

Climate Risk Is Rising. Is Our Infrastructure Ready?

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Alex Heil: Welcome to C-Suite Perspectives, a signature series by The Conference Board. I'm Alex Heil, senior economist at The Conference Board, and the guest host of today's podcast episode. Today we will discuss how companies are designing for resilience and infrastructure in a changing climate. Joining me is Greg Stonehouse, chief strategy officer for HDR. Welcome, Greg.

Greg Stonehouse: Thank you, Alex. It's great to be here today.

Alex Heil: It's great to have you. Both our backgrounds are certainly in this resilience and infrastructure space. But for the audience that may not be familiar with HDR, can you just give us a sense of what is behind the three letter abbreviation? What is HDR?

Greg Stonehouse: Sure. HDR is the initials of our original founders and subsequent generation of founders. We are a 100% employee-owned architecture and engineering firm that was founded in 1917, headquartered in Omaha, Nebraska.

We're very proud of our employee ownership model. We are one of the five largest employee-owned companies in the entire US. And that employee ownership is really what drives and shapes our culture, because every one of our employees has a stake in who we are and how we serve our clients.

Alex Heil: Great. That's very helpful. Thank you. Let's talk resilience. When we talk about designing for resilience in the context of climate change, what does that mean for infrastructure today? What does that mean in terms of what is changing now compared to infrastructure a generation ago?

Greg Stonehouse: Yeah, great question. Designing resilient infrastructure is really no longer optional, Alex. Infrastructure is the backbone of our communities and creating

resilient infrastructure is how we strengthen that backbone to protect our communities in the face of what is becoming a widening array of increasingly unpredictable circumstances and events.

When I was in college, almost 40 years ago now, we learned to design hard physical infrastructure that solved a very distinct, well-defined problem in the most efficient manner possible. Now with development and urbanization across the US, over time, more and more impervious surfaces erode our systems resilience to the changes in the climate.

We're experiencing more frequent and more intense precipitation events on one side. Additionally, as population growth has driven population and migration toward regions of the country that have water scarcity, even slight changes in temperature can create more intense drought conditions and have a much more dramatic effect on our water supplies.

So today, rather than looking toward resilience as what used to be an additional service to your project, we're integrating resilience into all our designs to try to help the owner capitalize on asymmetrical opportunities and benefits that might be achieved through taking just a more holistic view of a project. Resilience efforts are reducing our economic losses and they're ensuring that essential services remain available as climate extremes intensify their impacts upon our infrastructure.

Alex Heil: That certainly resonates with me in my 10 years at the Port Authority here in New York and New Jersey. Resilience and resilient infrastructure became more and more of an important topic. 10 years is a relatively short period of time but certainly it's true that over the last generation plus, this has now become at the forefront of design efforts.

What kind of projects are we talking about? I think intuitively a lot of listeners can probably relate to flood walls and making transit stops more resilient when it comes to precipitation and flooding events. Can you just add to the list a little bit? What else are we talking about?

Greg Stonehouse: It's becoming everything. It's roadways. Just to take it down to a very microscopic view, even the individual catch basins at a low point under a viaduct on a roadway where the size of the inlets to allow the flow of a more intense and or more frequent storm event. It's also in building construction. It is creating more energy-efficient and resilient buildings that are using materials-- glasses, steels, timber-- that are less intrusive upon the environment and upon our natural resources but also consume less energy and create a smaller carbon footprint over the lifecycle of a project.

It's bridges, it's power facilities, it is port facilities in terms of sea level rise. It's virtually everything that we experience and use every day but don't often really recognize as something that can be so easily impacted by minor shifts in our environment and our climate.

Alex Heil: And the minor shifts, they expect it to become large shifts over the rest of the century. I think that's certainly all true. From an economist point of view, all the resilient

design features, they basically prevent future damages by making those infrastructure items more resilient and able to withstand some of these extreme weather events. Does that come with a cost premium? If you are the owner of assets, is that something you need to start planning? That the cost-benefit calculus pencils out because of the avoided losses in the future. But is there something that would suggest resilient design is more expensive?

Greg Stonehouse: Not necessarily. It can come with an additional cost but I think what we're also trying to do is view these through a lens of opportunity as well. We had a project; it was a redevelopment of an industrial site in a major US city and a brownfield site that was prone to flooding. Rather than just installing gray concrete, gray infrastructure, what is a concrete solution to that? We used a green solution, a sustainable infrastructure solution to create a project that solved the flooding problem and cleaned up the brownfield environmental property.

But we did so in a manner that created green space. It created park space. It used elevated walkways so that even during a heavy precipitation event the park could still be used, people could still walk across pedestrian pathways that were elevated. And it did so in a manner that was actually done at a less expensive cost than the gray infrastructure, but it also brought additional benefits of park space, of recreational space.

And ultimately it precipitated economic development in the area, in the neighborhood around that. So the intangibles that can come, whether it does require a little bit of extra cost or even if it can be done at a savings, we should view these as investments and try to find the return on the investment that maybe extends beyond the boundaries or the limitations of the project site that we're dealing with.

Alex Heil: That's a very good point. I also think that with these kind of improvements and with these investments the way you described them, you know that sometimes the use of the site might be different than before. In terms of sea level rise, you have to embrace essentially higher sea levels and it turns into a design effort to make the site usable from various angles, even if there might be more impactful future climate events. That's a very good point.

For the people that are a little bit in the weeds, if you're thinking about this from the planning and the design stage, how does HDR think about some of these different risks and can you give us a sense of how some of these risk assessments, some of the climate modeling, how the nuts and bolts get turned into project plans, prioritizations of projects, some of the real technical aspects.

Greg Stonehouse: Previously, reliable weather data for the variables like temperature, rainfall, wind pressure, snow loads, those over probably the past 30 or 40 years have become a bit obsolete. Climate disasters, weather disasters in the US now are regularly approaching \$200 billion a year in damages and we're displacing upwards of 2 million to 3 million people per year, even if it's on temporary basis. Because of those implications, there's much more awareness and more intense focus on creating resilient solutions that

help can help us avoid that.

As a result, I would say our approach is reflecting a shift in the industry, where it's no longer that add on, it's a core design parameter. Resilience is a core design parameter that we use in evaluating the project and try to quantify the problem so that we can come up with redundant and resilient solutions.

We have added climatologists and meteorological sciences within HDR in the last 20 years and these folks are the ones that we bring into a project to help us try to quantify the problem. They're leaders in the industry. They're engaged in our industry, professional associations with their peers to advance tools and advance the science that can inform future decisions and help advance design standards.

Now, a little more specifically to your question. We use tools like triple bottom line analysis, where we can better quantify the social, the environmental, and the economic implications of design solutions. That helps us to facilitate transparent conversations and drive and advance solutions around the design outcomes without making it a climate change conversation, if you will. We don't all necessarily agree on the science and we don't necessarily have to, but collectively we've got a responsibility to move forward in a manner that develops strategies and mitigates climate risk but also unlocks opportunity and enables our utilities and our clients to champion sustainability and resilience within their communities.

The goal, I think, Alex, is really to obviously ensure that our infrastructure remains functional and safe in a climate that may look very different tomorrow than it looked yesterday or five or 10 years ago.

Alex Heil: From what you're saying, HDR has really gone through a transition in the levels of skills, sophistication, quantitative analysis that you bring to projects. What about the other side of the procurement of infrastructure? To what extent are cities and utilities in the process of rethinking their planning efforts, planning for resilience?

You mentioned the collaboration, has that changed in equal terms? Are we now basically looking at a situation where cities, states, municipalities, any other entities that are in charge of infrastructure have resilience as their main focus or is this still something where you have to really push the "Look, this is what you have to do because ultimately this is in your best interest?"

Greg Stonehouse: I think that varies from client to client. It probably varies a bit geographically, Alex. It certainly varies from smaller clients to larger clients. I think smaller municipalities probably get by on a much tighter budget and sometimes are driven to focus on the solutions that address the challenges that they have today. So we have to work with them, maybe in some cases a little more closely, to help them to appreciate the potential benefits and the value of a little bit of additional investment or maybe some redirection of that investment in an area that might provide a more resilient or longer-term, more sustainable solution.

I think you'll also see that you get sometimes competition within departments within an existing city. For example, they manage their budgets within a silo and they don't capitalize on the potential mutual benefit that can come with creating a more holistic solution that could expand across the street department, the water department, the utility department, and even the public safety side of things.

Alex Heil: Silos like that, based on my experience in the public sector, certainly they can be very much obstacles. Even if everybody acts with the best intentions, it still can be something that is not optimal by the time you actually get to the implementation phase. That's a very good point.

You mentioned some of this already, but everybody thinks, "Oh yeah, we need to protect existing infrastructure. We need to harden it, we need to make it resilient when it comes to extreme weather events." What about nature-based solutions? What role do those play in the redesign of infrastructure and assets going forward?

Greg Stonehouse: They're playing a larger and larger role. In the last, probably, 20 years, we've really expanded our appreciation for the value that natural solutions can provide us. As I mentioned, I'm down here on the Gulf Coast in Pensacola, Florida, and those barrier islands along the intracoastal waterway are nature's way of protecting the coastline against those extreme storm and weather events.

Again with population growth and migration, probably post-World War II, it's now shown us the implications of intense development along that coastal environment. Now we're doing a lot of work to reestablish and reinforce natural solutions to absorb the impact of the seas and of the storm surge that results from these intense weather events. We've got different solutions right along the beach. You have the reestablishment of the grasses and the dunes that can naturally absorb that wave action. As you move a little further into the coastal zone, into the estuaries, you'll see a lot of oyster beds and a lot of near shore oyster bed reestablishment that really softens the impact of those events against the waterfront, if you will, where the city meets the estuary. We're seeing a lot of that in terms of nature-based solutions in the coastal zone.

I'll also say on the architecture front, our architects are first in the world in health care architecture and they're doing a tremendous amount of net-zero building design and trying to build hospitals, high-tech facilities that provide a critical public safety social benefit in our communities but do so in a net-zero manner.

But we've even gone beyond that. When we get involved in the planning of a health campus, for example, we're now implementing regenerative design. When we get beyond just the footprint of a hospital building but can look at a campus, we're doing a lot to bring an ecological benefit, to create green space to have net-positive effects on the ecology, on human welfare, health, and on society in general.

These technologies and approaches are evolving but they're becoming more and more

prevalent. The earlier that we can get involved in the planning, the more we can have an impact on leveraging those dollars and turning that investment into something that goes beyond just providing, in the case of a hospital, just a health and wellness solution.

Alex Heil: Those are all really good points. It's interesting how they all play a role, regardless of where you look across the country, really. You mentioned Florida and some of the nature-based solutions there. The same conversation is ongoing here in New York City where I'm located. It's about the Billion Oyster Project. It's about the sand dunes along the Jersey Shore. Really, a spotlight was pointed at it after Hurricane Sandy hit. Some of these conversations are much broader than just building hard assets these days, which is a great point.

Greg Stonehouse: Yeah, they are. Your Billion Oyster Project in New York is one that we're very passionate about. HDR also has a foundation and we've actually contributed to that project and have quite a bit of involvement in that. So that's one that's near and dear to our hearts as well.

Alex Heil: That's interesting. We're going to take a short break and be right back with more of my conversation with Greg Stonehouse.

Welcome back to C-Suite Perspectives. I'm your host, Alex Heil, senior economist at The Conference Board. I'm joined by Greg Stonehouse, chief strategy officer for HDR. So, Greg, before the break, we started talking a little bit about different sectors. You mentioned health care. Let's talk in a more focused way about that.

What about some of the different sectors that HDR works with, like transportation, water, health care, energy? How can you apply lessons from one sector to another? What is your firm's approach to working across these different industrial sectors to make sure that the overall outcomes presumably are optimized?

Greg Stonehouse: I can attack that question from a couple different angles. But just in terms of context, I'll start off with the fact that 40% of our global population exists within what we call the coastal zone and the definition of coastal zone varies. But even here in the US, 40% of our population are in coastal counties, 15% of that population is within the first five miles from the shoreline.

When we look at that, we have a lot of infrastructure that is packed into a very narrow band right along the coast. That's some of our most intense and dense infrastructure systems. We have drinking water and wastewater treatment facilities. We've got major transportation routes. Our maritime services, our ports facilities connect our sea transportation to the rail hubs at these locations. And where the people live, they want their hospitals and their universities.

To your question on sharing solutions across sectors. All of these have linear systems, right? We've got water system conveyance, we've got power and energy transmission lines, and we've got major highway and rail corridors. The approaches that we take to

attacking these linear systems are very consistent and similar from one sector to another.

We recently completed a comprehensive physical assessment for a rail network that spans across North America to strengthen their system-wide resilience. We look at databases, we use the same climate models and we use similar data sets to integrate those into a single platform that enables a client to visualize their exposure to rainfall and flooding and extreme heat across all their facilities. We can bring tools that are very applicable across these multiple sectors.

The other thing is that we work really hard to be intentional about not only sharing resources from our various service lines but pushing holistic approaches. We employ a group of folks who sit in what we call our cross-sector services and they work to engage across all sectors. We have climate scientists, data analysts, strategic communications resources, environmental scientists, and even real estate experts that can all collaborate across our different business services to build unified and flexible decision support systems that can be employed across all sectors to direct resilient investment strategies.

Alex Heil: Yeah, that's interesting. One of the areas that works across sectors that you just mentioned is strategic communications. I could imagine that there's a lot of communication also with the communities, with local stakeholders. Can you speak a little to the engagement that is necessary to make projects successful? Because it's one thing to stay on the planning side and crunch the numbers and demonstrate what this means in terms of the benefits and costs of a project. But there's another dimension and it is actually engaging with the various stakeholder groups in the community.

Greg Stonehouse: Yeah, you're exactly right. We used to just call it strategic communications because we had to communicate what the project was going to be to the client, or not to the client but to the stakeholders. Probably 30 years ago, it was about informing them of what was going to happen. It has become much more exactly what you said, engagement. It's not just to the residents that are affected by a project. It's the stakeholders that are directly and indirectly connected with it.

It's much more about engagement and using that strategic communications to secure informed consent and get that buy-in, to give them the information that they need to get their input, to have a more of a give and take versus just distributing information to help us come back, reshape, refine, and improve the solution in a matter that actually earns consensus from the stakeholders that are involved and affected by the solution.

We use those folks very actively. We try to employ them on a lot of our projects. We probably initiated the strategic communications team maybe a little over a decade ago and that team has grown to over 200 professionals within our organization. So it's a very large group that brings a lot of skills and perspectives and, quite frankly, helps our engineers to view their projects through a different lens so that we can provide much more holistic solutions that are the connective tissue of society.

Our projects used to be just solving a very technical problem and now we're realizing

much more that the strategic communications folks are the connective tissue that connect our solutions to the communities in which they're built and delivered.

Alex Heil: That's absolutely critical for the success of a project. In terms of the success of a project, sometimes barriers continue to exist and they might be of various types. Funding can be one of them. Have you seen any particular funding strategy work better? What are your takeaways, based on your experience, when it comes to funding resilience projects and resilient infrastructure additions? Are there takeaways that you could talk about there?

Greg Stonehouse: There are. The first one that I will say is much more collaborative funding, leveraging dollars from federal resources, from state resources, and combining those with local resources. There are certainly organizations out there that provide grant funding that can help to create a bit of a force multiplier to deepen the benefit that a project might deliver. There's a lot of that going on.

There's also a lot of effort on the agency side of things to validate the grants in terms of improving the selection process that they use, to refine the metrics that they use to select and allocate grant dollars. And then ultimately measuring the performance of those projects that are implemented from those grants in order to track the outcomes and measure the performance and the improvement in project resilience over the life of a grant organization.

Alex Heil: I think what you're describing as this much more comprehensive multipurpose funding stream, that sounds like a very applicable strategy.

In the spirit of slowly wrapping up our conversation. There is one topic I just want to bring up briefly and that's innovation in engineering, design of projects. From my perspective, and to be perfectly clear, I'm not an engineer. I flunked out of mechanical engineering in college. It was miserable and I chose economics instead. But it certainly seems to me that we are now moving toward a world where there's greater recognition that just building a higher wall to keep out water is probably not going to be the right approach. I think that we need to really think about this. Living with, for instance, if we're talking about flooding, some of the flood waters, having infrastructure that deals with it differently than a traditional approach might suggest. What's your view in terms of the degree of innovation that we're actually finding in the industry?

Greg Stonehouse: I think we are in an interesting time with the advancement of technology and AI and machine learning. I think it is creating some real opportunities for us. We have been in an environment over the last probably 30 or 40 years, in the digital industrial revolution when we started to use computers and technology to operate systems and collect massive amounts of data. What we didn't do really was connect all that in a manner that enabled us to then analyze trends and take action from that data.

So we've got a massive amount of data out there. Now, for example, if we look at a major metropolitan city that has more intense rain events, we do these cloudburst analyses

where we can now predict much more accurately the intensity of a storm, when that storm is going to hit, and even localize that down to the neighborhood that it might impact most using climatologists and more meteorological sciences.

But when we combine that with the historical operation of our sewer and our stormwater system, we can move water around in different ways and accommodate that event using what we call real-time control. We can operate the system in advance of an event to try to create a little bit of a buffer in the system to enable that intense rain event to hit that neighborhood and give capacity in that neighborhood for that water to get out of there more quickly, to prevent and at least mitigate a potential wet weather event. The innovation that we're seeing now is really coming from our better use of historical information and our ability to synthesize that and make projections and predictions more on a real-time basis.

Certainly in the planning phase, we can now look at storm surge inundation using scenario planning to help a coastal city try to make sure that they are predicting at various levels of storm surge what transportation routes they may need to keep open, what they can do to create some flexibility and maintain access. And what level of protection they may need to provide emergency storm protection for a hospital, for example, to provide some sort of a flood hardening around an individual building within the downtown area in a severe storm to make sure that they can keep it operational and keep it up and running. There's a lot of innovation going on right now relative to our abilities to make that happen.

Alex Heil: I'm so glad you brought this up because data is critical, from my perspective, also going forward. It's certainly true that this all connects. We have now real-time opportunities to measure and track the performance of assets, transportation, water, energy, and otherwise. This becomes an integrated effort, not just planning with big data but also steering the operations, especially during extreme weather events, in the right direction. It's a great point.

To wrap things up and to maybe end on a positive note, what makes you hopeful? What makes you optimistic that we will be able to address some of these resilience challenges?

Greg Stonehouse: Unfortunately, Alex, climate change has become so politicized, both globally and here within the US, and it can even change dramatically from one administration to the next. I would say the good news for our industry is that most of us live in the middle of that spectrum where we recognize that our clients are in need of resilient solutions and they expect an approach that is environmentally, socially, and economically sustainable.

Because of that, our design standards continue to evolve to incorporate energy modeling and benchmarking and reduction targets. We are designing facilities that not only do carbon-balanced solutions but create net-positive environments. And now we've got the data and the tools and the collaboration to make smarter decisions, not just bigger ones.

When I look introspectively at the demographics within our organization, I will say that the

generations of our employee owners that are following the boomers and the Gen Xers are extremely passionate and engaged and committed to what we at HDR refer to as "cathedral building." It's conceiving and building something that may not be complete in the foreseeable future but we build it for future generations whom we may never meet. I would say that combining that mindset, the continuing evolution of our industry's perspective, the advancements in innovation, and our employees' passion for doing what is right gives me optimism that we can build systems that don't just withstand the future but they help us shape the future for the better.

Alex Heil: Great. Those are very wise words. Greg, thank you so much for joining us today.

Greg Stonehouse: Thank you. It's great to be with you today, Alex. I appreciate it.

Alex Heil: And thanks to all of you for listening to C-Suite Perspectives. I'm Alex Heil and this series has been brought to you by The Conference Board.

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