ST.GALLEN SYMPOSIUM

Global Essay Competition 2024

Title: Navigating Climate Resilience in Coastal Urban Landscapes

Introduction

The changing climate and rising sea levels pose a severe threat to coastal cities, exposing them to extreme weather events that endanger both life and property. Throughout history, humans have always strived for more development by disturbing natural ecosystems and encroaching upon water to expand urban areas resulting in accelerated climate change, serving as a global wake-up call. The urgency to address these issues is heightened by the narrowing window of time within which our actions can be effective, but delays will make impacts irreversible, exacerbating future challenges. Many major coastal cities, grappling with a housing crisis, are set to face exacerbated challenges with encroaching water, leading to scarcity of safe habitable coastal spaces. In this critical moment, it is imperative to foster resilience and sustainability in these vulnerable coastal cities by advocating for an approach that embraces thriving with less by limiting development in at-risk areas. This essay delves into the impacts, challenges and response to climate change in New York City and Rotterdam, while exploring solutions for protection aimed at accommodating and coexisting with water.

Urban Realities

In the past decades, many important cities have grown along the coastal regions, a trend driven by the imperative needs of trade, transportation and industry. Interestingly, the post-industrialization period witnessed an exponential surge in the growth of densely populated coastal cities that strived for more development and infrastructure. This growth, however, came with a cost that led to increased industrial processes, construction activities, and use of cars, all of which elevated energy consumption produced by fossil fuels. Consequently, carbon dioxide, the byproduct of burning fossil fuels and a major driver of climate change, began accumulating in the atmosphere due to its resistance to breakdown or removal. The Intergovernmental Panel on Climate Change (IPCC) states that human activities have caused unprecedented changes in the earth's climate causing extreme events which will only intensify in the future.[1]

As the sea levels rise and climate changes, coastal cities are constantly at high risk of coastal storms and flooding. A report by the IPCC indicates that the expected increase in global mean sea levels by the close of the century is estimated to range from 0.95 feet (0.29m) to 3.61 feet (1.1m).[2] Astonishingly, thirteen percent of the world's total urban land mass is in low-elevation coastal zones with disproportionately high populations.[3] Past development choices have disturbed natural ecosystems and encroached on water by altering coastlines and depleting living barriers like coastal wetlands to accommodate a rapidly increasing population.[4] The action of landfilling has further amplified the impacts

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[1] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. In Press.

[2] IPCC, 2019: Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3–35. https://doi.org/10.1017/9781009157964.001.

[3] Center for International Earth Science Information Network. (2019, October 25). *Rising Seas Threaten Low-Lying Coastal Cities, 10% of World Population*. State of the Planet, Columbia Climate School. https://news.climate.columbia.edu/2019/10/25/rising-seas-low-lying-coastal-cities/

[4] Jacobo, J., Manzo, D., & Zee, G. (2022, November 7). *How climate change, rising sea levels are transforming coastlines around the world*. ABC News. https://abcnews.go.com/US/climate-change-rising-sea-levels-transforming-coastlines-world/story?id=91681973

of climate change triggering the resurgence of water with ghost streams reappearing and causing nuisance flooding. The looming threat of rising sea levels poses a substantial risk to densely populated coastal areas, home to one in seven individuals globally.[5]

If emissions remain uncontrolled, over 800 million people in 570 cities could be at risk from sea level rise by 2050, with estimated global economic costs for cities reaching $1 trillion by mid-century.[6] It is important to note that a country's economy heavily depends on the functioning of its cities and vulnerability depends on its socio-economic composition and built environment. In response to this crisis, 196 parties adopted the Paris Agreement in 2015 with an aim to limit global warming to no more than 1.5°C, requiring a 45% reduction in emissions by 2030 and achieving net zero by 2050.[7] In addition to emissions reductions, building resilience is the key to protect coastal communities by guiding future growth towards safe higher grounds.

Climate Change and Cities

Urban resilience and sustainability have no silver bullet solution but requires a comprehensive approach to tackle the climate crisis for global well-being and security of life on earth. Climate mitigation and adaptation measures are key to this approach where mitigation refers to the actions, we take to reduce greenhouse gas emissions balanced by adaptation which refers to measure's cities are taking to respond to the impacts of climate change. While some cities are still struggling to recover and respond to climate impacts, some have already started to take proactive measures to prepare for future extreme events. To discuss the state of these actions globally, the essay explores two similarly vulnerable yet contrasting cities - New York, United States and Rotterdam, Netherlands.

New York City, located on the Eastern Atlantic Coast of the United States, in the delta of Hudson River, is exposed to severe storms, flooding and sea level rise with the most valuable properties in the world as well as a larger population living in the floodplains. New York got its wake-up call when the devastating Superstorm Sandy struck in 2012 paralyzing the city and causing extensive damages over $19 billion.[8] Following the hurricane, the city government called upon collaboration of academic experts, the private sector, and regional agencies to create urban resilience policies and climate action plans like OneNYC 2050,[9] specifically targeting sea level rise and floods. Presently, numerous ongoing projects aim to safeguard 520 miles of shoreline through a multifaceted approach with strategies like sea walls, flood parks and living shorelines.[10] Additionally, it is proactively taking actions to reduce greenhouse gas emissions by exploring offshore wind and community solar projects while investing in resilient infrastructure.[11] New York City, being the economic hub of the United States, has been proposed federal funding through a $52 billion US Army Corps of Engineers NYNJHATS project to protect the region. However, this project has faced criticism due to a singular approach tackling stormwater flooding and use of hard gray infrastructure, raising concerns about potential disruptions to natural ecosystems.[12]

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[5] Schechter, D., Horner, C., Rush, H., Mercedes, D., & Geller, L. (2023, December 8). *More than 70 million people face increased threats from sea level rise worldwide*. CBS News. https://www.cbsnews.com/news/increased-threats-of-sea-level-rise-worldwide/

[6] *Sea Level Rise and Coastal Flooding*. (n.d.). C40 Cities. https://www.c40.org/what-we-do/scaling-up-climate-action/adaptation-water/the-future-we-dont-want/sea-level-rise/

[7] *The Paris Agreement | Climate Action*. (n.d.). United Nations. https://www.un.org/en/climatechange/paris-agreement

[8] *Sea Level Rise and Coastal Flooding*. (n.d.). C40 Cities. https://www.c40.org/what-we-do/scaling-up-climate-action/adaptation-water/the-future-we-dont-want/sea-level-rise/

[9] OneNYC 2050, NYC Mayor's Office of Climate and Environmental Justice.

[10] Living shorelines, a green infrastructure strategy, uses native vegetation and low sills, as an eco-friendly alternative to hard shoreline stabilization like rip-rap or bulkheads. They provide benefits such as reducing nutrient pollution, creating essential fish habitats, and superior resilience to hurricanes compared to bulkheads.

[11] Delivering Sustainable Infrastructure, NYCEDC.

[12] Freudenberg, R., & Calvin, E. (2023, March 29). *RPA Comments on the New York-New Jersey Harbor and Tributaries…*. Regional Plan Association. https://rpa.org/latest/lab/hats-review

Rotterdam, Europe's largest port situated in the Netherlands delta of the Rhine and Meuse rivers, has 90% of the city below sea level vulnerable to rising oceans and fiercer storms.[13] The Maeslantkering, a monumental floodgate completed in 1997, was built as a consequence of repeated historic calamities and stands as the city's first line of defense, showcasing engineering prowess.[14] Renowned for their water management expertise, the Dutch excel in building dams and dikes, however a paradigm shift occurred in their attitude following two devastating floods in 1993 and 1995 that served as a wake-up call. A collaborative approach with water to give back some room that they had taken choosing to coexist with it rather than defend it resulted in a transformative project called 'Room for the River',[15] setting an example for global urban planning. The holistic vision involves strategies like creating lakes, parks, plazas and enormous reservoirs to accommodate swollen seas and rivers while concentrating population inland to restore natural floodplains. Rotterdam's commitment to climate resilience is evident with initiatives like Rotterdam Climate Proof (2008) and Rotterdam Climate Adaptation Strategy (2013)[16] which are tailored to area specific strategies. These strategies include addressing the outer-dyke city with multi-layered flood protection systems and inner-dyke urban areas to have sponge properties to effectively manage excessive water.

Adapt not Defend: Proactive Measures

The solutions proposed advocate for safe habitable coastal spaces by restricting development in at-risk areas and restoring natural floodplains for future growth and well-being. These should be integrated as a part of larger goals rather than using them in isolation since a multifaceted approach is the key to this pressing issue of climate change.

Equitable Managed Retreat: Climate adaptation strategies include three main approaches - protection through fortifications, living with water or retreat from the water. Managed retreat, largely seen as the last resort, is a form of migration involving retreat of people and infrastructure from the floodplains through government buyouts. Economically, it is not sensible to rebuild in places that are exposed to frequent floods. Therefore, billions of dollars used for recovery should be invested in proactive managed retreat as a pre-disaster strategy rather than a post-disaster recovery. It should be integrated into larger development strategies tailored to local conditions and community goals.[17] The complicated solution gets even more challenging when addressing low-income and racially diverse populations which largely tend to live in floodplains and lack resources to relocate.[18] Equity and collaboration, considered at the core of this process will lead to successful transition and equally protect everyone from the vulnerabilities of climate change.

Nature-based Solutions: Nature-based solutions preserve, manage, or restore ecosystems to effectively address societal challenges, providing benefits for human well-being and biodiversity.[19] Storm surges and coastal flooding are conventionally tackled with man-made gray infrastructure like seawalls and dikes but this approach, in contrast, leverages natural ecosystem services as a cost-effective alternative. It is an umbrella of a wide range of actions from restoring coastal ecosystems to urban green-blue infrastructure. Coastal ecosystems like wetlands, mangroves, oyster reefs act as buffers that reduce the impact of storms, protect the coast, absorb carbon and supports biodiversity. Green-blue infrastructure includes bioswales, green roofs, permeable surfaces, flood parks, and water plazas to manage water

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[13] Michael Kimmelman. (2017, June 15). *The Dutch Have Solutions to Rising Seas. The World Is Watching*. The New York Times. https://www.nytimes.com/interactive/2017/06/15/world/europe/climate-change-rotterdam.html
[14] Michael Kimmelman. (2017, June 15). *The Dutch Have Solutions to Rising Seas. The World Is Watching*. The New York Times. https://www.nytimes.com/interactive/2017/06/15/world/europe/climate-change-rotterdam.html
[15] Room for the River Programme, Dutch Water Sector.

[16] Rotterdam Climate Change Adaptation Strategy, Urban green-blue grids for resilient cities.
[17] Siders, A. R., Hino, M., & Mach, K. J. (2019, August 23). The case for strategic and managed climate retreat. Science, 365(6455), 761-763. https://www.science.org/doi/10.1126/science.aax8346
[18] Ajibade, I. J., & Siders, A. R. (Eds.). (2022). *Global Views on Climate Relocation and Social Justice: Navigating Retreat (Chapter 2, page 30)*. Routledge.
[19] Jongman, B., & Judson, S. (2023, March 29). *Nature-based solutions for climate resilience are catching on in World Bank projects: Less gray, more green and blue*. World Bank Blogs. https://blogs.worldbank.org/climatechange/nature-based-solutions-climate-resilience-are-catching-world-bank-projects-less-gray

and provide numerous co-benefits in addition to flood risk reduction.[20] It is projected that nature-based solutions have potential to contribute up to 37% of the necessary mitigation by 2030 to reach the objectives set by the Paris Agreement.[21]

Encouraging Multilateral Partnerships: The common goal of tackling the climate crisis, in the present time, lacks a collaborative approach, at both national and international level. Countries, within its own administrative framework, lack coordination between federal, state and local levels impeding comprehensive action critical for successful outcomes. Establishing robust collaborations is crucial for achieving desired goals in a timely manner. Furthermore, encouraging multilateral partnerships is an even bigger component to success where developed nations partner with vulnerable nations to aid in implementing best practices/lessons learned, develop training programs and educational scholarships.[22] A multilateral development fund system can be established where the developed countries provide financial support to the most vulnerable nations for recovery and preparedness.[23] The act of working together will yield superior outcomes than isolated efforts since our actions collectively will determine our future.

Establishing a Global Climate Ministry: The escalating climate crisis needs special attention to secure future life on earth. In response, this solution proposes to establish a Global Climate Ministry to specifically combat climate change and help countries advance their efforts to reduce carbon emissions and contribute to the well-being of all nations. Our actions today define our future; therefore, it is critical to monitor that one country is not burdened by the actions of other countries through a system of taxing countries for the amount of carbon emitted and providing credits/incentives for their best practices. The role of this ministry involves creating stringent policies for climate change mitigation and adaptation and introducing agreements to achieve set goals and targets. The lack of a powerful global entity that deals with the climate crisis has resulted in false goals and loose efforts as of today. In the proposed system, countries will be obligated to answer to the ministry for their actions and everyone, in collaboration, will have to put an extra effort for a substantial real change in the remaining window of opportunity.

Conclusion

The changes in climate that we witnessed in recent years are set to intensify, underscoring an urgency for collective action. It is each individual's responsibility to be mindful of their actions in order to secure a safe, healthy future for generations to come. A paradigm shift in our thought process from striving for more to thriving with less is the first step towards a positive change. This transformation necessitates reimagining the education curriculum, individual moral accountability and collective efforts of our leaders and policymakers. Acknowledging the complexities in the planning and implementation of the proposed solutions, their effective execution promises lasting and impactful results ensuring safe habitable coastal spaces for everyone. Despite posing a life-threatening global concern, there remains hope that our collective efforts can limit the global temperatures to below 2°C and mitigate the adverse impacts of climate change.

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[20] C40 Cities Climate Leadership Group. (n.d.). *GOOD PRACTICE GUIDE - Climate Change Adaptation in Delta Cities*. C40 Cities. https://www.c40.org/wp-content/uploads/2022/02/C40-Good-Practice-Guide-Climate-Change-Adaptation-in-Delta-Cities.pdf

[21] *Climate Explainer: Nature-Based Solutions*. (2022, May 19). World Bank. https://www.worldbank.org/en/news/feature/2022/05/19/what-you-need-to-know-about-nature-based-solutions-to-climate-change

[22] Ajibade, I. J., & Siders, A. R. (Eds.). (2022). *Global Views on Climate Relocation and Social Justice: Navigating Retreat (Chapter 3, page 43)*. Routledge.

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Word Count (essay text only): (1950/2100)