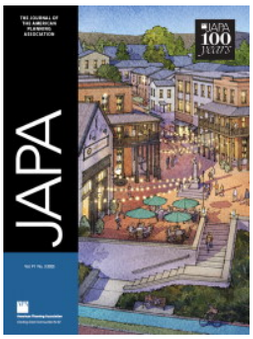

Journal of the American Planning Association

ISSN: 0194-4363 (Print) 1939-0130 (Online) Journal homepage: www.tandfonline.com/journals/rjpa20

Logistics of Zoning, Zoning for Logistics: Toward Healthy and Equitable Development for Urban Freight

Travis Fried, Carla Tejada, Sarah Dennis-Bauer, Otgondulam Bolbaatar, Anne Goodchild, Julian D. Marshall, Oliver Olmedo & Lizándro García

To cite this article: Travis Fried, Carla Tejada, Sarah Dennis-Bauer, Otgondulam Bolbaatar, Anne Goodchild, Julian D. Marshall, Oliver Olmedo & Lizándro García (30 Jun 2025): Logistics of Zoning, Zoning for Logistics: Toward Healthy and Equitable Development for Urban Freight, Journal of the American Planning Association, DOI: 10.1080/01944363.2025.2515134

To link to this article: https://doi.org/10.1080/01944363.2025.2515134

JOURNAL OF THE AMERICAN PLANNING ASSOCIATION
https://doi.org/10.1080/01944363.2025.2515134

Logistics of Zoning, Zoning for Logistics: Toward Healthy and Equitable Development for Urban Freight

Travis Fried[a], Carla Tejada[b], Sarah Dennis-Bauer[a], Otgondulam Bolbaatar[b], Anne Goodchild[a], Julian D. Marshall[a], Oliver Olmedo[a], and Lizándro García[a]

[a]Department of Civil & Environmental Engineering, University of Washington, Seattle, WA, USA; [b]Department of Mechanical & Industrial Engineering, University of Illinois, Chicago, IL, USA

ABSTRACT

Problem, research strategy, and findings: Warehousing and distribution center (W&D) expansion has raised concerns about the disproportionate exposure of nearby communities to freight traffic and its resulting health consequences. While local governments wield several tools to manage logistics-related development, few may be as consequential to public health disparities as zoning. In this study we synthesized the state of recent U.S. zoning actions related to W&D, examining their role as tools—or barriers—for advancing public health in communities historically burdened by freight traffic. Specifically, we investigated 92 zoning actions at 67 locations (51 municipalities, 9 counties, and 7 states) and assessed the level at which environmental justice (EJ) principles informed these actions. The most common zoning actions were discretionary decisions on site permits ($n = 32$). While we offer examples of councils considering EJ issues raised by communities, discretionary processes have drawbacks. Other actions include long-term plans ($n = 17$), land use definitions ($n = 13$), development standards ($n = 12$), and conditional use permitting ($n = 14$). We also examined four state-level policies. Many regulations restrict by-right W&D development with little indication that these changes are intended to benefit historically burdened communities.
Takeaway for practice: Local jurisdictions lack a unified regulatory approach to W&D. However, long-term plans and state environmental policies guide jurisdictions with the most EJ-explicit actions. Equitable and healthy urban freight requires clear strategic land use priorities and environmental safeguards for vulnerable communities but could also include flexibility for W&D development outside conventional industrial areas. We discuss how these findings fit into contemporary debates about zoning and urban freight planning.

KEYWORDS
Environmental justice, equity, last-mile delivery, urban freight, zoning

Globalized supply chains and a growing consumer economy have catapulted warehouse and distribution centers (W&D) to immense levels of development. Between 2003 and 2018, W&D building stock and floorspace increased 67% and surpassed office and retail as the dominant commercial and industrial land use in the United States (U.S. EIA, 2021). Fueled in part by online retail's increasing market share, some W&D opened close to urban centers to more reliably set and meet expectations for fast home delivery (Fried & Goodchild, 2023).

These trends often involve W&D disproportionately locating near marginalized communities (de Lara, 2018; Hesse, 2020; Yuan, 2018), which raises environmental justice (EJ) concerns about the negative effects for those living near W&D. In this study, we use the definition that environmental justice (EJ) is the right to a safe, healthy environment and to due process that ensures affected communities have a voice in policy decisions affecting their health and safety (Quattro, 2024). Proximity to W&D and freight traffic can increase exposure to several environmental burdens, including noise, hazardous material spills (Schweitzer, 2006), injurious and fatal collisions with commercial vehicles (Shin, 2024), and traffic-related air pollution (Dennis-Bauer & Jaller, 2023; Fried et al., 2024). Using satellite-based measurements of air pollution, Kerr et al. (2024) found

CONTACT Travis Fried tfried3@uw.edu

Supplemental data for this article can be accessed online at https://doi.org/10.1080/01944363.2025.2515134.

that W&D proximity increases exposure to nitrogen dioxide (NO_2) by 20%, on average. The resulting cumulative impacts on public health have prompted regulatory responses such as the warehouse Indirect Source Rules (ISRs) in California (Turner, 2024) and legal challenges to W&D development from EJ groups (Victoria, 2024).

Of the regulatory tools that cities use to steer development, zoning is particularly consequential for environmental and public health disparities (Maantay, 2002; Whittemore, 2017). At its most basic, zoning determines *what* developers can build and *where*. Conventional U.S. zoning practice enforces the strict separation of land uses and can set legal specifications for building bulk, lot coverage, parking minimums, buffers, and environmental performance. As such, zoning creates a spatial precondition for W&D location decisions that can contribute to their disparate siting near politically and economically marginalized groups (Tejada & Conway, 2024; Yuan, 2018) or their sprawl into regions with more lax regulations (Cidell, 2011; Dablanc & Ross, 2012).

This latter trend has increased freight distance traveled and emissions in some cases (Aljohani & Thompson, 2016), leading researchers to propose land use strategies aimed at mitigating transport-related impacts (see Box 1). *Freight-efficient land uses* (FELUs) seek to balance freight's private and external costs by accounting for policy impacts on transport supply and demand (Holguín-Veras et al., 2022). Meanwhile, *proximity logistics* focuses on integrating urban freight facilities into compact, mixed-use environments to improve last-mile efficiency (Buldeo Rai, 2023; Buldeo Rai et al., 2022). Cases in Paris (France) demonstrate how W&D can mesh into the neighborhood fabric, meet logistical needs of nearby businesses and residents, enable goods delivery by lower-impact vehicles, and host mixed-use opportunities such as restaurant suppliers and rooftop farms (Marshall, 2020). While these examples seem to promise environmental benefits in U.S. contexts (e.g., Gunes et al., 2024), reimagining W&D compatibility with residents and commercial businesses may conflict with *exclusionary zoning* policies that separate uses and densities. Moreover, the policies through which local jurisdictions can achieve this outcome, without disparately affecting historically marginalized populations, remain unclear.

Research Context and Purpose

For more than a half-century, planners have charged exclusionary zoning with contributing to excessive sprawl, racial and socioeconomic segregation, public health disparities, housing shortages, and gentrification (Whittemore, 2021). Renewed efforts to reform land use policies have ranged from overlays and density incentives that encourage compact, transit-oriented development to larger overhauls that introduce environmental performance standards and form-based codes (Forman et al., 2023). However,

Box 1. Overview of zoning-related urban freight literature.

	Geography	Zoning actions discussed	Recommendations/strategies
(FHWA, 2012)	U.S.	• Euclidean zoning • Overlay districts • Form-based zoning, performance zoning • Preferential/incentive zoning	• Context-specific solutions • Buffers & containment, loading door orientation, truck staging and parking, Light/noise mitigation • Preserve industrial land
(Holguín-Veras et al., 2022)	U.S.	• Long-term planning • Regulatory controls • Discretionary approaches	• FELU • Densify W&D in urban core, preserve existing W&D, Reserve/bank land, Co-locate near gateways, foster mixed-use, relocate some "large traffic generators"
(Yuan, 2019)	Southern California	• CUPs • Land use restrictions • Parcel sizes, land use definitions	• Reduce W&D impact, postpone W&D sprawl • Financial (dis)incentives • Environmental regulations
(American Institute of Architects NY (AIANY), 2022)	New York City	• CUPs • Development standards • Environmental/transport requirements	• CUP based on impact/size • "Nuanced" by-right in industrial zones • Community-led planning and rezoning
(Buldeo Rai, 2023; Buldeo Rai et al., 2022)	New York City	• "By-right" versus CUP • Definitions for last-mile facilities • Performance zoning	• Proximity logistics • Environmental regulation, context-specific design, Community Benefit Agreements (CBAs), Complete Streets

many reforms present mixed effectiveness in addressing stated policy goals, such as curbing sprawl (Ewing et al., 2022), preventing gentrification (Davis, 2021), or preserving industrial jobs in the urban core (Chapple, 2014; Davis & Renski, 2020; Ferm & Jones, 2017).

In fact, exclusionary zoning remains largely intact in most local jurisdictions (Imbroscio, 2021), even in cities taking steps toward denser, mixed-use development (e.g., Packer, 2024). Some scholars argue that regulators yield to competing pressures—from powerful real estate interests (Logan & Molotch, 2010; Stein, 2019) to parochial *homevoters* and Not In My Backyard (NIMBY) groups (Fischel, 2015; Hall & Yoder, 2022; Scally & Tighe, 2015; Sclar et al., 2020)—leading to decisions that prioritize short-term fiscalization or political gain. Others advocate for zoning's wholesale repeal or partial deregulation on market-libertarian, neoliberal, or constitutional grounds (e.g., Braver & Somin, 2024; Glaeser et al., 2005; Gray, 2022). Yet, among the smart growth and new urbanist standard-bearers for zoning reform, industrial uses—and W&D by extension—remain an underexplored topic (Leigh & Hoelzel, 2012). Moreover, although a few studies have acknowledged the role of zoning in urban freight planning (see Box 1), there has been limited research examining how zoning explicitly governs the siting and spatial organization of freight-intensive land uses. This research gap is especially salient from an EJ perspective (Fried et al., 2024; Tejada & Conway, 2024).

The purpose of our study is to synthesize the state of recent U.S. zoning action responses to W&D development, with a focus on actions that center EJ principles. We analyzed 92 zoning action cases at the municipality, county, and state levels; built a typology that captures the breadth of discretionary and regulatory zoning actions taken, including considerations for long-term planning; assessed the level at which EJ principles feature in or inform these actions; and discuss here the integration of *zoning for (FELU/proximity) logistics* into a broader EJ context.

What we label *zoning actions* are elements of local and regional land use policies that can constitute a broader approach to managing urban freight transport, controlling emissions, and enhancing public participation. Figure 1 presents these actions as hierarchical: a long-term plan may introduce place types that include new W&D definitions, development standards, and use conditions.

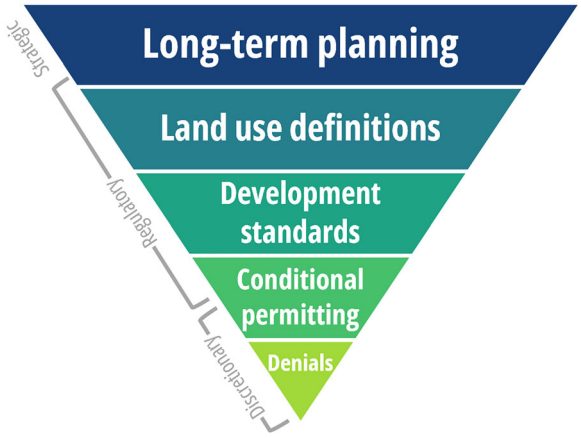

Figure 1. How zoning actions (center pyramid) fit into broader urban freight planning strategies.

Denying a rezoning permit, on the other hand, may not result in any higher-level change.

Analyzing zoning actions present challenges distinct from similar, national-level approaches to synthesizing urban freight planning strategies (e.g., Maxner et al., 2025). Despite state standardization laws homogenizing many jurisdictions' zoning codes, local regulations shaping W&D development can vary widely (Yuan, 2019). Neighboring municipalities typically do not coordinate freight-related land use decisions (Dablanc & Ross, 2012), sometimes using regulations and taxation in competition with each other to attract or discourage new industrial development (Chapple, 2018; Walker & Lewis, 2001). States also vary in the level of *police power* granted to local jurisdictions to govern private property rights, and institutional differences between zoning councils or boards can significantly influence decision making (Moore & Caporale, 2025).

There is no unified approach to zoning for logistics, and the extent to which zoning includes EJ principles varies across geographic and regulatory contexts. The following section describes our case study methodology to capture a typology of W&D-related zoning actions across the country.

Definitions, Data, and Methods

EJ principles are central to this study's analytical framing. Through its Planning Advisory Service (PAS) Report 608, the American Planning Association (APA) highlighted strategies that incorporate EJ principles into zoning codes, maps, and public participatory processes (Quattro, 2024). We distill here the definitions important to our approach:

- ***Disparate impact*** is a "discriminatory effect by a law on a [Title VI] protected class" (p. 12). The discriminatory effect may often be unintentional.
- ***Exclusionary zoning*** restricts land uses that homeowners typically perceive as threatening property values (Whittemore, 2021).

A zoning action creates disparate impact if it, for example, attracts W&D to overburdened or historically marginalized communities, or otherwise fails to mitigate its negative impacts. Exclusionary zoning can be a complementing force, such as by prohibiting W&D in wealthier single-family towns and neighborhoods. Disparate zoning can *pull* W&D to marginalized areas or make them easier to locate there; meanwhile, exclusionary zoning can make development more difficult in non-marginalized areas, effectively *pushing* these land uses away (e.g., Rothstein, 2017; Trounstine, 2020).

Public participation is also important to this study's approach. As the APA (2022) argued, "informed participation is critical to eliminating racism and discrimination in zoning" (p. 33). Their guide highlighted the importance of capacity building, representation on zoning boards, providing early and multiple public input opportunities for major projects, expanding public notification procedures and virtual engagement opportunities, presenting equity-based review criteria, and lessening the impact of NIMBY opposition by *limiting* public hearings when disparate impacts are not a concern. We then sampled national case studies and data from multiple sources, in line with Yin (2017), to synthesize a typology of approaches that incorporate EJ principles into W&D zoning actions.

Sample Selection

Our sample represents the forefront of zoning responses to W&D development. It is not intended to represent all zoning-related policies for W&D in the United States. To select our sample cases, we first reviewed policy scans relating to state and local EJ policies to identify regions taking proactive steps in regulating industrial development (e.g., Baptista et al., 2019). We also reviewed open geospatial platforms that track W&D development (e.g., Chicago Cityscape, 2024; Phillips & McCarthy, 2024). Frequently discussed regions include Southern California, Chicago (IL), and the New York City–Newark (NJ) metropolitan area. Next, we reviewed government websites and recent media reports to narrow our selection of counties and municipalities that have recently enacted zoning ordinances or permit reviews related to W&D. To expand the sample's geographic scope beyond these starting regions, we conducted a keyword search on recent media reports covering W&D development trends. We used two news aggregators (Newsbank Inc. and Google News), and the following search string:

> "environment*" OR "environmental justice" OR "pollution" OR "truck traffic" OR community OR zon* OR "overlay zon*" OR moratorium OR rezon*) AND (warehouse OR "distribution center" OR "delivery station" OR "fulfillment center" OR "last*mile"

We reviewed online, U.S.-based articles and excluded those with headlines and abstracts that did not concern W&D-related zoning (e.g., excluding articles pertaining to labor disputes). After pulling relevant municipalities, counties, and states from the articles, we conducted a deeper review of government documents to determine their relevance. This approach systematically captured the breadth of *recent* zoning responses to W&D development, especially in suburban locales where industrial zoning environments are largely overlooked despite the regional nature of logistics (Dablanc & Ross, 2012). In total, our study identified 92 cases at 67 locations (51 municipalities, 9 counties, and 7 states; Figure 2). *Cases* represent a zoning amendment, discretionary council action (pending or approved), or a state law with explicit mention of W&D uses. Accordingly, some locations offered more than one case. In the Online Appendix, we provide tables summarizing key demographic and policy information in the sampled jurisdictions (Tables A1–A3).

Data Sources

While media reporting helped narrow our case selection, we prioritized our analysis to primary sources when publicly available. Public documents serve not just as evidence for what they report, but as reflections of social contexts and meanings that require interpretation (Atkinson & Coffey, 2004). We included policy/ordinance texts, government memos, council meeting agendas/transcripts, zoning codes, long-term plans, and websites/reports from developers and advocacy groups, among other sources. In total, we used 213 documents to analyze the 92 cases.

These sources served as data in a document analysis methodology (Dalglish et al., 2021), which is applicable to case studies that construct rich,

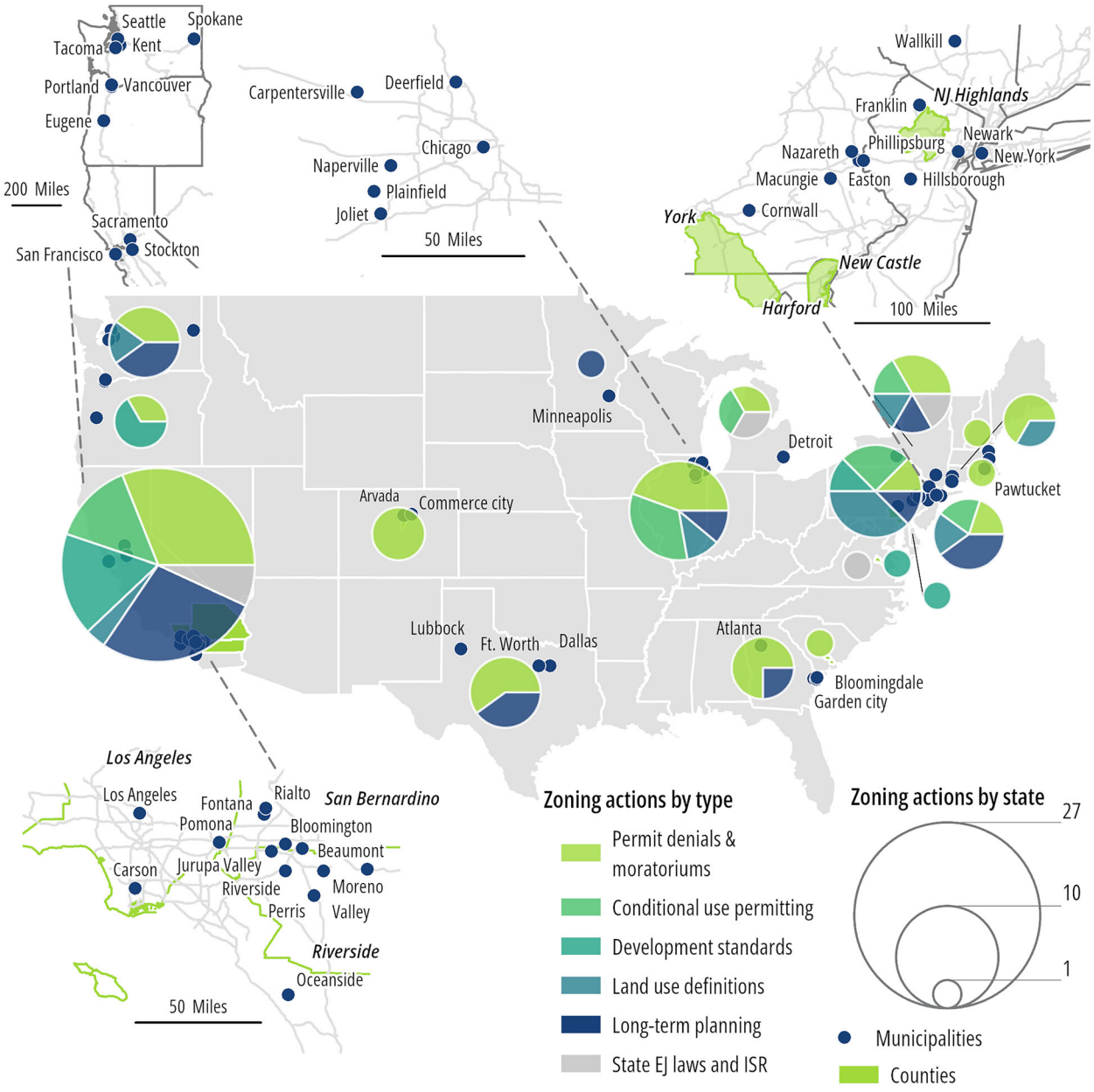

Figure 2. Sampled W&D-related zoning actions (n = 92).

comparative descriptions and typological frameworks (Katsela et al., 2022). However, generalizing case findings typically requires triangulation from multiple data sources. For instance, focusing solely on zoning texts and processes overlooks important supply chain and agglomeration factors that influence W&D siting (Kang, 2020; Rivera-Gonzalez et al., 2023), as well as instances of nonconformity where an existing land use does not match its designation on the zoning map (Hirt, 2013). Analyzing where W&D *can* locate is not the same as analyzing where they *are* located and *why*. Future studies could integrate mixed methods, such as spatially analyzing zoning maps and W&D locations (Tejada & Conway, 2024) and conducting interviews (Bjørgen & Ryghaug, 2022).

Our study achieved triangulation through multiple investigators. We each worked independently on a subset of case documents, with major policy documents reviewed by several authors to ensure robust interpretation. We met regularly to cross-verify interpretations and to minimize single-researcher bias, and without documented disagreement. We also provide access to our case study spreadsheet that summarizes the coding structure and contains links to analyzed documents to establish a chain of evidence that ensures replicability of findings (Yin, 2017).[1]

Zoning Action Typology and Coding

In conceptualizing FELU, Holguín-Veras et al. (2022) analyzed W&D-related zoning actions. Though they identified a zoning typology that serves as an initial structure for our coding analysis, the study did not consider EJ issues. For instance, the authors suggested it is "natural" that communities support relocating major W&D away from their homes, and acknowledged the potential for unintended consequences (p. 66). They highlighted the case of the Port of New York, where in the 1950s, authorities relocated major port activity from Manhattan to a less freight-efficient location in Newark. Though not discussed by the authors, this relocation also highlights the institutional, push-pull dynamics described above. Jacobs (1961) famously linked urban renewal efforts to the displacement—or *push*—of workers and some industry from Manhattan. Meanwhile, in Newark, a combination of factors facilitated the *pull* of industries into immigrant and working-class neighborhoods. Receiving communities, such as the Ironbound, remain de facto environmental "sacrifice zones" to this day (Winokur, 2020). Therefore, an EJ perspective focuses not just on where W&D are located or relocated, but on the cumulative and disparate impacts it causes.

Another significant omission of EJ perspectives in urban freight planning is the lack of meaningful public participation (Fried et al., 2024). In recent years, efforts have expanded to include more extensive community engagement for major freight-related projects (Fried & García, 2024, p. 193–195). Nevertheless, discussions on integrating freight stakeholder consensus into planning focus primarily on public- and private-sector decision makers (Holguín-Veras et al., 2022, p. 24–26).

Integrating EJ into zoning strategies for freight-efficient development requires considerations for public health protections and meaningful participation for communities disparately affected by freight transport. Holguín-Veras et al.'s typology served as conceptual themes that supported a structural coding analysis of selected documents (Saldaña, 2009). Structural codes segment the data into thematic typologies predetermined by existing research, which we then supplemented with additional data; in our case, by coding for in vivo and descriptive mentions of EJ principles. These precoded typologies are:

- **Long-term planning** (n = 17) offers comprehensive land use goals and timelines for policy implementation.
- **Regulatory controls** (n = 17) include ordinances and zoning text amendments.
- **Discretionary approaches** (n = 45) include case-by-case decisions made by zoning boards or councils.

We also examined state-level laws that may not amend local zoning per se, but will affect W&D development through environmental pre-emption and regulatory guidance (n = 13; see Online Appendix Table A3). Our coding method identified additional subtypologies embedded in regulatory controls (*development standards* and *land use definitions*) and discretionary approaches (*permit denials/moratoriums* and *conditional use permitting*). Long-term planning strategies also contain nuance. In some cases, planning documents are largely vision based or suggestive with limited regulatory requirements (e.g., model ordinances). Others align economic and socioenvironmental goals with broad overhauls to zoning codes. Although our study mostly analyzed approved permit decisions and regulations (n = 51), we also included proposals that were still pending decisions and strategic plans/model ordinances that inform best practices. We review the results below.

Results

Figure 3 summarizes the 92 zoning actions by type, year, region, and status. Most zoning actions occurred recently (76 occurred after 2020), which may be an outcome of increased media and political attention or newer state environmental laws concerning W&D and EJ issues. In 2016, for instance, California passed Senate Bill 1000, which required local agencies to include EJ elements in strategic plans. Most approved or proposed zoning actions in the state cited the policy. However, most actions outside of California—and long-term planning documents in major cities—did not cite EJ principles. The following sections describe some notable exceptions across zoning action types.

Permit Denials and Moratoriums

Moratoriums and permit denials are the most common response to newer W&D (n = 32). Denials apply to projects seeking discretionary permitting, such as for rezoning and variance applications. Moratoriums temporarily pause applications until cities enact more proactive policy measures, developers

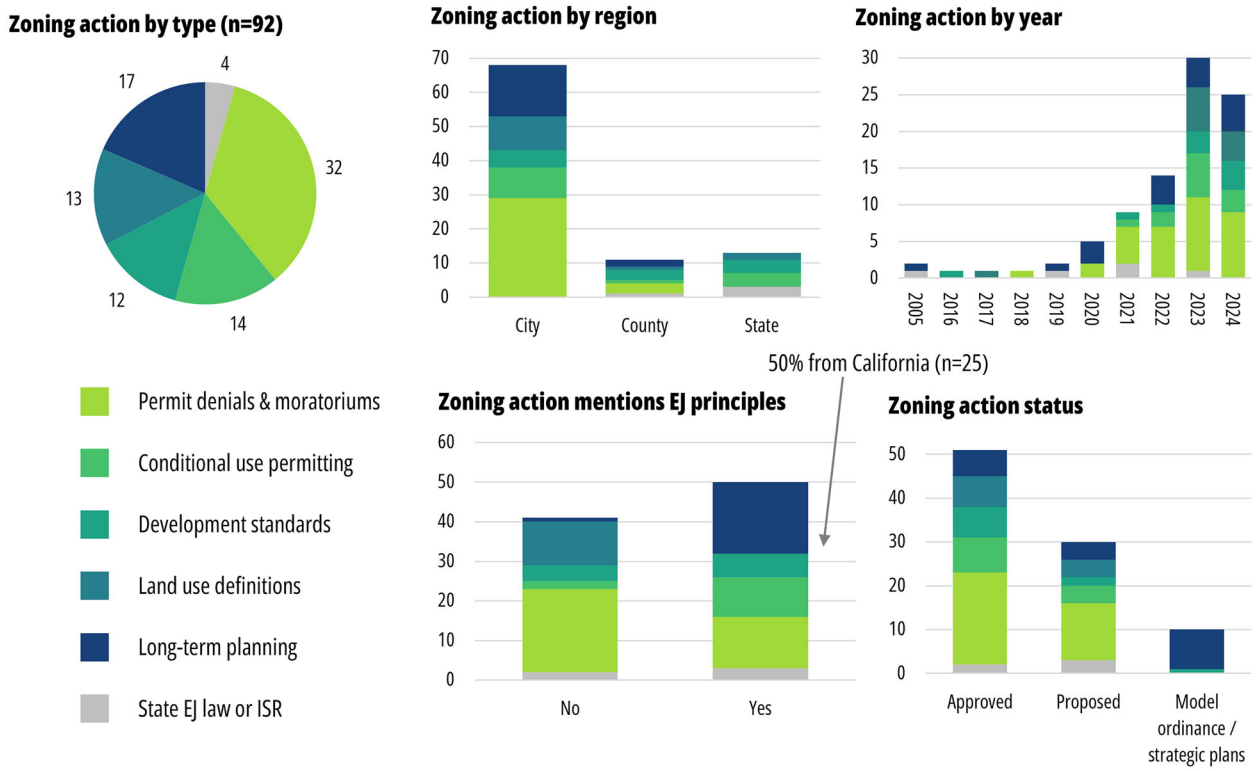

Figure 3. Overview of sampled zoning actions.

complete certain impact assessment studies, and/or implement agreed-upon traffic mitigation measures or community benefits agreements (CBAs). During discretionary permitting processes, zoning councils are often required to solicit community input through public hearings. In some cases, developers revise site plans in response to community input. In Oceanside (CA), the developers offered a reduced floorspace and loading zone plan for a proposed facility in an Airport Overlay Zone. In others, communities can pressure developers to withdraw projects. In West Dallas (TX), the developer dropped a planned 277,000-sq-ft distribution center after litigation from a church congregation that alleged environmental racism.

Since most zoning codes permit W&D development *by right*, the reasons for denials or conditions are project specific. Figure 4 summarizes denied and review-pending projects. Nearly half of the projects were greenfield development (i.e., rezoning agricultural land to industrial), whereas a quarter were brownfield (i.e., repurposing abandoned industrial or contaminated sites). Only nine projects sought to develop smaller micro-fulfillment/last-mile, mixed-commercial facilities, or adaptively reuse abandoned commercial sites. As such, most projects were expansive: The average facility size was roughly 1 million sq ft in floorspace. The largest proposal was a 6-sq-mile logistics park in Will County (IL).[2] The proposal's size and infrastructure needs created an ongoing annexation dispute between nearby villages and Joliet, the state's third largest city and a major intermodal freight hub.

Though pollution and traffic were common concerns, only one in three cases raised EJ issues. Other cases framed their opposition to new W&D around other issues. For instance, New Castle County's (DE) planning board emphasized the preservation of *community character* in reviewing new W&D permits (see Figure 4). In contrast, cases explicitly citing EJ concerns included:

- **Detroit (MI)** granted developers $33 million in tax incentives to redevelop the abandoned American Motor Corp. headquarters with an 800,000-sq-ft W&D. The project fell $2 million shy of the $75 million threshold that would require a CBA between the developer and the low-income neighborhood (Saha et al., 2024).
- In **Bloomington (CA),** an unincorporated municipality in San Bernardino County and home to predominantly Spanish-speaking residents, developers demolished 117 houses and an elementary school to build a 213-acre logistics park. Community groups successfully litigated the county, alleging the development violated state

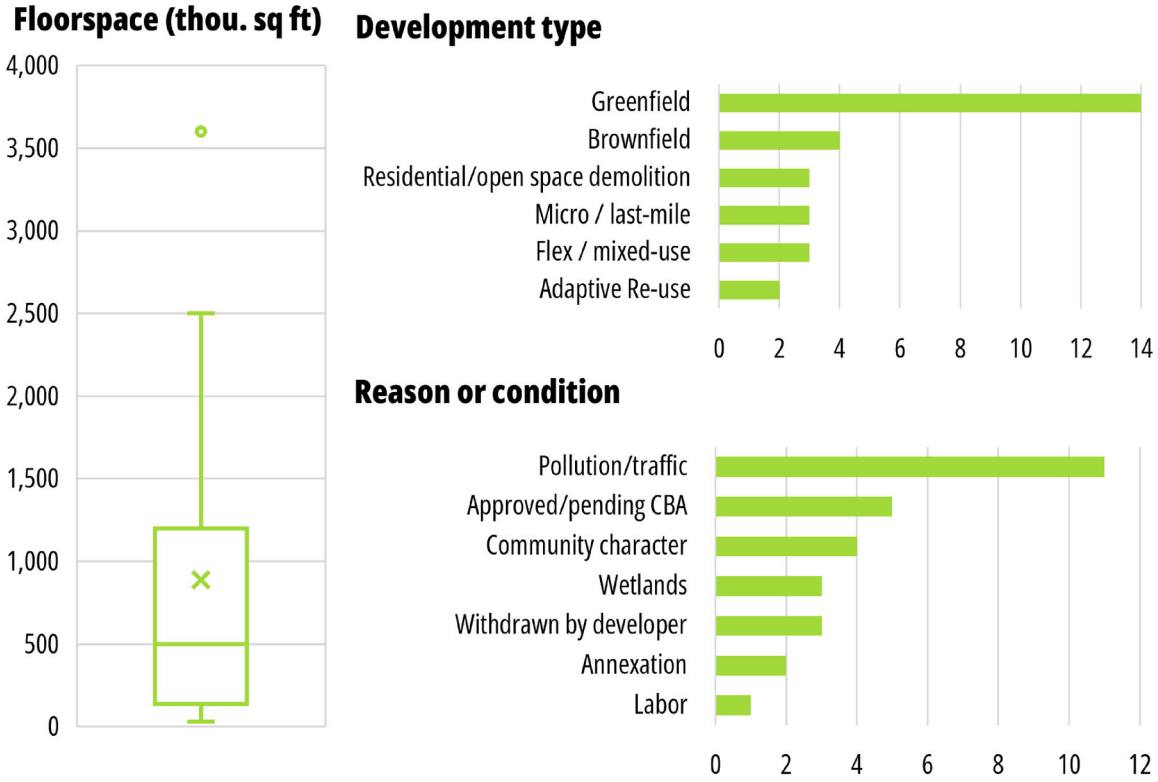

Figure 4. Summary of permit denials and pending decisions by size, development type, and council-stated reasons for denial or conditional approval (n = 29). Figures do not include moratoriums that were not project specific (n = 3).

environmental protections and that the county failed to provide Spanish-language notices and hearings. The developer must redo the Environmental Impact Review and site plan, which will include provisions for a CBA.

- **Pawtucket (RI)** is considering the sale of a public baseball field to a developer seeking a 500,000-sq-ft W&D. Residents of the low-income neighborhood claimed the baseball field is the only accessible greenspace in the district. State laws require permissions from state and national agencies before the council can sell public land to developers. The state Department of Environmental Management raised EJ concerns surrounding the sale.
- **Tacoma (WA)** approved a 150-acre development on an abandoned rail terminal, which neighborhood groups unsuccessfully appealed in 2023. The state Department of Ecology leveraged its authority over stormwater management to pause the project and secure a $9 million settlement to support air quality monitoring and traffic mitigations.

In the latter three cases, state environmental agencies played a mediating role in development outcomes (e.g., requiring full environmental reviews or prescribing mitigations), though state agencies are limited in their ability to stop or conditionalize development without pre-emptive policy. However, in addition to ad hoc council decisions on development permits, jurisdictions can also deliberate on what projects necessitate further conditions and public participation through conditional use permitting.

Conditional Use Permitting

Conditional use permitting (CUP) or authorization (CUA) constituted 14 cases. CUP establishes additional criteria for development before discretionary permit approval. These criteria can encompass impact reporting, facility operations, and public participation processes. Box 2 summarizes five prominent CUP provisions in major population areas.

Most CUP place facility size and distance from *sensitive receptors* (SR) requirements for W&D facilities. Chicago places thresholds of 10 acres and 660 ft from housing, open spaces, hospitals, daycares, and schools. The ordinance has raised criticism from both developers and EJ groups. Developers claim district-level discretion—or member deference—creates uncertainty in what traffic and air quality mitigations are acceptable for

Box 2. Overview of CUP processes in major jurisdictions.

	Ordinance	Applicable W&D facilities	Conditions for approval
Chicago	Air Quality Ordinance	• Facility lots > 10 acres; • Facilities < 660 ft from sensitive use	• Devs complete traffic study and air quality study • Devs host at least 1 community meeting in host district • Dev standards subject to Planned Development uses
San Francisco	Parcel Delivery Service CUA	• All uses except for cannabis-related facilities • Conditions for facilities > 5,000 sq ft	• EV charging installation • Devs complete traffic and emissions study • Commission complete economic study (jobs, public revenue) • Idling no more than 3 minutes • Facility is primary use
New York City	Last-mile Warehouse Special Permit (proposed)	• Facilities > 50,000 sq ft • Primary use is e-commerce	• Facilities > 1,000 ft from sensitive use • Facilities > 1,000 ft from other last-mile facilities • Some facilities conduct 80% of delivery via marine transport • Devs complete traffic and air quality study • Devs submit annual report on truck usage • Commision may request conditions (e.g., EV/bike adoption)
Sacramento	Truck usage in N. Sacramento (interim ord.)	• Facilities in industrial zones; • Facilities <1,000 ft from sensitive use • Major modifications of existing facilities subject to review/hearing.	• Not specified
Los Angeles County	Green Zones	• Facilities in GZ overlay • Facilities > 100,000 sq ft • Facilities < 500 ft from SR	• No outdoor loading operations 6:00 pm–8:00am • Idling no more than 5 minutes • WAIRE compliance • Zero emission off-road and landscaping equipment • 100 ft buffer on lot line closest to sensitive uses • Permitting varies by impacts determined in Site Plan Review

approval and can freeze development altogether. EJ groups argue the ordinance does little to stop-gap development if burdens are high or ensure community input is captured in projects. Meanwhile, only NYC and San Francisco's (CA) CUP provisions consider implications of last-mile delivery. Whereas San Francisco's implementation adds restrictions to facilities regardless of size, NYC's version explicitly seeks to reduce development near schools, parks, nursing homes, and public housing. The latter city offers conditions for development, including the adoption of e-cargo bikes and waterborne freight modes to mitigate traffic impacts.

Green zones (GZs) also aim to minimize industrial concentration in disadvantaged communities. Los Angeles County defines GZs as regions with a high concentration of stationary pollution sources near SR, among other demographic indicators. While the regulation sets development standards for many existing and future W&D within GZs, it also institutes a tiered discretionary process that includes public hearings and appeals for site plans deemed to have the most impact.

When and *how* developers and planning boards engage the public are central facets to CUP processes. Los Angeles County requires notices for residents within 300 to 500 ft of the project and a 15- to 30-day comment period, depending on project impact. New Jersey's EJ Law requires "meaningful" public participation within 200 ft of the project area and a 60-day comment period. The state's guidelines recommend multi-language circulation of project plans in newspapers and social media, as well as invitations to local EJ groups, schools and daycares, and faith-based organizations for in-person and virtual meetings.

CUP offers flexibility to deny or modify development to suit local contexts and community needs. However, their discretionary nature raises concerns from both community groups and developers, especially in cases where limited state guidelines and protections exist. On the other hand, development standards and land use definitions offer firmer regulatory controls that can dictate where facilities can locate and how they operate, particularly near SR.

Development Standards

Enhanced development standards constituted 12 observations in the sample, including one approved

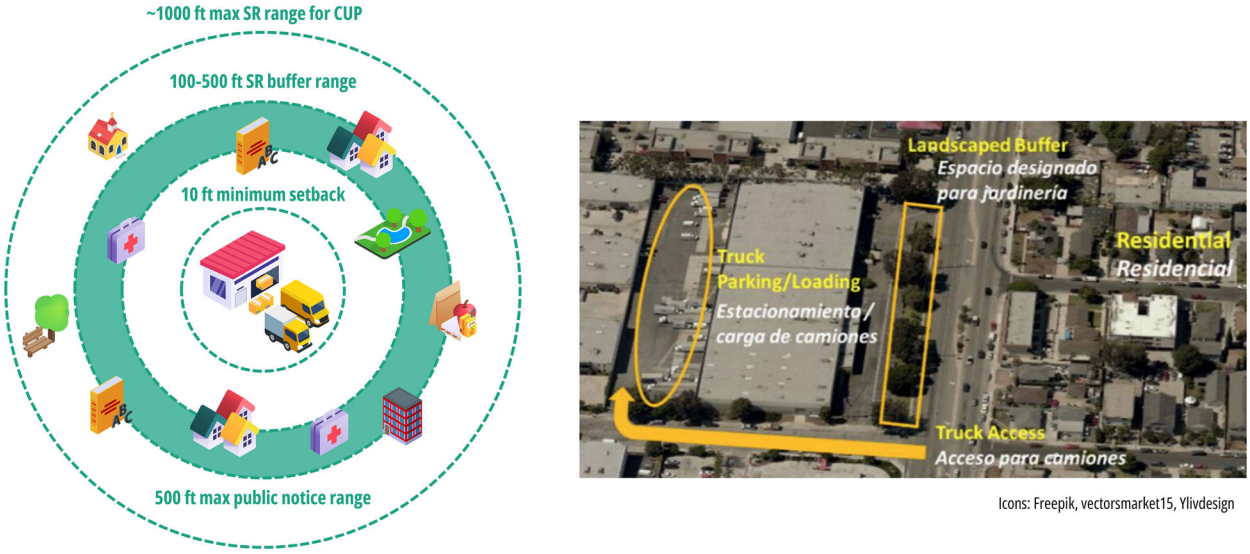

Figure 5. Observed buffer ranges in sampled development standards (n = 12) and example of SR-based site design for W&D. Source: Los Angeles County, 2024.

state-level policy, California's Assembly Bill 98, and three model ordinances from PennFuture (a Pennsylvania-based nonprofit), New Jersey, and California Attorney General Rob Bonta. Development standards offer construction, site design, and operational requirements—or best practices—that can minimize traffic-related impacts, particularly for nearby SR. Definitions for SR vary across zoning codes and state policy. They can encompass residences, schools, daycare centers, health clinics, nursing homes, places of worship, parks, community centers, and historical sites.

Development standards commonly increase buffering and screening requirements for lot lines adjacent to SR. Observed buffers vary widely, ranging from 10-ft setbacks to a 500-ft separation between truck loading doors and an SR property line (see Figure 5). However, the buffer distance necessary to effectively mitigate adverse health effects from truck traffic remains an open question. Air pollution, for instance, can exceed background concentrations within 500 and 1,600 ft of major roadways, depending on wind direction and vehicle operating conditions (Samuels & Freemark, 2022). Vegetative screening can improve pollution absorption, including for noise and ground contaminants; however, its effectiveness varies among pollutant type, vegetation density, and species composition. Standards can also require truck routing and facility entrances to orient away from SR, and place maximum times on truck idling. All four state-level actions and three local-level actions (e.g., Stockton [CA] for W&D > 100,000 sq ft) required zero-emission offroad equipment, solar readiness, and heavy-duty EV charging readiness, even offering regulatory exemptions for facilities serving zero-emission trucks.

All state-level development standards enhance public participatory procedures. PennFuture proposed W&D developers submit a community impact analysis to inform council decisions. Although impact analyses theoretically hold developers environmentally accountable, conflicts arise when data and methods are not openly communicated. For instance, communities in Tacoma (WA) and Commerce City (CO) questioned the impartiality and accuracy of developer-determined traffic impacts. New Jersey's model ordinance and Bonta's (2022) W&D best practices emphasized the importance of early and robust community engagement, including strong communication practices. They proposed creating a technical advisory group with seats dedicated to community members, as well as enforcing CBAs to compensate affected residents.

California's AB 98 stipulated a more data-driven accountability approach. The bill called for the deployment of mobile air monitoring systems in Riverside and San Bernardino counties to measure air pollution in communities near logistics land uses. Revenues generated from South Coast Air Quality Management District's (SCAQMD) Warehouse ISR also fund efforts that improve air quality in areas with high W&D concentrations. Funds include rebates for zero and near-zero emission trucks, charging infrastructure, and air filtration systems in homes and SR near W&D.

Box 3. Observed definitions of W&D and permitted zones.

Observed W&D classifications	Common use definition(s)	Typically permitted zones
Mini Warehouses, Mini Storage, Self Storage	Enclosed storage spaces for rent or lease to the general public, including self-storage facilities.	General/light industrial, commercial, some mixed-use overlays
Micro Fulfillment, Micro Distribution	Short-term storage of goods intended for on-demand home delivery; floorspace between 2,500 and 30,000 sq ft.	General commercial, light and medium industrial, some mixed-use overlays
Last-mile Fulfillment, Local Delivery Center, Parcel Delivery Service/Facility	Temporary storage, sorting, and redistribution of e-commerce goods for last-mile delivery, typically truck-to-van cross-docks.	General and light industrial areas, airport and port overlays
Fulfillment Centers	Longer-term storage of e-commerce goods, characterized by higher frequency truck traffic and extended-hour operations.	General and light industrial
High-Cube Facilities	High-automated storage or goods consolidation, characterized by higher frequency truck traffic. Can exceed 250,000 sq ft in floorspace and 50 ft in height.	General and light industrial, airport and port overlays
Retail Sales Warehouse	Wholesale retailers that emphasize the packaging and sale of products in large quantities or volumes.	General and light industrial, general and auto-dependent/highway commercial
Logistics/Distribution/Break-bulk Facilities	Storage and/or cross-docking of manufactured goods, and (sometimes) raw or hazardous materials, characterized by higher frequency truck traffic. Can exceed 250,000 sq ft in floorspace.	General and light industrial, airport and port overlays
Cold Storage	Refrigerated storage, wholesaling, and distribution facility for temperature-sensitive items. May require auxiliary power for refrigerated trucks to limit idling during loading.	General and light industrial, airport and port overlays.
Outdoor Storage	Outdoor pallet/container storage for any purpose besides display and truck terminals.	General and light industrial, general and auto-dependent /highway commercial
General/ Traditional Warehousing and Storage	Indoor long-term storage of goods, which may include sorting/cross-docking/value-added services.	General and light industrial, some mixed-use overlays, airport and port overlays
Freight/Truck/Intermodal Terminals	Indoor or outdoor storage and transloading, typically serving rail and long-haul trucking, characterized by heavy truck traffic.	General industrial, some port overlays

Land Use Definitions

Land use definitions determine where W&D are permitted by right, their general purpose, and where they can specify development standards and CUP provisions. The sample included 13 cases featuring 11 distinct definitions of W&D with some overlapping terminology (see Box 3). Precise definitions can be important for targeting effective site mitigations and participatory processes for facilities with the most significant traffic impacts. However, as PennFuture argued, developers often build W&D *on speculation* with limited information about future tenants and their traffic generation. Their model ordinance instead recommends defining standards based on expected facility size.

Nevertheless, W&D were permitted in nearly all industrial zones regardless of definition and size. Few cases permitted W&D in denser commercial and mixed-use zones. Most notably, NYC's City of Yes initiative recommended *micro distribution* facilities in Manhattan's neighborhood commercial districts (W&D $<$ 2,500 sq ft) and central business district (ground-floor W&D $<$ 5,000 sq ft) to encourage cargo bike mode shift and improve last-mile efficiency.

In general, however, sampled land use amendments created further restrictions on W&D. Definitions are powerful tools that jurisdictions can use to *zone out* or exclude certain types of W&D from light industrial zones, or even industrial development entirely. Vancouver (WA) prohibited

W&D > 250,000 sq ft from light industrial zones citing air pollution and climate concerns, while Deerfield (IL)—a wealthy Chicago suburb—removed several W&D definitions from permitted light industrial uses. These amendments, according to developers, can effectively freeze W&D development within the jurisdiction. However, there is little indication that these changes were intended to deconcentrate freight activity in historically burdened communities. For instance, we observed no regulatory cases of phasing out W&D that stopped conforming to amended land use definitions, such as through an amortization clause, a proposal advanced by EJ groups in Lubbock (TX). Restricting W&D expansion without relocating or mitigating the cumulative burdens of existing facilities fails to address disparate freight impacts.

Long-Term Planning

Explicit references to EJ principles in long-term planning documents varied widely. Atlanta (GA) and Dallas cited EJ principles in their *Place Type* zoning reform, a hybrid code informed by form-based principles, though only offering broad considerations for urban freight and industrial development. Meanwhile, Minneapolis (MN) has adopted a GZ model, although with less regulatory control than its Los Angeles County counterpart.

Generally, secondary city/suburban plans contained fewer provisions for reducing disparate impacts than center cities. Plans centered economic goals to preserve industrial land and encourage flexible, higher-density industrial development. Carson, adjacent to California's San Pedro Bay Ports, designated several Flex Districts that mix commercial, residential, and light industrial uses up to 5 stories. These districts permit W&D less than 30,000 sq ft. However, the plan more explicitly promoted higher-tech manufacturing rather than freight-efficient development. This goal mirrored Kent's (WA) emphasis on boosting competitiveness in the aerospace sector by imposing restrictions on truck loading doors that limit W&D development. The findings are like other studies that observed W&D offer less attractive development opportunities for cities than commercial and manufacturing uses (Dablanc & Ross, 2012).

Newark's plans encouraged more flexible industrial development while enacting policies that seek to mitigate disparate impacts and improve public participation. The city's EJ and Cumulative Impact Ordinance is a broad CUP provision that establishes public health–based review criteria. In addition, though their plan mentioned removing W&D larger than 50,000 sq ft from light and medium industrial zones, they also proposed permitting cargo bike–based micro-distribution models in nonindustrial areas. Los Angeles also integrated EJ principles more holistically. The city's hybrid zoning reform created flexibility in development (e.g., permitting W&D smaller than 50,000 sq ft in some mixed-use zones) while strengthening CUP provisions and health-related development standards. It also offered avenues to deconcentrate industrial land in overburdened communities: One ordinance in Wilmington-Harbor City prohibited new truck terminals except those using zero-emission fleets. Meanwhile, Seattle's Industrial and Maritime Strategy highlighted the economic importance of preserving industrial land while also recommending some industrial rezones in historically marginalized neighborhoods.

Discussion and Conclusion

Scholars have long explored the public health effects of disparate industrial zoning (Quattro, 2024) and state-level policy responses (Baptista et al., 2019). When it comes to W&D-related impacts and zoning, however, we observed most local actions relied on or enhanced discretionary procedures. Of these, a minority of non-California cases considered EJ principles. Though our study offers examples of councils and developers aligning with EJ groups—usually following appeals or litigation—these processes come with drawbacks. For instance, public hearings may require a level of participation (e.g., attending an evening, workday meeting at City Hall) that presents barriers for many marginalized population groups and may ultimately have little bearing on council decisions (Moore & Caporale, 2025; Whittemore & BenDor, 2019). As such, the statutory minimum for public participation and council discretion does not guarantee EJ outcomes.

On the other hand, zoning regulations can enhance standards for development and public participation, as well as redefine industrial uses near marginalized populations. We outline several measures that intend to mitigate traffic-related impacts for nearby SR. However, it is unclear whether protections are sufficiently robust. A 100-ft buffer around a new W&D may not reduce chronic hazard exposure for nearby populations, especially near

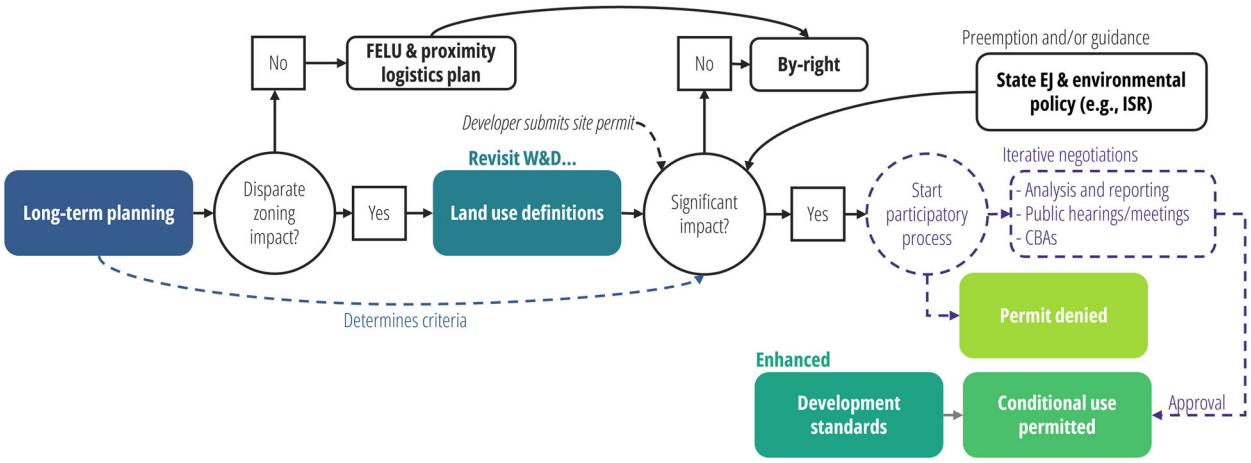

Figure 6. Decision pathways toward equitable and healthy development for urban freight.

industrial areas and major truck routes where concentrated freight activity generates pollution and other cumulative impacts that can extend well beyond property lines. While most observed zoning actions restricted by right W&D development, improving health outcomes in communities most affected by freight traffic was a rarely cited goal. Exceptions typically cited state laws and long-term planning objectives, pointing to the important role played by state environmental preemption and planning in local governance (Baptista et al., 2019; Yuan, 2019).

However, tightening W&D regulations adds development costs that risk the relocation of facilities to less freight-efficient areas (Holguín-Veras et al., 2022), and—if EJ is not considered—into economically and politically marginalized communities. Long-term planning can help identify scenarios for when to stop or conditionalize W&D development in overburdened communities, and when to relax controls and apply incentives to encourage FELU and proximity logistics. These strategies will vary by context, as jurisdictions must frequently balance competing political, social, and economic pressures, such as demands to preserve urban industry or expand housing supply through rezoning industrial land (Chapple, 2014). Figure 6 outlines pathways toward equitable development for urban freight in cases of disparate and significant impacts. These cases require public participation measures that identify how FELU/proximity logistics can meet local needs, including those of marginalized communities.

Implications for FELU and Proximity Logistics

Better integrating W&D into urban areas, particularly outside of industrial zones, will face challenges. Since its inception, zoning has served to shield homeowners from the noise, pollution, and working-class apartment buildings that industrial activities brought (Hirt, 2014). Our results suggest these exclusionary dynamics persist today. EJ activists in Newark and coastal Georgia—where low-income and minority communities have long borne a disparate share of freight impacts—have argued that serious policy attention toward *warehouse sprawl* emerged only after W&D began encroaching on wealthier, predominantly single-family towns and neighborhoods. This observation echoes findings from Scally and Tighe (2015), who showed how homeowners can leverage environmental concerns to oppose developments they perceive to threaten property values, namely those associated with increased traffic or low-income housing. For example, Bloomingdale's (GA) moratorium included both W&D and multifamily residential development. In another instance, a Connecticut state legislator used a budget amendment to restrict W&D in towns with populations between 6,000 and 8,000—effectively blocking a W&D project in a high-income town within their district. The same legislator later opposed a mandated housing density bill, citing the need to preserve home rule.

NIMBYism is also likely to challenge W&D in some freight-efficient areas. In response, new industrial urbanist scholars have proposed strategies for improving the compatibility of industrial uses with nearby residents and businesses (Ferm et al., 2021; Hatuka & Ben-Joseph, 2022). Research offers context-specific designs for mixed-use industrial facilities and their architectural interfaces with neighborhoods (Boeck & Ryckewaert, 2020; Lane & Rappaport, 2020), and for complete streets and place-making strategies that integrate people and

goods mobility (Buldeo Rai, 2024; Conway, 2024). E-commerce has spurred developers to re-urbanize some W&D, at times transforming them into chic, low-carbon, and mixed-use facilities to blend into neighborhood environments (Marshall, 2020). In that vein, cities should also broaden policies to support EJ and prevent economic displacement (Anguelovski, 2016). Research has only just begun to explore the linkage between reduced W&D density and gentrification (Qin et al., 2024).

One promising strategy involves CBAs, which establish concessions between developers and communities near proposed facilities (Buldeo Rai, 2023). One proposed CBA in San Francisco, for example, includes local hiring quotas, union protections, vehicle electrification requirements, and funds for greenspace, solar roofs, transit, and affordable housing. By providing tangible benefits, CBAs can supplement the oft-problematized economic promises associated with logistics-related development (Fried & García, 2024), while also better integrating W&D into urban environments.

Conclusion and Future Directions

The rapid expansion of W&D has prompted a wave of local and state regulations seeking to mitigate urban freight's disparate and adverse impacts. Our study is a first effort to synthesize the state of recent W&D-related zoning actions as a tool for protecting public health, particularly in areas historically burdened by freight traffic. We offer the following takeaways:

- **Local jurisdictions lack a unified regulatory approach to W&D.** Discretionary permitting was the most common response to new W&D development. These approaches can offer important opportunities for public participation and enhanced development conditions; however, without higher-level policy, development may not align with planning or community priorities.
- **Zoning actions largely restrict W&D.** Most regulatory controls added definitions, standards, and conditions intended to limit by right development. Some exceptions included cities updating zoning codes to allow for mixed-use micro-distribution.
- **EJ principles are not a central feature in most observed restrictions.** Most actions cited aesthetic or environmental concerns unrelated to W&D's disparate impacts, a possible indicator of broader exclusionary zoning practices that research has linked to contemporary socioeconomic and racial segregation (e.g., Rothstein, 2017; Trounstine, 2020) and health disparities (e.g., Prasanth et al., 2024).
- **Local jurisdictions with EJ-explicit actions have supporting long-term plans, as well as state policies and guidelines.** To borrow from Yuan (2019), local planning matters. But so does state policy (Baptista et al., 2019). Ensuring EJ factors into freight-related land use decisions require clear strategic priorities and environmental safeguards for vulnerable communities.

Our study comes with limitations that offer future avenues for research. First, we did not analyze zoning maps, which one would need to determine the extent of disparate zoning in our sample (Quattro, 2024). Including zoning maps, however, would have made it difficult to evaluate the quantity and heterogeneity of jurisdictions included in the study, especially given the limited availability of open land use data. Ongoing initiatives like the National Zoning Atlas can help support nationally comparative zoning analyses (Safavian et al., 2024). However, the Atlas offers limited information for nonresidential land uses as of 2024.

Second, we did not consider spatio-economic and supply chain factors that influence W&D siting decisions (Kang, 2020; Rivera-Gonzalez et al., 2023). As Bowen et al. (2009) suggested, economic agglomeration factors may outweigh institutional and sociodemographic factors in explaining disparities in industrial facility siting. Moreover, developers and property owners can play an important role in mitigating freight's negative externalities (Brettmo & Sanchez-Diaz, 2022). Future studies can explore the role of incentive zoning, such as tax increment financing, which can potentially support these private-led actions (Holguín-Veras et al., 2022). After all, zoning for more equitable and healthy urban freight does not guarantee that such development will occur.

Notes

1. DOI for summary of coded data and links to all sources analyzed: https://doi.org/10.5061/dryad.qjq2bvqsm.
2. Not visualized in the Figure 3 boxplot, as expected facility floorspace is unknown.

Funding

This research was conducted under contract to the Health Effects Institute (HEI), an organization jointly funded by the U.S. Environmental Protection Agency

(EPA; Assistance Award No. CR-83590201) and certain motor vehicle and engine manufacturers. The contents of this article do not necessarily reflect the views of HEI, or its sponsors, nor do they necessarily reflect the views and policies of the EPA or motor vehicle and engine manufacturers.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Notes on Contributors

Travis Fried tfried3@uw.edu
Carla Tejada ctejadal@uic.edu
Sarah Dennis-Bauer srdennis@uw.edu
Otgondulam Bolbaatar oboldb3@uic.edu
Anne Goodchild annegood@uw.edu
Julian D. Marshall jdmarsh@uw.edu
Oliver Olmedo oolmedo@uw.edu
Lizándro García lgarcia2422@gmail.com

ORCID

Travis Fried http://orcid.org/0000-0001-9076-487X
Carla Tejada http://orcid.org/0000-0001-5235-9283
Sarah Dennis-Bauer http://orcid.org/0000-0002-2169-5046
Julian D. Marshall http://orcid.org/0000-0003-4087-1209

References

Aljohani, K., & Thompson, R. G. (2016). Impacts of logistics sprawl on the urban environment and logistics: Taxonomy and review of literature. *Journal of Transport Geography*, *57*, 255–263. https://doi.org/10.1016/j.jtrangeo.2016.08.009

American Institute of Architects NY (AIANY). (2022). *Delivering the goods: NYC urban freight in the age of e-commerce*. https://www.aiany.org/membership/special-projects/project/delivering-the-goods-nyc-urban-freight-in-the-age-of-e-commerce/

American Planning Association (APA). (2022). *Equity in zoning policy guide*. https://planning-org-uploaded-media.s3.amazonaws.com/publication/download_pdf/Equity-in-Zoning-Policy-Guidev2.pdf

Anguelovski, I. (2016). From toxic sites to parks as (green) LULUs? New challenges of inequity, privilege, gentrification, and exclusion for urban environmental justice. *Journal of Planning Literature*, *31*(1), 23–36. https://doi.org/10.1177/0885412215610491

Atkinson, P., & Coffey, A. (2004). Analysing documentary realities. In D. Silverman (Ed.), *Qualitative research: Theory, method, and practice* (2nd ed.). Sage Publications.

Baptista, A. I., Sachs, A., & Rot, C. (2019). *Local policies for environmental justice: A national scan.* Tishman Environment and Design Center. https://www.nrdc.org/sites/default/files/local-policies-environmental-justice-national-scan-tishman-201902.pdf

Bjørgen, A., & Ryghaug, M. (2022). Integration of urban freight transport in city planning: Lesson learned. *Transportation Research Part D: Transport and Environment*, *107*, 103310. https://doi.org/10.1016/j.trd.2022.103310

Boeck, S. D., & Ryckewaert, M. (2020). The preservation of productive activities in Brussels: The interplay between zoning and industrial gentrification. *Urban Planning*, *5*(3), 351–363. https://doi.org/10.17645/up.v5i3.3092

Bowen, W. M., Atlas, M., & Lee, S. (2009). Industrial agglomeration and the regional scientific explanation of perceived environmental injustice. *The Annals of Regional Science*, *43*(4), 1013–1031. https://doi.org/10.1007/s00168-008-0239-6

Braver, J., & Somin, I. (2024). *The constitutional case against exclusionary zoning (SSRN Scholarly Paper 4728312)*. Social Science Research Network. https://papers.ssrn.com/abstract=4728312

Brettmo, A., & Sanchez-Diaz, I. (2022). Property owners as possible game changers for sustainable urban freight. *Research in Transportation Business & Management*, *45*, 100745. https://doi.org/10.1016/j.rtbm.2021.100745

Buldeo Rai, H. (2023). Urban warehouses as good neighbors: Findings from a New York City case study. *Transportation Research Interdisciplinary Perspectives*, *19*, 100823. https://doi.org/10.1016/j.trip.2023.100823

Buldeo Rai, H. (2024). A place for logistics: Perspectives from the placemaking literature. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*. Advance online publication. https://doi.org/10.1080/17549175.2024.2394198

Buldeo Rai, H., Kang, S., Sakai, T., Tejada, C., Yuan, Q., Conway, A., & Dablanc, L. (2022). "Proximity logistics": Characterizing the development of logistics facilities in dense, mixed-use urban areas around the world. *Transportation Research Part A: Policy and Practice*, *166*, 41–61. https://doi.org/10.1016/j.tra.2022.10.007

Chapple, K. (2018). The fiscal tradeoff: Sprawl, the conversion of land, and wage decline in California's metropolitan regions. https://escholarship.org/uc/item/4k71s79p

Chapple, K. (2014). The highest and best use? Urban industrial land and job creation. *Economic Development Quarterly*, *28*(4), 300–313. https://doi.org/10.1177/0891242413517134

Chicago Cityscape. (2024). *Chicago zoning changes & ordinances*. https://www.chicagocityscape.com/ordinances.php#/?full_text=warehouse

Cidell, J. (2011). Distribution centers among the rooftops: The global logistics network meets the suburban spatial imaginary. *International Journal of Urban and Regional Research*, *35*(4), 832–851. https://doi.org/10.1111/j.1468-2427.2010.00973.x

Conway, A. (2024). Accounting for freight in modern urban planning and design. In L. Tavasszy, M. Browne, & M. Piecyk (Eds.), *Advances in Transport Policy and Planning* (Vol. 14, pp. 1–32). Academic Press. https://doi.org/10.1016/bs.atpp.2024.09.008

Dablanc, L., & Ross, C. (2012). Atlanta: A mega logistics center in the Piedmont Atlantic Megaregion (PAM).

Journal of Transport Geography, *24*, 432–442. https://doi.org/10.1016/j.jtrangeo.2012.05.001

Dalglish, S. L., Khalid, H., & McMahon, S. A. (2021). Document analysis in health policy research: The READ approach. *Health Policy and Planning*, *35*(10), 1424–1431. https://doi.org/10.1093/heapol/czaa064

Davis, J. (2021). How do upzonings impact neighborhood demographic change? Examining the link between land use policy and gentrification in New York City. *Land Use Policy*, *103*, 105347. https://doi.org/10.1016/j.landusepol.2021.105347

Davis, J., & Renski, H. (2020). Do industrial preservation policies protect and promote urban industrial activity? Examining the impact of New York City's industrial business zone program. *Journal of the American Planning Association*, *86*(4), 431–442. https://doi.org/10.1080/01944363.2020.1753563

de Lara, J. (2018). *Inland shift: Race, space, and capital in Southern California* (1st ed.). University of California Press.

Dennis-Bauer, S., & Jaller, M. (2023). Truck transportation in California: Disaggregating public health costs from criteria pollutants. *Transportation Research Part D: Transport and Environment*, *122*, 103850. https://doi.org/10.1016/j.trd.2023.103850

Ewing, R., Lyons, T., Siddiq, F., Sabouri, S., Kiani, F., Hamidi, S., Choi, D., & Ameli, H. (2022). Growth management effectiveness: A literature review. *Journal of Planning Literature*, *37*(3), 433–451. https://doi.org/10.1177/08854122221077457

Ferm, J., & Jones, E. (2017). Beyond the post-industrial city: Valuing and planning for industry in London. *Urban Studies*, *54*(14), 3380–3398. https://doi.org/10.1177/0042098016668778

Ferm, J., Panayotopoulos-Tsiros, D., & Griffiths, S. (2021). Planning urban manufacturing, industrial building typologies, and built environments: Lessons from inner London. *Urban Planning*, *6*(3), 350–367. https://doi.org/10.17645/up.v6i3.4357

FHWA. (2012). *Freight and land use handbook*. U.S. Department of Transportation. https://ops.fhwa.dot.gov/publications/fhwahop12006/fhwahop12006.pdf

Fischel, W. A. (2015). *Zoning rules! The economics of land use regulation*. Lincoln Institute of Land Policy.

Forman, B., Norris, M., & Plass, L. (2023). *Reshaping the city: Zoning for a more equitable, resilient, and sustainable future*. Urban Land Institute. https://knowledge.uli.org/-/media/files/research-reports/2023/uli-report-reshaping-the-city-final.pdf

Fried, T., & García, L. (2024). Planning for equity and justice in freight. In L. Tavassz, M. Browne, & M. Piecyk (Eds.), *Advances in transport planning and practice* (Vol. 14). Routledge.

Fried, T., & Goodchild, A. (2023). E-commerce and logistics sprawl: A spatial exploration of last-mile logistics platforms. *Journal of Transport Geography*, *112*, 103692. https://doi.org/10.1016/j.jtrangeo.2023.103692

Fried, T., Goodchild, A., Browne, M., & Sanchez-Diaz, I. (2024). Seeking equity and justice in urban freight: Where to look? *Transport Reviews*, *44*(1), 191–212. https://doi.org/10.1080/01441647.2023.2247165

Fried, T., Verma, R., & Goodchild, A. (2024). Ecommerce and environmental justice in metro Seattle. *Research in Transportation Economics*, *103*, 101382. https://doi.org/10.1016/j.retrec.2023.101382

Glaeser, E. L., Gyourko, J., & Saks, R. (2005). Why is Manhattan so expensive? Regulation and the rise in housing prices. *The Journal of Law and Economics*, *48*(2), 331–369. https://doi.org/10.1086/429979

Gray, M. N. (2022). *Arbitrary lines: How zoning broke the American city and how to fix it*. Island Press.

Gunes, S., Fried, T., & Goodchild, A. (2024). Seattle microhub delivery pilot: Evaluating emission impacts and stakeholder engagement. *Case Studies on Transport Policy*, *15*, 101119. https://doi.org/10.1016/j.cstp.2023.101119

Hall, A. B., & Yoder, J. (2022). Does homeownership influence political behavior? Evidence from administrative data. *The Journal of Politics*, *84*(1), 351–366. https://doi.org/10.1086/714932

Hatuka, T., & Ben-Joseph, E. (2022). *New industrial urbanism: Designing places for production* (1st ed.). Routledge.

Hesse, M. (2020). Logistics: Situating flows in a spatial context. *Geography Compass*, *14*(7), e12492. https://doi.org/10.1111/gec3.12492

Hirt, S. (2013). Form follows function? How America zones. *Planning Practice and Research*, *28*(2), 204–230. https://doi.org/10.1080/02697459.2012.692982

Hirt, S. (2014). *Zoned in the USA: The origins and implications of American land-use regulation (Illustrated edition)*. Cornell University Press.

Holguín-Veras, J., Wang, C., Ng, J., Ramírez-Ríos, D., Wojtowicz, J., Calderón, O., Caron, B., Rivera-González, C., Pérez, S., Schmid, J., Kim, W., Ismael, A., Amaral, J. C., Lawson, C., & Haake, D. (2022). *Planning freight-efficient land uses: Methodology, strategies, and tools*. Transportation Research Board. https://doi.org/10.17226/26737

Imbroscio, D. (2021). Rethinking exclusionary zoning or: How I stopped worrying and learned to love it. *Urban Affairs Review*, *57*(1), 214–251. https://doi.org/10.1177/1078087419879762

Jacobs, J. (1961). *The death and life of great American cities* (Reissue ed.). Vintage.

Kang, S. (2020). Why do warehouses decentralize more in certain metropolitan areas? *Journal of Transport Geography*, *88*, 102330. https://doi.org/10.1016/j.jtrangeo.2018.10.005

Katsela, K., Güneş, Ş., Fried, T., Goodchild, A., & Browne, M. (2022). Defining urban freight microhubs: A case study analysis. *Sustainability*, *14*(1), 532. https://doi.org/10.3390/su14010532

Kerr, G. H., Meyer, M., Goldberg, D. L., Miller, J., & Anenberg, S. C. (2024). Air pollution impacts from warehousing in the United States uncovered with satellite data. *Nature Communications*, *15*(1), 6006. https://doi.org/10.1038/s41467-024-50000-0

Lane, R. N., & Rappaport, N. (Eds.) (2020). *The design of urban manufacturing* (1st ed.). Routledge.

Leigh, N. G., & Hoelzel, N. Z. (2012). Smart growth's blind side. *Journal of the American Planning Association*, *78*(1), 87–103. https://doi.org/10.1080/01944363.2011.645274

Logan, J. R., & Molotch, H. L. (2010). The city as a growth machine. In J. Brown-Saracino (Ed.), *The gentrification debates*. Routledge.

Los Angeles County. (2024). *Green zones program implementation guide*. https://planning.lacounty.gov/wp-content/uploads/2022/10/green-zones_implementation-guide.pdf

Maantay, J. (2002). Industrial zoning changes in New York City: A case study of "expulsive" zoning. *Projections: The Planning Journal of Massachusetts Institute of Technology (MIT)*, 63–108.

Marshall, A. (2020, January). In Paris, ecommerce warehouses get a chic makeover. *Wired*. https://www.wired.com/story/paris-ecommerce-warehouses-get-chic-makeover/

Maxner, T., Dalla Chiara, G., & Goodchild, A. (2025). The state of sustainable urban last-mile freight planning in the United States. *Journal of the American Planning Association*, *91*(1), 88–101. https://doi.org/10.1080/01944363.2024.2324096

Moore, A. A., & Caporale, A. (2025). The efficacy of statutory public hearings for planning: A comparison of four Canadian jurisdictions. *Journal of Urban Affairs*, *47*(3), 739–759. https://doi.org/10.1080/07352166.2023.2195664

Packer, R. (2024, September 7). Seattle's growth plan keeps most of the city unaffordable, county committee says. *The Urbanist*. https://www.theurbanist.org/2024/09/07/seattles-growth-plan-keeps-most-of-the-city-unaffordable-county-committee-says/

Phillips, S. A., & McCarthy, M. C. (2024). Warehouse CITY: An open data product for evaluating warehouse land-use in Southern California. *Environment and Planning B: Urban Analytics and City Science*, *51*(8), 1965–1973. https://doi.org/10.1177/23998083241262553

Prasanth, S., Oloyede, N., Zhang, X., Chen, K., & Carrión, D. (2024). Simulating desegregation through affordable housing development: An environmental health impact assessment of Connecticut zoning law. *Health & Place*, *88*, 103277. https://doi.org/10.1016/j.healthplace.2024.103277

Qin, Z., Yu, C., Lin, H., Yang, C., & Yuan, Q. (2024). Unraveling the role of freight facility development in the dynamics of gentrification. *Transportation Research Part D: Transport and Environment*, *137*, 104481. https://doi.org/10.1016/j.trd.2024.104481

Quattro, C. (2024). *Environmental justice and zoning reform (PAS Report 608)*. American Planning Association.

Rivera-Gonzalez, C., Holguin-Veras, J., & Calderon, O. (2023). Supply-chain-focused measures of centrality and spread in metropolitan areas. *Journal of Transport Geography*, *107*, 103553. https://doi.org/10.1016/j.jtrangeo.2023.103553

Rothstein, R. (2017). *The color of law: A forgotten history of how our government segregated America.* (Illustrated ed.). Liveright.

Safavian, T., La, A., McConnell, C., Brinkley, C., La, A., Safavian, T., McConnell, C., Brinkley, C. (2024). *National Zoning Atlas: A new public tool database*. https://escholarship.org/uc/item/708654wt

Saha, D., Fraser, C., Adcox, G., Scott, C., Said, E., Kenyon, M. (2024). *Detroit's community benefits ordinance: Lessons learned about the community engagement process and its outcomes*. https://www.wri.org/research/detroits-community-benefits-ordinance-lessons-learned-about-community-engagement-process

Saldaña, J. (2009). *The coding manual for qualitative researchers*.

Samuels, G., & Freemark, Y. (2022). *The polluted life near the highway*. Urban Institute. https://www.urban.org/sites/default/files/2022-11/The%20Polluted%20Life%20Near%20the%20Highway.pdf

Scally, C. P., & Tighe, J. R. (2015). Democracy in action? NIMBY as impediment to equitable affordable housing siting. *Housing Studies*, *30*(5), 749–769. https://doi.org/10.1080/02673037.2015.1013093

Schweitzer, L. (2006). Environmental justice and hazmat transport: A spatial analysis in southern California. *Transportation Research Part D: Transport and Environment*, *11*(6), 408–421. https://doi.org/10.1016/j.trd.2006.08.003

Sclar, E., Baird-Zars, B., Fischer, L. A., & Stahl, V. E. (2020). *Zoning matters: Institutions and action in the 21st century*. In Zoning. Routledge.

Shin, E. J. (2024). Patterns and sources of spatial inequity in freight crashes: An application of decomposition analysis. *Accident Analysis & Prevention*, *205*, 107683. https://doi.org/10.1016/j.aap.2024.107683

Stein, S. (2019). *Capital city: Gentrification and the real estate state*. Verso.

Tejada, C., & Conway, A. (2024). Measuring the social effects of urban logistics facilities development: The case of New York City. *Transportation Planning and Technology*. Advance online publication. https://doi.org/10.1080/03081060.2024.2397386

Trounstine, J. (2020). The geography of inequality: How land use regulation produces segregation. *American Political Science Review*, *114*(2), 443–455. https://doi.org/10.1017/S0003055419000844

Turner, A. (2024). *Cities, e-commerce & public health: 3 legal pathways to limiting freight vehicle emissions*. Sabin Center for Climate Change Law. https://scholarship.law.columbia.edu/sabin_climate_change/228

U.S. EIA. (2021, November). *Warehouses were the most common U.S. commercial building type as of 2018*. https://www.eia.gov/todayinenergy/detail.php?id=50496

Victoria, A. (2024, September 25). Judge halts controversial warehouse project in Bloomington, orders new environmental study. *KVCR News*. https://www.kvcrnews.org/2024-09-24/judge-halts-bloomington-warehouse-project-orders-new-environmental-study

Walker, R., & Lewis, R. D. (2001). Beyond the crabgrass frontier: Industry and the spread of North American cities, 1850–1950. In N. Fye & J. Kenny (Eds.), *The urban geography reader*. Routledge.

Whittemore, A. H. (2017). Racial and class bias in zoning: Rezonings involving heavy commercial and industrial land use in Durham (NC), 1945–2014. *Journal of the American Planning Association*, *83*(3), 235–248. https://doi.org/10.1080/01944363.2017.1320949

Whittemore, A. H. (2021). Exclusionary zoning: Origins, open suburbs, and contemporary debates. *Journal of the American Planning Association*, *87*(2), 167–180. https://doi.org/10.1080/01944363.2020.1828146

Whittemore, A. H., & BenDor, T. K. (2019). Opposition to housing development in a suburban US county: Characteristics, origins, and consequences. *Land Use Policy*, *88*(C), 104158. https://econpapers.repec.org/article/eeelauspo/v_3a88_3ay_3a2019_3ai_3ac_3as0264837719304764.htm https://doi.org/10.1016/j.landusepol.2019.104158

Winokur, J. (2020, October 17). *The sacrifice zone* [Documentary]. Talking Eyes Media.

Yin, R. K. (2017). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications, Inc.

Yuan, Q. (2018). Mega freight generators in my backyard: A longitudinal study of environmental justice in warehousing location. *Land Use Policy*, *76*, 130–143. https://doi.org/10.1016/j.landusepol.2018.04.013

Yuan, Q. (2019). Planning matters. *Journal of the American Planning Association*, *85*(4), 525–543. https://doi.org/10.1080/01944363.2019.1645614