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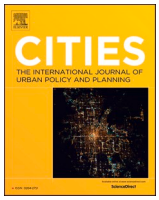

Rethinking the Regional Equity Atlas: Mapping platforms in constellations for social change

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ABSTRACT

Many U.S. localities use digital equity mapping in the form of Regional Equity Atlases (REAs) to inform the activities of policymakers and advocates. This article highlights lessons from our research leading up to and during an REA-building process in Central Virginia from 2018 to 2021 using constellation analysis (Ohlhorst & Schön, 2015). In the first section, we contextualize REAs by recounting a brief history of the intersections of geospatial mapping with regional and equity considerations within urban planning and policy. In the second section, we describe a field scan of existing REA platforms we conducted as in the 2018–2019 academic year. We assess the overall development of REA tools through modified constellation analysis in relation to an emerging body of planning scholarship around REAs. In the third section, we describe how we translated lessons from the field scan into a pilot REA and associated mapping and policy tools for a project in Central Virginia from 2018 to 2021. Our conclusion summarizes lessons we drew from these efforts in the context of accelerating shifts in the policy landscape and regional governance contexts in recent years.

1. Introduction

Many U.S. localities are establishing ongoing projects to represent the regional spatial dynamics of equity through digital mapping. This practice often takes the form of Regional Equity Atlases (REAs), data platforms intended to function as visualization tools for use by government officials, planners, non-governmental advocates, and grassroots actors, ideally supporting the identification and redress of persistent conditions of inequity. The authors of this paper served as academic and community participatory researchers in a planning grant undertaken in partnership with University of Virginia Libraries and supported by the Institute of Library and Museum Services in 2018 to 2021 for the development of a Regional Equity Atlas in Central Virginia.

This article highlights lessons from our research. In the first section, we contextualize REAs by recounting a brief history of relations between geospatial mapping, regional and equity considerations within urban planning and policy. In the second section, we describe a field scan of REA platforms we conducted during the 2018–2019 academic year. We assess the overall development of REA tools through modified constellation analysis (Ohlhorst & Schön, 2015) and the emerging body of planning scholarship around REAs. In the third section, we describe translating lessons from the field scan into a pilot REA and associated mapping and policy tools for a project in Central Virginia from 2018 to 2021. In this section, we add how constellation analysis can be used as a reflexive tool for researchers. Our conclusion summarizes lessons we drew from these efforts in the context of accelerating shifts in the policy landscape around equity-oriented projects.

2. Contextualizing REAs: Traditions of geospatial mapping in regional equity planning

Today's REAs emerged from various traditions within urban planning and adjacent fields. Geospatial mapping has been an integral part of planning since early 20th century urban reformers produced geographically detailed social surveys that purported to paint "a comprehensive account of the poor in large cities and making an urgent call for government action" (Batey, 2018, p. 49). These surveys left a dual legacy. On one hand, they were consonant with modern equity planning in the ways they spurred the development of "minimum standards for living" (Ward, 1990, p. 493) aimed at reducing human misery through governmental regulation of the built environment, with special focus in areas designated as "blighted," or "slums." On the other

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hand, reformers often pathologized populations, ascribing "moral deficiencies" to some groups, and making judgements about whether particular populations had either the capacity for self-governance or required policing and external social control (Fairfield, 1992).

Spatial surveys combining statistical analysis and geographical maps became popular, as Patrick Geddes's "survey-analysis-plan" approach dominated methodological training for planners in the first half of the twentieth century (Muller, 1992, pp. 126–127). Federal intervention dramatically expanded the use of geospatial mapping within planning, including city-wide land surveys as a form of work relief during the Great Depression (Pissourios, 2023, p. 5), the FHA standardization of risk-assessment rules in real estate through HOLC maps (Imbroscio, 2021), and the deployment of comprehensive-rational approaches requiring systematic land use classifications in plans for hundreds of US cities. Federal regulation during World War II expanded the adoption of local comprehensive planning by requiring municipalities document their need and preparedness for wartime resources including building material rations, highway dollars, and air travel routes (Hanchett, 1994). Post-War, local government planning capacity exploded with passage of the Housing Act of 1949, which required comprehensive plans as a condition for receiving federal funds under the Urban Renewal program.

Under this policy regime, the ranks of planners grew very quickly. Planners tended to be career administrators in local government, technocrats tasked with the scientific study of cities to inform and coordinate public investments. Planning processes also became increasingly intergovernmental: federal funding and urban development program requirements leaned on state and local governments to administer resource dispensation.

Today's REAs emerge from a mid-century equity planning tradition that emerged from planners who responded to the multiple popular social movements of the mid-20th century. Overall, equity planning disrupted mainstream conceptions of the planner as an apolitical figure, urging professionals to act in alignment with demands from urban rebellions in major cities, ongoing anti-war and civil rights movements (Metzger, 1996). Krumholz defined equity planners as redistributive agents, demanding practitioners address "unequal power and influence [by] placing priority attention on the needs of the poor [and] to provide them with countervailing power" (Krumholz, 1982, p. 165) from within local government. Davidoff (1965) represented a different approach modeled on professional legal aid by urging planners to make social movements and community groups their clients. He hoped advocate planners would present viable alternative plans representing community interests, transforming unitary "comprehensive" planning processes into pluralist milieus that surfaced competing social values and interests. Another major approach in equity planning is represented by Arnstein's ladder of citizen participation (Arnstein, 1969) which argued planners should redistribute power and voice in decision-making processes, picturing citizen control as a procedural ideal.

These varied approaches to equity planning produced a theory of change that was both influential and internally contradictory, structuring debates that are still salient in more recent REA-building processes. While Krumholtz and Davidoff used explicitly redistributive language, they also recentered the role of the credentialed professional as the actor through which challenges to moneyed interests would occur (Ross, 1977, p. 701). This professionalist attitude is somewhat in tension with Arnstein's ideal of democratization of planning processes.

The rise of equity planners coincided with continued mid-century expansion of federal structures, a wave of major federal anti-discrimination legislation, and processes of urban deindustrialization and widening social and wealth disparities between existing urban cores and sprawling metropolitan suburbs. In 1968, the Fair Housing Act outlawed housing discrimination against protected classes and introduced the mandate to "administer their programs 'in a manner affirmatively to further' fair housing" (Steil et al., 2021, p. 4). Despite these initial commitments, presidential administrations into the early 21st century moved away from strict enforcement of fair housing mandates (Steil, et al., 2021, p. 21). Also since the 1970s, "policies promoting urban decentralization steered state and federal planning resources away from equity planning in increasingly fragmented and segregated metropolitan areas" (Finio et al., 2020, p. 18).

Federal regulation in the 1990s revived regional planning in ways that tied transportation planning to environmental quality and equity. The 1990 amendment to the Clean Air Act and the 1991 Intermodal Surface Transportation Efficiency Act, (ISTA) set new air quality thresholds in urban areas, and required regional transportation plans to take a more comprehensive view including "explicit consideration of land-use and environmental policy and that reflected a more equitable balance between expenditures on roads and on other transportation modes" (Basmajian, 2013, p. 139). Since the 1980s, environmental justice advocates have highlighted spatial-racial-class disparities in exposures to toxins (Chavis & Lee, 1987). By the mid-1990s, federal executive order orders defined environmental justice (EJ), and new legislation mandated the incorporation of EJ considerations in subnational planning efforts (Brinkley & Wagner, 2024). These acts also combined to require more public input and collaboration in regional planning processes (Basmajian, 2013, p. 149).

Meanwhile, equity mapping re-emerged in conjunction with reconsideration of regional planning beginning in the late 1990s. New regionalist approaches de-emphasized top-down approaches and reframed regional planning as a conversation between local entities with diverse interests. By the early 2000s, quality of life, environmental, economic development, and infrastructural efficiency concerns were becoming relatively "co-equal" considerations amid this revived regional governance approach under the banner of smart growth (Norton, 2005, p. 57). Myron Orfield's (1997) influential "metropolitics" framework leveraged analytical maps to argue for strategies involving novel inter-urban coalitions to transcend what was seen as an intractable resource and political divide between declining majority-minority center cities and whiter, wealthier suburbs. Increasingly, urban scholars contended that structural economic forces (rather than moral deficiencies) were the primary determinants of urban poverty (Wilson, 1987), and framed regional inequality as the "geography of metropolitan opportunity," highlighting decaying center-city neighborhood conditions, the movement of high-paying jobs to the suburbs, and other geographically and demographically-specific trends as structural barriers to social mobility for poor urban populations (Chapple & Goetz, 2011, p. 459). Dominant policy solutions concurrently attempted to remedy racial and economic divides across the urban/suburban divide in major cities through dispersal policies that relocated urban public housing residents to wealthier areas (Finio et al., 2020, p. 18),[1] support for regional transit systems that connected central city residents to access quality jobs, and new regional governance strategies and tax base sharing (Chapple & Goetz, 2011).

By the early 2000s, debates emerged that questioned whether these regional policy approaches addressed equity as a central concern (Orfield, 2003), or simply positioned equity concerns as secondary to regional economic development agendas (Bollens, 2003). Amid this debate, opportunity maps piloted by the Kirwan Institute at Ohio State University (Powell et al., 2007) synthesized dramatic advances in Geographical Information System (GIS) technologies and related methods of analysis assessing fairness of public facilities distribution (Lucy, 1981; Talen, 1998), with emerging research on how neighborhood environment affects household social mobility (Briggs, 2005). Opportunity mapping frameworks used in planning have since become a more common practice, and tended to reinforce resident mobility-based

[1] Finio et al., 2020 point to the Gautreaux program in Chicago, the Move to Opportunity demonstration program, and HOPE VI programs as the trajectory of housing policies that aimed to move less wealthy residents into "high opportunity neighborhoods,"

regional policy approaches to inequity (Finio et al., 2020). REAs emerged as a discrete genre of maps amidst this shifting technological, governance, and policy environment.

3. Field scan: Lessons from constellation analysis of existing REAs

This section examines existing REAs and associated literature, focusing on regional-scale online mapping platforms or map-based reports that included "equity atlas" or "geography of opportunity" in their titles, were publicly available, and discoverable via internet search during 2018–2019. Table 1 shows the list of cases and variations in features common to these REAs.

This analysis uses a modified constellation-analysis approach (Ohlhorst & Schön, 2015), a graphical representational method inspired by Actor-Network Theory. Constellation Analysis starts with the premise that complex systems of decision-making and issue-related system innovations (like those around equitable regional planning and outcomes) emerge from interactions of heterogeneous elements. We modified the method to map relationships between regional governance elements across REA field-scan cases. We produced simplified constellation maps, highlighting three element categories: human actors (individuals or people grouped into organizational entities), technical elements (REAs and other mapping platforms), and symbolic elements (laws, policies, institutional and cultural rules).[2] We argue that elements across these element categories interact dynamically over time, describing an "innovation biography" (Ohlhorst & Schön, 2015) of the broadening adoption of and changes to mainstream ideas about "equity" in REA field-scan cases. The resulting analysis, detailed in this section, narrates REAs as a part of broader changes in equity-related regional governance systems and issue framings since the first REA released in Portland in 2007.

The constellation approach also helped us make sense of one of the most profound changes in urban governance in the US since the 1970s. Dramatic shrinking of many mid-century federal programs made urban development and service provision "increasingly dependent on networks of nonprofits led by local foundations, intermediaries, and anchor institutions" (Silverman et al., 2014, p. 5). This shift complicated the role of advocacy groups, who mid-century equity planners highlighted as representing the relatively powerless. By the early 2000s, growing non-profit organizations articulated equity-related values and reached new levels of national coordination and influence. A key example in equity mapping is PolicyLink, an entity formed in the late 1990s to bridge "those working for transformative change in local communities to the world of local, state, and federal policy" (Blackwell, 2024, p. 12). PolicyLink and other large advocacy organizations increasingly aligned the concept of equity with new regionalist approaches to urban development, focusing on regional equity, equitable development, and equitable public infrastructure at national equity summits they organized in the 2000s. In the same era, the term "anchor institution" came into common usage to describe "place-based establishments […that] invest in their surrounding communities as a way of doing business" (Koh et al., 2020, p. 309). Anchor institutions, especially higher education research institutions, are implicated in the historical production of spatialized inequality (Baldwin, 2021; Winling, 2017), are increasingly important players amid the global rise of speculative "eds and meds" approaches to urban development (Nie, 2024), yet could be spaces of possibility for resource redistribution and community wealth-building (Wilson & Gough, 2020).

Constellation analysis allowed us to systematically map the relationships between REAs and regional governance systems composed of interactions of multiple actors at multiple scales across multiple sectors in complex and overlapping policy-decision arenas (Boamah, 2018, pp. 3526–3527). Through our constellation mapping, we discerned four discrete types of REAs (Types 1–4 in Figs. 1-3). In the following section, we periodize the REAs into two waves, highlighting key changes in REA format, governance, and embeddedness in policy arenas over time.

3.1. The first wave: Non-profit-led REAs released 2007–2016 under Bush and Obama administrations

3.1.1. REA type 1-regional coalitional non-profit-led REA building efforts: Report-based REAs as advocacy plans

The first three REAs in our field scan, the Portland Equity Atlas version 1 (PEA1), the Denver Metro Equity Atlas version 1 (DMEA1), and the Metro Atlanta Equity Atlas (MAEA), share similarities that are described in a Type 1 constellation diagram (Fig. 1).

All three of these REAs were led by regional coalitions of nonprofits, emerged in settings with relatively strong regional planning organizations (RPOs), and released report-based atlases between 2007 and 2013. The PEA1 (Coalition for a Liveable Future, 2007) functioned like a Davidoff-style advocacy plan, released in close relation to two official regional plan amendments released by the RPOs in 2005 and 2010. The 150-page PEA1 used maps to argue for regional sustainability and highlight disparities in access to housing, schools, transportation, health/design, and parks/nature at the neighborhood level, setting a new standard for granularity and community engagement in equity mapping (Merrick, 2013, p. 1). Coalition for a Livable Future (CLF), a regionally-based non-governmental collective of advocacy organizations, led the PEA1-building effort after its success in pressuring Portland Metro to integrate its positions into the official 2040 Growth Concept Plan of 1995 (Merrick, 2013, p. 3). Reorganized as a nonprofit in 2000, CLF centered its mission on equity—regarded as the least emphasized pillar of the "three Es" sustainability framework alongside economics and environment (Merrick, 2013, p. 3). Influenced by Orfield and other "geography of opportunity" scholars, CLF partnered in 2003 with Portland State University's Institute of Portland Metropolitan Studies and Population Research Center to launch a GIS-based project, framing equity spatially as access to opportunities (Merrick, 2013, p. 1). Leveraging the university's neutrality and expertise for data preparation and analysis was seen as crucial for political legitimacy and policy success (Merrick, 2013, p. 4).

The next two REA cases, the Denver Metro Equity Atlas v. 1 (DMEA1) (Sadler et al., 2012) and Metro Atlanta Equity Atlas (MAEA) (Alexander et al., 2013) both adapted Portland's model. Both REAs emerged in regions with relatively strong RPOs: Denver Regional Council of Government (DRCOG), supported by the (voluntary) Metro Mayors Caucus, guided Denver's planning (Knaap & Lewis, 2011), while the Atlanta Regional Comission (ARC) served as the region's planning hub and managed transit-oriented funding (Basmajian, 2013, p. 185). Coalitional non-profits led both efforts: Mile High Connects (MHC), a nonprofit focused on equitable transit investment produced the DMEA1, and the Partnership for Southern Equity (PSE), a capacity-building equity group (Finio et al., 2020, p. 20) released the MAEA. The DMEA1, a 100-page transit-focused report, and MAEA, a written report with 200+ maps, both prioritized equity but engaged communities less than Portland's effort (Finio et al., 2020).

These first wave REAs can be considered advocacy plans in Davidoff's sense: they were documents produced by advocates banding together to interject equity-oriented regional visions into public discourse. They contributed to a growing consensus that framed social equity and regional economic development as aligned through "move to opportunity" solutions that purported to move residents in areas of concentrated poverty to higher opportunity areas. Despite contemporary critiques that questioned the effectiveness of these approaches in affecting social mobility for low income and minoritized populations (Chapple & Goetz, 2011) and negative social consequences of

[2] We consider our exercise a modified version of the constellation approach because we de-emphasize a fourth category, natural elements, which were not as relevant for our purposes.

Table 1
REA Field Scan Summary table (by Diamond, Wilson, and Russell).

	REA TYPE	Tool Name	Geographic Scale	Public Launch Date	Withdrawl Date	Behind Institutional Login	Purpose	Tool Format: Static maps/Report	Tool Format: Online Mapping Platform/GUI	REA Internal Governance: Coalition Partners: Government: National	Government: Regional	Government: Local	Non-Profit: National	Non-Profit: PolicyLink	Non-Profit: Other	Non-Profit: Regional	Non-Profit: Local	Education/Anchor: Health System	Education/Anchor: Local Academic Institution	Education/Anchor: Non-local Academic Institution	Data Types: Quantitative	Data Types: Qualitative-Resident Lived Experiences	Data Types: Change over time/Historical Data
First Wave REAs	Type 1	Portland Equity Atlas version 1 (PEA1)	Regional	2007	-		"presents the landscape of **equity conditions** in our region [...] for ensuring that all residents [...] have **equal access** to our exceptional **quality of life** and can be healthy and prosperous"	•			•					▲ (CLF)			•		•		•
		Denver Metro Equity Atlas version 1 (DMEA1)	Regional	2012			"to ensure that the region's significant investment in new **rail and bus service** will provide greater access to opportunity and a **higher quality** of life for all of the region's residents, but especially for **economically disadvantaged** populations who would benefit the most from safe, convenient transit service"	•								▲ (MHC)					•		
		Metro Atlanta Equity Atlas (MAEA)	Regional	2013			"to illuminate how **regional prosperity and growth** can be unlocked **when communities have equitable access** to a range of highly interconnected resources."	•			□					▲ (PSE)	•		•		•		•
	Type 2	Durham Neighborhood Compass (DNC)	Bi-Local	2014			"Neighborhood Compass is a **primary community resource** that allows you to **track changes in your community** with data"		•			○				▲ (DW)		•	•	•	•		•
First Wave REA Updates (versions	Type 1 updates	Portland Equity Atlas version 2 (PEA2)	Regional	2013	2015		" to **promote widespread opportunity** for a **stronger, healthier**, and more **sustainable** region"		•		•					▲ (CLF)			•		•	•	
		Denver Regional Equity Atlas (DMEA2)	Regional	2014		•	translates DMEA1 to GUI-based format		•		•					▲ (MHC)					•		
Related Mapping Tools		National Equity Atlas	National	2014			"we work to equip community leaders and **policymakers with actionable data** [...] to **advance equitable growth**" "one-stop-shop for data and policy ideas to **advance racial equity and shared prosperity** [...] providing **equity metrics** that are deeply disaggregated by race/ethnicity, gender, nativity, ancestry, **and income for the largest 100 cities, 150 regions, all 50 states, and the United States as a whole**"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Census Reporter	National	2014			"Census Reporter is an independent project to make it easier for journalists to write stories using information from the U.S. Census bureau"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Affirmatively Further Fair Housing Tool (AFFH-T)	National	2015	2018		**base data interface** for locality use in **Assessments of Fair Housing (AFH) required by 2015 HUD AFFH Rule**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Second Wave REAs	Type 3	Bay Area Equity Atlas (BAEA)	Regional	2019			• Build a **shared understanding** about the importance of **equity** to the region's future • Provide **equity metrics that are disaggregated** by race and other demographics to support more informed decision-making • Inform solutions for **equitable growth** by sharing effective and promising strategies •**Democratize data** and make data more accessible • Increase the capacity of change-makers and advocates to **use data to advance policy solutions**	*	•				▲		• (SFF)				•	•	•	•
	Type 4	Charlotte Built City Equity Atlas (CBCEA)	Municipal	2019			• **equitable access** to goods, services, built amenities •foster **upward mobility** • **mitigate displacement p**ressures	•				▲							•		•		•
Related Mapping Tools		Opportunity Atlas	National	2018			"Now you can trace the roots of today's **opportunity back to the neighborhoods** where people grew up. See where and for whom opportunity has been missing, how it is changing, and use this **data to inform local solutions** to help more children **rise out of poverty**"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Data.Census.Gov Website	National	2019			"the main portal to make census **data available to the public** via a GUI (graphic user interface) "	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Climate and Economic Justice Screening Tool (CJEST)	National	2022	2025		to support **enforcement of Justice 40 initiative** to assure that " **forty percent of the overall benefits of certain federal investments] flow to disavantaged communities**"	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

▲ Indicates Lead Organization.
○ indicates that local government(s) established the nonprofit that produced tool.
☐ indicates that entities are part of the non-profit org that established that produced tool.
- indicates feature not evaluated or not applicable due to tool format.
* indicates reports, analysis and other supporting analysis and interpretation is available through the GUI-based website along with user-driven data mapping capabilities.
Rows in dark grey indicate REA web interface was not reviewed for field scan because institutional login required, or tool was decomissioned at time of field scan, or was built after the field scan was conducted.
Rows in light grey indicate tools that are not REAs, but mentioned in text as related tools, shown for reference.

involuntary residential moves these policies often required (Imbroscio, 2012), regional coalitional framings of equity in Type 1 REAs paralleled definitions of equity put forth nationally by PolicyLink. Their Detroit Summit in 2011 positioned equity as the superior economic growth model for cities, and 2015 summit launched its "All-in Cites," initiative that would build:

> on the resurgence of US cities and their potential for innovation using a framework and policy agenda aimed at ensuring a fully inclusive urban comeback that nurtured the talents and tapped the skills of everyone, especially low-income people and people of color who had lived in cities through their long decline (Blackwell, 2024, p. 14).

Nationally, and regionally, emphasis on social mobility and race-based disparity emerged as the dominant framework for equity policy.

3.1.2. REA type 2-municipally-established non-profit as data intermediary-led REAs: Web-based mapping interface as democratization of data

The Durham Neighborhood Compass (DNC) (Dataworks NC et al., 2019) launched in 2014, exemplifies a Type 2 REA constellation: nonprofit-led, but distinct from Type 1 models in both context and format (see Fig. 1). Unlike Type 1 REAs, the DNC emerged in a setting with a relatively weak RPO, and comprehensive planning was managed through a long-standing bi-local agreement between Durham City and Durham County establishing the a City- County Planning Department as the main planning agency across both jurisdictions (Paterson, 1990).

Type 2 REAs like the DNC mark a shift from expert-synthesized, report-based atlases to interactive, user-manipulable online mapping, or Graphical User Interface (GUI)-based platforms. This transition coincided with a national movement toward open government data, as reflected in President Obama's 2013 open data policy established under Executive Order No. 13642. While these open data innovations are often touted as democratizing instruments for government transparency, and accountability, this heightened emphasis on "evidence-based" modes of governance also proved to be a double-edged sword, observed to result in governmental over-emphasis on efficiency, uses of data without effective on-the-ground reality checks, and opening the door to increased influence of private data collectors and brokers (Trish, 2018). The DNC aggregates data from national sources (e.g., Census, ACS) and

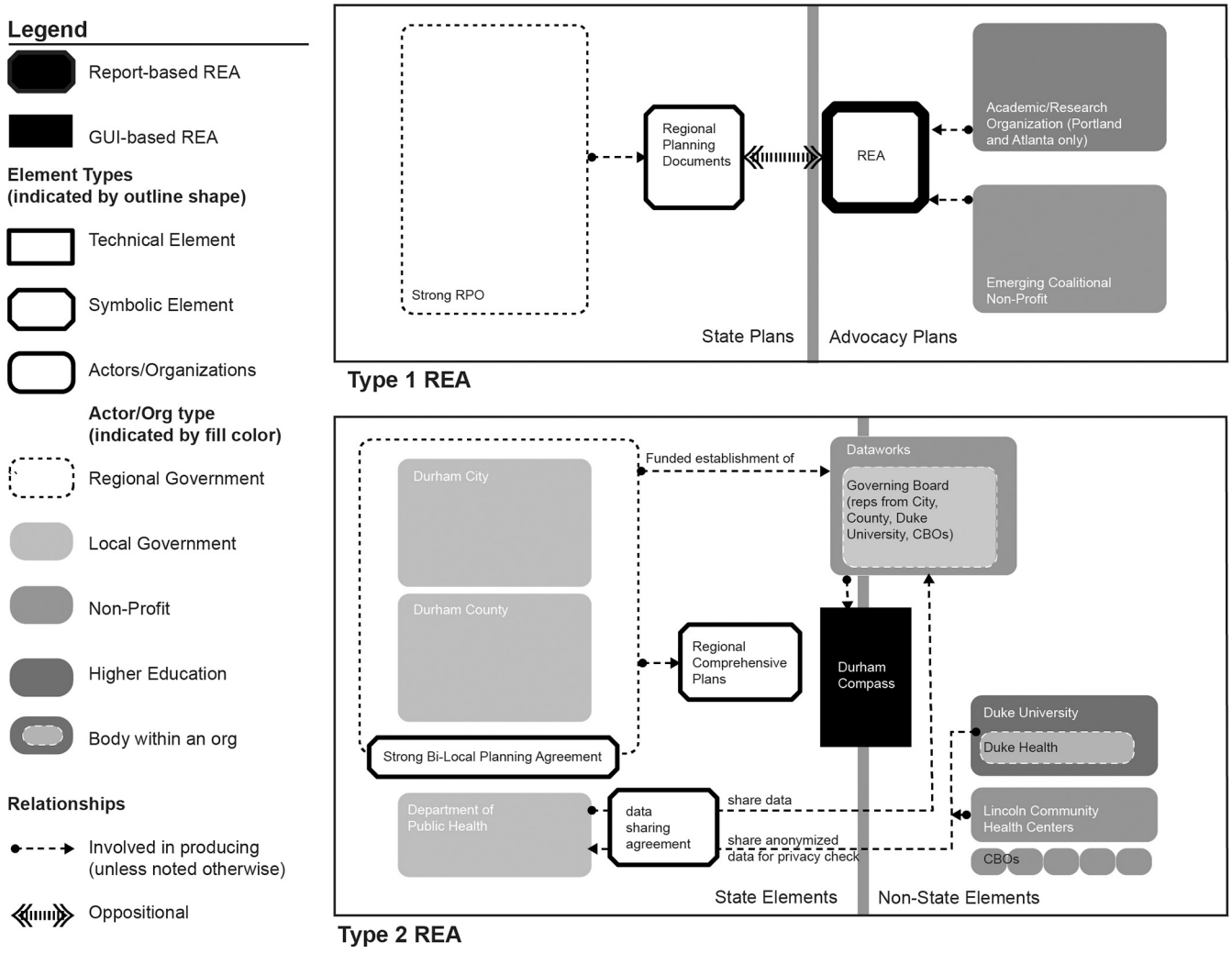

Fig. 1. REA Types 1 and 2 Constellation Diagram (by Diamond, Wilson, and Russell).

local agencies, addressing concerns that public data was previously inaccessible to local communities (Boulware et al., 2020, p. 788). In 2016, DNC became one of the first platforms in the U.S. to make local health system data available to the public. To manage the data and the DNC, Durham City and County both contributed funds to establish a new non-profit, Dataworks Inc. as a 'stakeholder neutral' data intermediary. In this example, the establishment of Dataworks was a mechanism to formalize interjurisdictional data workflows through a data-sharing agreement that clarified the roles of players across sectors in collecting and anonymizing (Duke Health and Lincoln Community Health Center), checking privacy Compliance (Durham County Department of Public Health), and hosting and visualizing patient data for public use (Dataworks) (Boulware et al., 2020, p. 786). In this case, the REA platform became a primary venue for intersectoral and intergovernmental regional coordination and data governance. Dataworks' board includes representatives from local government, Duke University, and community organizations, an arrangement that facilitated a "foundation for regional institutions to work together to address health issues of the community through responsible data stewardship" (Ibid, 786).

In the DNC, we can see representational and operational parallels emerging between the equity mapping approaches in earlier REAs, and health researchers and practitioners who have increasingly framed public health equity around social determinants of health (SDH). SDH-based approaches tracked connections between the specific physical and social environments residents experienced and disparate health outcomes. New data infrastructures like the DNC have braided and overlapped with REA coalitional arguments that define spatial equity through levels of environmental access to opportunities for social mobility.

The DNC example reflects the evolution from advocacy-driven, report-based atlases that make up Type 1 REAs to the collaborative, web-based tools designed to democratize data access and empower community-driven action that describe Type 2. This practice, however, must be read alongside critiques that public availability of data and visualization technologies does not automatically equate to narrative-shifting power (Nelson, 2002), and critics have pointed out the way data harvesting through public agencies can harden existing interpretive frameworks that pathologize populations and spin off new ways for various players to extract profits from urban populations (Eubanks, 2019).

3.1.3. *REA type 1 updates: Transitioning to GUI-based formats*

Across type 1 REAs by the mid 2010s, coalitional organizations decided to transition their first report-based releases to GUI-based "version 2.0" web-mapping platforms in ways that shifted organizational constellations. Portland's REA update (PEA2) released with myriad user-driven capabilities for overlay of multiple datasets, custom map and chart exports, data downloads, a curated set of composite indicator maps, and a collection of "equity stories" that reflected the lived experiences of area residents (Coalition for a Livable Future et al., 2013).

The PREA2 example points to a critical consideration: balancing the intensity of tool-building and qualitative data collection and interpretation efforts with the capacity of collaborators to sustain a tool's usefulness. By our field scan in 2018, the PEA2 tool was no longer available online, and CLF release explaining the tool's removal observed that the tool "should now be housed at an organization with greater research capacity," (Coalition for a Liveable Future, 2015),[3] and the website provided language about a version 3.0 that never released.[4]

Denver's version 2.0 (DMEA2), launched in 2014, was the only REA among our cases to use federal funding mechanisms briefly available to regional equity mapping efforts through the Sustainable Communities Initiative (2010–2015), which supported regional planning and projects across housing, environmental and transportation sectors, and required grantees to dedicate at least one tenth of funds to engaging "groups historically underrepresented in planning processes" (Finio et al., 2020, p. 20). In the case of DMEA2, the RPO (DRCOG), joined the effort by leading regional organizations in a successful Sustainable Communities Regional Program Grant (SCRPG) grant application, and used these funds to help translate the DMEA1 into an interactive website mapping platform (Perry, n.d.). As with the PEA2, our team did not review the web interface, which was held behind an institutional login. DMEA2's restriction of data in this case was intended to minimize access for speculative developers, who could use advocate-generated data in ways that would exacerbate already acute housing affordability issues (Howell & Wilson, 2018).

3.1.4. Equity mapping, federal policy, and public access to spatial data in the first-wave period

During 2007–2017, which we consider the temporal bounds of the first wave of REA projects, federal policymakers and non-governmental actors produced related national-scale equity mapping and data-democratization tools. In 2015, HUD and the EPA each launched major online equity mapping platforms. HUD's Affirmatively Furthering Fair Housing Tool (AFFH-T) was introduced alongside a new federal rule requiring jurisdictions receiving HUD funds to conduct fair housing assessments every five years. The AFFH-T provided baseline data (including demographics, housing, employment, transit, and school proficiency) for use in these assessments (Silverman et al., 2017, p. 144). The EPA's EJScreen Tool, mapped composite indices combining race, income, and environmental data to identify areas facing disproportionate environmental hazards. Both tools exemplified the federal embrace of data democratization, and regulatory adoption of disparity/opportunity frameworks that paralleled equity definitions from the first-wave of REA efforts.

Outside government, academic and equity-oriented non-profit organizations also produced new national scale spatial tools. PolicyLink and the University of Southern California Equity Research Institute (ERI) launched the National Equity Atlas in 2015, as a "detailed report card on racial and economic inequity" (Hoyer et al., 2022, p. 575). Northwestern University's Knight Lab introduced Census Reporter in 2014 (Knight Lab at Northwestern University, 2025), making Census and ACS data more accessible for journalists and the public by providing user-friendly, mapped visualizations, a capability unavailable from Federal web platforms until Data.Census.gov's launch in 2019.

3.2. The second wave: REAs released from 2017 to 2019 (Trump first administration)

REAs launched after 2017 represent a distinct second wave that emerged amid major policy changes. The Trump administration's Tax Cuts and Jobs Act of 2017 introduced "Qualified Opportunity Zones" (QOZs), using the language of spatialized opportunity to incentivize investment in low-income census tracts, though many critics argue QOZs primarily benefit the wealthy (Wendel and Jones, 2020, p. 280). By 2018, HUD attempted to suspend the AFFH rule and then withdrew the AFFH-T, the rule's main enforcement mechanism (Steil & Kelly, 2019, p. 101). Also by this time, REAs had matured, leading second wave tools to build on or integrate with existing platforms and governance structures. The two REAs discussed in this section illustrate different approaches: the first extends a national-level tool to region-specific analysis, while the second uses a report-based format similar Type 1 REAs to synthesize insights from earlier REA-like tools into an explicitly equity-oriented comprehensive plan.

3.2.1. REA type 3: National non-profit led REA extends to a region

The Bay Area Equity Atlas (BAEA) (PolicyLink et al., 2025) exemplifies the Type 3 REA constellation. (see Fig. 2). The BAEA was led by the same groups that developed the National Equity Atlas: PolicyLink in partnership with the University of Southern California's Equity Research Institute (ERI, formerly PERE), and added the regionally-based San Francisco Foundation as a third and local partner. Like Type 1 tools, it released in a context with relatively robust RPOs and ongoing regional planning processes that some players believed involved inadequate attention to equity concerns.[5]

Launched in 2019, the BAEA is a GUI-based tool, and shares resources and staff with the National Equity Atlas. Maintainance of the atlas is shaped by advisory committees of local CBOs, regional stakeholders, and major employers. The BAEA takes a resource-intensive approach to mitigating the risks of data accessibility, offering many formats: prepared charts, dashboards, profiles, fact sheets, and interactive story maps rather than raw data. Of all the REAs we reviewed, this example presented the most highly curated approach to equity mapping, addressing the trade-offs of earlier REAs between analytical depth and interface sustainability through garnering reliable support: ongoing support from ERI, the fundraising power of PolicyLink,[6] and the San Francisco Foundation ensures that as of mid-2025, BAEA remains online and updated, with a staff of fourteen.

3.2.2. REA type 4- planning agency-led REA built on type 2 tools and hybrid type 1/3 precursor

The Charlotte Built City Equity Atlas (CBCEA) (City of Charlotte, 2019) is a second-wave, Type 4 REA that takes a distinct approach to integrating existing tools and analyses (See Fig. 3). Like the Durham Neighborhood Compass (Type 2), the CBCEA originated in North Carolina, where comprehensive planning authority in the region's densest area is held by not by a strong RPO, but by the City of Charlotte through an agreement with Mecklenberg County (Mead, 2000). The CBCEA is a 74-page static report developed to inform the 2040 Charlotte Plan's equitable growth framework, equity indicators, and identification of areas "vulnerable to displacement."

The CBCEA builds on three prior REA-like tools (City of Charlottes, 2019, p. 12). First, it references the *Mecklenburg Quality of Life Explorer,* a

[3] This CLF release implies that the PREA2 website sunsetted alongside CLF in 2015, a year we include in Table 1 as the likely withdrawal date of the interface.

[4] We do not cover these tools in depth in this piece, but another approach to this tradeoff that was widely adopted and is now a common format is the regional data dashboard with composite indicators or indices that track change over time. As one example, the PREA1 and 2 efforts were paralleled by a more quantitative tool called the *Greater Portland Pulse,* an indicator tool that was easier for agencies to maintain and did not require intensive interpretation or complex code. (Merrick, 2013)

[5] Arias et al., 2017 note that one such official project, the SCRPG-funded Regional Prosperity Plan, had improved interjurisdictional cooperation, but exacerbated tensions between larger nonprofits and smaller community-based organizations (2017).

[6] Their publicly available financial disclosures report over $125 million in revenues, mostly through grants and donors in 2022 (PolicyLink and Aramino LLP, 2023)

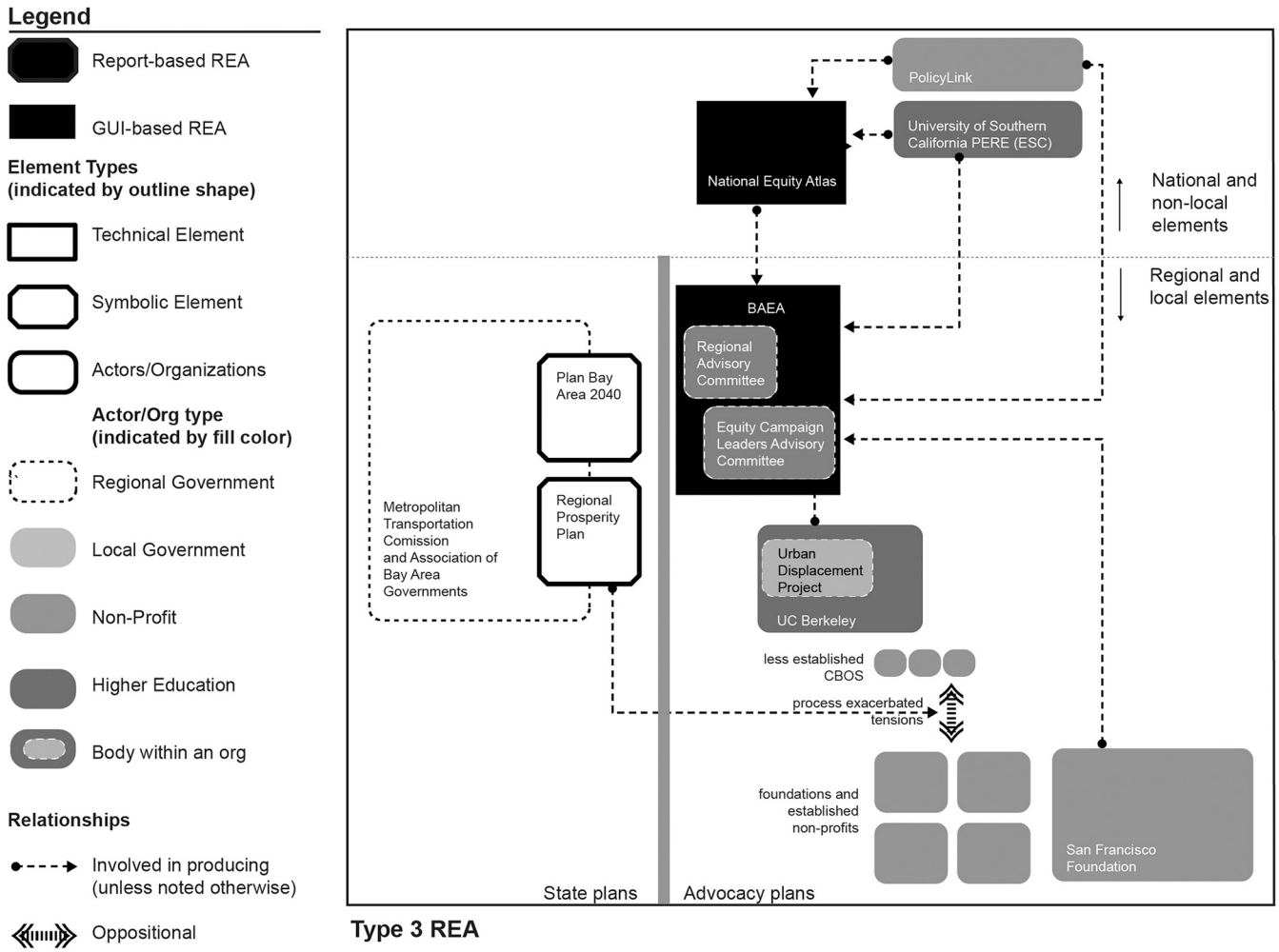

Fig. 2. REA Type 3 Constellation Diagram (by Diamond, Wilson, and Russell).

Type 2 REA launched in 2012 by the UNC Charlotte Urban Institute (UI) and local partners (Charlotte Urban Institute et al., n.d.). Data is managed by Charlotte Regional Data Trust, an intermediary organization with a board that gathers a broad coalition of leaders from across the region in a "community-university partnership that links data across [...] silos" to provide actionable information" (Charlotte Urban Institute, 2025). Second, the CBCEA draws on the *Leading on Opportunity Report (LOO)*, a Type 1 REA led by a non-profit that formed to after a Harvard study revealed the city to be toward the bottom of its list on a comparative study of "geographies of opportunity" in major cities across the US (Leading on Opportunity, 2017). This report led to further effort that ran concurrently to the CBCEA as a Type 3 tool led by the UNC Urban Institute and Opportunity Insights, that highlighted policy action areas in housing and education and called for further data collection "to better understand the magnitude of these issues and possible policy solutions" (Opportunity Insights & Leading on Opportunity, 2020, p. viii).

4. Applying lessons from the field-scan and project-specific qualitative data to prototyping REA tools in central Virginia

Our team's work began with a planning grant from the Institute of Museum and Library Services (IMLS). In 2018, Author B. W. Wilson collaborated with UVA Libraries to pilot a Regional Equity Atlas (REA) for Central Virginia, with A. U. Diamond as a key researcher. This effort soon joined the broader agenda of UVA's Initiative for the Redress of Inequity through Community-Engaged Scholarship (by 2020 renamed the Equity Center).[7] Concurrently, UVA experienced a presidential leadership transition, and Albemarle County established a new Office of Equity and Inclusion (OIE), led by S. Russell. Recognizing synergies, the authors integrated their efforts early on.

As we began the process, we used constellation analysis as a reflective (Fischler, 2012) and power-mapping (Noy, 2008) method to understand regional governance, focusing on the City of Charlottesville, Albemarle County, and UVA as key actors within the Thomas Jefferson Planning District Commission (TJPDC) (see Fig. 4).

In terms of symbolic elements, major organizations were all operating amid heightened pressure to address issues of equity and justice following the events that unfolded in the area over the summer of 2017.[8] By 2018, public discussion and ongoing debates about historical injustices—created a critical juncture for institutional change (for examples, see: Gathers et al., 2016; Klosterwill et al., 2020; Matthew, 2019; Waters-Wicks, 2014; Yager, 2019). All three authors recognized that these dynamics along with the leadership and structural changes across our institutions might represent a moment "of contingency when old policies and understandings no longer work," (Sorensen, 2015, p. 25) and substantial change might be possible.

We began by focusing on basic tools for embedding equity

[7] For clarity, this piece will use "UVA Equity Center" for all references to this entity, which had various names between 2018 and early 2025.

[8] For one account of the chain of events, which included the acute violence of the Unite the Right Rally of August 2017, see (Elliott & Director, 2022).

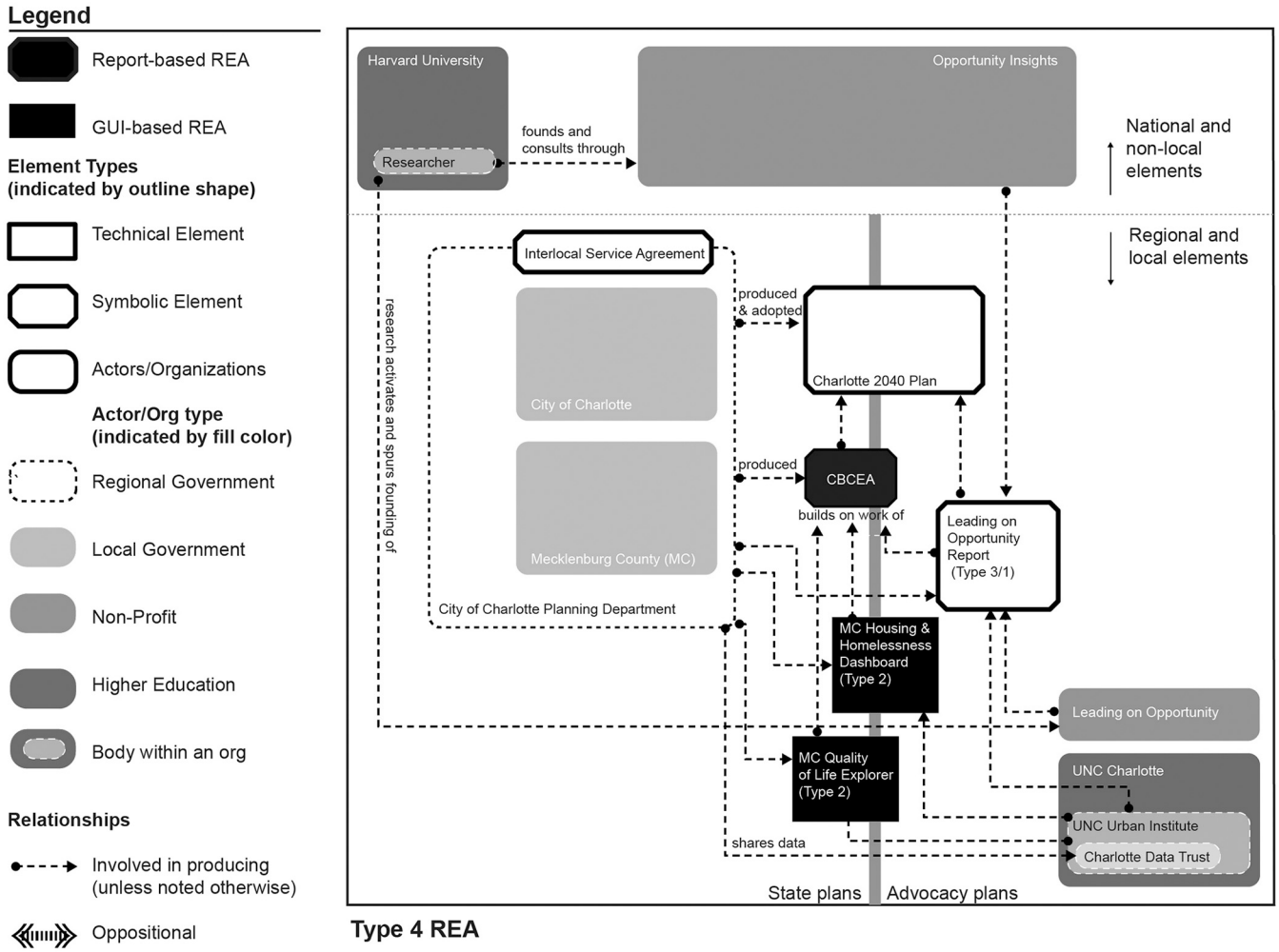

Fig. 3. REA Type 4 Planning Agency-led REA built on basis of existing Type 2 tools and hybrid Type 1/3 tool (by Diamond, Wilson, and Russell).

considerations into regional governance processes. During 2018, the UVA team conducted semi-structured interviews with potential users of an REA-like tool across Central Virginia (n = 15) who held roles in regional systems (Haslanger, 2016) that paralleled major actors across our field-scan cases. These interviews revealed diverse definitions of "equity" and "region," varied data sources, and concerns about tool usability, data control, inclusion, and organizational capacity. In parallel, Russell conducted phone interviews with local government practitioners embedded in equity offices, municipal administration, and human rights commissions across the US to understand best practices, tools, and metrics they used to operationalize equity values in their jurisdictions.

Fig. 4 also describes the suite of tools the REA team developed between 2018 and 2021. The UVA data visualization team built a prototype online mapping interface (Claibourn et al., 2021), meeting with potential users for feedback. As the team developed this prototype, authors piloted methods that became standard practices for governing all Equity Center projects, including establishing a community advisory committee for oversight and a Local Steering Committee to ensure coproduction and data sovereignty/safety. The prototype mapping tool development took place concurrent to efforts by Russell to equip the County's staff to view their work through an equity lens by contextualizing equity through a "quality of life" framing, responsive to the locality's traditional identity, values, and priorities at the time. Russell's work underscored high quality of life for all as the desired state, with equity serving as both the means of achieving the goal and the distributional measure denoting the success of programs and services. Russell's work on framing equity as integral to the County's mission acted as a complement to the UVA team's mapping project, opening a venue for the use of the mapping tools in Albemarle County's government processes.

Over the following summer, following the completion of the biannual community engagement survey, OEI staff conducted a "quality of life roadshow," devised to reach community members historically unresponsive to surveys or less represented at formal public meetings. This roadshow gathered details about lived experiences and perceptions of equity and accessibility, and how these experiences shaped perspectives on quality of life in Albemarle County. The strategy behind this effort was co-developed by a working group of County residents assembled with an emphasis on broad representation of the community across multiple dimensions (including: age, urban/rural residency, income, race, gender, religion, citizenship status). The roadshow offered a community grounded narrative on views of quality of life and well-being (expanding on traditional survey results), and aided in formally (and publicly) surfacing questions about how positive well-being and quality of life experiences were distributed across the Albemarle community and how internally generated outputs might connect to disparate outcomes. With the introduction of these questions simultaneously into the public discourse and internal operations, Albemarle County acted as a key driver of change-oriented conversations, opening other regional leaders' receptiveness to the developing participatory research and mapping approaches being led by the UVA Equity Center.

By 2021, the REA team produced its first public report, the Albemarle County Equity Profile (ACEP), which we presented to the

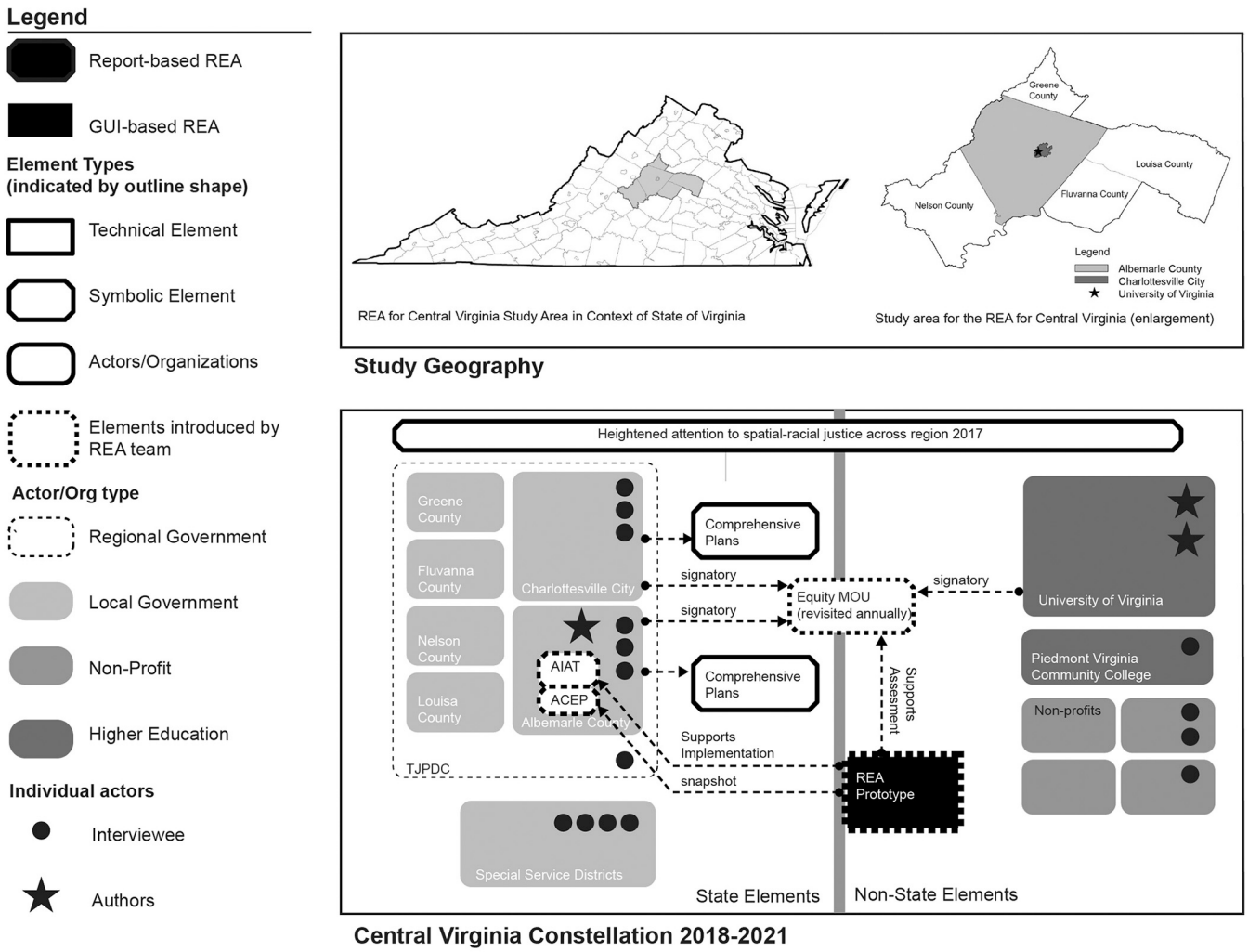

Fig. 4. Project Location in Central Virginia + Constellation Diagram of Central Virginia Regional Governance and REA project elements in 2018–21 (by Diamond, Wilson, and Russell).

Albemarle County Board of Supervisors in 2021 Russell, Siri, et al., 2021). Our approach developed from insights Russell gathered about equity indicators, which we saw as having the potential to shift what systems actors could "see" in setting system goals (Meadows, 2009) and provide a means of quantifiable accountability to considerations beyond economic growth, highlighting issues expressed by residents through the County survey and "road show." Emerging best practices included shifting indicators beyond the economic, bridging quantitative data and qualitative community perspectives, and using user-based disaggregated data for cross-systems analysis. Traditional metrics like GDP provide insight only into economic factors in measuring community health. Some scholars have explored concepts like sense of well-being (Mouratidis, 2021) and sustainable well-being (Cash-Gibson et al., 2023) to quantify quality of life outcomes from planning decisions. The ACEP uses the American Human Development Index (AHDI), which assesses well-being and opportunity in health, access to knowledge, and living standards (Measure of America of the Social Science Research Council, 2014, p.1). Now part of the public record of Albemarle County, the ACEP provides a quantitative baseline for evaluating future progress, operating as both a mechanism for institutional accountability and as a tool for local organizers/ advocates. As of 2025, the ACEP is being updated as a regional effort across the City and County, with the Center for Community Partnerships facilitating this joint analysis. (See Fig. 4).

Concurrently, the team developed the Albemarle County Equity Impact Assessment Tool (AIAT), aimed at building equity assessment into program and policymaking efforts at the County. The instrument, based on a similar tool developed in King County, Washington (King County, Washington, 2016), aimed to support County staff in considering the potential impacts of administrative decisions, routinizing consideration of equity in existing workflows. The online prototype Atlas acts as a supplement to the AIAT; offering insight into the geographic distribution of quality-of-life associated outcomes and socioeconomic factors.

A third policy instrument drew from our constellation insight that area municipalities and anchor institutes were independent centers of authority, so our team prioritized developing a mechanism for formalizing institutional partnerships in an effort to maintain the equity commitments emerging through varied means across jurisdictions. The team developed Virginia's first regional equity memorandum of understanding (MOU, 2021). This multi-jurisdictional MOU, formally adopted by the City of Charlottesville, Albemarle County, and the University of Virginia, recognized and affirmed their shared responsibility in advancing equity and inclusion the region and formalized a set of shared values relating to setting measurable goals and monitoring progress. Progress on the equity MOU is reviewed (alongside MOUs on transit, housing, economic development, and education) at an annual joint meeting of the localities.

5. Conclusions

Based on our work with constellation analysis as an evaluative tool and later in an applied project, we come to two sets of conclusions: the first is strategic, and the second is critical. Strategically speaking, our team found constellation analysis a useful method for surfacing our positionalities within institutions and for strategizing about where and how to focus our efforts to embed equity considerations in governance processes. In the years since our project, we have witnessed the political and material landscape shift even more dramatically beneath our feet. Constellation analysis is a relatively quick and low-barrier method for visualizing and discussing structural changes in regional governance and contextual conditions as they unfold, and as such can be a useful strategic tool for project teams aiming to continue to work amid inconsistent resource streams and political contexts.

Our second conclusion brings up more critical questions. In our field-scan, we used constellation analysis as a reflective tool for the planning fields, considering how both the definitions of equity and the structures for the governance and resourcing of REAs have changed in the first quarter of the 21st century. "Equity" has become a major normative concept for national non-profit actors like PolicyLink and REA-building coalitions. We found in this scan a relative dearth of critical planning scholarship that reconsiders equity planning frameworks in light of the rise of large non-profit advocacy organizations in conjunction with the academic-researcher, who we contend can no longer be pictured simply as community advocate or impartial researcher, respectively. The story the evolution of REAs reflects both increasing translation of equity language directly into government planning documents and policy instruments, but may also reflect the narrowing of organizing frames to those that align movement claims with interests of those in positions of relative power. Consider critics who observe that consensus-based issue framing often highlights the claims of relatively powerful segments of minoritized populations (Cohen, 1999), or scholars who argue that race and/or class-reductive movement frames limit public debate to policy solutions that continue to facilitate wider wealth redistribution in the upward direction (Johnson, 2023; Reed, 2020). Meanwhile, contemporary critics observe that our increasingly privatized governance systems spin advocacy organizations into a "non-profit -industrial complex" (Incite! Women of Color Against Violence, 2017) that can marginalize more fundamental visions for social change. The evolution of mainstream "equity" frameworks as championed by later REA projects makes clear that comprehensive REA tools aimed at longevity and qualitative depth are resource intensive and require a cadre of often philanthropically or academically supported experts to maintain these tools. How direct are the benefits that accrue to communities, versus the benefits of these projects to the careers of expert researchers, academic institutes, and resource flows to non-profits? Perhaps the most salient lesson we gleaned from these efforts is that while much urban studies scholarship considers REA tools, the specific histories, power dynamics, and benefits of REA-related research are underexplored both in practice and research. We hope to contribute to this scholarship with one practical tool for visualizing the rapidly shifting regional dynamics of power, and raise broader questions about how actor interests and positions impact issue framing, coalition-building, and technology-building efforts across scales.

CRediT authorship contribution statement

Alissa Ujie Diamond: Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Barbara Brown Wilson:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization. **Siri Russell:** Writing – review & editing, Project administration, Methodology, Investigation.

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Declaration of competing interest

The authors report there are no competing interests to declare.

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Data availability

This Project's IRB requires that qualitative interview and focus group data/transcriptions not be publicly shared.

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