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Beyond infrastructure: Patterns of environmental justice and multi-level governance in Greater Los Angeles transportation and hazard planning

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This study evaluates how environmental justice principles are integrated into transportation and hazard plans across multiple levels of jurisdictions in Greater Los Angeles, revealing how the multi-level governance framework shapes planning practices for environmental justice integration across levels and over time. We conduct a content analysis on 16 transportation, hazard preparedness, climate action, and racial equity plans to develop a scoring methodology. Through comparison we identify patterns and factors contributing to effective environmental justice integration in transportation and hazard planning. Findings show that although infrastructure (transportation and hazard) plans achieve higher environmental justice integration on average than other plans after 2019, some subdimensions – like recognition justice – remain less integrated. Curiously, the positive trend between environmental justice and multi-level governance observed for climate action and racial equity plans *is not* observed for infrastructure plans, suggesting greater nuance among the strategies that lead to its successful integration in infrastructure planning.

Keywords: Transportation Planning; Hazard Preparedness; Equity Evaluation; Environmental Justice; Multi-level Governance

1. Introduction

Climate-related events such as increased rainfall, flooding, and heatwaves disproportionately impact disadvantaged communities by exacerbating pre-existing socioeconomic stressors, including access to healthcare, education, and economic opportunities (Environmental Protection Agency, 2024). These overlapping challenges expose cleavages in policy planning and implementation, where siloed teams across jurisdictional scales address fragmented aspects of systemic issues. Experts in health, housing, transit, climate, and diverse government agencies widely acknowledge that historical racialized planning practices have *intentionally* shaped urban landscapes. These practices include segregating Black, Brown, and low-income communities through redlining, positioning people of color near high-polluting industries, and restricting their access to transportation infrastructure (Bullard, 2003; Jacobs, 2018). Contributing to the fight against these historic harms, **social vulnerability plans** (e.g., racial equity plans and increasingly climate action plans) are common practices today in jurisdictions across the United States.

While there is a growing call for "just urban transitions" to ensure that climate action plans also address equity and inclusivity (Diezmartínez and Gianotti, 2022), these plans' goals and implementation vary greatly, due in part to differences in resources, political landscape, activists' pressure, bureaucrats' political frameworks, and technical abilities. Moreover, racial equity planning alone cannot solve historic inequities. To address environmental injustices more systemically, its equity-based pillars must be integrated into other sectors, like infrastructure development. Functionally, integrating the principles of environmental justice across agencies directly conflicts with the economically driven priorities and organizational structures of government that prioritize efficiency and growth. This integration is even more challenging for a government that is rescaled and fractured across specialized departments (e.g., California Department of Transportation), specialized regulatory agencies (e.g., California Air Resources Board), joint regional governance entities (e.g., Southern California Association of Governments), and public-private partnerships (e.g., LA Metro's collaboration with private contractors for transit infrastructure projects).

This division creates a rescaled multi-level governance structure that prioritizes individual mandates over broader systemic goals (Brenner and Theodore, 2002; Harvey, 2005). The resultant compartmentalization contributes to significant challenges in addressing environmental justice principles and climate policies. Both environmental injustice and climate change are considered "wicked problems" due to their complexity, interconnectedness, and resistance to simple solutions (Rittel and Webber, 1973). These issues transcend sectoral and jurisdictional boundaries, requiring cross-sector collaboration and holistic approaches to address their systemic and multifaceted natures (Campbell, 2016; Marcuse, 2009). Environmental justice scholars and activists emphasize that government agencies, despite their diverse missions, must recognize their interdependence to advance environmental justice and climate resilience through systemic and integrated planning.

Given these overlapping challenges and the fragmented nature of policy planning, it becomes crucial to examine how **infrastructure plans** (i.e., transportation and hazard plans) coordinate with or deviate from climate and racial equity goals. This study focuses on the Los Angeles (LA) region, where a long history of climate and racialized social justice movements have shaped the political landscape. By investigating the integration of equity-focused goals into infrastructure plans, this research builds on a tradition of assessing plans to determine goal alignment, barriers, and optimal resource allocation (Escobedo Garcia and Ulibarri, 2023; Hossu et al., 2020). Our analysis is motivated by an awareness that hazard *mitigation* plans have received criticism for being reactive, aiming at immediate risk reduction rather than proactively planning for future risks, and focusing on sudden-onset events rather than gradual

changes, like rising temperatures and shifting weather patterns. Furthermore, these plans have traditionally overlooked equity, unlike climate *adaptation* plans which are required to prioritize social justice and ensure vulnerable communities are included in the process (Matos et. al, 2022).

This study investigates the barriers and facilitators to functionally integrating equity-based environmental justice principles across jurisdictions by evaluating how planning documents in the LA region incorporate calls from the **Environmental Justice** (EJ) Movement across different scales (city, county, region) and sectors (transportation, hazards). Specifically, we examine how the principles embedded in racial equity and climate action plans are reflected in transportation and hazard preparedness plans in Greater LA to answer the following research questions:

1. How well is equity integrated into infrastructure plans?
2. How does equity integration in infrastructure and social vulnerability plans change over time in the LA region?
3. To what degree are these planning efforts effectively coordinated across jurisdictions?
4. How does this multi-level coordination across jurisdictions (or a lack thereof) relate to the integration of equity concepts within planning documents and processes?

2. Theory

2.1. History of planning in the United States

American urban planning originated to eradicate Indigenous communities and later evolved to sort people and industries by desirability, creating tensions around land as a collective good and a means to expand economic gaps (Stein, 2019). The 1960s saw the rise of transnational corporations and the delegation of urban functions to corporations (Brenner, 1998; Jessop, 2002). The federal government created new agencies, thereby delegating housing, transportation, and land use powers to states and cities, necessitating cities to partner with corporations to deliver basic services, and prioritizing corporate outcomes over social services.

State agencies and localities have developed strategic plans since the early 20th century, with transportation, zoning, and hazard plans to follow. Many in turn created racial and economic divisions along geographic lines with policies such as redlining, freeway constructions, and transportation investments (Bullard, 2003). Radical planners, civil rights leaders, and advocates contend these processes created the intended outcomes, i.e., racial and economic segregation (Bullard, 2003; Davis, 1990; Gibbons 2019; Jacobs, 2018) and that environmental racism is not a happenstance but rather the outcome of deliberate planning practices focused on isolating people of color and increasing capital geographically (Jacobs 2018; Mendez, 2020; Pulido, 2000). EJ scholars ask practicing planners to accept the premise that racialized planning was carried out intentionally and is perpetually reinforcing – and reinforced by – a racialized system, requiring historical analysis to repair (Bullard, 1993; Davis, 1990; Jacobs, 2018; Roy and Berke, 2022). In response to growing inequities, African Americans led the call for Racial Equity Planning to address racialized policies (Arroyo, et. al, 2023). Climate and racial equity planning was driven by grassroots organizing in conjunction with top-down political pressures, and it emphasized multi-level coordination and community stakeholder inclusion. Collectively, these calls to action have accumulated in what is now referred to as the EJ Movement, which focuses on ending the racialized planning practices that have historically exposed people of color and low-income communities to higher risks of environmental pollution.

Prior research has explored whether environmental justice considerations have addressed inequities in transportation and hazard preparedness. However, these studies have focused on

a single plan type or jurisdiction, failing to account for the effects of the broader ecosystem of governance and the need for equity to be woven throughout many plans beyond social vulnerability plans. For instance, while studies like Méndez (2022) and Karner and Levine (2021) highlight the exclusion of vulnerable communities in planning and critique traditional methods of public engagement, they do not apply a comprehensive, agency-wide analysis guided by principles of environmental justice. Likewise, prior research on hazard impacts and infrastructure vulnerability (e.g., Cannon et al. 2023, Yu and Welch, 2022) has discussed equity processes but not explicitly analyzed how pillars of environmental justice are operationalized across multiple levels of governance. Finally, prior studies on this topic have primarily relied on interviews and surveys to assess equity rather than applying content analysis directly to planning documents, as we do in our study to fill a gap in analyzing the integration of multi-level governance and principles of environmental justice in plans and planning processes across jurisdictions.

2.2. Principles of environmental justice

Calls for EJ emerged as a response to the disproportionate exposure of low-income communities and communities of color to environmental hazards (Bullard, 1990; Cutter, 1995). Recognition justice, procedural justice, and distributive justice are three pillars that emerged from decades of work to end *environmental racism* (Maleki and Smith-Colin, 2023), defined as "any policy, practice, or directive that differently affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color" (Bullard, 1994). **Recognition justice** represents the first pillar of EJ. It acknowledges that planning practices have both created and exacerbated social and economic disparities, limiting access to resources, education, and employment opportunities for those living on the 'other' side of the freeway (Bullard 1993; Davis,1990; Jacobs 2018). When it comes to incorporating equity in transportation and hazards plans, it is crucial to recognize that physical infrastructure vulnerability to climate hazards and social vulnerability to climate hazards are interdependent. According to LA County's Vulnerability Assessment, *cascading vulnerability* recognizes that "the impacts of a climate hazard extend beyond the initial infrastructure disruption … [and that] climate-related infrastructure disruption can affect linked systems and socially vulnerable populations" (County of Los Angeles, 2021).

Recognition alone is not enough to address systemic racialized planning (Jacobs, 2018). Governance scholars contend that marginalized communities need to be a part of the process of governance and planning through **procedural justice** (Schlosberg and Collins, 2014; Ulibarri et al., 2022). Radical planners point to the role that embodied knowledge can play in untangling historically unjust planning practices (Jacobs, 2018; Mendez, 2020), which is gaining validation as a scientific basis for policy and planning decisions when implemented in collaboration with EJ leaders and can provide valuable experiential knowledge for reducing social vulnerabilities (Mendez, 2020). Community engagement and governance processes may include advisory boards, policy steering committees, and task forces, but embodied knowledge moves beyond community representation and centers planning processes and decisions on the lived experiences of community members.

The third pillar, **distributive justice,** is defined as the equitable distribution of environmental harms and benefits, which stems from the need to identify injustices of polluting industries disproportionately located in low-income, minority, and other politically disempowered communities (Bullard, 1994; Ulibarri et al., 2022; Woo et al., 2019). For this pillar, we specifically focus on how plans represent the just distribution of transportation resources, including both the potentially harmful impacts of goods movement networks and the need to prioritize spatial and temporal access to safe, affordable mobility for those who are

most vulnerable (Bullard, 2003). As with the previous two pillars, distributive justice is interdependent with the others. For people of color, low-income, women, and other marginalized peoples to experience distributive justice, it is necessary to go beyond recognition justice and incorporate procedural justice, such as through embodied knowledge (Schlosberg and Collins, 2014; Ulibarri et al., 2022; Whyte, 2011). These needs and challenges lead to our first two research questions wherein we investigate how well equity-focused principles of environmental justice are integrated into infrastructure plans and how that integration has changed over recent years following significant social movements, such as Black Lives Matter.

2.3. Multi-level governance as an analytical framework

EJ concerns are further complicated by the restructuring of governance that followed the shift from Keynesianism to neoliberalism in the 1970s, which removed federal welfare and placed more control and responsibility within regions and cities (Harvey, 1989; Molotch, 1976; Stone, 2004). The decentralization and delegation of powers out to civil society, down to local jurisdictions, and up to supranational organizations affected public policy and democracy by creating a rescaling of the state in a way that centralizes authority at higher levels of government that in turn delegate power to lower levels. The **multi-level governance** (MLG) framework emerged to analyze how this rescaling has affected democratic processes and policymaking through coordination between city, state, national, and international levels (Caponio and Jones-Correa, 2017; Hooghe and Marks, 2021; Saito-Jensen, 2015).

MLG literature argues that this rescaling creates flexibility through special-purpose jurisdictions tailored to specific policy problems with discrete goals (Hooghe and Marks, 2021). Classic MLG approaches often adopt normative or descriptive frameworks, focusing on the structural design of governance systems. However, such perspectives frequently overlook the tensions and collaborations that emerge on the periphery of these systems, where neighborhood organizations, private corporations, and social movements interact with formal governance structures (Marks et al., 2001; Peters and Pierre, 2004). Critical MLG scholars, by contrast, argue that governance is an evolving and dynamic process that often lacks formality. Such scholars highlight how governance operates outside the confines of established agreements, regulations, and jurisdictional boundaries, reflecting the adaptive nature of policymaking in fragmented systems (Peters and Pierre, 2004).

Building on this, a third view emphasizes that jurisdictional boundaries can create unique opportunities for cross-jurisdictional collaboration, allowing actors to engage in contractual or situational agreements tailored to immediate policy needs (Jessop, 2002; Ostrom, 2010). Our analysis adopts this perspective to examine the dynamics of coordination across governance scales, distinguishing between functional coordination within single jurisdictions (e.g., across various departments), horizontal collaboration between agencies or jurisdictions at the same level, and vertical collaboration involving overlapping jurisdictions and both public and private stakeholders (Hooghe and Marks, 2021).

However, the effectiveness and extent of such coordination often remains unclear, particularly in complex urban planning environments. Our study addresses this gap by quantifying measures of MLG in planning documents from the LA region, with a specific focus on evaluating the degree of coordination at each governance level and assessing how these interactions influence the integration of EJ principles in planning efforts (Peters and Pierre, 2004; Pierre, 2005). For instance, advocates for the Black Lives Matter movement engaged horizontally and vertically in multiple planning processes. We expect that the degree of their influence and integration into political decision-making varied significantly; thus, we expect their impact on policy diffusion also varied across agencies (McAdams, et.al, 2002).

This analytical framework guides our final two research questions wherein we examine the degree to which planning efforts are coordinated across multiple levels of governance, as well as the relationship between this coordination and the integration of equity-based principles of environmental justice in planning documents. By quantifying this coordination and identifying its gaps, this study provides insights into the role of MLG in facilitating – or impeding – equity-centered outcomes in urban planning and policy implementation in the LA region.

3. Methods

3.1. Site selection

The Greater Los Angeles region, home to nearly 10 million residents, exemplifies the challenges of integrating EJ principles and MLG frameworks into urban planning processes. This region has a deeply entrenched history of racialized planning, epitomizing the systemic challenges of addressing equity in a fragmented governance landscape. Los Angeles County has 88 incorporated cities and over 200 legislative bodies, making regional coordination difficult, especially in addressing climate risks such as extreme heat, flooding, and air pollution. Unlike San Diego, where transportation planning is centralized under the San Diego Association of Governments (SANDAG), Los Angeles divides authority among multiple entities. LA Metro manages regional transit, LADOT oversees city streets and local transit, and SCAG develops long-term plans but lacks control over funding. This decentralization makes it harder to implement cohesive, equity-focused transportation solutions, reinforcing longstanding disparities.

We have selected three levels of jurisdiction in the LA region to assess how EJ principles of equity have been incorporated into transportation and hazard plans. Specifically, we selected LA County Metropolitan Transportation Authority (Metro), LA County, and two cities (the cities of LA and Long Beach). Metro's service area is larger than the county, and the county includes both the cities of LA and Long Beach, which share a border. Each has a stand-alone equity, climate, transportation, and hazard plan (except for Metro's transportation plan, which is maintained at both regional and county levels). We include Metro as a regional planning authority, because it has an independent board created by the State of California with authority throughout the county (Metro, 2024), described in **Table 1** in the appendix. Los Angeles and Long Beach, the two largest cities in Los Angeles County, were selected to examine multi-level governance dynamics across adjacent jurisdictions. Their proximity allows for a direct comparison of how nested governance structures (spanning city, county, and regional agencies) shape transportation and environmental justice planning. Both Los Angeles and Long Beach have a strong history of civil rights activism, and both have an Office of Equity. They have both institutionalized racial and economic equity as an organizational priority and maintain equity oversight boards. While both cities operate within the same broader governance framework, their distinct policy approaches and administrative structures provide insight into how MLG influences equity outcomes at multiple scales.

3.2. Plan selection

We review the following four categories of plans: Racial Equity, Climate Action, Transportation, and Hazard Preparedness. Racial equity planning is the least regulated of the four, with no legally required inclusions, making racial equity plans an outlier. The other three are regulated by State and Federal bills that require equity or social vulnerability considerations, such as Senate Bill 1000, which mandates integration of EJ into local general plans (Babcock, 2013; California Legislative Information, 2016; Zuñiga and Méndez, 2023). General plans require planning for climate, transportation, and hazards/safety, and often include full plans for each. California Senate Bill 379 now requires the integration of social

vulnerability and climate change adaptation into local hazard mitigation and safety plans, and California's Assembly Bill 617 mandates the address of social vulnerabilities and air quality disparities in community-level air protection plans. These policies reinforce the mandate of equity considerations in transportation and hazard plans (Assembly Bill 617, 2017; California Legislative Information, 2016; Senate Bill 379, 2015). Additionally, after Hurricane Katrina, the Federal Transit Agency's *Transportation Equity in Emergencies* report recommended equity-focused practices, but these recommendations were not mandatory (Milligan and Company, 2007).

Although the state now mandates inclusion of various EJ considerations, transportation and hazard plans are overwhelmingly focused on protecting the built environment (FEMA, 2023; U.S. Department of Transportation, 2022; Waugh, 2000). Hazard preparedness plans, which are often developed in response to federal funding for relief (Federal Transit Agency, 2007; Zwerling et al., 1994), have historically lacked equity considerations and are under less EJ scrutiny than transportation plans (Cutter et al., 2008). We find this tension of prioritizing infrastructure and EJ requirements particularly interesting and deserving of analysis. The most recent version of each plan was used for this analysis, and the plans were compared by type and jurisdiction.

3.3. Research design and analysis

We implement a comparative case study using a nested exploratory sequential research design, illustrated in **Figure 1**, allowing us to compare different plans in a single region. We first conducted content analysis of nine racial equity and climate action plans through inductive coding, from which we developed a quantitative instrument for deductive coding of all 16 plans (Leckenby and Hesse-Biber, 2007). Further insights are drawn by examining correlations between the scores and conducting historical analysis of the plans.

Our data consists of 16 planning documents covering three levels of jurisdiction and four plan types. These plans and jurisdictions, with a summary of their governing power, are listed in **Table 1**. We began by qualitatively reviewing all collected climate and equity plans (n=9) to identify recurring themes and concepts. This involved a detailed reading of the plans and noting key terms, ideas, and policy objectives. Next, we developed an inductive coding matrix by defining codes based on patterns found in the raw data rather than predefined codes. The coding matrix identified emergent patterns and categorized them into relevant constructs and codes corresponding with our research questions related to EJ and MLG.

Deductive coding strictly adhered to the matrix of constructs created from analyzing the climate and equity plans and was conducted evenly across all 16 plans. Here, we developed compound constructs with keyword indicators to measure the level of inclusion of EJ and MLG in each plan. Together, the inductive and deductive coding resulted in our final codebook. The final constructed table of indicators and explanations can be found in **Table 2.** Constructs of EJ included Recognition, Procedural, and Distributive Justice, while constructs of MLG included Coordinated Governance and Engaged Planning. Engaged Planning was further defined by five types of planning processes: (1) *siloed* when they were guided by one department and included no other departments, (2) *functional* when there was coordination across the agency with both social vulnerability and infrastructure-centered departments, (3) *horizontal* when the agency worked with other same-level jurisdictions, (4) *vertical* when the agency worked with other levels of government and community stakeholders, and (5) *collaborative* when there was a community committee specific to the plan and an equity board of resident advocates tasked with collaboration specific to the plan at hand. If a plan fell into more than one of these categories (for example, both horizontal and vertical planning), it was assigned the higher score based on the review process described in **Table 2.**

Table 2: Social constructs and indicators chart**.**

Construct	Indicators (Search Terms)	Explanation
Environmental Justice		
Recognition Justice	Inequality, Disparity, Imbalance, Discrimination, Unequal treatment, Social injustice, Marginalization, Disadvantage, Exclusion, Systemic racism, Institutional bias, Structural barriers, Historical disadvantages, Socioeconomic gaps, Health disparities, Educational inequities, Economic inequality, Gender inequality, Racial disparities	Terms indicating acknowledgment of social injustices and systemic inequalities reflect efforts to recognize and address these issues in planning
Procedural Justice	Fair process, Transparency, Consistency, Participation, Decision-making, Due process, Accountability, Stakeholder involvement, Community meeting, Steering committee, Community organization, NGO, Survey, Focus group, Poll, Neighborhood leader, Outreach, Engagement	Terms indicating fair and inclusive decision-making processes, emphasizing transparency, accountability, and stakeholder participation in planning
Distributive Justice	Fair distribution, Resource allocation, Access to resources, Benefit-sharing, Just distribution, Needs-based allocation, Proportionality, Redistribution, Compensation, Fair wages, Balanced benefits, Budget, Workforce Development, Redline, Participatory budgeting, Community development grants, Reparations, Land trusts, Geographically distributed	Terms related to the equitable distribution of resources and benefits, ensuring fair treatment and opportunities for all community members
MLG: Coordinated Governance		
Federal Coordination	Federal, National, President, Congress, Congressional, White House	Terms indicating involvement or influence of federal-level governance and policies, reflecting the integration of national priorities and support for local equity outcomes
State Coordination	State government of California (State), California State Senate (Senate), California State Assembly (Assembly), Senate Bill (S.B.), Assembly Bill (A.B.), California Environmental Quality Act (CEQA or C.E.Q.A.), Governor of California (Governor), California Coastal Commission (Coastal Commission), California Air Resources Board (CARB or C.A.R.B.)	Terms related to state-level governance and legislative frameworks, indicating the role of state policies and regulations in planning and equity initiatives

MLG: Engaged Planning		
Siloed	Plan developed within one department or with one other department whose work is categorized in the same field	Review of the planning process and evaluation of committee members engaged in the creation of the plan; one department and lack of ongoing community-engaged processes
Functional	Coordination across the agency with both social vulnerability and infrastructure-centered departments	Review of the planning process; multiple departments engaged in the planning process across the jurisdiction
Horizontal	Coordination identified with similar jurisdictions at the same scale	Keywords related to coordination between neighboring cities like Los Angeles and Long Beach
Vertical	Coordination identified with other scales of governance, including community organizations	Keywords related to counties, states, federal government agencies, and community organizations; these organizations are not necessarily part of the steering committee process but are engaged in parts of the planning
Collaborative	A committee assigned specifically to the plan being evaluated	Review of the planning process and evaluation of committee members engaged in the creation of the plan

We determined the frequency of these constructs using the NVivo 14 Text Word search feature to score all 16 plans. The scoring methodology for the three EJ constructs and MLG Coordinated Governance constructs were based on their construct frequencies, using three evenly divided thresholds for low [0.0], medium [0.5], and high [1.0]. Engaged Planning was scored on a scale of [0] for Siloed, [0.25] Functional, [0.5] Horizontal, [0.75] Vertical, and [1] for Collaborative, demonstrating the level of engaged planning with diverse governing bodies regardless of EJ missions and differentiating between plans that simply mention processes inclusive of procedural justice and those that implement them.

After scoring the plans, we examined quantitative trends, including correlations between Total MLG Score and Total EJ Score, score comparisons between pre-2020 and thereafter, and data visualizations (e.g., trend lines, spider charts). Finally, to determine to what extent the events of 2020 affected the degree of equity integration in LA regional planning, we applied a historical analysis to our evaluation, with the beginning of 2020 serving as a marker of a shifting paradigm. George Floyd's murder in 2020 propelled the Black Lives Matter movement beyond its origins of 2013, becoming the largest social movement in American history, with an estimated 15 to 26 million people in the United States participating in demonstrations over victims of police brutality (Kaiser Family Foundation, 2020). The rise of the Black Lives Matter movement during the COVID-19 pandemic highlighted the intersectionality of race, poor air quality, access to healthcare, and health disparities, where Black Americans had substantially higher rates of infection, hospitalization, and death compared with white people. This historic analysis allows us to draw deeper insights from the data regarding potential reasons for changes in equity integration over time, such as the importance of social movements and cultural and political shifts in governance.

4. Results

4.1. Integration of environmental justice principles

The final scores are presented in **Table 3.** The average EJ score was 1.13/3.0 for hazard plans, 1.00/3.0 for racial equity plans, 0.83/3.0 for transportation plans, and 0.75/3.0 for climate action plans. Of the seven infrastructure plans, six scored a 0.0 for Recognition Justice. Of those six, three scored a 0.0 for Procedural Justice, and two scored a 0.0 for Distributive Justice. It should be noted that all plans included some degree of Recognition Justice, but our frequency-based scoring methodology assigned a 0.0 to those with relatively low counts. Among transportation plans, all had relatively lower integration of Recognition Justice and greater integration of Procedural Justice, as shown in **Figure 2a**. Among hazard plans (demarcated in the figure with cross-shaped symbols), most had lower integration of Recognition Justice and greater integration of Distributive Justice, which can be observed by the way the hazard plans triangle extends toward the lower left in the spider plot. Regional plans scored lowest across all EJ constructs, as shown in **Figure 2b**. These plans are depicted in the figure as the innermost triangle demarcated with circle-shaped symbols. Overall, these results suggest that while equity is considered to an extent in infrastructure plans, there remains room for improvement, particularly in terms of Recognition Justice.

Table 3. Final scoring results.

Plan	Year	RJ Score	PJ Score	DJ Score	Total EJ Score	Total EJ Score	State Score	Federal Score	Engaged Planning	Total MLG Score	Total MLG Score
Climate Action Plans (n=4)					**Pre-2020**	**2020+**				**Pre-2020**	**2020+**
City of LA Climate Action Plan	2019	0.00	0.00	0.00	**0.00**		0.00	0.00	1.00	**1.00**	
Metro Sustainability Plan 2020	2020	0.00	0.00	0.00		**0.00**	0.00	0.00	0.25		**0.25**
Long Beach Climate Action Plan	2022	0.50	1.00	1.00		**2.50**	0.50	1.00	0.50		**2.00**
LA County 2045 Climate Action Plan	2023	0.00	0.00	0.50		**0.50**	0.50	0.00	0.50		**1.00**
Average for CAPs		*0.13*	*0.25*	*0.38*	***0.00***	***1.00***	*0.25*	*0.25*	*0.56*	***1.00***	***1.08***
Average over all years					***0.75***					***1.06***	
Racial Equity Plans (n=5)											
Metro Equity Platform Framework 2018	2018	0.00	0.00	0.00	**0.00**		0.00	0.00	0.25	**0.25**	
Long Beach Racial Reconciliation	2020	1.00	1.00	1.00		**3.00**	0.00	0.00	1.00		**1.00**
Long Beach Equity Toolkit	2021	0.00	0.00	0.00		**0.00**	0.00	0.00	0.25		**0.25**
City of LA Repair Participatory Budgeting Guidebook	2022	0.00	0.00	0.00		**0.00**	0.00	0.00	1.00		**1.00**
LA County Equity Strategic Plan	2023	1.00	0.50	0.50		**2.00**	0.00	0.00	1.00		**1.00**
Average for REPs		*0.40*	*0.30*	*0.30*	***0.00***	***1.25***	*0.00*	*0.00*	*0.70*	***0.25***	***0.81***
Average over all years					***1.00***					***0.70***	

SOCIAL VULNERABILITY PLANS AVERAGE		*0.28*	*0.28*	*0.33*	*0.00*	*1.14*	*0.11*	*0.11*	*0.64*	*0.63*	*0.93*
Hazard Plans (n=4)											
City of LA Hazard Plan	2018	0.00	0.00	0.00	**0.00**		1.00	1.00	0.75	**2.75**	
Metro 2022 All-Hazards Mitigation Plan	2022	0.00	0.00	0.50		**0.50**	1.00	1.00	0.25		**2.25**
Long Beach Natural Hazard Mitigation Plan	2023	1.00	1.00	1.00		**3.00**	1.00	1.00	0.50		**2.50**
LA County Operational Area EOP 2023	2023	0.00	0.50	0.50		**1.00**	0.50	0.50	0.50		**1.50**
Average for Hazard Plans		*0.25*	*0.38*	*0.50*	***0.00***	***1.50***	*0.88*	*0.88*	*0.50*	***2.75***	***2.08***
Average over all years					***1.13***					***2.25***	
Transportation Plan (n=3)											
Long Beach 2013 Mobility Element	2013	0.00	0.00	0.50	**0.50**		0.50	0.00	0.00	**0.50**	
City of LA Mobility Plan	2016	0.00	0.50	0.00	**0.50**		0.50	0.00	1.00	**1.50**	
Metro 2023 Active Transportation Strategic Plan	2023	0.00	1.00	0.50		**1.50**	0.00	0.00	0.75		**0.75**
Average for Transportation Plans		*0.00*	*0.50*	*0.33*	***0.50***	***1.50***	*0.34*	*0.29*	*0.58*	***1.00***	***0.75***
Average over all years					***0.83***					***0.92***	
INFRASTRUCTURE PLANS AVERAGE		*0.14*	*0.43*	*0.43*	*0.33*	*1.50*	*0.64*	*0.50*	*0.54*	*1.58*	*1.75*

Note: "RJ" = Recognition Justice, "PJ" = Procedural Justice, "DJ" = Distributive Justice, "EJ" = Environmental Justice, "MLG" = Multi-Level Governance

4.2. Integration of environmental justice principles over time

Our analysis implements the comparative framework described in Section 3.3, examining how equity-related considerations are integrated across the most recent versions of 16 planning documents, inclusive of social vulnerability planning and infrastructure planning. Before 2020, the average Total EJ scores across all plan types (racial, climate, transportation, and hazard) were relatively low, indicating minimal integration of equity-related considerations in infrastructure and social vulnerability plans. After 2019, the average Total EJ scores increased across all four plan types, with the most significant improvements observed in hazard plans, which increased from an average score of 0.0 to 1.5 and racial equity plans which increased from an average score of 0.0 to 1.25.

Among the 11 evaluated plans adopted post-2019, three received a Total EJ Score of 0.0, while two achieved a Total EJ Score of 3.0/3.0. On average, hazard preparedness and climate action plans demonstrated greater progress over time in their inclusion of equity compared to transportation and racial equity plans, although all plan types showed progress over time. This is aligned with other studies showing that equity-focused principles of environmental justice are increasingly becoming central in climate action planning, especially in the largest U.S. cities (Diezmartínez and Gianotti, 2022). In terms of Total MLG Scores, only social vulnerability plans demonstrated progress over time.

4.3. Coordination in planning processes

Hazard plans on average were the most governmentally coordinated, scoring 2.25/3.0 in Total MLG, while racial equity plans had the lowest average Total MLG Score of 0.7/3.0. In between, climate action plans scored an average of 1.06/3.0 and transportation plans averaged 0.92/3.0. The examination of MLG in hazard plans reveals that these plans exhibit strengths in terms of coordination and engagement across different governance levels. Every hazard plan included some level of engagement from state, federal, and collaborative governance constructs, reflecting a relatively higher degree of coordination required from state, federal, and community stakeholders to implement these plans. However, despite the high level of coordination in hazard plans, the ability of stakeholders to influence the planning process is limited, suggesting room for improvement to ensure that stakeholders have meaningful opportunities to influence planning outcomes.

In contrast to hazard plans, racial equity plans received the lowest Total MLG Score across all plan types, suggesting the process of racial equity planning does not require the coordination seen in infrastructure plans. All five racial equity plans scored a 0.0 for State and Federal Coordination, as shown in **Figure 2c** (indicated by two square-shaped markers that appear only at the origin and along the Engaged Planning axis); however, three of the five scored a 1.0/1.0 for Engaged Planning, indicating that racial equity planning incorporates community engagement, which is integral to Procedural Justice. This trend can be observed in the figure as a square-shaped marker surpassing all others along the Engaged Planning axis. The relatively lower scores for State and Federal Coordination may indicate less dependency on these agencies to implement or guide racial equity plans compared to plans that require multiple agencies. For example, infrastructure plans depend on regulations or funding from state and federal agencies, each with its own levels of required coordination. Unlike other categories of planning documents, equity plans have less state and federal regulation, meaning plans are not identical and do not follow a preset scope of work. We see diversity in the types of equity plans evaluated; however, across the board, there is an opportunity for greater integration

and coordination across all levels of governance to potentially enhance the effectiveness and reach of equity plans. This coordination may also help boost the equity scores of other plan types. In terms of level of jurisdiction, regional plans (indicated in the figure by circle symbols demarcating the innermost triangle of the spider plot) scored lowest in Total MLG with an overall average of 0.88/3.0, as illustrated in **Figure 2d**.

Patterns in EJ integration and MLG for all four plan types are shown in **Figure 2e**, which depicts the relatively higher performance of hazard plans along dimensions of State and Federal Coordination (indicated by the outermost polygon on the lefthand side of the spider plot demarcated by cross-shaped symbols). **Figure 2f** illustrates these patterns for all three jurisdiction levels, revealing the relatively lower score for regional plans (depicted as the innermost polygon demarcated by circle-shaped symbols) along all six dimensions except for Federal Coordination.

4.4. Planning coordination and inclusion of environmental justice principles

Considering all plans collectively, we see a low positive correlation between Total EJ and Total MLG, illustrated in **Figure 3a**, with a Pearson correlation coefficient of 0.34. Often plans that scored higher on Total EJ also scored higher on Total MLG. Specifically, in **Figure 3b** we observe a positive trend in climate action and racial equity plans, but this trend is not observed for transportation or hazard plans. It is important to note that a lack of positive relationship between Total EJ and Total MLG among some plan categories does not indicate a lower Total EJ Score; rather, it may suggest these plan types achieved EJ by other mechanisms.

In considering Engaged Planning, the average Total EJ Score was highest among plans with Horizontal Engagement at 1.75/3.0, followed by Collaborative Engagement at 1.1/3.0, suggesting that higher levels of planning engagement correspond with more EJ integration. Only one plan was coded as Siloed, but the five plans coded as Functional revealed an average Total EJ Score of only 0.13/3.0. Only two of the plans were coded for Vertical Engagement, so additional practice of Vertical Engagement is needed before conclusions may be drawn about its relationship to EJ.

5. Discussion

5.1. Integration of environmental justice principles in infrastructure plans

Compared to social vulnerability plans, which emerged from community pressure and have fewer procedural mandates, infrastructure plans require coordination of funding, operations, and land use. The planning literature tells us infrastructure planning was not born of a drive to create equitable communities but rather to serve the growth of regions (Bullard, 1990), and over time the plans' goals became driven by private industry to move commercial goods and protect property.

Our analysis highlights that infrastructure planning efforts in Greater LA often lack equity integration, which is necessary for achieving EJ outcomes. Although hazard plans scored highest in EJ on average, the inconsistency of their integration of environmental justice principles is apparent. This inconsistency may be due to the culture of siloed planning, the belief that hazard planning is more technical, or the tradition of planning focused on loss of property.

Hazard plans had relatively less community engaged planning processes, despite their highest overall EJ score. One exception of a well-integrated hazard plan is the Long Beach Hazard Plan (2023). In the summer of 2020, Long Beach, like many cities, engaged in a thorough Racial Reconciliation process, co-led by the now Mayor Rex Richardson –

the youngest Mayor and first Black Mayor of Long Beach. Notably, the Director of the Disaster Preparedness and Emergency Communications Department, Reginald Harrison, is also Black, adding to the current minority racial representation of governmental leadership in Long Beach. The city's Racial Reconciliation process responded to the calls of the Black Lives Matter Movement, which demanded integration of race considerations across planning, including climate and health (Pignataro, 2022). While these elements likely contributed to equity integration in plans like the Long Beach Hazard Plan, they alone are not the sole contributing factors. Furthermore, they may not have the same impact in other cities that contain different histories, pressure points, and demographic makeups. For example, LA City also created a process of reconciling race relations and embedding equity into plans, but the relative impact on equity integration, thus far, has been less significant.

Apart from Long Beach, infrastructure plans had less integration of Recognition Justice, indicating a notable gap in acknowledging and addressing the needs and histories of marginalized communities. Recognition Justice is seen as the foundation or 'glue' linking the other EJ pillars (Ulibarri et al., 2022). Most plans that failed to integrate Recognition Justice also failed to integrate Procedural and Distributive Justice, signifying the need to recognize community vulnerability to create plans and distribute resources equitably.

Our research suggests that social movements arising from the pandemic, in tandem with broader policy change, heightened the focus on equity in infrastructure plans, leading to a greater emphasis on EJ processes. Disaster and hazard plans in LA City, Long Beach, and LA County now integrate strategies for managing pandemics, including planning for pandemics and health crises and equitable access to resources and services during public health crises.

5.2. Interactions between MLG and EJ

Infrastructure plans demonstrate differences in MLG and EJ outcomes. While these plans had relatively lower recognition of EJ, hazard plans were better at multi-level coordination. Of all infrastructure plans, only the City of LA Mobility Plan demonstrated Collaborative Engaged Planning (i.e., the plan included a formal ongoing process for socially vulnerable populations to contribute to the plan). By comparison, the level of engagement in LA City's Hazard Plan was limited to sharing meeting information with other agencies (Vertical Engaged Planning); the description of this engagement paired with its lack of EJ integration points to a need for improved engagement.

Five of the 16 plans included Collaborative Engaged Planning, yet no jurisdiction had more than one plan of the same type demonstrating Collaborative Engaged Planning. It is not clear from the plans how decisions were made regarding when to use Collaborative Engaged Planning. Considering plans released after 2019, those that included Collaborative Engaged Planning scored relatively higher in EJ on average. Surprisingly, despite the Collaborative Engaged Planning of the City of LA Mobility Plan, it was relatively less successful at integrating Recognition and Distributive Justice, suggesting that Collaborative Engaged Planning is not all that is required to integrate equity-related considerations into the planning process. Metro's Active Transportation Strategic Plan did not implement a plan-specific committee (Collaborative Engaged Planning), but it did provide plan access to the public and members of multiple Metro committees and other agencies (Vertical Engaged Planning), thereby integrating Procedural Justice to a greater degree. The potential disconnect between Collaborative Engaged Planning and

Procedural Justice may contribute to relatively lower integration of Recognitional and Distributive Justice.

MLG literature has yet to be fully applied to regional EJ planning as it is rooted in global and national governance; however, recent MLG literature has found that horizontal and vertical integration of community organizations increases policy inclusion of social equity (Caponio and Jones-Correa, 2017). Likewise, research on MLG of environmental policy is limited, but findings show higher MLG to be positively correlated with better environmental outcomes (Walti, 2004). Our findings are aligned with these studies and emphasize the need for social engagement to be plan specific. It is not enough to have engagement for a single governance level or plan; at this historical juncture, the integration of equity-related considerations requires frontline communities to have a committed role in the planning process beyond surveys and evaluations.

5.3. Recommendations for urban planning

Our analysis of transportation and hazard plans identifies relative shortcomings, particularly regarding the integration of EJ principles. Findings reveal that these planning processes are often bifurcated, with equity considerations inconsistently applied across levels of jurisdictions. This fragmented approach to equity integration risks neglecting the diverse needs of communities, ineffective resource allocation, and inadequate responses to daily needs and emergencies, thus perpetuating inequitable outcomes of transportation access and hazard preparedness. Moreover, the lack of coordinated planning across sectors can leave vulnerable populations unprotected. Marginalized communities, who are disproportionately affected by disasters and lack reliable transit options, may find themselves excluded from planning processes, leading to further marginalization, erosion of trust in government institutions, and diminished voices in decision-making.

To address these issues and foster inclusive and resilient communities, equity-centered principles must be integrated across planning efforts. Plans with the highest EJ scores also demonstrated diversity within departments and among community stakeholders. Creating dedicated equity-focused teams with representatives from all relevant city departments can break down silos, ensure consistent equity integration, facilitate collaboration and knowledge sharing, and lead to more comprehensive and inclusive planning outcomes.

Lastly, to foster a culture of equity, it is essential to provide ongoing equity, inclusion, and justice training for city staff and stakeholders. Most jurisdictions, except Metro, have staff trained through the Governing for Racial Equality program, which creates peer-to-peer networks and training cohorts for government staff. Continuous training is critical for transforming organizational culture and improving equity outcomes.

6. Conclusion

Key takeaways from our analysis highlight both the challenges and promising trends in integrating EJ principles into planning frameworks. Many plans exhibited relatively lower integration of equity-centered principles, particularly Recognition Justice. Six of the 12 plans that scored 0.0 for Recognition Justice also scored a 0.0 for Procedural and Distributive Justice, while the four plans scoring positively for Recognition Justice also scored positively along these dimensions. This suggests that a lack of recognition of past and ongoing injustices may undermine the overall equity framework of these plans.

Despite persistent challenges linked to fragmented governance structures, our research indicates positive upward trends in both equity integration and Collaborative

Engaged Planning over time. While some plans struggled to achieve meaningful equity integration due to siloed approaches, the overall trend shows notable improvements in both integration and coordination. The coordination across multiple levels of government in planning appears to increase capacity for the integration of equity-centered principles into social vulnerability plans. However, infrastructure plans still require greater engagement and recognition of those most impacted by historic racialized planning, along with direct planning processes that prioritize their needs and voices. By learning from successful models and existing gaps identified in this study, our analysis presents a promising opportunity to advance more inclusive, effective, and just planning frameworks.

6.1. Limitations and future work

It is worth noting that although scoring did not always rise to the levels marked as significant, there was inclusion of EJ pillars across all plans. The scores presented in this study are relative and intended to identify trends and patterns between EJ integration and MLG rather than to determine definitive equitable outcomes. Future work should examine how these plans and policies have been applied, enacted, and implemented, which may require extending this methodology to a larger sample beyond the LA region. While our research shines light on interdependencies between the integration of three pillars of EJ within these planning documents, we cannot say that the inclusion of one is the direct cause of inclusion of another. Thus, a research gap remains regarding the causal relationships between integration of recognition, procedural, and distributional equity in planning processes (Roy and Berke, 2022). Nevertheless, this comparative evaluation provides an analytical foundation that can inform future research on these causal relationships, which would reveal how these dimensions influence each other and contribute to equitable outcomes across scales.

This research contributes to the literature on multi-level governance and environmental justice in urban planning by validating an applied framework for evaluating planning practices, focusing on the integration of environmental justice principles and multi-level governance processes. The findings demonstrate how interactions between governance coordination and equity integration in planning documents influences planning processes, providing insights into systemic gaps in planning frameworks and opportunities for improvement.

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The first author served on the City Council for the City of Long Beach (2016-2020) during the period in which two of the planning documents analyzed in this paper were under development, although neither was finalized during the author's tenure. The author no longer holds this position and affirms that their current analysis is conducted independently and without any influence from prior involvement with the City of Long Beach or its planning processes.

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Figures

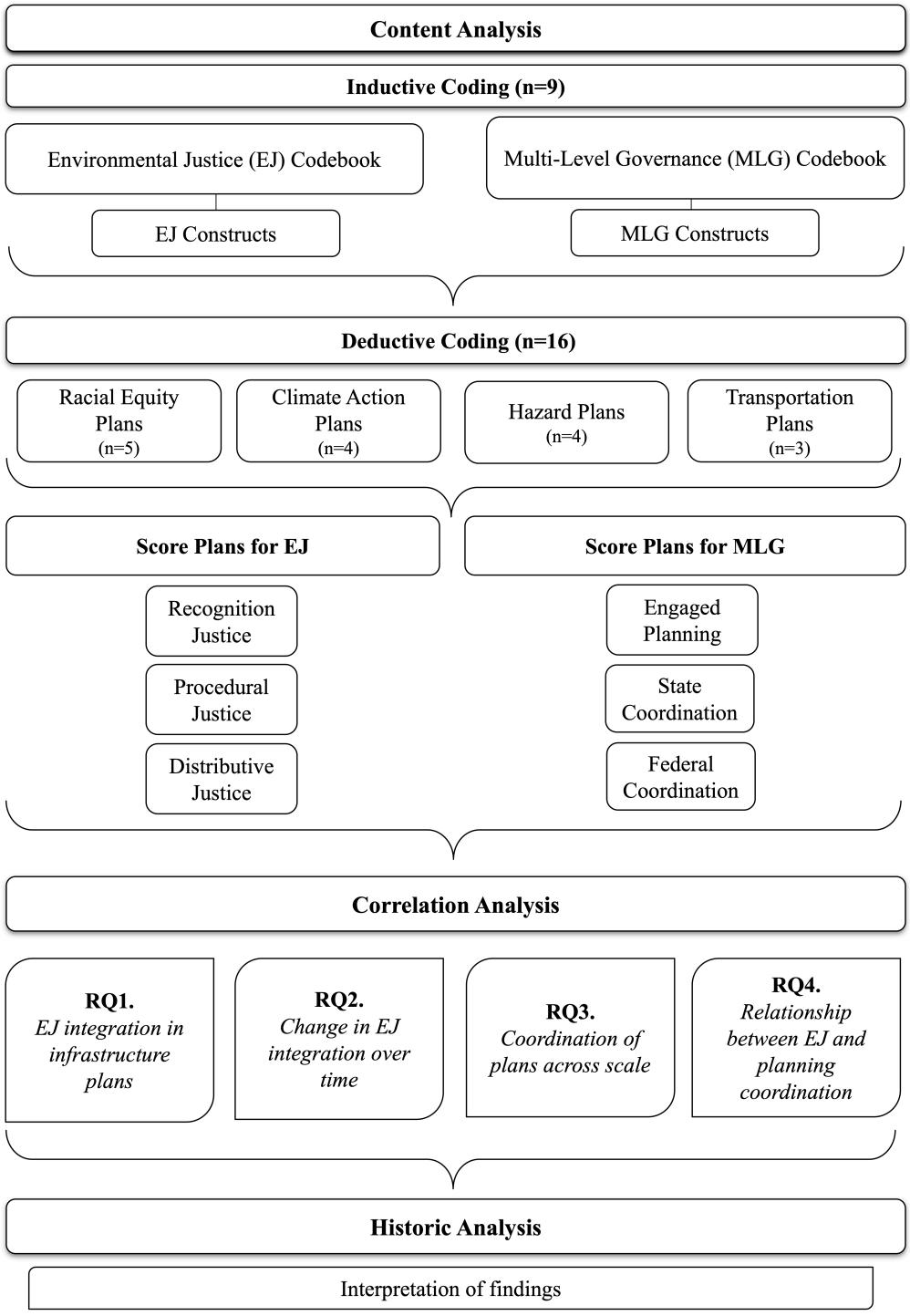


Figure 1. Diagram of research design.

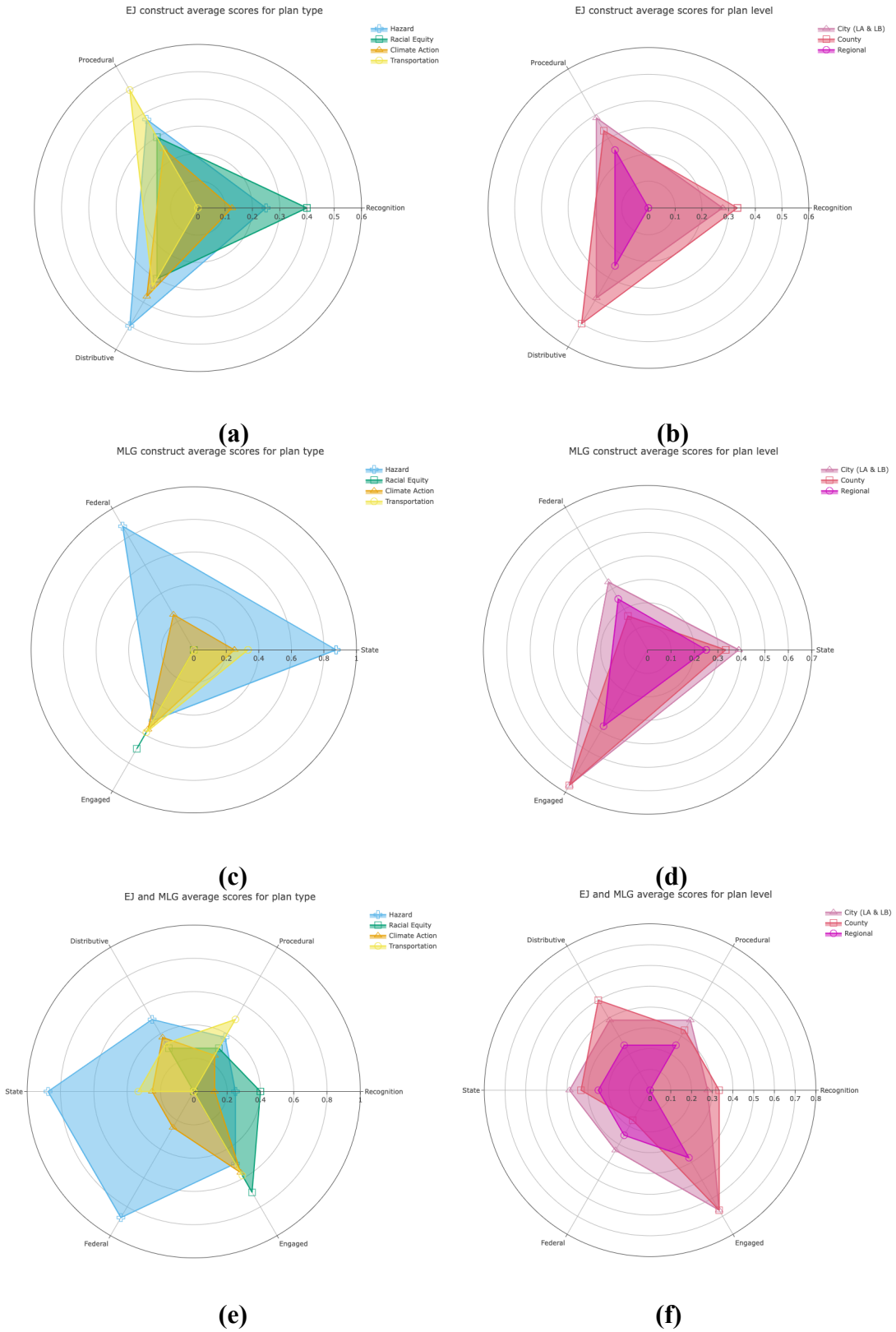
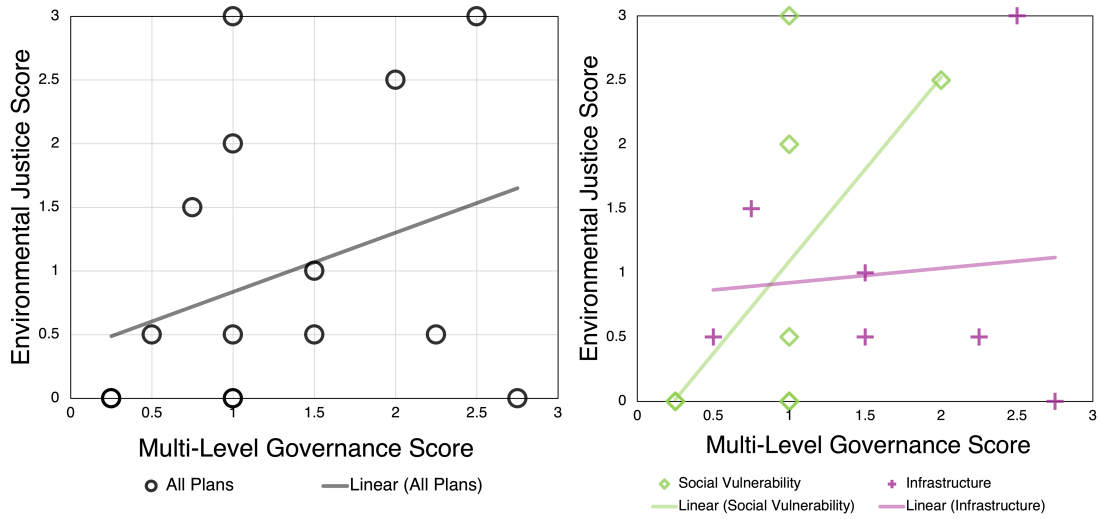


Figure 2. Spider charts of **(a)** EJ construct average scores for plan type, **(b)** EJ construct average scores for plan level, **(c)** MLG construct average scores for plan type, **(d)** MLG construct average scores for plan level, **(e)** EJ and MLG average scores for plan type, and **(f)** EJ and MLG average scores for plan level. "LA" stands for Los Angeles, and "LB" stands for Long Beach.



(a) **(b)**

Figure 3. Linear trend relationships between **(a)** Total EJ and Total MLG for all plans, and **(b)** Total EJ and Total MLG by plan type.