



# Built Environment Issues in Unserved and Underserved African-American Neighborhoods in North Carolina

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## ABSTRACT

Urban planning has focused on built environment issues in cities such as urban sprawl, availability of green space, and infrastructure for physical activity. However, in small southern towns, there are built environment issues which currently either are understudied or completely neglected by researchers. In this article, we describe the built environment issues that burden unserved and underserved communities of color in North Carolina. We use a case study of Mebane, NC to describe how neighborhoods of color in this small town have been impacted by environmental injustice through the denial of basic amenities, particularly sewer and water services, and overburdened by unhealthy land uses through inequities in the use of extraterritorial jurisdiction and annexation statutes. These planning inequities create public health risks for residents and nearby populations.

**Keywords:** built environment; environmental justice; basic amenities; land use planning; annexation; segregation; extraterritorial jurisdiction; disparities; communities of color; infrastructure

## INTRODUCTION

A WEALTH OF literature in urban planning, social sciences, and population health has focused on built environment issues in metropolitan areas, particularly urban sprawl, racial and economic segregation, metropolitan fragmentation, urban decay, environmental hazards, and related health outcomes. Resources have been invested to make communities more “walkable and livable” by reintegrating planning and public health to improve neighborhood infrastructure, including increasing availability of healthy foods at nearby grocery stores, creating access to green space and parks, and adding sidewalks and walking trails to increase quality of life and create better health outcomes.<sup>1</sup>

However, a paucity of resources has been invested into research, urban planning, and community development to address built environment and environmental justice issues that burden underserved and unserved populations of color

in semi-urban areas in small southern towns. Here, whites are often concentrated in the inner core while blacks are concentrated in the periphery, the opposite spatial dynamic of metropolitan cities where high concentrations of people of color and the poor are found in the eroded urban core while affluent and white populations are found in suburbs that surround the cities.<sup>2</sup> We purport that racial residential segregation in small southern towns results from the legacy of slavery and Jim Crow politics and policies.

First, we will detail our perspective on the role that built environment infrastructure disparities play in driving negative public health outcomes and the need to adapt the classic exposure-disease paradigm to research these issues. Then, we will discuss extraterritorial jurisdiction (ETJ) and access to basic amenities as important environmental justice issues in underserved and unserved communities of color in North Carolina. We will argue that the case study of Mebane, NC will broaden our understanding of environmental justice, built environment, and public health issues in the South.

### *Infrastructure disparities and the exposure-disease paradigm*

The provision of safe water and adequate sewer services by local municipalities to unserved residents (those using failing private septic systems and well water) and

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underserved residents (those using sub-standard public regulated sewer and drinking water infrastructure) prevents disease. Poor African-American neighborhoods' dependence on sub-standard sewer and water system infrastructure may stem from non-compliance by local publicly owned treatment works (POTWs) and drinking water treatment plants (DWTs) (e.g., sewage and drinking water treatment facilities) with Clean Water Act and the Safe Drinking Water Act regulations. The failure of municipalities to install up-to-code sewer and water infrastructure (i.e., underground sewage and drinking water pipes of the adequate size and material) can lead to vulnerabilities in the sewer and water systems, increased levels of harmful microbes and chemicals in residential drinking and surface water supplies, elevated exposure risks, increased occurrence of gastrointestinal (GI) and other illnesses, reduced neighborhood quality of life, and higher stress levels among poor people of color residents.

Currently, the exposure-disease paradigm focuses on the external exposure, exposure pathway mechanisms, biologically effective dose, dose-response relationships, and resultant health outcome.<sup>3</sup> We suggest that in unserved and underserved neighborhoods (where residents often have no access or access to *low quality* sewer and water infrastructure and other basic amenities), infrastructure disparities should be viewed as the engine for exposure-disease dynamics. An alternate interpretation of the exposure-disease paradigm should be employed in these populations. We suggest that it may not be necessary to expend research resources to rework a known exposure-disease relationship (e.g., exposure to fecal wastes in water supplies leads to increased GI illness). It is sufficient to merely document the existence of infrastructure disparities by showing non-compliance with existing environmental and public health statutes, civil rights legislation, and building codes. For example, by demonstrating non-compliance with the Clean Water Act and Safe Drinking Water Act through sampling of community surface and drinking water supplies in low-income communities of color, neighborhood residents can seek corrective actions and advocate for improved access to high quality sewer and water systems—which may reduce pollutant exposure risks, adverse health outcomes, and other harmful effects.

We frame the process of examining the intersection of environmental laws, public health statutes, and building codes with the assessment of exposure-disease dynamics in overburdened, marginalized, or underserved communities as a form of research driven by legal statutes and codes termed law-driven or “legal epidemiology.” Legal epidemiology places emphasis on non-compliance with legal statutes by municipalities, industries, and other entities, which leads to disparities in infrastructure and the production of sources of unhealthy exposures in underserved and unserved environmental justice communities. A traditional epidemiologic research approach may place more emphasis on measuring and evaluating relationships between exposure, dose, and the occurrence of disease instead of placing emphasis on measuring the source of exposure and infrastructure disparities. Thus, by using

legal epidemiology and a holistic infrastructure planning and development perspective, living conditions and health outcomes can be improved by gaining compliance with environmental laws, public health statutes, civil rights legislation, and building codes, releasing the unserved and underserved communities from showing a burden of proof or finding a “smoking gun.” Traditional epidemiologic research following the classic exposure-disease framework often may not be necessary. Demonstrating non-compliance with existing statutes may be sufficient to address water and sewer (and other built environment) disparities and public health problems in poor neighborhoods of color.

In the following sections, we will discuss the lack of basic amenities as a primary built environment issue, sewer and water infrastructure problems in NC, and environmental injustice and barriers to adequate sewer and water access and other basic amenities; in particular, the misuse of extraterritorial jurisdiction (ETJ) by local municipalities, and perform a case study of the aforementioned issues in Mebane, NC.

## DISCUSSION

### *Lack of basic amenities as a primary built environment issue*

Basic amenities include access to public and regulated sewer and water services, paved roads, gutters and ditches for stormwater management, accessible roads for proper connectivity (e.g., ingress/egress), and sidewalks. Basic amenities are the building blocks of neighborhoods. In many cases, neighborhoods without basic amenities are less resilient to environmental insults and weather-related perturbations, as seen in underserved New Orleans neighborhoods impacted by Hurricane Katrina. These neighborhoods can have lower quality of life, unhealthy living environments, and less sustainability.<sup>4</sup>

Our research has demonstrated that limited access to regulated, public sewer and water services is a primary public health issue in North Carolina. Residents who do not use regulated, public sewer and water services use septic systems for disposal and treatment of domestic sewage and well water as the primary drinking water supply. If septic systems are chronically failing, fecal waste can contaminate the household water supply through runoff caused by rain events or subsurface flow into groundwater reservoirs, posing serious disease risks for household residents and other populations in the area.<sup>5</sup>

### *Water and sewer infrastructure problems in the state of North Carolina*

A 1998 NC Rural Economic Development Center (NCREDC) report on water and sewer infrastructure needs across NC, entitled *Clean Water Our Livelihood, Our Life*, surveyed 405 public water systems (PWSs) and 254 public sewer systems in 75 counties and found that nearly 75% of North Carolinians are served by small water systems (e.g., systems serving fewer than 3,300 people) compared to 10% nationally. A PWS is defined as any water



system that serves at least 25 people or 15 service connections for at least 60 days per year. Across NC, small systems are faced with daunting problems of deteriorating, aging, and crumbling drinking water distribution and sewer systems. Fifty four sewer moratoria are imposed across the state of North Carolina. These municipalities are seriously lacking in funding to repair and upgrade existing infrastructure. Rehabilitation of old, deteriorating, leaking pipes poses a large need across the state because many drinking water distribution and sewer systems are 40 years old and some are more than 70 years old (North Carolina has some of the oldest drinking water systems in the Southeast). The nearly 3,000 miles of sewage collection pipe across NC made of vitrified clay that was installed during the 1930s is now crumbling and leaking and replacement can cost as much as \$75 per foot. One in four NC PWSs expects to be unable to expand drinking water systems by 2010.<sup>6</sup>

A more recent NCREDC survey in 2006 of 535 public water and sewer systems projected that \$7.64 billion and \$7.52 billion will be needed to meet the capital needs for water and sewer improvements through 2030, respectively (NCREDC, 2006). In addition to rising maintenance and expansion costs, deteriorating infrastructure has led to increased citations for violation of ever-stricter state and federal drinking and surface water quality regulations. During 2002, the North Carolina Division of Water Quality (DWQ) cited municipalities in NC for 2,047 sewage spills from government and private waste collection systems. Fines for enforcement and compliance violations are especially tough on small towns such as Oxford, NC, where sewage failures in 2006 forced the city to reach an out-of-court settlement with environmentalists and the DWQ. The DWQ enforced a moratorium on new sewer connections in Oxford and levied a statewide record \$100,000 fine for sewage infrastructure failures.<sup>7</sup>

Across NC, small towns transitioning from rural to semi-urban through long-term growth plans are struggling to meet state and federal drinking water and sewer infrastructure regulations as well as the service rehabilitation and connection requirements of residents. While water and sewer infrastructure failures negatively impact the health of residents across the state, infrastructure disparities (among low-income communities of color without access to public, regulated municipal water and sewer services) represent an understudied public health problem that has not been recognized or addressed by local officials, planning bodies, and the public health community.

#### *Extraterritorial jurisdiction*

Extraterritorial jurisdiction is the legal phrase used in North Carolina to describe the right municipalities have to apply zoning, planning, land use regulations, and community development ordinances to nearby properties that are neither within a municipality nor incorporated into another municipality. NC General Statutes (Article 19, 160A-360) states that a city may exercise its ETJ powers within a defined area extending outside its corporate lim-

its based on its population size; therefore, ETJ statutes give towns the ability to “legally discriminate” by choosing which neighborhoods they annex or do not annex into their corporate limits. Residents in annexed areas receive the right to vote and access to basic amenities. On the other hand, residents who remain outside the corporate limits and inside the ETJ do not have access to basic amenities or the right to vote to influence land use decisions.<sup>8</sup> The ETJ planning decisions of small towns contribute to the depression of health and quality of life in historically excluded neighborhoods.

In addition to controlling who lives within their corporate limits, local officials can use ETJ as a spatial driver of environmental injustice since they can annex certain neighborhoods, giving them access to basic amenities, while refusing to annex other neighborhoods located in unincorporated areas, preventing them from receiving basic amenities. Environmental justice goes beyond the siting of environmental hazards and unhealthy land uses in communities of color, it extends to the prevention of access to health-promoting infrastructure that buffers residential exposure to hazards and unhealthy land uses. For example, towns may choose to annex businesses, either as individual entities or as commercial parks, providing them with city services, while denying access to these health-promoting services in well-established neighborhoods of poor people of color located in the ETJ, even though the people of color neighborhoods may be closer or contiguous to the existing corporate boundary. Theoretically, an established poor people of color neighborhood may be bypassed indefinitely, resulting in what appears from a mapped perspective to be an irrational pattern of exclusionary land use (see Figure 1). Previous studies have demonstrated how inequities in planning, zoning, and land use decision-making can have negative impacts on health and quality of life in neighborhoods of color.<sup>9</sup> Over time, these neighborhoods may suffer from the effects of not having access to improved basic amenities.

#### *Case study of built environment issues in Mebane, NC*

Mebane, NC, is a small town of approximately 7,200 residents located between Burlington and Chapel Hill, NC. The 2000 U.S. Census reports that the town is 77% white and 18% African-American with a median household income of \$39,000. In this community, African-Americans are concentrated in four historic neighborhoods (West End, White Level, Buckhorn/Perry Hill, and East End) with the first three located in Mebane’s ETJ (see Figure 1).

The West End Revitalization Association (WERA), a community-based organization comprised of residents fighting against negative built environment issues in West End, White Level, and Buckhorn/Perry Hill, reports that the neighborhoods it represents are 85% to 95% African-American with many low-income residents (i.e., annual household incomes less than \$20,000 per year). Many of the residents are descendants of slaves and own land and property in Mebane passed down across multiple gener-





opment, transportation planning, environmental hazards and unhealthy land uses on communities of color and poor neighborhoods similar to the EJ issues described in Mebane, NC.<sup>12</sup>

**Denial of sewer and water services in WERA neighborhoods.** Figure 2 is an enlargement of the West End community displayed in Figure 1, showing the locations of different community assets and street names. The Mebane WWTP is directly south of the West End community boundary (see Figure 1), but many residents lack access to the sewer infrastructure. WERA documented that 60% of West End is located in the ETJ, while 40% is located in the city limits. Even the households located in the city do not have adequate access to sewer and water services; WERA surveyed West End residents within the city limits and found infrastructure disparities. For example, some homes do not have any public, regulated water and/or sewer services and are not in close proximity to the service lines. Other residents have sewer and water lines that run in front of their homes, but they are not tapped on. Some households are tapped on, but the sewer and water lines are: 1) not up to current building codes, 2) not in compliance with environmental laws (e.g., Clean Water Act, Safe Drinking Water Act), or 3) are up-to-code, but compromised.<sup>13</sup>

Many of the residents who live in the portion of West End found in the ETJ are unserved populations without access to any public, regulated sewer or water services.

Similarly, the White Level community, (Figure 3) located primarily in Mebane’s ETJ in the northern section of town (Figure 1), does not have access to sewer and water services. The neighborhood also has substandard housing and is faced with increasing septic system failures. The new high-income Mill Creek subdivision (99% white) (see Figure 1), located directly across the street from White Level, was annexed into the city, and has all basic amenities.<sup>14</sup> Like White Level, the Buckhorn/Perry Hill neighborhood (Figure 4) is located entirely in Mebane’s ETJ (Figure 1). A new Petro Truck Plaza (Figure 1) located in the neighborhood was satellite annexed and given water and sewer services, while Buckhorn/Perry Hill residents suffer from a lack of basic amenities.

WERA’s research, funded by an US Environmental Protection Agency (EPA) EJ small grant, revealed that households in all WERA neighborhoods are without regulated, public sewer service use private on-site septic tank-soil absorption systems. WERA’s survey of local residents found that up to 18% of households had failure or near failure of septic systems. Subsequent sanitary surveys by the City of Mebane revealed septic system failure rates of 50–100% on several streets in West End. Analysis of water samples from household well water and city water supplies showed evidence of fecal contamination as indicated by detection of *E. coli*, fecal coliforms, *Enterococcus*, and F<sup>+</sup>-specific coliphage. Additionally, turbidity levels were observed in WERA neighborhoods that exceeded EPA turbidity standards for drinking water in both well

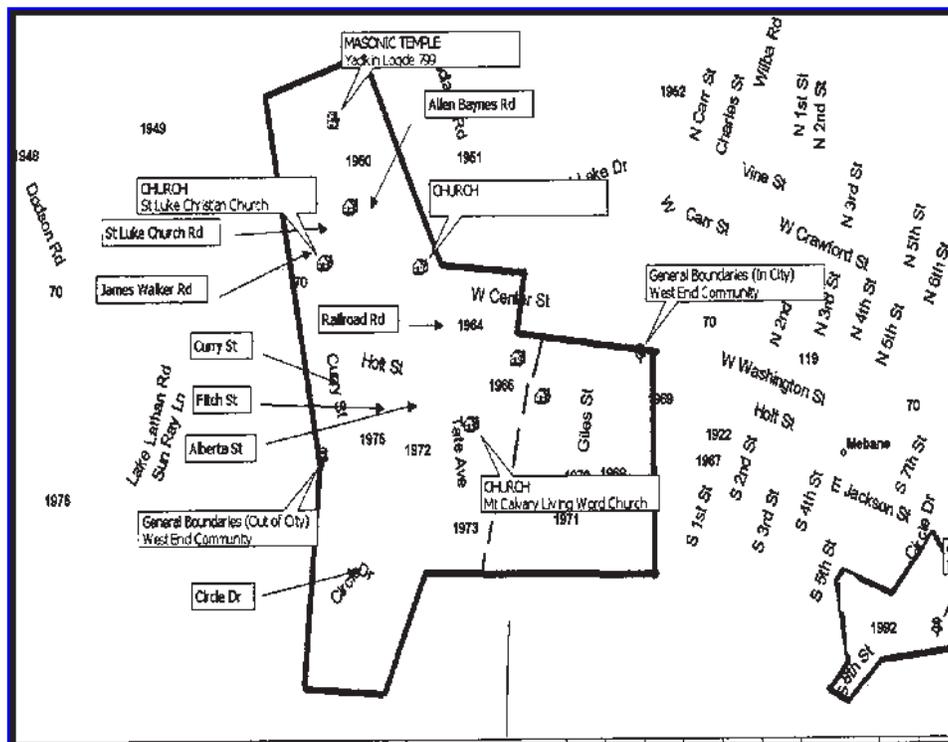


FIG. 2. Map of West End community located in the city limits and in Mebane’s extraterritorial jurisdiction with the location of community assets and street names.

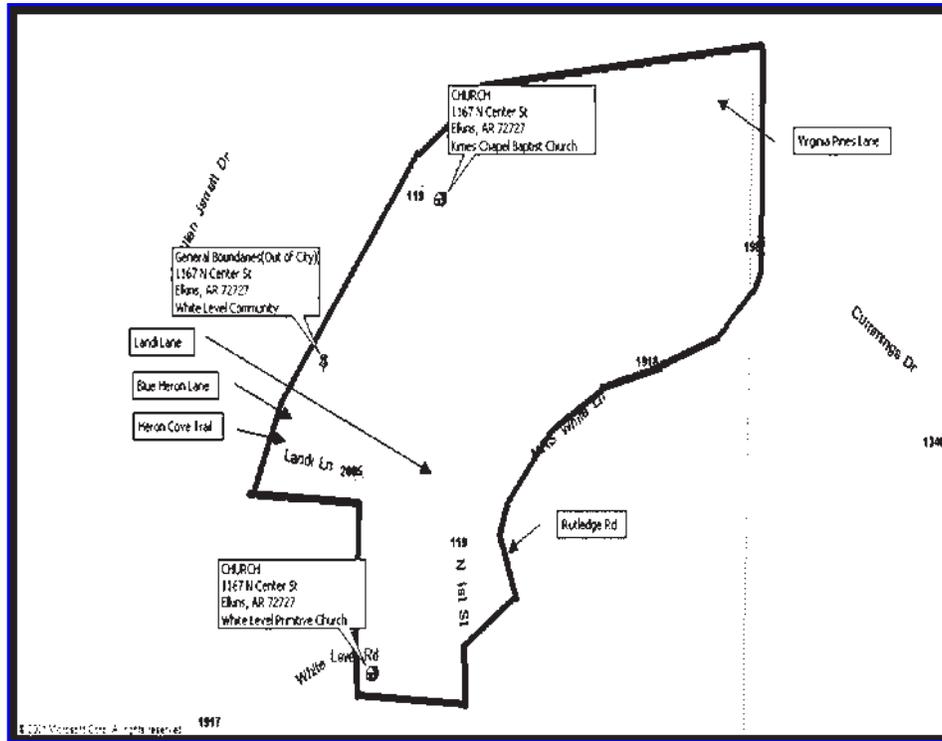


FIG. 3. Map of White Level community located primarily in Mebane’s extraterritorial jurisdiction with the location of community assets and street names.

water supplies and regulated, public water supplies. Fecal microbial indicator and turbidity levels are comparable to levels found in other studies that have been linked to outbreaks of GI illness and an increased incidence of endemic GI illness. Our research documented high levels of contamination in surface waters near WERA neighborhoods that exceeded the EPA and DWQ Maximum Contaminant Limits (MCL) for fecal coliforms (200 CFU/100ml), *E. coli* (126 CFU/100ml), and *Enterococcus* (33 CFU/100ml) in waters to be used for primary contact recreation. WERA’s study also found that West End residents within the city limits had “paper” sewer lines made of Orangeburg pipe, which is not up-to-code and easily corroded or damaged. The results of WERA’s study demonstrated: 1) that fecal contamination from communities with no sewer/water services increases the vulnerability of drinking and surface water supplies and 2) that the denial of basic amenities and the lack of up-to-code sewer and water infrastructure in unserved and underserved WERA neighborhoods causes an immediate and preventable public health risk for local residents and the greater Mebane area.<sup>15</sup>

### CONCLUSIONS AND RECOMMENDATIONS

The work of the West End Revitalization Association has revealed that unserved and underserved communities of color particularly in unincorporated areas are disproportionately impacted by environmental injustice from inequities in land use planning and development

through abuse of extraterritorial jurisdiction and annexation. The abuse of ETJ laws and annexation has led to racial residential segregation, social inequalities, and lack of political representation for historic African-American neighborhoods. We observe that these neighborhoods in Mebane have limited access to basic amenities (i.e., sewer and water services, paved roads, safe housing, gutters for stormwater management) while being disproportionately burdened by and exposed to unhealthy land uses. The use of annexation to protect the health and safety of residents is the most elementary tenet of land use planning, but in Mebane it has been applied unjustly and created environmental health risks for unserved and underserved communities.

We believe more resources should be invested to fully document the extent of infrastructure and basic amenity disparities in the South and the United States. Our research provides important insight into the problems in Mebane and North Carolina. However, we don’t know the extent of the infrastructure problems in segregated, disadvantaged, and poor communities of color across the South and the United States in incorporated and unincorporated areas. Recent news reports from state-level and national news agencies and research, training, and policy sessions led by WERA leaders at national forums and conferences on the topics attended by members of community-based EJ organizations, lawyers, and government officials anecdotally reveal the pervasive nature of the problem, but more empirical evidence is needed.

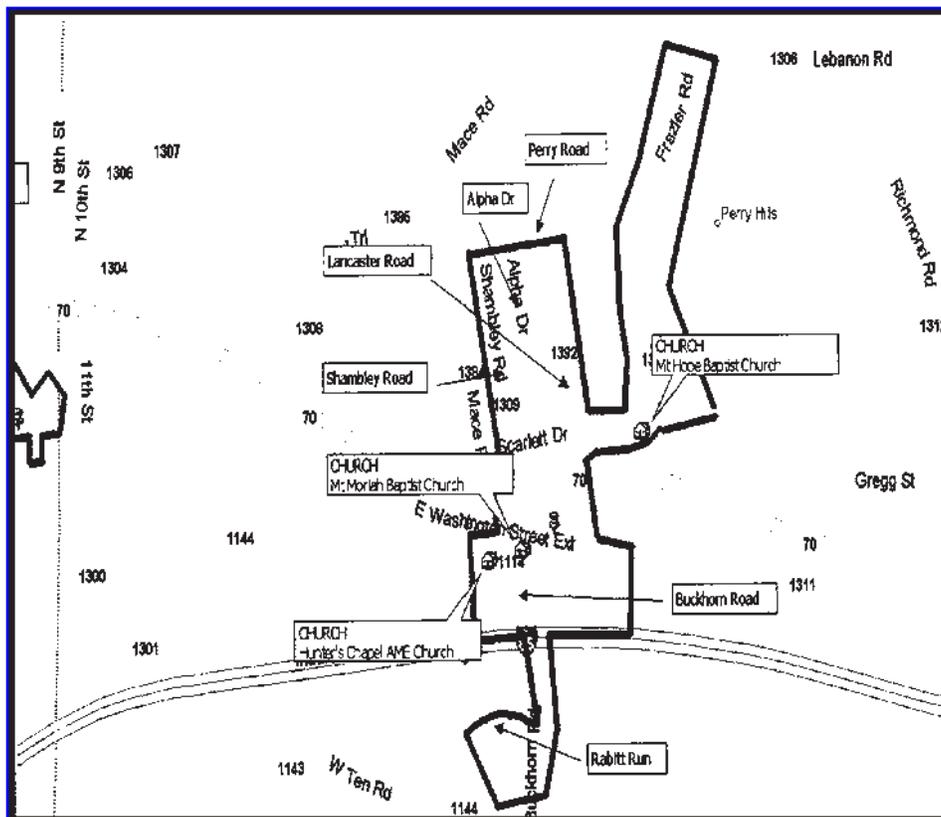


FIG. 4. Map of Buckhorn/Perry Hill community located primarily in Mebane's extraterritorial jurisdiction with the location of community assets and street names.

We recommend the following for researchers seeking to study and address infrastructure and basic amenity issues: 1) more work is needed to explore the issues of ETJ and annexation in driving environmental injustice and negative health and quality of life outcomes for unserved and underserved communities in the South who have limited access to basic amenities; 2) the exposure-disease paradigm should incorporate a more holistic perspective in understanding how the built environment can impact the health of vulnerable communities; 3) more focus should be placed on assessing infrastructure disparities and non-compliance with environmental laws and public health codes using a legal epidemiology approach; and 4) prevention research should integrate land use planning, community development, and social justice to improve built environment and health conditions in unserved and underserved communities.

From a policy perspective, we recommend the following: 1) states with ETJ laws and other planning designations that create de facto segregation and planning and zoning inequities amend these laws to protect and revitalize historically disadvantaged communities; 2) new funding mechanisms such as state revolving loan fund sewer/water grant programs be established to provide, maintain, and upgrade sewer and water infrastructure in unserved and underserved communities based on ASCE criteria; 3) healthy zoning initiatives be implemented to

help EJ communities overburdened by environmental hazards and underserved by basic amenities; 4) state and federal level Environmental Protection Agency (EPA), Department of Health and Human Services (DHHS), and Housing and Urban Development (HUD) collaboration to establish a priority list of communities with infrastructure needs, place moratoria on new residential, commercial, or industrial developments in municipalities found to have a history of environmental discrimination, and only lift moratoria when infrastructure needs are addressed in priority communities; and 5) community-based planning boards be given more authority to directly receive federal funding from agencies with infrastructure-related resources such as HUD in order to more effectively address the lack of basic amenities in unserved and underserved communities.

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