Achieving Resilient Mobility:

Essential Principles for Building Equitable Transportation Systems in an Era of Climate Crisis

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EXECUTIVE SUMMARY

Problem

Our transportation system has contributed to disparate living conditions for communities of color, leading to neighborhoods that are less healthy, less wealthy and consequently less resilient to the impacts of climate change. Further, climate change, as a threat multiplier, affects low-income communities of color first and worst — as a result, the consequences of vulnerable transportation infrastructure, insufficient evacuation planning, or inequitable disaster recovery strategies fall most severely on these groups. There is an urgent need for transportation decision makers to address the intersection of mobility equity, climate resilience and racial justice to ensure resilience for frontline communities under the impacts of climate change.

While some resilience planning is underway in our transportation agencies at the state, local and federal level, many of these efforts fail to meaningfully prioritize equity for low-income communities of color. Moreover, existing efforts often focus exclusively on infrastructure resilience, and fail to account for community resilience and the priorities of communities that face the most severe impacts. Further, equitable transportation resilience planning requires a multi-sectoral approach to address the intertwined issues of climate resilience, housing security, health, displacement and transportation.

Purpose

To reshape our transportation system and prioritize equity and resilience for frontline communities, transportation decision-makers must reconcile with the past, address current inequalities and carefully move forward with solutions and investments that ensure alignment with these future goals. This white paper recommends a set of guiding principles to advance equitable and resilient mobility efforts that can help build community resilience to climate change impacts.

Principles for Equitable and Resilient Mobility

I. Transform outdated practices: Reassess outdated mobility planning, investments, programs and projects and reshape them to center equity, meet the current and future climate resilience needs of frontline communities, and not replicate past injustices.

II. People first: Center the needs and priorities of frontline communities to shape transportation infrastructure efforts when preparing for, responding to and recovering from the effects of climate change.

III. Promote multiple benefits: Promote policies and plans that offer multiple benefits to frontline communities to help alleviate the historical and compounded injustices these communities face. Climate resilient mobility solutions should aim to support health, economic and housing security, displacement prevention, access to clean technology and people's ability to live where they work.

INTRODUCTION

Last winter, extreme weather in Texas left roads impassable. For days, residents in Winter Storm Uri's path — particularly unhoused, elderly, lower-income, and transit-dependent residents — were cut off from food, water, warming centers and medical care due to hazardous road conditions. The region was unprepared for the winter storm, and there was no plan in place for connecting its most vulnerable residents with lifesaving resources.[1]

In the summer of 2021, the Northwest experienced an extreme heat wave. Across the Pacific Northwest, public transportation services were suspended as rail lines buckled, roads closed and rail cables sagged. The heat wave created deadly conditions for low-income communities and communities of color who disproportionately live in homes with inadequate cooling and ventilation systems. With non-functional transportation systems due to the extreme heat, many people were unable to move to cooling centers.[2]

The following fall, California faced a devastating wildfire season.[3] When the Caldor fire prompted mandatory evacuations in the Lake Tahoe region, highway traffic became gridlocked for hours.[4,5]

Every year brings harsher storms and more extreme weather conditions. As we scramble to adapt to these unprecedented conditions, the link between transportation systems and the ability for impacted regions to prepare for, respond to and recover from climate disasters is clear. The rapidly intensifying effects of climate change on communities demand us to focus our transportation planning, policy and decision-making power to build resilience in our communities.

This white paper is a continuation of research initiated by Victor Flores, 2021 Greenlining Summer Associate. Our research methodology included a literature review of scholarly articles, agency reports and news articles; a landscape scan of transportation resilience strategies in California; and a limited number of stakeholder interviews.

While some resilience planning is underway in our transportation agencies at the state, local and federal level, many of these efforts fail to meaningfully prioritize equity for low-income communities of color. Moreover, existing efforts often focus exclusively on infrastructure resilience, and fail to account for community resilience and the priorities of communities that face the most severe impacts. Climate change, as a threat multiplier, affects low-income communities of color first and worst — as a result, the consequences of vulnerable transportation infrastructure, insufficient evacuation planning, or inequitable disaster recovery strategies fall most severely on these groups. There is an urgent need for transportation decision-makers to address the intersection of mobility equity, climate resilience, and racial justice to address the specific challenges of low-income communities of color and help them prepare for the impacts of climate change.

In this white paper, we (1) discuss pressing issue areas at the intersection of climate resilience and mobility equity to underscore the need to prioritize **frontline communities** in transportation resilience initiatives; and (2) offer a set of guiding principles intended for use by decision-makers that aim to improve resilience in our transportation system, such as in the design of state or local grant programs, guidance and planning documents, or legislation.

To date, climate priorities in the transportation field have largely focused on mitigating the effects of climate change through greenhouse gas emissions reductions and transitioning to a zero emission future.[6] However, the climate crisis is already affecting us, with devastating impacts on the health, safety and livelihood of frontline communities. Extreme heat events, shifts in seasonal temperatures, wildfires, extreme precipitation events, mudslides, more frequent droughts, sea level rise, storm surge, coastal flooding and winter storms all threaten our transportation system.[7] According to the the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report on Impacts, Adaptation, and Vulnerability, the "window of opportunity" to make

Frontline Communities refers to communities who experience continuing injustice—including people of color, immigrants, people with lower incomes, those in rural areas, and indigenous people—due to a legacy of systemic, largely racialized, inequity that influences their living and working places, the quality of their air and water, and their economic opportunities. In this paper, the phrases "communities of color" or "low income communities of color" are used in some instances for clarity and to draw specific attention to race and/or socioeconomic status.

Definition from The Climate Justice Working Group Report (2018) and Making Equity Real in Research [10,11]

Mobility refers to the movement of people, such as by walking, biking, public transit or driving. While we sometimes use the terms "mobility" and "transportation" interchangeably, we generally define "mobility" as the movement of people and "transportation" as the larger transportation system — which currently is very car-centric. Low-income communities of color suffer disproportionately from transportation-related pollution, endure longer, costlier and less reliable commutes, and generally have few mobility options available to them. Furthermore, these same communities rarely have a say in transportation planning and decision making processes that impact them.

Mobility Equity refers to a transportation system that increases access to high quality mobility options, reduces air pollution and enhances economic opportunity in low-income communities of color.

Source: https://greenlining.org/ publications/2018/mobility-equity-framework/[12] and Mobility Equity: Turning Theory into Reality - The Greenlining Institute[13]

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decisions that will allow us to adapt to climate change is quickly closing.[8] Therefore, while we continue to implement mitigation strategies and reduce greenhouse gas emissions within the transportation sector, we must simultaneously face the reality that climate change is already impacting us — and that this impact is falling disproportionately on frontline communities. Climate resilience planning in the transportation sector must intentionally prioritize resilience for frontline communities in the face of worsening climate impacts.

Within the transportation sector, **mobility,** which we define as the physical movement of people through space, is a critical issue especially as it relates to climate change and equity. To achieve equitable and resilient mobility, our transportation system must be able to support the movement of people during evacuations, adapt to withstand the worsening daily effects of climate change, and continue to connect people with economic opportunity to facilitate access to physical mobility and social mobility. A resilient future, supported by the transformation of our transportation system, is possible for our communities—but only if those in power act decisively to prioritize community needs, address transportation disparities[9] and reimagine mobility for a changing climate**.**

Climate Resilience is the capacity of a system (whether a community or an economy) to maintain 1) an intact core identity in the face of climate change; and 2) a state of dynamic balance within which change can be avoided or recovered from without a fundamental transition to a new form. Resilience can bridge mitigation and adaptation, and economy and ecology, and can help us create more social cohesion, inclusion, power and participation, and more holistic and systemic interventions. Elements of a resilient California include built infrastructure systems, people and communities, and natural systems.

Definition from The Climate Justice Working Group Report (2018) and Making Equity Real in Research [14,15]

Community Resilience is "the ability of communities to withstand, recover, and learn from past disasters, and to learn from past disasters to strengthen future response and recovery efforts." Community resilience includes social and economic equity, health and social connectedness, among other factors.

Definition from https://apen4ej.org/wp-content/uploads/2019/10/APEN-Mapping_Resilience-Report.pdf, adapted from (Cutter, S.L., K. Ash, and C. Emrich. 2014. The geographies of community disaster resilience. Global Environmental Change 29: 65–77.)

CLIMATE CHANGE, TRANSPORTATION AND RACIAL EQUITY: IDENTIFYING THE INTERSECTIONS

A landscape of inequality underlies our transportation system. Deliberate discriminatory policies shaped this landscape over time, to determine the paths highways carve across a city, the places that train lines do and do not reach, which communities are housed in floodplains and which live on high ground, and who might find themselves waiting in the sun at an unsheltered bus stop during an extreme heat event. Climate change further exacerbates these existing inequities in our transportation system. For example, the 2021 Los Angeles County Climate Vulnerability Assessment identified that during extreme heat events, households without vehicle or transit access face difficulty accessing cooling centers. The assessment also found that, during wildfires, those who rely on public transportation are forced to spend long periods outdoors waiting for transit to evacuate to safety, exposing them to smoke. Similarly, when inland flooding and extreme precipitation flood roads and transit infrastructure, people who rely on public transit are often forced to miss work, losing essential wages.[16]

Our existing transportation system has contributed to disparate living conditions for communities of color, leading to neighborhoods that are less healthy, less wealthy and consequently less resilient to the impacts of climate change. The construction of the interstate highway system in the 1950s and 1960s serves as a key example of the role deliberate historic transportation planning decisions play in exacerbating climate vulnerability today. Guided by racist ideologies and the desire to move federal funding into urban business districts,[17] officials used highway construction projects as a tool to accelerate the clearance of Black neighborhoods, thus exacerbating racial segregation in cities throughout the United States.[18] Highways were routed intentionally through Black and low-income communities, destroying vibrant neighborhoods and permanently displacing more than a million people.[19] Residents lost their homes and businesses, effectively robbing an entire generation of the ability to build wealth.

Highway projects in the 1950s and 1960s fundamentally reshaped our cities and many communities never recovered from its legacy. The ramifications of this are still apparent today. For example, communities that were divided and displaced due to highway construction often face health consequences as a result. Broadly speaking, frontline communities bear the greatest health and environmental burdens of pollution,[20] especially from transportation-related pollution sources.[21] In the San Francisco Bay Area, for instance, rates of childhood asthma from traffic-related pollution in neighborhoods with higher populations of people of color double those in predominantly white neighborhoods.[22] The impact of disparate pollution exposure is deadly; transportation-related pollution leads to health outcomes such as respiratory disease, lung cancer and preterm births, ultimately leading to higher rates of premature death for people of color.[23]

> The transportation system has been shaped by many entangled forces, including racial capitalism, settler colonialism, segregation, racial zoning, redlining, urban renewal and the highway project. For more information on these topics and policies, see Appendix.

The highway project also paved the way for problematic funding structures that persist to this day. Black Americans are over three times more likely to use public transportation than white Americans.[24,25] Meanwhile, our government funds car travel more generously than it does public transportation, directing about 80% of federal transportation funding exclusively towards highway maintenance and road construction, as opposed to just 20% for public transit.[26, 27]

Underfunded, inadequate and unreliable mobility options directly contribute to unequal access to economic mobility — so when our transportation system burdens communities of color with longer, costlier commutes, it plays a role in widening the racial wealth gap. Today, the median White family holds eight times the wealth of the median Black family and five times that of the median Hispanic family[28,29]—meaning that communities of color have less economic resilience to withstand and recover from the challenges of climate change compared to White communities.

The highway project also affected where, and under what conditions, communities of color are able to live. In many cities, housing that was demolished to make way for highways was never rebuilt. And, while the highway system initially facilitated White flight out of urban cores and into the suburbs, today's housing affordability crisis in cities has led to a reversal of this trend[30] and to the growth of suburban poverty.[31] As low-income communities and communities of color are pushed farther away from city centers, they lose access to reliable and efficient public transportation options. The present-day crisis of housing displacement further reduces community resilience[32] to climate change by disrupting social networks[33] and affecting the physical and mental health of those facing housing insecurity.[34]

Equitable and resilient mobility is intertwined with movements for climate and environmental justice, economic justice, mobility justice and housing justice. Identifying the intersections between climate resilience and mobility with these movements reveals that not only is our transportation system under-serving communities of color, it is also contributing to worse health and safety conditions.[35] The transportation, health, housing and environmental justice conditions of low-income communities of color, deliberately shaped through our nation's discriminatory history, place them at the highest risk to the effects of climate change. Equitable and resilient mobility efforts will therefore require multi-sectoral approaches that address these intersections and offer holistic solutions.

OUR VISION FOR EQUITABLE AND RESILIENT MOBILITY

Our current transportation system contributes to decreased climate resiliency in frontline communities by burdening these communities with higher costs, underfunding the public transportation systems that serve them, and failing to prioritize the safety of people of color. In addition, the existing racial disparities in infrastructure maintenance and quality mean that preventable harms from extreme weather events fall hardest on frontline communities. Increased frequencies of road closures, delays and disruptions to public transportation also affect economic livelihood. Outdated vulnerability mapping and flood prediction tools have left regions unprepared

for the impacts of storms on roadways, and typically fail to capture the needs of the most impacted frontline communities. During climate emergency evacuations and recovery efforts, people without personal vehicles are often not planned for, and are at risk of being literally and figuratively left behind.

Instead, we envision a transportation system that facilitates resilience for frontline communities; that connects us with jobs that help build wealth; that mitigates air pollution and greenhouse gas emissions; that protects communities from displacement and houselessness; and that, in worst-case scenarios, lets communities safely and equitably escape from storms, wildfires and other extreme weather events. This transportation system is possible — but to get there, decision-makers need to reconcile with the past, address current inequalities, and carefully move forward with solutions and investments that ensure alignment with these future goals.

HOW WE GET THERE: PRINCIPLES FOR EQUITABLE AND RESILIENT MOBILITY

The following principles are intended for use by decision-makers aiming to build resilience in our transportation system, such as in the design of state or local grant programs, guidance and planning documents or legislation. We imagine these principles will be especially relevant for local and state agencies and stakeholders working on planning and policy development, but can also be a tool, framework or conversation starter for other audiences including community-based organizations, transportation policy advocates or educational settings.

To advance equitable and resilient mobility efforts that can help build community resilience to climate change impacts, we recommend the following guiding principles:

I.   **Reassess outdated mobility planning, investments, programs and projects and reshape them to center equity, meet the current and future climate resilience needs of frontline communities, and not replicate past injustices.**

II. **Center the needs and priorities of frontline communities to shape transportation infrastructure efforts when preparing for, responding to and recovering from the effects of climate change.**

III. **Promote policies and plans that offer multiple benefits to frontline communities to help alleviate the historical and compounded injustices these communities face. Climate resilient mobility solutions should aim to support health, economic and housing security, displacement prevention, access to clean technology, and people's ability to live where they work.**

Below we elaborate on each of the three principles and provide a brief set of example strategies decision-makers can employ to center these principles in their planning. These strategy lists are not comprehensive and are intended to serve as illustrative examples of potential applications for these principles.

I. Transform outdated practices: Reassess outdated mobility planning, investments, programs and projects and re-shape them to center equity, meet the current and future climate resilience needs of frontline communities, and not replicate past injustices.

Transportation funding structures and project pipelines currently do not support the climate resilience needs and priorities of frontline communities. Within transportation agencies, the pipeline of planned projects can go back decades — meaning the transportation projects that are implemented today often do not align with the priorities and values necessary for a climate resilient and equitable future. Even in California, a national leader in climate commitments and investments, the state's legacy transportation investments — such as highway widening projects — hinder the state's ability to meet its climate goals.[36] This failure to adapt to our present day challenges and priorities spans across federal, state, regional and local levels of transportation project pipelines. Additionally, while transportation agencies solicit public input on planned projects, this engagement often relies on limited methods such as email, surveys or public comments that are not always accessible for frontline communities. As a result, the development and implementation of projects tend to reflect the voices of those who are able to provide input while leaving out the perspectives of those most impacted.

This raises the question: how can we achieve resilience and equity in our transportation system, if the long-standing pipeline of projects runs counter to these goals? Equitable and resilient mobility requires a commitment to disrupt and reshape these funding structures and planning practices to ensure that the projects we undertake prioritize resilience in frontline communities and meet their specific mobility needs.

In the article "All Transit Is Not Created Equal," Robert Bullard writes of the inequalities in transportation funding: "Follow the transportation dollars and one can tell who is important and who is not."[37] Our transportation funding system has been set up to prioritize highways and personal vehicle travel, with 82% of federal transportation funding directed towards highway transportation as opposed to rail and mass transit.[38,39] As a result of this imbalance in funding, planners and policymakers effectively prioritize the needs of higher-income people and suburban commuters.[40] This leaves frontline communities — who disproportionately rely on public transit and active transportation methods — with underfunded and less reliable mobility options. Transportation funding structures must ensure that funding is directed towards mobility improvements that allow frontline communities to reliably and safely access mobility options as they face the everyday impacts of climate change, and to evacuate safely during climate disasters such as wildfires.

In the article "White Men's Roads through Black Men's Homes," Deborah N. Archer writes that our highway infrastructure is currently "on the verge of transformational change" given aging infrastructure and growing demand. Archer warns highway builders that relying on "'traditional patterns of highway politics and policy focused on growth and expansion' at the expense of communities of color"[41] opens up the possibility of repeating the mistakes of the highway project and replicating past harms. Without changes to these funding structures and project plans,

already-limited climate resilience investments may be routed directly to problematic approaches like highways projects that replicate or worsen racial injustices such as air pollution and climate impacts.[42] We must reshape our mobility funding, planning and implementation practices to instead prioritize climate resilience for frontline communities and ensure that past harms are not replicated.

Example strategies that support this principle:

1. To reshape and evaluate mobility investments, we recommend incorporating the Clean Mobility Equity Playbook's Six Standards for Equitable Community Investment[43] into transportation resilience planning, programs and investments to ensure investments meet community needs and bring intentional and meaningful benefits into communities. By adopting these standards, we can challenge the status quo of community investment practices and proactively ensure that investments and projects moving forward intentionally center equity and community priorities — which is especially important as we invest in and develop climate resilience initiatives for frontline communities.

- Six Standards for Equitable Community Investment

  - **Emphasize anti-racist solutions.** Undoing racist policies like redlining[44] and highway construction that segregate communities of color requires anti-racist strategies to target and prioritize resources to communities of color—while dismantling the structures that reinforce these inequities in the internal planning, power and decision-making structures across all sectors of the transportation system.

  - **Prioritize multi-sector approaches.** We must prioritize mobility approaches that provide multiple benefits or "co-benefits" by addressing related issues and sectors at once, such as wealth-building, climate adaptation, anti-displacement and more, along with outreach, engagement and capacity-building that enables communities to help design their own clean transportation future. *See Principle 3 for more related strategies.*

  - **Deliver intentional benefits.** Benefits cannot trickle down to communities; they must go directly to the people most in need in the most impactful ways, while not increasing or creating new burdens.

  - **Build community capacity.** To ensure under-resourced communities are able to apply for, develop and implement clean mobility equity programs, programs must require and build in technical assistance, capacity building, and long-term training and skills development.

  - **Be community-driven at every stage.** Community-centered investment means lifting up community-led ideas and sharing decision-making power throughout every phase of a program's goal-setting, needs assessments, outreach, implementation and evaluation. *See Principle 2 for more related strategies.*

  - **Establish paths toward wealth-building.** In addition to providing cost savings, clean mobility programs must create jobs, workforce development and training opportunities. They must contract with local businesses and grow community-owned assets and infrastructure.

2. Develop and utilize community-driven climate vulnerability mapping tools to assess (1) if and how transportation and mobility infrastructure and systems are able to withstand climate risks; and (2) how any potential climate risks to transportation infrastructure will impact the people and communities that rely on it.[45] If the vulnerability assessment indicates that transportation infrastructure is at risk due to climate change, then transportation investments in that location must include strategies to mitigate that risk. For instance, active transportation investments in areas prone to extreme heat should include funding for shade and cooling.

3. Develop metrics to track the progress of mobility investments and ensure investments enhance climate resilience priorities for frontline communities, including adaptive management approaches to course correct when needed.

4. Assess local, regional, state and federal transportation plans for their alignment with climate resilience goals and racial equity priorities. An example of this type of assessment is the California Strategic Growth Council's Transportation Assessment Report, which evaluates how transportation planning and funding in California supports long-term climate goals.

II. People first: Center the needs and priorities of frontline communities to shape transportation infrastructure efforts when preparing for, responding to, and recovering from the effects of climate change.

To prepare our transportation system for the impacts of climate change, we need more resilient infrastructure. The U.S. Department of Transportation anticipates higher infrastructure maintenance costs, decreased infrastructure lifespan, and increased frequency of accidents, derailments and travel disruptions as a consequence of climate change.[46] In California, some transportation infrastructure is already becoming unusable and will need to be relocated or modified.[47] For example, the coastal highways in the city of Trinidad are rapidly eroding into the ocean. These damages to infrastructure fall upon a landscape of existing racial inequality, with ongoing disparities in infrastructure maintenance and quality between neighborhoods. For example, a study in Oakland, California found that road conditions are worse in the city's lowest-income areas;[48] and a study in Pennsylvania revealed that communities with more people of color have fewer bridges, restricting their overall access to transportation, work and services.[49]

Infrastructural improvements are necessary; however, these investments must be informed and driven by the priorities of frontline communities — which begins with placing the needs of people and the lived experiences of frontline communities at the center of planning and decision-making.[50] In "*Counterpoints: A San Francisco Bay Area Atlas of Displacement and Resistance*," John Stehlin and Deland Chan write, "Sometimes resisting infrastructure prevents a great injustice; other times, it perpetuates one. Often it does both: we may resist projects that would make a bad situation worse but, in doing so, fail to take steps to improve the systems that need fixing."[51] Frontline communities face the impacts of deliberate devaluation throughout history, leaving them with the burdens of infrastructural injustices and denying community members the benefits of

infrastructural investment. Narrowly focusing attention on infrastructure without considering the impacts on people and communities can perpetuate this injustice. For example, federal funds from the recent Infrastructure Investment and Jobs Act can only be spent on brand new public transit capital investments and infrastructure, ignoring the calls of communities to simply fund public transit operations and keep services running reliably for riders.[52]

Under our extractive and capitalist economic system, our transportation and climate disaster response systems are biased toward protecting property and infrastructure. For example, FEMA's aid approach often requires people to prove they own property such as homes or vehicles in order to receive aid — meaning that people without access to stable housing or transportation are not eligible for the same levels of financial assistance.[53] To advance equitable and resilient mobility requires a shift in this thinking, and requires decision-makers to consider the movement, health and safety, and economic well-being of people a top priority. We must begin with the principle of protecting people, and allow this to then inform our investments in infrastructure for climate preparedness, response and recovery.

An example of people-first recovery planning in the transportation sector can be seen in the freeway removal and conversion that occurred in San Francisco's downtown waterfront. While it is unclear whether earthquakes are caused or exacerbated by climate change impacts, we share this example to illustrate what a people-first recovery effort can look like following a natural disaster. In the 1960s, San Francisco residents protested the planned construction of freeways through the city, part of the nationwide movement of "freeway revolts." Despite these protests, several elevated freeways were constructed, including one which cut along the city's waterfront, producing pollution, obstructing views and limiting pedestrian access. In 1989, the Loma Prieta earthquake damaged these elevated freeways and the city was faced with the decision to either repair or remove the freeway. Responding to strong public opinion, the state's transportation agency decided to remove the freeway, replace it with a surface street, and redevelop the boulevard to include green space, pedestrian access, and space for housing and businesses.[54] This example highlights a disaster recovery effort that centers the needs of people rather than simply focusing on rebuilding infrastructure. While communities can't always mitigate the impacts of every climate disaster on their transportation system, decision-makers can utilize the opportunity to recover in an equitable and sustainable way that is driven by community needs, centering redevelopment on people rather than on property, profit or infrastructure.

The need to prioritize people first and foremost in resilient transportation efforts is especially relevant within the context of evacuation planning. Hurricane Katrina has been referred to as a "man-made disaster" due to the inequalities that existed in pre-Katrina New Orleans[55] which were compounded by the inequitable response to the storm and the redevelopment efforts that followed. Prior to and during the hurricane, frontline communities without access to cars were unable to evacuate and were forced to remain behind during the storm, while wealthy residents were able to flee.[56] Between 200,000 to 300,000 of the people at highest risk to the storm were without access to personal transportation — and officials failed to deploy buses and trains to prioritize their safety, even though they were aware of the risks that those who rely on public transportation faced. This resulted in avoidable tragedy and loss of life on a mass scale. After the hurricane, the city's

public transportation system was devastated, with more than half of city buses lost to flooding. Problematic recovery funding strategies, like FEMA's reimbursement model, meant that money wasn't available to adequately replace the lost transit services. New transit projects, like the streetcar system built a few years later through a 2009 stimulus funding program, failed to improve mobility. The impacts of this so-called man-made disaster can be seen and felt today: residents who must rely on New Orleans' transit system often have limited access to jobs and must take on excessive and often unreliable commutes, further exacerbating the slow economic recovery of the hardest-hit residents in the area.[57]

When frontline communities have access to affordable, reliable, safe mobility options, their ability to evacuate, resume their lives post-disaster, and continue to access jobs and opportunities under the everyday impacts of climate change is strengthened. An equitable and resilient mobility future can provide a wide array of high quality options that meet the needs of frontline communities, whether through walking, biking, public transit, shared mobility or electric vehicles (EVs). As we plan for the worsening impacts of climate change, it is not enough to simply bolster our infrastructure; we must deliberately prioritize the movement of people to ensure that frontline communities are neither literally nor figuratively left behind.

Example strategies that support this principle:

1. Utilize community vulnerability mapping and on-site data shaped by lived experience (or, "ground-truthing") to understand the climate resilience resources and needs of frontline communities, in order to inform mobility resilience projects.

2. "People-first" transportation planning must also consider the people who operate our transportation system. Directly and proactively consult frontline transit and freight workers and incorporate their expertise surrounding the health and well-being of operators and investments into transit operations when developing resilient mobility strategies and plans.

3. Explicitly prioritize and plan for the safety of frontline communities in all climate resilience planning.

   - Partner with, and adequately compensate community groups and trusted networks (e.g., community-based organizations, local agencies, community colleges, community leaders, faith-based groups, etc.) to execute various activities related to planning, designing, implementing and evaluating resilience plans.

   - Engage with communities who do not have access to personal vehicles to help determine alternative emergency evacuation plans for pedestrians, bicyclists or public transit users[58] and alternate routes when services are disrupted during regular climate effects such as extreme heat or rainfall.

   - Ensure that both community engagement around resilient mobility planning and transportation evacuation warning systems are appropriately translated into the most commonly spoken languages in the area via numerous channels. Refer to California's SB 160: Emergency Services: cultural competency as an example for how cultural competency requirements can be included in local emergency planning.

4. Prioritize community-driven, people-centered mobility investments regarding disaster preparation, recovery and rebuilding efforts.

▪ Refer to the Mobility Equity Framework which outlines how to center community voices in the transportation planning and decision-making processes, and includes an example of how it's been implemented in San Francisco's District 10.

5. In unincorporated, rural and/or disadvantaged communities where access to public transportation options is limited, support equitable electric car-sharing and vanpool options. These programs can improve resilience by strengthening community networks and providing transportation during climate disasters. Green Raiteros in Fresno County, California serves as a model example of an equitable shared electric mobility program in a rural area.

6. Increase transparency around decision-making related to service cuts especially in the wake of climate disasters and hot summer months[59] and develop transportation alternatives when service cuts occur.

7. Develop community-defined metrics of success for climate disaster preparedness, response and recovery to track progress of mobility investments and ensure they enhance climate resilience priorities for frontline communities, including adaptive management approaches to course correct when needed.

III. Promote multiple benefits: Promote policies and plans that offer multiple benefits to frontline communities to help alleviate the historical and compounded injustices these communities face. Climate resilient mobility solutions should aim to support health, economic and housing security, displacement prevention, access to clean technology and people's ability to live where they work.

Climate resilience, housing security, health, displacement and transportation are deeply intertwined issues. First, the ongoing housing and displacement crisis makes frontline communities more vulnerable to climate change. Displacement disrupts social networks[60] which play a significant role in a community's capacity for climate resilience.[61] Further, housing insecurity has consequences for frontline communities' physical and mental health.[62] Recent studies have found that low-income families facing high housing costs are more likely to end up living in homes containing toxins like lead or mold, triggering asthma and other health concerns.[63] When frontline communities are made sicker by the housing conditions around them, their capacity to adapt to and withstand climate change is lessened.

Our transportation system can exacerbate these issues of displacement and housing insecurity. Studies have found that transit-oriented development and investments in transportation improvements, when undertaken without anti-displacement strategies, are connected to worsening displacement through a phenomenon called transit-induced gentrification, causing residents to be

priced out of their communities.[64] When mobility projects are undertaken without resident input, they can be perceived as an indicator of unwelcome neighborhood change and social exclusion.[65] Frameworks of "investment without displacement" can serve as models for how to avoid this exacerbation of housing insecurity through transportation investments.[66,67] Ultimately, housing security is essential to community resilience.[68] When our transportation system exacerbates housing insecurity, it simultaneously makes frontline communities more vulnerable to the impacts of climate change by affecting health, access to jobs and wealth-building, and capacity to respond.

Conversely, our transportation system also has the power to support housing security and facilitate economic resilience for frontline communities – and, by extension, support their climate resilience capacity. When transportation systems connect communities to good jobs and opportunity, and help communities build wealth, they are able to better withstand the shocks and disruptions that come with climate change. For this reason, resilient mobility and economic security must support one another.

In cases where transportation planning falls short, or fails to proactively plan for the future disruptions that climate change will cause for mobility and livelihoods, we must ensure frontline communities have the wealth, access to resources and social support to withstand these situations. Lucas Zucker, the Policy and Communications Director at Central Coast Alliance United for a Sustainable Economy (CAUSE), explains this issue while describing the effects of the 2017 Thomas Fire that ravaged Southern California. In the aftermath of this disaster, an important highway was inaccessible for weeks, cutting many people off from their jobs. This disproportionately impacted the livelihoods of working-class families compared to higher-income ones who were simply able to work from home or charter boats to circumvent the obstructed highway.[69] Zucker says:

> "We need to build a safety net for all. It is impossible to predict everything that will go wrong [with climate change]. There is no way to build the kind of redundancy in the system for transportation, and jobs, and housing that can make people okay in every situation – but at the very least, the government can direct resources to where people need it. The fact is that in Ventura and Santa Barbara Counties, one in 10 people are undocumented and are completely excluded from any government help, and are disproportionately the people who need that help – that is at the center of the issue… At the end of the day, if you can't make the transportation system more resilient, ultimately what people need is unemployment benefits. Maybe if it wasn't so urgent for people to get back to work in the first place, if they had some sort of economic safety net, it wouldn't be as much of a problem that they got cut off from their access to work. It really underlines the importance of a safety net."[70]

Transportation, livelihood, wealth, health and housing are interconnected issues. Under the threats and ongoing impacts of climate change, to comprehensively bolster the resilience of our transportation system for frontline communities, it is critical to also support economic and housing security.

Developing and deploying mobility technology with a resilience lens can provide frontline communities with an array of co-benefits. For example, the California Energy Commission's School

Bus Replacement Program funds frontline school districts to transition diesel school buses to electric battery-powered buses. In addition to bringing children to school, these electric buses have also been used during crises to distribute free and reduced price lunches to low income students, as Wi-Fi hotspots for students without broadband, and as backup generators for emergency services and medical devices. Additionally, some EV manufacturers have begun outfitting their electric cars to serve as backup generators for users during blackout emergencies such as the recent winter storm in Texas.[71] There also may be opportunities to leverage shared mobility to facilitate more efficient evacuations.[72]

However, while these examples signal exciting opportunities to integrate resilience planning into mobility, frontline communities currently face barriers to accessing these mobility technologies. For example, less than 13% of electric vehicle owners in the United States are people of color[73] due to barriers like cost and lack of charging infrastructure. Currently, "charging deserts," or tracts of cities lacking EV charging stations, disproportionately exist in Black and Latino neighborhoods.[74] In the city of Chicago, for example, 70% of all public charging stations are concentrated in three of the city's wealthiest and whitest areas.[75] Black, Brown, and low-income communities have limited access to new mobility technology and infrastructure — meaning, without intervention, these groups will also be excluded from the multitude of co-benefits these technologies offer as tools for disaster preparedness, response and recovery, as well as the long-term health and economic benefits of no longer relying on a fossil-fuel powered vehicle.

Example strategies that support this principle:

1. Increase access to free transit or low-income fare programs in order to reduce transportation-cost burdens and increase access to jobs, education and services.

2. Create a community-driven anti-displacement plan in parallel with transportation planning to ensure that mobility investments do not exacerbate housing insecurity and climate vulnerability. For examples of anti-displacement strategies, refer to the Transformative Climate Communities program, which centers displacement avoidance as one of the project's key elements.

3. Strengthen social safety net and disaster relief programs to support people who are cut off from transportation access to work during climate disruptions. For example, the aforementioned Thomas Fire resulted in job loss which severely impacted undocumented workers, who are currenly excluded from federal disaster unemployment assistance programs.[76] Safety net programs should be accessible to all and help mitigate the socio-economic devastation of climate disasters.

4. Ensure that frontline communities, particularly those who do not have cars, have access to a variety of mobility options to resume their lives post-climate disruption — without having to shoulder inequitable transportation interruptions and burdens to their livelihoods.

5. Promote strategies that encourage walking, biking, public transit and EV adoption in frontline communities, to reduce pollution exposure, increase access to economic opportunity and reduce reliance on fossil fuels.

CONCLUSION

There is a pressing need for transportation decision-makers to address the intersection of mobility equity, climate resilience and racial justice to effectively meet the needs of low-income communities of color and help them prepare for the impacts of climate change. To begin addressing the multiple transportation injustices frontline communities experience, we must advance a vision for equitable and resilient mobility. Our mobility system has the power to support and enhance the well-being and livelihood of people of color, and advance more creative, community-driven solutions to help communities prepare for, respond to and recover from climate disasters.

APPENDIX

A. Racial Capitalism and Environmental Justice

Racial Capitalism is a way to describe the economic system of the United States, drawing attention to the way in which our economic system relies on the devaluation of Black people's lives in order to facilitate economic practices. As described in scholar Laura Pulido's article "Flint, Environmental Racism, and Racial Capitalism," the water crisis in Flint, Michigan provides an example of the intersection between racial capitalism and environmental justice. Pulido writes, "The fact that officials knowingly provided poisoned water to Flint residents shows the nefarious lengths the local state is willing to go to prioritize fiscal solvency and the utter disregard in which Flint residents are held."

Recommended Resources:

"Flint, Environmental Racism, and Racial Capitalism" by Laura Pulido

B. Settler Colonialism

Settler colonialism refers to the ongoing process of domination and subjugation where settlers establish and maintain power over indigenous territories and resources through the subjugation, elimination and erasure of indigenous peoples and culture.

Recommended Resources:

"Counterpoints: A San Francisco Bay Area Atlas of Displacement & Resistance" by Anti-Eviction Mapping Project

"Settler colonialism and the elimination of the native" by Patrick Wolfe

"Race, Sovereignty, and Civil Rights: Understanding the Cherokee Freedmen Controversy" by Circe Sturm

C. Racial Zoning, Segregation Ordinances and Redlining

Throughout American history, zoning has been used as a tool for segregation and the oppression of non-White people. This history continues to shape modern housing and land use patterns. After racial segregation ordinances were ruled to be unconstitutional in 1917, zoning became a tool to continue the practice of segregation, affecting the density, health and environmental conditions of Black neighborhoods. As a result of these practices, frontline communities are more likely to be living in proximity to pollution exposure and in areas with higher levels of risk to the impacts of extreme weather events worsened by climate change. Redlining was a Federal Housing Administration policy which denied loans and mortgages to predominantly Black neighborhoods, furthering segregation and locking this community out from wealth-building opportunities.

Recommended Resources:

"The Color of Law" by Richard Rothstein

"The Dream Revisited" by Ingrid Gould Ellen and Justin Peter Steil

D. Urban Renewal

The Housing Act of 1949 authorized the use of federal funding for the destruction of certain communities in cities. One of the act's five policies called for "the elimination of substandard and other inadequate housing through the clearance of slums and blighted areas" and promised governmental aid to support cities embarking in slum-clearing.[77] This act gave rise (and funding) to a process called "urban renewal," which would gain popularity in cities across the United States as a way to address poverty by removing the impoverished. Specifically, urban renewal destroyed Black neighborhoods, displacing residents and deepening racial inequalities. In a 1963 interview, writer James Baldwin said, "Urban renewal means moving the negroes out, it means negro removal. And the federal government is an accomplice to this fact."[78]

Recommended Resources:

"Tearing Down Black America" by Brent Cebul

"People and Plans: Essays on Urban Problems and Solutions" by Herbert J. Gans

E. The Highway Project

Highways—both their presence and their lack, their placement and what they replaced—tell a story of racism, exclusion and resistance. During the 1950s and 1960s, the construction of highways became a tool to accelerate the clearance of Black neighborhoods and facilitate the segregation of cities.

Recommended Resources

"People Before Highways" by Karilyn Crockett

"White Men's Roads through Black Men's Homes" Deborah N. Archer

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