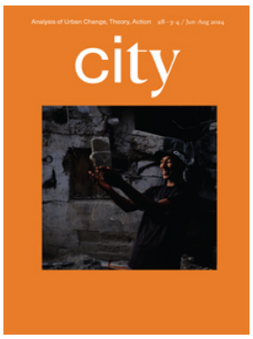

City

Analysis of Urban Change, Theory, Action

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/ccit20

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To cite this article: Julia Wagner, Mark Kear, Sarah Knuth, Sahar Zavareh Hofmann & Zac J. Taylor (05 Jul 2024): Grappling with real property supremacy in US urban climate finance, City, DOI: 10.1080/13604813.2024.2367922

To link to this article: https://doi.org/10.1080/13604813.2024.2367922

Published online: 05 Jul 2024.

Routledge
Taylor & Francis Group

Grappling with real property supremacy in US urban climate finance

Julia Wagner, Mark Kear, Sarah Knuth, Sahar Zavareh Hofmann and Zac J. Taylor

In US cities, drives to secure property value against climate risks have become a preoccupation for mainstream climate finance. This real property bias sidelines non-owners and inhabitants of historically marginalized housing types, limiting their capacity to prepare for and recover from climate change events. In this intervention, we survey major pathways of existing climate finance, before turning to emerging trends for residential 'climate-proofing,' retrofitting efforts that bring climate finance 'home' to the building level. Building on the concept of 'real property supremacy,' we demonstrate how resourcing climate response is limited by the privileging of real property in the structure and distribution of low-carbon financial tools and incentives. We argue that this privileging reproduces hierarchies of protection for some, while exacerbating existing social inequalities, exclusions, and predations for others—ultimately, yielding greater control over climate futures to those with asymmetrical power over real property. This structurally unequal treatment risks locking-in extant social hierarchies embedded in US real property relationships instead of seizing opportunities to transform them via the historic urban investments required for climate change.

Keywords **real property supremacy, climate finance, property, devaluation, climate risk, real estate**
URL https://doi.org/10.1080/13604813.2024.2367922

Introduction

In February 2023, a widely publicized article in *Nature Climate Change* circulated an alarming calculation. The authors estimated the United States (US) housing market to be overvalued by $121 to $237 billion due to unpriced flood risk under climate change, what they termed a 'flood risk housing bubble' (Gourevitch et al. 2023, 251). Soon after, two of the US's largest home insurers, State Farm and Allstate, declared that they would stop writing new policies in California, citing in part 'rapidly growing catastrophe exposure' from climate change-linked hazards—a serious concern for future home values in the state. Similar strains related to intensified and varied disaster risk face home insurance markets in Florida and Louisiana, and likely other states soon (Flavelle, Cowan, and Penn 2023). Meanwhile, major US housing markets are already being reshaped by decarbonization regulations like tightening energy efficiency standards as well as bans on gas furnaces and water heaters in new homes (National BPS Coalition 2023)—moves carrying devaluation risks for existing housing. These variegated climate-related threats to housing values are an influential way in which US climate risk is being understood by many.

As we explore in this intervention, drives to secure housing property value—and particularly, single-family homeowners—against devaluation due to climate risk have become an important preoccupation for mainstream climate finance in the US. This preoccupation with the preservation of exchange and asset values, we contend, deeply influences the climate change-targeted investment and financing approaches pursued by major public and private institutions—what we identify as a recurrent and profound real property bias in these interventions. Property devaluation risks are undoubtedly important concerns for climate justice as well, especially to frontline low- and moderate-income homeowners who are already cost-burdened. However, mainstream climate finance too often sidelines major shares of US housing when focusing on asset devaluation as such. Typically missing from these narratives and approaches are large swathes of residents in the US housing market, including those who do not own their homes, or who own housing types other than conventional single-family homes. These 'other' housing tenures make up more than 40% of all US housing today[1], with significantly higher rates in some urban areas. They include renters, those living in public housing, the unhoused, and 'half-way' homeowners (Sullivan 2018) living in manufactured homes[2]. It is no coincidence that these are central housing tenures for lower-income and minority US Americans—all the more so amid the United States' deepening income inequality and housing affordability crisis. Decentering these forms of real property biases in US climate finance, imaginatively and materially, is thus essential to advancing more just urban climate responses.

US climate finance takes increasingly diverse forms, from insurance market instruments to built environment decarbonization incentives to new financing mechanisms for large-scale disaster risk reduction infrastructures. In surveying some major pathways of mainstream urban climate finance today, we note various ways in which they center real property values as a chief concern. By way of example, we pay particular attention to the emerging trend towards residential 'climate-proofing'. Climate-proofing interventions seek to

mitigate climate risks by retrofitting existing buildings, assembling climate risk responses from the individual parcel up. In the jargon of the financial sector, such interventions typically address either physical risks (e.g. via disaster mitigation, like anti-flood measures) or transition risks (e.g. via decarbonization, like solar power installations). Climate-proofing drives in US cities are fueling a trend for public and private climate finance to 'come home' in instruments that seek to mobilize capital for climate response at the scale of the property parcel. They typically employ forms of value capture finance[3] that shore up the value of real property parcels against potential biophysical threats and economic devaluation. To explore how real property bias is structuring and dividing these home-focused interventions, we contrast how conventional single-family homeowners, mobile/manufactured home owners, and renters in multi-family housing encounter climate-proofing and related financing mechanisms—or are structurally barred from, disadvantaged, or exploited within them. Such bias stands to lock-in extant social hierarchies within US real property relations, instead of seizing opportunities to re-orient them through the historic investments required to transform and adapt the country's built environment to climate change.

In interpreting real property bias as a structural logic in US finance—and now climate finance—we draw centrally on the concept of 'real property supremacy.' Kear, Meyer, and Wilder (2023a) coined this term to theorize how mobile home owners have been marginalized within US housing finance and its legal-regulatory support apparatuses, which structurally favor conventional single-family homes and homeowners. As we discuss, the concept's broader provocation emphasizes that not all property tenures and housing occupants are equal in US legal frameworks or in their treatment by dominant state-financial institutions: owners of real property are more valued, receiving greater protection in law, policy, and custom. This makes access to financial markets easier and less costly for certain households, and more scarce, expensive, or even predatory for others. Such property-financial hierarchies are rooted in longer-term US political efforts to promote mass homeownership, themselves steeped in white supremacist projects from settler colonial land grabbing to racial redlining and racially-targeted subprime lending. These situated histories of real property supremacy underline the potential injustice of this structural bias in climate finance—an understanding important to imagining more liberatory climate responses and their resourcing.

We argue that mainstream climate finance is biased by this real property supremacy, a bias that inherently limits resourcing for just climate futures. In the next section, we review the concept of real property supremacy and its problematic tendency to reinforce asymmetric property relations. Next, we delimit this phenomenon within climate finance more broadly, before illustrating how a systemic bias towards real property creates inequities, exclusions, and predation within three distinct housing tenures in the United States: single family homes, manufactured housing, and multi-family rental residences. This primarily conceptual intervention draws on authors' diverse empirical research on these topics across multiple US settings (including cities in Arizona, California, Louisiana, Florida, New York, and Pennsylvania), as well as related critical scholarship. Our treatment is exemplary rather than comprehensive or

comparative, as more empirical work is needed to examine the property dynamics within other tenures. For example, climate risks facing public housing residents, collective-tenure co-owners, and unhoused Americans urgently demand more attention than we provide here. As environmental justice scholars, critical disaster studies researchers, and others working in aligned traditions have long demonstrated, there are also likely to be correlations between problematic articulations of climate finance and many uneven and intersecting forms of material and socio-economic vulnerability—raising important questions for further situated research and dialogue across academic fields.

Structural bias in US climate finance: thinking through real property supremacy

We contend that a structural bias in favor of homeowners within mainstream housing-related climate responses and finance is not merely a consequence of current policy failures, inattention to inequality, or lack of political will. Instead, we argue that it is rooted in deeper legacies of what we call real property supremacy (after Kear, Meyer, and Wilder 2023a) in the US. We define real property simply as 'land and its appurtenances' or land and the buildings affixed to it (Harvey 1982, 330). Real property takes different forms in a variety of contexts and includes both urban real estate and rural land. Research like Knuth (2021), Van Sant, Shelton, and Kay (2023), and Aalbers et al. (2023) has documented how and why financial institutions increasingly invest in and own a variety of types of real property. Building on this scholarship, we are chiefly concerned with how climate finance is applied in urban real estate, most particularly housing.

In the US settler colonial context, liberal private property regimes are hegemonic, enshrined in law and buttressed by institutions, popular epistemologies, and practices. Moreover, the promotion of mass (white) real property ownership has functioned as a central state strategy for centuries. Racialized histories of land theft, longstanding practices of redlining,'whiteness as property' more generally (Harris 1993), and ongoing racialized land, property and financial exclusions, extractions, and dispossessions indelibly mark US property relations (e.g. Einhorn 2001; Byrd et al. 2018; Blomley 2020). This colonial property project (Bhandar 2018) has long included mass single-family homeownership for white working class households to build wealth and middle class identity (e.g. Jackson 1987; Freund 2007; Gibbons 2018). It encompasses normative ideals, racialized patterns of wealth creation, and selectively distributed possibilities for long-term livelihood security, as well as specific patterns of urban spatial development—most strikingly, if not exclusively, associated with suburbanization. This large-scale expansion in single-family homeownership was enabled by an array of housing finance, planning, and policy interventions—perhaps most centrally, heavily state-supported mortgage markets from the mid-twentieth century. Together, these interventions—while excluding millions—have elevated real property as the most privileged and protected form of housing, as well as the most significant asset and form of collateral for Americans.

That these legacies weigh upon and haunt new challenges like climate risk governance is not surprising. As a concept, real property supremacy emphasizes that property relations are mutually constitutive of social relations (Blomley 2004), and acknowledges how white supremacy has figured in the development and maintenance of real property relations in settler colonial contexts (Bhandar 2018). Relatedly, it provokes us to question how social hierarchies and modes of domination working through real property can be transferred to social programs structured around it. While the racialization of climate finance is not the remit of this paper (though see Hofmann et al. 2024 and Kear et al. this issue), we argue that the marginalization and inequities expressed here are distributed along historically and geographically specific racial categories working through modes of possession and privilege in real property. Such racialized social hierarchies are a necessary fixture in the reproduction of racial capitalism (Robinson 1983), and unsurprisingly figure into capitalist financial approaches to climate change.

However, critical scholars must also ask more specifically how these legacies work in practice for climate finance—how they translate into institutional and financial forms that shape (and constrain) opportunities for intervention. Here we extend our analysis beyond the particular instance of manufactured housing featured in Kear, Meyer, and Wilder (2023a) to theorize how US housing geographies, real property biases and climate financing intersect more broadly. We suggest that contrasting experiences of climate finance discussed in the sections below highlight three crucial dynamics in the relationships between finance and real property: (i) the entanglement of property hierarchies and social hierarchies, (ii) the crucial role of the state and public finance authorities in producing and maintaining property and tenure hierarchies, and (iii) how the absence of institutional finance and state supported markets can create conditions for predatory lending as well as reduced household capacity to manage risk—including climate risk—through credit.

First, given that property expresses social relations between people, it is important to remember that such relations are often asymmetrical and incite political struggles over ownership and access (MacPherson 1999). Property is composed of metaphorical sticks in a 'bundle of rights,' including exclusive ownership, use, usufruct, improvement, and disposition (Blackstone 1765). Accordingly, such rights may be distributed across persons through contract; they legally flow through and are arranged at the discretion of a (theoretically singular) property owner. Marginalization vis-à-vis real property—i.e. exclusion from ownership, the treatment of other claims and property forms as inferior collateral, a lack of value-enhancing state subsidies and protections—can often translate into social marginalization. Analysis of real property supremacy in climate finance must thus attend to the multiple, imbricated hierarchies of social difference that legitimate and uphold liberal property relations (Ranganathan 2016; Roy 2017; Bledsoe and Wright 2019; Bonds 2019). Researchers have demonstrated the mutual constitution of property and racial subordination (Bhandar 2018), emphasizing that property is far from a 'self-evident category' (Blomley 2004, 2) or object, but rather a site of social relations, and a lens through which to understand social meanings and structures of domination (Correia 2013). It matters whether one is an owner, borrower, or lessor of real

property; these relative social positions regarding real property produce power differentials between individuals and groups.

We echo calls to build upon genealogies of property that bring attention to 'property's legitimation through reliance on social difference' (Ranganathan and Bonds 2022, 198) and the potentially constitutive role of property relations in shaping differential vulnerability to climate change by race, class, gender, and other axes of social difference and dominance. Use of 'supremacy' in the concept of real property supremacy is thus not evoked haphazardly but rather in explicit reference to the function of white supremacy in the development and maintenance of real property in settler colonial contexts. While white supremacy and real property supremacy are distinct, they are interrelated because real property relations in land are simultaneously protected by the logics of white supremacy and work to reinforce it as an institutional treatment of land that privileges white individuals. We follow Harris' pathbreaking (1993) work explaining how 'whiteness evolved into a form of property' in which case law legally enshrined the social privileges of whiteness as proper to white individuals. Such social ownership of privilege inheres in certain forms of property more than others, when properties and places are selectively coded as white. From this foundational work, we can see how the re-valorization of urban real estate and gentrification of neighborhoods often leads to increased policing (Bonds 2019) or the outright 'banishment' of non-white residents (Roy 2017). Given the potential re—and de-valorization impacts of once-in-a-generation investments in climate mitigation and adaptation intervention in cities and real estate, it is imperative to interrogate the systemic privileging of white people as the benefactors of extant real property relations—something we hope this intervention will encourage.

Second, real property supremacy is enabled by state policies related to public finance, particularly around lineages of housing finance. Unequal access to home financing is directly shaped by US federal policy choices and the property hierarchies underlying them (e.g. Freund 2007; Wyly et al. 2012). This not only includes long-term legacies of settler colonial expulsion and racialized redlining but also extensive apparatuses for subsidizing and underwriting mortgages for real estate that neglect habitable forms of personal property, like manufactured housing[4]. To understand real property supremacy is to recognize that all property is not equal in the eyes of existing state-financial institutions nor their practitioners (Lamb, Linda, and Spicer 2023). It is noteworthy that most of the climate financing mechanisms that we will discuss below are explicitly or implicitly state-sponsored. Given the immense public involvement in regulating property and financial markets in the US, government policies play a critical role in shaping the trajectories of climate adaptation and mitigation initiatives brought about by climate finance. Scholars must ask how both the state (at various scales) and private investors depend upon the perpetuation of accumulation through real property, and how particular climate financing mechanisms can deepen this dependence (Taylor 2020). Relatedly, more research is needed on the role that state-sanctioned property and finance hierarchies, and biases in the application of de-risking efforts (Gabor 2021; Aalbers et al. 2023), play in shaping direct and indirect vulnerability to climate change (e.g. via hazard exposures in the first case, or risk-adjusted devaluations in the latter).

Third, financial exclusion and marginalization patterned by real property supremacy do not always preclude access to financial markets altogether, but can establish market-making opportunities for more predatory financial actors. Spaces of financial marginalization may serve as potential sites of exploitation and expropriation (e.g. contract for deed and other forms of predatory non-mortgage home financing; see Jang-Trettien 2022), neglect, or abandonment (e.g. Teresa 2022). These inequities have long plagued many households' efforts to maintain or technologically upgrade their dwellings, and to undertake more significant repair efforts, recover, or relocate after disasters (Raymond, Green, and Kaminski 2022). While owners of real property can rely on a legitimate credit system backed by the state, real property's 'others'—renters, informal land holders, personal property owners, homeowners on reservation trust land, and the poor more generally—are left with fewer options. If they can access financing at all, they must often turn to unscrupulous and/or higher-cost lenders. We will argue below that these inequities persist in emerging drives for urban climate-proofing.

Put simply, we argue that the United States' systematic property biases and hierarchies already make access to financial markets easier and more affordable for some households, and unevenly costly and/or predatory for others—underlying privileges which come with attendant social, spatial, and temporal inclusions and exclusions. As we explore further below, this systemic privileging of real property above other forms of ('non-')property in housing is now shaping unequal consideration within and access to climate finance markets—hierarchies which threaten to delimit the forms of mitigation and adaptation that are possible, and for whom they are possible, in US cities.

Mainstream climate finance in US cities

We expand the concept of real property supremacy beyond its original application to mobile and manufactured housing to consider how finance for climate mitigation, adaptation, and disaster recovery, like housing finance writ large, may be limited by the social relations of real property. Significant investment will be required for decarbonization and adaptation-targeted climate-proofing projects at the building level as well as broader programs of urban (re)planning, (re)development, and disaster preparedness and recovery. Collective urban resourcing does not have to mirror the United States' historical forms of debt financing, which have depended on often fraught agreements between the state and private finance. We are animated by a broad view of what urban climate finance could *become* for US cities. In an argument that we return to in the conclusion, we suggest that climate finance should be defined in terms of the resources needed to solve urban social problems arising under climate change, and to do so equitably, inclusively, and in support of the transformation of systemic injustices. Climate finance should thus aim to be reparative, and set in motion new cycles of value creation that promote more equitable, socially sustainable outcomes (e.g. Taiwo 2022; Webber et al. 2022).

However, in this section we primarily grapple with *existing* mainstream climate finance in the US: institutional forms of finance from both public and

private sources. While these mainstream responses advance seemingly similar material strategies to a reparation—and equity-oriented vision of climate finance, we suggest that real property supremacy's structural biases advance very different justice outcomes within them. In this sense, Gourevitch et al.'s (2023) intervention cited in the introduction exemplifies, though is by no means the only example of, common mainstream problem framings. We highlight and problematize three features of such framings. First, their calculation centers the climate risks of a certain set of real property actors: homeowners, urban governments, and federal government programs that have historically subsidized US real property ownership via mortgage market supports (Government-Sponsored Enterprises, or GSEs, like Fannie Mae) and public insurance backstops for climate-related hazards (especially the National Flood Insurance Program, or NFIP). Such framings highlight important actors and problems, but can effectively sideline consideration of non-owning households.

Second, the specific *form* of climate risk Gourevitch et al. (2023) and problem framings like it center is the devaluation of individually-owned residential properties, as a risk to homeowners but also broader governmental apparatuses dependent on these real property values. These authors argue that the collapse of a climate-related property bubble would mean that 'many homeowners would be at risk of losing value in their largest asset—their home. In turn, municipalities that are heavily reliant on property taxes for revenue would be vulnerable to budgetary shortfalls' (251). Here, from the perspective of real property supremacy, climate change is a threat not only to home equity, but to the urban 'growth machine' (Logan and Molotch 2007), and the rentier dynamics that have prioritized property exchange values and shaped municipal governance in the United States for more than a century. In threatening property values, climate change may diminish the 'full faith and credit' that underlies municipal borrowing and investment capacity—likely exacerbating extant intra—and inter-urban inequalities. Home equity is indeed an important consideration for households and communities alike; however, the formulation of climate risk through real property value *primarily* elides a much more robust landscape of interlocking climate risk considerations, including health risk factors (Harlan and Ruddell 2011) and energy costs (Jessel, Sawyer, and Hernández 2019) to name a few.

Furthermore, climate-fueled devaluation of real property at scale is a major concern for financial institutions and financial system regulators, with strong echoes of the Global Financial Crisis (e.g. Christophers 2017; Morris and Collins 2023). This is particularly so as real property (both urban and rural) has become even more central to financial strategy in late capitalism (e.g. Knuth 2021; Kay and Tapp 2022; Van Sant, Shelton, and Kay 2023). Large shares of global collateral now circulate in multi-trillion dollar real property asset classes—an 'asset economy' (Adkins, Cooper, and Konings 2020) driven by competition for forms of property that appreciate faster than inflation and (in theory) may offer counter-cyclical protections against crises in more conventional financial assets (Knuth 2021; Aalbers et al. 2023). A third feature of Gourevitch et al.'s (2023) framing is the prospect of parallel NFIP and GSE insolvency, due respectively to growing damage claims from homeowners and large-scale climate risk-related defaults in their mortgage property portfolios.

This potential for property market collapses to become fiscal crises again echoes the subprime crisis; mainstream risk management now includes new US federal government mandates for climate-related financial risk disclosure (Knuth et al. 2024). Here particular legacies of state support characteristic of US real property supremacy have become (again) a crisis for the state itself. Mounting pushes for federal agencies to reduce their climate-related financial risks—to unwind themselves from real property commitments-come-risks—are raising thorny justice questions. For example, will 'rationalization' of NFIP premiums render insurance unaffordable for cost-burdened homeowners (Elliott 2021)? Will prospective GSE withdrawals from some markets drive new forms of 'climate redlining' (Knuth et al. 2024)?

More generally, critical scholarship has flagged some of these same underlying issues as concerns for climate justice. For example, real property devaluation-related climate risks are very legitimate justice problems for low-income homeowners who are struggling to afford mounting insurance and mortgage finance bills in 'high risk' markets or to obtain credit to adapt and repair their homes, and face other challenges in relocating to 'less risky' locations if home values collapse (Knuth et al. 2024; Taylor and Knuth 2024). So are dilemmas facing US municipal governments under simultaneous risks of lost property tax bases and credit rating downgrades in municipal bond markets (Cox 2022)—particularly Black majority cities who already often access debt finance on unequal terms (Ponder 2021). However, this picture retains a structural real property bias: these are far from the only specifically housing-related climate risks facing urban inhabitants. Where, in this picture, are direct exposures to harms like heat waves that are exacerbated for unhoused city dwellers as seen during recent heat waves in Arizona (du Bray et al. 2023)? Or renters and tenure-insecure households experiencing new forms of climate gentrification and displacement due to the kinds of value-at-risk appraisals discussed above (Taylor and Aalbers 2022)? What about renters whose experiences of energy poverty and chronic and acute climate impacts are filtered through landlords' underinvestment and extractions (e.g. Melvin 2018)? Climate change here sharpens existing forms of environmental injustice (Bigger and Knuth 2023).

Such real property bias in problem framing necessarily influences the solution space which comes into focus, within which we also see a prioritization of real property and real property owners in climate risk protection drives. Public and private institutional responses that prioritize real property owners currently coalesce at various scales in the United States. The most resource intensive interventions may be organized by federal and state governments or cross-state regional initiatives rather than urban governments, though they will be highly meaningful for urban communities and households' experiences on the ground. For example, major physical infrastructure like seawalls or institutional interventions like managed retreat aimed at climate risk reduction will transform metropolitan built environments at very large scales: a task for which significant and steady funding is needed. Both homeowners and non-homeowners in metropolitan areas may face dilemmas if general property market values are insufficiently high to "justify" such investments. For example, it is notable that current cost–benefit criteria used by US Army Corps of Engineers to design new infrastructure often result in the best protections being afforded

to areas with the highest defensible property value (USGAO 2019). Similar problems have been identified with managed retreat buy-out programs (Siders 2019) that rely on established cost–benefit logics, with the effect of promoting disproportionate retreat in low-income or minority communities.

Scholars increasingly argue that these structural biases are creating an inequitable 'splintering protectionism' in US urban landscapes (Johnson 2015; Taylor 2020), in which climate risk triggers a migration of capital towards lower risk, higher value property markets in ways that may yield deepened forms of marginalization and injustice (Taylor and Aalbers 2022). These dynamics also reproduce and potentially worsen enduring challenges associated with coordinating and resourcing larger-scale, regional spatial interventions in the context of the United States' highly decentralized and fractured municipal finance system, which is also contingent on the depth and durability of local property tax bases (Shi et al. 2023).

In another example, insurance-linked securitization (ILS) has emerged as an influential response to managing growing property exposure and losses in climate-exposed cities and regions, where crises of insurability—and mass residential market crisis—loom large (Johnson 2015; Taylor 2020). Via ILS, homeowners' insurance premiums are securitized and sold to pension funds and other institutional investors, raising capital for more expensive payouts and in theory geographically diffusing re/insurers' exposure to any one risk. The conditions for ILS also require substantial state interventionism, as in Florida, where public institutions source, subsidize, and backstop property risks for offshore investors through a myriad of state insurance institutions and de-risking mechanisms (Weinkle 2015; Taylor 2020). The benefits of this public de-risking and risk arbitrage are not accessible to tenants, who are excluded from protections afforded by property insurance markets.

In various climate responses organized by US urban governments, real property supremacy has taken an influential shape in inherited paradigms of real estate-led growth (e.g. Logan and Molotch 2007; Ashton, Doussard, and Weber 2012). These growth machine logics play a crucial role in shaping how cities devise and prioritize public investments. The defense and enhancement of property value is a central concern to urban machine actors. A growing suite of urban climate finance tools seek to secure property tax bases; many of these projects adopt the logics of private finance to de-risk private investment and make projects more 'bankable' (Gabor 2021; Bigger and Webber 2021). Often building on long-existent finance tools pioneered by US cities (Knuth 2023), these instruments include a range of value-capture mechanisms to make interventions self-financing by leveraging real property values, as we will explore further in the next section. Cities frequently use these 'off book' financing practices to evade debt restrictions and other formal limitations on municipal bonding powers—limits that will sharpen if climate change devalues urban real property and shrinks cities' property tax bases (Taylor and Knuth 2024).

If real property supremacy pervades the logic of (climate) finance, then any semblance of a just approach to resourcing climate action must attend to the hierarchical privileges embedded in real property regimes, or else risk re-enforcing and reproducing them. In the next section, we dig deeper into these

dynamics in practice, exploring how real property supremacy is structuring climate finance across three applications of residential climate-proofing—with very different outcomes for occupants who are differentially placed in US property-financial hierarchies.

Climate-proofing inequities in US housing: real property supremacy at work?

Climate-proofing measures aim to tackle climate risks by retrofitting existing urban built environments, often at the scale of individual homes and real property parcels. Climate-proofing is growing in popularity and assuming many forms in US cities. Some programs, such as structural hardening, are intended to mitigate material threats posed by physical risks like more frequent and more intense hurricanes, wildfires, and heat waves (and the rising insurance costs associated with them; see Taylor and Knuth 2024). Decarbonization interventions like energy efficiency retrofits and electrification (oil/gas system replacement) increasingly speak to transition risks (e.g. Christophers 2017; Morris and Collins 2023), as mandates and market norms advance—and with them, regulatory demands on financial institutions. In other words, instead of merely missed opportunities to grow real property values, failure to decarbonize increasingly also risks devaluation (Knuth 2016; 2019). Both home owning and non-home owning households may experience these risks in worsening energy poverty and associated cost and health risks (Harrison and Popke 2013)—particularly as fossil energy prices rise and become more volatile (Bigger and Knuth 2023). In exploring how real property supremacy shapes unequal access to finance—and now climate finance—we illustrate how US single-family homeowners, mobile home owners, and renters in multi-family housing are encountering climate-proofing opportunities and related financing mechanisms through three examples.

Privileging access to climate-proofing for single-family homeowners

Our first example considers climate-proofing experiences for the most structurally privileged of our three housing types, conventional single-family homeowners—more particularly, experiences with residential Property Assessed Clean Energy (PACE) financing as a climate-proofing mechanism. PACE was first trialed in California cities in the late 2000s as an instrument to help single-family homeowners afford decarbonization improvements like energy efficiency retrofits and solar panels. It builds on a US urban financing tool used since the mid-nineteenth century, the special district (Einhorn 2001; Fuller, Kunkel, and Kammen 2009). As Taylor and Knuth (2024) discuss, PACE's key innovation is for municipal government-run PACE programs to front homeowners the entire costs of needed retrofits, then for homeowners to pay these costs back over time via senior liens added to their existing property tax bills, for periods which may range from 5–25 years. Taylor and Knuth show that PACE is increasingly being used as a tool for climate-proofing, particularly hurricane hardening retrofits to reduce Florida homes' wind risks in major storms—a $1.5 billion and growing market in the state. PACE-financed retrofits

are marketed as important pathways for homeowners to reduce property devaluation risks—in theory mitigating both future physical damages and reducing their insurance premiums.

However, PACE has drawn noteworthy justice critiques. The instrument was originally imagined as a tool particularly for low-income homeowners unable to affordably access conventional financing for home improvements like home equity loans or second mortgages (Fuller, Kunkel, and Kammen 2009). In practice, consumer advocates have accused PACE programs of predatory lending practices, frequently racialized. PACE liens are supposed to be self-financing and add no net debt load to homeowners (or to urban governments running PACE programs), as they are meant to recoup upfront costs via proportionate savings in utility bills, insurance costs avoided, and/or home values increased (Knuth 2019; Taylor and Knuth 2024). However, these savings streams do not always materialize, adding property tax repayment pressures to homeowners' existing cost burdens and potentially risking tax foreclosures. Taylor and Knuth (2024) suggest that, paradoxically, wealthier homeowners least in need of PACE may be benefiting most from it, as liens are typically a far more minor share of their total home values.

Experiences with PACE nevertheless highlight the structurally uneven advantages that single-family homeowners still possess over housing forms discussed below. PACE liens have been billed as (in theory) more affordable financing alternatives for cost-burdened homeowners precisely *because* they possess an 'untapped resource' in the property they own (e.g. Fuller 2009). PACE lending is tied to home values rather than household incomes and credit ratings, and its real property-secured lenders can foreclose on homes to recoup their investments. Due to PACE's senior lien status, they can even get their cut before mortgage lenders and other debtors. These features effectively allow homeowners to take on more debt than their household incomes would otherwise support. In theory (again not necessarily in practice) PACE's aura of municipal government support, its qualities as real property-secured debt, and senior lien status will generate lower interest rates than alternative home financing forms—including because these very features allow PACE liens to be packaged into highly rated municipal bonds and on-sold to financial markets, bringing more capital into the sector. In sharp contrast, non-homeowners have no direct access to this financial innovation, nor the governmental attention and resources that it represents and materializes.

Ultimately, homeowners are advantaged in that they can access finance and leverage residential property values in ways not accessible to households who do not own homes, or the 'right' kinds of homes. Moreover, PACE's special district-based model aligns and equates these homeowners' own self-interest in maintaining and growing their personal home values with the broader public interest—an equation formally built into these instruments' authorizing language. Einhorn (2001) has argued that in these highly individualistic, anti-redistributive financing logics, special districts were shaped by the racialized politics of the Civil War era, particularly property debates revolving around slavery. Carried forward and adapted for climate challenges, these logics and favored treatment demonstrate what being on the winning side of real property supremacy can look like, particularly for higher-income homeowners.

Differentiated protection in manufactured housing

In contrast to single-family housing, most mobile home residents own their homes separately from the land beneath them. Consequently, their homes are legally coded as personal property rather than real property. As Kear, Meyer, and Wilder (2023a) show, this leaves most manufactured housing buyers outside the housing-finance system built over the last century to promote the 'American Dream' of homeownership—including mortgage insurance and the secondary mortgage market. Consequently, loans are riskier and application denial rates are higher for manufactured housing than for any other housing type. Applications for manufactured housing personal property loans are denied an astonishing 64% of the time, compared to 9% for conventional mortgages (Liang, Siegel, and Staveski 2022). Support from federal programs through the Federal Housing Administration or Veterans Affairs reduces denial rates remarkably. It is significant, therefore, that neither program provides similar benefits to personal property. The only US federal program that does, the US Department of Housing and Urban Development's Title I Manufactured Housing Program, is moribund, declining from a high of 26,000 loan originations in 1991 (Park 2022) to only 3 in 2021 (Ginnie Mae 2022). Moreover, personal property borrowers are excluded from consumer protection laws that cover mortgagees, and mobile home residents have been chronically left out of stimulus and aid programs put in place to help renters and mortgagees—including most recently relief under the 2020 CARES Act. In short, while the real property lending market is highly liquid, competitive, and government supported with many consumer protections, the personal property lending market is credit-constrained, oligopolistic, and largely unsupported by the state, with relatively few protections for borrowers.

This lack of government support for manufactured housing purchased as personal property is also a driver of wealth-eroding predatory lending. Once denied, determined buyers must either drain their savings and pay in cash, or turn to alternative sources of home financing, which often come with usurious interest rates (in excess of 25% APR) and few protections (Kear, Meyer, and Wilder 2023a). Such trends are especially concerning in Latinx communities, who represent a growing percentage of the manufactured housing population, especially in urban areas, and who are 1.6 times as likely to use alternative financing (e.g. land contracts, lease-purchase agreements, or forms of seller-financing) than US households on average (Pew 2022). In other words, lack of state support and institutional credit scarcity has not precluded the presence of finance in manufactured housing. Rather, scarcity and exclusion have created market opportunities for high-cost and predatory lenders.

This kind of predatory lending is now eroding wealth along with household-level capacity to adapt in the face of climate hazards, including but not limited to extreme heat (Pierce, Gabbe, and Rosser 2022; Kear et al. 2023b) and flooding (Rumbach, Sullivan, and Makarewicz 2020). These combined financial-climate risks exacerbate other material challenges to climate-proofing manufactured housing. Harrison and Popke (2013) and others (e.g. Varfalameyeva et al. 2021) characterize a variety of extreme heat and weatherization challenges for manufactured housing, ranging from ineligibility for utility assistance programs (Kear et al. 2023b) to physical deficiencies, especially in older units with air leakage through walls, lack of insulation, hazardous materials like

asbestos and formaldehyde, and inadequate/unreliable electrical systems (e.g. aluminum wiring).

Meanwhile, the land—the real property—to which many mobile homes are tied in mobile home communities (MHCs) across the country is a lucrative asset, increasingly sought after for the portfolios of REITs, private equity giants, and sovereign wealth funds (see Aalbers et al. 2023). Despite the fact that, as one company explains to potential investors, the 'MHC is expected to continue to deliver outsized risk-adjusted returns and remain a top performer in commercial real estate due to its predictable, durable, stable cash flows,' the GSEs have pursued their 'duty to serve underserved markets credit' from the Federal Housing and Finance Agency (see Kear, Meyer, and Wilder 2023a) by subsidizing investor MHC purchases. Such financial activity around MHCs does not yield provisions for climate-proofing benefiting the residents of manufactured housing. On the contrary, these trends are adding displacement and maladaptive forms of retrofitting to the financial-climate risks faced by manufactured housing inhabitants.

Namely, relatively low-cost government-sponsored capital from GSEs has abetted 'BRRRR' (buy, rehabilitate, raise rents, refinance, repeat) investors in the sector. Such investment strategies often depend on affordability-eroding lot-rent increases and/or cosmetic improvements designed to increase MHC valuations, or exchange values. These often come at the expense of climate-use values, such as shade, reflective insulated window coverings, older street-facing cooling devices, or trees and hedges that cover windows (Kear et al. 2023b). Even as mobile home residents struggle to finance their homes, the land where their homes are located is increasingly incorporated into global financial circuits and associated dynamics, exposing residents to new financial-cum-climate stressors such as price volatility, social rigidity of corporate ownership, and restrictions on adaptive strategies judged not aesthetic to investor classes (e.g. shade sails and window insulation). Exclusion from the United States' dominant system of housing provision through mortgage de-risking has created deleterious social and environmental effects for millions of mobile and manufactured housing residents, raising the stakes of real property supremacy among residents of this 'third housing type' (Rumbach, Sullivan, and Makarewicz 2020).

Split incentives and new risks for renters

The inequities of climate finance via real property regimes are also increasingly evident in the ways mandated decarbonization retrofits for real estate, including multi-family rental housing, are being financed—who benefits, and who is made to bear the costs. For instance, in an effort to reach an 80% reduction in carbon emissions by 2050, New York City passed the Climate Mobilization Act in 2019, which required existing buildings over 25,000 square feet to initiate graduated emissions reductions beginning in 2024. As of 2023, the leaders of 45 US cities, counties, and states had pledged to pass similar building performance legislation (National BPS Coalition 2023). To achieve new standards, building owners and operators often must pursue comprehensive energy efficiency measures and electrification/fuel-switching upgrades for building systems such as space and water heating. These retrofits often require investments beyond the scope of a building's capital reserves, prompting building owners to pursue additional forms

of public and private finance. While we lack space to characterize the full diversity of retrofit financing mechanisms available to landlords and large commercial property owners, they include public and private debt, rebates, and tax incentives.

As in the case of residential PACE above, once upfront financing costs are repaid, energy retrofits promise significant financial benefits and risk reduction for real property owners. For example, a key incentive for commercial real estate owners is the ability to reduce energy costs and thereby increase a buildings' net operating income (e.g. Kramer Mills and Scott 2022). In commercial property markets, a building's improved energy/emissions performance can translate to green value premiums when advertised as an amenity to climate—and ESG-inclined end-users and capital providers (Knuth 2016; 2019). Retrofits can also reduce the decarbonization-related transition risks at the top of institutional real estate industry agendas (e.g. Knuth 2019; Scott 2023)—thereby securing 'rent at risk' (Taylor and Aalbers 2022) for investors. Energy upgrades thus help buildings remain 'underwritable' in the eyes of finance and continue to circulate on the commercial real estate market.

Mandated decarbonization retrofits may address multiple longstanding 'split incentive' problems in rental housing (e.g. Bouzarovski and Cauvain 2016; Castellazzi, Bertoldi, and Economidou 2018). Consider the case of century-old multi-story apartment buildings that are commonly found in US cities, which often use an oil-fueled boiler to power hot water and steam heating systems for the entire building. Today, landlords of such multi-family buildings often cover rental units' cost of heating as part of their monthly operating expenses, primarily because technical limitations associated with oil boilers have enforced master-metering of these utility costs. Electrification retrofits may allow property owners to sub-meter, registering the discrete energy usage of each rented unit for separate billing—and making tenants directly responsible for utility costs. In master-metering situations, tenants may have little direct understanding of their specific energy use. Beyond that, tenants have limited legal rights to undertake retrofits on their own, mixed incentives to do so (since landlords will appropriate many of the benefits) and compromised access to financing if they wish to try. Meanwhile, since tenants ultimately pay utility costs, whether directly or incorporated in rents, landlords have limited voluntary incentives to invest in related forms of building maintenance and repair. In such cases, tenants are subjected to deteriorating conditions—a long-term environmental justice problem exacerbated by climate risks like worsened heat waves (e.g. Bigger and Knuth 2023; Hamstead 2023).

However, renters may not share in many of the financial benefits of decarbonization retrofits—and may be financially harmed by it, if building owners leverage climate-proofing to pass on new costs and risks. In the sub-metering case above, building-level energy savings *could* be translated into reduced rent (with additional utility cost savings for tenants able to reduce their unit's energy use). In practice, it is more likely that landlords will maintain rents according to market rate for all comparable units, and capture new returns via passing along the cost of utilities to tenants. Moreover, where tenants are not legally protected, landlords may use such climate-proofing upgrades to justify rent increases and evictions (and see Hamstead 2023; R. Gourevitch 2024). These extractions and risks reflect extant property-based power imbalances and forms of precarity that we see in many other landlord/tenant dynamics. This

unevenness is also strongly racialized in the United States—today, over half of Black and Latinx-led households nationwide are renters, versus only about a quarter of white-led households (DeSilver 2021).

Because renters are structurally disadvantaged within the social relations of real property, there is an urgent need to preserve and enhance renter rights within climate-proofing mandates. In New York City, tenant protections have begun to be addressed in a number of ways: limits on sub-metering after substantial rehabilitation projects on subsidized buildings, subsidies for utility allowances, and eased decarbonization compliance requirements on buildings with rent-regulated units. These are steps in the right direction but fall short of integrating wholesale renter protections. Ultimately, when climate finance is targeted at parcels of real property rather than geared to the actual needs of housing inhabitants, climate-proofing threatens to be realized at significant cost to non-owners.

Conclusion: moving climate finance beyond real property supremacy

In this intervention, we have surveyed a range of contemporary applications of urban climate finance to climate adaptation and decarbonization needs in the United States, including growing forms of climate-proofing. Our discussion has been exemplary rather than comprehensive; much more research is needed to fully grasp these myriad changes. Nevertheless, our survey has drawn out significant and worrisome trends. We have identified recurrent tendencies for mainstream climate finance to frame the defense of property values and privileged classes of property owners as the central problem to be 'fixed' by climate finance, pushing to the margins many other forms of climate risk being articulated through US housing. The housing stock of US cities is comprised of diverse forms and tenures; a real property-centric approach to financing offers neither an adequate nor just approach to transitioning these diverse built environments and their inhabitants to a climate-changed future. Namely, it overlooks or under-resources the needs of tens of millions of households living in already socially and financially marginalized housing tenures. Such sidelining threatens to significantly worsen these households' already inequitably distributed climate(-financial) risks. In the process, it doubles down on legacy inequities—class, race, and colonial—in how the United States codifies property, which we have characterized here as long-embedded forms of real property supremacy. Attention to these extant property-financial hierarchies and inequities emphasizes that housing-related risks and precarity are already a lived reality for many Americans: the housing crisis is not arriving with climate change but is already here, and has been for generations.

In examples above, these real property biases sometimes took the form of outright exclusion from financial resources, coupled with barriers in accessing the full bundle of rights associated with real property ownership—in, for example, mobile home owners' exclusion from the real property category, or renters' limited power to undertake climate-related building improvements. They also manifested in unequal access to state support apparatuses afforded

to conventional single-family homes and homeowners—making finance for housing 'others' more scarce, slow, expensive, and potentially actively predatory. These obstacles do not imply a wholesale absence of climate risk response by currently marginalized households. At the intersection between what governmentally regulated institutional finance refuses to underwrite and where governments fail to fill the gap, improvisational financial practices can emerge, including mutual aid and solidarity efforts (Rosario and Ponder 2020; Safri and Madra 2020, Robin 2022; see also Kear et al. this issue). However, such gaps simultaneously create conditions for predatory and maladaptive outcomes.

The problems discussed here underline the importance of decentering, reimagining, and remaking climate finance in new forms. Far from totalizing or inexorable, the real property-centric versions explored here are just one possible pathway for the resourcing of urban climate response—and frequently a fraught and brittle one. Alternatives are already emerging, such as proposals to re-fund public housing at scale (Aldana Cohen et al. 2021), climate-proofing initiatives with expanded protections for renters (Bigger and Knuth 2023), and public power drives against high-pollution 'peaker plants' that simultaneously target injustices in energy/climate, incarceration, and housing (Bratspies 2021), among a broader suite of urban reparative measures (Safransky 2022; Webber et al. 2022). Ultimately, progressive and radical interventions must think transformatively in reimagining urban climate responses and their resourcing. This may require more holistic overturning of existing forms of urban finance, and perhaps outright refusal of private property in urban planning and practice (Dorries 2022). Climate finance, at the end of the day, is still finance. It provides tools for altering the material conditions of places, and such alterations are often imperative for the ongoing livability of homes and neighborhoods in a changing climate. Yet finance capital, by design, also hinges upon and reinforces regressive regimes of liberal property ownership and growth imperatives.

In 2010, the late Mike Davis argued that 'the cornerstone of the low-carbon city, far more than any particular green design or technology, is the priority given to public affluence over private wealth' (2010, 43). The real property-centric view we have explored here inverts Davis's formulation. Under real property supremacy, the cornerstone of the low-carbon city is private wealth. Private wealth in the form of real property is both the chief object to be protected in a climate-changed future and also central to existing financial tools imagined for this task. For climate finance to become liberatory and reparative, it must break free of this regressive legacy and advance more effective, responsible, and inclusive ways of investment and dwelling in a changing climate.

Funding

This work was supported by National Science Foundation: [grant nos 2322934 and 1945996]; Urban Studies Foundation: [grant no USF-SSA-210206].

Notes

1 In 2022, the US had about 85 million units of owner-occupied housing and over 45 million renter-occupied units (American Community Survey 2022). Manufactured housing accounted for about 7% of these totals in 2018, 5% owner-occupied and 2% rented (Fannie Mae 2020). The United States had over 900,000 public housing units in 2023 (HUD 2023), and almost 600,000 Americans were unhoused on an exemplary night in 2022 (HUD 2022).

2 The term 'mobile home' in US regulatory parlance refers to transportable residential

structures on a permanent chassis built before June 1976. 'Manufactured home' is used by regulators to refer to transportable residential structures built after June 1976 and approved by the US Department of Housing and Urban Development (HUD). We use both terms interchangeably.

3 The phrase 'value capture' has different meanings in different contexts and disciplines. In a policy sense, it can refer specifically to an approach to public finance, particularly for public transportation, that 'aims to capture the value of benefits received by property owners or developers as a result of infrastructure improvements, and to use these revenues to fund such improvements' (Zhao, Das, and Larson 2012; see also Rybeck 2004). We use the phrase 'value capture finance' to refer more broadly to the use of various arrangements that leverage the value of real property to finance climate related investments. For more in-depth discussion on how forms of value capture can translate into 'urban green grabbing' by elite financial actors, see García-Lamarca, Anguelovski, and Venner 2022).

4 It is important to note that in highlighting the role of the state, we are not absolving private market actors in enacting and exploiting social and property hierarchies. As Walker (2019) argues in response to Rothstein's (2018) The Color of Law, 'housing segregation, like racism in general, has deep roots in American society [, and] wasn't imposed by the federal government.' Spatially and racially discriminatory financial practices extend far beyond those rooted in the law or state policy. There is a broad suite of practices and non-state actors (Hill 2021), from banks to real estate professionals and neighborhood associations (Jurjevich et al. 2023), that contribute to past and present racial and spatial housing inequality. We call in the state to turn critical attention to the manner in which policy can codify racist market practices but also to highlight how the state can enable reparative, redistributive, or 'predistributive' remedies through property relations (Imbroscio 2021).

Acknowledgements

This work was generated through collective thinking and fruitful discussions facilitated by the Urban Climate Finance Network. The authors were able to develop this paper at a workshop at the University of Zurich thanks to a Seminar Series grant from the Urban Studies Foundation [grant number USF-SSA-210206]. Sahar Zavareh Hofmann was affiliated with Trier University as a Postdoctoral Researcher where earlier work on the manuscript was conducted. Julia Wagner was additionally supported by funding from the National Science Foundation Graduate Research Fellowship and the National Science Foundation Doctoral Dissertation Improvement Award. The authors would like to thank Dave Backer, Emma Colven, Savannah Cox, John Hogan Morris, and two anonymous reviewers for their thoughtful remarks on earlier drafts of this manuscript. All errors and omissions are, of course, our own.

Disclosure statement

No potential conflict of interest was reported by the authors.

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