

**Environmental Gentrification: An Analysis of the Unforeseen Consequences of
Environmental Infrastructure on Marginalized Communities**

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Climate change and flooding do not impact people equally; residents of low-income communities and marginalized groups face a disproportionate number of challenges from environmental disasters. These communities “have contributed the least to climate change, have had the least access to environmental amenities such as green space, are the most exposed to climate hazards and effects, and have the fewest resources to adapt” (Anguelovski, Connolly, Garcia-Lamarca, et al., 2019, p. 1). Marginalized populations are likely to face residential displacement due to the creation of environmental infrastructure in their communities.

Gentrification that is caused by sustainability practices is referred to as environmental gentrification, a process in which supposedly progressive sustainability practices are used to drive up property values and displace low-income residents. Quastel, Moos, and Lynch epitomize this in their argument that “sustainability planning actively contributes to, rather than simply exists alongside, growing urban inequality as it reinforces rising house prices and social exclusion associated with the new economy” (Quastel et al., 2012, p. 1060). Sustainability initiatives can paradoxically enhance gentrification and threaten to displace vulnerable residents.

Flooding causes significant damage and loss of life. Hazardous weather events increase in frequency each year and bring higher intensity rainfall that threatens to overwhelm local storm water systems. The technical project that coincides with this research paper addresses this issue by developing a flood monitoring system that monitors flood levels and alerts community residents in order to reduce the impacts of flooding. This STS research paper discusses how environmental projects can potentially cause gentrification and negatively impact vulnerable and marginalized communities. At this time, researchers do not understand the full effects of

sustainable projects on vulnerable communities. This paper provides a synthesis of the insights gained from a review of relevant literature on the causes and effects of environmental projects, along with strategies to reduce environmental gentrification. Actor-network theory (ANT) is used as a method of analysis to understand the social implications of environmental technology and the paths by which unintended gentrification can occur. Based on ANT analysis, I argue that in order to reduce the potential of reinforcing gentrification, policies must be set to ensure that the creation and implementation of environmental projects prioritizes protecting existing residents.

Problem Definition: Lack of Communication between Environmental, Social, and Economic Actors

Due to climate change and increased flooding, it has become abundantly apparent in the past few decades that sustainability must become a fundamental element of designing modern cities. Many communities throughout the country have embraced the concept of sustainability and have made efforts to include sustainable developments into their plans. However, there is typically an inconsistency between achieving environmental goals and creating equity. Sustainable development addresses the economic growth and environmental aspects of sustainability, but has traditionally neglected to address the social justice and equity issues that can occur in communities. Gentrification is a social equity problem that pushes out low-income residents in favor of high-income in-migrants (Gould & Lewis, 2016). Similarly, environmental gentrification, or green gentrification, is the process of creating and reinforcing environmental privilege for elites and represents how green initiatives can enhance gentrification (Anguelovski, Connolly, Garcia-Lamarca, et al., 2019).

Environmental initiatives often lead to gentrification by their predisposition to increase property prices in nearby areas. Browne (2018) emphasizes that “The loss of affordable housing is a major consequence of implementing ecological enhancements and environmental amenities; therefore, this issue should be addressed prior to rapid development and real estate market speculation” (p. 2). Residential and commercial developers view the creation of green amenities as a key element to attract the affluent consumer market to these newly redeveloped communities. Sustainable projects often emphasize economic development and have shown to lead to an increase in property values in nearby neighborhoods and the decrease of affordable housing (Maantay & Maroko, 2018). Figure 1 depicts the potential short-term and long-term consequences of green infrastructure on environmental gentrification. The figure shows that in the short term, some populations might be excluded from using and benefiting from green interventions. In the long-term, these interventions can lead to increased vulnerability to climate-risks and the displacement of residents. Residents can become more vulnerable to both climate risks and displacement due to environmental gentrification (Anguelovski, Connolly, Pearsall, et al., 2019). Cost-of-living surges can cause low-income families to become displaced, and with the decrease of affordable housing, they are left with nowhere to go. This paper examines the extent to which the implementation of environmental enhancements and amenities will lead to gentrification and the loss of affordable housing within communities and explores how this pattern can be broken.

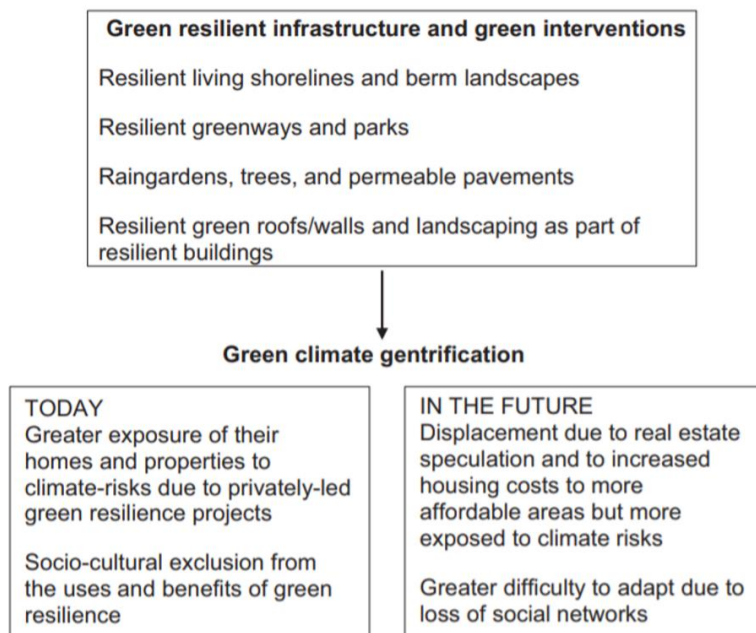


Figure 1: Consequences of Green Infrastructure (Anguelovski, Connolly, Pearsall, et al., 2019, p. 26141). In the long-term, green interventions can lead to increased vulnerability to climate-risks and the displacement of residents.

This research pursues an improved understanding of the possible social and economic consequences of implementing sustainable practices. This knowledge can provide an insight into the conflicts between environmental, social, and economic factors that persist in sustainable development. Browne (2018) illustrates how “Sustainability initiatives should not undermine the social fabric of a community; rather, it should coincidentally preserve and protect the physical and social environment” (p. 2). Although green projects should benefit both the environment and people that are most vulnerable, this is hardly the case in many U.S. cities. In order to understand and prevent negative consequences of environmental practices, this paper conducts case studies on two cities in which environmental gentrification is occurring and provides strategies to reduce its effects. Possible mitigation and prevention strategies for preserving affordable housing during

the implementation of sustainability initiatives can be utilized by environmental project planners and agencies.

Methods: Actor-Network Theory as a Sociotechnical Framework to Analyze Environmental Gentrification

In this research paper, ANT is used as a framework for understanding the detrimental effects of sustainable projects on environmental gentrification and what can be done to reduce these effects. ANT is a method for investigating sociotechnical processes, it views the social, technical, conceptual, and textual aspects of engineering as interconnected facets of systems. In ANT, action is conducted by an actor which is “any agent, collective or individual, that can associate or disassociate with other agents” (Crawford, 2005, p. 1). Actors are defined by the networks that they are in and the interactions they have with other actors (Callon, 1990). These actors then form networks that combine diverse technical and social elements which can in turn also be actors in other networks.

Michel Callon, one of the creators of ANT, asserts that “science and technology are a product of interaction between a large number of diverse actors” (Callon, 1990, p. 133). Green projects and environmental gentrification are systems composed of numerous heterogenous aspects. ANT provides a way to describe and analyze the relationships and networks between actors in sociotechnical systems such as these. Callon illustrates that the actors involved in technological change can "develop complicated strategies and many possible innovations with unexpected social and technical implications" (1990, p. 133). ANT is useful for understanding the potential of technological projects and the relationships they will have with society. In this paper, ANT is used as a tool to investigate how environmental projects can potentially cause

unforeseen gentrification. Additionally, this framework helps in understanding what strategies can be used during the planning and implementation stages of projects in order to reduce the possibility of causing environmental gentrification. This paper conducts two case studies on environmental gentrification through the lens of ANT.

The Anacostia River

The Anacostia River is located in Washington DC and flows into the Potomac River. The Anacostia has been mistreated for decades, causing it to become highly polluted and neglected. In recent years, many efforts in cleaning up the river have been successful and have helped revive the river to its former self. Some view this transformation of the Anacostia as a model for sustainable economic development, demographic growth, and an opportunity for racial reconciliation in DC, one of the nation's highest segregated cities (Ranganathan & Hyra, 2020). However, the revitalization of the river can also represent environmental gentrification as communities by the river have seen a large influx of new wealthier, whiter, residents that have displaced lower-income and minority residents (Anguelovski, 2019).

In 1989, the Anacostia Watershed Society created a plan to have swimmable and fishable river by 2025 and has been working to clean up the river since then (Momin, 2019). In 2000, the Anacostia Waterfront Initiative advanced efforts to promote the economic revitalization of the waterfront and create projects to increase accessibility to the Anacostia. With the improvement of the river, developers have been seizing waterfront property on the west side of the river to construct upscale neighborhoods. Investments in the west side have indirectly led to an increase in property prices on the east side of the river (Momin, 2019). The concerns of environmental

gentrification by marginalized residents on the east side of the river have largely gone unheard as economic development has been prioritized over equitable development.

Anacostia, a neighborhood east of the river, was the first African-American settlement of freedmen in post-civil war Washington and is currently where half of DC's African American population resides (Anguelovski, 2019). In the 1950s, Black Anacostia residents were evicted and moved into mass public housing units by urban redevelopment initiatives. Subsequent decades of housing segregation policies and urban renewal measures led to poverty rates to surge well into the 1980s and are currently among the highest in the district (Anguelovski, 2019). Local activists and residents view urban greening initiatives as a new system for causing mass displacement. In Anacostia, property prices are rapidly soaring and median sale prices have multiplied by 2.5 between 2014 and 2018 (Anguelovski, 2019). This rise shows how the river initiatives escalated environmental gentrification and unfortunately could mean displacement for many Black residents.

The Atlanta BeltLine

In the past few decades, large projects that reuse existing infrastructure or sites to create new development have gained popularity in urban planning for their supposed ability to further sustainable development. Such projects are able to provide communities with environmental amenities including green spaces, increased ability to walk and bicycle, and additional local shopping facilities. An example of a sustainable development project is the Atlanta BeltLine in Georgia, a publicly funded initiative that is currently under development. The BeltLine aims to transform a former railway corridor around the center of Atlanta into a ring style multi-use trail, creating a route for pedestrian and bicycle traffic around the core of Atlanta. The BeltLine plan

was created by Ryan Gravel in 1999 and is estimated to be complete in 2030 (Immergluck, 2017). This project will connect 45 neighborhoods in Atlanta through the 22-mile loop of trails, parks, and a streetcar. In 2016, the Atlanta BeltLine Inc (ABI), the agency that is creating the BeltLine, stated that the project is comprised of “four open trails; two trails under construction; seven parks; intensive planning for modern streetcar expansion; more than \$3 billion in private economic redevelopment; hundreds of affordable workforce homes; free fitness classes; a linear arboretum; an urban farm; and the largest temporary public art exhibition in the South” (Immergluck, 2017, p. 2).

Community development efforts such as the BeltLine are expected to cause a moderate increase in property prices due to the area becoming more appealing to potential renters and homebuyers. This effect could benefit lower-income and middle-income homeowners who would like to sell their homes and move away and who have the means to do so. Additionally, conventional community development occurs gradually over time and as a result property values are affected slowly, giving public developers time to provide affordable housing options and maintain the economic and social diversity of the community. However, this is not the case for the BeltLine and other large scale environmental projects in which big expected increases in property values due to the project can lead to financial speculation in the area. Widespread speculation by investors that purchase properties with the intent to flip them in the near future can rapidly increase property prices to the detriment of existing residents. In Atlanta, the BeltLine induced extensive speculation before groundbreaking in 2011 and was seen as the heart of real estate (Immergluck, 2017). Once the trail and park developments began on the east side of the BeltLine, real estate investors were drawn to all parts of the BeltLine. By 2014, construction

of luxury apartment buildings skyrocketed while thousands of low-cost rental units were disappearing (Immergluck & Balan, 2018).

In the planning of the BeltLine, the Atlanta City Council required the ABI to direct 15% of all BeltLine bond proceeds to fund affordable housing development (Immergluck & Balan, 2018). The ABI defined affordable housing as “rents not exceeding 30 percent of the tenant’s or buyer’s income and incomes of no more than 60 percent of the metropolitan median income for rental properties and 100 to 115 percent of the metropolitan median for owner-occupied properties” (Immergluck & Balan, 2018, p. 6). However, beginning in 2007, declining property values caused the bond market to quickly disappear along with the 15% of proceeds for affordable housing. Communities along the BeltLine put pressure on the ABI to create additional affordable housing options. In September 2016, two important members of the ABI resigned over the issue of inadequate housing affordability (Stafford & Mariano, 2017). One of the members was Ryan Gravel, the creator of the BeltLine and the urban designer who led the movement to convince Atlanta to initiate the project. The ABI announced the increase of funding goals for affordable housing soon after these resignations and media coverage.

Figure 2 shows that between 2011 and 2015, the median property sale price of areas within half a mile of the BeltLine increased at a significantly higher rate than properties in the rest of the city. Over the four years, the highest increase in median sale price was in the Southwest region in which prices increased by 68%. In the other three regions median prices increased by 40 to 51%, while prices of properties further away from the BeltLine only rose by 17% in the four-year period (Immergluck & Balan, 2018). Increasing home values can cause the overall tax base of the city to rise. As this gentrification increases, building owners pass on their rising tax bills to their tenants, causing many renters along the BeltLine to see increases in rent. Most

lower-income residents are likely to be renters, which are in turn less likely to have the ability to access savings to help them face this burden, and are thus expected to be displaced by these rising property costs. The Atlanta BeltLine has created many consequences on housing and economic opportunities for lower-income residents near the BeltLine. In Atlanta, the ABI put profits over the needs of the people. The BeltLine is an immense investment by the city that should be beneficial and available to all residents, not just those that can afford it. As the construction of this project continues, the ABI must focus more on creating affordable housing options for lower-income households and to assist current residents in remaining in these communities.

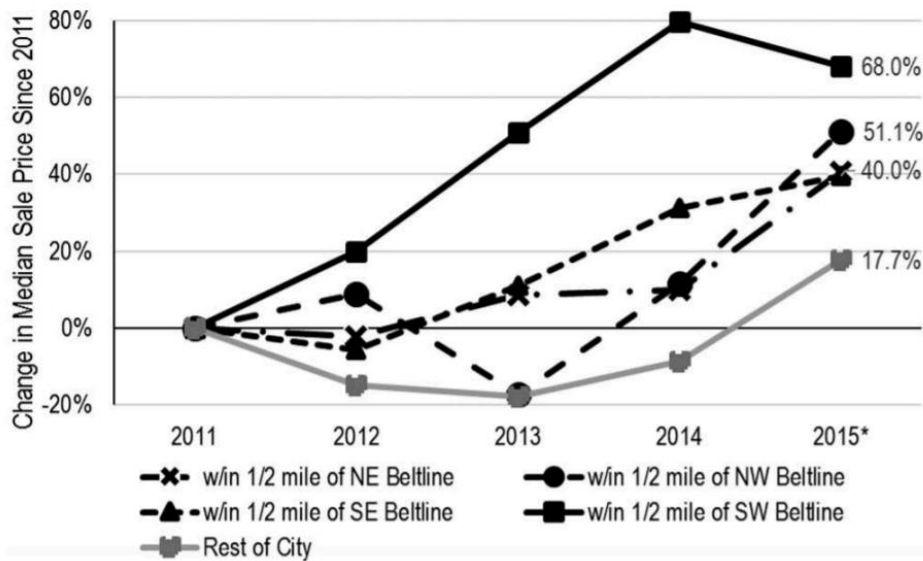


Figure 2: Cumulative Change In Median Property Sale Price (Immergluck & Balan, 2018, p. 556). Changes in median sale price from 2011 to 2015 for sales within one-half mile of each of the four Beltline segments. The median property sale price of areas within half a mile of the BeltLine increased at a significantly higher rate than properties in the rest of the city during this time period.

Results: Reducing Environmental Gentrification when Implementing Sustainable Projects

Environmental gentrification is often a major consequence of greening efforts and other environmental improvements in lower-income communities. When environmental gentrification occurs, it causes greening projects to only benefit the incoming affluent residents and leads to the existing low-income and vulnerable residents to be further burdened through displacement from the newly improved neighborhood into worse communities. Although sustainable initiatives were initially meant to further environmental justice, they are currently only adding to environmental gentrification. Maantay and Maroko define environmental justice as a process that “seeks to ensure that everyone has equal access to environmental benefits and the means to achieve healthy lives” (2018, p. 13). The goal of environmental justice is to protect low-income, minority, immigrant, and other disadvantaged groups that already bear a disproportionate share of environmental burdens. It is clear that environmental gentrification is the opposing force of achieving environmental justice.

Environmental gentrification in the Anacostia neighborhood and around the BeltLine exemplify that combatting gentrification requires planners that are driven to design projects that explicitly address the needs of all residents, especially those that are marginalized. Additionally, communities must provide these planners with the institutional capacity to design and implement projects that prioritize the people first. This capacity is gained by forming multisectoral alliances between environmental, housing, and social justice groups to put pressure on local governments to make equity-minded decisions. Through an ANT perspective, it can be seen that distant actors in this system are very fragmentized and are thus unaware of problems that they might be contributing to. Since the environmental gentrification process involves a plethora of actors with many diverging interests, addressing environmental gentrification first requires creating

awareness on the possible inequity that can be caused by green improvements. With the formation of community engagement in the Anacostia and public ownership of the project, vulnerable residents will be able to see the benefits of environmental improvements and remain in their communities.

Large-scale environmental projects such as the Atlanta BeltLine are likely to fuel environmental gentrification while using current approaches to redevelopment planning. Dan Immergluck created a new approach to planning and implementation called Affordability First for projects such as the BeltLine that have the ability to rapidly transform communities in a significant manner (Immergluck, 2017). The Affordability First approach recognizes the ability of large-scale projects to cause rapid increases in property values and thus creates awareness to combat this issue. This approach creates plans for preserving affordable housing before other aspects of the project are considered. Green infrastructure planning must include financing to protect existing social and public housing and build new permanent affordable housing in communities around the infrastructure. In addition to housing, further anti-displacement tools should be implemented including rent control, community land trusts, and rental subsidies (Anguelovski, Connolly, Pearsall, et al., 2019). These investments help ensure that green infrastructure will protect vulnerable residents from both climate change impacts and displacement.

In order to ensure the protection of vulnerable communities, existing and potential environmental gentrification must be well understood. However, environmental gentrification is currently not a well-known topic and is lacking thorough research in most communities. Research must explore how the impacts of green infrastructure can worsen the security and vulnerability of long-term residents. The demographics of the residents moving to new protected

areas and those that are being displaced to communities with few environmental and social safeguards must be understood through quantitative analyses. Additionally, qualitative research on policy and planning processes should be conducted to educate residents, particularly those that are most vulnerable to gentrification such as racial minorities and immigrants. Such education will help residents understand the risks of green infrastructure and recognize if it is occurring in their community along with establishing inclusion to address environmental gentrification.

Conclusion

Green infrastructure and urban greening projects are often hailed as ways to protect cities against climate change impacts. The negative impacts of such projects for socially vulnerable residents are repeatedly overlooked in order to sell a new brand of environmentally resilient cities to investors, real estate developers, and new sustainability-class residents. Case studies on the Anacostia river and the BeltLine through the perspective of ANT illustrate that environmental initiatives can enhance gentrification and cause those that are the most vulnerable to be displaced. It is an environmental contradiction that the people most vulnerable to natural disasters are also the most negatively impacted by environmental interventions that were meant to protect them.

The planning of sustainable projects must include planners that are motivated to create infrastructure that benefits all residents and provide these planners with the institutional capacity to implement these designs. Agencies that plan and develop large environmental infrastructure should implement the Affordability First method. Using this approach, planning starts with creating a set of tools to protect existing residents from surges in rent and property taxes along

with providing long-term affordable housing. In order to prevent environmental gentrification from occurring, further research and quantitative analyses needs to be conducted on the impacts of green infrastructure on residents. These strategies can be utilized by green infrastructure planners, local government agencies, and social justice groups who want to preserve affordable housing during the implementation these infrastructures. If implemented successfully, these results could help reduce the disproportionate number of challenges marginalized groups face from environmental disasters and assure that sustainability initiatives will benefit all residents.

References

- Amadeo, K. (2020, September 14). *Why Floods Are a More Dangerous Threat Than Terrorism*. The Balance. <https://www.thebalance.com/mississippi-river-flooding-3305663>
- Anguelovski, I. (2019, September 2). Is Gentrification In Washington DC’s Anacostia Whitewashing Black Culture? *Barcelona Lab for Urban Environmental Justice and Sustainability*. <http://www.bcnej.org/2019/09/02/is-gentrification-in-washington-dcs-anacostia-whitewashing-black-culture/>
- Anguelovski, I., Connolly, J. J., Garcia-Lamarca, M., Cole, H., & Pearsall, H. (2019). New scholarly pathways on green gentrification: What does the urban ‘green turn’ mean and where is it going? *Progress in Human Geography*, 43(6), 1064–1086. <https://doi.org/10.1177/0309132518803799>
- Anguelovski, I., Connolly, J. J. T., Pearsall, H., Shokry, G., Checker, M., Maantay, J., Gould, K., Lewis, T., Maroko, A., & Roberts, J. T. (2019). Opinion: Why green “climate gentrification” threatens poor and vulnerable populations. *Proceedings of the National Academy of Sciences*, 116(52), 26139–26143. <https://doi.org/10.1073/pnas.1920490117>
- Auffhammer, M. (2018). Quantifying Economic Damages from Climate Change. *Journal of Economic Perspectives*, 32(4), 33–52. <https://doi.org/10.1257/jep.32.4.33>
- Browne, S. (2018). *The Causes and Effects of Environmental Gentrification: An Examination of the Impacts of the Trinity River Balanced Vision Plan*. <https://smartech.gatech.edu/handle/1853/59967>
- Callon, M. (1990). Techno-economic Networks and Irreversibility. *The Sociological Review*, 38(1), 132–161. <https://doi.org/10.1111/j.1467-954X.1990.tb03351.x>

- Crawford, C. (2005). Actor Network Theory. In *Encyclopedia of Social Theory*. SAGE Publications, Inc.
- Gould, K. A., & Lewis, T. L. (2016). *Green Gentrification: Urban sustainability and the struggle for environmental justice*. Routledge.
- Immergluck, D. (2017, September 1). Sustainable for Whom? Large-Scale Sustainable Urban Development Projects and “Environmental Gentrification.” *Shelterforce*.
<https://shelterforce.org/2017/09/01/sustainable-large-scale-sustainable-urban-development-projects-environmental-gentrification/>
- Immergluck, D., & Balan, T. (2018). Sustainable for whom? Green urban development, environmental gentrification, and the Atlanta Beltline. *Urban Geography*, 39(4), 546–562. <https://doi.org/10.1080/02723638.2017.1360041>
- Maantay, J. A., & Maroko, A. R. (2018). Brownfields to Greenfields: Environmental Justice Versus Environmental Gentrification. *International Journal of Environmental Research and Public Health*, 15(10). <https://doi.org/10.3390/ijerph15102233>
- Momin, K. (2019, June 4). Confronting Environmental Gentrification: The Case of the Anacostia | Environmental Law Institute. *Environmental Law Institute*. <https://www.eli.org/vibrant-environment-blog/confronting-environmental-gentrification-case-anacostia>
- Ranganathan, M., & Hyra, D. (2020). The Racial Inequities of Green Gentrification in Washington, DC Working Paper. *Barcelona Laboratory for Urban Environmental Justice and Sustainability*.
- Stafford, L., & Mariano, W. (2017). Beltline CEO steps down; New head to focus on affordable housing. *The Atlanta Journal-Constitution*. <https://www.ajc.com/news/local-govt-->

politics/beltline-ceo-steps-down-new-head-focus-affordable-
housing/RoWS3022b1qY18eWAoBa6M/

Sweet, W. V., Obeysekera, J. T. B., Marra, J. J., & Dusek, G. (2018). *Patterns and projections of high tide flooding along the U.S. coastline using a common impact threshold*. [PDF].
<https://doi.org/10.7289/V5/TR-NOS-COOPS-086>

Vitousek, S., Barnard, P. L., Fletcher, C. H., Frazer, N., Erikson, L., & Storlazzi, C. D. (2017). Doubling of coastal flooding frequency within decades due to sea-level rise. *Scientific Reports*, 7(1), 1399. <https://doi.org/10.1038/s41598-017-01362-7>