Green Infrastructure and Gentrification

Bibliography

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Table of Contents

Background & Scope

The NOAA Office for Coastal Management provides support to coastal planners and managers interested in green infrastructure as a cost-effective method to reduce the impact of coastal hazards while still providing habitat benefits. The Office has a searchable Green Infrastructure Effectiveness Database that includes records of papers and grey literature on the effectiveness of green infrastructure, its benefits, and costs. The Office for Coastal Management is also interested in the intersection between green infrastructure and gentrification. This bibliography was created by the NOAA Central Library's Research Service to collected information on that intersection.

The research collected here spans the years 2009-2021 and includes academic papers and grey literature from universities, non-profits, non-governmental organizations, and governments from around the world. It is primarily organized by coastal geographic region of focus, as defined by the Office for Coastal Management. All non-geographically-based literature, literature covering multiple regions, and literature covering non-coastal states is in the first General section. As the Office for Coastal Management is primarily concerned with coastal states in the United States, U.S. geographical regions have been listed separately. Internationally-based literature was still included, and can be found in Section 8. During the research collection, no examples were found for Alaska, the Caribbean, or Pacific Islands.

Section 1: General

Section 2: U.S., Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Pennsylvania, Wisconsin)

Section 3: U.S., Mid-Atlantic (Delaware, Maryland, New Jersey, New York, Pennsylvania, Virginia, Washington, D.C.)

Section 4: U. S., Northeast (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island)

Section 5: U.S., West Coast (California, Oregon, Washington)

Section 6: U.S., Southeast (Florida, Georgia, North Carolina, South Carolina)

Section 7: Gulf of Mexico (Alabama, Florida, Louisiana, Mississippi, Texas)

Section 8: International

Sources Reviewed

Along with a web search for relevant grey literature materials, the following databases were used to identify sources: Dimensions, Lens.org, Clarivate Analytics' Web of Science, Wiley Online Library, Science Direct, BioOne Complete, Google Scholar, and JSTOR. Only English language materials were considered.

Section 1: General

Abel, T. D., Clauson, S., & Salazar, D. (2020). Skewed Sustainability and Environmental Injustice across Metropolitan St. Louis, Missouri. In *Case Studies in Suburban Sustainability.* S. J. Garren & R. Brinkmann (Eds.), (1 ed., pp. 185-200): University Press of Florida https://doi.org/10.2307/j.ctv17mrttj.14

Urban and industrial air pollution exposure disparities continue to challenge the sustainability efforts of many North American cities. In this chapter, we review the case of the St. Louis region and its multidecade problems of racial segregation, inequitable development, and air pollution exposure inequality. In particular, we evaluate recent efforts by the St. Louis region to overcome past challenges and initiate a new regional plan that incorporates sustainability and livability principles through coordinated planning that integrates housing, land use, economic and workforce development, transportation, and infrastructure investments.

Anguelovski, I., & Alier, J. M. (2014). The 'Environmentalism of the Poor' revisited: Territory and place in disconnected glocal struggles. *Ecological Economics,* 102, 167-176. https://doi.org/10.1016/j.ecolecon.2014.04.005

In 2002, the year it was published, The Environmentalism of the Poor was one of the first books examining in a multidisciplinary perspective three parallel environmental movements around the world. Eleven years later, we re-examine these movements - the Cult of Wilderness, the Gospel of Eco-Efficiency and the Mantra of Environmental Justice, - focusing on the increased visibility of struggles representing Environmental justice and The Environmentalism of the Poor. Even if they are often disconnected from an organizational standpoint, glocal manifestations of resistance have emerged since the 1990s. Today, environmental movements assert common values related to place, identity, and culture. Activists' concepts such as ecological debt, environmental justice, environmental liabilities, land grabbing, environmental gentrification, corporate accountability, climate justice, food sovereignty, or economic degrowth are the keywords of the networks of the global Environmental justice movement. At the same time, such concepts support the rural and urban movements that remake place for marginalized groups, re-assert traditional practices, and protect territory from contamination, land appropriation, and real estate speculation. Some possibilities exist for cooperation between Environmental justice and the other varieties of environmentalism. Here, comparative research can help unravel the use of valuation languages different from "green" economic growth or sustainable development.

Anguelovski, I., Brand, A. L., Connolly, J. J. T., Corbera, E., Kotsila, P., Steil, J., . . . Ramos, L. A. (2020). Expanding the Boundaries of Justice in Urban Greening Scholarship: Toward an Emancipatory, Antisubordination, Intersectional, and Relational Approach. *Annals of the American Association of Geographers,* 110(6), 1743-1769. https://doi.org/10.1080/24694452.2020.1740579

Supported by a large body of scholarship, it is increasingly orthodox practice for cities to deploy urban greening interventions to address diverse socioenvironmental challenges, from protecting urban ecosystems to enhancing built environments and climate resilience or improving health outcomes. In

this article, we expand the theoretical boundaries used to challenge this growing orthodoxy by laying out a nuanced framework that advances critical urban environmental justice scholarship. Beginning from the now well-supported assumption that urban greening is a deeply political project often framed by technocratic principles and promotional claims that this project will result in more just and prosperous cities, we identify existing contributions and limits when examining urban green inequities through the traditional lenses of distributional, recognition, and procedural justice. We then advocate for and lay out a different analytical framework for analyzing justice in urban greening. We argue that new research must uncover how persistent domination and subordination prevent green interventions from becoming an emancipatory antisubordination, intersectional, and relational project that considers the needs, identities, and everyday lives of marginalized groups. Finally, we illustrate our framework's usefulness by applying it to the analysis of urban residents' (lack of) access to urban greening and by operationalizing it for two different planning and policy domains: (1) greening for well-being, care, and health and (2) greening for recreation and play. This final analysis serves to provide critical questions and strategies that can hopefully guide new urban green planning and practice approaches.

Anguelovski, I., Cole, H., Connolly, J., & Triguero-Mas, M. (2018). Do green neighbourhoods promote urban health justice? *Lancet Public Health,* 3(6), E270-E270. https://doi.org/10.1016/s2468-2667(18)30096-3

For the past 30 years, a search for social and health justice has shaped many cities in North America and Europe. Residents of these cities have mobilised to address the effects of neighbourhood disinvestment, pollution, harmful land uses, and low-quality green spaces on health. In cities such as Leipzig or Barcelona, these movements have transformed neighbourhoods. However, while green amenities are important selling points for attracting high-income populations, the resulting increased property values shape a new conundrum, embodied in the exclusion and displacement associated with so-called green gentrification.

Anguelovski, I., Connolly, J. J. T., 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

Scholars in urban political ecology, urban geography, and planning have suggested that urban greening interventions can create elite enclaves of environmental privilege and green gentrification, and exclude lower-income and minority residents from their benefits. Yet, much remains to be understood in regard to the magnitude, scope, and manifestations of green gentrification and the forms of contestation and resistance articulated against it. In this paper, we propose new questions, theoretical approaches, and research design approaches to examine the socio-spatial dynamics and ramifications of green gentrification and parse out why, how, where, and when green gentrification takes place.

Anguelovski, I., Connolly, J. J. T., Pearsall, H., Shokry, G., Checker, M., Maantay, J., . . . Roberts, J. T. (2019). Opinion: Why green "climate gentrification" threatens poor and vulnerable populations. *Proceedings of the National Academy of Sciences,* 116(52), 26139. https://doi.org/10.1073/pnas.1920490117

Cities in the Global North are increasingly adopting green interventions meant to enhance their climate resilience capacity. Plans include Philadelphia, PA's Growing Stronger, Boston, MA's Resilient Boston Harbor (Fig. 1), Malmö, Sweden's Green and Blue Infrastructure Plan, and Barcelona, Spain's Green Infrastructure and Biodiversity Plan. Such plans and interventions mark the emergence of a new type of climate planning: green climate resilience.

In today's cities, however, low-income communities, people of color, and migrant communities face well-documented forms of climate injustice. Typically, these populations 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 (1), and have the fewest resources to adapt (2⇓–4). We argue here that an emerging fifth type of climate injustice arises because these populations are among the social groups most likely to experience residential and social displacement—in the short and mid-term—from green climate infrastructure (5⇓–7) and its associated gentrification risks. It's what we call green "climate gentrification."

As a group of social scientists who specialize in environmental justice, we thus call for climate researchers to demystify the supposed benefits of green climate interventions and identify inequities embedded in urban green resilience (8, 9), especially interventions related to green climate gentrification.

Anguelovski, I., Shi, L. D., Chu, E., Gallagher, D., Goh, K., Lamb, Z., . . . Teicher, H. (2016). Equity Impacts of Urban Land Use Planning for Climate Adaptation: Critical Perspectives from the Global North and South. *Journal of Planning Education and Research,* 36(3), 333-348. https://doi.org/10.1177/0739456x16645166

A growing number of cities are preparing for climate change impacts by developing adaptation plans. However, little is known about how these plans and their implementation affect the vulnerability of the urban poor. We critically assess initiatives in eight cities worldwide and find that land use planning for climate adaptation can exacerbate socio-spatial inequalities across diverse developmental and environmental conditions. We argue that urban adaptation injustices fall into two categories: acts of commission, when interventions negatively affect or displace poor communities, and acts of omission, when they protect and prioritize elite groups at the expense of the urban poor.

Asmare, L. (2021). *Environmental Gentrification: An Analysis of the Unforeseen Consequences of Environmental Infrastructure on Marginalized Communities.* (Bachelor of Science Undergraduate honors thesis), University of Virginia, Charlottesville, VA. Retrieved from https://libraetd.lib.virginia.edu/downloads/jh343t27b?filename=Asmare_Loza_STS_Research_Paper.pdf

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. The paper looks at the areas around the Anacostia River in Washington D.C. and BeltLine in Atlanta, Georgia.

Audubon Center at Debs Park, Public Counsel, SEACA, & TeamFriday. (2020). *Greening in Place: Protecting Communities from Displacement.* Retrieved from https://www.greeninginplace.com/toolkit

Access to high-quality parks, green spaces, and recreation areas has significant and long-lasting positive impacts on individual and community health. Green infrastructure projects, such as parks and open space, can increase biodiversity, improve storm water absorption, reduce urban heat island effects, and regulate climate emissions. Green infrastructure can also facilitate healthy lifestyles and foster strong social connections by providing a venue for community-building. The benefits of green infrastructure are well-documented, yet inequitable investment and racialized land use practices have long-deprived communities of color and low-income neighborhoods of green spaces. By focusing on historically disinvested communities, public and private green infrastructure investments can address disparities

and promote environmental justice. However, it is not enough to simply locate green infrastructure projects in underserved neighborhoods. Numerous studies have shown that green infrastructure—particularly when executed alongside larger "revitalization" initiatives—can increase property values and accelerate real estate speculation, which contributes to the eventual displacement of the low-income residents in the neighborhood. As such, green infrastructure investments must be undertaken with affirmative protections and plans in place to reduce the risk of inadvertently excluding and harming the very residents they intend to benefit. In order to avoid intensifying environmental injustice under the guise of environmental ethics, green infrastructure investments must be paired with coordinated policies to maximize opportunity and prevent displacement. Greening In Place presents a framework for equitable green development to inform the efforts of park agencies, conservation authorities, and community advocates as they work to promote healthy, sustainable, and inclusive green development. The Guide assesses displacement risks associated with green infrastructure investment and provides a number of recommended strategies to reduce the potential harmful economic impacts such investments may have on vulnerable populations. Accompanying this Guide is an appendix on implementing the strategies listed here, which breaks down when different strategies in this Guide could be pursued by different stakeholders in the development process.

Baró, F., Langemeyer, J., Łaszkiewicz, E., & Kabisch, N. (2021). Editorial to the special issue "Advancing urban ecosystem service implementation and assessment considering different dimensions of environmental justice". *Environmental Science & Policy,* 115, 43-46. https://doi.org/10.1016/j.envsci.2020.10.008

No abstract available.

Blok, A. (2020). Urban green gentrification in an unequal world of climate change. *Urban Studies,* 57(14), 2803-2816. https://doi.org/10.1177/0042098019891050

Over the past few decades, notions of environmental, ecological or green gentrification in cities have entered the lexicon of critical urban scholars and activists alike, not least in North American and European settings. This happens amidst growing concerns that the current policy and planning emphasis on making cities more sustainable serves in some cases to exacerbate socio-material inequalities in the city via forms of residential displacement. In this critical commentary, I respond to recent calls for expanding the socio-geographical parameters of green gentrification research, and for enriching the agenda via new theoretical approaches, by highlighting one particular avenue of problematisation that seems so far conspicuously lacking. This is the realisation that, in an unequal world of anthropogenic climate change, green gentrification must be grasped not only at local but also, simultaneously, at transnational scales of risk-induced socio-spatial restructuring. My suggested approach to a more multi-scalar and climate-sensitive notion of green gentrification proceeds via sociologist Ulrich Beck's theorising of the intensifying socio-material inequalities of climate change in "world risk society", along with ethnographic work on urban climate politics in Copenhagen, the capital of Denmark, and in the North-West Indian city of Surat. While allowing us to analyse the many local ambivalences wedded with urban sustainability politics in the global North and global South alike, Beck helpfully insists that we keep their unequal trans-local interconnectedness in view, yielding a radicalised notion of green gentrification as set in-between and connecting localised and globalised frames of inequality in new ways.

Boulton, C., Dedekorkut-Howes, A., & Byrne, J. (2018). Factors shaping urban greenspace provision: A systematic review of the literature. *Landscape and Urban Planning,* 178, 82-101. https://doi.org/10.1016/j.landurbplan.2018.05.029

Over the past two decades, there has been an efflorescence of park and greenspace research. This trend may reflect substantial increases in urban populations globally and concomitant pressures on land resources – including greenspace. But so far research has mainly tended to focus on demand rather than supply, and specifically the practice of provision – notwithstanding the body of literature studying disparities in greenspace access and geographic distribution through an environmental justice lens (e.g. using spatial analysis). Comparatively fewer studies have considered the interplay of factors that may shape local government's capacity to supply greenspace. This paper reports results of a systematic quantitative review of the greenspace provision literature: assessing the factors that configure its supply, and different approaches to planning and assessing greenspace provision. A conceptual model is offered, explaining the interaction between greenspace provision factors across different scales. Findings suggest many cities continue to experience gaps between planned and actual greenspace provision. Moreover, urban greenspace is typically planned using a recreational standards approach, despite increasing demands for a range of ecosystem functions, services, and benefits. Future research should engage directly with greenspace managers responsible for urban greenspace delivery, especially in rapidly expanding cities, to illuminate points of convergence and divergence between theory and practice. Policy implications include consideration of holistic greenspace planning approaches that better recognise and respond to emerging demands upon, and for, urban greenspace.

Browning, M., & Rigolon, A. (2018). Do Income, Race and Ethnicity, and Sprawl Influence the Greenspace-Human Health Link in City-Level Analyses? Findings from 496 Cities in the United States. *International Journal of Environmental Research and Public Health,* 15(7). https://doi.org/10.3390/ijerph15071541

Examination of the greenspace human health relationship operates in at least four dimensions: what is considered greenspace? which moderators and mediators are included? what outcomes are measured? and which units of analysis (e.g., individuals, cities) are studied? We examined three of these four dimensions in a cross-sectional study of 496 of the 500 most populated US cities (total population size = 97,574,613, average population per city = 197,920). Spatial average models tested the effect of two greenspace measures (Normalized Difference Vegetation Index greenness and tree cover) on two outcomes (obesity and mental health), while adjusting for income, race and ethnicity, sprawl, age, sex, physical inactivity, median age of housing, and total population. We conducted analyses at the city scale, which is an understudied unit of analysis, and compared findings to individual- and neighborhood-level studies. In two of four models, greenspace was associated with better health. We found race and ethnicity moderated this relationship with varying results. In full sample analyses, cities with greater percentages of non-Hispanic Whites showed links between higher tree cover and lower obesity but marginal relationships between higher greenness and lower obesity. In subsample analyses with majority-non-Hispanic Black cities, higher tree cover was associated with lower obesity and better mental health. These findings advance previous research by showing that race and ethnicity moderate the greenspace health link at the city level.

Browning, M., & Rigolon, A. (2019). Could nature help children rise out of poverty? Green space and future earnings from a cohort in ten US cities. *Environmental Research,* 176. https://doi.org/10.1016/j.envres.2019.04.016

Background: Growing up in poverty is associated with poor health, and the American Dream of upward mobility is becoming an illusion for many low-income children. But nearby green space can support academic achievement, creativity, and emotional regulation, and these traits might help children rise out of poverty. Objectives: To examine the relationship between recent incomes of children born into poverty in the ten largest U.S. cities and densities of residential green space during childhood. Methods: We calculate park proximity, park acreage, new park development, and NDVI greenness for 1980-1990 from Landsat and Trust for Public Land data. We obtain the 2014 income for children born between 1978 and 1982 into families in poverty from The Opportunity Atlas cohort, aggregated at the tract level (n = 5849). Results: Conditional autoregressive (CAR) models of tracts show statistically significant associations between income rank and above-average levels of greenness but not between income rank and park measures, adjusting for individual and neighborhood confounders and spatial autocorrelation. We estimate that, over a 30-year career, children growing up in tracts with the most vegetative cover will earn cumulatively $28,000 more than children growing up in tracts with the least cover, on average. Tracts with lower than average levels of precipitation, higher disadvantage, higher population density, or higher annual temperatures do not show beneficial effects of green space. Conclusions: Greenness may be weakly associated with children rising out of poverty in wetter, cooler, less dense, more advantaged census tracts.

Burley, B. A. (2018). Green infrastructure and violence: Do new street trees mitigate violent crime? *Health & Place,* 54, 43-49. https://doi.org/10.1016/j.healthplace.2018.08.015

Exposure to violence has been deemed as a public health epidemic due to its negative impact on mental health outcomes, especially for residents of neighborhoods where violent crime is prevalent. Access to nature has the potential to mitigate diminished mental health outcomes, such as aggression. However, current literature specifying effective and equitable green infrastructure practices is lacking. The purpose of this study was to measure the extent to which Portland's green infrastructure initiative reduced neighborhood violence by increasing the availability of new trees to residents of underserved communities as a modality for green infrastructure intervention. Lagged multilevel modeling was used to determine whether an increase in new street trees resulted in reduced violent crime counts in the years following the planting of the trees. Results indicated that there was a strong negative correlation between the number of trees planted and violent crimes in the years following the planting of trees, net of neighborhood covariates. This effect was especially pronounced in neighborhoods with lower median household income. These findings suggest that the inclusion of new street trees in underserved neighborhoods may be one solution to the endemic of violence in such neighborhoods.

Byskov, M. F., Hyams, K., Satyal, P., Anguelovski, I., Benjamin, L., Blackburn, S., . . . Venn, A. (2021). An agenda for ethics and justice in adaptation to climate change. *Climate and Development,* 13(1), 1-9. https://doi.org/10.1080/17565529.2019.1700774

As experts predict that at least some irreversible climate change will occur with potentially disastrous effects on the lives and well-being of vulnerable communities around the world, it is paramount to

ensure that these communities are resilient and have adaptive capacity to withstand the consequences. Adaptation and resilience planning present several ethical issues that need to be resolved if we are to achieve successful adaptation and resilience to climate change. In this paper, we present six core discussions that should be an integral part of adaptation and resilience planning: (i) Where does 'justice' feature in resilience and adaptation planning and what does it require in that regard?; (ii) How can it be ensured that adaptation and resilience strategies protect, take into consideration, and represent the interest of the most vulnerable individuals and communities?; (iii) How can different forms of knowledge be integrated within adaptation and resilience planning?; (iv) What trade-offs need to be made when focusing on resilience and adaptation and how can they be resolved?; (v) What roles and responsibilities do different actors have to build resilience and achieve adaptation?; (vi) Finally, what does the focus on ethics imply for the practice of adaptation and resilience planning?

Campbell-Arvai, V., & Lindquist, M. (2021). From the ground up: Using structured community engagement to identify objectives for urban green infrastructure planning. *Urban Forestry & Urban Greening,* 59. https://doi.org/10.1016/j.ufug.2021.127013

Municipal governments are increasingly looking to green infrastructure to address climate-related flooding and water quality issues, and as a cost-effective way to augment aging 'grey' stormwater infrastructure. There is also a great deal of interest in more fully involving citizens in efforts to increase the amount of green infrastructure in cities. Despite this acknowledgement of the importance of public engagement, however, many green infrastructure initiatives still adhere to a top-down and expert-driven process of site selection and design. This mismatch between process and engagement ideals can lead to suboptimal outcomes in terms of sustaining these projects over the long term, the achievement of multifunctional and inclusive spaces, and missed opportunities to increase civic capacity to participate in and drive urban planning initiatives. Further, the turn to green infrastructure has been criticized for not including a diversity voices in planning, design and implementation, with green gentrification occurring as a result. Thus, the objectives of this research were to, in collaboration with communities, (i) use structured elicitation to establish social and ecological priorities (in the form of key ecosystem services and disservices) to inform a community-based GI design and planning process, and (ii) use this collaboration to inform the development of the Land.Info DSS that creates realistic representations of site scale landscape change and incorporates community identified priorities as real-time feedback. Community members reported that including their design objectives in the Land.Info design tool helped to guide their green infrastructure designs and that they modified their designs in response to the feedback provided within the interface. Additional desired outcomes of this research were to provide a vehicle for improved public engagement and learning opportunities for GI planning, design and implementation, and to develop a reliable and scalable method for incorporating community values and needs into these processes. Providing residents with meaningful opportunities for input and collaboration in urban landscape planning and design aligns with the growing interest in democratizing the design, management, and governance of public spaces.

Choi, D. A., Park, K., & Rigolon, A. (2020). From XS to XL Urban Nature: Examining Access to Different Types of Green Space Using a 'Just Sustainabilities' Framework. *Sustainability,* 12(17). https://doi.org/10.3390/su12176998

Different types of urban green spaces provide diverse benefits for human health and environmental sustainability, but most studies on access to green space focus on neighborhood parks, with less work on smaller or larger green spaces. In this study, we examined sociodemographic differences in access to green spaces of different sizes for 14,385 census block groups in 12 U.S. cities using a 'just sustainabilities' framework. We classified green spaces into street-level greenery (XS), neighborhood parks (S-L; walking and cycling access), and large parks (XL; walking, cycling, and driving access). We ran spatial filtering models at the census block group level using different thresholds based on transportation modes. We uncovered a complex picture of inequality, with consistent injustices for XS green space, and fewer injustices for S-L and XL green space based on socioeconomic status and age, and some instances of just distributions for S-L and XL green space based on race/ethnicity. Our findings present a concerning picture for 'just sustainabilities': the green space type that is most often part of sustainability and climate adaptation strategies-street greenery-is unjustly distributed, likely as a result of structural racism in U.S. institutions. By examining multimodal access to green spaces of different sizes, this study helps urban greening professionals develop more just and sustainable strategies.

Coggins, S., Berrang-Ford, L., Hyams, K., Satyal, P., Ford, J., Paavola, J., . . . Harper, S. (2021). Empirical assessment of equity and justice in climate adaptation literature: a systematic map. *Environmental Research Letters,* 16(7). https://doi.org/10.1088/1748-9326/ac0663

The normative concepts of equity and justice are rising narratives within global climate change discourse. Despite growing considerations of climate equity and justice within the adaptation literature, the extent to which adaptation research has worked to empirically assess and operationalize concepts of equity and justice in practice remains unclear. We employ a systematic mapping approach to examine how equity and justice are defined and understood within empirical climate change adaptation research, and how extensively they are being assessed within adaptation literature. Structuring our work using a conceptual approach focusing on distributional, recognition, procedural, and capability approaches to justice, we document and review articles that included empirical assessments from searches performed in Web of Science (TM), Scopus (R), and Google Scholar (TM) databases. Our results highlight that greater attention in the literature is given to certain aspects of justice (e.g. distributive and procedural justice concerns) on certain topics such as climate policy and adaptation finance. Most of the included papers scored highly according to our criteria on their empirical assessment of equity and justice. The lowest scores were found for the methodological rigor of assessments. We find limited research on empirical equity and justice assessment and call for a multiscale and holistic approach to justice to address this research gap.

Cole, H. V. S., Lamarca, M. G., Connolly, J. J. T., & Anguelovski, I. (2017). Are green cities healthy and equitable? Unpacking the relationship between health, green space and gentrification. *Journal of Epidemiology and Community Health,* 71(11), 1118-1121. https://doi.org/10.1136/jech-2017-209201

While access and exposure to green spaces has been shown to be beneficial for the health of urban residents, interventions focused on augmenting such access may also catalyse gentrification processes, also known as green gentrification. Drawing from the fields of public health, urban planning and environmental justice, we argue that public health and epidemiology researchers should rely on a more dynamic model of community that accounts for the potential unintended social consequences of upstream health interventions. In our example of green gentrification, the health benefits of greening can only be fully understood relative to the social and political environments in which inequities persist. We point to two key questions regarding the health benefits of newly added green space: Who benefits in the short and long term from greening interventions in lower income or minority neighbourhoods undergoing processes of revitalisation? And, can green cities be both healthy and just? We propose the Green Gentrification and Health Equity model which provides a framework for understanding and testing whether gentrification associated with green space may modify the effect of exposure to green space on health.

Connolly, J. J. T., & Anguelovski, I. (2021). Three Histories of Greening and Whiteness in American Cities. *Frontiers in Ecology and Evolution,* 9. https://doi.org/10.3389/fevo.2021.621783

How has urban greening related to the degree of whiteness in neighborhoods? The answer to this question provides an essential "historical diagnostic" that can be used to develop an approach to urban ecology which integrates racial and ethnic change into the planning for proposed interventions. In this paper we employ state sequence analysis to analyze the historical trend of greening (including the implementation of new parks, greenways, community gardens, green recreation areas, and nature preserves) between 1975 and 2014 in a sample of nine cities in the United States relative to concentrations of white and non-white residents. We divide the nine cities into three common growth trajectories and separately examine the trends for each growth trajectory. We further illustrate these trends by mobilizing qualitative data from field work in selected neighborhoods to help explain the processes that generate certain key findings in the quantitative data. We find that the relationship between greening and race/ethnicity differs according to city-level growth trajectory. Cities with continuous high and rapid levels of growth in the postwar period have the strongest link between increased greening and whiter populations. Meanwhile, in cities that contracted or had a punctuated growth pattern, non-white areas had a uniformly low level of greening that occurred mostly in recent years. In all, we show how urban growth, greening, and whiteness are inextricably associated qualities of American cities. We argue that understanding this association is essential for development of a race-conscious model for enhancing urban ecosystems.

Cousins, J. J. (2021). Justice in nature-based solutions: Research and pathways. *Ecological Economics,* 180. https://doi.org/10.1016/j.ecolecon.2020.106874

Nature-based solutions are quickly rising to the top of the sustainable urban development agenda as an ecosystem-based approach to mitigate and adapt to climate change, while also improving livelihoods

and biodiversity. Achieving sustainability and resilience through nature-based solutions is an important means for cities and communities across the globe to take climate action and experiment with new forms of governance, infrastructure, and planning and design. In this paper, I map the academic research structure of nature-based solutions and find that issues of social and environmental justice remain peripheral. To center justice in research and practice, I argue for a re-orientation towards just nature-based solutions-approaches that utilize the power of nature and people to transform the social, political, and economic drivers of socio-spatial inequality and environmental degradation into opportunities to create progressive, cohesive, antiracist, and social-ecologically sustainable communities. Based on the findings of the literature review and bibliometric analysis, I propose three pathways for just nature-based solutions: (1) race and class; (2) transformative co-production; and (3) value articulations. These starting points link to current principles in nature-based solutions and help bring clarity for scholars, activists, and planners on how to critically engage with the politics of environmental governance and decision-making.

Derkzen, M. L., Nagendra, H., Van Teeffelen, A. J. A., Purushotham, A., & Verburg, P. H. (2017). Shifts in ecosystem services in deprived urban areas: understanding people's responses and consequences for well-being. *Ecology and Society,* 22(1). https://doi.org/10.5751/es-09168-220151

Urban commons are under pressure. City development has led to the encroachment and ecological degradation of urban open space. Although there is growing insight that urban ecosystems need to be protected, there is hardly any attention for the consequences (of both pressures and protection efforts) for vulnerable human population groups. We aim to understand how urban development affects the well-being of the urban poor, through shifts in ecosystem services (ES) and people's responses to these shifts. We performed household interviews and group mapping sessions in seven urban lake communities in Bangalore, India. Changes at Bangalore's lakes can be summarized by three trends: privatization followed by conversion, pollution followed by degradation, and restoration followed by gentrification. Over time, this resulted in a shift in the types of ES supplied and demanded, the nature of use, and de facto governance: from provisioning, communal and public; to cultural, individual, and private. Lake dwellers responded by finding (other) sources of income, accepting lower quality or less accessible ES, and/or completely stopping the use of certain ES. The consequences of ecosystem change for people's well-being differ depending on a household's ability to adapt and on individual circumstances, land tenure and financial capital in particular. To guarantee a future for Bangalore's lakes, restoration seems the only viable option. Although beautiful lake parks may be a solution for the well-off and not-too-poor, leaving the very poor without options to adapt to the new circumstances puts them at risk of becoming even more marginalized. We show that ecosystem degradation and restoration alike can impact the well-being of the urban poor. People's experiences allowed us to couple ecosystem change to well-being through ES and adaptation strategies. Hence, we revealed multiple cause-effect relations. Understanding these relations contributes to sustainable urban development for people from all layers of society.

Eakin, H., Bojorquez-Tapia, L. A., Janssen, M. A., Georgescu, M., Manuel-Navarrete, D., Vivoni, E. R., . . . Lerner, A. M. (2017). Urban resilience efforts must consider social and political forces. *Proceedings of the National Academy of Sciences of the United States of America,* 114(2), 186-189. https://doi.org/10.1073/pnas.1620081114

Environmental disasters, ranging from catastrophic floods to extreme temperatures, have caused more than 30,000 deaths per year and more than US$ 250–300 billion a year in economic losses, globally, between 1995 and 2015 (1). Improved infrastructure and planning for extreme events is essential in urban areas, where an increasingly greater fraction of the world's inhabitants reside. In response, international governmental and private initiatives have placed the goal of resilience at the center stage of urban planning. [For example, The 100 Resilient Cities Initiative (www.100resilientcities.org/); the Global Covenant of Mayors (https://www.compactofmayors.org/globalcovenantofmayors/); and the recent UN Habitat III (https://habitat3.org/the-new-urban-agenda)]. In addition, scientific and policy communities alike now recognize the need for "safe-to-fail" infrastructural design, and the potential role of green and blue infrastructure in mediating hydrological and climatic risks in cities (2). Nevertheless, the social and political norms, values, rules, and relationships that undergird and structure the myriad decisions made by public and private actors—what we call "socio-political infrastructure"—are likely to be as influential in urban vulnerability dynamics as "hard" infrastructure and environmental management. Urban planning for enhanced resilience and sustainability is ultimately a complex social and political process. Socio-political infrastructure creates patterns of behavior and action that shape the built environment. Developing more sustainable pathways of urban development hinges on making this socio-political infrastructure transparent and legible in the tools and approaches available for risk management. We argue that sustainability science is in the position to create the tools, methods, and strategies to identify, represent, and communicate the significance of these social and political processes to decision makers at all levels. In doing so, we can help ensure that these underlying drivers of urban vulnerability become subject to policy intervention.

Faber, D., & Kimelberg, S. M. Sustainable urban development and environmental gentrification: The paradox confronting the U.S. environmental justice movement. In *Uprooting Urban America: Multidisciplinary Perspectives on Race, Class and Gentrification.* H. R. Hall, C. C. Robinson, & A. Kohli (Eds.). New York: Peter Lang https://doi.org/10.3726/978-1-4539-1270-6

No abstract available.

Fox, S. (2019). Environmental gentrification. *University of Colorado Law Review,* 90, 803-865. Retrieved from http://lawreview.colorado.edu/wp-content/uploads/2019/04/9.-Fox_.pdf

Gentrification is a term often used, much maligned, and difficult to define. A few general principles can nonetheless be distilled regarding the concept. First, gentrification is spurred by rising desirability of an area for housing or commercial purposes. Second, this rising desirability, following basic supply-and-demand principles, leads to higher property values and rents in an uncontrolled market. Third, gentrification leads to a shift in the demographics of a neighborhood. This shift can change not only the socioeconomic and racial composition of the area but also the community's character, as residential and commercial options begin to reflect the preferences of the new arrivals to the neighborhood. Much has been written and discussed about the nature of gentrification and its impacts on communities. Less has

appeared in the legal literature focusing on one specific catalyst for gentrification—improvements to the environment. Environmental gentrification is a term used by social scientists to refer to the process by which environmental cleanups, or other improvements to environmental health, spur the cycle of gentrification. Where land or waterways have been contaminated, cleanup of those resources often leads to renewed interest in the surrounding areas by developers and more affluent tenants and homebuyers. This is particularly the case in urban areas where the quantity of usable land is limited. In such areas, environmental contamination may have long contributed to depressing property values below what the market would otherwise support; removal of that contamination may make these neighborhoods instant targets for new residential entrants and new development. In the same way, recovery of natural resources and open land may make the surrounding communities immediately desirable. When that happens, communities that have long been subject to the ill effects of environmental contamination may gain relief only to face pressures on other fronts, including rising rents and property taxes. While environmental law has much to say about facilitating environmental improvements, it has had few entry points to date for addressing the impacts of environmental gentrification. These impacts include reduced affordability, displacement, and corresponding loss of community, all of which may undermine the ability of environmental laws to achieve environmental justice goals. Moreover, these impacts also have the potential to reverse efforts toward urban sustainability. Thus, environmental law may work at cross-purposes with itself: while traditional environmental laws encourage environmental cleanups, their failure to respond to the broader issue of affordable housing means that urban areas may be far from sustainable in a larger sense. This Article examines the divide that often exists between environmental law and affordable housing and explains why the problem of environmental gentrification is one for environmental law to solve. Finally, it suggests some legal tools to consider when confronting this phenomenon.

Georgetown Climate Center. *Equitable adaptation legal & policy toolkit.* Georgetown University. Washington, DC. Retrieved from https://www.georgetownclimate.org/adaptation/toolkits/equitable-adaptation-toolkit/introduction.html

Many local governments and community-based practitioners are incorporating principles of equity into their climate adaptation planning and implementation. This toolkit highlights best and emerging practice examples of how cities are addressing disproportionate socioeconomic risk to climate impacts and engaging overburdened communities. This toolkit will further explore how cities are moving beyond equitable adaptation planning and implementing policies that address both social equity and climate resilience. The toolkit is intended to aid local governments and community-based organizations nationwide that are centering equity in their adaptation initiatives. In comparing promising practices and case studies across cities, the toolkit draws lessons from different approaches and provides frameworks to help practitioners craft similar legal and policy options for their own jurisdictions in ways that will help them advance equitable responses to the impacts of climate change.

Haase, D., Kabisch, S., Haase, A., Andersson, E., Banzhaf, E., Baro, F., . . . Wolff, M. (2017). Greening cities - To be socially inclusive? About the alleged paradox of society and ecology in cities. *Habitat International,* 64, 41-48. https://doi.org/10.1016/j.habitatint.2017.04.005

Greening cities, namely installing new parks, rooftop gardens or planting trees along the streets, undoubtedly contributes to an increase in wellbeing and enhances the attractiveness of open spaces in cities. At the same time, we observe an increasing use of greening strategies as ingredients of urban renewal, upgrading and urban revitalization as primarily market-driven endeavours targeting middle class and higher income groups sometimes at the expense of less privileged residents. This paper reflects on the current debate of the social effects of greening using selected examples. We discuss what tradeoffs between social and ecological developments in cities mean for the future debate on greening cities and a socially balanced and inclusive way of developing our cities for various groups of urban dwellers. We conclude that current and future functions and features of greening cities have to be discussed more critically including a greater awareness of social impacts.

Harper, E. T. (2020). Ecological Gentrification in Response to Apocalyptic Narratives of Climate Change: The Production of an Immuno-political Fantasy. *International Journal of Urban and Regional Research,* 44(1), 55-71. https://doi.org/10.1111/1468-2427.12842

Anxieties over the potential impacts of climate change, often framed in apocalyptic language, are having a profound, but little studied effect on the contemporary Western urbanscape. This article examines the ways in which current theorizations of "ecological gentrification" express only half the process, describing how green space is used for social control, but not how ecology is used as a justification regime for such projects. As urbanites seek out housing and living practices that have a lower environmental impact, urban planners have responded by providing large-scale regeneration of the urbanscape. With the demand for this housing increasing, questions of inequality, displacement and dispossession arise. I ask whether apocalyptic anxiety is being enrolled in the justification regimes of these projects to make them hard to resist at the planning and implementation stages. The article shows that, in capitalizing on collective anxiety surrounding an apocalyptic future, these projects depoliticize subjects by using the empty signifier, "Sustainability", leading them into an immuno-political relationship to the urbanscape. This leaves subjects feeling protected from both responsibility for, and the impacts of, climate change. Ultimately, this has the consequence of gentrification coupled with potentially worsening consumptive practices, rebound effects and the depoliticization of the environmentally conscious urbanite.

Hart, M., Du, J., & Coccoli, C. (2019). How to Prevent City Climate Action from Becoming "Green Gentrification". World Resources Institute. Retrieved from https://www.wri.org/insights/how-prevent-city-climate-action-becoming-green-gentrification

A new set of resources from WRI and C40 provides a roadmap for cities to assess equity in their climate action planning process — because urban climate action can help to address injustices inherent in climate change, but only if city governments put people at the center of their climate action planning process.

Heck, S. (2021). Greening the color line: historicizing water infrastructure redevelopment and environmental justice in the St. Louis metropolitan region. *Journal of Environmental Policy & Planning*. https://doi.org/10.1080/1523908x.2021.1888702

In 2011 the St. Louis Metropolitan Sewer District developed a geographically bifurcated gray and green approach addressing aging sanitary and stormwater infrastructure in the region. This approach maps tightly to the region's persistent patterns of racial segregation allocating green infrastructure to areas of North St. Louis which is majority Black and where significant disinvestment has taken place. While green infrastructure often is hailed as a more equitable way to address urban flooding, a crucial question remains as to how urban greening strategies grapple with persistent urban inequities. This article examines the relationship between geographically uneven infrastructural investments and persistent urban inequities. Drawing on six months of ethnographic and archival fieldwork on St. Louis's wastewater redevelopment project, I argue that racial capitalism must be incorporated as a framework through which to analyze the equity dimensions of infrastructure redevelopment projects. I found that rather than contend with path dependencies of structural racism, St. Louis's approach to wastewater redevelopment relies on geographies of racial capitalism to save costs, subjecting marginalized communities to cost-saving approaches with no measures or plans to measure benefits beyond stormwater retention.

Hoover, F. A., Meerow, S., Grabowski, Z. J., & McPhearson, T. (2021). Environmental justice implications of siting criteria in urban green infrastructure planning. *Journal of Environmental Policy & Planning*. https://doi.org/10.1080/1523908x.2021.1945916

Green infrastructure (GI) has become a panacea for cities working to enhance sustainability and resilience. While the rationale for GI primarily focuses on its multifunctionality (e.g. delivering multiple ecosystem services to local communities), uncertainties remain around how, for whom, and to what extent GI delivers these services. Additionally, many scholars increasingly recognize potential disservices of GI, including gentrification associated with new GI developments. Building on a novel dataset of 119 planning documents from 19 U.S. cities, we utilize insights from literature on justice in urban planning to examine the justice implications of criteria used in the siting of GI projects. We analyze the GI siting criteria described in city plans and how they explicitly or implicitly engage environmental justice. We find that justice is rarely explicitly discussed, yet the dominant technical siting criteria that focus on stormwater and economic considerations have justice implications. We conclude with recommendations for centering justice in GI spatial planning.

Hopkins, K. G., Grimm, N. B., & York, A. M. (2018). Influence of governance structure on green stormwater infrastructure investment. *Environmental Science & Policy,* 84, 124-133. https://doi.org/10.1016/j.envsci.2018.03.008

Communities are faced with the challenge of meeting regulatory requirements mandating reductions in water pollution from stormwater and combined sewer overflows (CSO). Green stormwater infrastructure and gray stormwater infrastructure are two types of water management strategies communities can use to address water pollution. In this study, we used long-term control plans from 25 U.S. cities to synthesize: the types of gray and green infrastructure being used by communities to address combined sewer overflows; the types of goals set; biophysical characteristics of each city; and

factors associated with the governance of stormwater management. These city characteristics were then used to identify common characteristics of "green leader" cities-those that dedicated > 20% of the control plan budget In green infrastructure. Five "green leader" cities were identified: Milwaukee, WI, Philadelphia, PA, Syracuse, NY, New York City, NY, and Buffalo, NY. These five cities had explicit green infrastructure goals targeting the volume of stormwater or percentage of impervious cover managed by green infrastructure. Results suggested that the management scale and complexity of the management system are less important factors than the ability to harness a "policy window" to integrate green infrastructure into control plans. Two case studies-Philadelphia, PA, and Milwaukee, WI-indicated that green leader cities have a long history of building momentum for green infrastructure through a series of phases from experimentation, demonstration, and finally in the case of Philadelphia a full transition in the approach used to manage CSOs.

Jelks, N. O., Jennings, V., & Rigolon, A. (2021). Green Gentrification and Health: A Scoping Review. *International Journal of Environmental Research and Public Health,* 18(3). https://doi.org/10.3390/ijerph18030907

Urban greening initiatives are often linked to enhanced human health and wellbeing, but they can also be a driver of gentrification. To date, few studies have focused on how green gentrification shapes health. In this scoping review, we analyzed existing peer-reviewed research on how greening initiatives in gentrifying neighborhoods impact health, well-being, and health pathways (e.g., physical activity, affordable housing). Using a multi-step approach to scoping the literature (including searches in PubMed, JSTOR, and Google Scholar), we identified 15 empirical studies that met our inclusion criteria. We found studies focusing on green space use, physical activity, sense of community, safety, and self-reported health. Overall, longtime, marginalized residents are negatively impacted by green gentrification as they experience a lower sense of community, feel that they do not belong in green space, and, in many studies, use green space less often than newcomers. Overall, the research in this area is limited, and more studies on mental health and cardiovascular health markers could advance this literature. Based on the limited available evidence, we suggest that public health, urban planning, and parks professionals could collaborate to enhance the use of green space for marginalized residents and their feelings of inclusion in gentrifying areas.

Jennings, V., Floyd, M. F., Shanahan, D., Coutts, C., & Sinykin, A. (2017). Emerging issues in urban ecology: implications for research, social justice, human health, and well-being. *Population and Environment,* 39(1), 69-86. https://doi.org/10.1007/s11111-017-0276-0

Urbanization affects landscape structure and the overall human condition in numerous ways. Green spaces include vegetated land cover (e.g., urban forests, trees, riparian zones, parks) which play a distinctive role in urban ecology. This article reviews emergent literature on the linkages between urban green spaces, social justice, and human health. We explore this subject in the context of landscape structure, ecosystem services, and distributional equity as it relates to various health outcomes. Finally, we conclude by identifying gaps in the scholarship and potential areas of future research.

Jennings, V., Larson, L., & Yun, J. (2016). Advancing Sustainability through Urban Green Space: Cultural Ecosystem Services, Equity, and Social Determinants of Health. *International Journal of Environmental Research and Public Health,* 13(2). https://doi.org/10.3390/ijerph13020196

Urban green spaces provide an array of benefits, or ecosystem services, that support our physical, psychological, and social health. In many cases, however, these benefits are not equitably distributed across diverse urban populations. In this paper, we explore relationships between cultural ecosystem services provided by urban green space and the social determinants of health outlined in the United States Healthy People 2020 initiative. Specifically, we: (1) explore connections between cultural ecosystem services and social determinants of health; (2) examine cultural ecosystem services as nature-based health amenities to promote social equity; and (3) recommend areas for future research examining links between urban green space and public health within the context of environmental justice.

Jurjonas, M., & Seekamp, E. (2020). 'A commons before the sea:' climate justice considerations for coastal zone management. *Climate and Development,* 12(3), 199-203. https://doi.org/10.1080/17565529.2019.1611533

If climate change mitigation and adaptation are a human right, institutional change is needed that considers coastal ecosystem integrity as a common pool resource. Increasing risks in coastal zones necessitates adopting new and frequently controversial zoning, planning, and management practices, particularly as insurance programmes reform or require bailouts. In the U.S., current coastal policy frameworks employed by the Federal Emergency Management Agency (FEMA) and state-level authorities incentivize defensive strategies, especially in high-value tourism destinations, despite critiques of inequity and longer-term evidence demonstrating that hardening shorelines shifts erosion patterns. Other coastal regions and developing countries that cannot afford defensive strategies - particularly rural, minority, and impoverished communities located adjacent to estuarine areas - rely heavily on ecosystem services for protection and will likely disproportionately face buyouts, forced relocation, and retreat as seas rise.

Krings, A., & Schusler, T. M. (2020). Equity in sustainable development: Community responses to environmental gentrification. *International Journal of Social Welfare,* 29(4), 321-334. https://doi.org/10.1111/ijsw.12425

Sustainable development aims to address economic, social, and environmental imperatives; yet, in practice, it often embodies a neoliberal market logic that reinforces inequalities. Thus, as the social work profession grapples with its role in advancing environmental sustainability, practice models must explicitly attend to social and economic justice. For example, environmental gentrification refers to situations in which the cleanup of contaminated land or the installation of environmental amenities intentionally or unintentionally catalyzes increased housing costs, thereby contributing to the displacement of vulnerable residents. With the goal of contributing to practice knowledge, we conducted a systematic review of peer-reviewed articles (1997-2017) to learn how community groups have responded to the threat of environmental gentrification. We found that community organizations employ a range of strategies, including blocking development, negotiating for protections, planning alternatives, and allying with gentrifiers. We conclude by exploring ethical implications and practice

principles to help social workers engage in truly sustainable development. Key Practitioner Message: - The term environmental gentrification describes situations where improvements to environmental quality increase real estate prices, contributing to the displacement of vulnerable residents; - An environmental justice framework attending to procedural, distributional, and recognition-based claims provides a model for social work practice; - Opportunities exist for social workers to take an intersectional rather than siloed approach to integrate economic, social, and environmental concerns.

Ling, Z. Y., Hung, W. K., Lin, C. S., & Lu, M. C. E. (2020). Dealing with Green Gentrification and Vertical Green-Related Urban Well-Being: A Contextual-Based Design Framework. *Sustainability,* 12(23). https://doi.org/10.3390/su122310020

Urbanization and climate change have generated ever-increased pressure to the ecosystem, bringing critical resilience challenges to densely congested cities. The resulted displaced and encroached habitat in need of recuperation demands a comprehensive overhaul to the customary urban planning practices; further, the deteriorating public health state of urban residents calls for strategies in dealing with green deprivation and gentrification issues. Frequently, urban greening strategies are envisaged at a macro-scale on a dedicated horizontal track of land, rendering local implementation in a densely built neighborhood a challenged undertaking. Communities lacking green and land resources could promote vertical greening to enable and enhance social and psychological well-being. This study ascertains that vertical greenery closest to the inhabitants could be allocated on a building facade. It can contribute to a more sustainable ecology. The article presents the systemic design approach to urban vertical greening thinking and its role in well-being provision. We propose an interdisciplinary multicriteria contextual-based scalable framework to assess vertical green infrastructure; the prototype requires an innovative approach to balance architecture, human needs, and the local environment. The vertical greening application provides an alternative paradigm in the design implementation for urban green. We proposed the locality and place to be incorporated into the vertical greening design framework. The research concludes the three-tiered consideration framework resulted: (1) in line with the human-habitat ecosystem, the local environment-social dimension is explored; (2) the well-being criteria encourage the design practice's support for localized driven community vitality; (3) the design paradigm requires integration with the increasing demand for green space as well as taking into account the impact of severe climate; and (4) the framework should achieve the strengthening of health and well-being of the community.

Lugo, A. E. (2015). Can Human Infrastructure Combat Green Gentrification?: Ethnographic Research on Bicycling in Los Angeles and Seattle. In *Sustainability in the Global City: Myth and Practice.* C. Isenhour, G. McDonogh, & M. Checker (Eds.), (pp. 306-328). Cambridge: Cambridge University Press https://doi.org/10.1017/CBO9781139923316.021

No abstract available.

Mahon, L., & Shih, W. Y. (2018). What might 'just green enough' urban development mean in the context of climate change adaptation? The case of urban greenspace planning in Taipei Metropolis, Taiwan. *World Development,* 107, 224-238. https://doi.org/10.1016/j.worlddev.2018.02.035

This paper argues that climate change adaptation through strategic greenspace planning requires scholars and planners to think differently about what equity means in an urban greenspace context. We use the heat mitigation potential of greenspace and the case of Taipei Metropolis in Taiwan to assess challenges arising from thinking about fairness in terms of distribution of benefits from greenspace functions, as opposed to fairness in greenspace accessibility and availability. Urban greening to foster 'resilient' communities arguably deflects from - or even exacerbates - structural causes of vulnerability, with benefits accruing disproportionately to more affluent or empowered groups. Yet the need for practical action on climate threats in cities is urgent, and for heat, strategic greenspace use considered systematically across a city may mitigate effects through the cooling effect of vegetation. The challenge is thus to balance the justice concerns associated with urban greening with this tangible risk reduction potential. We undertake content analysis of articles from two Taiwanese newspapers - the Taipei Times and the China Post - to assess how heat and greenspace issues have been discussed in urban governance debates within Taipei. We suggest change adaptation through urban greening raises three challenges for equity thinking: (a) guiding planning and governance processes with scientific understanding of how green space functions are delivered, even in the face of urban development pressures and site-specific controversies; (b) tempering the social cohesion and practical deployment benefits of neighbourhood-level greening with the need for specific understanding at the city-wide level to most effectively realise ecosystem services; and (c) linking targeted adaptation actions with broader rationales for urban greening, whilst not diluting justice concerns. We caution that pragmatism towards all urban climate adaptation via greening as intrinsically 'good' must not serve as a blinder to the need for accompanying social policy measures to reduce unequal vulnerability to climate risks.

Maia, A. T. A., Calcagni, F., Connolly, J. J. T., Anguelovski, I., & Langemeyer, J. (2020). Hidden drivers of social injustice: uncovering unequal cultural ecosystem services behind green gentrification. *Environmental Science & Policy,* 112, 254-263. https://doi.org/10.1016/j.envsci.2020.05.021

The extent to which new greening initiatives contribute to gentrification processes in urban areas is of rising interest to researchers and policymakers, but the precise (and often intangible) aspects of green spaces that embed them within gentrification processes are not well understood. The Cultural Ecosystem Services (CES) literature offers new ways of measuring these aspects. In this study, we use geo-located social media data to assess the value attributed to CES in 18 urban parks in Barcelona, of which 9 were shown to have experienced green gentrification in previous studies. We performed descriptive analysis and statistical independence tests on 703 photos downloaded from the social media platform Flickr. Of the 703 photos analyzed, 85% were taken in parks associated with green gentrification; nevertheless, around 80% of all photos depicted built infrastructures rather than ecological features – indicating that green gentrification is not strictly about greenness and how visitors value it. Statistical results show that parks that experienced green gentrification were significantly associated with "aesthetics" and "recreational activities", whilst parks that did not experience green gentrification were significantly associated with "cultural identity" and "social activities". These results suggest that justice outcomes following from the relationship between urban greening and gentrification are dependent on the social-cultural associations with green spaces that the ecosystem

services framework formulates, making it a potentially powerful tool for understanding how to generate more just greening policies in cities.

Maiello, M. (2019). *Urban Environmental Gentrification: Evaluating the Impact Large Green Infrastructure Projects Have On Urban Residents.* (Bachelor of Arts Undergraduate honors thesis), William and Mary, Williamsburg, VA. Retrieved from https://scholarworks.wm.edu/honorstheses/1311/

With the rise of the environmental movement nationally and internationally, American cities are becoming increasingly focused on environmental initiatives to improve environmental quality, boost economic revenue, and better the quality of life for urban residents. Cities across the country have adopted the trend of implementing Large Green Infrastructure Projects, converting formerly developed but now unused areas into environment-oriented parks, based on the model project of the New York City High Line. While these projects benefit urban communities economically, socially, and environmentally, they often do so at the expense of minority and low-income residents. The Large Green Infrastructure Projects generally increase cost-of-living in their surrounding areas, displacing the at-risk communities unable to afford the higher cost in a process known as gentrification. In this research, I develop a methodology for quantitatively measuring the occurrence of gentrification, largely based on prior research with a similar goal. I apply the created methodology to several Large Green Infrastructure Projects in an attempt to validate the methodology and analyze gentrification occurring in surrounding neighborhoods. The analysis aims to show that gentrification in neighborhoods adjacent to the Large Green Infrastructure Projects has occurred at a greater rate than on a city-wide scale. The goal of this research is to identify project implementation as a primary cause for the displacement of low-income and minority urban residents; the application of my methodology will provide quantitative evidence for Large Green Infrastructure Projects being a cause of urban environmental gentrification. This research emphasizes the necessity for development companies and local housing authorities to implement better policies to protect low-income and minority housing during Large Green Infrastructure Project planning.

O'Brien, L., De Vreese, R., Atmis, E., Olafsson, A. S., Sievanen, T., Brennan, M., . . . Almeida, A. (2017). Social and Environmental Justice: Diversity in Access to and Benefits from Urban Green Infrastructure - Examples from Europe. In *Urban Forest: Cultivating Green Infrastructure for People and the Environment.* D. Pearlmutter, C. Calfapietra, R. Samson, L. Obrien, S. K. Ostoic, G. Sanesi, & R. A. DelAmo (Eds.), (Vol. 7, pp. 153-190) https://doi.org/10.1007/978-3-319-50280-9_15

No abstract available.

Paneerchelvam, P. T., Maruthaveeran, S., Maulan, S., & Abd Shukor, S. F. (2020). The use and associated constraints of urban greenway from a socioecological perspective: A systematic review. *Urban Forestry & Urban Greening,* 47. https://doi.org/10.1016/j.ufug.2019.126508

There are studies claiming that the use of greenways is highly influenced by personal, social, and physical attributes. Nonetheless, there is a lack of systemic reviews that have synthesized the evidence. This study systematically reviews the literature to gather evidence related to the types of attributes and constraints affecting the use of urban greenways. The literature reviewed was published between 2000 and 2018. The findings from the review could be assimilated into some recommendations for future researchers. The review adapted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines in reporting systematic reviews and meta-analysis. Keywords linked to greenways and their constraints were researched by two independent reviewers. A total of 45 publications were published between 2000 and 2018 (N = 45) that met all the selection criteria for the systemic review. The studies were carried out in America, the United Kingdom, Australia, Germany, Turkey, Japan, and China, with respondents ranging from 21 to 17,338. These studies were heterogeneous in their design, population, urban greenway assessment, and data. From the review, it was found that most studies concluded that the use of greenways was highly influenced by personal, social, and physical attributes. Weather and time of day also influenced users' decision to use the urban greenways. Nevertheless, the factor of time was not highlighted in most of the studies. Following this, more studies are needed on the role of time of day (day or night). This review agrees that users' decisions to use greenways are influenced by physical, social and personal attributes. More studies focusing on users' choices and decisions to use greenways are necessary to provide sensible and practical ways of improving urban greenways based on the population's preferences. Apart from that, more researches on the factor of time would be beneficial.

Pearsall, H., & Anguelovski, I. (2016). Contesting and Resisting Environmental Gentrification: Responses to New Paradoxes and Challenges for Urban Environmental Justice. *Sociological Research Online,* 21(3). https://doi.org/10.5153/sro.3979

This paper analyzes environmental gentrification (EG), or the exclusion, marginalization, and displacement of long-term residents associated with sustainability planning or green developments and amenities, such as smart growth, public park renovations, and healthy food stores. We consider how activists, communities, and urban planners address these unjust processes and outcomes associated with EG and how these strategies compare to those used by environmental justice (EJ) activists. Our evaluation of relevant literature indicates several similarities with EJ resistance tactics, including collective neighborhood action, community organizing, and direct tactics. We also identify several different strategies enabled by certain urban environmental conditions, such as leveraging environmental policies and taking an active role in neighborhood redevelopment planning processes, collaborating with 'gentrifiers,' and creating complementary policies to manage displacement and exclusion. Our analysis indicates a need for more research on how activists can better assert the social and political dimensions of sustainability and their right to the city, and how green and sustainable cities can achieve justice and equity.

Porter, L., Rickards, L., Verlie, B., Bosomworth, K., Moloney, S., Lay, B., . . . Pellow, D. N. (2020). Climate Justice in a Climate Changed World. *Planning Theory & Practice,* 21(2), 293-321. https://doi.org/10.1080/14649357.2020.1748959

Climate justice is a framework that brings into view the intersection between climate change and the way social inequalities are experienced as structural violence. Climate justice has grown in public debate and grassroots campaigning over the past decade, where not for profits and environmental NGOs in particular increasingly make the connection between human rights, uneven development and climate change. Often presented as a question of human rights, climate justice debates are often focused on the distributional effects of climate change – pointing out that those effects disproportionately burden the poorest and least disadvantaged. Much discussion in the climate justice field has examined the global maldistribution of climate change impacts, particularly between developing and developed nations. Linked with the understanding that developed nations are the biggest producers of the emissions that induce climate change, the ways that privileged nations and groups redistribute the effects of the harms they produce to burden the poor somewhere else, becomes clear.

Rigolon, A., Browning, M., McAnirlin, O., & Yoon, H. (2021). Green Space and Health Equity: A Systematic Review on the Potential of Green Space to Reduce Health Disparities. *International Journal of Environmental Research and Public Health,* 18(5). https://doi.org/10.3390/ijerph18052563

Disadvantaged groups worldwide, such as low-income and racially/ethnically minoritized people, experience worse health outcomes than more privileged groups, including wealthier and white people. Such health disparities are a major public health issue in several countries around the world. In this systematic review, we examine whether green space shows stronger associations with physical health for disadvantaged groups than for privileged groups. We hypothesize that disadvantaged groups have stronger protective effects from green space because of their greater dependency on proximate green space, as they tend to lack access to other health-promoting resources. We use the preferred reporting items for systematic reviews and meta-analyses (PRISMA) method and search five databases (CINAHL, Cochrane, PubMed, Scopus, and Web of Science) to look for articles that examine whether socioeconomic status (SES) or race/ethnicity modify the green space-health associations. Based on this search, we identify 90 articles meeting our inclusion criteria. We find lower-SES people show more beneficial effects than affluent people, particularly when concerning public green spaces/parks rather than green land covers/greenness. Studies in Europe show stronger protective effects for lower-SES people versus higher-SES people than do studies in North America. We find no notable differences in the protective effects of green space between racial/ethnic groups. Collectively, these results suggest green space might be a tool to advance health equity and provide ways forward for urban planners, parks managers, and public health professionals to address health disparities.

Rigolon, A., & Christensen, J. *Greening without Gentrification: Learning from Parks-Related Anti-Displacement Strategies Nationwide.* UCLA Institute of the Environment & Sustainability. Retrieved from https://www.ioes.ucla.edu/wp-content/uploads/Greening-without-Gentrification-report-2019.pdf

In this policy report, we share the results of an ongoing study to identify and classify parks-related anti-displacement strategies (PRADS). Through a nationwide search, we identified 27 large park development

projects in marginalized neighborhoods in 19 cities. We reviewed policy documents and media accounts and conducted interviews with project stakeholders. The good news is that stakeholders in about half of the projects we surveyed, including many park advocates and local community organizations, are proposing and actually implementing PRADS. The bad news is that the other half of the projects have not taken concrete actions yet.

Rigolon, A., & Németh, J. (2019). Green gentrification or 'just green enough': Do park location, size and function affect whether a place gentrifies or not? *Urban Studies,* 57(2), 402-420. https://doi.org/10.1177/0042098019849380

Recent research shows that the establishment of new parks in historically disinvested neighbourhoods can result in housing price increases and the displacement of low-income people of colour. Some suggest that a "just green enough" approach, in particular its call for the creation of small parks and nearby affordable housing, can reduce the chances of this phenomenon some call "green gentrification". Yet, no study has tested these claims empirically across a sample of diverse cities. Focusing on 10 cities in the United States, we run multilevel logistic regressions to uncover whether the location (distance from downtown), size and function (active transportation) of new parks built in the 2000-2008 and 2008-2015 periods predict whether the census tracts around them gentrified. We find that park function and location are strong predictors of gentrification, whereas park size is not. In particular, new greenway parks with an active transportation component built in the 2008-2015 period triggered gentrification more than other park types, and new parks located closer to downtown tend to foster gentrification more than parks on a city's outskirts. These findings call into question the "just green enough" claim that small parks foster green gentrification less than larger parks do.

Sekulova, F., Anguelovski, I., Kiss, B., Kotsila, P., Baro, F., Palgan, Y. V., & Connolly, J. (2021). The governance of nature-based solutions in the city at the intersection of justice and equity. *Cities,* 112. https://doi.org/10.1016/j.cities.2021.103136

No abstract available.

Shi, L. (2020). Beyond flood risk reduction: How can green infrastructure advance both social justice and regional impact? *Socio-Ecological Practice Research,* 2(4), 311-320. https://doi.org/10.1007/s42532-020-00065-0

Green infrastructure is being pulled in divergent directions. As climate impacts intensify, advocates are promoting larger, ecosystem-scale strategies to help mitigate flood risks. Yet, research on existing urban greening projects finds that they can cause gentrification and displacement, suggesting that smaller projects may be more desirable from an equity perspective. This essay argues that cities need both large-scale and justice-enhancing nature-based solutions. They can help overcome tensions in these goals by (1) reframing green infrastructure as a way to support community development and integrated socio-ecological landscapes, and (2) advancing metropolitan regional governance strategies that alleviate municipal fiscal imperatives to maximize local land development. These proposals suggest that

the practice of green infrastructure would benefit from diversifying its ranks to include social and government policy, community development, and agroecology, as well as learning from the Global South and those currently positioned as "off the map" of technical expertise. They also point to the need for interdisciplinary research that provides an evidence base for more transformative social, ecological, and governance strategies. While the essay focuses on the US context, it is relevant to an international audience given that similar challenges confront cities worldwide and that it highlights how the Global North can learn from the Global South.

Shi, L. D., Chu, E., Anguelovski, I., Aylett, A., Debats, J., Goh, K., . . . VanDeveer, S. D. (2016). Roadmap towards justice in urban climate adaptation research. *Nature Climate Change,* 6(2), 131-137. https://doi.org/10.1038/nclimate2841

The 2015 United Nations Climate Change Conference in Paris (COP21) highlighted the importance of cities to climate action, as well as the unjust burdens borne by the world's most disadvantaged peoples in addressing climate impacts. Few studies have documented the barriers to redressing the drivers of social vulnerability as part of urban local climate change adaptation efforts, or evaluated how emerging adaptation plans impact marginalized groups. Here, we present a roadmap to reorient research on the social dimensions of urban climate adaptation around four issues of equity and justice: (1) broadening participation in adaptation planning; (2) expanding adaptation to rapidly growing cities and those with low financial or institutional capacity; (3) adopting a multilevel and multi-scalar approach to adaptation planning; and (4) integrating justice into infrastructure and urban design processes. Responding to these empirical and theoretical research needs is the first step towards identifying pathways to more transformative adaptation policies.

Siders, A. R. (2019). Social justice implications of US managed retreat buyout programs. *Climatic Change,* 152(2), 239-257. https://doi.org/10.1007/s10584-018-2272-5

Global climate change poses significant risks to coastal and riverine communities. Managed retreat, the purposeful movement of people and infrastructure out of vulnerable floodplains, is one possible adaptation strategy. The USA has already engaged in a limited amount of retreat by providing federal funds to purchase and demolish or relocate vulnerable properties. As retreat programs are expected to expand in size and frequency to address the increased risks posed by climate change, a review of how such property acquisition programs have been implemented is timely. Specifically, decisions made by government officials regarding where to acquire properties have significant potential social justice implications, as buyouts could promote or reduce existing social inequities, but it is unclear how such decisions are being made. A review of eight US buyout programs suggests that buyouts, as practiced, lack transparency, which may increase public distrust of the process and reduce participation. Moreover, decisions often involve political motivations and rely on cost-benefit logic that may promote disproportionate retreat in low-income or minority communities, continuing historic patterns of social inequity. However, as low-income communities in the USA also tend to be highly vulnerable to climate-exacerbated hazards, a decision not to relocate may also promote disproportionate harm. The buyout programs reviewed provide examples of how to mitigate these concerns through increased transparency, emphasis on relocation, explicit focus on social inequality, longer-term and larger-scale

holistic approaches, and participatory pre-disaster planning. Further research on past programs is needed to evaluate outcomes and processes to improve future adaptation efforts.

Taguchi, V. J., Weiss, P. T., Gulliver, J. S., Klein, M. R., Hozalski, R. M., Baker, L. A., . . . Nieber, J. L. (2020). It Is Not Easy Being Green: Recognizing Unintended Consequences of Green Stormwater Infrastructure. *Water,* 12(2). https://doi.org/10.3390/w12020522

Green infrastructure designed to address urban drainage and water quality issues is often deployed without full knowledge of potential unintended social, ecological, and human health consequences. Though understood in their respective fields of study, these diverse impacts are seldom discussed together in a format understood by a broader audience. This paper takes a first step in addressing that gap by exploring tradeoffs associated with green infrastructure practices that manage urban stormwater including urban trees, stormwater ponds, filtration, infiltration, rain gardens, and green roofs. Each green infrastructure practice type performs best under specific conditions and when targeting specific goals, but regular inspections, maintenance, and monitoring are necessary for any green stormwater infrastructure (GSI) practice to succeed. We review how each of the above practices is intended to function and how they could malfunction in order to improve how green stormwater infrastructure is designed, constructed, monitored, and maintained. Our proposed decision-making framework, using both biophysical (biological and physical) science and social science, could lead to GSI projects that are effective, cost efficient, and just.

The Kresge Foundation. (2021). Climate Resilient and Equitable Water Systems (CREWS). Retrieved from https://kresge.org/initiative/climate-resilient-and-equitable-water-systems-crews/

Low-income communities and communities of color across the U.S. are disproportionately vulnerable to urban flooding and extreme rainfall. This inequity is due to a complex combination of institutions, policies and investments that have historically marginalized these communities, both socially and economically, and now puts them at risk of bearing the adverse impacts of climate change. In March 2016, Kresge launched the CREWS initiative to support grantees working at the intersection of water, climate resilience, and equity. The initiative aims to address those inequities by building climate-resilient water systems and thereby providing low-income communities and communities of color with an opportunity to be healthy, safe and economically unburdened in the face of urban flooding.

The CREWS initiative consists of more than 30 organizations working to advance equitable solutions to climate-related storm and flood impacts on low-income communities. They work at multiple scales and geographies across the nation. Our diverse group of CREWS grantee partners include: water utility leaders, community-based organizations, environmental nonprofits, environmental justice organizations, neighborhood coalitions, academic and applied research institutions, artistic and cultural expression leaders, project developers and funders.

Tonne, C., Adair, L., Adlakha, D., Anguelovski, I., Belesova, K., Berger, M., . . . Adli, M. (2021). Defining pathways to healthy sustainable urban development. *Environment International,* 146. https://doi.org/10.1016/j.envint.2020.106236

Goals and pathways to achieve sustainable urban development have multiple interlinkages with human health and wellbeing. However, these interlinkages have not been examined in depth in recent discussions on urban sustainability and global urban science. This paper fills that gap by elaborating in detail the multiple links between urban sustainability and human health and by mapping research gaps at the interface of health and urban sustainability sciences. As researchers from a broad range of disciplines, we aimed to: 1) define the process of urbanization, highlighting distinctions from related concepts to support improved conceptual rigour in health research; 2) review the evidence linking health with urbanization, urbanicity, and cities and identify crosscutting issues; and 3) highlight new research approaches needed to study complex urban systems and their links with health. This novel, comprehensive knowledge synthesis addresses issue of interest across multiple disciplines. Our review of concepts of urban development should be of particular value to researchers and practitioners in the health sciences, while our review of the links between urban environments and health should be of particular interest to those outside of public health. We identify specific actions to promote health through sustainable urban development that leaves no one behind, including: integrated planning; evidence-informed policy-making; and monitoring the implementation of policies. We also highlight the critical role of effective governance and equity-driven planning in progress towards sustainable, healthy, and just urban development.

Toxopeus, H., Kotsila, P., Conde, M., Katona, A., van der Jagt, A. P. N., & Polzin, F. (2020). How 'just' is hybrid governance of urban nature-based solutions? *Cities,* 105. https://doi.org/10.1016/j.cities.2020.102839

Hybrid (or multi-actor) governance has been identified as a key opportunity for upscaling urban nature-based solutions (referred to as urban NBS), representing a demand-driven and cost-effective realization of urban green infrastructure. However it is unclear how such hybrid governance affects the justice outcomes of urban NBS. Through six in-depth cases of urban NBS we show that hybrid governance can lead to both improvements and deterioration of distributional, procedural and recognition justice, depending on the hybrid governance choices. By exploring the tensions between these justice impacts we formulate three main policy implications for hybrid governance settings: the need for transparent decision-making on the distribution of costs and benefits; safeguarding public control over the urban NBS and the use of scientific expertise in combination with bottom-up consultation procedures to recognize both current and future voices.

Triguero-Mas, M., Anguelovski, I., García-Lamarca, M., Argüelles, L., Perez-del-Pulgar, C., Shokry, G., . . . Cole, H. V. S. (2021). Natural outdoor environments' health effects in gentrifying neighborhoods: Disruptive green landscapes for underprivileged neighborhood residents. *Social Science & Medicine,* 279, 113964. https://doi.org/10.1016/j.socscimed.2021.113964

Background Cities are restoring existing natural outdoor environments (NOE) or creating new ones to address diverse socio-environmental and health challenges. The idea that NOE provide health benefits is supported by the therapeutic landscapes concept. However, several scholars suggest that NOE

interventions may not equitably serve all urban residents and may be affected by processes such as gentrification. Applying the therapeutic landscapes concept, this study assesses the impacts of gentrification processes on the associations between NOE and the health of underprivileged, often long-term, neighborhood residents. Methods We examined five neighborhoods in five cities in Canada, the United States and Western Europe. Our case studies were neighborhoods experiencing gentrification processes and NOE interventions. In each city, we conducted semi-structured qualitative interviews on NOE interventions, equity/justice, gentrification and health (n = 117) with case study neighborhood residents, community-based organizations, neighborhood resident leaders and other stakeholders such as public agencies staff. Results Respondents highlighted a variety of interconnected and overlapping factors: the insufficient benefits of NOE to counterbalance other factors detrimental to health, the use of NOE for city branding and housing marketing despite pollution, unwelcomeness, increase of conflicts, threats to physical displacement for themselves and their social networks, unattractiveness, deficient routes, inadequate NOE maintenance and lack of safety in NOE. Conclusions Our study demonstrated that underprivileged neighborhood residents were perceived to experience new or improved NOE as what we call "disruptive green landscapes" (i.e. non-therapeutic landscapes with which they were not physically or emotionally engaged) instead of as therapeutic landscapes.

Venable, V. (2021). *Evaluating the Social Equity Implications of Green Infrastructure for Urban Resilience.* (Master of Science Master's thesis), Oregon State University, Corvallis, OR. Retrieved from https://ir.library.oregonstate.edu/concern/graduate_projects/1j92gf76s

As the threat of climate change becomes more imminent and the role of cities in climate adaptation becomes clearer, urban resilience, the ability of a city or urban system to withstand a wide array of shocks and stresses, has gained increasing attention in climate adaptation policy and planning. Critics of traditional resilience-building investments claim that these policies do not adequately consider power, politics, and justice, therefore preventing systemic change and sometimes even exacerbating social inequities. Using panel data at the census tract level in Washington D.C., Portland, Oregon, and Houston, Texas, this research looks at how green infrastructure flood risk reduction (GI-FRR) projects affect housing affordability between 2010 and 2019. This analysis is supplemented by a qualitative review of each city's climate adaptation plan using the Fitzgibbons & Mitchell (2019) rubric to evaluate how intentionally cities incorporated aspects of justice, equity, and power. Findings indicate that census tracts with newly implemented GI-FRR projects experience increases in household income, housing values, and percentage of people with a bachelor's degree in Portland, Oregon and Washington, D.C. However, there was no significant relationship between green infrastructure implementation and gentrification in Houston, Texas. I also identify that while cities incorporate equity to varying degrees, the outcomes in terms of housing affordability and neighborhood change are not significantly different. These conclusions add insight to climate planning on the city and local level by identifying a critical side effect of building urban resilience without an equity lens: gentrification and a widening resilience gap. Further research should investigate how this relationship extrapolates to other cities with varying zoning policies and of varying sizes and regions as well as considering other resilience programs to better understand the impact of resilience investments on housing affordability and community evolution.

Walsh, E. A. (2018). White fragility as an obstacle to anti-racist resilience planning: Opportunities for equity-conscious partnerships. *Journal of Urban Management,* 7(3), 181-189. https://doi.org/10.1016/j.jum.2018.12.005

Despite more than forty years of progress in the development of ecological resilience research since C.S. Holling's publication of "Resilience and Stability of Ecological Systems" in 1973, the vulnerability of low-income communities and communities of color has only escalated. Although global climate change in the Anthropocene increases collective vulnerability for the human family, low income communities and communities of color, both within cities, and throughout the world are more vulnerable (Anguelovski et al., 2016, Baker, 2012; Bullard and Wright, 2012; Kashem, Wilson, & Zandt, 2016). In the United States, people of color and low-income communities are disproportionally likely to live in environments with poor air and water quality, limited access to healthy food and soil, in close proximity to toxic waste, in substandard shelter, and in locations more vulnerable to climate change and extreme weather events (Agyeman, 2005; Bullard, Mohai, Saha, & Wright, 2007; Bullard, 2007; Hood, 2005; Wilson, 2018). Even though resilience research calls for diverse and inclusive frameworks for adaptive co-management of social-ecological systems (Olsson, Folke, & Berkes, 2004), in many vulnerable neighborhoods, structural racism and classism prevent residents from having a seat at the table when decisions are made about their community (Agyeman, 2010; Bullard et al., 2007; Cole & Foster, 2001). Sexism, heterosexism, ableism, and ageism also limit equitable participation by (and protection of) diverse community members vulnerable to climate change and environmental injustices (Adamson, Evans, & Stein, 2002). In light of these challenges, how can practice research frameworks for building resilience support the long-term well-being and adaptive capacity of vulnerable communities?

Wolch, J. R., Byrne, J., & Newell, J. P. (2014). Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'. *Landscape and Urban Planning,* 125, 234-244. https://doi.org/10.1016/j.landurbplan.2014.01.017

Urban green space, such as parks, forests, green roofs, streams, and community gardens, provides critical ecosystem services. Green space also promotes physical activity, psychological well-being, and the general public health of urban residents. This paper reviews the Anglo-American literature on urban green space, especially parks, and compares efforts to green US and Chinese cities. Most studies reveal that the distribution of such space often disproportionately benefits predominantly White and more affluent communities. Access to green space is therefore increasingly recognized as an environmental justice issue. Many US cities have implemented strategies to increase the supply of urban green space, especially in park-poor neighborhoods. Strategies include greening of remnant urban land and reuse of obsolete or underutilized transportation infrastructure. Similar strategies are being employed in Chinese cities where there is more state control of land supply but similar market incentives for urban greening. In both contexts, however, urban green space strategies may be paradoxical: while the creation of new green space to address environmental justice problems can make neighborhoods healthier and more esthetically attractive, it also can increase housing costs and property values. Ultimately, this can lead to gentrification and a displacement of the very residents the green space strategies were designed to benefit. Urban planners, designers, and ecologists, therefore, need to focus on urban green space strategies that are 'just green enough' and that explicitly protect social as well as ecological sustainability.

Yu, P., & Sun, P. (2021). *Progress in environmental gentrification research and hotspot analysis based on CiteSpace analysis*. Paper presented at the 2021 International Conference on Tourism, Economy and Environmental Sustainability (TEES 2021). https://doi.org/10.1051/e3sconf/202125102071

With the advent of the post-industrial era, environmental improvements and sustainable initiatives that lack sufficient attention to the social justice aspects of environmental changes generates environmental gentrification. The purpose of this paper is to systematically explore the frontiers of gentrification research and the knowledge base of environmental gentrification. Therefore, based on Web of Science Core Collection Database, this paper analysed the progress and hotpots of environmental gentrification using CiteSpace, identified keywords relevant to environmental gentrification and their frequency of co-occurrence using the function of keyword co-occurrence analysis, recognized top ten clusters using the function of cluster analysis. Environmental gentrification is the frontier on gentrification research, which knowledge base and hotpots research should arouse our attention. This paper can help readers to understand the status quo and development trend of environmental gentrification better, recognize defect in the development of environmental gentrification, and provide a promising direction for future research.

Zuniga-Teran, A. A., Gerlak, A. K., Mayer, B., Evans, T. P., & Lansey, K. E. (2020). Urban resilience and green infrastructure systems: towards a multidimensional evaluation. *Current Opinion in Environmental Sustainability, 44*, 42-47. https://doi.org/10.1016/j.cosust.2020.05.001

Multifunctional and connected green infrastructure (GI) systems have been linked to urban resilience. Although there have been significant scholarly efforts to assess resilience and to evaluate the benefits of GI, it remains unclear the degree in which GI efforts enhance resilience. Following theoretical frameworks that study coupled infrastructure systems, this paper explores the state of the art on the contribution of GI to urban resilience from multiple dimensions: (1) policy - that promotes the adoption of GI, (2) performance - assessment of GI impacts on water infrastructure systems resilience, (3) connectivity - evaluation of human and wildlife movement through GI, and (4) social - community cohesion as a result of GI efforts. We argue that beyond their individual contributions to supporting urban resilience, the interactions across the various dimensions are key to enhancing resilience. Ultimately, participatory processes are needed to assess resilience originating from GI systems and avoid injustice.

Section 2: U.S., Great Lakes

Coutts, C., & Miles, R. (2011). Greenways as Green Magnets:The Relationship between the Race of
      Greenway Users and Race in Proximal Neighborhoods. *Journal of Leisure Research,* 43(3), 317-
      333. https://doi.org/10.1080/00222216.2011.11950239

Although advances have been made in research examining race and the use of public parks, there has
been little attention paid to urban greenways. Using Geographic Positioning System (GPS) and
Geographic Information System (GIS) technology, this exploratory study examines whether the racial
composition of neighborhoods surrounding two urban greenways in Michigan acts as a barrier to trail
use or whether these urban greenways operate as "green magnets," facilitating links between
neighborhoods of varied racial composition. The results of this study revealed that the racial
composition of the neighborhoods greenway users passed through did not predict the race of users on a
given segment. These findings suggest that greenways might facilitate racial comingling in urban public
space.

Finewood, M. H., Matsler, A. M., & Zivkovich, J. (2019). Green Infrastructure and the Hidden Politics of
      Urban Stormwater Governance in a Postindustrial City. *Annals of the American Association of
      Geographers,* 109(3), 909-925. https://doi.org/10.1080/24694452.2018.1507813

Infrastructure tells a material story of ongoing challenges in cities, reflecting the diverse, normative
desires of different communities. In this article we examine the introduction of green infrastructure
technologies into urban infrastructure systems to think critically about these challenges and desires.
Green infrastructure is an intentionally designed, multifunctional technology that directly uses or mimics
the ecological processes of soils and plants (e.g., green rooftops, rain gardens, and bioswales). Facing
budget shortfalls as well as demands to mitigate hazards and green the city, urban leaders are looking at
green infrastructure as a facility that can provide diverse cobenefits along with traditional services. A
focus on stormwater-based metrics, however-effectively reframing green infrastructure as green
stormwater infrastructure-discursively tamps down alternative politics and desires for the city. Through
a case study of Pittsburgh's stormwater governance, we argue that the work to (re)technologize green
infrastructure as green stormwater infrastructure is an act of depoliticization that hinders needed
conversations about just infrastructure outcomes. We draw on themes from qualitative interviews with
community members engaged in urban water governance to suggest that these moments of transition
provide an opportunity to illuminate previously obscured infrastructure politics and challenge the forms
of knowledge that bind us to conventional routines of urban environmental governance. We see an
opportunity to reframe the conversation in a way that opens up opportunities for historically
disenfranchised communities to voice their needs beyond the technocratic problem of stormwater
management.

Goldberg, M. (2021, Aug. 6, 2021). PA Cities have a sewer-system problem. Green infrastructure can help, but comes with risks. *The Allegheny Front*. Retrieved from https://www.alleghenyfront.org/pa-cities-have-a-sewer-system-problem-green-infrastructure-can-help-but-comes-with-risks/

No abstract available.

Harris, B., Rigolon, A., & Fernandez, M. (2020). "To them, we're just kids from the hood": Citizen-based policing of youth of color, "white space," and environmental gentrification. *Cities,* 107. https://doi.org/10.1016/j.cities.2020.102885

In gentrifying communities, youth of color are often the subject of citizen-based policing by white residents, who use nonemergency 311 calls to police unwanted behaviors, eliminate incumbent symbols of ownership (e.g., graffiti), and gain control of the space. To date, little research has examined such policing efforts in neighborhoods experiencing environmental gentrification. In these neighborhoods, parks and greenways are often established to attract white newcomers, and thus citizen-based policing to ensure that parks remain "white spaces" might be particularly strong. Using a mixed-method design, we examined the citizen-based policing of youth proximate to Chicago's 606, an urban greenway connected to environmental gentrification. Interviews revealed that white residents frequently and increasingly used citizen-based policing to monitor and control youth of color's behaviors on The 606. In response, youth avoided greenway segments in white-majority neighborhoods, used the greenway when less populated, or avoided it altogether. A mixed-effects quasi-Poisson model supported these findings, showing that the number of graffiti-related 311 calls significantly increased in the years preceding and following the greenway's opening, particularly in areas closest to The 606. Planners and policymakers need to recognize these issues and work to ensure park spaces in gentrifying areas promote inclusion and diversity.

Heath, T., Merrifield, L., Brown, K., Heim, K., Salazar, K., & Walker, C. (2020). *Building an equitable and just green infrastructure strategy in the North Central Region.* North Central Region Water Network and University of Illinois Extension. Retrieved from https://northcentralwater.org/files/2020/09/EquitableGreenInfrastructure-9-24-2020.pdf

Climate change will bring more intense storms, droughts, heatwaves, and other severe weather events. Histories of subjugation and institutional racism in the United States mean that the communities most exposed to these events are those that are already facing inequities. Low-income communities in both urban and rural areas are on the front line of climate change. To rise to these challenges "we cannot continue to plan for it using the tools of the past" (Bullard, 2016, p. 2). Building social equity and environmental justice into the conversation of green infrastructure (GI) is an opportunity to transform communities by integrating economic, environmental, and social goals. GI has the potential not only to meet community stormwater management needs but to address the other inequitable burdens exasperated by climate change, such as pollution and lack of access to greenspace (Schrock, 2015). As communities begin to adopt GI to update their stormwater infrastructure and address these challenges, the lack of institutional knowledge and formal guidance at the state level has led to a highly localized approach. To understand how communities were addressing these issues at the local level, 18 listening sessions were organized with representatives of more than 30 communities across nine states between

January and April 2020. On April 28, over 100 people participated in a virtual summit to help identify and prioritize barriers and opportunities for communities seeking to add socially just benefits to their GI practices.

Hughes, S. (2020). Principles, drivers, and policy tools for just climate change adaptation in legacy cities. *Environmental Science & Policy,* 111, 35-41. https://doi.org/10.1016/j.envsci.2020.05.007

Climate change adaptation presents an opportunity for legacy cities to address growing social, racial, and economic inequality, or engage in just climate change adaptation. While the importance of just and equitable climate change adaptation is well understood, the policy and politics that underlie such efforts are less well understood. This paper focuses on the development of just climate change adaptation strategies in legacy cities, particularly those in the Great Lakes region of the U.S., where the challenges and opportunities for climate change adaptation are particularly high. Detroit, Michigan and Cleveland, Ohio are used as illustrative case studies. These cities are two of the only two legacy cities of the Great Lakes region to have developed formal and explicit adaptation plans, and foregrounded justice and equity early in the process. A review of planning documents, and interviews with key stakeholders, in the two cities are used to identify the components of justice being included in climate change adaptation planning, the drivers or motivations for foregrounding justice in their adaptation planning, and the policy tools being used or developed to reach these goals. The findings reveal an awareness among stakeholders and decision makers in both cities of the importance of addressing inequality in climate change adaptation, some attention to justice principles in the adaptation plans themselves, and a diverse set of policy tools emerging to support this work. Importantly, despite relatively modest ambitions for climate change adaptation, both cities face implementation challenges that are likely to be common among legacy cities of the region.

Radonic, L., Cooper, L. T., & Omans, M. (2020). At the Crossroads of Flood Mitigation and Urban Revitalization: Residents' Perspectives of Shifting Floodplain Governance in the United States Rust Belt. *Human Organization,* 79(2), 117-129. https://doi.org/10.17730/1938-3525.79.2.117

Over the past decade, floods have increased in frequency and intensity, a trend that is expected to intensify over the next twenty-five years. This article addresses an under examined tension in floodplain governance: how a policy instrument designed to mitigate flood hazards in urban neighborhoods also has the potential to drive changes that may lead to environmental gentrification. Through survey and interview data concentrated in an economically depressed neighborhood in Lansing, Michigan, we explore how floodplain residents perceive their own vulnerability to flooding and interpret neighborhood land-use changes precipitated by shifts in floodplain governance. We found that while residents may recognize their neighborhood is at risk of flooding, they downplay their own vulnerability due in part to overconfidence on structural flood control measures. Relatedly, residents value the state's new flood risk mitigation program for contributing to neighborhood revitalization, generally without recognizing its flood risk adaptation objectives. Ironically, some elements of floodplain governance may drive the deterioration that necessitates urban revitalization, while others may disenfranchise low-income long-time residents. This case illustrates that shifting floodplain governance towards green infrastructure is not fully comprehensible to some residents, pointing to the need for participatory approaches that create a shared vision for urban floodplain neighborhoods.

Rigolon, A., & Nemeth, J. (2018). "We're not in the business of housing:" Environmental gentrification and the nonprofitization of green infrastructure projects. *Cities,* 81, 71-80. https://doi.org/10.1016/j.cities.2018.03.016

Environmental gentrification, or the influx of wealthy residents to historically disenfranchised neighborhoods due to new green spaces, is an increasingly common phenomenon around the globe. In particular, investments in large green infrastructure projects (LGIPs) such as New Yorks High Line have contributed to displacing long-term low-income residents. Many consider environmental gentrification to be an important environmental justice issue, but most of this research has focused on distributional justice; that is, quantifying whether LGIPs have indeed contributed to gentrifying neighborhoods around them. Limited work has focused on procedural justice in the context of environmental gentrification, or how planning processes can shape project outcomes. This is a particularly critical oversight because many LGIP planning processes are led by nonprofits, a governance model that has already raised important equity concerns in the context of planning and maintenance of smaller neighborhood parks. Yet less is known about the impacts of park nonprofits leading LGIPs. To address these gaps, we study the planning process of the 606, a rails-to-trails project located in Chicago, U.S. that contributed to environmental gentrification. Through interviews with key actors and a review of planning documents, we find that although delegation of leadership to park nonprofits has some benefits, a number of drawbacks also arise that might make gentrification a more likely outcome, namely the fragmentation of efforts to develop economically viable LGIPs while also preserving affordable housing. These findings suggest the need for cross-sectoral municipal planning efforts and for building more robust coalitions comprised of parks and housing nonprofits.

Rigolon, A., Stewart, W. P., & Gobster, P. H. (2020). What predicts the demand and sale of vacant public properties? Urban greening and gentrification in Chicago. *Cities,* 107. https://doi.org/10.1016/j.cities.2020.102948

Many post-industrial U.S. cities have developed programs to promote the greening of publicly-owned vacant lots, including initiatives in which homeowners can purchase nearby lots and turn them into yards or community gardens. These initiatives can result in greener landscapes in marginalized communities, but we know little about the spatial patterns of vacant land disposition and whether demand for and sale of publicly-owned lots are stronger in gentrifying neighborhoods. We examined the Chicago Large Lot Program and used neighborhood sociodemographic, environmental, and safety factors to predict the demand and sale of vacant lots. We found that the demand for Large Lots was significantly higher in tracts showing early signs of gentrification between 2000 and 2015 (those with higher increases of college graduates and White residents) and for tracts located closer to downtown. Also, the percentage of Large Lots sold was significantly larger in areas closer to downtown and farther from Lake Michigan but not associated with gentrification, which might be due to neighborhood political forces seeking to retain public control of vacant lots in gentrifying neighborhoods. Although other studies show that urban greening precedes gentrification, our findings suggest that the demand for urban greening might also follow early gentrification.

Safransky, S. (2014). Greening the urban frontier: Race, property, and resettlement in Detroit.
Geoforum, 56, 237-248. https://doi.org/10.1016/j.geoforum.2014.06.003

In 2014, approximately 100,000 lots lie "vacant" in Detroit after decades of industrial decline, white flight, and poverty. Planners and government officials have proposed to repurpose Detroit's highest vacancy neighborhoods, deemed to have "no market value," as blue and green infrastructure (retention ponds, carbon forests, urban farms, greenways). According to the Detroit Future City plan, traditional public services (water, street lights, transportation, garbage pickup) and the "grey infrastructures" that deliver them will be reduced and eventually withdrawn from these zones. While Detroit is widely touted for its potential as a model green city, the costs and benefits of green redevelopment are distributed unevenly within the context of gentrification and bankruptcy. Through an analysis of media representations, a contentious citywide planning project, and the construction of a private urban forest, I demonstrate how settler colonial imaginaries and rationalities articulate with austerity measures to prepare a postindustrial urban frontier for resettlement and reinvestment. During the historical era of U.S. settler colonialism, economic development happened through westward expansion on a continental scale (and then imperial scale), but today, in the urban United States, it occurs through internal differentiation of previously developed spaces and is taking a new form. Where the rural settlers of the 19th century sought to conquer wilderness, "urban pioneers" in the 21st century deploy nature as a tool of economic development in a city with a shrinking population and a large spatial footprint. Yet accumulation by green dispossession still turns on some of the defining features of settler colonialism, e.g., private property as a civilizing mechanism on the frontier, the appropriation of collective land and resources, and the expendability of particular people and places. The production of this new urban frontier also depends, like any frontier, on erasure: the material and discursive work of presenting "empty" landscapes as in need of improvement by non-local actors. I argue that understanding the stakes of postindustrial urban development struggles requires attention to how concepts of (white) settler society – which have been absorbed into political and legal-juridical institutions, discourses, myths, symbols, and national metaphors – are used to claim "wild" and "empty" lands like those in Detroit.

Walker, R. H. (2021). Engineering gentrification: urban redevelopment, sustainability policy, and green stormwater infrastructure in Minneapolis. *Journal of Environmental Policy & Planning*. https://doi.org/10.1080/1523908x.2021.1945917

Cities increasingly turn to green stormwater infrastructure (GSI) to improve water quality and mitigate flooding risk, yet like other forms of green infrastructure, early research suggests GSI may contribute to 'green gentrification,' in which greening increases housing costs, drives gentrification and displacement, and deepens inequalities. Using a spatially explicit mixed-methods approach, I interrogate the relationship between GSI and gentrification in Minneapolis, MN, a city characterized by deep racial inequalities potentially exacerbated by green gentrification. From 2000-2015, census tracts that gentrified received, on average, more GSI projects, more funding per project, and more funding overall. Gentrified tracts received five times more GSI funding than low-income tracts that did not gentrify. Buffer analysis reveals that, adjacent to GSI, rent prices and the college-educated share of the population increased at rates significantly higher than the city average. Quantitative and qualitative analysis of institutions providing and receiving GSI funding indicates that inter-governmental collaborations between watershed governing bodies and city government direct GSI funding to gentrifying areas, where GSI aid in and legitimize the aesthetic transformation of gentrifying

neighborhoods. When enmeshed in neighborhood recapitalization via green gentrification, GSI may ultimately deepen environmental inequalities, highlighting the need for planning and policies that proactively mitigate gentrification risks.

Section 3: U.S., Mid-Atlantic

Anguelovski, I., Ranganathan, M., & Hyra, D. (2020). *The Racial Inequities of Green Gentrification in Washington, DC.* Retrieved from https://www.american.edu/spa/metro-policy/upload/racial-inequities-of-green-gentrification.pdf

Washington, DC is one of the most intensively gentrifying cities in the United States (Hyra 2015, Hyra and Prince 2015, Prince 2016, Richardson, Mitchell, and Franco 2019), but gentrification and displacement are not homogenous across its landscape. In this chapter we consider the process of green gentrification, focusing on the transformations of the Anacostia River. Many residents remember the Anacostia River as a highly polluted, neglected, and segregating river. More recently, however, the river's partial clean-up and revitalization have turned it into a new green icon of the revived US capital. While many see it as a symbol and opportunity for racial reconciliation in the highly segregated "Chocolate City," it also increasingly embodies the traits of a gentrifying and displacing riverfront. Neighbourhoods in southeast Washington along the Anacostia River have come to represent two extremes and frontiers: on the one hand, a green and gentrification frontier in the wealthy Navy Yard on the western shore, and on the other, an open frontier on the east shore (Williams 2015). In this chapter, we examine urban redevelopment and greening trends in the east frontier and zoom in on the 11th Street Bridge Park construction project and its surrounding area. Our analysis demonstrates that while this project claims to be equity-driven, it currently fails to fundamentally address the city's historic racial inequality and the erosion of Black land ownership. Furthermore, as the intervention is driven by external corporate and philanthropic interventions, it risks neglecting or undermining long standing racial justice efforts at the grassroots level and overlooks local calls and mobilization for more abolitionist and emancipatory urban greening practice.

Checker, M. (2011). Wiped Out by the "Greenwave": Environmental Gentrification and the Paradoxical Politics of Urban Sustainability. *City & Society,* 23(2), 210-229. https://doi.org/10.1111/j.1548-744X.2011.01063.x

This essay examines the intersection of environmental justice activism and state-sponsored sustainable urban development?how is environmental justice activism enabled or disabled in the context of rapid urban development, consensual politics and the seemingly a-political language of sustainability? Drawing on ethnographic research conducted in the Harlem neighborhood of New York City, I define a process I refer to as "environmental gentrification," which builds on the material and discursive successes of the environmental justice movement and appropriates them to serve high-end development. While it appears as politically-neutral, consensus-based planning that is both ecologically and socially sensitive, in practice, environmental gentrification subordinates equity to profit-minded development. I propose that this process offers a new way of exploring the paradoxes and conundrums facing contemporary urban residents as they fight to challenge the vast economic and ecological disparities that increasingly divide today's cities.

Chestnut, D., Krasny, M. E., & Tidball, K. G. (2018). Countering Environmental Gentrification Through Economic, Cultural, and Political Equity: The 11th Street Bridge Park. In *Grassroots to Global: Broader Impacts of Civic Ecology.* M. E. Krasny (Ed.), (pp. 194-212): Cornell University Press Retrieved from http://www.jstor.org/stable/10.7591/j.ctt1w0dcb0.15

As we trace the history of environmental stewardship and activism along the Anacostia River and its tributaries, we demonstrate how communities excluded from the river created their own ways to access and to care for the river and its humans, fish, birds, and other inhabitants. We also explore how communities negatively impacted by the river's use as an industrial, defense, and sewage dumping ground and as a transportation corridor have joined forces with environmental organizations and government agencies to transform pockets of the watershed and its neighborhoods. In this way, we examine environmental justice issues of "inclusion" in environmental degradation and "exclusion" from environmental goods, as well as how nonprofits, government, and community members respond to these issues. Finally, we explore efforts to thwart physical displacement of long-term lower-income residents. We use the case of the 11th Street Bridge Park and how it is creating new strategies to ensure housing, cultural, and political equity.

Connolly, J. J. T. (2019). From Jacobs to the Just City: A foundation for challenging the green planning orthodoxy. *Cities,* 91, 64-70. https://doi.org/10.1016/j.cities.2018.05.011

Now that Jane Jacobs' ideas are seen as urban planning orthodoxy, it is unclear how her institutional goal of progressive change for the field will carry forward. In the 1960s, Jacobs created the conditions for institutional change by offering a thorough critique of the "Radiant Garden City Beautiful" orthodoxy of urban planning and presenting a solution for the problems that she saw with this approach. She argued that the top-down, design-oriented planning of her time hurt the lives of individual residents and diminished society as a whole. Her solution was a new way of seeing the city: as a functional and efficient social system. Since the 1990s, a global planning orthodoxy – of which Jacobs' ideas are part – developed around the "Smart Sustainable Resilient City." This orthodoxy has been subject to critique, but Susan Fainstein's Just City theory offers tools for comprehensively challenging the approach and a solution for addressing the problems. In order to demonstrate the need for institutional change within the Smart Sustainable Resilient City orthodoxy, I use the Just City theoretical perspective to interpret the results of an analysis of green gentrification in New York City between 1990 and 2014. I argue that the over-valuation of Jacobsian diversity within the current urban planning orthodoxy generates unjust outcomes. The just green city, then, requires de-emphasizing Jacobs' intellectual project in favor of her far more important institutional project.

Fitzgerald, J., & Laufer, J. (2017). Governing green stormwater infrastructure: the Philadelphia experience. *Local Environment,* 22(2), 256-268. https://doi.org/10.1080/13549839.2016.1191063

Many cities throughout the world are adopting green infrastructure techniques to reduce stormwater and sewer overflows into waterways, which is particularly problematic for places experiencing more frequent and severe rain events. Governance of green stormwater implementation is proving to be as important as the techniques themselves. Building on the climate and sustainability governance literature, we argue that effective governance requires planning across city departments,

experimentation and a strategy for organisational learning. We employ a case study of Philadelphia, the first city in the United States to attempt an entirely green approach to meeting federal regulations to examine issues of governance that emerged and how they were addressed. The case study draws on interviews with fourteen public and private sector actors involved in implementation, a site visit to observe the installations and to discuss the approach with a key planner, and grey literature. We find that silos can be broken down and that if open communications and a willingness to change practices are present, obstacles cited in the literature can be overcome. The key implication is that the three elements of governance need to be built into the green infrastructure planning process. While the analysis focuses on a US city, the departments involved and the governance needs of green stormwater infrastructure are similar in cities in much of the world.

Gould, K. A., & Lewis, T. L. (2017). *Green Gentrification: Urban sustainability and the struggle for environmental justice*: Routledge. Retrieved from https://www.routledge.com/Green-Gentrification-Urban-sustainability-and-the-struggle-for-environmental/Gould-Lewis/p/book/9781138309135

Green Gentrification looks at the social consequences of urban "greening" from an environmental justice and sustainable development perspective. Through a comparative examination of five cases of urban greening in Brooklyn, New York, it demonstrates that such initiatives, while positive for the environment, tend to increase inequality and thus undermine the social pillar of sustainable development. Although greening is ostensibly intended to improve environmental conditions in neighborhoods, it generates green gentrification that pushes out the working-class, and people of color, and attracts white, wealthier in-migrants. Simply put, urban greening "richens and whitens," remaking the city for the sustainability class. Without equity-oriented public policy intervention, urban greening is negatively redistributive in global cities. This book argues that environmental injustice outcomes are not inevitable. Early public policy interventions aimed at neighborhood stabilization can create more just sustainability outcomes. It highlights the negative social consequences of green growth coalition efforts to green the global city, and suggests policy choices to address them. The book applies the lessons learned from green gentrification in Brooklyn to urban greening initiatives globally. It offers comparison with other greening global cities. This is a timely and original book for all those studying environmental justice, urban planning, environmental sociology, and sustainable development as well as urban environmental activists, city planners and policy makers interested in issues of urban greening and gentrification.

Gould, K. A., & Lewis, T. L. (2018). From Green Gentrification to Resilience Gentrification: An Example from Brooklyn. *City & Community,* 17(1), 12-15. https://doi.org/10.1111/cico.12283

No abstract available.

Graham, L., Debucquoy, W., & Anguelovski, I. (2016). The influence of urban development dynamics on community resilience practice in New York City after Superstorm Sandy: Experiences from the Lower East Side and the Rockaways. *Global Environmental Change,* 40, 112-124. https://doi.org/10.1016/j.gloenvcha.2016.07.001

While (urban) resilience has become an increasingly popular concept, especially in the areas of disaster risk reduction (DRR) and climate change adaptation (CCA), it is often still used as an abstract metaphor, with much debate centered on definitions, differences in approaches, and epistemological considerations. Empirical studies examining how community-based organizations (CBOs) "practice" resilience on the ground and what enables these CBOs to organize and mobilize around resilience are lacking. Moreover, in the growing context of competitive and entrepreneurial urbanism and conflicting priorities about urban (re)development, it is unclear how urban development dynamics influence community-based resilience actions. Through empirical research conducted on the Lower East Side, a gentrifying neighborhood in Manhattan, and in Rockaway, a socio-spatially isolated neighborhood in Queens, we investigate community organizing of low-income residents for (climate) resilience in a post-disaster context. Results show that both the operationalization of resilience – how resilience is "practiced" – and the community capacity to organize for the improved resilience of low-income residents are strongly influenced by pre-existing urban development dynamics and civic infrastructure – the socio-spatial networks of community-based organizations – in each neighborhood. The Lower East Side, with its long history of community activism and awareness of gentrification threats, was better able to mobilize broadly and collectively around resilience needs while the more socio-spatially isolated neighborhoods on the Rockaway peninsula were more constrained.

Hamilton, T., & Curran, W. (2012). From "Five Angry Women" to "Kick-ass Community": Gentrification and Environmental Activism in Brooklyn and Beyond. *Urban Studies,* 50(8), 1557-1574. https://doi.org/10.1177/0042098012465128

In this article, a new conceptual framework is advocated to evaluate the range of environmental activism in already-gentrifying neighbourhoods and to recognise the agency and resilience of long-term residents. The category of gentrifier-enhanced environmental activism is meant to account for attempts to forge coalitions (however uneasy they may turn out to be) between long-term residents and gentrifiers. This includes attempts by long-term residents to mitigate environmental gentrification by "schooling" gentrifiers in communities' longstanding concerns and needs, framing these concerns as a common cause rather than allowing for the takeover of local environmental politics often associated with environmental gentrification. The example is used of the fight to clean up Newtown Creek in Greenpoint, Brooklyn, as a case study in how environmental veterans made strategic alliances with gentrifiers who brought new resources to the area in order to achieve political pressure for change and to promote more just sustainabilities.

Heckert, M., & Rosan, C. D. (2016). Developing a green infrastructure equity index to promote equity planning. *Urban Forestry & Urban Greening,* 19, 263-270. https://doi.org/10.1016/j.ufug.2015.12.011

The Philadelphia Water Department has committed to taking a green infrastructure (GI) approach to reduce stormwater runoff and prevent combined sewer overflow events. Promoting GI as a stormwater

management technique in a city necessitates development of a more distributed urban environmental management system, through which the city's water department needs to coordinate with a wide range of public and private stakeholders, shifting power from the utility to these other stakeholders. We argue that distributed urban environmental management can lead to more inclusive outcomes but only if there is an intentionality about how funds are distributed, which communities are prioritized, how partners are chosen and cultivated, and which types of projects are implemented in which neighborhoods. We suggest the development of an equity index to help identify communities that would most benefit from GI investment as critical for equitable GI planning. Using Philadelphia as a test case, we develop a Green Infrastructure Equity Index, designed with the indirect benefits of green infrastructure in mind, to determine which communities could benefit the most from investment in GI based on their "equity void ranking". We argue that developing a GI Equity Index provides a much more nuanced analysis of communities that takes into account the built environment as well as the underlying social and economic conditions. The GI Equity Index also allows for a shift in the way we define equity. In doing so, it (1) changes the conversation about equity in GI planning using careful data analysis that takes into account both socio-economic and built environment variables; (2) provides a visual tool that communities can use to understand underlying conditions and the existing placement of GI; and (3) serves as a framework that can be tailored to allow communities to weight their priorities, putting more power in their hands.

Heckert, M., & Rosan, C. D. (2018). Creating GIS-Based Planning Tools to Promote Equity Through Green Infrastructure. *Frontiers in Built Environment,* 4(27). https://doi.org/10.3389/fbuil.2018.00027

The Philadelphia Water Department, now known as Philadelphia Water (PW), has been coordinating with other city and private and non-profit stakeholders to install green infrastructure (GI) across the city as a means of addressing stormwater runoff as well as promoting social, economic, and environmental benefits such as improved health, job creation, and carbon sequestration. While many planning tools exist to assist in the development of green infrastructure projects, recent critiques have highlighted limitations in their considerations of non-environmental concerns, and several new planning tools have been proposed that use indexes and other need-based approaches to account for a wider range of potential program impacts. Even these new ideas, however, fail to systematically account for the possibility that not only desired GI benefits but also the impacts of specific GI projects may vary considerably from place to place. Based on our experiences with a community advisory board working to assess co-benefits of GI, we propose the inclusion of more interactive methods for incorporating community perspectives on the benefits of GI into GI planning methodologies to make them both more equitable and more responsive to community needs.

Maantay, J., & Maroko, A. (2009). Mapping urban risk: Flood hazards, race, & environmental justice in New York. *Applied Geography,* 29(1), 111-124. https://doi.org/10.1016/j.apgeog.2008.08.002

This paper demonstrates the importance of disaggregating population data aggregated by census tracts or other units, for more realistic population distribution/location. A newly developed mapping method, the Cadastral-based Expert Dasymetric System (CEDS), calculates population in hyper-heterogeneous urban areas better than traditional mapping techniques. A case study estimating population potentially impacted by flood hazard in New York City compares the impacted population determined by CEDS with

that derived by centroid-containment method and filtered areal-weighting interpolation. Compared to CEDS, 37% and 72% fewer people are estimated to be at risk from floods city-wide, using conventional areal weighting of census data, and centroid-containment selection, respectively. Undercounting of impacted population could have serious implications for emergency management and disaster planning. Ethnic/racial populations are also spatially disaggregated to determine any environmental justice impacts with flood risk. Minorities are disproportionately undercounted using traditional methods. Underestimating more Vulnerable sub-populations impairs preparedness and relief efforts.

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

Gentrification is a growing concern in many urban areas, due to the potential for displacement of lower-income and other vulnerable populations. This process can be accelerated when neighborhood "greening" projects are undertaken via governmental or private investor efforts, resulting in a phenomenon termed environmental or green gentrification. Vacant land in lower-income areas is often improved by the existing community through the creation of community gardens, but this contributes to these greening efforts and paradoxically may spur gentrification and subsequent displacement of the gardens' stewards and neighbors. Is proximity to community gardens in less affluent neighborhoods associated with an increased likelihood of gentrification? Using Brooklyn, New York as a case study, we examined this question using Geographic Information Systems and two spatial methods: a census block group proximity analysis, and a hot spot analysis, to determine the potential impact of proximity to community gardens in lower-income areas. The results of the analyses suggest that proximity to community gardens is associated with significant increases in per capita income over the five years study period, which is indicative of areas undergoing gentrification. This has implications for environmental justice because existing lower-income residents are likely to be displaced after their community is improved environmentally.

Meerow, S. (2020). The politics of multifunctional green infrastructure planning in New York City. *Cities,* 100. https://doi.org/10.1016/j.cities.2020.102621

Cities are expanding green infrastructure and presenting it as a panacea for social and environmental challenges, but the reality is more complex and inherently political. We need to advance our understanding of these politics, which I divide into the politics of green infrastructure performance and planning. I use New York City as a case study to begin unpacking these politics of planning. New York City's green infrastructure program focuses on water quality, but aims to provide other sustainability benefits. How are potential benefits prioritized, factored into planning, and what are the implications of these decisions? I examine these questions by combining spatial analyses, survey, and interview data. I survey local stakeholders about the relative importance of six benefits of green infrastructure (managing stormwater, reducing social vulnerability, increasing access to green space, improving air quality, mitigating the urban heat island effect, and increasing landscape connectivity). Second, I use spatial multi-criteria analysis to identify priority neighborhoods for green infrastructure based on those criteria. I examine tradeoffs and synergies between criteria and compare modeled priorities with existing green infrastructure locations. Interviews with key decision-makers provide a deeper understanding of

planning processes. Results illustrate why spatial planning represents a critical challenge for green infrastructure planning.

Miller, J. T. (2016). Is urban greening for everyone? Social inclusion and exclusion along the Gowanus Canal. *Urban Forestry & Urban Greening,* 19, 285-294. https://doi.org/10.1016/j.ufug.2016.03.004

Focusing on the subthemes of how governance happens and processes of marginalization, this paper examines a case study in Gowanus, Brooklyn to explore inclusion and exclusion in urban environmental decision-making processes. This work gains support from theoretical considerations in urban political ecology and interdisciplinary research on green gentrification and how power differences and inequity impact civic involvement. The Gowanus Canal in Brooklyn, New York became a Superfund site in 2010, after much debate between local, state, and federal government offices over how to pursue clean up. Private development, local and state initiatives are addressing the sewage and other contamination along the banks of the canal while the Superfund clean up in the waterway takes place. The area has become a site for enacting waterfront planning and economic development, green infrastructure creation, brownfield redevelopment, and other local and state green planning initiatives. Public forums on cleaning and greening Gowanus have engaged the community, and allowed space for discussing the possibilities for the future of the area. This paper will focus on interview responses in relation to the federal Environmental Protection Agency decision-making process. Why do some residents support or oppose the clean up processes in Gowanus, and what influences their ability or desire to take part in the decision-making processes? Further, for whom is this space being redeveloped, and how do inclusion and exclusion operate to create divisions in decision-making processes surrounding the clean up?

Shokry, G., Connolly, J. J. T., & Anguelovski, I. (2020). Understanding climate gentrification and shifting landscapes of protection and vulnerability in green resilient Philadelphia. *Urban Climate,* 31, 100539. https://doi.org/10.1016/j.uclim.2019.100539

As resilience strategies become a prominent orthodoxy in city planning, green infrastructure is increasingly deployed to enhance protection from climate risks and impacts. Yet, little is known about the social and racial impacts of such interventions citywide. In response, our study uses a quantitative and spatial analytical approach to assess whether interventions we call "green resilient infrastructure" (GRI) protect social groups traditionally most at risk and/or least able to adapt to climate impacts – or conversely, if the aggregate effect is maladaptive and inequitable outcomes (i.e. shifting vulnerability or climate gentrification). First, we performed a pre-post test of GRI siting distribution relative to socio-ecological vulnerability in Philadelphia neighborhoods. Second, we examined gentrification trends in relation to GRI siting and whether these interventions contribute to increasing the socio-ecological vulnerability of historically marginalized populations. Our findings point to a strong negative association between GRI siting and increased minority population, and a strong positive association between GRI siting, gentrification, and reduced minority population. The paper contributes to a better understanding of siting inequities and urban climate injustice dynamics and offers a new conceptual frame for critical urban adaptation research and practice of the pathways that shape uneven and unjust outcomes.

Stand, J., Stand, B., Stand, T., & Stand, P. (2018). Community Land Trusts: A New Model for Urban Equity and Environmental Resilience. In *International Low Impact Development Conference 2018: Getting in Tune with Green Infrastructure.* J. Hathaway (Ed.), (pp. 159-167) https://doi.org/10.1061/9780784481783.019

Community land trusts (CLTs) are a developing trend in community land ownership and stewardship. As American cities continue to grow, gentrification, densification, and displacement are issues that threaten many existing neighborhoods. Using the lens of the South Bronx Land and Resource Trust (SBxLCRT), we will examine the CLT's roots under the leadership of We Stay/Nos Quedamos Inc., a 25-year old community development corporation active in planning and development in Community Districts 1, 2, and 3 in the Bronx, New York City. This will explore the CLT's implications in the formation of municipal policy, environmental resilience, and community equity.

Section 4: U. S., Northeast

Anguelovski, I. (2015). Healthy Food Stores, Greenlining and Food Gentrification: Contesting New Forms of Privilege, Displacement and Locally Unwanted Land Uses in Racially Mixed Neighborhoods. *International Journal of Urban and Regional Research,* 39(6), 1209-1230. https://doi.org/10.1111/1468-2427.12299

Local activists engaged in contemporary environmental justice struggles not only fight against traditional forms of hazardous locally unwanted land uses (LULUs), they also organize to make their neighborhoods livable and green. However, urban environmental justice activism is at a crossroads: as marginalized neighborhoods become revitalized, outside investors start to value them again and they themselves invest in green amenities. Yet vulnerable residents are now raising concerns about the risk of displacement from their neighborhoods in consequence of environmental gentrification processes. Their fear is linked to environmental amenities such as new parks or remodeled waterfronts, as well as (most recently) healthy food stores. Using the case of a conflict around a new Whole Foods supermarket in Boston, MA, I examine how food venues and stores labeled as healthy and natural can create socio-spatial inequality together with privilege, exclusion and displacement in racially diverse neighborhoods. I analyze how high-end supermarket chains target inner-city neighborhoods for their growth and profit potential, and demonstrate that their arrival contributes to what I call supermarket greenlining'. This greenlining illustrates the process of food gentrification, and the manipulation of health and sustainability discourses about food by healthy and natural food investors and their supporters. The opening of high-end supermarkets thus converts such stores into new LULUs for historically marginalized groups.

Douglas, E. M., Kirshen, P. H., Paolisso, M., Watson, C., Wiggin, J., Enrici, A., & Ruth, M. (2012). Coastal flooding, climate change and environmental justice: identifying obstacles and incentives for adaptation in two metropolitan Boston Massachusetts communities. *Mitigation and Adaptation Strategies for Global Change,* 17(5), 537-562. https://doi.org/10.1007/s11027-011-9340-8

We explored the possible future impacts of increased coastal flooding due to sea level rise and the potential adaptation responses of two urban, environmental justice communities in the metropolitan Boston area of Massachusetts. East Boston is predominantly a residential area with some industrial and commercial activities, particularly along the coastal fringe. Everett, a city to the north of Boston, has a diversified industrial and commercial base. While these two communities have similar socioeconomic characteristics, they differ substantially in the extent to which residents would be impacted by increased coastal flooding. In East Boston, a large portion of residents would be flooded, while in Everett, it is the commercial/industrial districts that are primarily vulnerable. Through a series of workshops with residents in each community, we found that the target populations do not have an adaptation perspective or knowledge of any resources that could assist them in this challenge. Furthermore, they do not feel included in the planning processes within their communities. However, a common incentive for both communities was an intense commitment to their communities and an eagerness to learn more and become actively engaged in decisions regarding climate change adaptation. The lessons that can be applied to other studies include 1) images are powerful tools in communicating concepts, 2) understanding existing cultural knowledge and values in adaptation planning is essential to the planning process and 3) engaging local residents at the beginning of the process can create important educational

opportunities and develop trust and consensus that is necessary for moving from concept to implementation.

van den Berg, H. J., & Keenan, J. M. (2019). Dynamic vulnerability in the pursuit of just adaptation processes: A Boston case study. *Environmental Science & Policy,* 94, 90-100. https://doi.org/10.1016/j.envsci.2018.12.015

This article argues that the justness and the efficacy of adaptation processes are dependent on how and when planning actors measure vulnerability and define vulnerable populations. Through a review of climate adaptation and disaster risk reduction literature, this article takes the position that the advancement of procedurally just adaptive planning should engage a dynamic framing of vulnerability that brings together aspects of both contextual and outcome vulnerability in order to support ongoing adaptation planning efforts that include the acknowledgement and representation of a full range of stakeholders. To illustrate this position, a case study of the City of Boston's resilience plans is presented to explore the strengths and weaknesses of current planning practices that vary in their static and dynamic conceptualization of vulnerability and participatory planning processes. This article opens the door for future research that evaluates the procedural justness of adaptation planning processes that are challenged to balance vulnerability assessment methodologies and engagement processes within the context of dynamic social, economic, environmental change.

Section 5: U.S., West Coast

Allison, J. R. (2020). *Greening Inequality: How Urban Sustainable Development Fails Under Neoliberalism* (Bachelor of Science Undergraduate honors thesis), Portland State University, Portland, OR. Retrieved from https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=2157&context=honorstheses

No abstract available.

Christensen, J., Rigolon, A., Mark, R., Kairam, S., & Molina, D. *Investment without displacement: Recommendations from a participatory action research project in South Gate, CA.* The Trust for Public Land. Retrieved from https://www.tpl.org/sites/default/files/Urban%20Orchard%20Investment%20without%20Displacement.pdf

In recent years, South Gate, a city of approximately 100,000 people located southeast of downtown Los Angeles has seen a number of new planned public and private investments. These investments include the Urban Orchard, a new 30-acre park along the Los Angeles River, a cultural center at the confluence of the Rio Hondo, and Metro's West Santa Ana Branch rail line and transit oriented development hub. In addition, recently enacted legislation such as LA County Measures A and W and State of California Proposition 68 will fund additional parks and green infrastructure bringing more investment to South Gate and other Gateway Communities in the future. These new investments will bring much needed green space, providing residents with opportunities to play, gather, exercise and grow food as well as crucial green infrastructure that will mitigate the effects of climate change in neighborhoods that have been historically underserved. These improvements will provide more equitable access to the health, social, and environmental benefits that parks and open spaces provide. However, they will also attract new economic investment and potential real estate speculation. Therefore, it is important to understand these opportunities and risks, as well as strategies to best position residents to benefit from these developments and guard against any potential harms. This report focuses specifically on the development of the Urban Orchard, a community-driven park project currently being developed on 30-acres of post-industrial land along the Los Angeles River. In addition to supporting the community design process and project development, The Trust for Public Land and research partners are facilitating a participatory action research project to understand the risk of gentrification and displacement in the communities surrounding the Urban Orchard. This report is an executive summary of our research findings and recommendations, which builds upon lessons from South Gate and experiences from other communities around the country.

Donovan, G. H., Prestemon, J. P., Butry, D. T., Kaminski, A. R., & Monleon, V. J. (2021). The politics of urban trees: Tree planting is associated with gentrification in Portland, Oregon. *Forest Policy and Economics,* 124, 102387. https://doi.org/10.1016/j.forpol.2020.102387

This study evaluated the hypothesis that urban-tree planting increases neighborhood gentrification in Portland, Oregon. We defined gentrification as an increase in the median sales price of single-family homes in a Census tract compared to other tracts in the city after accounting for differences in the

housing stock such as house size and number of bathrooms. We used tree-planting data from the non-profit Friends of Trees, who have planted 57,985 yard and street trees in Portland (1990–2019). We estimated a mixed model of gentrification (30 years and 141 tracts) including random intercepts at the tract level and a first-order auto-regressive residual structure. Tract-level house prices and tree planting may be codetermined. Therefore, to address potential endogeneity of tree planting in statistical modeling, we lagged the number of trees planted by at least one year. We found that the number of trees planted in a tract was significantly associated with a higher tract-level median sales price, although it took at least six years for this relationship to emerge. Specifically, each tree was associated with a $131 (95% CI: $53–$210; p-value = 0.001) increase in tract-level median sales price six years after planting. The magnitude of the association between the number of trees planted and median sales price generally increased as the time lag lengthened. After twelve years, each tree was associated with a $265 (95% CI: $151–$379; p-value<0.001) increase in tract-level median sales price. Tree planting was not merely a proxy for existing tree cover, as the percent of a tract covered in tree canopy was independently associated with an increase in median sales price. Specifically, each 1-percentage point increase in tree-canopy cover was associated with a $882 (95% CI: $226–$1538; p-value = 0.008) increase in median sales price. In conclusion, tree planting is associated with neighborhood-level gentrification, although the magnitude of the association is modest.

Nieberg, H. (2019). *Los Angeles' Riparian Renaissance: Rethinking the Geographies of Gentrification through Green City-Wide Infrastructure Projects* (Bachelor of Arts Undergraduate honors thesis), Macalester University, St. Paul, MN. Retrieved from https://digitalcommons.macalester.edu/cgi/viewcontent.cgi?article=1060&context=geography_honors

The neoliberal restructuring of global cities has allowed larger scales of investment that has catalyzed and enlarged gentrification processes. The impacts of gentrification today have the potential to transcend individual communities and affect the whole city. Building on the "rent gap" theory, I examine the reasons and ways capital is injected in capital-deficient neighborhoods, and how the inflow of capital affects the spatial scales in which the process of gentrification is occurring today. While there are studies on the impacts local green infrastructure-spending and greening initiatives can have on neighborhood gentrification, we know less about how large, arterial green infrastructure projects contribute to a city-wide understanding of gentrification. This thesis extends existing work on gentrification by using a case study of a 51-mile long green-infrastructure project that aims to revitalize the Los Angeles River. I focus on understanding the spatial scales at which processes of gentrification operate, through analyzing historic and current patterns of real estate speculation. By using historic home ownership loan corporation (HOLC) spatial data regarding where areas were restricted for loans, and modern turnover in acquisition of residential, industrial, and commercial properties, I study the impact the Los Angeles River has had on changing real estate speculation patterns along the Los Angeles River and its potential for future investment. As investors and developers start seeing spatial investment opportunities that transcend just a singular neighborhood, this research aims to further an emerging conversation on how city-wide green infrastructure projects can contribute to the theoretical conversation about the spatial patterns of gentrification in 21st-century global cities. The Los Angeles River offers hypotheses to be explored that green city-wide infrastructure projects can produce new forms of real estate speculation and acquisition, therefore contributing to a much larger discussion on the enlarging fiscal, spatial, and social processes of gentrification.

Reed College Environmental Studies Junior Seminar. (2018). *Green Infrastructure Distribution in Portland, Oregon.* Reed College. Portland, OR. Retrieved from https://www.reed.edu/es/assets/ES300-2018-project-Green-Infrastructure-Distribution-FINAL.pdf

Flooding has historically been, and remains, a central environmental challenge facing the city of Portland. One of the city's newest initiatives to manage flooding is the Green Infrastructure program. Here, we look specifically at "Green Streets," one type of Green Infrastructure with particular potential to reduce flooding risk. However, Green Streets can also change other neighborhood characteristics, including property values, which can lead to gentrification. Thus, the city must strike a delicate balance between failing to address flooding in socioeconomically vulnerable areas and driving up housing costs as streets become more visually appealing with the installation of Green Streets. We set out to determine what the goals of the Green Street Program are, the extent to which the distribution of Green Streets meet these goals, and the ways in which this distribution might be improved. Based on GIS mapping and multilinear regression analysis, we find that the distribution of Portland's Green Streets are likely driven primarily by preexisting risk of flood, but that socioeconomic factors may also play a role. We also use field surveys and questionnaires sent out to city employees and volunteer Green Street stewards to develop a more qualitative analysis of the Green Streets installed so far and the motivations behind their installment and use. We find that poorer neighborhoods with higher levels of "social vulnerability" have proportionately higher rates of Green Street placement. Thus, we discuss the possible gentrification that often occurs with the implementation of new infrastructure, including Green Infrastructure, and we offer policy proposals to improve the effectiveness of the Green Streets program overall.

Reibel, M., Rigolon, A., & Rocha, A. (2021). Follow the money: Do gentrifying and at-risk neighborhoods attract more park spending? *Journal of Urban Affairs*. https://doi.org/10.1080/07352166.2021.1886857

Recent research has shown that spending in urban green spaces including parks has fostered gentrification, a process known as green gentrification. But could ongoing gentrification and gentrification risk also precede local spending on new or existing parks? Focusing on the City of Los Angeles, we investigate whether park investment generated through developer fees in 2016-2018 went disproportionately to neighborhoods undergoing gentrification or at risk to gentrify. Logistic regression models show that park spending occurred disproportionately in tracts with traits of ongoing gentrification, some characteristics of gentrification risk, and higher educational attainment. Also, areas with higher proportions of Black and Asian residents saw fewer park investments. As cities around the world increasingly rely on developer fees to fund public amenities, planners and policymakers should develop strategies to ensure such investments do not accelerate existing gentrification and displacement of the most marginalized.

Rice, J. L., Cohen, D. A., Long, J., & Jurjevich, J. R. (2020). Contradictions of the Climate-Friendly City: New Perspectives on Eco-Gentrification and Housing Justice. *International Journal of Urban and Regional Research,* 44(1), 145-165. https://doi.org/10.1111/1468-2427.12740

As local governments and corporations promote "climate friendliness", and a low-carbon lifestyle becomes increasingly desirable, more middle- and upper-income urban residents are choosing to live near public transit, on bike- and pedestrian-friendly streets, and in higher-density mixed-use areas. This rejection of classical forms of suburbanization has, in part, increased property values in neighborhoods offering these amenities, displacing lower-income, often non-white, residents. Increased prevalence of creative and technology workers appears to accelerate this trend. We argue that a significant and understudied socio-environmental contradiction also occurs where the actual environmental outcomes of neighborhood transformation may not be what we expect. New research on greenhouse gas emissions shows that more affluent residents have much larger carbon footprints because of their consumption, even when reductions in transportation or building energy emissions are included. We describe an area in Seattle, Washington, the location of Amazon's headquarters, experiencing this contradiction and show a distinct convergence of city investments in low-carbon infrastructure, significant rises in housing prices and decreases in lower-income and non-white residents. We conclude with a discussion of a range of issues that require more attention by scholars interested in housing justice and/or urban sustainability.

Sandoval, V. (2018). *Green Gentrification Analysis: A Case Study of the East Bay Greenway in Oakland, California*. University of California, Berkeley. Retrieved from https://nature.berkeley.edu/classes/es196/projects/2018final/SandovalV_2018.pdf

Green development provides a new public amenity to under-resourced Oakland communities in the San Francisco Bay Area of California. The lack of green spaces in these low-income and primarily minority communities exist due to the city's history of redlining and misguided urban planning. These new green space developments include parks, tree plantings, and gardens. Yet, the positive intention of providing these communities with improved open space access and healthier environments could also lead to an outcome of displacement and gentrification. Green gentrification consists of profit-driven developments in working class communities and communities of color that have suffered from a history of redlining in their neighborhoods. The process is observed through decreases of low-income, people of color in communities that begin to cater towards higher-income populations that are able to afford higher rent prices. In this context, displacement is the forced movement of current residents from their homes due to extreme changes in rent. To best understand how these communities are displaced through new green developments raising property values and rent prices, I did a case study of the planned East Bay Greenway in the preliminary phase of development. I then interviewed various stakeholders involved in the project's planning and development process from the City of Alameda. This included city government officials, community group representatives, and project designers and managers, whom are also governmental officials. I additionally interviewed academics and researchers who interact with the topic through projects and personal research. Through these interviews, this research aimed to identify issues that may eventually contribute to displacement as this project moves forward with development. The main challenges I identified were that stakeholders lacked an ability to address displacement in the planning process and variousinstitutional, economic, and practical barriers prevented a procedural displacement dimension.The inability to communicate these displacement concerns during green

development is likely a significant contributor to the possibility of green gentrification in the East Bay Area.

Yudelevitch, E. (2019). *Green Gentrification: A Study of Revitalized Parks in Los Angeles.* (Bachelor of Arts), Occidental College, Los Angeles, CA. Retrieved from https://www.oxy.edu/sites/default/files/assets/UEP/Comps/2019/emma_yudelevitch_green_gentrification.pdf

Green gentrification describes the occurrence or exacerbation of gentrification in vulnerable communities where green infrastructure, such as parks, have been implemented or revitalized. The purpose of this study was to test theories of green gentrification in the city of Los Angeles, with particular scrutiny on Proposition O that granted approximately $105 million for the revitalization of community parks (Hansen Dam Park, Echo Park, and South Los Angeles Wetlands Park). This study examined the following research questions: What is the correlation between the revitalization of green space and gentrification? And What are community perceptions of sustainability discourse and how green infrastructure affects their community? A Difference in Differences regression was conducted to supplement the 8 community leader interviews collected on perceptions of green space impacts and sustainable discourse.

Section 6: U.S., Southeast

Hasala, D., Supak, S., & Rivers, L. (2020). Green infrastructure site selection in the Walnut Creek wetland community: A case study from southeast Raleigh, North Carolina. *Landscape and Urban Planning,* 196. https://doi.org/10.1016/j.landurbplan.2020.103743

Recent findings have shown that minority communities are frequently underserved by green infrastructure developments relative to non-minority communities, as local installations of green infrastructure often follow patterns of gentrification. Antipathy from these communities toward existing environmental management efforts present further obstacles related to green infrastructure placement. While hydrologic modeling has been highly utilized in decision support for green infrastructure placement, this technique does not consider ownership, access concerns, or the importance of visibility. Alternatively, participatory geographic information systems (PPGIS) can provide a different perspective from hydrologic models, as they have the potential to forecast community perceptions of green infrastructure utility, rather than hydrological benefit. We use a mixed-methods approach to optimize green infrastructure site-selection that considers hydrologic vulnerabilities in the context of place-based knowledge and historical realities. Residents' perceptions of the locations of nuisance flooding were reported via participatory mapping within a paper-based survey (n = 95) conducted in the communities surrounding Walnut Creek, a historically African-American community in Raleigh, North Carolina. Hotspot analysis was used to identify statistically significant clustering, which was related to a correspondence between participant-indicated nuisance flooding sites and high flow accumulation cells. Comparison of the participatory and hydrologic hotspot analyses show some geospatial overlap for potential green infrastructure placement. We propose that, when undertaken with community input, green infrastructure installation in these downstream areas may help offset localized flooding patterns while facilitating greater trust with stormwater and environmental practitioners.

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

Large-scale, sustainable urban development projects can transform surrounding neighborhoods. Without precautionary policies, environmental amenities produced by these projects, such as parks, trails, walkability, and higher-density development, tend to result in higher land and housing costs. This will make it harder for a low- and moderate-income households to live near the projects, and neighborhoods are likely to become increasingly affluent. The Atlanta Beltline will ultimately connect 45 Atlanta neighborhoods via a 22-mile loop of trails, parks, and eventually a streetcar, all of which follow abandoned railroad tracks. This paper examines the effect of the Beltline on housing values within one half mile. From 2011 to 2015, depending on the segment of the Beltline, values rose between 17.9 percent and 26.6 percent more for homes within a half-mile of the Beltline than elsewhere. The implications for housing affordability and neighborhood change of projects like the Beltline, and associated policy questions, are addressed.

Keenan, J. M., Hill, T., & Gumber, A. (2018). Climate gentrification: from theory to empiricism in Miami-Dade County, Florida. *Environmental Research Letters,* 13(5), 054001. https://doi.org/10.1088/1748-9326/aabb32

This article provides a conceptual model for the pathways by which climate change could operate to impact geographies and property markets whose inferior or superior qualities for supporting the built environment are subject to a descriptive theory known as 'Climate Gentrification.' The article utilizes Miami-Dade County, Florida (MDC) as a case study to explore the market mechanisms that speak to the operations and processes inherent in the theory. This article tests the hypothesis that the rate of price appreciation of single-family properties in MDC is positively related to and correlated with incremental measures of higher elevation (the 'Elevation Hypothesis'). As a reflection of an increase in observed nuisance flooding and relative SLR, the second hypothesis is that the rates of price appreciation in lowest the elevation cohorts have not kept up with the rates of appreciation of higher elevation cohorts since approximately 2000 (the 'Nuisance Hypothesis'). The findings support a validation of both hypotheses and suggest the potential existence of consumer preferences that are based, in part, on perceptions of flood risk and/or observations of flooding. These preferences and perceptions are anticipated to be amplified by climate change in a manner that reinforces the proposition that climate change impacts will affect the marketability and valuation of property with varying degrees of environmental exposure and resilience functionality. Uncovering these empirical relationships is a critical first step for understanding the occurrence and parameters of Climate Gentrification.

Montgomery, M. C., & Chakraborty, J. (2015). Assessing the environmental justice consequences of flood risk: a case study in Miami, Florida. *Environmental Research Letters,* 10(9), 095010. https://doi.org/10.1088/1748-9326/10/9/095010

Recent environmental justice (EJ) research has emphasized the need to analyze social inequities in the distribution of natural hazards such as hurricanes and floods, and examine intra-ethnic diversity in patterns of EJ. This study contributes to the emerging EJ scholarship on exposure to flooding and ethnic heterogeneity by analyzing the racial/ethnic and socioeconomic characteristics of the population residing within coastal and inland flood risk zones in the Miami Metropolitan Statistical Area (MSA), Florida—one of the most ethnically diverse MSAs in the U.S. and one of the most hurricane-prone areas in the world. We examine coastal and inland flood zones separately because of differences in amenities such as water views and beach access. Instead of treating the Hispanic population as a homogenous group, we disaggregate the Hispanic category into relevant country-of-origin subgroups. Inequities in flood risk exposure are statistically analyzed using socio-demographic variables derived from the 2010 U.S. Census and 2007–2011 American Community Survey estimates, and 100-year flood risk zones from the Federal Emergency Management Agency (FEMA). Social vulnerability is represented with two neighborhood deprivation indices called economic insecurity and instability. We also analyze the presence of seasonal/vacation homes and proximity to public beach access sites as water-related amenity variables. Logistic regression modeling is utilized to estimate the odds of neighborhood-level exposure to coastal and inland 100-year flood risks. Results indicate that neighborhoods with greater percentages of non-Hispanic Blacks, Hispanics, and Hispanic subgroups of Colombians and Puerto Ricans are exposed to inland flood risks in areas without water-related amenities, while Mexicans are inequitably exposed to coastal flood risks. Our findings demonstrate the importance of treating coastal and inland flood risks separately while controlling for water-related amenities, and recognizing intra-

ethnic diversity within the Hispanic category to obtain a more comprehensive assessment of the social distribution of flood risks.

Palardy, N. P., Boley, B. B., & Gaither, C. J. (2018). Resident support for urban greenways across diverse neighborhoods: Comparing two Atlanta BeltLine segments. *Landscape and Urban Planning,* 180, 223-233. https://doi.org/10.1016/j.landurbplan.2018.08.021

Urban greenways are increasingly seen as sustainable infrastructure initiatives designed to catalyze economic development, urban renewal and healthy cities. However, there has been little consideration for how the racial and socioeconomic composition of neighborhoods influence resident support for greenways. This is important due to documented divergent racial preferences for recreation and the potential paradoxical impact greenways can have on gentrification. Hence, this study assessed resident perceptions of the Atlanta BeltLine in two neighborhoods differing in their racial and socioeconomic composition. Using a theoretical framework grounded in social exchange theory and Weber's theory of formal and substantive rationality, results from 418 surveys (600 distributed) revealed that in an affluent, majority white neighborhood, the BeltLine was supported more by residents, with residents indicating greater use of the trail and higher levels of psychological empowerment than residents of a less affluent, majority African American neighborhood. Despite these differences, support for the BeltLine was found to be a function of the same factors of frequency of use, perceived economic benefits and perceived psychological empowerment across both neighborhoods. Results suggest that residents generally form their opinions of urban greenways in a similar fashion even though the model explained more variance in the majority white neighborhood (68% vs 57%), highlighting the need for future research to investigate other factors that may influence why African Americans support or oppose urban greenways in their neighborhoods. Implications are discussed for urban planners, who have the difficult task of developing urban greenways within heterogeneous cities.

Section 7: Gulf of Mexico

Barra, M. P. (2021). Good Sediment: Race and Restoration in Coastal Louisiana. *Annals of the American Association of Geographers,* 111(1), 266-282. https://doi.org/10.1080/24694452.2020.1766411

Building on a small, yet growing body of scholarship focused on the political ecology of race and critical race studies of science and technology, this article follows the ways sediment, science, and race intersect on the grounds of environmental restoration in coastal Louisiana. Mobilizing ethnographic field work and historical research conducted with African-American communities and coastal scientists, I empirically expand upon geographer Kathryn Yusoff's (2018) notion of the "geosocial registers" of the Anthropocene through an examination of the entwined histories of coastal engineering and racial inequality that situate contemporary debates about large scale coastal restoration projects along Louisiana's disappearing coastline. In dialogue with critical work on the relationship between racism, science, and the constitution of the Anthropocene, I argue that coastal restoration is a geophysical and social process upon which racial inequality is forged and contested. The article concludes by considering how environmental restoration can participate in creating alternative forms of social and environmental repair by aligning the goals of coastal science with those of racial justice for communities of color living in changing coastal landscapes.

Browne, S. (2018). *The Causes and Effects of Environmental Gentrification: An Examination of the Impacts of the Trinity River Balanced Vision Plan on West Dallas, TX.* Georgia Institute of Technology, School of City and Regional Planning. Retrieved from https://smartech.gatech.edu/bitstream/handle/1853/59967/samantha_browne_the_causes_and_effects_of_environmental_gentrification.pdf?sequence=1&isAllowed=y

This paper discusses the concept of environmental gentrification in the context of the Trinity River Balanced Vision Plan in the City of Dallas, which plans to create a sustainable urban park by improving flood control and enhancing the Dallas floodway with recreational amenities and transportation access. A Geographic Information Systems (GIS) analysis of the demographic and property value changes in West Dallas, the area that borders the Dallas floodway, was conducted to detect any signs of gentrification since the adoption of the city's visionary plan for the Trinity River corridor. Although there were some changes detected, there was no sign of any displacement occurring in these neighborhoods yet. The inclusion of a comparative case study of the Los Angeles River Revitalization and Atlanta BeltLine projects provides an illustration of how similar projects have loss affordable housing due to gentrification, as well as the mitigation measures that were taken to address this issue. The result is a review of possible mitigation and prevention strategies for preserving affordable housing during the implementation of sustainability initiatives, followed by the recommended strategies for West Dallas before the execution of the Trinity River Balanced Vision Plan.

Carter, L. R. (2019). *Decoding the Jolly Green Giant: an analysis of green gentrification in the contex tof rails-to-trails policy.* (Doctor of Philosophy in Urban Planning and Public Policy Doctoral), University of Texas Arlington, Arlington, TX. Retrieved from https://rc.library.uta.edu/uta-ir/handle/10106/28098?show=full

Recent urban public policies and planning initiatives have resulted in increased efforts to improve stewardship of our limited natural resources (sustainability), increase defenses against natural stressors (resiliency), while also seeking to prevent and remedy unequal environmental burdens placed on minority, elderly, and lower-income communities (environmental justice). This research seeks first to evaluate how the intersection of these policies combine to create the urban phenomenon of Green Gentrification, where the intended effect of these actions is to improve environmental characteristics and infrastructure, but they often result in the displacement of original citizens and culture the improvement sought to help (Gould & Lewis, 2017, p. 13; Wolch, Byrne, & Newell, 2014, pp. 234-235). The Institutional Analysis and Development (IAD) Framework will be used to provide an explanation of the context within which Green Gentrification occurs (Polski & Ostrom, 1999, p. 5; McGinnis, 2011, p. 169: Schlager & Cox, 2018, p. 215). Subsequently, a quantitative analysis will be employed to analyze changes to the sociodemographic makeup of neighborhoods adjacent to the linear park before and after construction using Linear Hedonic Regression. The case study for this research will be The Katy Trail in Dallas, TX, a Rails-To-Trails project (16 U.S.C. § 1247(d)). Finally, possible solutions of practical planning applications and policy strategies will be presented to maximize environmental benefits, increase community ownership, and minimize displacement to move the field closer to making green infrastructure a reality for all communities.

Garcia-Lamarca, M., Anguelovski, I., Cole, H., Connolly, J. J. T., Arguelles, L., Baro, F., . . . Shokry, G. (2021). Urban green boosterism and city affordability: For whom is the 'branded' green city? *Urban Studies,* 58(1), 90-112. https://doi.org/10.1177/0042098019885330

Increasingly, greening in cities across the Global North is enmeshed in strategies for attracting capital investment, raising the question: for whom is the future green city? Through exploring the relationship between cities' green boosterist rhetoric, affordability and social equity considerations within greening programmes, this paper examines the extent to which, and why, the degree of green branding - that is, urban green boosterism - predicts the variation in city affordability. We present the results of a mixed methods, macroscale analysis of the greening trajectories of 99 cities in Western Europe, the USA and Canada. Our regression analysis of green rhetoric shows a trend toward higher cost of living among cities with the longest duration and highest intensity green rhetoric. We then use qualitative findings from Nantes, France, and Austin, USA, as two cases to unpack why green boosterism correlates with lower affordability. Key factors determining the relation between urban greening and affordability include the extent of active municipal intervention, redistributional considerations and the historic importance of inclusion and equity in urban development. We conclude by considering what our results mean for the urban greening agenda in the context of an ongoing green growth imperative going forward.

Houston, D., & Zuniga, M. E. (2019). Put a park on it: How freeway caps are reconnecting and greening divided cities. *Cities,* 85, 98-109. https://doi.org/10.1016/j.cities.2018.08.007

The international green infrastructure literature has examined rails-to-trails and freeway-to-boulevard conversions, but these strategies can be impractical or politically unfeasible. An understudied movement among United States cities has demonstrated a strategy for greening freeways that remain in service: freeway cap parks, or decks with parks built in the air space directly above below-grade freeway sections that can help reintegrate communities, conceal traffic, reduce air pollution, and provide green space. We provide the first assessment of the design, function, and placement of freeway cap parks and assess the emerging sustainability discourse of cap park planning. We examine 18 completed and 9 proposed cap parks in 24 U.S. cities to identify four cap park development models that can be adapted worldwide to green below-grade freeway segments and reconnect communities. Given historic disparities in freeway placement, we examined the distribution of cap parks and found they are located in areas that could help address disparities in park access in freeways corridors. Our detailed case studies stress the struggle within the cap park sustainability discourse to balance economic, environmental, and equity concerns. Dallas' Klyde Warren Park is an economic success story, but illustrates how developers use cap parks to sideline equity concerns. Denver's proposed 1-70 cap park illustrates strategies to mitigate environmental justice impacts of freeway expansion projects, but equity concerns remain given continuing impacts of the expanded freeway system. Cap parks should be embraced as a vital component of green infrastructure that reconnects and greens cities divided by freeway construction, but planners should take strong steps to address housing affordability and gentrification concerns for adjacent communities.

Loughran, K., & Elliott, J. R. (2019). Residential buyouts as environmental mobility: examining where homeowners move to illuminate social inequities in climate adaptation. *Population and Environment,* 41(1), 52-70. https://doi.org/10.1007/s11111-019-00324-7

This study examines where residents move after accepting federally funded buyouts of their flood-prone homes. We use the concept of "environmental mobility" — defined as local, voluntary moves undertaken in the face of imminent environmental risk — to distinguish this type of climate adaptation from longer-distance and less-voluntary types of movement. We then use the case of Houston, Texas — the site of more than 3000 such buyouts between 2000 and 2017 — to build a unique dataset that enables, for the first time, address-level analysis of such environmental mobility. Results affirm that most people who move from residences of publicly identified environmental risk relocate to destinations nearby. Results also indicate that this environmental mobility reflects and thus seems to depend on racialization processes of neighborhood attainment, thereby challenging a purely technocratic framing of current buyout policies and illuminating the racialized nature of environmental mobility more generally.

Nost, E. (2019). Climate services for whom? The political economics of contextualizing climate data in Louisiana's coastal Master Plan. *Climatic Change,* 157(1), 27-42. https://doi.org/10.1007/s10584-019-02383-z

Adaptation planning includes contextualizing global and regional climate data within specific decision-making processes. As such, planners are increasingly interested in climate services. Climate services

involve the expert production of forecasts, scenarios, economic analyses, and other data products to help users meaningfully address local changes and variabilities. For instance, in the US state of Louisiana, modelers tailor 50-year storm, precipitation, and sea level rise predictions to help planners select adaptive ecological restoration projects. Modelers do so by downscaling the data, combining it with other social and biophysical information, and framing results in terms of stakeholder interests. In this paper, I question what it means to develop adaptation information that is geared towards specific users and stakeholders. Given the growing recognition that adaptation planning can prove maladaptive, I ask, when do climate services actually exacerbate existing vulnerabilities? To answer, I draw on three cases from Louisiana's coastal Master Plan and highlight political economic factors informing climate services: influential stakeholders, funding dynamics, the framing of planning decisions, and differential harms and benefits. I argue that when climate data is made relevant to existing interests, budgets, and plans, it can reproduce vulnerabilities and foreclose transformative adaptation. However, marginalized stakeholders can also pressure experts to contextualize data in ways that mitigate vulnerabilities. I conclude that climate services research and practice should expand user-centered approaches by asking climate services for whom and by assessing the winners and losers from climate variability, change, and adaptation actions themselves.

Section 8: International

Anguelovski, I., Connolly, J. J. T., Masip, L., & Pearsall, H. (2018). Assessing green gentrification in historically disenfranchised neighborhoods: a longitudinal and spatial analysis of Barcelona. *Urban Geography,* 39(3), 458-491. https://doi.org/10.1080/02723638.2017.1349987

To date, little is known about the extent to which the creation of municipal green spaces over an entire city addresses social or racial inequalities in the distribution of environmental amenities - or whether such an agenda creates contributes to green gentrification. In this study, we evaluate the effects of creating 18 green spaces in socially vulnerable neighborhoods of Barcelona during the 1990s and early 2000s. We examined the evolution over time of six socio-demographic gentrification indicators in the areas close to green spaces in comparison with the entire districts. Our results indicate that new parks in the old town and formerly industrialized neighborhoods seem to have experienced green gentrification. In contrast, most economically depressed areas and working-class neighborhoods with less desirable housing stock and more isolated from the city center gained vulnerable residents as they became greener, indicating a possible redistribution and greater concentration of vulnerable residents through the city.

Anguelovski, I., Irazabal-Zurita, C., & Connolly, J. J. T. (2019). Grabbed Urban Landscapes: Socio-spatial Tensions in Green Infrastructure Planning in Medellin. *International Journal of Urban and Regional Research,* 43(1), 133-156. https://doi.org/10.1111/1468-2427.12725

Cities confronted with unsustainable development and climatic changes are increasingly turning to green infrastructure as an approach for growth and climate risk management. In this context, recent scholarly attention has been paid to gentrification, real-estate speculation and resident displacement in the context of sustainability and green planning in the global North. Yet we know little about the environmental-justice implications of green infrastructure planning in the context of self-built settlements of the global South. To what extent do green infrastructure interventions produce or exacerbate urban socio-spatial inequities in self-built settlements? Through the analysis of a greenbelt project, an emblematic case of green infrastructure planning in Medellín, we argue that, as the Municipality of Medellín is containing and beautifying low-income neighborhoods through grabbing part of their territories and turning them into green landscapes of privilege and pleasure, communities are becoming dispossessed of their greatest assets—location, land and social capital. In the process, community land is transformed into a new form of aesthetically controlled and ordered nature for the middle and upper classes and for tourists. By contrast, communities' planning alternatives reveal how green planning can better address growth and climate risks in tandem with equitable community development.

Bouzarovski, S., Frankowski, J., & Tirado Herrero, S. (2018). Low-Carbon Gentrification: When Climate Change Encounters Residential Displacement. *International Journal of Urban and Regional Research,* 42(5), 845-863. https://doi.org/10.1111/1468-2427.12634

This article focuses on the emergence of "low-carbon" gentrification as a distinct urban phenomenon, a process that we see as the outcome of efforts to change the social and spatial composition of urban districts under the pretext of responding to climate change and energy efficiency imperatives. The article develops a conceptual framework for scrutinizing low-carbon gentrification, predicated upon insights from literatures on ecological gentrification and displacement. It documents the existence of an "eco-social paradox" associated with new patterns of socio-spatial segregation and energy efficiency retrofits. We interrogate the discursive and policy frameworks, socio-spatial implications and political contestations of low-carbon gentrification. Evidence is drawn from case study research in an inner-city district of the Polish city of Gdansk, where such processes have been unfolding since 2006 due to the implementation of a targeted urban regeneration programme. This investigation is positioned within a wider analysis of secondary written sources about similar developments in other geographical contexts across Europe and North America, where anecdotal evidence suggests that low-carbon gentrification may be widespread and common.

Chen, Y., Xu, Z., Byrne, J., Xu, T., Wang, S., & Wu, J. (2021). Can smaller parks limit green gentrification? Insights from Hangzhou, China. *Urban Forestry & Urban Greening,* 59, 127009. https://doi.org/10.1016/j.ufug.2021.127009

Urban green spaces can improve residents' health and well-being. However, international research shows that urban greening can produce gentrification effects. A dilemma for planners is determining whether the scale of greening or the characteristics of green spaces is driving gentrification. In this article, Canonical correlation analysis (CCA) and field investigations are used to assess the potential gentrification effects of a new public green space in the urban central area of Hangzhou, China. Hangzhou is one of China's 'garden cities', but rapid urbanization and climate change are increasing urban heat-island impacts, requiring large-scale urban greening. The two-stage CCA not only confirms the green gentrification phenomenon within the study area but suggests that large green spaces appear to foster gentrification due to their functional benefits, favorable policy support, elaborate embellishments, and strict management and maintenance regimes. Appropriate policy responses may include using a 'just green enough' approach: whereby distributed smaller green spaces, with less stringent maintenance could resolve the green gentrification paradox.

Chu, E., Anguelovski, I., & Carmin, J. (2016). Inclusive approaches to urban climate adaptation planning and implementation in the Global South. *Climate Policy,* 16(3), 372-392. https://doi.org/10.1080/14693062.2015.1019822

As cities increasingly engage in climate adaptation planning, many are seeking to promote public participation and facilitate the engagement of different civil society actors. Still, the variations that exist among participatory approaches and the merits and tradeoffs associated with each are not well understood. This article examines the experiences of Quito (Ecuador) and Surat (India) to assess how civil society actors contribute to adaptation planning and implementation. The results showcase two distinct approaches to public engagement. The first emphasizes participation of experts, affected

communities, and a wide array of citizens to sustain broadly inclusive programmes that incorporate local needs and concerns into adaptation processes and outcomes. The second approach focuses on building targeted partnerships between key government, private, and civil society actors to institutionalize robust decision-making structures, enhance abilities to raise funds, and increase means to directly engage with local community and international actors. A critical analysis of these approaches suggests more inclusive planning processes correspond to higher climate equity and justice outcomes in the short term, but the results also indicate that an emphasis on building dedicated multi-sector governance institutions may enhance long-term programme stability, while ensuring that diverse civil society actors have an ongoing voice in climate adaptation planning and implementation. Policy relevance Many local governments in the Global South experience severe capacity and resource constraints. Cities are often required to devolve large-scale planning and decision-making responsibilities, such as those critical to climate adaptation, to different civil society actors. As a result, there needs to be more rigorous assessments of how civil society participation contributes to the adaptation policy and planning process and what local social, political, and economic factors dictate the way cities select different approaches to public engagement. Also, since social equity and justice are key indicators for determining the effectiveness and sustainability of adaptation interventions, urban adaptation plans and policies must also be designed according to local institutional strengths and civic capacities in order to account for the needs of the poor and most vulnerable. Inclusivity, therefore, is critical for ensuring equitable planning processes and just adaptation outcomes.

Chu, E., Anguelovski, I., & Roberts, D. (2017). Climate adaptation as strategic urbanism: assessing opportunities and uncertainties for equity and inclusive development in cities. *Cities,* 60, 378-387. https://doi.org/10.1016/j.cities.2016.10.016

An increasing number of cities are recognising the impacts of climate change on their development pathways. In this paper, we assess strategic climate adaptation actions in the cities of Durban (South Africa), Indore (India), and Medellin (Colombia), and examine different approaches to integrating emerging adaptation priorities into urban, plans, programmes, or governance arrangements. We highlight sources of planning tension - particularly between aspects of the planning process and larger urban political economic forces - that reshape how subsequent adaptation interventions are framed and implemented. We find that when advanced with a focus on alignment with development, strategic actions that transcend individual actor or sectoral interests have a better chance at taking root. However, we note that a procedural focus in strategic urbanism must also be accompanied by an integrated assessment of planning outcomes in order to ensure more equitable and inclusive development in cities. Although strategic approaches may facilitate coherent policy framings, targeted actor coalitions, and opportunities for collaborative action, such approaches are often unable to adequately capture the difficult policy trade-offs or contestations that are required to further overall adaptive capacities of cities. In other words, strategic adaptation actions must be considered in relation to the powerful, and often entrenched, political economic interests that constrain urban equity at-large.

Cole, H., Triguero, M., Connolly, J., & Anguelovski, I. (2017). A Longitudinal and Spatial Analysis Assessing Green Gentrification in Historically Disenfranchised Neighborhoods of Barcelona: Implications for Health Equity. *Journal of Transport & Health,* 5, S44-S44. https://doi.org/10.1016/j.jth.2017.05.333

Municipal green space is generally regarded as beneficial for the health and well-being of urban residents due to reductions in pollution, increased social interaction, and encouragement of healthful behaviors. However, greening may also lead to "green gentrification", causing economic stressors and displacement among vulnerable populations. Little is known about how green gentrification processes may modify the relationship between green spaces and health outcomes. We evaluate the effects of new green spaces in socially vulnerable neighborhoods of Barcelona between 1990 and the early 2000s on the socioeconomic composition of areas surrounding these spaces and apply our findings to the development of a testable conceptual model for understanding the implications of our results for health equity.

Cooke, B. (2020). The politics of urban greening: an introduction. *Australian Geographer,* 51(2), 137-153. https://doi.org/10.1080/00049182.2020.1781323

Global enthusiasm for nature in cities is at high point. Australia is no exception, where there is a great deal of policy momentum and research interest in urban greening. The challenges presented by increasing urban heat associated with climate change, greater awareness of the potential social, physical and psychological benefits of exposure to ecologies for people, and recognition of cities as vital habitats for more-than-humans are central tenants of urban greening enthusiasm. Yet, there is a need for a more critical lens on urban greening in Australia. One that interrogates the purported normative, apolitical and instrumental benefits of greening, to position greening within a trajectory of the power relations, settler-colonialism, socio-ecological processes and capital flows that constitute the urban. This editorial introducing the special issue on urban greening politics explores how different conceptions of urban natures – green space, urban forestry and green infrastructure – have been put to work, before outlining the potential of 'urban greening' as the terminology for a more politically sensitive and process-orientated framing. The editorial concludes with a summary of the contributions to the special issue.

Dick, J., Carruthers-Jones, J., Carver, S., Dobel, A. J., & Miller, J. D. (2020). How are nature-based solutions contributing to priority societal challenges surrounding human well-being in the United Kingdom: a systematic map. *Environmental Evidence,* 9(1). https://doi.org/10.1186/s13750-020-00208-6

The concept of nature-based solutions (NBS) has evolved as an umbrella concept to describe approaches to learning from and using nature to create sustainable socio-ecological systems. Furthermore, NBS often address multiple societal challenges that humans are facing in the medium to long-term and as such can enhance human well-being (HWB). This study was commissioned to fulfil the need for a targeted systematic evidence map on the linkage between NBS and HWB to support focused research going forward that addresses the key knowledge needs of policy makers in the UK and beyond.

Fisher, D., Blackstock, K., & Irvine, K. (2021). "It's on the 'nice to have' pile": Potential principles to improve the implementation of socially inclusive Green Infrastructure. *Ambio,* 50(8), 1574-1586. https://doi.org/10.1007/s13280-020-01372-2

Green Infrastructure (GI) research tends to focus on the need for GI to enhance ecological processes, its potential to provide health and economic benefits, and on the barriers preventing its uptake. Yet there has been inadequate focus on the social aspects of GI. In the United Kingdom (UK) the need for GI is well established, such that policymakers and planners are now turning to the question of how GI should be implemented. Drawing on a mixed method research approach centring on practitioner experience, this paper identifies potential social principles that underpin GI and questions the extent to which these are being implemented in the UK. Results highlight the hitherto unexplored complexities of GI maintenance, the effects of austerity politics, and the role of local-level power dynamics on the implementation of GI. Findings have implications for international literature on GI as well as nature-based solutions more broadly.

Hughes, S. (2013). Justice in Urban Climate Change Adaptation: Criteria and Application to Delhi. *Ecology and Society,* 18(4). https://doi.org/10.5751/ES-05929-180448

Cities around the world are increasingly developing plans to adapt to the consequences of climate change. These plans will have important consequences for urban populations because they are likely to reshape and reconfigure urban infrastructures, services, and decision making processes. It is critical that these adaptation plans are developed in a way that is just. Criteria was developed that can be used to assess justice in adaptation so that the processes, priorities, and impacts address the needs of the most vulnerable urban populations. Further, mechanisms are outlined that have been proposed as responsible for producing urban injustice. The justice criteria are applied to the case of adaptation planning in Delhi and the extent to which poor and informal populations are included and affected by this planning. The analysis shows that adaptation planning in Delhi does not meet the justice criteria in part because of a lack of capacity and the political economy of poverty in the city. The criteria for justice and mechanisms of injustice offer an important step toward developing a greater understanding of not only whether city-level adaptation planning is just, but also why it is or is not.

Kotsila, P., Horschelmann, K., Anguelovski, I., Sekulova, F., & Lazova, Y. (2020). Clashing temporalities of care and support as key determinants of transformatory and justice potentials in urban gardens. *Cities,* 106. https://doi.org/10.1016/j.cities.2020.102865

Urban gardens, consolidating spaces as new urban commons, are faced with the contradiction and challenge of being embedded in neoliberal landscapes of urban governance. While their transformative and justice potential has often, and rightly, been celebrated -offering new pathways towards food security and sovereignty; serving social empowerment and political engagement; making cities greener, healthier and more participatory- the mechanisms that can limit such potential have not been explored as much. Focusing on community gardens that have received some municipal support, we apply a feminist political ecology lens to examine the so far under theorized role of care and time in urban gardens, and the way these aspects are conditioning the sustenance and just distribution of benefits that we know can emerge from urban gardens. Our qualitative empirical analysis of eight municipally supported gardens in Athens, Barcelona, Dublin and Leipzig examines the conflicting time frames and

priorities that gardening projects often have to navigate, revealing how the function of urban gardens is constrained by two types of 'clashing temporalities': (i) the invisibility of gardening needs and of their social benefits in a context of limited structural support, and (ii) the undermining of care materialities in light of short municipal timeframes and fast urban growth.

Oscilowicz, E., Honey-Roses, J., Anguelovski, I., Triguero-Mas, M., & Cole, H. (2020). Young families and children in gentrifying neighbourhoods: how gentrification reshapes use and perception of green play spaces. *Local Environment,* 25(10), 765-786. https://doi.org/10.1080/13549839.2020.1835849

It has been well established that gentrification can undermine access to green amenities for socially vulnerable residents through socio-cultural or physical displacement from working-class and minority neighbourhoods. However, in the growing literature on environmental gentrification, little attention has been given to the impacts of gentrification on young families and children, especially in neighbourhood green spaces where children socialise and play. Using observational methods, surveys and interviews, we assessed perceptions and use of green play spaces in two neighbourhoods of Barcelona at different stages of gentrification. One neighbourhood suffers from advanced residential, commercial and tourism-led gentrification (La Ribera) while the other (Poblenou) experiences more recent gentrification. We find that advanced and more complex processes of gentrification are more likely to be associated with dissatisfaction of public space and less use by children and families. We also observe lower levels of trust, increased delinquency and a greater sense of insecurity. In contrast, early-stage gentrification is linked to new place relations and attachment around green play spaces that are highly used by children and their families. Yet, our research also shows that neighbourhood gains in terms of increased access and use of green play spaces might be short-lived as residents there point to fear of displacement. Our findings thus reveal how gentrification can operate to offer short-term green benefits but possible long-term losses for socially vulnerable families in gentrifying neighbourhoods.

Porter, L., Hurst, J., & Grandinetti, T. (2020). The politics of greening unceded lands in the settler city. *Australian Geographer,* 51(2), 221-238. https://doi.org/10.1080/00049182.2020.1740388

Urban greening is a buzz term in urban policy and research settings in Australia and elsewhere. In a context of settler colonial urbanism, like Australia, a first fact becomes clear: urban greening is always being practiced on unceded Indigenous lands. Recognising this requires some honest reckoning with how this latest urban policy response perpetuates dispossessory settler-colonial structures. In this paper, we listen to the place-based ontologies of the peoples and lands from where we write to inform understanding the city as an always already Indigenous place – a sovereign Aboriginal City. In so doing, the paper tries to practice a way of creating more truthful and response-able urban knowledge practices. We analyse three distinct areas of scholarly research that are present in the contemporary literature: urban greening and green infrastructure; urban political ecology; and more-than-human cities. When placed in relationship of learning with the sovereign Aboriginal City, our analysis finds that these scholarly domains of urban greening work to re-organise colonial power relations. The paper considers what work the practice and scholarship of 'urban greening' might need to do in order to become response-able and learn to learn with Indigenous sovereignties and ontologies.

Sharifi, F., Nygaard, A., Stone, W. M., & Levin, I. (2021). Green gentrification or gentrified greening: Metropolitan Melbourne. *Land Use Policy,* 108, 105577. https://doi.org/10.1016/j.landusepol.2021.105577

Urban greening is a tool of urban planning to mediate problems related to urban living and betterment of residents' quality of life. Given the inequitable distribution of this urban public health infrastructure, increasing green area within disadvantaged neighborhoods is one of the contemporary initiatives in urban planning. However, some argue that urban greening can have mixed consequences. Specifically, urban greening efforts may lead to "green gentrification", and as a result, can unintentionally displace lower income residents and increase inequities. Despite this, few studies have investigated the relationship between gentrification and urban greening. We aim to empirically answer the questions, "Does urban greening lead to gentrification?" or "Does gentrification lead to urban greening?". We draw on green space data from Landsat and census socioeconomic data over 1996–2016 to analyze the historical data of urban greenness changes and area profile transitions. The result does not indicate any statistically significant evidence that urban greening catalyzes gentrification, but does show that gentrification actuates urban greening. The policy implications are discussed.

Silva, C. D., Viegas, I., Panagopoulos, T., & Bell, S. (2018). Environmental Justice in Accessibility to Green Infrastructure in Two European Cities. *Land,* 7(4). https://doi.org/10.3390/land7040134

Although it is well-established that urban green infrastructure is essential to improve the population's wellbeing, in many developed countries, the availability of green spaces is limited or its distribution around the city is uneven. Some minority groups may have less access or are deprived of access to green spaces when compared with the rest of the population. The availability of public green spaces may also be directly related to the geographical location of the city within Europe. In addition, current planning for urban regeneration and the creation of new high-quality recreational public green spaces sometimes results in projects that reinforce the paradox of green gentrification. The aim of this study was to explore the concept of environmental justice in the distribution of the public green spaces in two contrasting cities, Tartu, Estonia; and Faro, Portugal. Quantitative indicators of public green space were calculated in districts in each city. The accessibility of those spaces was measured using the "walkability" distance and grid methods. The results revealed that there was more availability and accessibility to public green spaces in Tartu than in Faro. However, inequalities were observed in Soviet-era housing block districts in Tartu, where most of the Russian minority live, while Roma communities in Faro were located in districts without access to public green space. The availability of public green spaces varied from 1.22 to 31.44 m2/inhabitant in the districts of Faro, and 1.04 to 164.07 m2/inhabitant in the districts of Tartu. In both cities, 45% of the inhabitants had accessible public green spaces within 500 m of their residence. The development of targeted new green infrastructure could increase access to 88% of the population for the city of Faro and 86% for Tartu, delivering environmental justice without provoking green gentrification. The outcome of this study provides advice to urban planners on how to balance green space distribution within city neighbourhoods.

Sultana, R., Birtchnell, T., & Gill, N. (2020). Urban greening and mobility justice in Dhaka's informal settlements. *Mobilities,* 15(2), 273-289. https://doi.org/10.1080/17450101.2020.1713567

Urban greening in Dhaka, Bangladesh is fraught with injustice for slum dwellers. Access to the commons for the enactment of gardening, farming and foraging by the urban poor, many recent internal migrants from rural areas, is contested by wealthier citizens, developers and political elites. Through qualitative research with households within the informal settlement of Korail in Dhaka's urban core, and a range of stakeholders in governmental and non-governmental organizations, this study critiques competing policy visions that involve urban greening and urban green infrastructure. Repurposing the conceptual lense of 'mobility justice' to analyse environmental and ecological issues in the global South, the findings highlight the importance of mobility concerns to just futures for urban planning.

Tozer, L., Hoerschelmann, K., Anguelovski, I., Bulkeley, H., & Lazova, Y. (2020). Whose city? Whose nature? Towards inclusive nature-based solution governance. *Cities,* 107. https://doi.org/10.1016/j.cities.2020.102892

Nature-based solutions have recently been embraced as one route towards simultaneously addressing urban environmental and social problems, but an emerging agenda has sought to ask whether and how the 'greening' of cities may actually reinforce inequalities or lead to new forms of social exclusion. Using comparative case-study analysis, this paper examines the extent to which nature-driven stewardship initiatives recognize and redress inequalities. We compare two urban contexts that have undergone significant societal transformations over the last two to three decades: Sofia and Cape Town. The comparison shows how nature-driven stewardship initiatives differentially address deeper roots of environmental, social and racial privilege shaped significantly by post-socialist and post-apartheid transition contexts. Instead of assuming a homogenous ideal of urban nature and focusing on questions of the distribution of urban nature and its access, this paper finds it is important to consider the kinds of social relations that are required to both shape decision-making processes and generate meaningful and diverse values and ways of relating to nature in the city. Furthermore, it finds that inclusive nature-based solution governance recognizes and redresses both inequalities in access and inequalities that perpetuate dominant views about what nature is and for whom nature is produced and maintained.