Sea-Level Rising

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Abstract

Global sea-level rise has been a major issue for coastal development since the 20th century and believed to be the result of two major factors: thermal expansion and melting ice caps. An astonishing 90% of atmospheric heat is associated with human emissions. Thermal expansion is a matter of scientific certainty: water expands as it warms. Melting ice is adding to the water levels as the atmospheric temperatures increase. Decades of attempts to control the sea-level have been met with varying degrees of success. Rising sea-levels have driven everyday tidal levels to historic heights and have exaggerated storm surges to devastation levels. This affects millions of people. In the United States alone, almost 40% of the population lives in highly populated coastal areas.

What we discovered throughout history is that cities have done little to protect their residence until something devastating breached their space. The Netherlands and the United States are just two of the many examples we investigated. Cities in the Netherlands moved ahead with innovations at a faster pace, but still could not protect itself from the flood waters. US cities, like Manhattan, battled arrogance and denial and moved even slower. As a result, Manhattan authorities neglected to enact precautionary steps that would have prevented massive destruction from Hurricane Sandy in 2012. With hurricane damages repaired, bureaucratic red tape and slow action hindered acceptance and construction of the many ground-breaking solutions to protect Manhattan. Consequently, in 2025, Hurricane Phoenix's storm surge paired with the already flooding high tides, wiped out half of Manhattan. As sad as the overwhelming losses were; the destruction opened the doors for the innovative design of a safer, more secure city that incorporated the water level.

Today Manhattan is divided into two sections; one part referred to as Old "Historic" Manhattan and the other New "Innovative" Manhattan. Old Manhattan is the remnants of what Manhattan used to be in the 20th century. New Manhattan offers a shift in coastal living. Innovations have provided the means for residents to coexist with nature instead of making it a battle between man and nature. The state-of-the-art infrastructure that includes food provisions, energy production, transportation options and living spaces have also improved the health and well-being of its residents. Unfortunately, this has resulted in a deeper economic divide between those rebelling change in Old Manhattan and those embracing it in New Manhattan.

Globally, eight of the world's ten largest cities are near a coast, and with continued ocean and atmospheric warming, sea-levels are expected to rise for many centuries causing increasing devastation. Coastal cities need to adopt and invest in a new mindset toward living with our planet's natural habitat. New Manhattan has stood as a model for this type of living. Other countries such as the Netherlands and their floating developments are embracing this change. It is up to us to assist and change the remaining cities before it is too late. It is wise for us to remember, nature will never allow mankind to harness its power for long, before it reminds us – it was here first.

Compilation

This document is meant to serve as a brief history of post Hurricane Phoenix Manhattan. The city now exists as two distinct entities, New Manhattan and the Historic District. Although these areas had previously acted as one unified borough, today only their histories unite them. The separation came immediately after Hurricane Phoenix as half of the city was leveled, while the other half managed to survive. New Manhattan was quickly rebuilt over the ashes of the former city, becoming a model city for combating rising sea levels. New Manhattan's modernity, coupled with its reduced occupancy, caused property values to skyrocket. This created strong socio-economic and cultural divides between the districts, causing the middle class to struggle against rising sea levels while watching the upper class residents of New Manhattan live lives of luxury.

This tale of destruction and restoration, of despair and hope, starts in the year 1966, when a substantial amount of smog covered the New York City skyline. The poor air quality resulted in 400 deaths and many emergency anti-pollution plans into place. Later in 2000, scientists started becoming increasingly vocal about other environmental issues such as ice melting, temperatures warming, and sea levels rising. They routinely discussed that humans are destroying our atmosphere and causing major planetary shifts due to the excessive lifestyles many led. There were many skeptics that kept the population from truly accepting these warnings.

In 2010, the Dutch took heed of the scientists' warnings and began the process of adapting their coastline to accommodate the changing world. However, nature decided not to wait for the completion of the upgrades.

However, in 2012 nature gave the humanity a wakeup call. Hurricane Sandy devastated Manhattan and people started to pay attention. Plans were developed and infrastructure revised to accommodate flood conditions. But, as with any new plans, government works slow and money was an issue, and the slow pace of change put the city at risk.

Across the world, however, other nations began to act proactively to attempt to mitigate the damage. With rising sea levels, the Netherlands approaches the issue with an adaptive solution where rather than keeping the rising waters away the apartments are now able to rise alongside the water.

The United Nations urge other sovereign nations to begin preparing for climate related catastrophes. UN Messenger of Peace Leonardo DiCaprio releases a film with National Geographic discussing the dangers of climate change, adaptive and mitigative techniques to solving the problem, and the importance of education.

However, the preparations by the Dutch, as well as the warnings of the UN, were not enough. In August of 2020 the Dutch city of Rotterdam, second-largest city in the Netherlands, was completely destroyed by the largest hurricane and storm surge ever recorded. The total number of deaths were massive and the damage was in the billions. This single event opened the

eyes of many countries including the United States, especially Manhattan whose change after Hurricane Sandy were moving slow.

By 2021, scientists, engineers and activists stepped-up efforts to convince New York City's Mayor that action needed to be taken. The next phase involved contacting architectural firms across the globe to research and ultimately design the best solution for Manhattan. This process, unfortunately would take three years.

In the year 2023, the design officials decided on the construction of "The Big U" project. Rebuild By Design is the creator of the solution. The "Big U" is a 10 mile barrier that stretches from West 57th Street down to the Battery and up to East 42nd Street. The Big U creates a shield against rising water levels. This flood-prevention technology is designed to both protect public gardens and parkland for all city residents. They have made their millions reimagining community solutions for large-scale, complex problems. As the plan neared completion, on September 25, 2025, the most devastating storm to ever hit the continental US made direct landfall on New York City. It was Hurricane Phoenix that changed the face of Manhattan forever. Every side of Manhattan from the shoreline inland for blocks had been flattened. Seventy-five percent of Manhattan was just gone. The worst of the devastation went from west 54th street to the peak of the city and extended up the eastside to east 40th street. It took a year to clean out everything that was destroyed, but then the construction of what we know today as New Manhattan could begin.

With one part of Manhattan destroyed, and the other protected by the "Big U", it was time to rebuild. Now with a clean slate to work with, developers began to reimagine New Manhattan as an opportunity to innovate and accommodate the unpredictable connection to the sea. The next construction phase was imperative to complete before any other phase was to begin. It was a modified version of the original Big U proposed before the hurricane's devastation. It would not only protect the city, but provide adequate space for recreation. The grand scale of this innovation was known worldwide. It re-established the property values that were washed away by Phoenix.

The year 2027 brought about the Sustainable Housing Act. With the destruction of many buildings, requirements in the designing of new buildings are put into place. All buildings in New Manhattan were to be constructed with the use of passive solar for heating and cooling in an effort to lessen electricity demands. Solar could do more than just create electricity for the city, it also provides hot water. Solar thermal collectors can be placed atop the roof alongside the traditional photovoltaic panels and heat hot water tanks, reducing the need for fossil fuels. Citizens do not mind these extra costs for sustainable solutions because it decreases utility bills exponentially. Heat also comes from advances in thermal technologies, specifically in trapping thermal energy. Passive solar solutions help lower the reliance on the thermal collectors for heat, allowing the sun to do the job itself. By improving the designs of windows and walls, insulation drastically improves to create a better collection of solar heat in the winter, but also a rejection of solar heat in the summer. Buildings were built a lot shorter. In New Manhattan, there are no

more skyscrapers and instead buildings are no longer built tall and thin and are built wider and shorter. In addition to the new framework of these buildings, the floor and materials in these buildings were also waterproof.

With the constant flooding occurring the subway systems were abandoned for an aboveground alternative. City planners turned to the monorail as the solution to this issue. In 2027 construction began on the Grand New Manhattan Monorail System. This system was designed to connect both the existing subway system found throughout the rest of New York City, as well as a massive parking garage on the mainland. The rail ultimately began use in 2029 once construction was finished.

Taking ideas from Dutch coastal engineers, considered by many to be the premier coastal engineers of the world, city planners decided that they could not longer simply expect to keep all water out, but must learn how to live with allowing water into the city. To this end, in 2029, New Manhattan banned all automobiles from the city and transformed the existing roads within the city into canals that can be used to mitigate floods.

In order to offer a substitute for the lack of automobiles, city officials allowed the creation of W.O.L, Water Or Land, vehicles. The ferries worked similarly to Uber or Lyft, where someone could request a W.O.L. ferry to transport them to their destination through an app. The W.O.L ferries were manufactured in order to be able to withstand any weather conditions including hurricanes and major floods that could possibly occur if the sea level continues to rise. Additionally, the new system fully ran on renewable gases and solar energy. The new system created new jobs for many citizens, helping to revitalize the New Manhattan economy.

To offer a way to navigate the city in case of flooding, other than the W.O.L. system, suspended walkways were implemented throughout the city. The concept originated from the walkway in New York City called the High Line, which sustained little damage after Hurricane Phoenix. The walkways would offer enough space below them for the ferries and other vehicles to navigate with ease. The walkways operated as a free substitute to the W.O.L. system, consisting of both bike lanes and pedestrian paths. The walkway would connect building to building as if the road system originally in the city was risen up to adjust to the changing climate.

Modifications were made to the Urban Care Act in 2029 which modify the existing pathways with the construction of solar walkways. Local government hopes this enactment of new criteria will help ease energy demands of New Manhattan, leading it towards self-sustainability. 140 feet of panelling is equivalent to the electrical demands of one house. Suspended walkways were adopted to have solar cells for floors. Solar walkways had been tested in Europe and after seeing positive results, they became the answer for a sustainable New York City. The LED lights within the panels allow for lanes to be lit up for a safe and visible way to travel around. The success of the solar walkways, coupled with the difficulty of transporting goods into the city, led government officials to rethink rooftop solar panels. Building codes were adjusted to encourage more urban farming. It was changed to state that all buildings in New Manhattan must produce a certain amount of food per floor, or receive a fine. This caused many

to replace their rooftop solar panels with rooftop farms, while others turned towards hydroponic farming. The new building codes also included rules which did not allow the construction of buildings greater than ten stories. This was intended to improve their chances of surviving high winds, like those experienced during Hurricane Phoenix.

As New Manhattan continued to create a more suitable and eco-friendly living environment, the city noticed a dramatic decrease in asthma and obesity rates. Due to the cities reduction in motor vehicles and increased options in man-powered travel options, people began to use the alternatives. Biking, walking, and running to destinations help people to cut weight while the battery-powered automobiles reduce the emissions which are inhaling. While New Manhattan experiences this increase in the standard of living, the Historic District continues to see a worsening in conditions.

In 2030, the New York state government approves the construction of an offshore wind farm to further assist New Manhattan towards full sustainability. The turbines are to be placed out in the Lower Bay, just south of Manhattan. Each offshore turbine can produce 3.6 megawatts, which can provide power to around 3,000 homes. While the turbines started in the shallow water, they continued to expand to the nearby shores and beyond. These turbines were able to provide more energy than all solar energies in the city combined. Turbine efficiency continued to increase and cheaper materials were used to create them. Government subsidies to companies creating turbines promoted growth in the sector. Opposition to the turbines, specifically the “not in my backyard” mindset, ended with the rising sea level and decreasing interest in the aesthetics of seafront property.

In 2036 as a final development towards self sustainability, New Manhattan begins the production of its first tidal turbine farm through the enactment of the Sustainable Solutions Act. Harnessing the power of the tides, these turbines reside deep offshore to provide clean energy to the city. A reliance of strictly solar and sustainable gas does not provide enough diversity in the city’s energy sector. The turbines are located in the Sandy Hook Bay and Lower Bay, just south of New York City. With the rising sea levels, the deeper waters allowed for the use of this technology, as boats can now function without disrupting the turbines processes.

All of these innovations have left the Historic District behind, stuck in time, as they did not have the opportunity to completely rebuild their city and instead must address coastal engineering problems as they present themselves. Many residents left the city after the devastation of Hurricane Phoenix, fleeing to the countryside or the newly built New Manhattan. The ensuing population drop has left the Historic District as a ghost town when compared to the thriving metropolis that once existed there. The city now floods regularly, making the bottom floors of many buildings unusable causing many residents to retreat to the upper floors of their skyscrapers. Entire sections of the city have been leveled to allow room for coastal engineering projects. The most successful of these were the sand dune dikes that doubled as parking garages. The sea wall which engineers developed is one of the main reasons why the city is still standing. Because of the cost of the endeavor, the property values skyrocketed beyond their pre-hurricane

ones and left New Manhattan attainable for only the wealthy. The suffering of Historic District citizens coupled with the relative prosperity of New Manhattan has led to extensive civil strife. Numerous violent protests as well as an influx of crime led to the building of the Wall, which physically divides the districts. This led to further suffering for the residents of the Historic District, dropping their population to an even greater degree. This has led to the current debate of possibly leveling the entire Historic District in order to rebuild it as a mirror image of New Manhattan. Until the decision can be reached on whether to revitalize the city or to completely rebuild it, the people of the Historic District continue to suffer.

Below are two examples of citizens from Manhattan, during the later 2030's, where both perspectives are viewed upon. One citizen lives the luxurious life in New Manhattan while the other survives day to day in the Historic District.

New Manhattan Citizen

New Manhattan has a completely different design than the rest of New York City and acts as a separate entity. Clear differences can be seen between New Manhattan and the Historic District in terms of coastal engineering. New Manhattan has adapted well and focuses on minimizing damage when storms strike, allowing the water to become a part of daily life. The Historic District, on the other hand, focuses on preventing water from entering the city at all costs. This is an example of a city that hopes to maintain a pre-Phoenix existence, refusing to appropriately acknowledge the dangers of a changing world.

New Manhattan is very different from most cities designed before the turn of the century, but the population does not suffer as a result. Buildings are now built much lower to the ground, in order to help prevent the catastrophe experienced on 11/10. This means that fewer people live in Manhattan now, but it is worth it for the increased safety of those who do remain. These new buildings also were designed with the expectation that they would flood. All buildings have a bottom floor that is designed to withstand water damage, while the basements often have exceptional drainage systems. The skyline that once represented the city is gone, but the people and our cultural identity remains.

Flooding is now a regular occurrence in New Manhattan and the transportation system had to be adjusted accordingly. The old subway tunnels are now completely submerged in water daily, when the tide comes in, rendering them unusable. The roads can no longer support cars, as it is far too dangerous of a risk to allow them to be caught in the city when the tide comes in. Instead, they have been lowered to act as canals that absorb the water from high tides and floods, protecting the surrounding buildings. Now, only bicycle and pedestrian paths remain. While this may seem like a great inconvenience to the people of New Manhattan, many citizens embrace the change. The streets are no longer congested, asthma rates have dropped exponentially and buildings look cleaner than ever. Without worrying about room for parking there is far more available space, compensating for the loss of skyscrapers. The lower buildings also allowed for

the development of our new public transportation system, the monorail. This high-speed monorail facilitates travel throughout New Manhattan, allowing people to reach their destinations quicker than ever before. It is much more expansive than the previous subway system and even connects to the subway system in the historic district of the city. The system connects to the mainland at a massive parking garage, allowing visitors from the rest of the country to visit New Manhattan. This new form of transportation is far more sustainable and efficient than the previous forms New York City has seen and has received nearly universal acclaim from New Manhattan's residents.

Urban farming is also expanding exponentially as transporting materials into the city has become increasingly difficult. The only method of bringing produce into the city is through the canals. While this is possible, it is much more expensive, causing lawmakers to make some changes. The building code for New Manhattan now requires buildings to produce a certain amount of food per floor or pay a fine. The vast majority of buildings now include a rooftop farm to help supply the tenant's needs and avoid this fine. While outsiders may look at this as a negative, many in the city see it as a blessing in disguise, as fresh produce was nearly impossible to find in New York before the storm.

Historic District Citizen

Living in Old Manhattan varies much differently than the newer, rebuilt side of the city. On that side people are able to live without worry that their homes will be damaged during the storm seasons, but for us over here the only defense between us and the raging waters is the storm wall.

Ever since I was a child I always found enjoyment in fishing, and after failing to complete my degree in marine biology, fishing was the field of work I too ended up in. Everyday I wake up early and head down to the docks where I meet with my crew before setting sail. We make our way out into open waters, just outside the Hudson River, and spend the day catching whatever we can. We then bring in that catch and sell the fish to a middleman, who then sells it to the local markets. I will usually try to keep some of the catch to bring home for dinner for my family.

With the conditions of the subway deteriorating due to the constant flooding, we no longer can use them. Instead we have the monorails or the above ground walkways. Having a limited income I try to restrict our usage of the monorail, but sometimes it is simply too impractical to walk such far distances.

Many of my decisions along the way led me to this lesser standard of living which I have today. My first decision I had to make regarding these rising sea levels was whether or not to stay here in the city. As they started to increase I assumed the people of the world would come together to find some solution to stop this whether it be renewable energies, reduced emissions, or something along that line. This optimism led me to see it out, and so I stayed in the city. My

family was comfortable here, I had a job, and was able to sustain my way of living. Plus, in the past when storms have hit (like Katrina and such) the government has always come to the rescue.

Another decision which also ended up being a mistake was when the government began fixing up New Manhattan, I wrongfully assumed they would prepare the whole city for the rising sea levels, not just the part which was destroyed. The new side of the city became the focal point, and all we got was a sea wall, which did not even end up restricting all the flooding. As people saw the better features of the newer city they began to relocate, as long as they had the money. For those of us who could not afford the move, we saw our standard of living continue to decrease. The less people in the area, the less people were concerned with how the storms would affect us.

This system of rising sea levels affects my life greatly. One of the biggest interactions between me and the waters is the restriction of my family's level of well being. After the damage dealt to the one side of the city, the idea that this could happen to any of us lingers in the back of our heads. Besides a constant fear of the destruction of our home, the repairs to the city as well as New Manhattan our paid by our taxes, meaning I have even less income to spend on my family. This takes away from my savings and puts our future in jeopardy. This is no longer an interaction with the system anymore, this system has a controlling grip on my life as well as that of my family.

The rising sea waters affect my life and I care very much about the mitigation of the issue rather than the adaptation to it. The rebuilt side of the city is made for this new climate of higher sea levels, it is made to withstand aquatic issues and catastrophic events. Our side of the city is not, and boxing us up with a wall is not the solution to our issues. Water will continue to rise, and sooner or later it will not matter how tall the wall is, and it will be breached. If I could afford the luxurious lifestyle of living in New Manhattan then I would not even second guess the idea of moving there, but a person in my line of work just cannot make ends meet in that frivolous of a lifestyle. I need to save to make sure my family has a back up plan, whether that be for flood repairs, moving elsewhere, or just for the latter part of my life, money just for contingency plans. God forbid, if I used that money to move to the new part of town and an even stronger storm was able to cause damage to our new home, we would be ruined. The adaptation techniques really only benefit the upper class citizens of the city, leaving the rest of us to fend for our lives against the changing climate.

As the temperatures increase my catch of fish seem to be increasingly harder to find. As these fish dwindle so will my income, and that of many other people. Instead fish will begin to just be imported from elsewhere leaving all of us fishers to relocate or find other sources of work.

Conclusion

Today is December 31st 2040. I haven't been consistent with my annual recap journaling ever since Hurricane Phoenix hit Manhattan and wiped out half of our city. Looking back, I never would have expected my life to be where it is now. I never would have imagined half of the technology we have now. I never would have thought about my sister having such a different lifestyle than mine just because she lives on the other side of the road in Old Manhattan. It is crazy to think about how much your life can change in the blink of an eye. It is crazy to imagine how much of an impact that our human activity had on these changes. I wonder how different our lives would be if we would've realized our impact on nature sooner. Now, we look back and can analyze and see how we have changed our relationship with nature and work to use our technologies to help bring out that technology better. Now after much thought, I realized that technology will either control, mediate, or reveal nature.

One relationship between technology and nature is the ability technology has to control nature. One the biggest technological system that was created was the "The Big U". The Big U demonstrates how technology has controlled nature. The main objective of the Big U is to help us, people of Manhattan, feel safer dealing with the higher sea levels and the risk of flooding in certain areas by creating a shield against these rising water levels. By building the Big U, we intended to control nature by controlling which areas of the city were most susceptible to flooding.

Another relationship between technology and nature is technologies' ability to mediate nature. In the new technological system, one of the more explicit representations of this relationship is shown in the creation of the canal system. Unlike the cars from before the storm, the canal system allows nature to appeal to not only one's eyesight but also to their ears and nose. I used to drive to work everyday before the storm. Now, I use the new canal system. Since the canals are slower, I actually have time to witness and experience the environment around me everyday. I can see the sun rise and feel the cool breeze every single morning from the rooftop deck with my cup of coffee every single day before work. It is so much better than trying to look through my rearview mirror at the sun rise behind me while stuck in bumper to bumper traffic. Now, I can relax and enjoy it.

The last relationship between technology and nature is the ability technology has to reveal nature. Although there is not a specific technology that strictly reveals nature in our eco socio-technical system, New Manhattan as a whole is a good example of revealing. This is because instead of trying to control nature as in Old Manhattan, we in New Manhattan use our technology to experience nature everyday. The water cannot be ignored in New Manhattan since most of our new technology especially in our transportation system adapts and lives within the water instead of holding off the water like in Old Manhattan.

As any citizen that travels or lives in either New or Old Manhattan can see, there are many different ways to experience nature. Whether someone controls it like the people in Old

Manhattan, or mediates and reveals it like us in New Manhattan, is up to them. But from the way I see it mediating and revealing nature helps us feel safer and more appreciative of the environment around us.

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