infrastructures as solutions to political, social, environmental and historical problems confronting urban design and planning, and engines for producing new forms of territory and governance. This logic also prompts us to ask about the possible alternatives, can we tell alternative histories? Produce different environments and designs that create encounters with loss and the ruins of our planet in a manner that allows us to imagine actions *other* then continued circulation of capital? It goes without saying, that many of us are committed to this struggle, as part of not only this campus, but a broader effort to rethink race, sex, class, and ecology.

Our challenge then is to fundamentally transform the current resilient hopes of deferring negative futures through the practices of demoing, that mirrors the models of software development, to another mode. This demands beginning to examine the social movements, construction projects, and many efforts in art, design, the humanities science, and politics, that have challenged the positive embrace of end times, and fought to reintroduce other forms of time and life into space. When concrete first emerged as an ideal material in modern architecture and in art, it was in the interest of producing another world, utopias, one that was not yet here. Today, we face another challenge—one of imagining another world while recognizing the tragedy that already has, and is still, occurring to most of life on earth. This demands a change of tense for design and politics. We cannot dream of creative destruction, since we have indeed already destroyed the world, but nor can we continue to embrace a world without futures.

best summated in the separation between risk and uncertainty first laid out in the 1920's by the economist Frank Knight. According to Knight, uncertainty, unlike risk, has no clearly defined endpoints or values.[8] It offers no clear-cut terminal events. In this case, the test no longer serves as a simulation of life. Rather, the test-bed makes human life itself an experiment for technological futures. This "uncertainty" embeds itself in our technologies—both of architecture and finance. Thus in financial markets we continually "swap," "derive" and "leverage" never fully accounted for risks in the hope that circulation will defer any need to actually represent risk, and in infrastructure, engineering, and computing, we do the same.

As future risk transforms into uncertainty, high technology, particular "smart" and "ubiquitous" computing infrastructures become the language *and* practice by which to imagine our future. Instead of looking for utopian answers to our questions regarding the future, we focus on quantitative and algorithmic methods, on logistics, on how to move things not where they end up or measuring the impacts of these actions. Resilience now married to infrastructures of ubiquitous computing and logistics becomes the dominant method for engaging with possible urban (but also more sui generis infrastructures of transport, energy grids, financial systems etc.) collapse. At the same time, terms like "smartness" become our new catch phrase for an emerging form of technical rationality whose major goal is management of an uncertain future through a constant deferral of future results or evaluation through a continuous mode of self-referential data collection without endpoint, and the construction of forms of financial instrumentation and accounting that no longer engage, or even need to engage with, alienate, or translate, extraction from history, geology, or life.

One of the key (and troubling) consequences of these two operations that now shape and form many logistical territories—the practice of demoing, prototyping, and versioning and the imaginary and discourse of resilience--is to obscure differences in kinds of catastrophes. While every crisis event--for example, the 2008 sub-prime mortgage collapse or the Tohoku earthquake of 2011--is different, within the demo-logic that underwrites the production of smart and resilient cities, supply chains, and infrastructures. These differences can be subsumed under the general concept of on-going crisis without clear event structure. That is, whether threatened by terrorism, sub-prime mortgages, energy shortages, or hurricanes, smartness always respond in essentially the same way (and this because the demo is a form of temporal management that through its very practices and discourses evacuates any historical and contextual specificity of the catastrophe). It is precisely this evacuation of differences, temporalities, and societal structures that most concerns me in confronting the extraordinary rise of ubiquitous computing and high-tech

[8] Frank Knight, Risk, Uncertainty, Profit, (Boston: Schaffner and Marx Houghton Mifflin, co., 1921), http://www.econlib.org/library/Knight/knRUP.html. web.

What is true of design is mirrored in finance. As Melinda Cooper has noted in discussing weather futures, contemporary markets have now produced derivatives that are literally producing value from betting on adverse and unpredictable events in *relation to one another* not as discrete occurrences with lived impacts. As she notes,

"As a futures methodology, scenario planning is designed to foster decision-making under conditions of uncertainty. Its focus is not risk as such, but rather the radical uncertainty of unknowable contingencies –events for which it is impossible to assign a probability distribution on the basis of past frequencies…In the process, it is the very relationship between the measurable 'substance' of the commodity – its stored value –and the event-related nature of price that is reworked: where traditional derivatives contracts traded in the future prices of commodities, financial derivatives trade in futures of futures, turning promise itself into the means and ends of accumulation."[6]

Time here becomes not a relationship to the spatial circulation of goods, labor, and commodity, but a thing in itself, a non-historical, but also non-geological or environmental time. Time as a pure ecology of self-reference. Such understandings of time, of course, demand that we ask what the relationship is between derivation and extraction? And provokes new practices most significantly around measurement, since time no longer equals money but rather money derives from the time=time. The form of time here is speculative not predictive. This logic takes its built form in engineering and design through the production of the test-bed, demo, or prototype, which is a form of speculation on a future, without prediction; a practice invoked in many places, as for example through the prototypes and design demos that plan and re-perform seemingly without consequence the destruction of New York City.

Another way to think about how resilience and prototyping or demoing are linked is through distinguishing between risk and uncertainty. If the Cold War was about nuclear testing and simulation as a means to avoid the unthinkable but nonetheless predictable—nuclear war—the formula has now been changed.[7] This distinction is

[6] Cooper, Melinda. "Turbulent Worlds: Financial Markets and Environmental Crisis." *Theory, Culture &Society* 27, no. 2-3 (2010): 167-90: 173-78.

[7] It is important to recognize that there are also alternative histories of temporality and control within computing coming from cybernetics. In the work on organizations and economics from figures such as Herbert Simon, and in the work on neural nets coming from the heritage of Warren McCulloch and Walter Pitts, ideas of "Fuzzy" problems and logic were prevalent, and preemption, not prediction, was a dominant theme. These influences went on to be very important and influential in engineering and financial culture, particularly through the figure of Nicholas Negroponte and through architectural collectives such as Archigram and the Metabolists. For more information see: Orit Halpern, "Cybernetic Rationality," *Distinktion: Scandinavian Journal of Social Theory* 15, no. 2 (2014); Judy L. Klein Paul Erickson, Lorraine Daston, Rebecca Lemov, Thomas Sturm, and Michael D. Gordin, *How Reason Almost Lost Its Mind: the Strange Career of Cold War Rationality* (University of Chicago Press, 2013).

opportunity to foster new research and **fresh thinking** about the use of New York City's harbor and coastline. As in past economic recessions, **construction has slowed** dramatically in New York, and much of the city's **remarkable pool of architectural talent is available** to focus on innovation."[5]

This rather stunning statement turns economic tragedy, the unemployment of most architects, and the imagined coming environmental apocalypse into an opportunity for speculation—technically, aesthetically, and economically. A literal transformation of emergency into emergence; a model for managing perceived and real risks to the population and infrastructure of the territory not through "solving" the problem, but through absorbing shocks, and modulating the way environment is managed.

Such logics pervade the landscape of large logistical and computational environments. Returning to the initial example of the imagined, never constructed, high bandwidth smart city of Rajarat, the development of so-called smart cities follows, on the one hand, a logic of software development. That is, every present state of the smart city is understood as a demo or prototype of a future smart city; every operation in the smart city is understood in terms or testing and updating. As a consequence, there is never a finished product, but rather infinitely replicable yet always preliminary versions of these cities around the globe. Engineers interviewed at the site openly spoke of it as an "experiment" and as a "test," admitting the system did not work, but could be improved in the next instantiation elsewhere in the world. This idea of the infrastructure as "demo" avoids any actual questions of whether there is an impact to this construction on the planet, or labor, or its inhabitants, and opens the door to assimilate any difficulty or challenge into the next version.

The concept of resilience is married here with a concept of a future that is always a version, perhaps a derivative replica, of another moment. This is a form of time where difference is not historical or progressive, but repetitive in practice (the same method is repeated again and again) while producing constantly differing territories. This is a self-referential difference, only measured or understood in relation to the many other versions of smart cities all built by the same corporate and national assemblages.

RESILIENCE AND DERIVATION

This design logic allows the management and negotiation of risks through derivation (from an imagined origin) in a manner that avoids ever having to finally discover the impact of respective events—whether weather, economic, or security—on the world.

[5] Barry Bergdoll (curator), "Introductory statement", https://www.moma.org/explore/inside_out/rising-currents?x-iframe=true#description, accessed November 3, 2016. Emphasis mine.

states. [3] Holling also underscored that the movement from valuing stability to valuing resilience depended upon an epistemological shift: "Flowing from this would be not the presumption of sufficient knowledge, but the recognition of our ignorance: not the assumption that future events are expected, but that they will be unexpected."[4]

Contemporary planning, finance, and design practice abstract the concept of resilience from a systems approach to ecology and turns it into all-purpose epistemology and value, positing resilience as a more general strategy for managing uncertainty without endpoint while encouraging the premise that our world is indeed so complex that unexpected events are the norm. Resilience also functions in the landscape of planning and management to collapse the distinction between *emergence* (which would simply denote something new) and *emergency* (which denotes something new that threatens), and does so in the interest of producing a world where any change can be technically managed and assimilated, while maintaining the ongoing survival of the system, rather than the survival of any particular animal species (which is to say there can be losses to biodiversity, but as long as the system continues to function these are tolerable and acceptable, system survival is more important then the survival of unique individuals or even species).

Nowhere is this better exemplified then in the example of New York City, whose current slogan after the devastation of Hurricane Sandy in 2012 is "Fix and Fortify." A more clear statement about the stance of urban planners to trauma could perhaps not be found. It is very clear that planning must simply assume and assimilate future, unknowable shocks and that these shocks may come in any form—security, economic, environment.

In this case the real destruction of New York was initially imagined as an opportunity for innovation, design thinking, and real-estate speculation. In what can only be considered an enduring irony (maybe ecologies have a sense of humor), MOMA and PS 1 decided to run a design competition and exhibition titled "Rising Currents," in 2010 (shortly before a real hurricane would hit New York) that asked the cities' premier architecture and urban design firms to design for a city ravaged by sea-level rise as a result of global warming. The discourse was abundantly positive.

"MoMA and P.S.1 Contemporary Art Center joined forces to address one of the most **urgent challenges** facing the nation's largest city: sea-level rise resulting from global climate change. Though the national debate on infrastructure is currently focused on "shovel-ready" projects that will **stimulate the economy**, we now have an important

[3] C. S. Holling, "Resilience and Stability of Ecological Systems," *Annual Review of Ecological Systems* 4 (1973): 1-23.
[4] Ibid:21.

improvement.[1] The irony is that this hopeless situation is actually met with hopeful speculation, usually through new forms of temporal management in finance and technology. Thus, real estate speculation can continue to occur on new silk roads, and never occupied "smart" or at least high-end developments, even as the Himalayan floodplanes are destroyed because the end never arrives, but is simply delayed or, more appropriately, derived.

Resilience is a complicated term, for it plays important, but differing, roles in multiple fields, such as engineering and the material sciences (since the nineteenth century, the "modulus of resilience" has served as a measure for the capacity of materials such as woods and metals to return to their original shapes after an impact), as well as ecology, psychology, sociology, geography, business literature, and public policy (in which fields resilience names ways in which ecosystems, individuals, communities, corporations, and states, respectively respond to stress, adversity, and rapid change). The understanding of resilience most crucial to large scale planning projects and contemporary discourse was first forged in ecology discourse during the 1970s, and especially in the work of C.S. Holling, who established a key distinction between "stability" and "resilience." Working from a systems perspective and interested in the question of how humans could best manage elements of ecosystems that were of commercial interest (e.g., salmon, wood, etc.), Holling developed the concept of resilience to contest the premise that ecosystems were most healthy when they returned quickly to an equilibrium state after being disturbed. Holling called the return to a state of equilibrium "stability," but argued that stable systems were often unable to compensate for significant and swift environmental changes. As Holling put it, the "stability view [of ecosystem management] emphasizes the equilibrium, the maintenance of a predictable world, and the harvesting of nature's excess production with as little fluctuation as possible," yet this very approach that "assures a stable maximum sustained yield of a renewable resources might so change [the conditions of that system] . . . that a chance and rare event that previously could be absorbed can trigger a sudden dramatic change and loss of structural integrity of the system."[2] Resilience, by contrast, denoted for Holling the capacity of a system *to change* in periods of intense external perturbation and thus persist over long time periods. The concept of resilience thus enabled a management approach to ecosystems that "would emphasize the need to keep options open, the need to view events in a regional rather than a local context, and the need to emphasize heterogeneity. Resilience is, in this sense, defined in relationship to crisis and states of exception; that is, resilience is a virtue when the latter are assumed to be either quasi-constant or the most relevant

[1] Braun, Bruce, and Stephanie Wakefield (unpublished paper). "Living Infrastructure, Government, and Destituent Power." In *Infrastructure, Environment, and Life in the Anthropocene Conference*. Concordia University, October 19-20, 2015: 1-16.

[2] C. S. Holling, "Resilience and Stability of Ecological Systems," *Annual Review of Ecological Systems* 4 (1973): 21.

RESILIENT HOPES

What does posing questions about planetary futures and technology in terms of infrastructural discourses produce? This question initially emerged for me as a result of field work in West Bengal. There, I was witness to the mass extraction of boulders and sand from the river beds at the base of the Himalayas in Shiliguri that have fueled a speculative building boom in the region and the country. Concrete, as it happens, demands sand particles that are clean, smooth, hard, and without clay or chemical coatings or contamination for the mixture; sand that has been worn by water, usually dredged from a river or seabed. The extraction of sand and boulders from riverbeds in the interest of real-estate speculation amounts to a massive geo-engineering project, whose scale is yet to even be recognized. The result of this speculative extraction is that the rivers are sinking into the earth and drying up, effectively destroying a major source of water for much of India. This trauma is only compounded by the fact many of the new roads and housing complexes, being built as supposedly "smart" and high-tech developments in the name of economic prosperity, go unoccupied, result in the dispossession of millions of the previous lower caste inhabitants, and are heavily leveraged. While global banking profits through credit-debt swaps, localities are often "left in the dust" both literally and figuratively; one can barely breathe in Shiliguri as a result of the dust from extraction.

This scene opens to a series of questions about how speculation and computation (particularly in finance) are joined together and operating under conditions of environmental and human catastrophe. I propose that this scenario is but one piece of a new form of speculative hope that is indoctrinated within an emergent paradigm of what I want to label "resilient hope." Resilient hope links high-technology computational infrastructures of ubiquitous computing and "smartness," data centers, and finance to the far more "concrete" – if we will – spaces of locations such as West Bengal.

RESILIENCE AS INFRASTRUCTURE

In that this is a short and speculative piece, I want to focus on how resilience and technology marry to create this form of preemptive infrastructural governance that naturalizes precarity, sacrifice, and violence as necessary economic values rather then political options.

Resilience is a particular logic. It is not about a future that is better, but rather about an ecology that can absorb constant shocks while maintaining its functionality and organization. It is a state, following the work of Bruce Braun and Stephanie Wakefield, of permanent management without ideas of progress, change, or