the investigation is in preparation for publication;

- All major contracts supporting the investigation have been awarded and work is in progress;
- An Internal Review Board (IRB) non-research exemption has been granted for all the NCST investigation projects; and
- The Privacy Impact Assessment (PIA) has been approved by DOC for new EL-managed data systems for the Hurricane Maria work.

The Hurricane Maria progress report will be published in English and Spanish. The executive summary is expected to be the most informative section for many stakeholders. It includes information about the progress of the investigation, outreach to date, an initial wind-field model, and other highlights from the technical projects.

For the Hazard Characterization project, anemometers have been installed on three cell towers in the Yabucoa Region, near where Hurricane Maria made landfall. Measurements of topographic effects on winds at these cell tower sites will provide full-scale data for validation of wind tunnel models and computational fluid dynamics (CFD) models that are being used to evaluate topographic effects on winds in Puerto Rico during Hurricane Maria. For the Critical Buildings project, five hospital facilities have been selected for evaluation; four facilities reside in the regions of Puerto Rico that have been selected for further study in the investigation and one hospital is in a location in Puerto Rico calculated to have the highest topographic speedup factor. A three-dimensional model has been created from drone images to support the fabrication of a wind tunnel model.

For the Emergency Communication project, the sampling plan for household surveys has been completed and data collection is now underway.

Due to COVID-19, the Hurricane Maria Team has transitioned to phone and/or web-based modes of data collection for the projects dependent on social science data collection methodologies. Pandemic training and safety protocols have also been put in place for field teams collecting information. NIST is continuing to work via telework and is meeting with contractors remotely.

### **Committee Discussion**

The Committee wanted to know how the census geographic units employed in the sampling methodology will be used for the Emergency Communications project's household survey, and if the survey will be done by phone and/or web. NIST responded that addresses pose a challenge in Puerto Rico, but the Contractor's data collection team will have a walking plan with directions based on the physical location of the census block group and a predetermined starting point. This method will require the data collectors' physical presence at the location to either drop off (e.g., postcard with the survey web link) or collect information (e.g., phone number for follow-up). The field team will be abiding by COVID-19 safety protocols while working. Other methodologies for data collection have been proposed and can be used if necessary.

The Committee noted some sensitivities around the previous mortality study by George Washington University (GWU) and wanted more information on NIST's methods for evaluating the work proposed for the NCST investigation. NIST responded that the contract supporting the work in the NCST investigation was openly competed and the proposals were rigorously evaluated by a technical evaluation team before awarding the contract. The political charge surrounding the morbidity and mortality of Hurricane Maria is related to the death count shared by the Government of Puerto Rico and

estimated by several studies using varying methods. The goal of the NCST investigation, supported by this contract, is to answer the question of *how* building failures led to deaths and not to generate another death count for the storm.

## **V. Hurricane Maria Investigation Project Management**

The presentation provided by Mr. Benjamin Davis can be found here:

[Hurricane Maria Investigation Project Management Presentation](#)

Mr. Davis gave an overview of the Hurricane Maria Program, which is using two statutory authorities (NCST and NWIRP) and eight supporting contracts to achieve its goals. He described the acquisition process, which was broken down into five phases: sources sought, develop and submit acquisition documents, solicit the competition, evaluate offers, and award contracts.

The process described was typical for the acquisition of services specific to the Hurricane Maria Program. The contracts supporting the NCST projects required review by the NIST Office of Chief Counsel, which is an additional step in the contract timeline. Contract clauses related to activities that support an NCST Investigation were added to each contract awarded under the Hurricane Maria Program. In some cases, these clauses resulted in the need for additional negotiations between NIST and contract awardees.

Mr. Davis also presented the timelines for each contract that was awarded to support the Hurricane Maria Program. He noted a few key conclusions that can be drawn from reviewing all the contract timelines:

- Contracts with lower complexity and higher market availability of services resulted in shorter acquisition times.
- The development of the statements of work (SOWs) required substantial effort.
- The work contracted to support the Hurricane Maria Program falls outside of expertise housed at NIST.
- A one-month government shutdown resulted in more than one month of delay for awarding contracts.
- Some contracts took longer to award because of NIST's stringent technical requirements, as well as the unique requirements for the NCST Investigation.

## **Committee Discussion**

The Committee had no questions in response to this presentation.

## **VI. Hurricane Maria NCST Investigation Morbidity and Mortality Project**

The presentation provided by Dr. Judith Mitrani-Reiser can be found here:

[Hurricane Maria NCST Investigation Morbidity and Mortality Project Presentation](#)

Dr. Mitrani-Reiser began with a brief overview and mentioned that the NCST Act authorizes NIST to establish teams to assess building performance and emergency evacuation procedures in the wake of any event that has resulted in or could have resulted in significant loss of life. The objective of the Morbidity and Mortality project is to complete a quantitative morbidity and mortality assessment of Puerto Rico, to better understand how damaged buildings and supporting infrastructure played a role in the injuries and deaths associated with Hurricane Maria. The results are intended to provide guidance to improve codes, standards, and inform future approaches to attribute and predict loss of life due to building failure(s) caused by windstorms.

The contract supporting this project was recently awarded to the George Washington University Milken Institute School of Public Health and the University of Puerto Rico—Medical Sciences. This contract has three primary deliverables for which extensive detail on methodology was provided. The main deliverables of the contract are: an integrated database of deaths in Puerto Rico resulting from Hurricane Maria; a spatial and temporal analysis of deaths; and the deployment of a disaster-centric verbal autopsy to next of kin, which includes a questionnaire and a module of analysis to ascertain the cause of death. All of the project leads are fluent in Spanish, which was a skill requested in the contract solicitation. Dr. Mitrani-Reiser also presented a project management dashboard developed in Smartsheet that will be used to track all of the project deliverables and communicate project status to team members.

Dr. Mitrani-Reiser ended her presentation by thanking Dr. Thomas Kirsch from the National Center for Disaster Medicine and Public Health, and Captain Rebecca Noe from the Centers for Disease Control and Prevention for all of their collaborative efforts.

### **Committee Discussion**

The Committee found the presentation of the contractor's plans to be very impressive and wanted to know about how the key informants could be identified and if NIST had an estimate of a percentage of deaths that will be able to be identified. NIST responded that death certificates include next of kin as a standard piece of information, and plan to use that information to identify key informants. Dr. Mitrani-Reiser responded that death certificates do not typically include a notation attributing fatalities to a storm. Dr. Carlos Santos-Burgoa of the George Washington University added that the likelihood of identifying information is high, and that other sources of data will be collected in addition to death certificates (e.g., 911 emergency call records, DMORT records, funeral and burial assistance records). He also noted that the quality of information from verbal autopsies may vary, and that having different sources of information in the integrated database is important. Dr. Santos-Burgoa concluded that the most important question to answer in their work is, "what led to the death?"

The Committee also asked about the reliability of identifying the cause of death correctly. NIST responded that the goal of the integrated database is to identify as much information as possible around every single death that resulted from Hurricane Maria. The verbal autopsies are expected to provide more information to lead to the accurate determination of cause of death. The contract supporting this effort also has an option for a clinical panel, which would be made up of medical experts that would be able to arrive at a consensus regarding the cause of death for cases with incomplete information.

The Committee expressed their enthusiasm for a methodology to account for deaths resulting from a hazard, such as Hurricane Maria. The Committee recognized that a disaster-centric verbal autopsy instrument represents a significant outcome for both this project and the broader field of disaster

metrology and is looking forward to the progress of the work. NIST responded that the CDC has been providing advice on this project since the beginning and has vested interest in supporting the development of this instrument. Further, this aspect of the project fits well within NIST's domain of disaster metrology as the project team works to establish a standardized method to identify the cause(s) of death in the wake of a hurricane. This is expected to be able to serve as a model for other types of hazard events such as earthquakes or volcanoes.

The Committee asked if causes of death that were not related to building failure (e.g., lack of medicine) would be included in the analysis. NIST responded that the goal is to identify any death directly related to building failure that occurred within fourteen days of the event. Ultimately, the plan is to collect as much data as possible and to allow each death to tell its story. Due to the larger geographic scope of the current investigation, additional information about all deaths, regardless of cause, following Hurricane Maria will be collected.

Finally, the Committee asked if a further explanation could be given around the "reliability score" that was mentioned in the presentation. NIST responded that a reliability score will be included to indicate the level of confidence in the linking of other records to death certificates (e.g. assigning credit for the number of matched fields) throughout the linkage process of the integrated database. For example, if data from multiple sources matches, then the "Reliability Score" will be 100%. However, when multiple data sources produce conflicting information, the score will be lower. Ultimately the team will need to determine what is the lowest acceptable score.

## **VII. Open Committee Discussion**

Since there were no registrants for the public comment period, the Committee transitioned into an open discussion. Dr. DesRoches asked if the Committee had any questions about any of the topics covered.

The Committee asked about the National Disaster Safety Board, which is a legislative initiative currently under development. NIST responded that the agency had provided technical assistance on the proposed language in the legislation and there was nothing further to share at this time.

The Committee asked how NIST will extrapolate lessons from Hurricane Maria to other events and communities to prevent loss of life in the future. Dr. Main responded that NIST will look at the relevant standards that are currently in place and identify gaps or needs for improvement. Dr. Main noted that there were features about this event that were similar to previous events, such as Hurricanes Harvey and Irma, in which non-structural damage resulted in loss of function for critical buildings. NIST will investigate the factors that led to loss of building function, which are not limited to structural failures but include damage to building envelopes and rooftop equipment. The investigation's focus on engineered structures will also enable NIST to evaluate the performance of buildings conditioned on the era of codes and standards used in their design. As with previous NCST investigations, the findings of the Hurricane Maria investigation will inform recommendations for improvements to U.S. codes and standards. For example, current standards provide limited guidance on how to account for topographic effects on wind in the design of buildings, and this event provides an opportunity for NIST to evaluate these effects and the adequacy of existing standards. Dr. Mitrani-Reiser added that this investigation

could also result in recommendations for a standard death certificate form that would contain specific information to better identify the cause of death.

Dr. Harary thanked the Committee for their engagement and informed them that he and the NCST members would be available for any further questions.

### **VIII. NCSTAC Preparation of Annual Report to Congress**

The Committee entered into their working session for a discussion of key points for their 2020 Annual Report to Congress. The Committee Chair reviewed the draft material for the Report with the Committee. The Committee discussed the recommendations that would be listed in the Report and made sure that the letter included all of the information the Committee was briefed on throughout the year. Key points included adding text about NIST's response and adaptation to COVID-19 and the updates received related to the Hurricane Maria Program's contract support. The Committee also deliberated on whether they wanted to add more information about what they learned during the preceding presentations. Information about the morbidity and mortality project was added to reflect the importance of how the findings and procedures that will be developed for the project will have further uses in the future.

The Committee also discussed how many events have been scored by NIST during 2020. Dr. Dillard confirmed for the Committee that NIST had scored 21 events up until the date of the meeting but that she is in the process of scoring two additional events. Because the Report is done on a calendar year basis, the Report will reflect the number of investigations that were completed on a calendar year as well, as opposed to a fiscal year basis. NIST will confirm the number of events closer to the end of 2020.

Mr. Klein brought up the many events scored dealing with extreme weather events (e.g., hurricanes, tornadoes, etc.) and suggested including the link between the increasing number of extreme weather-related events and climate change in the report. The Committee decided not to include that information in the report this year, but to keep this in mind for future reports.

Mr. Izquierdo-Encarnación suggested that in an effort to increase the safety of structures used for shelter in the U.S., the Committee should recommend government oversight and evaluation in regard to the safety and resilience of structures that are to be used as shelters for hazardous/extreme events. Mr. Klein added that he agreed and that this point is touched on in the current letter, where it discusses the condition of tornado shelters. Dr. Corotis agreed that it was an area that should be studied further. Dr. Sutton added that she noticed that during the presentation about the events that had been scored, Dr. Dillard noted that there was a lack of consistency in the conditions of shelters, along with guidance about shelter use during the pandemic. Dr. Sutton understood that there was a limit on the amount of resources, but expressed strong interest in NIST studying the condition of shelters and that are used as well as the communication methods used to inform people about shelter locations. The fact that the pandemic now also needs to be taken into consideration, specifically planning for socially distanced sheltering, makes the shelter issues more urgent. Mr. Izquierdo-Encarnación noted that the schools that were used for shelters in Hurricane Maria were not in the best condition during the event. Dr. Shoaf stated that usually, the people who use emergency shelters are already part of a vulnerable population. She added that if the shelters they use are not safe, the people using the shelters are made even more



vulnerable. The Committee decided to add text regarding planning for infectious disease transmission to the report. Following the discussion, Mr. Davis, serving as the Designated Federal Officer, thanked the Committee for their work throughout the day and called the meeting to a close.