



Climate Change and Environmental Justice: Considerations for Transportation Decision-making

Rising levels of greenhouse gas (GHG) pollution, primarily from burning fossil fuels, are trapping heat in the atmosphere, causing climate changes such as: more frequent heat waves, heavier downpours, rising sea levels, and stronger coastal storms.¹ Low-income communities are often severely impacted because they have fewer resources than most in the area to adapt to such changes. The U.S. Department of Transportation's (USDOT) policy statement on climate change affirmed that USDOT will address issues of inequality and environmental justice (EJ) associated with climate change impacts and adaptation. Transportation agencies at the Federal, State, and local levels can reduce negative impacts of climate change on low-income populations and minority populations (EJ communities), through stakeholder inclusion, proactive planning, risk mapping, and the careful consideration of community needs in emergency operations procedures.

Climate change impacts on transportation for EJ communities

Climate change impacts can damage and disrupt transportation systems.

Flooding from heavy rainfall, sea level rise, and hurricanes damages roads, bridges, and public transportation. Heat waves can accelerate deterioration of pavements and buckle railroad tracks, increasing maintenance costs.

While climate-related impacts to transportation facilities and networks affect all communities, EJ communities are particularly vulnerable. Some low-income families do not have access to a private automobile to evacuate from hurricanes and may depend on the availability of public transportation. According to the U.S. Census, nine percent of all U.S. households do not own a car.

EJ communities may be underrepresented in their political structure. Many individuals face time, budget, logistics, or other constraints that prevent them from participating in public meetings or applying for disaster assistance. As such, government responses could be less likely to address their needs.

During heat waves or inclement weather, individuals may be exposed to unsafe or uncomfortable conditions while waiting for public transportation, while those with more resources may opt to drive or stay home. Disruptions in services or connections (such as: a bridge or tunnel washed out or a transit line down) may force lengthy, expensive detours. Additionally, low-income and minority populations are also be more likely to live in hazardous locations, such as

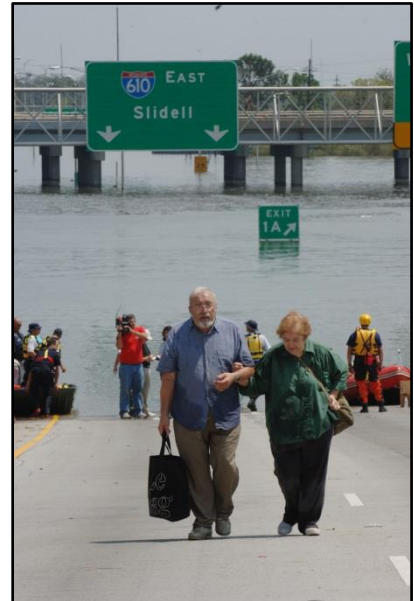


Figure 1. People rescued in New Orleans following Hurricane Katrina
Source: FEMA.

[Executive Order 12898](#), Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations to the greatest extent practicable and permitted by law.

[USDOT's policy statement](#) on climate change affirmed that USDOT will implement eight guiding principles, including: "Prioritize the most vulnerable: Adaptation plans should prioritize helping people, places, and infrastructure that are most vulnerable to climate impacts. They should also be designed and implemented with meaningful involvement from all parts of society. Issues of inequality and environmental justice associated with climate change impacts and adaptation should be addressed."

¹ US Global Change Research Program, [National Climate Assessment](#), 2014. National Academy of Sciences, [America's Climate Choices](#), 2011.

floodplains, because housing costs are lower there.² Heat waves and high temperatures can intensify the urban heat island effect³, increasing mortality risks for households without air conditioning.

Impacts of climate action strategies on transportation needs of EJ communities

EJ communities may be harmed if their needs are not properly considered when developing strategies to reduce climate change impacts. For instance, diverting floodwaters from a transportation asset could concentrate flooding in another location, such as an area with low property values.

EJ communities may benefit from strategies that serve an entire area, protecting residences and businesses as well as infrastructure. Green infrastructure, such as vegetated swales to manage stormwater, and the provision of green space may provide flood protection as well as recreation and health benefits to EJ communities.

Strategies such as integrated land-use and transportation planning, or improving the quantity and quality of public-transit service, can reduce GHG emissions and benefit low-income communities. Shifts from fossil fuel energy (coal, petroleum, etc.) to renewables (solar, wind, etc.) reduce air pollution and can also benefit EJ communities that may be near polluting facilities.

Taxing or pricing GHG emissions as a policy to reduce GHG pollution could harm EJ communities by raising energy bills. However, pricing policies can be designed to minimize or eliminate the burden on low-income individuals by using the proceeds to provide rebates or energy efficiency improvements. In addition, government investments in technology development may lower costs for renewable energy, as is already being seen with reduced costs for wind and solar-power generation and for electric vehicles.

Resources for identifying and addressing the needs of EJ communities

State and local departments of transportation (DOTs) and Metropolitan Planning Organizations (MPOs) can all play a part in reducing negative impacts of climate change on EJ communities and to ensure that climate action strategies benefit EJ communities.

Stakeholder inclusion and proactive planning

The full range of community members and issues, including EJ populations and climate change, should be considered in federally mandated processes; such as, transportation planning,⁴ project development, and risk-based asset management. Inclusive stakeholder engagement in long-range transportation planning, and throughout the transportation project-development process, provides a forum in which entities such as emergency responders, healthcare industries, paratransit companies, utilities, governments, businesses, and citizens can more tangibly understand and prepare response plans to address climate change impacts on transportation infrastructure in EJ communities.

FHWA has produced several resources, such as the [FHWA Climate Change Adaptation Framework](#), to help State and regional transportation agencies plan proactively for climate change in order to minimize impacts on communities. Another resource, the [Guide to Assessing Criticality in Transportation Adaptation Planning](#) helps transportation agencies identify which transportation assets are most critical for protection from climate impacts, based on usage (daily traffic), safety (evacuation routes, access to hospitals), and socio-economic factors (access to jobs, access for low-income populations).

Several of the States and regions which partnered with FHWA on [climate resilience pilots](#) included the consideration of EJ communities in their climate vulnerability and adaptation analyses. For instance, the

² Lee, Dalbyul et al., "The Growth of low-income population in floodplains," *KSCE Journal of Civil Engineering*, March 2014.

³ Where heavy presence of paved surfaces and lack of tree shade and vegetation can make temperatures several degrees warmer than outlying areas.

⁴ See for instance 23 CFR 450.210.

San Francisco Metropolitan Transportation Commission (MTC) pilot included social equity considerations as a key factor. This factor helped to bring attention to the transportation needs of EJ populations most vulnerable to climate change.

MPOs and DOTs can map climate hazards and socio-economic risks to determine where they overlap. As an example, a Union of Concerned Scientists (UCS) [report](#) identifies coastal "climate equity hotspots," communities that face a heightened risk of coastal flooding due to a combination of socio-economic and climate risk factors. The UCS report screened 35 coastal counties and plotted their climate and socio-economic relative risks (see Figure 2). The climate risk indicator used data on sea-level rise and tidal-flooding projections through 2045 and the socio-economic risk indicator used data on county-level per-capita income, poverty rates, race/ethnicity, and education.

Another study used the Socio-economic Vulnerability Index (a measure of county and census tract-level vulnerability to environmental hazards) and a model of the impacts of sea-level rise on coastal property and found that a mid-range scenario for sea-level rise (26 inches by 2100) would impact approximately 1.6 million people, of which 20 percent are among the most socially vulnerable.⁵

The USDOT Gulf Coast Study [criticality assessment](#) mapped locations of low-income and minority populations, major employers, attraction zones, and other factors to help determine which transportation assets were most critical (see Figure 3). These assets were then further analyzed to determine their vulnerability to climate change impacts. For instance, a public transit provider's bus maintenance facilities were analyzed due to the criticality of transit service to low-income populations.

Non-discrimination in Emergency Operations Plans

Egress and evacuation procedures in cases of extreme weather should consider the needs of all segments of the population, including persons with disabilities, limited English proficient individuals, low-income populations, and minority populations. Emergency operations plans should also consider that many of the individuals that constitute these populations may not own a car. Therefore, alternative means of transportation for egress and evacuation may need to be concentrated in communities with a high percentage of these populations, and instructions and directions may need to be translated in languages other than English.

Various nondiscrimination statutes require that government services provided pre- and post-extreme weather events are allocated and distributed in a way that does not discriminate on the basis of race, color, national

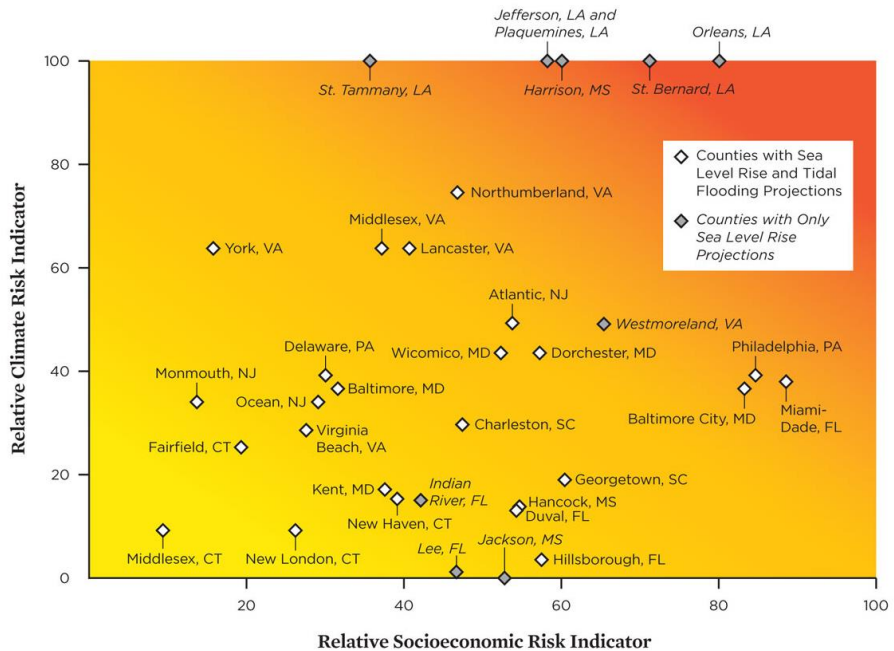


Figure 2. Climate and socio-economic risk for 35 coastal counties. Source: UCS

⁵ Martinich, J. et al. "Risks of sea level rise to disadvantaged communities in the US." *Mitigation and Adaptation Strategies for Global Change*, 2013. As cited in Union of Concerned Sciences 2015.

origin, limited English proficiency, sex, age, or disability. In addition, Executive Order 12898 covers low-income populations which are not a protected category under Title VI of the Civil Rights Act of 1964.

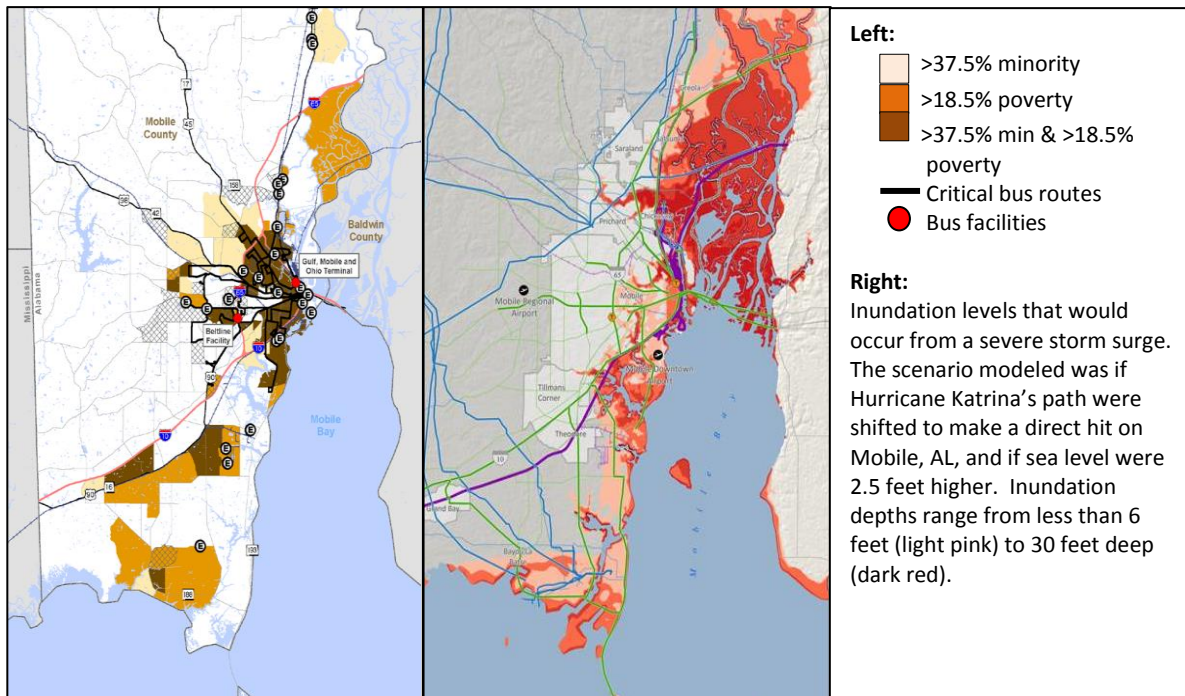


Figure 3. Criticality and exposure mapping of Mobile, Alabama, from the US DOT [Gulf Coast Study Phase II](#).

The items to be distributed might include emergency supplies; such as sand bags, masks, water, food, and medical supplies. There are also information resources available to assist state and local agencies. FHWA has a number of publications on [emergency transportation operations](#), including evacuating populations with special needs. Transit Cooperative Research Program Report 150, [Communication with Vulnerable Populations: A Transportation and Emergency Management Toolkit](#) describes how to create a communication process to reach vulnerable populations regarding their transportation options in emergencies. Examples from different parts of the United States may also be useful. One innovative example comes from Wilmington, NC. The local transit provider, Cape Fear Public Transportation Authority or WAVE Transit, developed a new transit center that also operates as an emergency evacuation center, complete with showers and temporary space for evacuees. The transit center also incorporates green design with a green roof and the facility collects water and converts it to potable drinking water. WAVE Transit also worked closely with New Hanover County government to develop a thorough evacuation plan, outlining the procedures for evacuating all people and animals.⁶

For more information, visit the FHWA Environmental Justice and Climate Change web pages:

Climate Change - http://www.fhwa.dot.gov/environment/climate_change/

Environmental Justice - http://www.fhwa.dot.gov/environment/environmental_justice/

⁶ [New Hanover County Emergency Operations Plan](#)