Metropolitan Waterfront Alliance

Testimony of Cortney Worrall, Chief Operating Officer at Metropolitan Waterfront Alliance
on amendments to Local Law 22:
To amend the New York City charter, in relation to convening the New York City panel on climate change regularly, for the purpose of producing a report on climate change adaptation in New York City.

Before the Committee on Environmental Protection
April 25, 2012

Good morning and thank you for the opportunity to submit this written testimony. I am Cortney Worrall, COO at the Metropolitan Waterfront Alliance. The Metropolitan Waterfront Alliance (MWA) is a coalition of over 640 businesses, community and recreational groups, educational institutions, and other stakeholders committed to transforming the New York and New Jersey Harbor and its waterways to make them cleaner and more accessible, a vibrant place to play, learn and work with great parks, great jobs and great transportation for all.

MWA commends New York City for its progressive leadership in addressing climate change impacts on the City. New York City is recognized nationwide for its climate change assessments, mitigation strategies, and adaptation strategies. We support the proposed amendments to Local Law 22 and look forward to working with the City on this and more of the City's climate change work.

MWA and many of its partners have a unique perspective on climate change adaptation that we believe should be reflected in the proposed amendments. The New York City waterfront is particularly vulnerable to impacts from climate change be it the frequency and intensity of

storms, sea level rise, or local flooding due to storm surges. Therefore we propose additional language regarding the New York City waterfront and other edits to the proposed amendments.

The New York City Waterfront Management Advisory Board was newly reinstated as of last year and has begun to meet twice per year to review progress on the City's implementation of the New York City Comprehensive Waterfront Plan. Goal 8 of the Comprehensive Waterfront Plan - *Identify and pursue strategies to increase the city's resilience to climate change and sea level rise* – describes the challenges facing the City's waterfront. This includes impacts to parks, esplanades, piers, beaches and boat launches; residential and commercial buildings; the working waterfront and industrial areas of the waterfront; and impacts on our transportation system from storm surges and flooding from climate change and sea level rise. For these reasons MWA recommends including on the New York City Panel on Climate Change representatives of waterfront related non-governmental organizations and one to two representatives of the New York City Waterfront Management Advisory Board. Specific edits to the amendments that we recommend are:

j. New York city panel on climate change. 1. There shall be a New York city panel on climate change whose members shall include but not be limited to, climate scientists and experts, academics, private sector practitioners, including legal, insurance, and risk management experts, representatives of waterfront oriented non-governmental organizations, and representatives of the Waterfront Management Advisory Board who shall be appointed by the mayor.

MWA also recommends that in subsection iv the following language is included to ensure plans such as the New York City Comprehensive Waterfront Plan that include climate change sections are included in the assessment of plans given new findings and climate change predictions:

vi. Adaptation plan assessment. Analysis and assessment of the New York city climate change adaptation task force's, or any other applicable department or office's, active or adopted adaptation plans or *sections of plans that address climate change impacts* in light of the panel's current findings and predictions on climate change data and impacts.

In order to make sure the panel is effective and responsive to a changing environment, MWA recommends the panel meet at least once every year as opposed to the once every two years that was proposed in the original amendment. Many successful climate change working groups, around the country meet as frequently as a bi-monthly basis. In addition we propose the addition of the word "waterfront" to section 2 to charge the panel with the task of analyzing specific threats to the City's waterfront and developing an adaptation strategy to mitigate these risks as part of the report produced by the panel. Specifically we recommend:

2. i. The panel shall meet at least *once every year* for the purpose of developing climate change projections for New York city and tools to assist the city's climate change adaptation task force, or any other applicable department or office, in implementing procedures, actions, and programs to address current and future impacts on critical New York city infrastructure, *waterfront,* and on vulnerable citizens.

MWA's general recommendations include more specific information about metrics for climate change indicators. We suggest changing this section of the amendment to read as follows:

ii. Indicators and monitoring. Discussion and analysis of indicators to monitor for climate change data, which shall include, but not be limited to, the *atmospheric carbon dioxide levels, greenhouse gas emissions*, global and regional sea level, *seasonal anomalies* in *polar ice melting*, and *any* advances in climate science and technology *that can aid in measuring and analyzing this data.*

MWA recommends that before determining climate risks factors and infrastructure impacts policymakers must first look at climate change scenarios. For this reason, we suggest swapping Section 3.iv. with Section 3.v. Analyzing and assessing climate change scenarios will give decision makers the background to determine focus areas for mitigation and adaptation strategies. The analysis for determining climate risk factors and infrastructure impacts should assess the physical, economic and social vulnerability under varying climate scenarios.

The proposed amendment states that the panel will meet to develop tools to assist in "implementing procedures, actions, and programs to address current and future impacts on…vulnerable citizens". In order for this to be effective, a method of communication between the panel and vulnerable citizens must be established. In order to accomplish this we are proposing the following addition to Section 3 of the amendment:

vii. The panel should develop a community or borough-level communications strategy in

order to ensure the public is informed about the findings of the panel. As part of this strategy, the panel should aim to create a brief, high-level version of the report that can be distributed to City residents, particularly those who have been deemed "vulnerable citizens" in order to educate them about potential risks and the adaptation measures that can be taken to mitigate those risks.

To ensure the effectiveness of communication measures it will be essential to guage the current level of knowledge and opinions on climate change and how it will affect New York City as well as the willingness of residents to learn about climate change in order to take action. It will be essential for the panel to take advantage of existing modes of communication or through public forums. Some existing modes of communication include the City's website, newsletters, community boards, and through community-based organizations to gather this information and to distribute educational information. Including information on climate risks, storm vulnerabilities and emergency evacuation procedures can also be effectively communicated through inclusion on tax bills, signs on public transit, and at events. MWA welcomes New York City to participate in City of Water Day on July 14, 2012, an event attracting over 20,000 residents in New York City alone by providing climate change adaptation resources and information at a booth or a table.

MWA's 2012 Waterfront Conference will be held on May 18, 2012 and will include a panel devoted to the topic of climate change adaptation. The panel will address the ways we can move forward as a region in the implementation of the New York State, New York City, and New Jersey municipal climate change adaptation strategies. Implementation of any climate change adaptation strategy will involve many levels of political, jurisdictional, planning, and financial

complexity that we are only beginning to address. MWA looks forward to increasing the level of dialogue about these issues and working with its government partners and Alliance Partners to work for progress in climate change adaptation planning and implementation.

Thank you for the opportunity to testify today and I'd be happy to answer any questions you might have. The full text of MWA's recommended edits to the amendments are as follows.

Int. No.

By Council Member Gennaro

A LOCAL LAW

To amend the New York city charter, in relation to convening the New York city panel on climate change regularly, for the purpose of producing a report on climate change adaptation in New York city.

Be it enacted by the Council as follows:

Section1. Legislative findings and intent. The Council finds that in order to increase the effectiveness of New York City measures intended to prepare for and alter the course of adverse climate change impacts on New York City's critical infrastructure and vulnerable citizens, and consistent with the spirit of PlaNYC 2030 and the New York City Climate Protection Act, Local Law 22 of 2008, the New York City Panel on Climate Change should be institutionalized. The Council also finds that global climate models predict that temperatures, precipitation, sea levels, and extreme weather events will increase dramatically, even in the next ten years. The Council further finds that a significant number of variables, including but not limited to an increase in temperatures, can have an immutable effect on New York City's future and that identifying and gauging these variables can also inform and dictate our intelligent response to climate change. Finally, the Council finds that New York City will be benefited by permanent, periodic updates on current climate change data, trends, and projections, and analysis on how this information poses new and various risk scenarios concerning critical infrastructure and vulnerable citizens. Therefore, the Council finds that it is in the best interests of the City to convene the New York

City Panel on Climate Change regularly, for the purpose of producing a report on Climate Change Adaptation in New York City.

§2. Section 20 of the New York city charter is amended by adding a new subdivision j to read as follows:

j. New York city panel on climate change. 1. There shall be a New York city panel on climate change whose members shall include but not be limited to, climate scientists and experts, academics, ~~and~~ private sector practitioners, including legal, insurance, ~~and~~ risk management experts, representatives of waterfront oriented non-governmental organizations, and representatives of the Waterfront Management Advisory Board who shall be appointed by the mayor.

2. i. The panel shall meet at least once every ~~two~~ years for the purpose of developing climate change projections for New York city and tools to assist the city's climate change adaptation task force, or any other applicable department or office, in implementing procedures, actions, and programs to address current and future impacts on critical New York city infrastructure, waterfront, and on vulnerable citizens.

ii. For purposes of this subdivision, the term "vulnerable citizens" shall mean individuals or communities especially susceptible to, and unable to cope with, adverse climate change impacts including persons age sixty or older, women, children, persons with disabilities, and the poor.

3. No later than one year after the panel first convenes and every ~~second~~ year thereafter, the panel shall prepare and make public a report of its findings on climate change data, predictions, and the current and projected impacts on

infrastructure and vulnerable citizens. The report shall include, at a minimum:

i. Observed climate. Current findings on trends in temperature, precipitation, sea level changes, and extreme weather events.

ii. Indicators and monitoring. Discussion and analysis of indicators to monitor for climate change data, which shall include, but not be limited to, the ~~Earth's carbon cycle~~ atmospheric carbon dioxide levels, greenhouse gas emissions, global and regional sea level, ~~changes~~ seasonal anomalies in ~~polar ice~~polar ice melting, and any advances in climate science and technology that can aid in measuring and analyzing this data.

iii. Future data predictions. Predictions of future temperature, precipitation, sea level changes, and extreme weather events, identifying their probability of occurrence and the factors that influence any uncertainties in each prediction.

v. Climate change scenarios. Descriptions of plausible future climate conditions in New York city based on future data predictions and response strategies based on current or possible adaptation plans, taking into account factors such as, but not limited to, population growth, and technological and land-use changes.

iv. Climate risk factors and infrastructure impacts. Generalized climate variables prioritized by considerations of the potential impacts to New York city's critical infrastructure and vulnerable citizens, which shall include, but not be limited to, temperature-related impacts, precipitation-related impacts, and sea level rise-related impacts.

~~v. Climate change scenarios. Descriptions of plausible future climate~~

~~conditions in New York city based on future data predictions and response strategies based on current or possible adaptation plans, taking into account factors such as, but not limited to, population growth, and technological and land-use changes.~~

vi. Adaptation plan assessment. Analysis and assessment of the New York city climate change adaptation task force's, or any other applicable department or office's, active or adopted adaptation plans or sections of plans that address climate change impacts in light of the panel's current findings and predictions on climate change data and impacts.

vii. The panel should develop a community or borough-level communications strategy in order to ensure the public is informed about the findings of the panel. As part of this strategy, the panel should aim to create a brief, high-level version of the report that can be distributed to City residents, particularly those who have been deemed "vulnerable citizens" in order to educate them about potential risks and the adaptation measures that can be taken to mitigate those risks.

§3. This local law shall take effect one hundred eighty days after enactment, except that the director of the office of long-term planning and sustainability shall take such measures as are necessary for its implementation, including the promulgation of rules, prior to such effective date.

LS # 3184 SS
2/29/12 2:35 p.m., 3/12/12 2:56 p.m.;3/20/12 3:41 p.m. , 4/6/12/ 10:48 a.m.; 4/10/12 9:42 a.m.

UPROSE

NEW YORK CITY COUNCIL ENVIRONMENTAL PROTECTION COMMITTEE HEARING HEARING ON TO AMEND CITY CHARTER, IN RELATION TO NEW YORK CITY PANEL ON CLIMATE CHANGE
May 19th, 2012

Testimony by Sabrina Terry, Environmental Justice Planner, UPROSE

Good afternoon and thank you for the opportunity to testify before you today. My name is Sabrina Terry and I am the Policy Analyst of UPROSE, Brooklyn's oldest Latino community based organization. We are a multi-cultural and multi-racial environmental justice organization that builds intergenerational, indigenous leadership, mobilizes Sunset Park community residents on issues of sustainable and just development, and promotes governmental accountability and participatory community planning practices.

Sunset Park is home to over 127,000 residents, most of whom are immigrants from the Spanish-speaking Caribbean, Mexico, China, the Middle East, and beyond. Latinos and Asians are the largest populations constituting roughly 50% and 25% of the total neighborhood population, respectively. The poverty rate in Sunset Park is higher than the overall poverty rates of both Brooklyn and greater New York City. Sunset Park is one of six Significant Maritime Industrial Areas (SMIA) designated by the New York City Department of City Planning. This designation attests to the fact that Sunset Park harbors significantly more industries within its boundaries than surrounding neighborhoods, industries that pose numerous health threats to the residents of the neighborhood. Our working class community of color also has a 90% risk storm surge within the next 10 years that will cover nearly half of the neighborhood.

UPROSE is an active member of the New York City Environmental Justice Alliance, a coalition of grassroots organizations that advocate for improved environmental conditions and against inequitable environmental burdens by influencing City and State policies. We are also an active member of the EJ Leadership Forum on Climate Change, that advocate for climate justice policy that recognizes and addresses the burdens placed on communities of color and low-income communities by the rapidly changing climate.

We applaud the city councils initiative to amend the city charter for the purpose of strengthening the NYC Panel on Climate Change and producing a report that could assist communities such as Sunset Park. We are concerned, however, that the preliminary outline of the amendments do not include the following:

1. **Communities with inequitable environmental burdens (EJ Communities) as apart of the criteria/definition of "vulnerable citizens".** Low-income communities of color are often more at risk because they live in geographically susceptible areas in close proximity to noxious facilities, which become public health threats in the context of extreme weather. The definition of

UPROSE

"vulnerable" must take into account communities whose circumstances will require additional support.

2. **Community-based research models that aim to strengthen capacity on the local level.** A participatory model will ensure that local knowledge is leveraged while simultaneously educating the community on their unique susceptibilities. This will also produce resolutions that are crafted in a manner that fit the unique culture and urban fabric of each community. Lastly, a more inclusive model could help encourage communities to leverage their own resources, thus becoming more self-sufficient and resilient.

We are expressing these concerns based on our intimate experiences fighting for climate justice in our community and the greater New York City. We urge you to recognize the additions that we have raised about the proposed amendments and to sincerely address them so that the amendments will truly accomplish their intent.

In conclusion, we support the proposed amendment, as it will help ensure a safer and more resilient city. Please count on our resources, knowledge and skills to achieve shared goals.

Thank you.

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STATEMENT TO THE NEW YORK CITY ENVIRONMENTAL PROTECTION COMMITTEE

ON THE PROPOSAL TO AMEND THE NEW YORK CITY CHARTER, IN RELATION TO RECONVENING THE NEW YORK CITY PANEL ON CLIMATE CHANGE

by

Malcolm J. Bowman, School of Marine & Atmospheric Sciences, Stony Brook University

25 April 2012

My name is Malcolm Bowman and I am Professor of Physical Oceanography and Distinguished Service Professor at the State University of New York at Stony Brook (Stony Brook University). I am an expert on the tides, circulation, waves, sediment transport and flushing characteristics of the bays, estuaries, rivers, inland seas and coastal oceans surrounding Metropolitan New York, Long Island and the New York Bight. My research is focused on storm surge prediction, extreme waves and tsunami, rising sea levels and other climate change issues.

I was appointed by Mayor Michael Bloomberg to serve on the New York City Panel on Climate Change, established in 2008. The panel met for one year, culminating in the 2010 report, "Climate Change Adaptation in New York City: Building a Risk Management Response." I was responsible for contributing to the projections of the magnitude and rate of regional climate change.

Thank you for reading into the record this testimony on the proposal to amend the New York City Constitution, in relation to reconvening the New York City Panel on Climate Change, for the purpose of producing a regular series of reports on climate change issues that are relevant to the future security and survivability of New York City.

I support the proposal to institutionalize the Panel. There is a continuing and urgent need to evaluate the latest science, environmental issues, economic threats, infrastructure protection, societal concerns and engineering solutions, centered around climate change in all its manifestations. These concerns and proposed solutions must be brought to the attention of the City Council and the Mayor's Office of Sustainability and Long Term Planning by leading climate science, engineering and policy experts on a regular basis.

However, in my opinion, the Panel needs to include wider representation from various professional groups and agencies than hitherto fore, it needs to meet at least annually and it needs to present a bi-annual report to the Council. I recommend that the proposed Panel be reconstituted to include representatives, beyond those already suggested, from the New York Academy of Sciences, the Metropolitan Transport Authority, the Port Authority of NY and NJ,

The Nature Conservancy, the Metropolitan Section of the American Society of Civil Engineers, New York State Society of Professional Engineers and the US Army Corps of Engineers (observer status).

Many or most of the proposed mitigation measures to protect the city against the twin threats of rising sea level and storms surges will eventually involve major excavation, beach nourishment and engineering works of a regional nature. Future Panel agendas must include feasibility and cost/benefit studies of storm surge barriers which may be found to be the most cost effective long-term solution for protecting the hundreds of miles of shoreline of Metro New York for the foreseeable future. Such analyses were glaringly absent from the 2010 report.

I also recommend that the Chair of the Panel be elected from within its membership and that the Chair rotate every two years to ensure the widest selection and evaluation of all relevant issues.

Finally many lessons can be learned from the experience of our European counterparts, particularly in the U.K., Netherlands, Italy and the Russian Federation as they move forward in protecting their major cities from the imminent threats of rising sea level, storm surges and other manifestations of climate change.

Respectfully submitted,

Stony Brook NY,

25 April 2012

Local Law 22 of 2008, the New York City Panel on Climate Change

Hearing, April 25, 2012, 250 Broadway, New York City, 10:00AM

Thank you for this opportunity to speak with you this morning about the importance of this Local Law to amend the New York City Charter, in relation to convening the New York City panel on climate change regularly, for the purpose of producing a report on climate change adaptation in New York City. Congratulations to Samara Swanston and the Council Members who have worked on this important law, and to Mayor Bloomberg, who, in so many ways, has contributed to the improvement of our city's environment.

If you were to refer to the 2002 Oxford American College Dictionary, you would find that the Holocene, that began about 10,000 years ago, is a geological epoch relating to the present and is the second epoch in the Quaternary period after the Pleistocene. However, referring to the Holocene as the present epoch is inaccurate. Global scientists have just updated this information because, for the first time in history, human activity has altered the planet - we have entered a new epoch. We are now in the Anthropocene epoch, "anthro", meaning human. Things are moving quickly.

My name is Catherine Skopic; and I'm an Educator, Artist and environmentalist. I've been at the United Nations as a member of Civil Society, engaged in the on-going process of preparing for Rio+20 taking place this year- the 20-year anniversary of the first earth summit of 1992 in Rio de Janeiro. During one of the reports we heard from the global scientific conference held a few months ago, nine planetary boundaries have been identified; and three of these are near or at the tipping point: climate change, bio-diversity and the nitrogen cycle. So this new law being proposed is "right on target," as they say, in addressing the climate change challenges we face here in the city.

Before the start of the industrial age, the carbon dioxide content of the atmosphere was 280 parts per million - ppm. We are now way above that. In fact, there is a website where you can find the exact carbon dioxide level of the moment - www.CO2Now.org. Looking there, you would find that in March of 2010, the CO2 level was 391.08. March 2011, it was 392.40; and March of this year, 2012, it was 394.45. If you were to chart the data, you would have a steadily rising curve; and this is causing havoc for all earth systems.

The hottest summers have occurred within the last three decades. We've just had one of the warmest, driest winters on record. I've lived in NYC since 1968; and this past fall, experienced the first ever evacuation for parts of the city due to the oncoming storm and expected flooding. Most of this one by-passed us; but there will be more storms in the future. In fact James Hanson, one of our top scientists and a former NASA scientist wrote a book published in 2009, Storms of My Grandchildren - The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity. James Hanson has identified 350 ppm CO2 as the level we must get back to for our survival. James Hanson and Bill McKibben are working together on this - you may have heard of Bill McKibben's 350.org, involving efforts to accomplish CO2 reduction in over 180 countries around the world.

And just as humans have impacted the planet in negative ways, humans can impact the planet in

positive ways. We can work to adapt to, mitigate and prepare for results of past behavior that cannot be changed at this point and work to change the things that can be - for ourselves, future generations and the very planet itself.

And this piece of legislation does just that - helps us to prepare for and to adapt to the changes already set in motion; and, in so doing, also makes us ever more mindful of our present behaviors, their affect on our earth and the need to change our ways. For starters, we can move to renewable energy sources in as big a way as possible.

Again, congratulations, Samara Swanston and Council Members, for your foresight and your service to the citizens of New York City - and the world - for this brilliant and much needed piece of legislation!

Respectfully and in PEACE,

Catherine Skopic
Chair, Environmental Task Force

CITY COUNCIL ENVIRONMENTAL PROTECTION COMMITTEE TESTIMONY April 25, 2012

I am surprised anyone is here this morning when Greenwich Village en masse is going to a 10 AM meeting at the American Indian Museum to stop NYU's expansion plans and everyone else is boarding busses to Albany to lobby against fracking.

I am here to testify, but I am not sure whether I should be testifying for or against this plan. I certainly like the idea of including representation from the vulnerable public. I don't think of myself as one of the vulnerable elderly, but I am aware that if a major hurricane hits New York City, they are the ones who will be most affected and, based on what happened in New Orleans, they are the ones most likely to die. Did the last ad hoc NPCC report mention the number of deaths that could occur? Loss of life is definitely a risk factor. I want to state that the NPCC report does provide a very important service in describing the pace of climate change, but if it does not do a better job in dealing with calamities that can descend upon a good portion of New York City residents, is it really worth institutionalizing the report?

The many risk factors, loss of life, loss of residences, loss of jobs due to the impossibility of getting to work, the impact of the greatest city in the world coming to a standstill for weeks or months because of no working transit system, should be a paramount concern of the NPCC. Certainly most people in this room realize that I am an advocate for a study of storm surge barriers, and I am appreciative that both Long Term Planning and City Planning will commence the study of storm surge barriers in June, but unless NPCC, which presently has no interest in storm surge barriers and has not adequately addressed risk factors, makes a major change, I would have to be against institutionalizing a NPCC report every two years.

I realize that the theory of resilience is very popular in governmental circles at this time. In Douglas Hill's editorial, which I am sure many of those in this room have read, he enumerates what risk factors were not covered in the last NPCC report. I should first point out to the committee though Doug now lives in Huntington, he was born in the Bronx and received his BA and his PHD in engineering from CCNY. The five risk factors that NPCC has ignored according to ASCE (American Society of Engineers) are: Keep safety at the forefront of public priorities, quantify the risks, communicate the risks to the public and decide how much risk is acceptable, rethink the whole system, including land use and place safety first. I think part of the problem is that no engineers participated in the last NPCC document. I trust that if this legislation is passed, they will participate in both the discussions and in the writing of the next NPCC report.

I am just a concerned layman who has been reading some of the literature in the field and talking to many of the experts. I personally think it has been proven that storm surge barriers work, not only nearby in Stamford, New Bedford and Providence, but also around the world. Secondly, no one is leveling with members of the public about the degree of danger they are in, and thirdly, much of the land use policy the city has ignored the dangers of future sea level rises by continuing development in areas at sea level.

I believe that the City Council is the body of government which is closest to the citizens of New York City and is first to reflect their concerns. That is why I am sure that the Council will take steps to make sure that NPCC will be more inclusive in what it publishes in the future, giving equal weight to the risk factors.

(over)

I have spent much time talking to members of the public, and they don't have a clue about what impact global warming will have on them. They are aware of sea rises in the future, but they are not aware of the danger they face personally or of the damage their property could sustain. Most of their assets are in their homes. The MOMA show last year gave an impression of how the city would cope with the storm surges. I thought it was quite imaginative, but I would hardly say that is was an adequate solution. To those who say storm surge barriers won't work in the very long run, I would probably agree, but if they give New York City 100 to 200 years of safety, I think the public would agree that it would be worth the expense. The approximate $10 billion planning and construction cost is very cheap compared to an insurance company's estimate that a Katrina like storm would cause $200 billion in damage to property and in work time lost.

Barriers at The Narrows, Arthur Kill and Throgs Neck could protect much of New York City. Another plan that would consist of a barrier from the Rockaways to Sandy Hook and Throgs Neck would be of equal cost with the first plan. I believe both plans will be studied by the Office of long Term Planning and Sustainability in conjunction with City Planning's Waterfront Department . NYCs storm surge barriers could be planned and built within 10 years, four years for planning, six years for construction. The new barriers in New Orleans took only five years and they were much more extensive. The reason it has taken thirty years to build most storm surge barriers is that much of the time is spent in getting the public and government to agree to them. Unfortunately, both often have to be shown by experiencing a major hurricane. What a waste of time, resources and lives. Bob Yaro of RPA told me it usually takes two hurricanes; after the first one, people are lulled into thinking that it won't happen again. It takes the second one to convince them. I certainly hope we can learn from other cities' hesitancy.

Everyone is talking about spending money on infrastructure, setting up infrastructure banks. There would be no better infrastructure project in this century than storm surge barriers that would protect our beloved city.

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The City of New York
Manhattan Community Board 1
Julie Menin CHAIRPERSON | Noah Pfefferblit DISTRICT MANAGER

The New York City Committee on Environmental Protection
Public Hearing on

Climate Change

Testimony by
Catherine McVay Hughes, Vice-Chairperson,
Manhattan Community Board 1

Wednesday, April 25, 2012, 10 a.m.
250 Broadway, 16th Floor Committee Room, New York, NY

Good afternoon, Chairperson James Gennaro. I am Catherine McVay Hughes, Vice Chairperson of Manhattan Community Board One and I am here to testify on behalf of CB1 regarding climate change.

I am proud to report that, at last night's full board meeting, CB1 motioned to support the New York City Council legislation to amend the New York City charter, in relation to convening the New York City panel on climate change regularly, for the purpose of producing a report on climate change adaptation in New York City. CB1 supports additional research in the area of climate change, as it has in the past.

On January 24th, 2012, CB1 passed a resolution requesting that the Army Corp. of Engineers to expeditiously conduct a study about the feasibility of installing storm surge barriers to protect New York City. This resolution was the result of a series of meetings and reports, dating back to 2008.

In 2008, Mayor Bloomberg convened the New York City Panel on Climate Change (NPCC) composed of leading scientists, social scientists, academics and risk management experts to advise the City on climate change. The NPCC projects that by mid-century, New York City's average temperatures will rise by three to five degrees Fahrenheit and sea levels could rise by more than two feet. By the end of the century, the city's climate may be more similar to North Carolina's than present-day New York City and sea levels could rise by as much as four and a half feet.[1]

On December 16th, 2011, David Bragdon, Chairperson of the New York City Long-Term Planning and Sustainability Office, stated at a New York City Council Oversight Hearing of the

[1] From testimony by David Bragdon, Director, Mayor's Office of Long-Term Planning and Sustainability, before the City Council Committees on Environmental Protection and Waterfronts, Dec. 16, 2011

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Environmental Protection Committee that his agency would commence a study of storm surge barriers.[2]

According to Douglas Hill, consulting engineer and adjunct lecturer at the School of Marine and Atmospheric Sciences at Stony Brook University, "Relative sea level has been rising inexorably in New York City over the past 140 years at an average rate of 0.27 m (10.7 in.) per century due to both geologic subsidence and the warming trend in the twentieth century ....There is little doubt that New York City will be exposed to major coastal flooding within the next several decades as sea level rises and storms may become more frequent and severe."[3]

The flooding caused by such a surge - which happened in the 19th century – would be calamitous, particularly to those living within several blocks of the Hudson River.[4]

According to one hurricane expert who participated in the drafting of a significant U.S. Army Corps of Engineers study of storms and evacuation in New York City, a Category 3 hurricane could cause 30-foot storm surges, flood hundreds of miles of the city's coast and force the evacuation of over 2.5 million residents.[5]

The Federal Transit Administration has stated that the "Combined economic and physical damage losses from subway tunnel flooding under a 100-year storm surge were estimated at $58 billion at current sea levels and $84 billion with four feet of sea-level rise, assuming a linear recovery and an estimated subway outage time of three to four weeks. Direct physical damage alone was estimated at $10 billion for the former and $16 billion for the latter."[6]

Given all of this data and research, it seems that the prudent response would be a comprehensive study of storm surge barriers to prevent New York City from being flooded. Storm surge barriers have been built in London and Rotterdam and are being built in Venice to protect those cities, and could be protective of New York City.

Community Board #1 calls upon members of the New York City Council to support our request that the Army Corp. of Engineers conduct a study about the feasibility of installing storm surge barriers, and that this study include consideration of the environmental and ecological impact of storm surge barriers. The City should not only rely on evacuation and remediation activities at the time of a weather-related disaster, but should seriously evaluate what could be done ahead of a disaster that might reduce or eliminate the effects of a weather calamity.

Thank you for the opportunity to testify today.

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[2] Kreuzer, Terese L. "A Tide of Concern Is Rising Risk of Storm Surges." Downtown Express. Community Media LLC, 4 Jan. 2012. Web. 6 Jan. 2012. <http://www.downtownexpress.com/?p=5935>.

[3] Hill, Douglas. "Must New York City Have Its Own Katrina?" Leadership and Management in Engineering 8.3 (2008): 132-38. Print.

[4] http://www.nyc.gov/html/oem/html/hazards/storms_hurricanehistory.shtmla

[5] From Preliminary Report on New York City Emergency Response and Evacuation Plans in the Event of a Weather-Related Emergency issued by the New York State Assembly Standing Committee on Corporations, Authorities, and Commissions on Sept. 15, 2005. The U.S. Army Corps of Engineers study cited dated from 1993.

[6] Federal Transit Administration Research, "Flooded Bus Barns and Buckled Rails: Public Transportation and Climate Change Adaptation" (August 2011, FTA Report No. 0001, Prepared by FTA Office of Budget and Policy).

Testimony of Adam Freed, Deputy Director,
Mayor's Office of Long-Term Planning and Sustainability

New York City Council Committee on Environmental Protection Hearing Concerning
Intro 834

April 25, 2012

Good afternoon, Chairman Gennaro and Committee Members. My name is Adam Freed, and I am the Deputy Director of the Mayor's Office of Long-Term Planning and Sustainability. On behalf of the Administration, I appreciate the opportunity to testify on Intro 834 and discuss New York City's efforts to ensure that our climate change initiatives are guided by the best available science. This has been a hallmark of PlaNYC, Mayor Bloomberg's long-term sustainability plan, and our climate resilience program, which was cited by the National Academies of Science's America's Climate Choices committee as "one of the most comprehensive approaches so far to adaptation in the United States" and was the subject of a hearing before this committee last December.

The Administration supports the intent of a bill to institutionalize the regular adoption of New York City-specific climate change projections, which are the foundation on which our climate resilience program is based, and a process to ensure that our efforts are based on the latest scientific information. PlaNYC includes an initiative to

achieve these very goals. This includes institutionalizing the New York City Panel on Climate Change (NPCC), which was convened by Mayor Bloomberg in 2008 to develop City-specific climate change projections and advise the City on scientific issues related to climate change. The NPCC consists of leading climate and social scientists, economists, and risk management and insurance experts. While this bill meets the broad intent of our initiative, there are several elements of the bill as currently drafted that we suggest be amended.

The current bill broadens the scope of the NPCC to include topics that the panel is not constituted to address and could divert the advisory panel's energy from critical scientific issues that remain unresolved. To best meet the City's scientific needs, the NPCC should focus on four critical activities: 1) the regular adoption of New York City-specific climate projections, 2) the development of indicators to track changes in our climate and climate impacts, 3) the provision of guidance on how to use climate projections and uncertainty ranges, 4) and the periodic reporting on emerging issues related to climate science and modeling. This last activity includes addressing gaps in our current knowledge that are essential to effectively plan for climate change, including the potential acceleration of sea level rise due to rapid ice melt and projections for wet bulb temperatures (the combination of heat and humidity), wind, the frequency and intensity of coastal storms, the relationship of air and surface temperatures on the urban heat island effect, and hourly rainfall.

The NPCC developed and released the City's first official climate change projections in 2009. This work was funded through a $350,000 grant from the

Rockefeller Foundation. The panel projects that by mid-century, New York City's average temperatures will rise by three to five degrees Fahrenheit, and sea levels could rise by more than two feet. By the end of the century, the city's climate may be more similar to North Carolina than present-day New York City. While New Yorkers currently experience an average of 14 days a year with temperatures over 90 degrees Fahrenheit, by the 2080s it could be more than 60 days. These changes pose real and significant risks for New York City and have informed our climate resilience efforts, as detailed in December and in the PlaNYC 2012 Progress Report released earlier this week.

As our climate and the state of climate science continue to evolve, it is essential to reevaluate our projections. The current bill would require the NPCC to update its projections at least once every two years. This could cause unnecessary expenses and could cause undue confusion and redundancy in resilience planning and implementation efforts. Instead, adoption of new projections should be timed to take advantage of updated climate models and findings of the Intergovernmental Panel on Climate Change (IPCC), which are released every four to five years. This would not prevent the NPCC from making amendments or recommendations to their projections on a more frequent basis, but would enable the development of new information and models to dictate this timeline rather than an arbitrary deadline. Thus, we recommend that the NPCC adopt new projections at least once every five years rather than once every two years.

Since the NPCC's projections were issued in 2009, the National Oceanic and Atmospheric Administration funded the Consortium for Climate Risk in the Urban Northeast (CCRUN) through its Regional Integrated Sciences and Assessments (RISA) program. The mission of the CCRUN, which is comprised of scientists from Columbia University, City College of the City University of New York, the Stevens Institute of Technology in New Jersey, the University of Massachusetts-Amherst, and Drexel University, is to serve stakeholder needs in assessing and managing risks from climate variability and change. The creation of the CCRUN and the forthcoming National Climate Assessment, due to be completed by the U.S. Global Change Research Program (USGCRP) in 2013, could obviate the need for the NPCC to develop its own climate change projections. The NPCC could use existing models and information to "adopt" New York City-specific projections. If additional research or modeling is necessary, the City could work with the CCRUN or regional scientific and academic institutions to procure this information, which would be independently reviewed and vetted by the NPCC and included in their adopted projections.

Thank you for the opportunity to testify about this bill and to discuss the Administration's efforts to increase the city's climate resilience. We look forward to working with you to revise the bill and ensure that our climate risks are addressed through informed decision-making, based on the latest scientific information.

I would be happy to answer any questions.

4 the record

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EDITORIAL

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The Lessons of Katrina, Learned and Unlearned

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ABSTRACT

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Originally planned to evaluate storm surge barriers, the New York City Panel on Climate Change (NPCC) instead developed a process for government agencies and private stakeholders to adapt critical infrastructure in New York City to the effects of climate change. In its influential 2010 report, the NPCC ignored the literature documenting the lessons learned from Hurricane Katrina striking New Orleans in 2005. A report by the American Society of Civil Engineers (ASCE) sums up these lessons in 10 calls to action. An examination of the NPCC report suggests that half of these lessons have been learned and half have not. Essentially, the ASCE makes public safety, health, and welfare, not adapting critical infrastructure, its top priorities. The NPCC report fails to quantify the risks, does not address the question of an acceptable level of risk, and does not evaluate the consequences of severe coastal flooding. Although storm surge barriers have been found to be hydrologically and technically feasible, they are dismissed as mere contributions to the discussion that are not needed for at least the next several decades, despite the report's own accounting of the extreme uncertainty and possible effects of severe hurricanes and nor'easters. The NPCC report features Flexible Adaptation Pathways to plan and revise adaptation measures over time, which ignore the possibility of hedging strategies and the well-established precautionary principle. Without an engineering presence, the NPCC also overlooks consideration of lead times in planning major projects. It is concluded that the NPCC report is delaying regional measures against severe coastal flooding, discouraging hedging and the precautionary principle, and deterring adequate measures to protect public safety, health, and welfare.

ADDITIONAL INDEX WORDS: *Coastal zone management, risk management, climate change adaptation, coastal flooding, storm surge, storm surge barriers, New York City.*

On Earth Day, April 22, 2007, the mayor of New York City released "PlaNYC: A Greener, Greater New York," the city's comprehensive plan to prepare for a changing climate and take actions to build climate resilience. Among its 127 planned measures was the creation of a board to advise the city on climate change. As the report stated,

> Storm surge barriers could protect significant swaths of our coastline, but still leave others exposed—and cost billions. Any assessments on that scale will need to be undertaken carefully. That's why we will create a New York City Climate Change Advisory Board. (City of New York, 2007, p. 139)

In August 2008, the name of the board was changed to the New York City Panel on Climate Change (NPCC, after the international Intergovernmental Panel on Climate Change, or IPCC), and so was its purpose:

> The goal of the NPCC is to contribute to an effective, ongoing, and beneficial *process* for responding to the risks that climate change poses to New York City in the coming decades...It has suggested approaches to create an effective *adaptation* program for *critical infrastructure.* (NPCC, 2010, pp. 7, 11) (emphasis added)

The NPCC report released in May 2010 is influential. It provides the principal scientific guidance to the other climate change group convened by the city, the New York City Climate Change Adaptation Task Force, which consists of 32 city and state agencies and private companies that operate, regulate, or control critical infrastructure; assess risks; and develop strategies to increase the city's climate resilience. The NPCC report has been cited in the update of the city's Comprehensive Waterfront Plan, the report of the New York State Sea Level Rise Task Force, and the draft ClimAID report of the New York State Energy Research and Development Authority.

What this report says, matters. Yet despite its ubiquity, the NPCC report seems never to have been critically reviewed.

Strangely, the NPCC report makes no mention of the lessons of Katrina, the hurricane that devastated New Orleans in 2005.

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Table 1. *Calls to action of the ASCE Hurricane Katrina External Review Panel.*

ASCE Lesson	Learned	Unlearned
1. Keep safety at the forefront of public priorities		X
2. Quantify the risks		X
3. Communicate the risks to the public and decide how much is acceptable		X
4. Rethink the whole system, including land use		X
5. Correct the deficiencies	√	
6. Put someone in charge	√	
7. Improve inter-agency coordination	√	
8. Upgrade engineering design procedures	√	
9. Bring in independent experts	√	
10. Place safety first		X

Although the NPCC report examines the plans for climate change in three other urban areas—Chicago, London, and King County, Washington—New Orleans is conspicuously missing. Although more than 300 references are cited in several sections of the NPCC report, there is no mention of the three major studies of Katrina:

(1) "Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System," the final report of the Interagency Performance Evaluation Taskforce (IPET) and an evaluation by more than 150 engineers and scientists (U.S. Army Corps of Engineers, 2009)

(2) "The New Orleans Hurricane Protection System: What Went Wrong and Why," a report of the American Society of Civil Engineers (ASCE) Hurricane Katrina External Review Panel, a group of 19 engineers and scientists (ASCE, 2007)

(3) "The New Orleans Hurricane Protection System: Assessing Pre-Katrina Vulnerability and Improving Mitigation and Preparedness," presented by Jeffrey Jacobs of the National Academy of Engineering and National Research Council (NAE/NRC) to the U.S. Senate Committee on Environment and Public Works (NAE/NRC, 2009)

It seems reasonable, therefore, to examine the NPCC report to assess the extent to which the lessons of Katrina have been learned. Those who would argue that New York City cannot be compared with New Orleans because so much of New Orleans is below sea level should be reminded of the 1900 hurricane that struck Galveston, Texas, in which between 6000 and 12,000 people lost their lives (Blake and Gibney, 2011; Larson, 1999). Galveston is above sea level.

The ASCE report in particular culminates in 10 "calls to action"—which I call "lessons"—by which the NPCC report can be evaluated, as shown in Table 1. Although the NPCC report brims with climate change trends, by the standards of the ASCE report, it falls short of analyzing climate change risks. This evaluation is my own and not necessarily that of the ASCE or the State University of New York at Stony Brook.

LESSONS

I limit my remarks to one lesson that seems to have been learned and five others that seem not to have been learned.

ASCE Lesson 1: Keep Safety at the Forefront of Public Priorities

The ASCE would make public safety, health, and welfare its top priorities:

> All responsible agencies in New Orleans and *throughout the nation* should re-evaluate their policies and practices to ensure that *protection of public safety,* health, and welfare is the *top priority* for the infrequent but potentially devastating impacts from hurricanes and flooding. (ASCE, 2007, p. 74) (emphasis added)

In contrast, "The NPCC has suggested approaches to create an effective *adaptation* program for *critical infrastructure....*" (NPCC, 2010, p. 7) (emphasis added). Thus, the NPCC has chosen to focus *only* on adapting critical infrastructure. Examples of critical infrastructure given by the NPCC are subways, bridges, tunnels, and the water supply system.

It is true that the continued functioning of critical infrastructure is essential to protecting public safety, health, and welfare. Moreover, beginning to adapt critical infrastructure to climate change may be the first thing that can be accomplished. The central fact about Katrina, however, is not that the critical infrastructure (as defined by the NPCC) in New Orleans failed but that about 1200 people died when the hurricane hit (Blake and Gibney, 2011, p. 7). They died because the levees failed. A failed levee is like no levee, which is what we have in New York. What is most important is that direct measures begin be taken to protect the public from catastrophic flooding.

In the nightmare scenario for New York City, as described in a government report (U.S. Army Corps of Engineers *et al.,* 1995), hurricane winds would cause windows and masonry from high buildings to fall into the streets. People would rush into the subways, and the subways would then be flooded by the storm surge. Subways in lower Manhattan and elsewhere are below sea level.

The NPCC report is right in including the subway system as critical infrastructure to be protected, but there is nothing in the report to suggest that subways deserve priority nor that this in itself is sufficient to adequately protect public safety. On balance, I give the NPCC report a failing mark on lesson 1.

ASCE Lesson No. 2: Quantify the Risks

In ordinary conversation, "risk" simply means the likelihood of some unfortunate event. However, the NPCC report (2010, p. 31) quantifies risk as follows:

> Risk = the probability of an event multiplied by some measure of its consequences

To quantify risk, therefore, it is necessary to quantify both the consequences and the probability of their occurrence. Based on the expected gradual rise in sea level, the NPCC report projects changes in the average recurrence intervals of storms described as 1-in-10-year, 1-in-100-year, and 1-in-500-year floods, together with relative expected increases in flood heights, for three time slices: the 2020s, 2050s, and 2080s. However, it makes a distinction between these storms and

"extreme events," such as intense hurricanes and northeasters. With regard to changes in extreme events, it reports that only qualitative statements can be made; specifically, intense hurricanes are more likely than not to increase, and any change in the severity of northeasters in the 21st century is too uncertain to support even qualitative statements. Moreover, the *consequences* to New York City of these extreme events is neither quantified nor described. Thus, it cannot be said that the NPCC report quantifies the risks.

ASCE Lesson No. 3: Communicate the Risks to the Public and Decide How Much Is Acceptable

The NPCC recommends that New York City's risk management response "include multiple layers of government and a wide range of public and private stakeholder experts to build buy-in and crucial partnerships for coordinated adaptation strategies [and] take account of the private sector in these interactions" (2010, p. 145).

Surely, this qualifies as communicating with the public. However, the NPCC report does not address how much risk is acceptable. The coastal flooding hazard cited frequently in the NPCC report is the so-called 100-year storm, which has a 1-in-100 probability of occurring in any given year. The 100-year storm is defined by the Federal Emergency Management Agency based primarily on the historical record, with the extent of flooding shown on flood insurance rate maps. Perhaps this is to be taken as the NPCC's implicit level of acceptable risk. However, the NAE/NRC report concludes that for heavily populated urban areas, where the failure of protective structures would be catastrophic, the 100-year standard is inadequate. In the Netherlands, where the standard of protection is the 1000-year flood, which implies a greater flood height than that in a 100-year flood, consideration is being given to raising the standard in some critical areas to the 10,000-year flood, which again has a relative increase in flood height (Wolman, 2008). In any event, the NPCC report contains no explicit evaluation of acceptable risk; thus, lesson 3 cannot be considered "learned."

ASCE Lesson 4: Rethink the Whole System, Including Land Use

According to the NPCC report, "The Adaptation Assessment Guidebook [Appendix B of the report] lays out a multi-step process *to help stakeholders* create an inventory of their at-risk infrastructure and develop adaptation strategies to address those identified risks" (2010, p. 235) (emphasis added).

This exclusive focus on stakeholders precludes consideration of *regional* protection measures, since none of the stakeholders are responsible for protecting the entire region.

ASCE Lesson 7: Improve Interagency Coordination

As stated in the NPCC report,

> The City has developed an effective approach to climate change adaptation [including] ... development of an evolving dynamic process among City government, public and private stakeholders, and experts to develop a risk-management approach to climate change and to begin to implement Flexible Adaptation Pathways for the city. (2010, pp. 9–10)

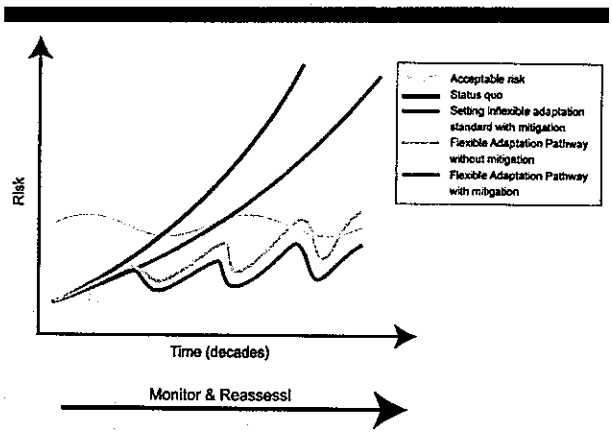

Figure 1. Flexible Adaptation Pathways (NPCC, 2010).

By providing its report through the New York City Climate Change Adaptation Task Force to its 32 members, including 10 city agencies, 8 state agencies and authorities, and 14 stakeholders in the private sector, the NPCC has surely served to improve interagency coordination. But what are "Flexible Adaptation Pathways"?

Flexible Adaptation Pathways are defined as "a sequence of strategies policy makers, stakeholders, and experts develop and implement that evolve as our knowledge of climate change progresses" (NPCC, 2010). The concept is illustrated with a conceptual diagram, adapted from the City of London, "The Thames Estuary 2100 Plan" (2011), and shown in Figure 1.

The light blue line represents what is regarded as acceptable risk (not defined in the NPCC report), which can be expected to vary little over time. As time passes, the status quo would come to exceed this acceptable risk (assuming that it does not already do so). If adaptation plans made now were never changed, the acceptable risk would also be exceeded in time. With Flexible Adaptation Pathways, however, adjustments would be made as new knowledge of the threats developed. Also taking into account the mitigation[1] of the causes of climate change, this periodic readjustment would keep the risks even lower.

What could be wrong with this idea? Surely, it is clear that as new information emerged, adjustments would be made in the measures to be taken. Why does anything so obvious deserve a special name with initial capital letters?

But wait: Don't the measures to be taken have something to do with the severity of the risks that are being undertaken? Yes, says the NPCC report:

[1] The NPCC report (2010) makes the usual distinction between *mitigation* of the causes of climate change and *adaptation* to its consequences.

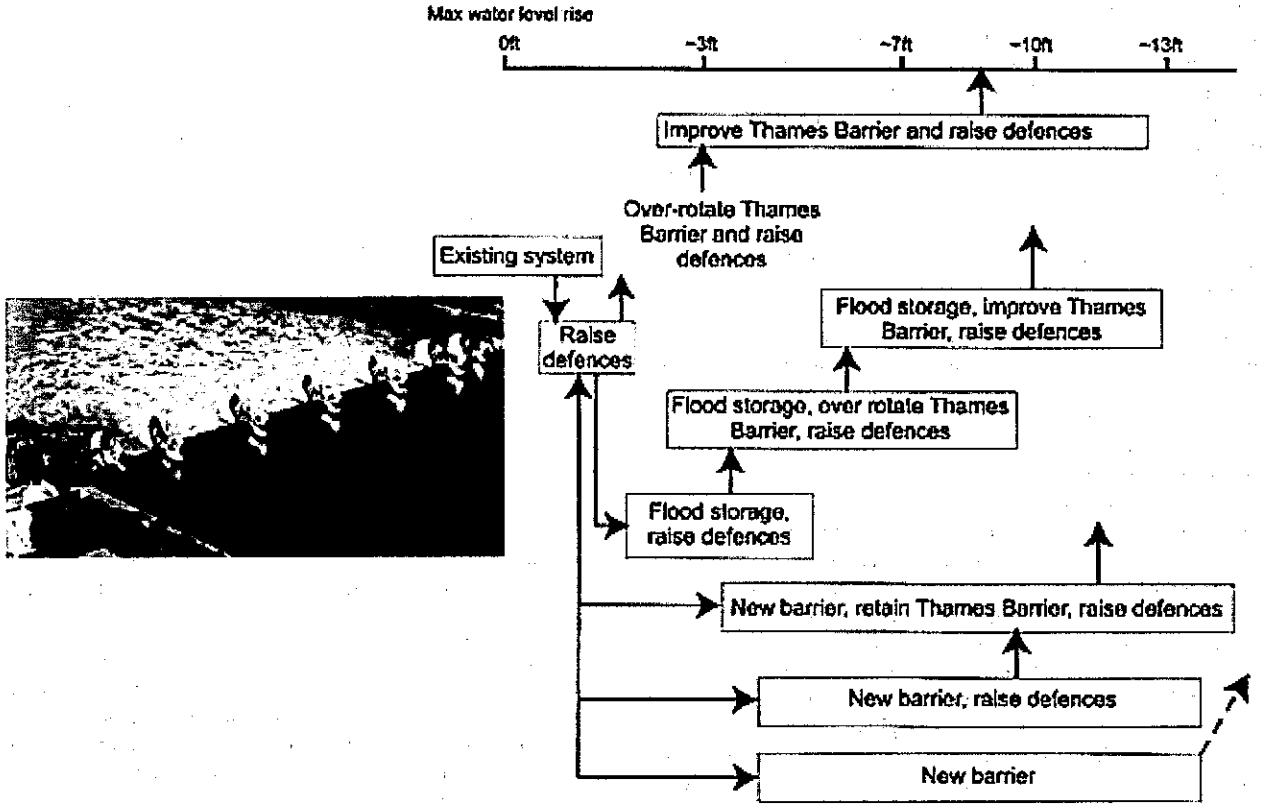

Figure 2. Iterative adaptation strategies to protect London from coastal storms.

> Policy makers can identify tipping points in natural and social systems, perhaps described in terms of critical thresholds of irreversible or particularly deleterious impacts, based on scientific research. These can be an essential part of designing these pathways, *but only if* they can be expressed in terms of timely "triggers" that determine when an adaptation measure is required. (2010, p. 37) (emphasis added)

"But only if" is a Big If. It means that nothing is done unless scientific research turns up new information so precise that the timing of the risk can be quantified. But the NPCC report (2010) also says:

(1) "Many uncertainties about the earth's climate system are so profound that they may never be resolved in a timely fashion." (p. 33)
(2) "Yet decision makers cannot simply ignore highly unlikely triggers that might lead to irreversible impacts or extraordinary consequences." (p. 32)
(3) "In monetary policy, *hedging* strategies have been employed against large risks whose likelihoods and/or consequences cannot be estimated." (p. 32)
(4) "Uncertainty makes the case for near-term actions through *hedging* against climate risks denominated in terms of both monetary damages and other indicators, such as billions of additional people who might be facing hunger, water stress, or hazards from coastal storms." (p. 31) (emphasis added)

Hedging and the Precautionary Principle

Thus, hedging—taking action now to avoid severe future risks, even when they cannot be quantified—is the *opposite* of Flexible Adaptation Pathways as defined in the NPCC report, which requires action only if timely triggers can be identified. This contradiction goes unnoticed in the NPCC report.

Moreover, hedging has a long history in environmental planning, where it goes by the name "the precautionary principle." As it is defined in the NPCC report, "Where threats of serious or irreversible damage to people or nature exist, lack of full scientific certainty should *not* be viewed as sufficient reason to *postpone* measures to prevent the degradation of the environment or protect the health of the citizens" (2010, p. 91) (emphasis added).

This definition is adapted from San Francisco's Environment Code Ordinance, which mandates the adoption of the precautionary principle throughout the city and the county (Bay Area Working Group on the Precautionary Principle, 2011). San

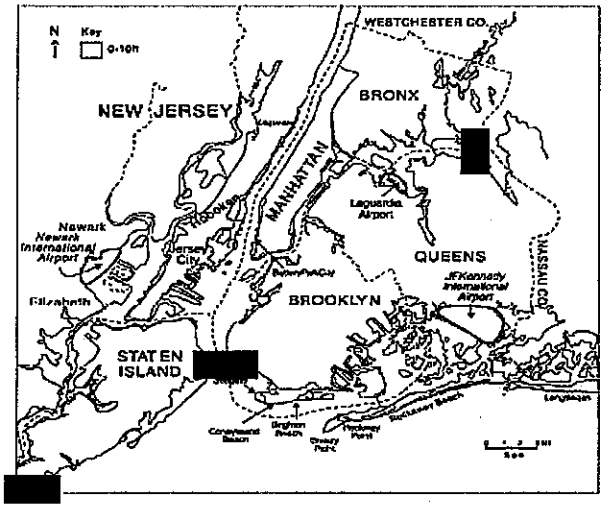

Figure 3. Location of three barriers to protect inner New York City from a storm surge. Gray areas show the extent of the 100-year flood. (Map adapted from Gornitz, 2001)

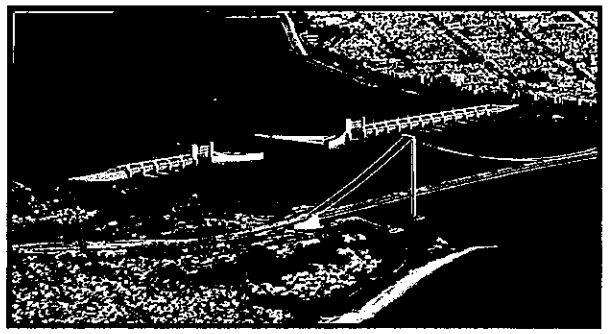

Figure 4. Conceptual design of a storm surge barrier across the Narrows. (Jansen and Dircke, 2009.)

Francisco is not the only place where the precautionary principle is public policy. In the law of the European Union, the application of the precautionary principle has been made a statutory requirement (Wikipedia, 2011).

Again, the contradiction between the precautionary principle and the Flexible Adaptation Pathways goes unnoticed in the NPCC report. This is important because Flexible Adaptation Pathways might be considered the theme of the NPCC report. These pathways are mentioned throughout the report, and they are touted in the executive summary, conclusions, and recommendations, where hedging and the precautionary principle go unmentioned. Will Flexible Adaptation Pathways then serve only as an excuse for procrastination?

An illustration of using Flexible Adaptation Pathways to protect London is given in the NPCC report (Figure 2). Various improvements in the level of protection are shown according to the expected rise in sea level. These include improving the present Thames Barrier and building a new barrier. A crucial difference, however, is that the choice in London is between protection and more protection, while the choice in New York is between adding protection and continuing to be unprotected.

Storm Surge Barriers

This brings us back to storm surge barriers, ostensibly the reason the NPCC was created. The proposal to protect New York City with storm surge barriers originated at the Marine Sciences Research Center, now the School of Marine and Atmospheric Sciences, at Stony Brook University. In a report (Bowman *et al.*, 2004), the group reported the results of applying a meteorological/hydrodynamic model that demonstrated that much of the New York metropolitan region can be protected with three barriers placed at narrow points in the waterways surrounding the city. These would be placed at the upper end of the East River, across the Narrows, and at the mouth of the Arthur Kill, which separates Staten Island from New Jersey (Figure 3). Another concept would replace the latter two with a barrier extending from Sandy Hook to the tip of the Rockaway Peninsula.

At a March 2009 conference sponsored by sections of the ASCE and the New York Academy of Sciences, four major engineering firms presented conceptual designs of the barriers, and a fifth reported on the geotechnical aspects of the barrier sites, thus establishing their technical feasibility (Abrahams, 2009; Jansen and Dircke, 2009; Lacy, DeVito, and De Nivo, 2009; Murphy and Schoettle, 2009; Padron and Forsyth, 2009). An example is the design of the barrier across the Narrows shown in Figure 4.

If such barriers are ever to protect New York City, steps need to be taken soon for the assessment promised in PlaNYC (City of New York, 2007). This is not because of the time it takes to build such barriers—8 to 10 years, by the experience of similar barriers in Europe—but because of the time of the time it takes to *start* to build them. As seen in Table 2, this has taken two or three decades in Europe. This time period would likely be no shorter in New York when you consider what is entailed: gaining public support, gaining support and funding from the governments involved, making assessments, preparing designs, obtaining permits, preparing the environmental impact statement, holding hearings, fighting lawsuits, *etc.*

This is known as "lead time," a concept that is also missing from Flexible Adaptation Pathways. Lead time is mentioned nowhere in the NPCC report. How could it have been overlooked? Possibly, it was overlooked because of the makeup of the NPCC. As described in the report, the NPCC "consists of climate change and impacts scientists, and legal, insurance, and risk management experts" (NPCC, 2010). Is something missing? People in these professions have never built anything, so the thought of lead time may not have occurred to them. There are no civil engineers on this panel devoted to protecting critical infrastructure. This must be surprising to the ASCE, which, on the national level, takes on the role of the steward of infrastructure, periodically providing a report card on the state of the infrastructure in the United States, with recent grades ranging from C to D-minus.

In the 350-page NPCC report, storm surge barriers are discussed in two paragraphs, the essence of which is as follows:

Table 2. *Delays in constructing storm surge barriers.*

Barrier (country)	Flood	Delay (years)	Start	Construction Time (years)	Completion
Providence (U.S.A.)	1938	23	1961	5	1966
New Bedford (U.S.A.)	1938	24	1962	4	1966
Stamford (U.S.A.)	1938	27	1965	4	1969
Thames River (U.K.)	1953	21	1974	10	1984
Eastern Scheldt (the Netherlands)	1953	14–26	1967–1979	7	1986
Maeslant (the Netherlands)	1953	36	1989	8	1997
Venice (Italy)	1966	37	2003	(11)	(2014)

> At present, conceptual designs of storm surge barriers should be considered as *contributions to the discussion*... [that] would require very extensive study.... New York City could protect against some level of storm surge with a combination of local measures (e.g., flood walls and reclaimed natural barriers), improved storm information and forecasting, and evacuation plans for at least the next several decades. (2010, p. 76) (emphasis added)

The colossal complacency of the latter sentence is belied by sections of the rest of the NPCC report (2010):

(1) "Because the climate processes affecting extreme events, such as hurricanes and nor'easters, may change in the future, prediction of future extremes is generally characterized by higher uncertainty." (p. 57)
(2) "Intense hurricanes will become more likely than not." (p. 57)
(3) "Changes in the distribution of extreme events could have large effects." (p. 58)
(4) "For New York City, the primary near-term risk is coastal flooding from nor'easters." (p. 114)
(5) "Historical nor'easters have reached intensities comparable to category 1 and 2 on the Saffir-Simpson scale." (p. 114)
(6) "The nor'easter of December 1992 had the highest storm surge since modern record keeping was recorded at the Battery." (p. 114)

The aforementioned northeaster of December 1992 completely shut down New York City subways, the Port Authority Trans-Hudson system, Metro North service to Grand Central Station, and portions of the Long Island Rail Road, and it required the rescue of passengers on subways and drivers stalled on the Franklin D. Roosevelt East River Drive. If the storm surge had peaked 2 ft higher, according to a government study, lives could have been lost on the roadways and rail systems (U.S. Army Corps of Engineers *et al.*, 1995, pp. 37–39).

Table 3. *Average return periods of hurricanes striking the New York region.*

Category (hurricane)	Last Occurrence	Average Return Period (years)	Expected Return Date
1 (Bob)	1991	17	2008
2 (Gloria)	1985	39	2024
3 (Long Island Express)	1938	68	2006

Why Were the Lessons of Katrina Ignored?

Why were the lessons of Katrina ignored by the NPCC? Will hurricanes not strike New York City? If they do, will the damage not be significant? In any case, can nothing be done to protect the region from coastal storm damage? Let us examine these possibilities.

Will Hurricanes Not Strike New York City?

In the past, epic hurricanes have struck the city. In the 1815 hurricane, according to the historical record, sea level rose 13 ft/h, flooding everything south of Canal Street. In the 1893 hurricane, a 30-ft storm surge swept across southern Brooklyn and Queens. Hog Island south of the Rockaway Peninsula was obliterated. The 1938 "Long Island Express," which would be classed as a category 3 hurricane today, only brushed New York City but drowned 50 people on Long Island and more than 600 in New England, mostly in Providence, Rhode Island (Wikipedia, 2011).

Moreover, we have the statement of Max Mayfield, the former director of the Tropical Prediction Center of the National Hurricane Center, who told a congressional committee on May 24, 2006, that "It is not a question of *if* a major hurricane will strike the New York area, but *when*..." (Mayfield, 2006) (emphasis his). This statement was quoted in the NPCC report (2010, p. 119). As to when, the National Oceanic and Atmospheric Administration is less guarded than the NPCC in forecasting hurricanes. NOAA has reported on the Web its estimates of the average return periods of hurricanes striking the New York City region (National Hurricane Center, 2011). Table 3 shows the return periods counting from the last hurricane of the same category.

In other words, we have been overdue for hurricanes of category 1 and 3, and we can expect a category 2 within the next two decades. Of course, hurricanes do not return at the average return periods on schedule; otherwise, we would already have had hurricanes of category 1 and 3.

Will the Damage Not Be Significant?

According to modeling done by the New York City Office of Emergency Management, the consequences of a catastrophic storm surge striking the city would be dire. Up to 3 million people would need to be evacuated. More than one-third of the city's land—some in each of the five boroughs—would be inundated, flooding 577 schools, 88 fire and emergency service facilities, and 80 hospitals and nursing homes (New York City Office of Emergency Management, 2009).

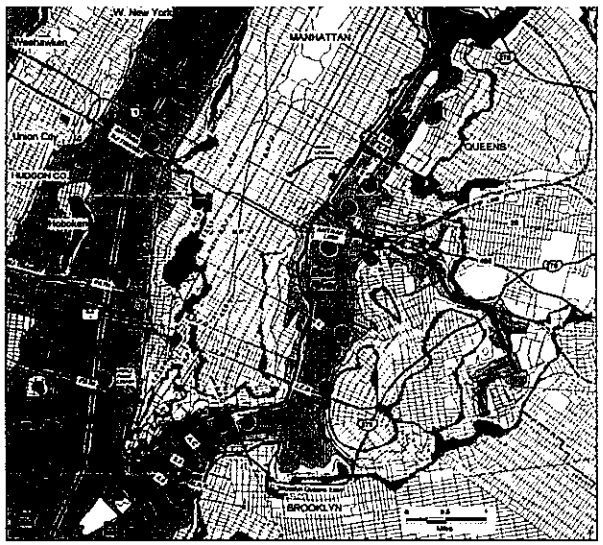

Figure 5. Flooding in the central city from a worst-case hurricane of various categories. Dark blue = category 1, light blue = category 2, yellow = category 3, red = category 4. (U.S. Army Corps of Engineers *et al.*, 1995.)

The consequences to lower Manhattan of a worst-case scenario, in which the eye of the hurricane strikes New Jersey and the city receives the brunt of the high winds and the storm surge, would be disastrous, as shown in Figure 5 (U.S. Army Corps of Engineers *et al.*, 1995). Its effect on the financial community, the heartbeat of New York City's economy—immediately and over the long term—can only be guessed.

A study by the Organization for Economic Cooperation and Development ranked 136 port cities in the world by their exposure and vulnerability to climate extremes (Nicholls *et al.*, 2008). New York City was rated among the top 10 in terms of population exposure. It was rated second only to Miami in terms of "value of property and infrastructure assets." However, Miami does not contain the financial center of the world. In terms of the economic consequences of a disastrous flood, New York City is undoubtedly first.

Can Nothing Be Done To Protect the Region from Coastal Storm Damage?

To answer this question with complete assurance, an assessment of storm surge barriers is needed, as originally promised by PlaNYC (City of New York, 2007).

ASCE Lesson 10: Place Safety First

The NPCC report refers to "needed studies" adding that it is necessary to "conduct feasibility studies of nonstructural and structural citywide protective measures, as appropriate over *future* time periods" (2010, p. 11) (emphasis added). This isn't putting safety first. This is putting safety off.

CONCLUSIONS

In this life-or-death matter, conclusions can be drawn from the lessons of Katrina and the inconsistencies of the 2010 NPCC report:

(1) By focusing only on the critical infrastructure of individual stakeholders, the NPCC report is *delaying* regional measures against severe coastal flooding.
(2) By promoting Flexible Adaptation Pathways, it is *discouraging* hedging and the application of the precautionary principle.
(3) By dismissing storm surge barriers, it is *deterring* adequate measures to protect public safety, health, and welfare.

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☐ in favor ☐ in opposition

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(PLEASE PRINT)

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I represent: UPROSE

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Name: Adam Freed

Address: 253 Broadway

I represent: Mayor Michael Bloomberg

Address: "

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(PLEASE PRINT)

Name: Catherine Skopic

Address: 140 West Broadway, N.Y.C. 10013

I represent: Myself - Citizen, Parent

Address: _____

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Date: _____

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I represent: NYH20 / ARCHITECT

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Name: Catherine McVay Hughes

Address: _____

I represent: Vice Chairperson, Community Board 1

Address: 49-51 Chambers St, Suite 715

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Appearance Card

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Name: Cortney Worrall, MWA

Address: 241 Water Street

I represent: Metropolitan Waterfront Alliance

Address: 3875 Waldo Ave

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Appearance Card

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(PLEASE PRINT)

Name: PAUL GALLAY

Address: 20 Cedar Rd Ossining NY

I represent: Riverkeeper

Address: Same

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