• Thank you, Lynsey. I’m very glad to have this opportunity to talk about the role of design and design thinking as it contributes to innovation in resilience.

Slide 4

• I’d like to begin with just a brief overview of what we’re going to talk about here today.
• First, I’m going to try to situate just what it is that we are talking about
• Words like design, innovation, and resilience can have very broad meanings
• So I’ll be framing these terms at the outset… just so that we’re all on the same page for the purposes of this webcast.
• Next, I’ll be introducing HUD’s recent Rebuild by Design competition (or what I’ll be referring to as the RBD competition) and discussing how the competition can serve as a good lens through which to look at innovative design – both in terms of process and product.
• Then I’ll talk a little about the fundamentals that underlie any process that’s going to produce innovation in resilience… synthesizing them into five basic elements.
• I’ll walk through each these elements in relation to how they were reflected in the RBD competition process.
• Then, we’ll look at the winning proposals from RBD; each of these proposals contains good examples of innovative approaches and design solutions for increasing resilience.
• And Lastly, I’ll wrap-up with some quick references for folks to learn more if they’re interested;
• So… with that… let’s begin.

Slide 5

• We begin with the question… What are we really talking about here?
• As I mentioned before… design, innovation, and resilience can sometimes be pretty fuzzy terms – so I’ll touch briefly on each of them.

Slide 6

• Design thinking is a **process**; it’s a process for solving problems… and it’s essential to arriving at innovative solutions.

• A variety of different graphic representations of this process are out there – but they all involve these three basic steps or stages… **understanding** the problem, **creating solutions**, and **implementing** them (… or what this particular graphic refers to as “deliver”)

• Implementation, or delivery, includes testing or monitoring how well the solutions work

• We sometimes too often think we have a thorough understanding of the problem by being aware of its symptoms – and jump right into coming up with solutions.

• However, what we find when looking at **resilience**… is that the **problem** is more complicated than we think…

• … it’s not just about how a hazard behaves and its impact on a thing… it’s about the **role** and **value** of that impacted thing in relation to everything around it… and how it **then** impacts those things

• So taking a step back to better define the problem is usually the best place to start… looking at the best available science as well as human behavior and perceptions (which is noted here as empathy)

• After developing a better understanding of the problem, it’s time to generate ideas for solving it

• This is usually an iterative process – sometimes referred to as **ideation**… where alternatives are successively evaluated until a final solution is determined.

• It’s then time to put thought into action… implementing the solution and testing it (which, again, means monitoring its performance and effectiveness)

• I know this all sounds terribly simple… even remedial… but I think it’s helpful nonetheless for us to remind ourselves of this basic framework.
Slide 7

• Why it’s helpful to reflect on design thinking is because it’s essentially the same as a traditional community planning process.

• This is a slide from the U.S. Climate Resilience Toolkit, which can be found at toolkit.climate.gov.

• You can see here that the framework for addressing climate issues at the community level moves through the same basic stages...

• ...identifying the problem, coming up with and evaluating options, then ultimately taking action to implement.

• The only thing I would add here is a sixth step, which is to monitor and evaluate the action... this brings the process full circle.

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Slide 8

• Resilience is one of many places where policy and design intersect.

• While policy and design are reflections of who we are, as well as what we want to be...

• ... they're also natural reflections of our inherent desire and drive to innovate.

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Slide 9

• Which leads us to innovation...

• When we talk about innovation, we are talking about something more than just being new.

• In order to be innovative, it has to be new and better... not just new.

• To innovate is to advance, move forward, improve...

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Slide 10

• And design innovation in resilience isn’t limited to just structural and nature-based solutions...

• it can, and should, include design of ...
• research and analysis... communications and outreach strategies... governance structures... financing models... policy frameworks... approaches to monitoring and performance measurement... and other related activities.

Slide 11

• So... on to resilience...

• One of the most frequently asked questions I hear with the growing emphasis on resilience is how it relates to sustainability.

• These are both very large concepts that receive a great deal of intellectual inquiry and debate...

• but I still find it helpful to position them at a macro level... even at the risk of boiling them down into bullet points in a presentation.

• Sustainability and resilience are related and complimentary concepts.

• How these two concepts are related is that they are both about the long-term or indefinite viability of a thing to exist in a healthy, functional state.

Slide 12

• What distinguishes these two, is that sustainability tends to focus more on the consumption of resources and production of negative outputs as the central condition to long-term viability...

• ... whereas resilience tends to focus on the ability of a thing to withstand and adapt to negative impacts as the central condition to long-term viability.

Slide 13

• Or, put more simply... the focus of sustainability is the impact of a thing on the world...

• ... the focus of resilience is the impact of the world on a thing.

• I think we can consider resilience as a fundamental principle of sustainability...

• in other words... if we’re not looking at risk and vulnerability, how can we be sure that something is sustainable over the long-term?
Slide 14

• Resilience is all about risk and vulnerability.

• So... in looking to increase resilience... the *fundamental* lens through which the problem and solution are identified is *risk and vulnerability*

Slide 15

• So that means that to understand resilience, we need to understand risk...

• ... so what is risk?

• Risk is the *probability* of a thing happening, relative to the *consequence* if it does.

Slide 16

• While determining probability can be more of a *statistical* calculation...

• estimating *consequence*, or *impact*, is a much more nuanced thing – which needs to consider the elements of vulnerability.

• The basic elements of vulnerability are *exposure*, *sensitivity*, and *adaptive capacity*.

• *Exposure* looks at where different threats or hazards might occur, in relation to their probability

• *Sensitivity* considers the *degree* to which assets would be impacted...

• ... things like buildings, infrastructure systems, and natural resources... but also things like public services, jobs, and perhaps most importantly... people.

• *Adaptive capacity* looks at the *ability* of an asset to make *adjustments* to maintain functionality

Slide 17

• One of the most important things about risk... is that it needs to be communicated in terms that are *understandable* and *meaningful* to individuals at a personal level.

• The most *classic* example is what it means to live in the so-called 100-year floodplain...
• ... which is more accurately defined as the one-percent-annual-chance floodplain.

• Looking at this probability in terms that people more commonly understand... we find that there is a one in four chance you will be flooded over the lifetime of a 30-year mortgage.

• There is a 40 percent chance of this level of flood occurring in the next 50 years...

• ... or we can even consider the probability over an average lifetime, which is a 55 percent likelihood.

• So how we communicate risk – and our general awareness of it – matters.

• Imagine if we understood the 100-year flood zone as the 40 percent flood zone...

• ... I suspect that living or working there would suddenly seem more risky.

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Slide 18

• Now we’re going to shift a little... to look at HUD’s Rebuild by Design competition as a lens for innovation through both its process and product.

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Slide 19

• Rebuild by Design was a regional planning and design competition to increase resilience in the Sandy-affected region.

• It sought to engage the best interdisciplinary planning and design talent in the world... to come up with innovative ways to incorporate resilience into the disaster recovery and rebuilding process.

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Slide 20

• One of the ways that the competition process was innovative... is that it engaged agencies from across the federal government through the President’s Hurricane Sandy Rebuilding Task Force.

• However, perhaps its most important innovation was how it partnered with philanthropy, nonprofits, and academia... to leverage their talents and resources and produce an outcome that government could not produce alone.
• This slide identifies the many philanthropic entities that funded the competition prize and administration... as well as the partner organizations that helped to administer the competition on HUD's behalf.

Slide 21

• This competition was unique in that it was a two-phased competition...

• ... and rather than presenting a well-defined problem, and asking for the best solution...

• ... the process began with defining the problem.

• It was through a deeper and broader understanding of the nature problem at various scales... that the best solutions would emerge.

Slide 22

• And RBD didn’t just seek innovative solutions, it sought innovative yet implementable solutions.

• What does implementable mean?

• It means coming up with something that is technically feasible, financially feasible, politically feasible, and legally feasible.

Slide 23

• So... Rebuild by Design represented innovation in process... through the use of a two-phase competition to find solutions to “wicked” problems...

• ... in partnership... through leveraging knowledge, resources, and skill sets within and outside of government...

• and in policy... through an up-front commitment of resources to help build winning projects, and a focus on implementability with local support

Slide 24

• Through the RBD process, we’ve come to learn that basic elements are necessary when it comes to producing innovation in community resilience.

• These five elements are that innovation...
1. is Multi-Disciplinary & Collaborative
2. takes a Regional, Systems Approach
3. is Iterative & Participatory in process
4. examines Multiple Hazards & produces Co-Benefits, and
5. seeks Integrated Solutions that are Leveraged

• This is just one of many slides in this webcast, but I think it is perhaps the most important and central to what you are trying to do.

• If your approach to resilience doesn’t include one or more of these elements... for whatever reason... I strongly encourage you to think about how you can overcome whatever challenge may be limiting you.

Slide 25

• So on to looking examples of how the RBD process was able to incorporate these elements...

• First, we’ll look at how a competition process can be multi-disciplinary and collaborative

Slide 26

• The competition’s call for participants didn’t just seek planners, designers, and engineers...

• ... it required truly multi-disciplinary teams... which included climate scientists, hydrologists, sociologists, economists, community engagement specialists, communications specialists, and others.

• The result was 10 teams that represented more than 200 interdisciplinary professionals and experts.

• ... And allowing for more than one winner in the competition meant that they were not competing against each other...

• ... which enabled this incredible brain trust to work collaboratively, each producing a result which couldn’t have been possible entirely on their own.

Slide 27

• In addition, collaborative administration of the competition connected the teams to:
• Local, state, and federal government agencies (.... both subject matter and program specialists)
• Local elected officials
• Local and regional authorities, such as transit and water/wastewater
• Local community-based organizations
• Top-tier scientists
• Philanthropies & foundations
• ... and many others

Slide 28

• Next, we’ll look at the need for a regional, systems approach.

Slide 29

• When looking at resilience, the geographic scale of analysis should be that at which the threat or hazard exists.

• For most hazards, this is a regional level...

• .... natural hazards don’t recognize or adhere to political boundaries.

Slide 30

• For example, when looking at floodplains and watersheds for the greater New York/New Jersey metropolitan area, we realize that two-and-a-half million people live in the flood zone.

• ... and with sea-level rise, this number is only going to increase.

Slide 31

• When looking at potential toxic hazards, we realize that 80 percent of the region’s fuel storage is in the flood zone.

Slide 32

• In regard to electricity, 75 % of the region’s power generation is within the floodzone.

Slide 33
• These are all critical observations to understanding systems interdependencies and risk at a regional level.

Slide 34

• It’s also necessary to identify and map the location of the most vulnerable populations.

• Here we see that the nation's highest concentration of public and assisted housing lies in the floodplain along the Lower East Side of Manhattan.

Slide 35

• So when you begin to map physical vulnerability, such as the floodplain shown here...

Slide 36

• ... and you overlay that with social and economic vulnerabilities... you start to see where areas of high risk emerge.

• Looking at opportunities for resilience is to look at the nexus among physical, social, and economic vulnerabilities.

Slide 37

• These nodes of vulnerability also emerge where infrastructure networks converge.

Slide 38

• This analysis is what led the Rebuild by Design teams to focus on the areas which they did... each of these ten places represent key nodes of risk and vulnerability.

Slide 39

• The next element of innovation is an iterative and participatory process.
Slide 40

- One of the critical things to ensure effective citizen participation is to have creative outreach tools.

- This could look like user friendly brochures... postcards... smartphone apps... installations in places with high foot traffic such as shopping areas or train stations... interactive surveys... and many other tools.

Slide 41

- Also of fundamental importance is real, meaningful public engagement... not just your default public hearing.

- These are opportunities to facilitate a public dialogue...

- ... not just a monologue where the public speaks to government and government listens... or where government speaks to the public and the public listens.

Slide 42

- This is an infographic illustrating the various stakeholder outreach activities conducted by one of the RBD design teams, the OMA team, mid-process.

- It demonstrates how important it is to engage everyone from local residents at neighborhood meetings in a community center to senior elected officials at City Hall and the State Capitol.

Slide 43

- This is an example of the stakeholder outreach conducted by the PennDesign/OLIN design team in the Hunts Point/South Bronx area.

- It demonstrates the numerous stakeholders engaged through dozens of meetings – and how the outreach strategy targeted government, community, and industry stakeholders.

Slide 44
• Innovative outreach means *leaning forward*... for instance don’t make business come to you – you can go to them.

Slide 45

• Innovative outreach also means seeking *individual* voices... personal stories and experiences *matter*.

Slide 46

• Hold outreach events that bring the community together...

• This is another example from Hunts Point, where a key anchor institution is the regional food market...

• ... so organizing a cooking competition was quite natural and appropriate... but it also became an opportunity to talk about and promote resilience.

Slide 47

• One of the most valuable outcomes of an iterative and participatory design process is that it enables the *alignment of interests* across interest groups and geographies...

• ... it allows you to find the common ground upon which to build.

Slide 48

• The end result, however, is securing the necessary community support for the project to be realized... with a strong sense of local ownership and continued stewardship.

Slide 49
Now on to the fourth element of innovation, which involves examining multiple hazards and producing co-benefits.

• The Rebuild by Design competition focused primarily on flooding being the principal hazard presenting a threat to the area; but many regions are subject to multiple threats... such as tornadoes, earthquakes, wildfires, landslides, drought, and other natural hazards.

• This slide, however, shows that even when looking at just one hazard – flooding – we need to look at that hazard in all its incarnations.

• In this case, that means understanding the various patterns and directions of floodwaters – including heavy rainfall from the sky, intense run-off from higher land, or storm surge from the coast.

Looking at multiple hazards also means looking at those that come in the form of a sudden event, such as a hurricane as well as those that result from gradual changes in conditions, such as sea-level rise.

Seeking co-benefits means looking for ways to achieve more than just risk reduction alone...
• ... it means looking for economic benefits, social benefits, and ecological benefits, as well.

Achieving co-benefits is managing risk while at the same time adding cultural amenities... restoring natural systems... and providing opportunities for growth.
Slide 54

• Lastly, we’ll look at the fifth element… how innovation requires integrated and leveraged solutions.

Slide 55

• Building a wall, elevating, or moving out of harm’s way can be effective methods of reducing flood risk.

• However, when used alone as singular approaches to address the multi-faceted problem of building resilience, they often fail to provide a robust and holistic solution... especially in dense urban communities.

Slide 56

• The best and most appropriate tools will be dictated by the unique characteristics of each individual landscape...

• ... its people, its buildings, its natural environment, its economy... resilience is place-specific.

• There is no template for resilience... it’s not defined by what it looks like, it’s about how it performs.

Slide 57

• This is an image of Hurricane Sandy.

• We’ve seen images like this before... such as Hurricane Katrina... and we know we’ll see similar one’s in the future.

Slide 58

• One of the conditions that we’re trying to avoid is this... the failure of one or more infrastructure systems.
• So how do we do this in dense urban places such as Lower Manhattan?

Slide 59

• Well... our historical default response to reducing flood risk has principally been three approaches... fortify, elevate, or relocate.

• As suggested in this rendering, the option of fortification with floodwalls or levees isn’t always the most appropriate response...

• ... particularly in areas where we wish to maintain the community’s connection to the water... not isolate ourselves from it.

Slide 60

• The second approach... elevating... is the primary method of mitigating risk under the National Flood Insurance Program.

• However... in cases of dense urban environments, it’s simply not feasible to elevate an entire city.

Slide 61

• The third approach... which is to relocate or retreat... also isn’t a feasible alternative in many places.

• ... So what we need are localized and integrated solutions that are an assemblage of a number of different approaches or design alternatives.

Slide 62

• As mentioned before... floodwalls and elevation can be part of the solution... but they are not the only design approaches at our disposal.
• Innovative resilient solutions will consider how best to employ the full range of design approaches...

• ... which can include things like slowing & storing water flows... as well as using constructed natural systems such as wetlands and reefs.

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Slide 63

• ... And even if we are considering a wall... it’s important to ask the question – as the BIG design team did – how can a wall be more than just a wall?

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Slide 64

• When various approaches are integrated together... they are able to leverage each other to maximize co-benefits and provide the greatest possible return on investment.

• Each customized application of design approaches results in a different built and natural landscape...

• ... but they should all achieve the common benefits of reducing risk while also providing additional value to the community.

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Slide 65

• So... now we’ve looked at various ways of bringing innovation in resilience into the planning and design process.

• Here, we’re going to shift... and look at the products of that process...

• ... and I’m going to do this by looking at the six winning projects from Rebuild by Design as case studies featuring innovative design solutions.

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Slide 66

• Being that the design competition was to increase resilience in the Sandy-affected region, the primary hazard that these projects addressed is flood risk.
• However, addressing other types of hazards... such as wildfires, earthquakes, and tornadoes... can also be informed by the underlying principles and approaches employed here.

Slide 67

• The first project that we’ll look at is from the design team led by the Bjarke Ingels Group, or BIG.

Slide 68

• Their proposal... titled “The BIG U”... seeks to provide large-scale coastal flood protection around Lower Manhattan (hence the “U”).

• ... but it does so by introducing design solutions that are uniquely tailored to the character of each neighborhood... and informed by the input of residents.

• In this sense... the project is thought of by the design team as being the love child of Robert Moses and Jane Jacobs...

• ... combining ambition and visionary thinking with meaningful and engaged participation by local residents.

• The system was designed as a series of compartments, similar in concept to the hulls of a ship... meaning that if one is compromised, the others (being segmented off) will remain effective.

Slide 69

• HUD has allocated $335 million in disaster recovery funds to New York City to help implement the first compartment... which is along East River Park on the Lower East Side.

Slide 70

• One of the contributing factors that drove the team to engage here is the combination of physical vulnerability and social vulnerability.
• Not only is there a need to reduce flood risk with physical infrastructure... there's also a need to build a stronger social infrastructure for the significant population of vulnerable residents that live in the area.

Slide 71

• The proposed project addresses the simultaneous need for surge protection, flood mitigation, and community access to the water... while investing in an underutilized strip of East River Park.

• It does this through an integrated system of deployable walls and floodgates, medians, pavilions, bridges, ramps, and undulating berms.

Slide 72

• The largest extent of the project consists of a system of undulating berms that provide protection from storm surge and rising sea levels... while supporting a series of pedestrian bridges... and maintaining existing sports fields.

• Ramps and bridges are inserted at intervals on major streets, in conjunction with concentrated green infrastructure enhancements.

Slide 73

• These large, landscaped bridges connect East River Park to the community... bringing people to the waterfront in places where the existing coastline prevents it.

Slide 74

• Berms and bridges are planted with a diverse selection of salt tolerant trees, shrubs and perennials...

• ... providing a resilient habitat of tough urban species, that also filter car exhaust and enhance the view from the adjacent highway.

Slide 75
• Ramps allow residents and visitors a way to move between the park and the bridges.

• New plazas would create points of connection... where a series of waterfront activities could occur along the water's edge.

• Overall... this project will substantially reduce flood risk for an area with a high concentration of vulnerability... while at the same time adding tremendous civic, social, and ecological value.

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Slide 76

• Next... we’re going to look at the Lifelines proposal for the Hunts Point neighborhood in the South Bronx.

• This proposal is from the design team led by PennDesign/OLIN.

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Slide 77

• Among the prime motivating factors influencing a focus on this area is that...

• ... it is home to the food market responsible for the distribution of all fresh produce, meat, and seafood for the entire region.

• In addition... it is also home to a very low-income residential community and a major wastewater treatment plant... all exposed to a high level of flood risk.

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Slide 78

• In response, the PennDesign/OLIN team took an integrated approach to flood protection and resilience.

• In addition to providing flood protection... the team recognized the need to restore ecological systems... create job opportunities for the local workforce... improve public health conditions... and capitalize on the ability to serve as a maritime supply-chain hub.

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Slide 79
• At the heart of the proposal, we again see a system of flood protection infrastructure improvements uniquely tailored to the various edge conditions along the peninsula...

• ... from bulkheads and floodgates to marshland restoration.

• The vision is for the area to serve as a laboratory for piloting and testing different methods coastal edge protection... essentially serving as a levee lab.

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Slide 80

• The proposal contains a series of tidal wetlands for high-volume stormwater treatment...

• ... which also improve water quality and habitat in typical storms

• The wetlands are augmented with passive and active pumping systems.

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Slide 81

• The project proposes alternatives to fill... such as cantilevered decks... and decking on light structure where operations make it impossible to build a greenway on land.

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Slide 82

• In thin sections... where there’s no room for meaningful new ecology... creative use of flood walls can still provide public access and recreational opportunities... while also managing operational conflicts with adjacent industry.

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Slide 83

• The waterfront becomes a space not just for recreation...

• ... but also for work... incorporating job training initiatives related to the adaptation of working waterfronts.
• The overall assemblage of integrated design approaches in this project... results in a compact greenway of flood protection that also opens public access to the Bronx and Harlem Rivers.

• HUD has allocated $20 million to New York City to implement a pilot project from this proposal, which the city has already committed to matching with an additional $25 million.

• The city is also looking at additional leveraging opportunities with the various private-sector stakeholders that would benefit from the project.

Slide 84

• Next is the Living Breakwaters proposal from the design team led by SCAPE/Landscape Architecture

• This proposal focuses on the South Shore of Staten Island in New York City.

Slide 85

• Staten Island’s South Shore is very vulnerable to high-velocity coastal flooding and land erosion.

• Though it was once buffered by a shallow bay... dredging and the diminishment of natural and farmed oyster reefs have left it more exposed to wave action over time.

Slide 86

• The proposal seeks to reduce future wave action through an integrated approach that also serves to improve ecological conditions and provide cultural benefits.

Slide 87

• The proposal is centered around the construction of off-shore breakwaters... which serve as a foundation to accommodate new marine growth and provide ecological habitat.

• ... the breakwaters are just one element of a layered approach to risk-reduction that includes multiple lines of defense.
• While living breakwaters reduce erosion and wave heights at the shoreline...

• ... they can also serve to catalyze new waterfront activity... grow beaches... protect sensitive ecosystems... and enable more ecologically- and aesthetically-sensitive methods of construction along the coast.

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• As part of its community outreach and engagement, the design team made very clear what breakwaters do and what they don’t do.

• While they do provide a wide range of functions – what they don’t do is keep out flood water.

• This type of clear communication is very necessary in effectively managing expectations and raising awareness of existing risk.

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• When looking at ecology....

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• Breakwaters are able to help restore beaches... depending on their placement in relation to the shoreline.

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• They are also able to reduce erosion and shoreline loss.

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• Breakwaters can create niches that serve as critical habitat for juvenile fish to mature.
Slide 94

- Overall... they can enhance and strengthen marine ecosystems.
- Designed as living systems... they will build up biogenically... in parallel with future sea-level rise.

Slide 95

- In terms of cultural benefits...

Slide 96

- The design team focused on the area’s rich history with oysters

Slide 97

- Through the mapping of areas that are suitable for restoration of oyster reefs...

Slide 98

- ... and an expert understanding of what is required for oysters to live and thrive...
- ... the proposal seeks to re-introduce the oyster as a central character in the marine ecology of the area.

Slide 99

- ... and as a central character... the proposal uses oysters to drive education and awareness about what it means to live with... and near... coastal waters.
- To do this... the SCAPE team worked in partnership with local schools... to create and deliver a curriculum that brought students down to directly engage with oysters and the water...
• ... while also developing their awareness and understanding of water-related risk.

Slide 100

• Another one of the proposal’s elements to maximize cultural benefits is what they are calling a “water hub” ...

• ... a community facility located along the shoreline that can house educational, recreational, and other community functions.

• The water hub is designed as a place to foster social cohesion as a group gathering space...

• ... it also serves as a bridge to the shoreline... protecting the layered dune system below.

Slide 101

• Conventional flood protection techniques... such as walls... erect a barrier between people and water... and ultimately sever our visual and physical relationship with it.

• This proposal aims to reduce risk... while increasing the perception of risk... by creating a space that integrates aquatic habitat and community access.

Slide 102

• And we’ll wrap up looking at this project by examining its risk reduction.

Slide 103

• As part of the interdisciplinary design team... the scientists at the Stevens Institute conducted hydrodynamic modeling... to estimate the effect that exposed breakwaters would’ve had relative to the Sandy storm surge.
• This area along the South Shore experienced surge wave heights of about 4 to 6 feet.

• Incorporating the exposed breakwaters into the model… resulted in an estimated reduction in wave height of between about 2 to 5 feet.

• This is a significant reduction… which dramatically expands the range… and lowers the cost… of land-based actions that are necessary.

• By reducing wave heights, this reduces the amount of land that would otherwise fall in the high-velocity and coastal storm surge zones on floodmaps.

• This type of modeling is very effective in beginning to see how and where financial benefits might be experienced by property owners.

• Next we’ll take a quick look at the proposal focusing on Long Island… titled “Living with the Bay”

• This design team was led by Interboro Partners… and their proposal addressed flood risk in Nassau County.

• Nassau County is an area of high exposure due to its south-facing shore that is vulnerable to coastal storm surge.

• In many areas, even a Category 2 surge can fully flood a two-story house.
• However… to fully understand the problem of flooding… the Interboro team understood that they had to examine not just how water moves in the form of a coastal surge, but how it falls from the sky and runs off the land.

• This slide maps the location of all of the stormwater outfalls in the area… which are concentrated in the natural arteries of streams and rivers.

• They discovered that a significant factor contributing to flooding in the area wasn’t just preventing water from getting in… it was the inability to allow water to get out.

• As shown here… the location and elevation of many of the stormwater outfall pipes are such that they become backed-up… even in periods of high tide.

• The challenge here is that in periods of low tide… stormwater (with its collected pollutants) drains directly into the streams… which raises water levels downstream and channels pollutants into the bay.

• During periods of high tide or storm surge… these arteries become clogged… causing flooding and higher water levels to neighborhoods upstream.

• The result is that nuisance flooding can become chronic…

• ... and during periods of intense storms, severe flooding can occur even in areas of higher ground.

• The Interboro team’s proposal was a comprehensive and layered strategy for managing water that creates a buffered bay.
• The strategy included managing sediment flows, creating smart barriers for surge protection, enhancing ecological edge conditions, maximizing the ability of streams to slow water flow, and the creation of green corridors.

• The element of the proposal that received HUD funding to help implement was the “Slow Streams” component.

• The most ideal place to implement this strategy is along the Mill River, which experienced flooding due to that damaging confluence of storm surge and drainage back-ups.

• This site also presents a very common landscape condition shared by so many of our coastal and riverine communities that have experienced an urbanization of these natural systems – essentially a hardening of the arteries.

• The proposal seeks to take an urbanized Mill River and transform it...

• ... into a slow stream that serves functionally to store and slow the flow of water...

• ... but which also creates recreational and community spaces while strengthening ecological health and diversity.

• The transformation into a slow stream involves a system of natural and structural elements such as bioswales, catchment basins, and sluices.
• The result is an approach that provides room for the river... increasing its absorptiveness and ability to filter stormwater contaminants that threaten nearby wetlands.

Slide 119

• The project envisions riverfront parks that serve as a cultural and recreational amenity...

Slide 120

• ... and at the scale of the neighborhood streetscape, it proposes bio-swales that also serve a variety of functions.

• As this project is built-out, it's our hope that the approach can be highly replicable and able to be modified for riverine communities with similar risks and vulnerabilities throughout the country.

Slide 121

• Next, we are going to look at a proposal for the meadowlands region in New Jersey.

Slide 122

• The Meadowlands has a long history of striving to find the right balance among natural, cultural, and economic forces...

• ... and its position within the New York/New Jersey metropolitan area ensures that it will always play a critical role as part of the region.

• Through a strategy focused on protection, connection, and growth – the MIT/ZUS/URBANISTEN team envisions a new meadowlands.
Slide 123

- The meadowlands as a site in need of investment in resilience was revealed and confirmed by the design team’s regional analysis of risks and vulnerabilities...

- ... mapping the intersection of elements such as public health, transportation, energy, land use, and social vulnerability.

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- The proposal is again a comprehensive strategy at the regional or watershed scale in response to the nexus of multiple systems that transcend political and jurisdictional boundaries.

- The strategy aims to restore, protect, and grow natural habitat as well as the built environment through the introduction of an integrated berm serving as a piece of adaptive green-infrastructure.

- It does this via two primary project components, which the team calls the meadowband and the meadowpark.

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- The meadowband is a berm designed to be covered by a street lined with commercial, retail and residential buildings overlooking the park.

- Entry points to the park, as well as a chain of public spaces such as boardwalks, sports fields, sculptures, and playgrounds — define the Meadowband as a civic amenity.

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- The meadowpark connects existing and new marshes and freshwater basins with an intricate system of higher and lower berms, which would provide flood protection from storm surges.
• With custom dimensions for each segment, these bermed chambers would capture water. Some would isolate and contain polluted waters, while others could separate fresh or brackish water.

• The meadowpark was conceived in such a way that it would result in a contiguous ring of land, providing public accessibility along the berms while also featuring occasional recreational and cultural opportunities.

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• How these two components come together is in the form of integrated berm protection... improving the natural landscape on one side and the built landscape on the other, both serving as cultural amenity.

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• This integrated berm can take on a number of configurations to respond to each unique edge condition.

• Each segment is adapted to accommodate both the existing site and the future planned outcome, whether that’s the restoration of wetlands or a more compact and dense form of commercial and industrial development.

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• The strategy was divided into phases that can serve as pilot projects focused on both risk and opportunity.

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• HUD funding has been dedicated to assist with implementing Pilot Area #1 in the northern reaches of the meadowlands, which includes the local municipal jurisdictions of Little Ferry, Moonachie, Carlstadt, and Teterboro.
• This aerial image of the targeted area shows the complex mix of natural wetlands, industrial properties, and residential neighborhoods.

• Successful implementation of this project will require new and innovative forms of coordination and collaboration.

• However, local, regional, state, and federal stakeholders are stepping up to take on that task.

• The vision is to transform an often neglected but very valuable landscape from an image such as this...

• ... to this...

• ... re-connecting people to the land and water, while at the same time restoring and protecting.

• An image here of ways to engage with sensitive landscapes... raising awareness and appreciation while treading lightly.

• Ultimately, the New Meadowlands proposal seeks to strike a grand bargain... where there the natural environment is restored, people are connected, and business has a safe place to grow
As with some of the other Rebuild by Design proposals, preliminary modeling of flood scenarios with and without the resilience investment indicate clear and measurable reduction in flood risk for a wide variety of property owners.

Absent a project such as this, property owners in the pilot area can only expect the cost of flood insurance to rise... along with their risk.

However, if projects like this are able to measurably lower flood risk to a point where the floodmaps need to be re-drawn, then protected property owners can look forward to cost savings in the future rather than increases.

The last project we'll look at is in the Hoboken area along the Hudson River.

The proposal is called Resist, Delay, Store, Discharge and was developed by the OMA-led design team.

This proposal focuses on the extreme flooding experienced in the city of Hoboken as a result of Hurricane Sandy.

As you can see in this map from 1868, Hoboken was originally almost an island of a city – along the lowlands of the Hudson River across from Manhattan.

Tidal inlets bordered the city to the north and south.

So... naturally when Hurricane Sandy hit, the storm surge breached at these two points and caused severe flooding from the back of the city toward the river.
• Flooding is also compounded by 94 percent of the city’s surface being impervious... not uncommon for the 4th densest city in the U.S.

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• The main elements of the comprehensive water strategy are fairly simple... the innovation is in how design is used to tie them all together.

• The first element is Resist – prevent water from coming in;

• Second is Delay – slowing the rate at which water flows across the city and increasing the rate at which it drains into the ground;

• Third is to Store – increasing the ability to hold and retain water;

• And finally... Discharge – getting rid of the water being held, primarily through traditional means such as pumps.

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• When these four elements are combined as part of a comprehensive strategy, they have the ability to substantially alter the level of flood risk in the city.

• It’s a layered system that includes the hard and the soft, the grey and the green.

• Employing the use of green infrastructure is central to the delaying and storing – and it will also play a part in the resist strategy.

• At the same time, more structural and technological solutions will be integrated with the nature-based approaches to result in resist and discharge elements that are strong, efficient, and effective.

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• HUD has provided funding to help implement the resist element of the strategy – shoring up the breach points where Hoboken borders the City of Weehawken to the north and Jersey City to the south.

• Similar to the other winning proposals, this strategy proposes coastal protection that is segmented and customized to respond to the various edge conditions along the Hudson River.

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• In certain areas, this could look like a terraced green edge... in others a more traditional bulkhead... and others a deployable floodwall.

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• It’s a weaving of these design approaches together... incorporating a boardwalk as defense, a park as defense, and a building as defense.

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• The objective is to create resilience that is multi-layered and multi-functional...

• ... reducing risk while restoring wetlands and capitalizing on natural features for bioretention.

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• ... providing parks and open spaces that strengthen the city’s connection to the water, rather than walling itself off from it.

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• And in the end... there needs to be results that are measurable.
• This is a model illustrating the how two-thirds of the city is currently at risk of being flooded (the 100-year and 500-year floodplain in Hoboken are very close to one another... almost co-terminous).

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• This is the model illustrating flood risk with the resist elements implemented.

• You can see how significantly these kinds of investments can fundamentally change the landscape of risk... virtually taking an entire city out of the floodplain.

• Again... as post-completion risk levels are able to be certified and reflected in a re-drawing of the floodmaps, there is significant financial gain to be had by thousands of property owners.

• This prospect creates an opportunity to explore creative financing mechanisms that can borrow against those future savings and financial benefits.

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• So... now that we've taken a look at some of what came out of the Rebuild by Design process, we can ask ourselves... what does it take to get to design innovation?

• From our experience, I suggest that design innovation is hinged on three things... ambition, inclusiveness, and environmental understanding.

• Many things contribute to design innovation, but I don’t think it can be achieved without these three things – they’ve proven to be central ingredients in providing the foundation from which innovation can grow.

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• So what is so new about all this... actually not much.

• In the 1960s... these things came to a head within the planning and design disciplines...

• So we’ve known how fundamental they are for more than 50 years.
• However, putting them all together often times remains elusive.

• Our universal and shared challenge to address the impacts of a changing climate now presents us with an opportunity to build on those legacies.

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• Resilience is about opportunity...

• ... the opportunity to do more with our actions... to maximize benefits, impact, and return on investment...

• Resilience is about placing us in the best possible position to thrive and prosper.

• These are some of the reasons why Secretary Julian Castro likes to refer to HUD as being the Department of Opportunity.

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• So with that I’ll wrap up and leave you with a few key references on this last slide.

• Don’t forget... if you have any questions regarding the National Disaster Resilience Competition, be sure to send an email to resilientrecovery@hud.gov

• I hope this was helpful for you... and I look forward to seeing the innovative work you’ll be producing in the future.

• Lynsey... do you have some final words you wanted to wrap up with?