Natural Hazards Center and FEMA Webinar Series
"Making Mitigation Work"
Written Questions and Answers after the February 9, 2021 Webinar
Building Codes Save:
The Data Behind a Nationwide Effort to Reduce Hazard-Related Property Loss

Mathew Francis, AECOM
Frank Lavelle, Applied Research Associates
Shane Parson, AECOM
Hope A. Seligson, Independent Consultant
Jonathan Westcott, Federal Emergency Management Agency

Question from Daniel Maxfield:
Curious as to why wildfires wouldn't be included in the hazards? I figured that would make that figure much higher.

> **Response:** Great question. The available modeling platform (Hazus) is not currently able to perform this type of analysis for wildfire hazards. In the future with better modeling capabilities and data available to us we would like to do this type of analysis for wildfire.

Question from Dirk Bouma:
An integrated hazard approach that includes fires, wind loads, flood impacts (freeboard & scour), and earthquakes (& tsunamis?) would seem more useful.

> **Response:** We agree Dirk. The Hazus method is not yet developed for fires which are problematic in terms of risk and damage functions, but there is interest in developing that. Also, the tsunami code provision went into place in IBC 2018 so would not be addressed in the current database but will be in important component of future updates. A companion program, FEMA's National Risk Index, provides a helpful evaluation of a suite of hazards on a local lookup basis.

Question from Dirk Bouma:
Also, if design code is based on historic data but we are now in a new paradigm (caused by global climate change) that results in higher intensity storms, how would that be protective? Are there efforts to address this?

Response: In general, if climate change causes hazards like flooding and hurricane winds to be more severe in the future, then this loss avoidance study provider a lower-bound analysis. To model future conditions, not only climate change but also projected future growth, would need to be included in modeling simulations. These are great suggestions for possible follow-on studies.

Question from Larry Stevig:
Was seismic study limited to the western states? NMSZ not considered?

Response: The current study focused on the 6 western states that produce the majority of average annual losses per FEMA's 2017 national Hazus Study (https://www.fema.gov/sites/default/files/2020-07/fema_earthquakes_hazus-estimated-annualized-earthquake-losses-for-the-united-states_20170401.pdf) ; the potential for expanding the assessment to include the NMSZ is discussed in Appendix F of the BCS report.

Question from Michael Godfried:
Did seismic modeling take into account catastrophic earthquakes like the Cascadia Subduction Zone and more localized faults?

Response: The seismic modeling utilized probabilistic ground motions computed based on the USGS' National Seismic Hazard Maps, which do include earthquake events on the Cascadia Subduction Zone, as well as many smaller faults.

Question from Larry Stevig:
Since avoided losses are difficult to measure, is there any plan to validate the numbers in this report by assessing impacts of disasters that occur in the next few years?

Response: FEMA often performs post-flood losses avoided studies focusing on acquisition and elevation projects. Following an unprecedented rainfall event in Colorado in 2013, FEMA performed a losses avoided study evaluating "higher standard" scenarios including regulating freeboard, restricting the building of residences and critical facilities in regulatory floodplains, and controlling development in erosion zones. The Colorado study used existing geospatial data and loss data from several federal programs. The study yielded a return on investment of 3.91. For a summary, see: https://www.fema.gov/case-study/loss-avoidance-study-higher-regulatory-standards-2013-colorado-floods. Should the opportunity present itself, FEMA may assess the impacts of building codes following a specific future disaster. Note, a list of FEMA loss avoidance studies is available here - https://www.fema.gov/grants/mitigation/loss-avoidance-studies.

Question from Susan Park:
Aside from NFIP's CRS program, what are some other programs that incentivize local adoption of modern/higher building codes?

Response: Section 8.3 of the BCS report summarizes two FEMA programs that are designed to promote or incentivize local adoption of modern building codes. Under development is FEMA's Building Codes Strategy – This agency-wide strategy will advance the outreach, training, education, development, adoption, and enforcement of hazard-resistant building codes across FEMA programs. FEMA Building Resilience Infrastructure and Communities (BRIC) Program – This new grant program funds eligible state/local building code adoption and

enforcement activities that evaluate, enhance, or develop codes and workforce training: https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities and https://www.fema.gov/sites/default/files/2020-08/fema_bric-and-building-codes_support_document_August_2020.pdf. For example, as part of the BRIC FY2020 Notice of Funding Opportunity (NOFO), Applicants having mandatory building code adoption requirement (2015 or 2018 versions of International Building Code and International Residential Code) would be more competitive/likely to receive funding.

Question from Michael Godfried:
Would FEMA consider doing studies looking at land use codes and their cost saving potential? For example, limiting construction in hazard areas rather than rebuilding at higher codes.

Response: This was considered but not taken incorporated into the Study.

Question from Erin Cobb:
Did the study look at reasons why communities don't adopt building codes? What are common barriers?

Response: A report by the Environmental and Energy Study Institute (EESI) identifies several barriers to adopting building codes: political philosophies regarding the role of government in regulation; a desire to keep initial construction costs down to maintain affordability for building owners (without taking into account added value of losses avoided); lack of funding, staffing, or training in building departments to adequately enforce the codes. https://www.eesi.org/papers/view/the-value-and-impact-of-building-codes. On the other hand, A 2019 study by the Federal Alliance for Safe Homes (FLASH), "Why Americans Aren't Concerned About Building Codes (even though they should be)," the general public believes the right codes are already in place or they happen automatically.

Question from Daniel Maxfield:
This presentation is very good for the States/Localities to update their codes. For homebuyers (maybe those building for the first time) where can they go to find mitigation best practices that exceed the state/local mandate?

Response: There are a variety of guidance publications related to mitigation best practices available at https://www.fema.gov/emergency-managers/risk-management/building-science and other online resources, here is an example of a few.

- Homeowner's Guide to Earthquake Safety, published by the California Seismic Safety Commission, available here: https://ssc.ca.gov/wp-content/uploads/sites/9/2020/08/20-01_hog.pdf
- New construction:
  - FEMA P-499, Homebuilder's GUide to Coastal Construction (Flood and Wind): https://www.fema.gov/sites/default/files/2020-08/fema499_2010_edition.pdf
  - IBHS FORTIFIED Home: https://fortifiedhome.org/
- Even existing homes that aren't subject to most code requirements can benefit from mitigation to reduce risk.
  - Mitigation for Homeowners (Flood and Wind): fema.gov/sites/default/files/2020-07/mitigation_homeowners_fact_sheet_2017.pdf

- FEMA P-312, Homeowners Guide to Retrofitting, Six Ways to Protect Your Home From Flooding: https://www.fema.gov/sites/default/files/2020-07/fema_homeowners-guide-to-retrofitting_guide.pdf
- FEMA P-804, Wind Retrofit Guide for Residential Buildings: https://www.fema.gov/sites/default/files/2020-08/fema_p804_wind_retrofit_residential_buildings_complete.pdf

Question from Elizabeth Melton:
How do we make loss avoidance analysis a regular part of the mitigation cycle? We touched on how important it is to make mitigation personal and the steps your team has taken helps bring us closer to that goal. Right now there is strong focus on mitigation at national and local levels but it won't be long before we see inquiries about the impact of the recent federal investment in mitigation. Outside of a specific case-study or larger national study it's rare that we go back to identify the post-disaster benefit of the mitigation action.

> **Response:** FEMA regularly performs event-specific loss avoidance studies following tornadoes, floods, and hurricanes. These studies quantify the losses avoided due to the implementation of real mitigation projects. https://www.fema.gov/grants/mitigation/loss-avoidance-studies

Question from Daniel Acosta:
What opportunities have vulnerable communities with lower opportunities to adopt building codes? I can think about for instance applying for a BRIC grant?

> **Response:** Section 8.3 of the BCS report summarizes FEMA Building Resilience Infrastructure and Communities (BRIC) Program – This new grant program funds eligible state/local building code adoption and enforcement activities that evaluate, enhance, or develop codes and workforce training. In FY20 BRIC set aside $20 million for tribal governments. Small, impoverished communities are eligible for an increase in cost share from the standard 75% federal/25% non-federal up to 90 percent federal/10 percent non-federal. For insular areas, including American Samoa, Guam, the Northern Mariana Islands, and the U.S. Virgin Islands, FEMA automatically waives the non-federal cost share for the Recipient when the non-federal cost share for the entire Award is under $200,000. (https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities)

Question from Sharyl Rabinovici:
How can we translate the findings here to be meaningful/to influence actions of 1) individual building owners, 2) local elected, 2) state legislators, constituents and donors who influence the behavior of local electeds?

> **Response:** There is a brochure available via https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes-save-study/materials along with some info graphics intended to translate the findings in a meaningful and actionable manner, specifically with elected officials in mind.

Question from Sharyl Rabinovici:
What role does code adoption status tracking? Which is the best entity to centralize and standardize/supervise such tracking? For instance, CA has a seismic safety commission. Academics can do it, but who's responsibility should it be? Should this be required in LHMPs for DMA/Stafford Act eligibility?

> **Response:** Each entity that tracks building code adoption likely has their own specific purposes for tracking and tracks different pieces of information. FEMA tracks code adoption status and whether flood hazard provisions are weakened in its Building Code Assessment Tool using data obtained from ISO BCEGS and other FEMA research – This detailed interactive map is intended for use by FEMA and states, and shows counties at risk, by hazard, and whether that county has adopted an up-to-date hazard resistant code for that specific hazard without weakening the code (http://geo.stantec.com/National_BCATS_Portal/viewer/).

Question from Katherine Carpenter:
How do you anticipate COVID-19 has affected code adoption since you published this study?

> **Response:** The International Code Council has stayed on schedule in its code development process and has moved the latest committee action hearings to a virtual format. Many states are moving their meetings to a virtual format and going forward with their code adoption processes. Additionally, related to code enforcement, ICC has conducted multiple surveys of local building departments to see how they are adapting to COVID-19. https://www.iccsafe.org/advocacy/coronavirus-response-center/survey/

Question from Jim Murphy to Panelists:
Do you look at commercial and industrial structures also?

> **Response from Hope Seligson during webinar:** Yes - the database included all types of building occupancies - residential, commercial, industrial, etc.

Question from Anonymous:
Did the database also include schools?

> **Response from Hope Seligson during webinar:** Schools are included in the database, although may be limited; the source data is derived from local assessor's data (and other sources) and publicly-owned, nontaxable structures often have limited data within assessor's data sets.

Question from David Knops to Panelists:
What is freeboard?

> **Response from Shane Parson during webinar:** Freeboard is additional elevation for the lowest floor of a structure In FEMA NFIP participating communities, the minimum standard is lowest floor the base flood elevation (100-year or 1%-annual-chance event) elevation. Freeboard is added to this elevation.

Response from Mathew Francis during webinar: David, freeboard is the amount of building first floor elevation above the mapped flood level for a given building location. It serves as a margin of safety for flood hazard uncertainty.

Question from Erin Cobb:
@Shane - Although freeboard is not a state mandate in MO, about 80% of NFIP-participating communities have adopted higher standards and often that includes freeboard. I'm assuming you didn't ask for CIS data on higher standards/freeboard and relied more on CRS or the ASFPM lists; and even if CIS was used, many states didn't start their "data clean-up" effort regarding higher standards until mid-2020.

Response: The Study would not reflect recent changes in CIS as part of “data clean-up” effort regarding higher standards in mid-2020.

Question/Comment from Tom Hughes:
To the panelist - Comm of PA - don't agree with your Freeboard assessment - we have that in freeboard in our State Model Ordinance (1.5 feet and gets us two in the NFIP policy reduction) - due to this report are going back to verify and update this higher standard in the FEMA CIS database as the FEMA contractor was not updating that toggle for year for all map updates - It should be noted that ALL of FEMA Region III has DFIRMS now, our last County, Lackawanna County went final, held up due to FEMA decision on natural valley "protections" for previously constructed levees by the USACE which were turned over to the locals who now find that with climate change, their levees need to be higher for USACE and FEMA requirements.

Response from Shane Parson during webinar: For the question on PA freeboard, the Appendix to the study has details on the specific sources used for the freeboard adoption at the state level. While we used a range of national data sources including existing statewide adoption lists from ASFPM, we were not able to do state level verifications with state officials. We welcome additional clarification on adoptions within individual states, especially where existing sources may have errors on the distinction between freeboard in model ordinances versus actual mandatory local adoption.

Question from Kurt Luecke:
Freeboard is one benefit but is there any Data on foundation damage loss avoidance when following TB1 guidance as well?

Response: The study did not differentiate loss avoidance based on whether or not the foundation followed the requirements in FEMA Technical Bulletin 1.

Question/Comment from Christa Lopez:
The biggest challenge we face in Texas is gaining buy-in. We tried getting legislation passed during last state lege session in 2019 and we are working on doing the same this year. Being a ‘home rule’ state, we face jurisdictions that say they cannot afford to train their staff to new code, they do not have adequate staff to enforce new code, and at times we don't want the government telling us what to do with our land. We have a long road ahead of us.

Response: The challenge of buy in across Texas occurs in many other states. The primary purpose of BCS is to provide compelling economic evidence to help communities seriously

consider buy-in. There are good examples in Texas of strong code option such as Harris Co. and San Antonio, where neighboring communities can look at comparative losses avoided and see the opportunity of adoption.

Question from Zahraa Saiyed:
Great question re barriers. also wondering about quality of enforcement and true application of the code?

> **Response:** The BCS study assumes that codes that are adopted are enforced, resulting in buildings built to code. The BCS study acknowledges the impacts and challenges of enforcement in Section 3.1.2. BCEGS assesses community enforcement and assigns each community a grade of 1 to 10 (lower score shows higher commitment to building code enforcement). BCEGS rating components provide a view of community resources, training, and local regulatory commitments. Unfortunately, BCEGS enforcement-related data is not available for many of the jurisdictions modeled. However, BCEGS has published a "National Building Code Assessment Report" (2019) that provides a snapshot of BCEGS ratings at the state level (https://www.isomitigation.com/siteassets/downloads/iso-bcegs-state-report_web.pdf). IBHS's "Rating the States Report" (2018) provides an overview of 18 hurricane-prone coastal states and their progress in strengthening residential codes; the ratings are based on an evaluation of 47 key data points including adoption, enforcement, training and certification, and licensing requirements. https://ibhs.org/public-policy/rating-the-states/

Question from Laura Geronimo:
Apologies that I arrived late, but is there a link to the report?

> **Response:** The report is here: https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes-save-study#

Comments:

Comment from Eric Lynn:
I am surprised by the lack of data and/or losses avoided in counties across central Missouri given the multiple MO River floods in the past 20 years.

> **Response:** There is little freeboard adoption in Missouri in general.

Comments, Suggestions, or Questions for the Natural Hazard Center?
Please contact: katherine.murphy-1@colorado.edu.

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