May 2021 InteRaCt Webinar
Moving Resilience from Research to Practice

#	Pre-webinar Questions	Responses
1	To what degree do you incorporate social and civil infrastructure into your resilient planning?	The social infrastructure is incorporated right now and there are components of it that are included in the development of the interdependent infrastructure model. We are in the process of putting it in hospitals and schools and other social infrastructure as well as the institutions. So right now a lot of the focus is on the households demographics and knowing that the disadvantaged populations are being dislocated from homes at a disproportionate rate.
2	Does the resilience model take into account climate change?	The Mobile, AL testbed that was brought into the center about a year ago is focusing on sea level rise, hurricanes as well as multimodal transport and so that will be in the full release version one year from this summer.
3	Could the check flood for critical structure be more severe than the five hundred year storm?	From a resilience planning resilience planning perspective, it depends on the community goals and objectives and what hazards they are looking at in the designs or their extreme hazards. Certainly, for an extreme level that should be considered but it also depends on what financial resources are available to a community. So again, these types of things are up to the community based on their constraints and needs but they can definitely be modeled in IN-CORE.
4	What is the responsiveness to evolving specifications?	So if I am understanding the question correctly, within the analyses, the fragility would change. For example, we are developing tornado fragilities for buildings designed to higher wind speeds, so if the code required this, then these could be used to see how it changes the resilience of a community.
6	Does the risk modeling consider cascading disasters and the possible impacts?	Yes. Right now much of the modeling is done with scenarios but it can be done repeatedly to do a full risk analysis. We plan to do that relatively soon but right now it is essentially putting another loop into the analysis process with the hazard model. We are generally more focused on scenarios for planning.

7	How to move resilience to practice without transforming it into "performance-based" requirement? How integrate sustainability?	For a community that is being modeled they want to answer - what is the performance of this and that in our community such that they can achieve their desired level of resilience. If we did achieve the building code or if we did have a mandatory retrofit, how do we change the performance and how does that change what happens at the community level from the social to the economics to the fiscal recovery as well. Of course, they are all intertwined that is one of the purposes. So we are not focused on sustainability but the community could add that as a constraint they use.
8	Would consensus standards, like those from ASTM, also be considered as a means to take resilience research into practice?	It could be. I think doing something like that would require setting up a model seeing what the effect is it all comes back to being able to measure and that's essentially what IN-CORE does.
#	**Questions During Webinar**	**Responses**
9	Can you elaborate the models that you are using are very complex with so many factors, right? So could you elaborate on the verification of these, trying to see what your model is assuming and what is happening in the communities and what kind of results you have obtained?	So we have actually a major task which is one sixth of the efforts in the center these last five years which focuses on verification and validation. One major hindcast was the early focus and the idea was that several years into the Joplin tornado we had documentation so what we do that model that you saw is actually a model of the community in 2010 prior to the 2011 tornado. We run the analysis which it basically means to compare to what actually happened and this provides our validation.

10	My understanding is that one of the major portions of the end users for IN-CORE platform is community decision makers (ex. Lumberton city personnel, or even North Carolina office of Emergency Management with mostly management roles and hands-on personnel). Those decision makers are mainly not familiar with technical terms of resilience planning ((ex. terms such as building functionality with dependency, etc.)) or they have no readily available access to technical expertise, especially in smaller communities, to utilize a high end tool such as IN-CORE web application. How important is it to evaluate the end user abilities to use IN-CORE? How about running a survey on way more than three hindcast communities and ask several IN-CORE potential end-users across the country and try to understand how much actual use they can get from IN-CORE application given the complexity of the terms and the web application? and maybe modifying or simplifying the platform accordingly, and potentially providing trainings.	Yes, that is absolutely correct in that communities would not necessarily be familiar with all the terminology and technical approaches. However, the objective of the partnerships is to determine what their capacity is, so we can then shape IN-CORE input and data sets to better serve their needs.
11	A challenge mentioned was that what is scientifically optimal is not necessarily doable by a community. Are there plans to take this type of research to codes or standards bodies to help make resilience more doable	Yes, we have six community partners that we'll be working with over the next three years to better understand what communities actually need. Regardless, our goal is not to try to tell communities what is best for them, but give them choices to make their own decisions and explore viable options based on their community specifics.
12	So you are assuming the process of verifying your models so you don't have any solid conclusion?	No, we do, the Joplin model is validated but we are in the process of doing it for hurricane models. We don't always have validation at the systems of systems level because of the complexity but each of the individual system models is validated and then the methodology used to combine them is validated itself.
13	I know you mentioned that your models are not considering climate change or the sea level rise. There's a couple questions related. Do you have any idea maybe in the future if those could be incorporated into the modeling?	Yes, absolutely it's not that they can't be included, and will be in approximately six months as part of the Mobile, Al testbed. One of our teams is developing those models in python and Jupiter notebooks so those will be included soon.

14	One of the challenges that there are so many different industries that are working in the area of resiliency so when you are working what are the easiest way to work different officials? Say for example you have the center and the sponsored by NIST and at the same time there are maybe different entities throughout the US so do you find that to be a bit challenging or how did you address and make sure that the officials were added together to come up with a solution?	One of the things that we focused on is not trying to reinvent the wheel for anything so we started essentially during the proposal stage with a detail gap analysis and then it went on for several years into the first five-year period to only develop certain key fragilities that we were missing. These are things like hospitals modeling and other social.
15	Could you also elaborate on the level of details you have incorporated modeling the structural responses… the high level of accuracy depends on the lots of details that goes into the structures you have so how detailed are you modeling the structures and how confident are you about the structural response to different loading scenarios?	Of course - it depends a little bit on the hazards and the subsequent loading but all of the modeling is done using fragilities and all of those fragilities are developed using very detailed models. So, for example, the suite of 15 flood archetypes was a six-month effort for a PhD student to develop and validate them. From a seismic perspective we are pulling fragilities from the NSF MAE center, from PEER, some were developed as part of the Center. Every building is a little different and it may have had different maintenance so we are not catching all of those details but the development of fragilities is actually stated in our code.
16	Could you elaborate on… you see looking at the crystal balls maybe the future some of the conclusion you are making finding its way into the specifications in the codes or requirements of the resiliency?	That's a tough question that we have talked and debated since the beginning of the Center, but obviously building codes, standards operate at the individual facility level so community resilience right now is to inform how those codes should be changed. I think we will see a high level standard of some kind soon on resilience.
17	Could you elaborate on the model which you are using could it be applied to say for example maybe you levy or dams too?	Yes, definitely. It would require you to do a level two analysis for the hydrological and hydraulics models with a dam or levee in place. In fact, we've done this for a North Carolina testbed and explored optimal placement and length of a levee.
18	What do you see as the next step to develop not only the resilient community but a resilient nation	I think its going to take getting research into practice, not just the practice of the communities but also communities reaching out to engineering professionals and planners. The planners are already doing it but they can't measure the resilience necessarily and so that's where these models come in; to enable them to measure it so that they can make decisions with some level of certainty.