# PAST IS PROLOGUE

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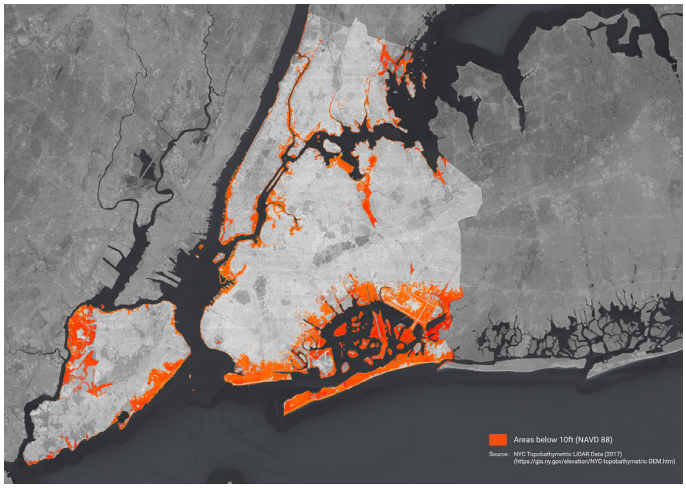
Hurricane Ida has demonstrated how, when considering the impacts of the climate crisis on our cities, the past is prologue. The flooded basement apartments in Flushing, located in the floodplain of the buried Kissena Creek, are a vivid example of how the land use choices that were made, and the urban systems constructed, have not taken our natural systems into account. The hubris of fossil-fuel driven development and use of concrete has come to roost in the climate emergency, where tempests spurred by the same hubris overwhelm our cities. We need to undo and repair at a massive scale to mitigate these impacts, at a speed much greater than with which our cities were built.

What has me worried is that, while Ida was bad, future climate conditions will be much worse, and will start to compound one another. Undoing and repairing needs to be combined with preparation for that future. This all needs to start now: city making (and changing) takes time, especially when one wants to optimize the transformation with ongoing investment cycles.

Two issues demand extra attention. The first is that, with sea-level rise, large areas of New York City will effectively become a polder, as the Dutch call it, meaning an area surrounded by dikes and kept dry by pumps.

In New York City, for example, 120 square miles of land lie less than 6 feet above the high tide line. This land is home to nearly half a million New Yorkers, as well as $101 billion in property value, more than 1,500 miles of road, and 100 public schools. These numbers nearly double at 9 feet above the high tide line – Sandy's peak flood elevation as measured at the Battery in New York City.[1] For urban communities in this situation to remain livable towards the end of the century, it is necessary to protect against repeat or permanent coastal flooding and drastically alter the stormwater management infrastructure such that water can be retained during heavy precipitation events.



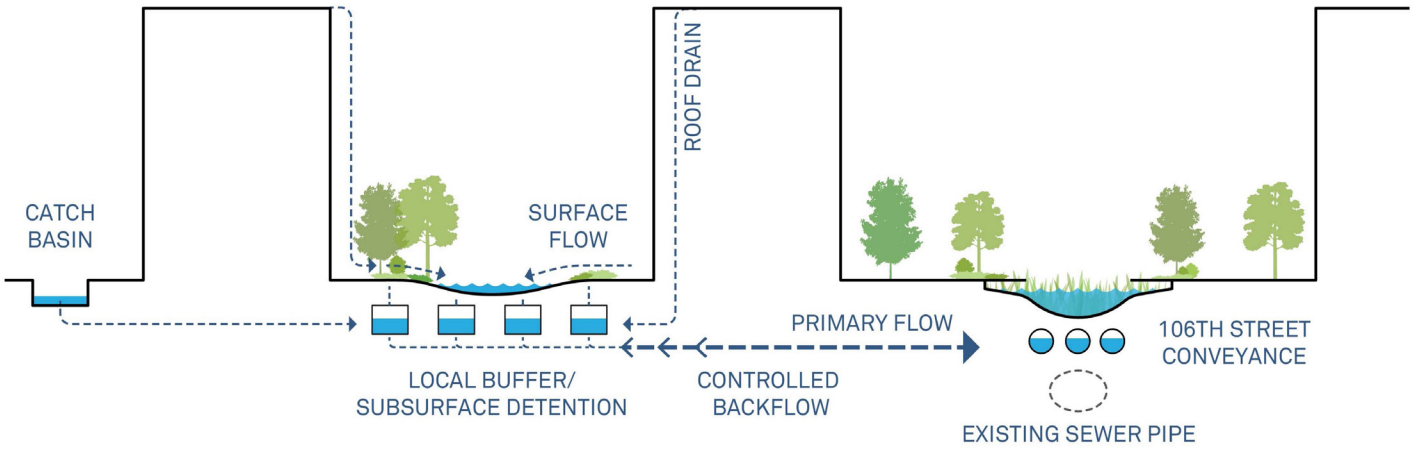

[1] Climate Central New York and the Surging Sea April, 2014

Stormwater management infrastructure ideally encompasses all scales of intervention, from measures for individual buildings, such as rainwater barrels or "blue" roofs, places for stormwater in parks and open spaces, temporary water detention above ground or through detention crates below, to measures using public infrastructure such as roads and sewer systems. In densely built-up cities, in particular, there is very little space available for stormwater management, so every possible measure counts.

In a study for New York City's East Harlem neighborhood, commissioned by New York City's Department of Parks and Recreation and the Mayor's Office of Resilience, ONE Architecture & Urbanism, working with the landscape architecture firm Starr Whitehouse, explored the relationships between coastal protection, stormwater management, and open space. East Harlem is a low-lying part of Manhattan, and drains a large area. In old maps, such as the well-known Viele map from 1865, creeks flow from what is now Amsterdam Avenue, on the west side of the island, to the East River. On the map, the coastal area is swampy and marshy. The flood maps that were made for the study showed that exactly those areas, the former creeks and swamps (particularly between 96th and 120th street) would flood all the way to Central Park during a big rainstorm event or a coastal flooding event. Further analysis showed that a future coastal protection system would increase the flooding from a cloudburst unless additional measures, either using retention or pumps, were taken.

The team proposed an approach aimed at reducing pumping as much as possible and instead invest in green solutions that enhance the neighborhood. Stormwater pumps are designed for average rainfall – not extremes – use a lot of energy, have a chance of failure, and have none of the benefits that green retention infrastructure would have, such as streetscape improvements and cooling effects. The approach calls for decentralized retention infrastructure at all scales, connected into a system that would optimize the storage capacity and be able to convey the water to the shore where it can, at least in the coming decades, drain at low tides. In this study, E. 106th street was proposed to become what is essentially a new, partly nature-based, partly piped creek that holds and conveys water. A newly imagined street with its creek in the middle can double as a piece of social infrastructure, with a pedestrian promenade and a bikeway, and places to hang out or play in the shade of the new vegetation. As such, the development of public green stormwater infrastructure can undo some of the historical inequities, including lack of tree canopies, that plague the formerly redlined neighborhood.

The second issue is adapting to climate change and population increases. With the increased rainbombs that will come with a changing climate, it is important to create much more space for water retention and conveyance. At the same time, the city is densifying, as it should be. But the City's guidelines and norms for new projects are



based on near term climate projections rather than on the climate reality affecting these developments during their lifespan. An analysis by my firm for the Resilience by Design Amsterdam Metropolitan Region program showed that even recent area developments will have to be adapted to accommodate a changing climate after 2050, and that the increased density of development results in a lack of space to adapt by using cost-efficient and multi-benefit green/blue infrastructure solutions. This will result in significant additional costs for expensive solutions in future years, such as blue roofs, crates under pavements, and tanks in basements. These costs could have been avoided by taking future climate change into account now, with early investments in open space reservations and blue/green infrastructure.

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It also makes financial sense. Economic analysis shows that by accounting for the multiple benefits such solutions bring (including higher real estate revenue because of the increased attractiveness of the environment), the total return on investment will be higher. However, making long-term investments in climate-robust solutions early is often difficult for real estate developers – or first-time buyers – who have a much shorter time horizon. The result, however, might be a combination of distressed real estate in the future, or much higher adaptation costs, which just might fall in the public domain.

Taking future climate change into account now should guide the way our city is made, including a recalibration of the balance between built-up area and an increased amount of open area providing a host of ecosystem services to mitigate flooding and urban heat, retain fresh water, increase biodiversity, and provide recreational amenities. By keeping generous open areas in the public domain, access to these green spaces can be given to all, and public authorities can ascertain that this new public infrastructure performs optimally on a systems level.

The ultimate consequence of the East Harlem work demonstrates that in order to adapt to climate change, we must reimagine the role of parks, streets, and public spaces as infrastructure for water management, and invest in the associated budgets for construction and maintenance. This work could be stewarded by its communities and the people employed by a new "Climate Corps," further enhancing connections to neighbors. If the "now" is the past of the future, let us not make the same mistakes in their prologue.