A look at how the changing climate is impacting New York State's building stock

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Hurricane Sandy caused more than $60 billion in damage across New York City and Long Island in 2012. Credit: University at Buffalo

Much of the talk about buildings and climate change has focused on reducing greenhouse gas emissions. What often gets overlooked is ensuring that buildings are prepared for future climate impacts.

That's imperative because with climate change will come more frequent,

intense storms, along with other climate-related hazards.

Take, for example, Hurricane Sandy, which whipped through New York City and Long Island in 2012, causing more than $60 billion in damage, or the "Snowvember" storm two years later in Buffalo that dumped 7 feet of snow across parts of the region.

Many states prepare climate assessments that gauge the impact of climate change on numerous sectors, such as the economy, transportation and agriculture. However, none of these reports have examined how climate change will impact buildings, the places in which people spend more than 90 percent of their time.

New York has become the first state to do so. A three-year effort between researchers at the University at Buffalo and the New York State Energy Research and Development Authority (NYSERDA) has resulted in the publication of three reports: a climate hazards profile, regional costs of climate-related hazards for the state's building sector, and a set of climate resilience strategies for buildings.

The reports were published online and are intended to provide information and strategies that can be valuable to everyone from architects and engineers to state and federal policymakers.

"The vast majority of our building stock has already been built. So thinking about how to rehabilitate or retrofit existing buildings is really important going forward. Making sure our buildings are prepared and more resilient to future climate impacts is also very cost effective," said Nicholas Rajkovich, an assistant professor of architecture in UB's School of Architecture and Planning and the principal investigator on the project.

Rajkovich and his UB research team—which included faculty and

students affiliated with UB's School of Architecture and Planning and the UB Regional Institute—began working with NYSERDA in 2015, after the state agency issued a request for proposals for a project aimed at taking a closer look at how climate change has affected buildings in the state.

"New York is a national and global leader when it comes to our efforts to combat climate change and advance a clean energy agenda that reduces emissions through greater use of renewable energy and energy efficiency," said NYSERDA President and CEO Alicia Barton.

"Our partnership with the University at Buffalo has allowed us to be one of the first states seeking to increase the resiliency and efficiency of existing building stock by projecting the impacts of extreme events and climate change on buildings, and we look forward to continuing our work together on this critical issue," Barton added.

Climate resilience is becoming a key issue in the built environment, one that has major economic and societal implications, Rajkovich said, citing a National Institute of Building Sciences report from earlier this year that found that society saves $6 for every dollar spent on federal grants that improve resilience to climate hazards.

"We spend 90 percent of our time indoors, and 40 percent of greenhouse gas emissions come from the building stock in the U.S., so I think this deserves its own deep dive," said Rajkovich, who is also principal investigator in the Resilient Buildings Lab in UB's School of Architecture and Planning.

"It's exciting to have this opportunity with NYSERDA. Our hope is that other states will want to take a closer look at this as well," he added.

Understanding New York's climate hazards

The New York State Climate Hazards Profile pulls together data from a variety of sources to provide information on the historical, current and potential impacts of climate change on the built environment. The report includes climate hazards such as hurricanes and tropical storms, flooding, severe storms, winter storms, wildfires, sea level rise, heat waves and even pest infestation.

The information is broken down by county and region, which allows everyone from building professionals to elected officials to visualize climate risks at a local level.

It also makes available in one document information that would normally require an extensive amount of research to find.

Historical data, for example, is contained in the multi-hazards report that the New York State Division of Homeland Security and Emergency Services (DHSES) compiles, while current climate hazards information could be acquired from the National Weather Service.

For a future outlook, one could consult climate assessments such as ClimAID, compiled by NYSERDA.

Calculating climate hazard costs

This 62-page document considers the historic building-related economic losses from four types of climate hazards—winter storms, hurricanes, severe storms and flooding—from 1960 to 2014.

During that time, hurricanes caused more than $11 billion in property damage, with Hurricane Sandy accounting for the bulk of that figure, while flooding caused more than $7 billion.

Surprisingly, however, the impact of hurricanes extended beyond New York City and Long Island. The largest per-event property damage costs from hurricanes occurred in the Catskill Mountains and West Hudson River Valley, East Hudson and Mohawk River Valley, and Adirondack Mountain regions.

Flooding has been extremely damaging, especially in the Southern Tier and the East Hudson and Mohawk River Valleys, where flooding caused greater total losses than hurricanes. Floods caused an average of $5.09 million per event statewide.

"One of the interesting things that come out of this report is that even though 40 percent of building stock is downstate, some of the more rural regions of the state may actually be less prepared because they have a lot fewer contractors and other service providers who can help respond. So, it makes adaptation potentially more challenging in places like the Adirondacks or the Southern Tier," Rajkovich said.

Climate resilience strategies for buildings

Many building professionals mistakenly assume that future weather conditions will be similar to what's been experienced in the past.

That's likely to be a costly mistake as climate conditions change in the coming decades, according to the researchers, who say that increasing the resilience of buildings now can reduce the negative impacts of climate hazards in the future.

The Climate Resilience Strategies for Buildings in New York State report identifies 25 strategies that can help improve the climate resilience of buildings in the state.

Each strategy is formatted on a two-page spread that features

information on suggested locations, applicable hazards and related strategies. Each is applicable to multiple climate hazards.

"The strategies in here are pretty high-level. Building owners and operators can find guidance to help them make their buildings more resilient to some of these potential climate hazards," Rajkovich said. "But I think the existing building stock is going to be a tough nut to crack. We really need to focus significant attention on it."

October symposium aims to bring more attention to the issue

In addition to compiling the reports, the project also included interviews with practicing building professionals. Those conversations revealed that architects and engineers are thinking heavily about reducing a building's greenhouse gas emissions, but not as much about climate impacts on the building stock.

"They weren't thinking as much about adaptation," Rajkovich says. "Our hope is that this project gets people to start thinking about this issue."

Toward that end, the research team is hosting a symposium Oct. 1 in Albany, New York.

More information: Adapting buildings for a changing climate: ap.buffalo.edu/adapting-buildings

Provided by University at Buffalo

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