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The Roosevelt Project

Industrial Heartland Electric Vehicle Case Study Working Paper Series

Driving toward Environmental Justice & Health:
Challenges, Opportunities & Tools for an
Equitable Electric Vehicle (eV) Transition



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**Driving toward Environmental
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Electric Vehicle (eV) Transition**

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WP-2021-RP-IH-2

The Roosevelt Project

A New Deal for Employment, Energy and Environment

About the Roosevelt Project

The Roosevelt Project takes an interdisciplinary approach to the transitional challenges associated with progress toward a deeply decarbonized economy. The project aims to chart a path forward through the transition that minimizes worker and community dislocations and enables at-risk communities to sustain employment levels by taking advantage of the economic opportunities present for regional economic development. The first phase of the project involved an analytical assessment of cross-cutting topics related to the transition. The second phase of the project assesses the transition through the lens of four regional Case, working with local partners on the ground in the Industrial Heartland, Southwest Pennsylvania, the Gulf Coast, and New Mexico. The project was initiated by former Secretary of Energy, Ernest J. Moniz, and engages a breadth of MIT and Harvard faculty and researchers across academic domains including Economics, Engineering, Sociology, Urban Studies and Planning, and Political Science.

REPORT SPONSOR



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Driving toward Environmental Justice & Health: Challenges, Opportunities & Tools for an Equitable Electric Vehicle (eV) Transition

NOV 2021 White Paper #2



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Research Team

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EGE2's offices are situated on the Original Lands of the Potawatomie Peoples. We acknowledge that this work was conducted on these lands, and appreciate the sacrifices our ancestors made to allow us to do the work that we do.

List of Abbreviations

The background of the page features a stylized, artistic illustration of a landscape. In the foreground and middle ground, there are large, tangled, and looping grey shapes that resemble roadways or highways, some with white dashed lines. These shapes are set against a backdrop of a soft-focus green field and a light blue sky with faint clouds. The overall aesthetic is clean and modern, with a focus on environmental and infrastructure themes.

BIPOC	Black, Indigenous, and People of Color
CBA	Community benefits agreement
CBO	Community based organization
COC	Community of Color
COH	Culture of Health
CSR	Corporate Social Responsibility
EJ	Environmental Justice
EPA	Environmental Protection Agency
EV	Electric vehicle
GIS	Geographic Information System
ICE	Internal combustion engine
LMI	Low to moderate income
LIC	Low-income community
PM2.5	Fine particulate matter, 2.5 microns or less in diameter
POC	People of Color
VOC	Volatile organic compound

Introduction

Stellantis, formerly Fiat Chrysler Automobiles (FCA) is on a journey to become one of the market leaders in developing low-emissions vehicles. In January 2019, FCA announced a [\\$2.6 billion expansion](#) of their existing Jefferson North Assembly Plant (JNAP) and Mack Engine plant on the East Side of Detroit, Michigan that would produce the next generation Jeep Grand Cherokee and an all-new three-row full-size SUV along with plug-in hybrid (PHEV) models. In anticipation of this announcement, [Just Beniteau Residents \(residents living on the fenceline of the new facility expansion\) immediately raised concerns about the project's potential negative impacts on their health and quality of life. With the initial support of the Detroit People's Platform, Just Beniteau Residents and shortly thereafter a larger network of advocates – including](#) members of the FCA Neighborhood Advisory Council, Metro Detroit A. Philip Randolph Institute, Detroit Justice Center, Members from UAW Local 7 & Local 51, East Side Community Network, Church of the Messiah, the Boggs Center, Freedom Freedom, and Detroit residents representing solar, wind energy, access to community internet and restorative and transformative justice initiatives - developed a set of proposals for FCA and the City of Detroit to consider that could make this East Side neighborhood a model of “true sustainability and an incubator for imaginative work, community respect and dignity” along with the plant expansion. This community vision integrated with a Community Benefits Agreement (CBA) - a project-specific agreement between a developer and a broad community coalition that details the project's contributions to the community and ensures community support for the project - could potentially increase jobs and training opportunities associated with the JNAP expansion and also ensure a healthy and safe community for all. Unfortunately, the [Community Benefits Agreement ordinance in the city of Detroit](#) failed to protect the interests of the impacted community based on a number of factors: political pressure, a rushed CBA timeline and process, a lack of transparency in decision making structures, withholding air monitoring data, not disclosing the array of chemicals being used in the facility, and inaccurate modeling of potential air impacts from the expansion. In fact, after residents dug in deeper, and reviewed over 20 years of environmental data from the previous engine plant and its sister plant across the street, it became highly unlikely that emissions from this state-of-the-art assembly plant would meet the community health and safety needs as promised by Stellantis.

As of [November 2021](#), the new facility has had multiple air violations filed with the State of Michigan Department of Environment, Great Lakes and Energy (EGLE) since expanding production in Spring 2021. According to residents, the final CBA and overall community engagement process with the City of Detroit and Stellantis has not afforded any additional protections or efforts to mitigate the increased emissions from production. Moreover, residents living on the fenceline of the Stellantis facility are suffering with health issues from undetermined chemical releases that are not only an odor nuisance, but have caused sickness, nausea and emotional trauma due to the fear of being exposed to a cocktail of unknown chemicals. The zip codes surrounding this industrial complex – 48213, 48214 and 48215 – have some of the highest levels of volatile organic compounds (VOCs) and the highest asthma hospitalization rates for the majority African-American community in the Detroit area due to existing pollution from auto production.

Long-time Beauniteau Street resident [Robert Shobe](#) shared how the Stellantis facility has affected his personal health and quality of life in a statement: “When my eyes start to burn I start to become more afraid of all the things I can’t smell than those that I can.” He lives about 200 yards from the facility. As a cancer patient, Mr. Shobe’s health status makes him particularly vulnerable to the adverse impacts of environmental contaminants. He is battling lymphoma, and was diagnosed with chronic obstructive pulmonary disease (COPD), which can make it difficult to breathe. He’s noticed over the last year an increase in both air quality concerns and his own symptoms. Breathing in now causes him to cough and develop increased tightness in his chest, he is more easily fatigued and has developed frequent bouts of nausea. His symptoms often clear up within an hour of leaving the neighborhood.

"I've been a prisoner in my own home for the past 5 to 6 months because of the smells from that facility. We've made complaints and nothing has happened. They came in and tore down the berm that would have insulated us from the dust and issues when they expanded the plant. We've been dealing with dust and health issues for the last three years and now we are dealing with unseen stuff. Nobody can tell us exactly what we are breathing... it's a joke"

The unfortunate battle between politics, our industrial revolutions and our health, as we see playing out in Detroit and across this country, is not a new phenomenon.

The Need for Environmental Justice

African-American communities, Native American Communities, other communities of color (COC) and low-income communities (LIC) have historically lived in neighborhoods that have been hazardous to their health. Regrettably, industry itself has been a primary source of that hazard.

The [Environmental Justice Movement](#) is the culmination of multiple mobilizations by COCs against environmental threats and decisions placing their health at risk: the strike of African-American sanitation workers in Memphis, Tennessee led by Dr. Martin Luther King, Jr., demanding better pay and working conditions; a group of African-American homeowners in Houston, Texas fighting to keep a sanitary landfill from being placed near a local school; and the protest by rural, African-American residents of Warren County, North Carolina against the siting of polychlorinated biphenyl (PCB) landfill in their community, are just a few examples.

The Environmental Protection Agency (EPA) defines Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies U.S. EPA. Environmental Justice can only be achieved when everyone enjoys the same degree of protection from environmental and health hazards, and equitable access to the decision-making process that allows for a healthy environment to live, learn, work, and play in.

In the case of the Stellantis facility and the approximately 70 residents living near the facility fence line they have not been buffered or protected from the industrial poisoning of their East Side community. Ironically, the intention to produce low-emission vehicles that are heralded by the industry to be both a health and climate benefit to contemporary society are driving the immediate hurt and harm to these communities. Many of these communities are located in the same areas that the auto industry invested in during the early and mid-20th century, and thus are witnessing history repeat itself in economic promises and environmental harm. Hence, the purpose of this research is to explore the environmental health and justice implications of the eV transition on LIC/COC, and illuminate a set policies, practices and processes that can contribute to a transition that is equitable, accessible and beneficial to the physical environment (air, water and land) and the health and well-being of people living near these facilities.



THE ENVIRONMENTAL LEGACY OF THE AUTO INDUSTRY: THE NEED FOR A JUST TRANSITION

The impact of the automobile manufacturing industry stretches far beyond the plant assembly floor. Building an automobile involves the extraction of raw materials, material processing and transporting parts and finished products. It requires substantial energy use and a human workforce. While the economic tax base and workforce opportunities that accompany the auto industry ecosystem in a city or community are prioritized in planning any plant transition or transformation, the impacts that receive less attention are the visible (and invisible) effects to the physical environment and the human health and well-being of the surrounding community.

A recent study investigated how the historical construction of the metropolitan manufacturing economy is linked to changing levels of industrial air pollution. Recognizing the large declines in manufacturing nationally (e.g. in the 1970s nearly one in four American workers was employed in manufacturing compared to just one in twelve in 2015), the study found higher levels of industrial pollution in metropolitan areas that have experienced a decline in manufacturing, which is counterintuitive. The findings suggest that metropolitan areas that were strong historically in manufacturing work are places that are characterized by environmental injustice, and still typically host greater numbers of older facilities that have less pollution prevention technology (Smiley, 2020).

While air quality in the United States has improved, air pollution remains a major health risk in the United States and globally, particularly within cities and disadvantaged communities (Zhang et. al, 2021). There is a chemical cocktail that people are exposed to, released at various points in the lifecycle of car manufacturing and the utilization of dirty energy sources, such as coal-fired power plants. As it relates to energy production, the emissions most critical to human health include carbon dioxide (a greenhouse gas), multiple toxics, and fine particulate matter (better known as PM2.5). By itself, PM2.5 is responsible for 85,000 to 200,000 excess deaths per year in the United States, and unfortunately, People of Color (POC) experience greater than average exposures from all sectors (Tessum et. al, 2021). A recent study assessed the health benefits of light duty electrification in

large metropolitan areas of the United States and found that even where fossil fuels are used as an energy source, eVs still result in air pollution benefits (Choma et. al, 2020). However, with any significant industrial and economic transition, an appropriate assessment must examine both the potential benefits and the potential harm.

Root Cause: Racism

Systemic and institutional racism has long been the driving factors that have led to many low-income residents, POC, and Indigenous Peoples living in communities that are severely hazardous to their health. The combination of multiple sources of industrial pollution, inadequate infrastructure, and lack of environmental enforcement are just a few of the reasons we see health disparities in various hot spots (areas with multiple pollution sources) across the country. Sociologist Dr. Robert Bullard, EJ scholar, and activist, defines environmental racism as “any policy, practice or directive that differentially affects or disadvantages (where intended or unintended) individuals, groups or communities based on race (Bullard, 2000). The reality of environmental racism was the impetus for what has become the Environmental Justice (EJ) movement, some say, akin to the Civil Rights Movement (U.S. EPA 2021). The Environmental Justice movement began with African-American workers and communities raising their voices against disproportionately hazardous working and living conditions compared to their white counterparts. Many say the Environmental Justice movement began with the protest of sanitation workers with Dr. Martin Luther King, Jr. in Memphis, Tennessee demanding higher pay and better working conditions for Black workers in the late 1960s. Others refer to the protests that occurred in Warren County, North Carolina that sparked national attention when the state decided to dump 40,000 cubic yards of soil contaminated with hazardous chemicals in a poor Black community in the early 1980s. While the foundations of this movement started decades ago, the guiding principles of the movement - created at the People of Color Environmental Leadership Summit in Washington DC in the early 90s, guide the work of many grassroots organizations today. The 17 Principles of Environmental Justice (EJ Principles) speak to affirming the sacredness of Mother Earth (shown in Figure 1).

The EJ Principles were created in 1991 and they remain as relevant today as the transition from ICE to eVs could leave a similar legacy. While the primary focus of any industrial transition is typically focused on jobs and workforce, our intent is to offer an evidence-based and community-informed guiding framework that can help federal, state, and local decision-makers and other key stakeholders consider and prevent the potential harms to public health and the physical environment the eV industry could cause if environmental justice is not prioritized.

WE, THE PEOPLE OF COLOR, gathered together at this multinational People of Color Environmental Leadership Summit, to begin to build a national and international movement of all peoples of color to fight the destruction and taking of our lands and communities, do hereby re-establish our spiritual interdependence to the sacredness of our Mother Earth; to respect and celebrate each of our cultures, languages and beliefs about the natural world and our roles in healing ourselves; to insure environmental justice; to promote economic alternatives which would contribute to the development of environmentally safe livelihoods; and, to secure our political, economic and cultural liberation that has been denied for over 500 years of colonization and oppression, resulting in the poisoning of our communities and land and the genocide of our peoples, do affirm and adopt these Principles of Environmental Justice:

The Principles of Environmental Justice (EJ)

- 1) **Environmental Justice** affirms the sacredness of Mother Earth, ecological unity and the interdependence of all species, and the right to be free from ecological destruction.
 - 2) **Environmental Justice** demands that public policy be based on mutual respect and justice for all peoples, free from any form of discrimination or bias.
 - 3) **Environmental Justice** mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other living things.
 - 4) **Environmental Justice** calls for universal protection from nuclear testing, extraction, production and disposal of toxic/hazardous wastes and poisons and nuclear testing that threaten the fundamental right to clean air, land, water, and food.
 - 5) **Environmental Justice** affirms the fundamental right to political, economic, cultural and environmental self-determination of all peoples.
 - 6) **Environmental Justice** demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials, and that all past and current producers be held strictly accountable to the people for detoxification and the containment at the point of production.
 - 7) **Environmental Justice** demands the right to participate as equal partners at every level of decision-making, including needs assessment, planning, implementation, enforcement and evaluation.
 - 8) **Environmental Justice** affirms the right of all workers to a safe and healthy work environment without being forced to choose between an unsafe livelihood and unemployment. It also affirms the right of those who work at home to be free from environmental hazards.
 - 9) **Environmental Justice** protects the right of victims of environmental injustice to receive full compensation and reparations for damages as well as quality health care.
 - 10) **Environmental Justice** considers governmental acts of environmental injustice a violation of international law, the Universal Declaration On Human Rights, and the United Nations Convention on Genocide.
 - 11) **Environmental Justice** must recognize a special legal and natural relationship of Native Peoples to the U.S. government through treaties, agreements, compacts, and covenants affirming sovereignty and self-determination.
 - 12) **Environmental Justice** affirms the need for urban and rural ecological policies to clean up and rebuild our cities and rural areas in balance with nature, honoring the cultural integrity of all our communities, and provided fair access for all to the full range of resources.
 - 13) **Environmental Justice** calls for the strict enforcement of principles of informed consent, and a halt to the testing of experimental reproductive and medical procedures and vaccinations on people of color.
 - 14) **Environmental Justice** opposes the destructive operations of multi-national corporations.
 - 15) **Environmental Justice** opposes military occupation, repression and exploitation of lands, peoples and cultures, and other life forms.
 - 16) **Environmental Justice** calls for the education of present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives.
 - 17) **Environmental Justice** requires that we, as individuals, make personal and consumer choices to consume as little of Mother Earth's resources and to produce as little waste as possible; and make the conscious decision to challenge and reprioritize our lifestyles to insure the health of the natural world for present and future generations.
- More info on Environmental Justice can be found online at www.ejnet.org/ej/**

Delegates to the First National People of Color Environmental Leadership Summit held on October 24-27, 1991, in Washington DC, drafted and adopted 17 principles of Environmental Justice. Since then, The Principles have served as a defining document for the growing grassroots movement for environmental justice.

Figure 1: Principles of Environmental Justice. <http://www.ejnet.org/ej/principles.html>

RESEARCH QUESTIONS & METHODOLOGY

The goal of this study was to take a deep dive into the environmental justice and health impacts of the automotive industry's transition to eVs. The six cities chosen for this study represent both major urban (Flint, Detroit, Toledo) and rural areas (Lima, Lordstown, Kokomo) in the Midwest. Two main research questions drove this exploration:

- How might the transition to electric vehicles disproportionately impact the physical environment and community health?
- What frameworks/policies/platforms are necessary to support a thoughtful, equitable transition from internal combustion engines to eVs?

To explore these questions, qualitative and quantitative methods were used to understand how the automotive industry has impacted the physical environment and public health of communities in our six study cities. A summary of key findings from the literature review on approaches to address historical concerns (e.g., legacy pollution, learnings from previous industrial transitions) and future needs (i.e., community revitalization, culture and equitable clean energy transition) will be shared in **Section 1**. **Section 2** provides reflections from a set of 32 semi-structured interviews conducted with national and local leaders on the eV transition and how to integrate environmental justice and health into the sector are shared. **Section 3** will merge the findings from both the literature review, quantitative data and geographic analysis to inform a set of decision-making supports and tools.

Section 1: Historical concerns, Culture change & Future needs for an Equitable eV Transition

A comprehensive literature review was conducted to understand the effect and existing best practices related to automobile and other industrial transitions. Peer-reviewed literature, ranging from 2002 to 2021, was examined using the key words: automotive industry transitions, brownfields and environmental health, energy access and electrification, best practices on transitions, community re-stabilization, environmental justice, and past and existing policies that support a just transition. There was a limited number of studies found that addressed the intersections of health, justice and the automotive industry. However, a report from the Environmental Protection Agency (EPA) provides the strongest example of this intersection through their work on Brownfields.

The Environmental Protection Agency (EPA) defines a Brownfield as the expansion, redevelopment, or reuse of a property which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (U.S. EPA 2019). Each state in focus for this study (Michigan, Indiana, and Ohio) has a large number of brownfield sites in need of remediation. Data from Michigan's Environment Great Lakes & Energy website shows over 6,000 open brownfield sites currently, with several thousand others listed without a distinct open or closed site status (EGLE 2021). In Indiana, the Indiana Finance Authority reports a similar number of sites (State of Indiana 2021). Ohio does not mandate the reporting of brownfield sites and lists approximately 300 known brownfield sites on the state's Environmental Protection Agency website (Ohio EPA, 2021). From a health perspective, Brownfield properties typically have a range of contaminants that can impact human health due to environmental contamination from the previous use of the property. Table 1 describes some of the common contaminants found at these sites and the human health effects from exposures.

Table 1: Environmental Contaminants Often Found at Brownfield Sites. Environmental Protection Agency (2019).

Common Brownfield Contaminants and Their Health Effects			
Contaminant	Substance Type	Examples of Past Use	Potential Health Effects
Lead (Pb)	Metals	Mining, fuel, paint, inks, piping, batteries, ammunition	Damage to brain, nerves, organs, and bone; cancer
Petroleum	Oil, hydrocarbon compounds	Drill and refining, fuel, chemical and plastic production	Headache; nervous system, immune, liver, kidney, and respiratory damage; cancer
Asbestos	Fiber in rock	Mining and processing, piping, insulation, fire proofing, brakes	Lung scarring, mesothelioma and lung cancer
Polycyclic aromatic hydrocarbons (PAHs)	Hydrocarbon compounds, combustion byproduct	Coal tar, creosote, soot, fire, industry/ manufacturing byproduct	Liver disorders; cancer
Other metals	Metals	Metal fabrication, plating, mining, industry/ manufacturing	Immune, cardiovascular, developmental, gastrointestinal, neurological, reproductive, respiratory and kidney damage; cancer
Volatile organic compounds	Manmade chemicals	Industry and commercial product solvents, degreasers, paint strippers, dry cleaning	Eye irritation; nausea; liver, kidney and nervous system damage; birth defects; cancer
Polychlorinated Biphenyls (PCBs)	Manmade chemicals	Heat and electrical transfer fluids, lubricants, paint and caulk, manufacturing, power plant	Disruption or damage to the immune, hormone and neurological system; liver and skin disease
Arsenic (As)	Metals	Pesticides, agriculture, manufacturing, wood preservative	Nausea, vomiting and stomach pain; blood disorders; nerve damage; skin disease; lung and skin cancer

Roadmap for Community Revitalization

In 2011, about 350 auto manufacturing and supplier plants had closed in the United States, forcing these communities to grapple with the challenges posed by the presence of idled and contaminated plants or “auto brownfields” (EPA Roadmap to Revitalization). In 2013, the United States Environmental Protection Agency’s Office of Solid Waste and Emergency Response Program and several other federal and private-sector partners created a Roadmap for Auto Community Revitalization to help local officials identify a range of supports to clean up brownfields and put contaminated properties back into productive use after auto transitions. Brownfield cleanup can be a significant burden on cash-strapped communities due to a combination of factors: the loss of a significant source of jobs and property-tax

revenue, population flight, and blight. However, the Roadmap (Figure 2) provides a set of 12 steps – and tools - that should be considered for large economic transitions. The Roadmap addresses the potential contamination of air, land, and water that can negatively impact human health, and also stresses the importance of creating a consistent opportunity to engage impacted communities in the planning and decision-making processes.



Figure 2: Roadmap for Auto Community Revitalization (US EPA 2013).

The unfortunate reality is that Brownfield sites are more likely to be located near minority and low-income neighborhoods. The remediation of brownfield sites is often subject to several hyperlocal forces, including the political will of local leaders, community pressure, and/or the viability of the site for economic investment. Minority residents end up bearing the burden of this slow-moving bureaucracy (Eckerd and Keeler 2012). Brownfields can have a negative impact on community health (Litt, Tran & Burke 2002, Wilson et al 2013) and housing prices (Woo and Lee 2016), imposing further detriment to these areas. While minority populations may be perceived as benefitting economically from local industry often having a higher share of employment in industrial facilities they are more likely to suffer health-wise from their presence by living and working in close proximity to polluting industries. Even with more employment opportunities, the potential exposure risks by Black and Hispanic populations are greater than the benefits of employment and higher-paying jobs (Ash and Boyce 2018). Therefore, any economic benefits of industrial presence for LIC and BIPOC are challenged, particularly when taking into consideration long-term health effects, access to health care, and health insurance rates of these populations.

Exploring a culture of health in the auto industry

The dominant culture of the auto industry has rarely centered issues of environmental protection, justice and public health. Within the auto industry, corporate culture can evolve based on demographic shifts, leadership and global trends, and heightened interest in sustainability. According to some organizational change experts, culture change requires a set of leadership tools including a clear vision, strong leadership, role-modeling and a set of core stakeholders (Denning, 2011). In 2016, a unique collaboration between The Robert Wood Johnson Foundation, the Harvard Business School, and the Harvard T.H. Chan School of Public Health resulted in a joint venture to investigate how the auto industry embraced a vision called the Culture of Health.

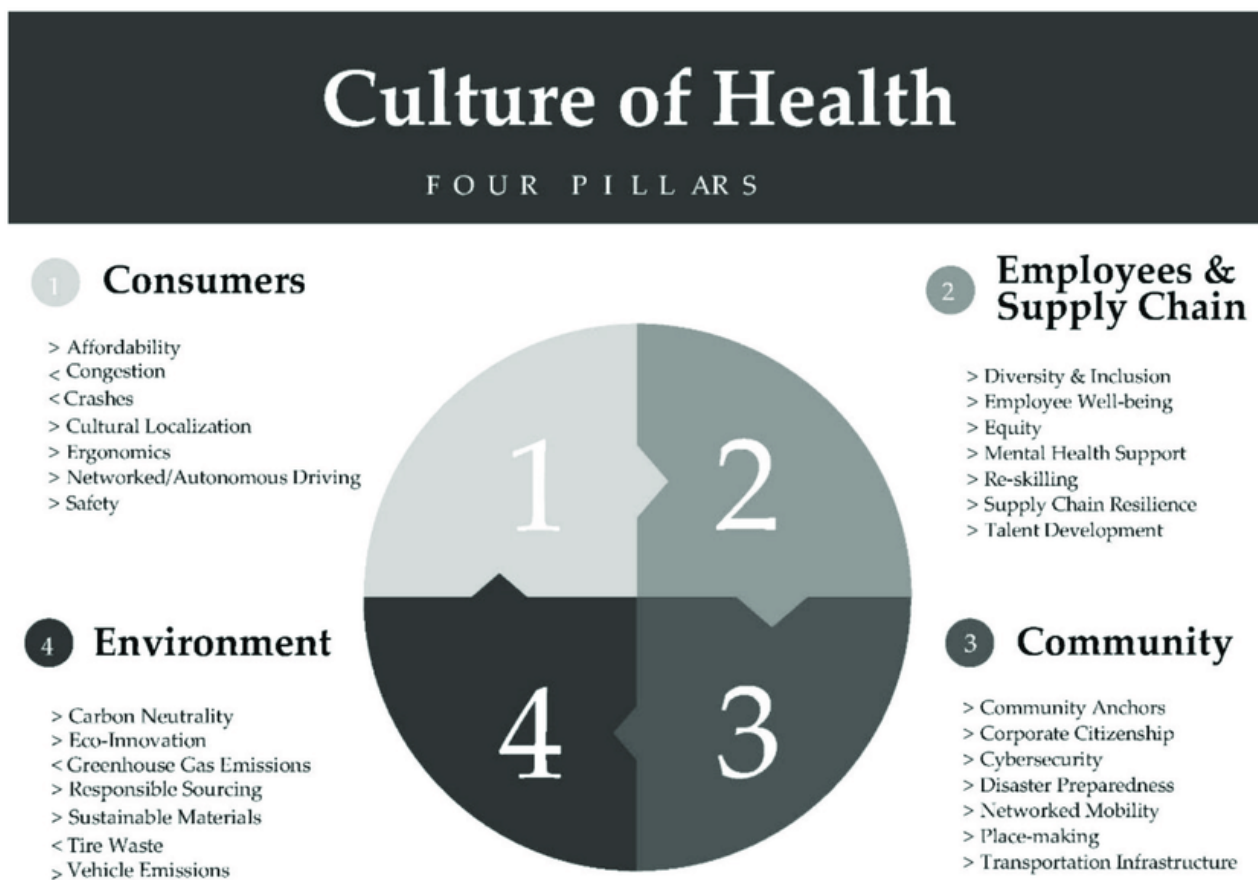


Figure 3: Culture of Health Framework (Purcell et al 2021): The diagram above explores the researcher's thematic analysis results from interviewing auto leaders from 7 different companies.

In 2021, researchers interviewed 64 auto industry leaders across 7 companies to better understand how they considered their company's role in developing this culture. Respondents acknowledged that while the auto industry has played a positive role in the health of various communities by providing cars that allow access to jobs, healthcare, and food, it has also had negative environmental and public health impacts on communities, particularly from an emissions and land use standpoint.

The COH framework, as seen in Figure 2, outlines 4 pillars of societal health & well-being: Consumers (products/services delivered to), Employees/workers (treatment of), Community (investments in health of local communities), and Environment (impacts on surrounding areas). In pillar 4, respondents noted that eVs could have a positive environmental impact by reducing vehicle emissions and responsibly sourcing materials. However, they acknowledged that not all the consequences of eVs are known at this time. This study was a first to examine strategy and actions of the auto industry through the lens of health, and provides a possible framework for auto leaders and manufacturers in the eV transition to consider as they build a holistic culture of health within the auto industry. Some of their findings included:

- Lowering the barriers to car ownership through financial literacy and making the process more equitable
- Providing mental health support to improve the health of those populations disproportionately affected by the pandemic, (Minority populations—including those in the LGBTQ + community)
- Going beyond the 'good neighbor' efforts and collaborating with community non-profits in economically depressed areas targeting issues related to food deserts, lack of adequate medical facilities, poor transportation infrastructure and limited adult training opportunities
- Engaging in economic development and place-making opportunities, by redeveloping historically underserved areas while preserving the culture heritage of existing neighborhoods, and
- Making efforts to reduce the environmental impact of their products, mitigate carbon emissions and water waste

In summary, both the **EPA's revitalization Roadmap** and the **Culture of Health Framework** offer critical perspectives for auto leaders to recognize the past environmental concerns connected to the auto industry, and the importance of transforming the culture of the auto industry to better embrace health considerations for the future, particularly as vehicle electrification is pursued.

Learning from Past Industrial and Non-Industrial Transitions

Writer and philosopher George Santayana said “those who cannot remember the past are condemned to repeat it.” Past transitions – whether they occurred in the automotive sector or other sectors – carry lessons learned that can potentially be applied to the eV transition. A subset of the 32 leaders we interviewed (more details in Section 2) shared advice and guidance from previous transitions that can inform and shape how the sector approaches the eV transition. Table 2 provides a brief summary of the transition and advice/lessons learned from our interviewees.



LESSONS LEARNED

Table 2: Learnings from industrial and non-industrial transitions

Transition	Advice/Lessons to Share
The solar energy transition – the need to secure an American supply chain	<p>“Under the President Obama administration, we incentivized solar, but we failed to secure a spot in the solar supply chain. We didn't invest in the supply chain or our own workers' positions in it. Where we failed, China succeeded. They lead the solar industry supply chain in place of the United States. I see this same exact thing happening right now in the EV space, specifically when it comes to energy storage. Nearly 90% of the battery supply chain is dominated by China and eastern Asia. If we continue to only incentivize for but not invest in building the American supply chain, if we continue to offer our workers seats but fail to help them find their chairs at the EV table, we will continue to miss the opportunity to grow the American workforce and lose our international foothold to other countries who are more aggressive in staking their claims in this advancing technology.”</p> <p>“Supply chain vs. assembly divide: auto production in the US is shifting, with jobs in both supply chain and assembly. And there will be impacts and shifts between those two pieces ...but the real shift isn't between supply and assembly, but where the auto industry is going, what is going to be on-shored or offshored, will really impact communities”</p>
Closing of the Detroit Incinerator – the need for a phased approach to the transition, acknowledging the range of impacts on the impacted communities	<p>“[On the Detroit incinerator closing] I think that in an ideal world, city officials should have started a comprehensive zero waste plan that coordinated and assisted in the closure of the incinerator. For many years before the shutdown, the facility was showing signs of operational failures that leaked pollution in amounts much greater than EPA's Clean Air standards; harming many communities nearby the facility. Much of this pollution was caused by burning recyclables and compostable waste. Since 2011, Detroit city officials had access to zero waste experts and plans for zero waste systems that would have prevented the health disparities caused by incineration. Even though the incinerator is now closed, the communities around the facility are still experiencing the negative health effects caused by incineration pollution”</p>
Coal to clean energy transition – the need to support legacy ideologies and culture around dominant energy sources	<p>“The state legislature is avoiding that [tapping into more sustainable energy sources like solar and wind] by putting a lot of limitations around wind, solar... The Just Transition Fund is interested in transitioning away from a coal based economy. So they do a lot of work in Appalachia. They have had a hard time getting traction and kind of a foothold here in Ohio because particularly communities in that region have been seriously disinvested over decades, and right now have very ideologically driven local leadership and so it's hard to sort of overcome those ideologies”</p>
The Inaccessible transition – the lack of access to capital to support green transitions	<p>“I think the statistics are that LMI (<i>Low to moderate income</i>) communities represent 40% of the population but only have 5% of the solar. ..that's an imbalance that needs to be addressed. And what are the issues behind that? It's, at the end of the day, it's finding the money to be able to put solar in place, and low and moderate income communities don't typically have that, don't typically have the credit ratings to be approved for a loan, and they arguably need it the most because of the energy poverty that exists. You know, the electric bills are a very high component of community spending and the public health affects, you know, our most polluted zip code in Detroit has zero solar in it. So, there are environmental justice implications. You could make an argument that, you know, any solar reduces impact, reduces carbon emissions and that's good for everyone. However, we need to be able to make sure that's balanced and that we do have clean energy in the communities that need it the most”</p>
River Rouge coal plant shutdown – reinvesting in the changing community landscape and being a more conscientious partner	<p>“This June, the DTE River Rouge Coal Plant was shut down permanently. That actually is, is going to be wonderful to stop the pollutants in the air. But now you've taken away an industry that provided revenue via taxes, businesses which were supported by employees of the plant. River Rouge is a marginalized community that relied on the plant for years. The closure impacts the community's economy. The coal plant provided a tax base which helped the community. So what can DTE do to then reinvest back in that community? We need to look at trying to find equitable ways to come to the table with DTE to say, you've been in the community, you polluted the community, you're changing over to bringing, you know, reducing emissions. So how do we include River Rouge residents in those "green jobs, new economy, jobs? Or how do you reinvest back into that community, having taken so much from that community for so long? So those are some of the things that we're trying to do to push the utility to help correct the detrimental environmental impacts in this community. We need to say to DTE, "you've got to be a more conscientious neighbor, a more conscientious partner versus just contributing toxic waste and toxic air, and taking from people and making their situations even worse”</p> <p>“If the US changes only the vehicle manufacturing to electric, and the US continues to import battery parts and other pieces of the supply chain from elsewhere, it is a huge missed opportunity for good jobs in the US; the opportunity for a new industry, with more jobs on shored is ideal, from setting up and co-locating battery and supply chain plants near EV manufacturing plants for efficiency and ability to increase invest the local community”</p>
Transition of manufacturing facilities and land – revitalizing contaminated properties	<p>“Chrysler hasn't had issues...they been taking care of their waste very good.”; “It was a transmission plant, and oil seeps in the ground. Over the 50 -60 years the plant has been there. They use 1000s gallons.”; “The steel mill closed down about 20 years ago and they had environmental problems”</p>
Transitioning from strong urban/inter-urban transportation systems – the need to consider multi-modes of transport for LIC/COC	<p>“I love this history of really, a very well developed public transportation system, streetcar system in Toledo, in the 20s and 30s and then, even a, an interurban, I think it was called from Toledo to Detroit, it's a train you could get on the train in Toledo and go to Detroit, had its own track and it was great.”... “And he [Ford] also tore up the inner, the interurban railroad. That was destroyed and Toledo has, you know the, the streetcar system in Toledo was also destroyed. And how that was engineered, I don't know. That I don't know, I know Ford did the interurban, he got rid of that.” -</p>
Transition of land – environmental responsibility and stewardship	<p>“General Motors in Lordstown, of course that's now where all the activities happening with the new electric vehicles, they built an actual Turnpike exit right here to make it easier, because they were employing thousands of thousands of people. So Lordstown not only had the turnpike access, but a lot of green space, and didn't have to worry about cleanup of brownfields and everything. So that was an ideal place so not only [for] the auto industry now, which had a lot of other industries, especially warehousing and distribution centers, because of the proximity to the transportation, use of getting in and out of the area and no brownfield stuff to worry about. So, we're seeing that but now with eV stuff we're also seeing some, a lot of vendors coming in that are going to be supporting the electric vehicle movement.”</p>
Transitioning from silos to regional development	<p>[In Warren & Lordstown] It was incumbent upon us to take a look regionally, because like I said, Warren does not have any industry. So we can't attract a business because we're mostly residential. So we started taking a regional approach. What we looked at when I took the job and starting to get involved with some of the regional agencies like the Port Authority, Eastern Gateway Community College and the Council of Governments have tried to struggle in your regionally at what we need help we can help each other. We are now working with one of our townships and what we call the Golden Triangle Area which is a huge industrial area. Just to the north of the city. And we formed a coalition where we've been able to go out and get grant dollars, started making infrastructure improvements. Now the majority that again is not the city, but there's 30 companies up there that. The Golden Triangle, you have 30 factories in that region. They probably employ well over 3,000 people and a majority live in a city of Warren. So that's what we've got to start doing, gotta stop being our own little silos and start working with each other because of two things: 1) The companies don't care what jurisdiction they're in The other thing too is people need jobs, you know if we help people in Holland get jobs, those people in Holland, have money they're going to spend it, they're going to spend it in the region so it's going to go well. So the biggest problem was making that transition.</p>

Frameworks to support an equitable eV Transition

As the United States and the Midwest move towards vehicle electrification, centering the Principles of Environmental Justice in this transition requires an examination of which communities could benefit or be harmed by eV manufacturing. Other countries and geographies offer a set of foundational frameworks and guidance that are centered on energy justice, a just transition and clean mobility. We will focus on two: energy justice in Norway and the Greenlining Institute's Clean Mobility Equity Framework.

Energy Justice and eV transition in Norway.

In a paper by Sovacool et al (2019), authors analyze four cases of decarbonization, one of which is related to the eV transition in Norway. Using the four dimensions of Justice (Distributive, Procedural, Cosmopolitan, Recognition), the authors offer a set of recommendations and policy solutions that underscore the spirit of several of the Principles of Environmental Justice, particularly how we consume resources, work to minimize waste and uphold the right for people to participate as equal partners at every level of decision-making.

Table 3: Dimensions, Definitions and Recommended Policy Solutions to Address eV in Injustice in Norway

Dimensions of Injustice in EV Transition: Learning from Norway			
Dimension	Definition	Examples of Injustice in Norway	Recommended Policy Solutions
<i>Distributive Justice</i>	Equitable distribution of social and economic benefits and costs, fair and open access	EV ownership limited to those with higher	Increase consumer knowledge of cheaper EVs, less subsidies for those on high-incomes, compensation for disrupted sectors (toll roads, ferries, charging)
		Increased traffic congestions for buses	
		Elitism	
		Future implications on the grid	
		Occupational hazards	
<i>Procedural Justice</i>	Adherence to due process, fair and adequate public participation, inclusion and consent	Public subsidies for EVs cost tax payers and the	Better inclusion of entire population in EV policies (e.g. public charging infrastructure coverage), more comprehensive transport policy
		Increase in EVs will be a challenge to the grid	
		Procedural exclusion of e-bikes	
		Planning bias towards motorized cars	
		Policy decided unilaterally: tax payers not	
<i>Cosmopolitan Justice</i>	Protection of global human rights, accounting and mitigation of global externalities	Exclusion of public transport users/advocates	Certification programs for materials, make car manufacturers responsible for emissions from EV manufacturing and battery lifecycle waste streams
		Global pollution generated by the manufacturer	
		Waste generated by old EV batteries	
		Economic/ social injustice of natural resource	
		Legacy of fossil fuel cars ending up in	
<i>Justice as Recognition</i>	Appreciation for the vulnerable, marginalized, poor or otherwise underrepresented groups	The elderly	Avoid regressive EV subsidies, encourage lower-cost EV development, provide access to EV infrastructure
		People living in colder climates	
		People living with hearing problems	
		Working families	
		The differently abled	
		Low-income people	
		Fossil-fuel dependent people	

The Greenlining Institute Clean Mobility Equity Framework

Based in Oakland, California, the Greenlining Institute is a significant thought leader in guiding equitable and just transitions. They worked with a coalition of over 50 partners to develop the Clean Mobility Equity Framework, originally developed to evaluate the equitability of California clean mobility policies and programs. However, this framework as presented in Table 4 presents six standards of equitable investment in clean transportation that not only serve as a method for evaluation, but also function as a guide toward designing just and equitable clean mobility plans in general. Most notably, the standards presented build on foundational elements of the Principles of Environmental Justice.

Table 4: Six Standards of Equitable Investment. The Greenlining Institute (2021)

Greenlining Institute's Six Standards of Equitable Investment in Clean Transportation		
Standards	Definition	Best Practices
<i>Emphasize Anti-Racist Solutions</i>	"Address underlying inequities with anti-racist solutions that target and prioritize the most impacted communities, centering anti-racist approaches in internal planning, power and decision-making."	Mobility equity programs should be built to benefit communities most harmed by systemic racism. Race should be a key indicator for targeting investment based on need, and should be included in analysis tools.
<i>Prioritize Multi-Sector Approaches</i>	"Provide co-benefits by addressing multiple issues and sectors at once, such as outreach, engagement, capacity-building, wealth-building, climate adaptation, anti-displacement and more, because piecemeal approaches do little to foster transformative systems change."	Create mobility equity programs that show co-benefits across sectors (health, housing, etc.) and issues at once (outreach, engagement, capacity building, climate adaptation, anti-displacement).
<i>Deliver Intentional Benefits</i>	"Rather than expecting benefits to trickle down to communities, programs can ensure they go directly to the people most in need in the most impactful ways, while not increasing or creating new burdens."	Benefits should be considered for different community members, based on need. Avoid risk of displacement as a consequence of investing in low-income communities of color through community-driven anti-displacement planning.
<i>Build Community Capacity</i>	"Prioritize capacity-strapped communities by building in and requiring technical assistance, long-term training and skills development. This should include contracting mechanisms to pay residents, community-based organizations and local leaders for their participation."	Sufficiently fund bottom-up, proactive capacity building and technical assistance. Evaluate technical assistance provider's effectiveness in relieving barriers to grant and resource acquisition for communities and organizations underrepresented in planning and implementing clean mobility solutions.
<i>Be Community-Driven at Every Stage</i>	"Truly community-centered investment requires lifting up community-led ideas and sharing decisionmaking power...make community members and organizations part of every phase of the program or policy."	Support existing programs that already have community buy-in where possible. Identify who experiences barriers to participation in community-driven approach development, and find means to overcome this.
<i>Establish Paths Toward Wealth-Building</i>	"Address the racial wealth gap, which continues to grow today. In addition to cost savings, clean mobility programs must create jobs, workforce development and training opportunities, protect workers from exploitative labor practices, and help communities build assets and economic infrastructure."	Establish policy measures that build wealth in the community (contracting with women and minority-owned businesses, rules stipulating transfer of mobility assets to communities at no cost if the program is discontinued, etc.) Contract with local CBOs to compensate community members for outreach and engagement activities.

SECTION 2: QUALITATIVE EXPLORATION: LEARNINGS FROM COMMUNITY & STAKEHOLDER EXPERT INTERVIEWS

Building on the literature review, 32 community experts from a range of sectors shared their lived experience that illuminated the historical, present and future considerations to ensure an equitable and just transition to eVs. Semi-structured interviews with leaders representing all of our study states and various sectors were conducted between May and June 2021. All community-based/grassroots leaders received an honorarium for their time. The majority of the interviews were recorded using Zoom, lasting between 30 minutes to 1 hour. Prior to each interview, all potential interviewees received a brief project information sheet that described the study, the benefits and risks and how confidentiality would be maintained. The research team used a standard set of interview questions. Professional transcripts were generated from each interview and used by the research team to support the coding process, where all responses were categorized and organized based on common themes. The results of this thematic coding process provide the foundation for this analysis. The interviewee representation by state and sector is described in Figure 4 below:

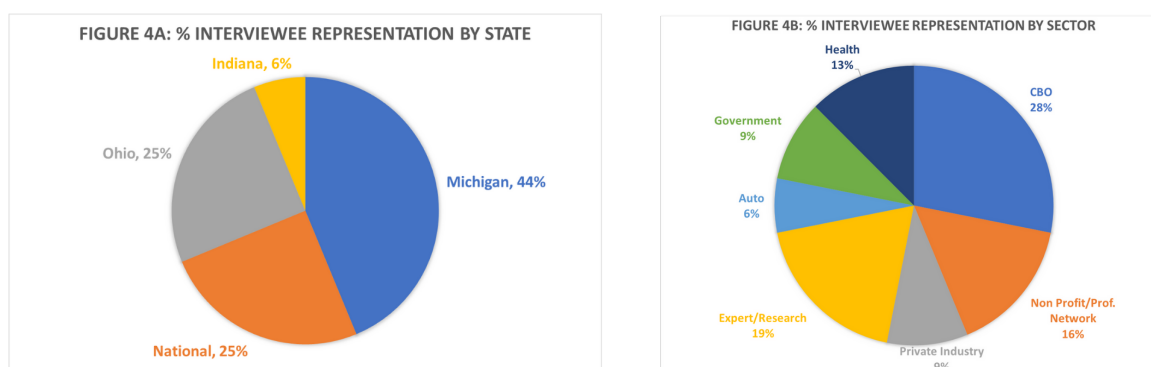


Figure 4A-B: Interviewee representation by State and Sector

While a range of concerns and considerations emerged from these conversations, four themes were consistently raised across interviewees that will be the focus of this section: legacy environmental pollution and health, equity frameworks and just transition guidance, defining who benefits (or not) from eVs, and opportunities for an equitable eV future.

Legacy Environmental Pollution & Health

Interviewees were asked to comment on the legacy and current environmental issues impacting public health (including waste, toxins, and other health concerns) that are connected to the auto industry and how that would or should influence the eV transition. They shared several concrete legacy issues that related directly to environmental injustice: the construction of highways through Black communities that disrupted neighborhood and culture; the number of Brownfields that remain in communities; the manufacturing processes that exposed workers to dust and contaminants; and, the remnants of pollution and contamination that still exist today. One respondent shared their experience:

"Back in the day – the Central Foundry was where you made cylinders for the car; we had 3 or 4 smokestacks, giving out chemical dust; it would be dust that would corrode your car; they had no environmental process to control and people were breathing in soot; it was a big concern with no respirator when you worked. People were getting sick from black lung; they would give you extra 5 years seniority when you started because the work was so dirty; They tore down the foundry in 1985...but the dirt and the environment is still dirty and around is still here today"

Pollution from point sources (i.e. manufacturing facilities, energy generating plants) and mobile sources (i.e. cars, trucks, public transportation vehicles) increase the likelihood of asthma, cancer related illness and even juvenile diabetes, especially for people of color.

"48217 in Southwest Detroit is considered the most highly polluted area in the state and predominantly Black, Hispanic, and low income. There are multiple factories (coal plant, steel mill and wastewater treatment plant) and transport lines where trucks that bring supplies in and out, as well as the highways that increase vehicle emissions. All these factors contribute to the poisonous air that spreads across parks, schools, neighborhoods, and recreation centers. Health studies look at school absences because children with asthmatic conditions due to poor air quality miss a lot of school. They look at emergency room visits because of underlying conditions exacerbated by air pollution. The poor air quality from emission creates a cycle of poor health, limited education (high absentee rate) and missed days from work due to illness which impacts the socio-economic levels for these communities with poor air quality"

Beyond the manufacturing facilities, LIC/COCs can be exposed to more pollution through multiple pathways, including vehicular emissions. As a result of inequitable transportation infrastructure design that allowed more highways and highly trafficked areas in LIC/COC, the depositing of Lead (Pb) from gasoline can get into neighborhood soils, causing current lead toxicity challenges for children across neighborhoods. Moving to electric vehicles could also minimize other health impacts beyond the respiratory system, including the cardiovascular system and reproductive health:

“Currently in Toledo, Lucas County, Black babies are dying at three times the rate of white babies. So we have a huge disparity in this and it has nothing to do with socioeconomic [status], income level, and education, any of that. When you tease all that out, the disparity still exists. So there’s really nothing genetically wrong with Black women that they can’t carry their babies. So, it’s the environment and the other issues, more specifically the racism that African Americans have endured for hundreds of years in this country that cause this”

An environmental justice leader called the legacy of the former auto industry “destructive”, highlighting the need for a ‘clean, green approach” to making new factories because certain communities are often stuck living with the pollution.

“Those who have money, who have economic well-being, often are not the same people who are experiencing environmental injustices because they can afford to move away from, out of the epicenter of areas where there is, where there's high levels of pollution”

Equity Frameworks & Just Transition Guidance

The Environmental Justice Principles speak to authentic engagement of communities, particularly those that have been historically marginalized. Unfortunately, Black, Indigenous, and People of Color leaders are not being represented at the decision tables, nor have enough of a say in creating or implementing the plans that are being devised on various eV and clean energy initiatives. Several interviewees raised the need for more People of Color to be engaged and lead conversations related to the EV transition:

“These policies impact citizens and communities that often have no representation at the table where issues that directly affect their lives are being determined. What we're trying to do is to figure out who would benefit most from these particular initiatives, who has been overlooked the most, that when we're looking at policies, BIPOC (Black, Indigenous, and People of Color) community residents are able to offer recommendations from the evaluation, implementation, and the development phases, from the start the beginning of planning. So that what is being proposed is actually going to be beneficial for their communities and that their needs are prioritized and addressed”

Another set of Principles that are utilized to create and sustain a diverse table of stakeholders are the Jemez Democratic Organizing Principles, which focus on bottom-up organizing, ensuring EJ and frontline communities are the decision-makers in the process. Operationalizing equity as a social value is needed in every part of the process – from development, production, and deployment of EV technologies.

“Let's say a solar panel has embodied energy, meaning it took energy to make that solar panel, it didn't just show up. It takes a certain amount of energy to make a product, and that product also generates. So, is it possible to have embodied injustice, meaning that, even if all phases of manufacturing are done very, very well but some of that cobalt for that solar panel came from an artisanal mine that was using child labor, while it brings a lot of community benefits back, you can say that there's embodied injustice in that particular material”

Defining who benefits (or not) from eVs

The eV transition has many leaders cautiously optimistic about the benefits for BIPOC and LIC neighborhoods. Some experts have suggested that the majority of People of Color will stand to win because we will all be at an advantage when the air is cleaner because theoretically there will be less asthma, less heart disease, and fewer strokes that “plague Black People and low-income people everywhere”. But if the source of the electricity is coal-based, putting more eV’s on the grid will still cause harm unless the eV transition is coupled with widespread grid upgrades and clean energy investment:

"Well, ideally, all electric vehicles will be powered by clean energy. I mean that is where those two things connect, and they intersect. Yeah there's no emissions coming out the tailpipe but you know there are a lot of emissions, created in order to power that plug. So I would love to see the planning for the EV infrastructure coincide with or have the goal be to power that as much with clean energy as possible. These little off grid charging stations are a great way to do it, putting solar on buildings and then plugging into the building power that's another way to do it. But ultimately, to get the most health and climate benefits from EVs, they need to be powered by clean energy so those things definitely need to be hand in glove, in my opinion"

The sourcing of components across the global supply chain – particularly batteries and solar panels are made up of dozens of parts across the world where, as one interviewee stated, “we don't always have good light shed into what's actually happening from Occupational Health and Safety standpoint”. The proper sourcing and disposal of batteries as they relate to the expansion of the eV industry was a key concern for many interviewees, as waste streams are often an afterthought of industrial expansion.

Even if eVs become the main mode of transportation and the energy issues are sorted out, another key issue lingers that still has the potential of disadvantaging many Black, Brown, and low-income communities in the eV transition: eV vehicle ownership. Purchasing an eV vehicle is a major investment. Many interviewees noted the cost of eVs as a major hurdle, as well as whether all communities would have adequate access to charging stations, and whether covering the extra energy costs that come with charging vehicles at home would be feasible. The financial aspect and potential financial burden of eV ownership is important to consider alongside the potential environmental and health benefits of the transition:

"I think financing is often thrown around as a like, oh, if costs are a barrier let's offer financing. But that doesn't necessarily recognize that people might not want to take on debt, and it's not really reasonable to say, oh, we think there's societal benefits of EVs, therefore you need to take on debt so you can purchase an EV when that might not be someone's priority. So I think there's like, this big question of imposing the values of EVs being a societal benefit onto individuals, and asking them to pay more, or take on debt to purchase something that we value as a society"

Opportunities

Multiple concerns were raised about how and if LICs and COCs will benefit from the eV transition. Whether the challenge is shifting the narrative from eV's being a "White people thing", or addressing the access and affordability challenges for Black, Brown, Indigenous communities, and low-income Whites who might not be able to afford an electric vehicle. Table 5 summarizes a list of existing inequities related to the eV transition and potential solutions.

Table 5: Existing inequities and solutions for an equitable eV transition

Inequity	The reality for Black and Brown communities	Root cause	Potential Solution
Privileged mobility	Limited charging infrastructure, compared to middle, upper class suburban communities	Disproportionately exposed to transportation emissions because of redlining, segregation.	Prioritized investment in community-driven clean mobility programs and transport infrastructure planning
Limited opportunities for entrepreneurship	Seen as consumers; not prioritized to benefit from the decision-making processes	Access to decision-making tables	Create real representation and shared ownership in decision-making spaces beyond tokenization; fund and support BIPOC-led companies and organizations
Elite technology	Lack of opportunities to skill-up existing minority owned businesses as it relates to eV building and repair	Limited information and access to training in certain communities	Create wrap-around services including training and workforce development programs in auto communities and sites of EV manufacturers
Health Disparities	Disproportionate exposure to dirty air	Environmental racism, equity-focused planning	Targeting pollution reductions in overburdened areas
Energy Burden	Spending a large percentage of their income on energy costs	Lack of energy efficient homes, affordability, policies and financial resources to promote home weatherization and energy efficiency	Equitable Decarbonization programs
Climate Injustice	A range of disproportionate health impacts (high low-birth weight babies, asthma, juvenile diabetes, cancer, lead poisoning)	Racism driving blaming people for their medical conditions exacerbated by climate change	Acknowledge the baseline health of communities in any analysis of eV transitions; end subsidies for oil and gas industries
Dirty energy sources	The energy grid is still highly connected to energy generated from coal	Primarily located in or near LIC (Low-income community)/COC (Communities of color)	Plan for renewable and clean charging sources where EVs are produced, sold, and driven

SECTION 3: THE PATH FORWARD: CENTERING PEOPLE IN AN ELECTRIFIED FUTURE

Achieving an equitable and just transition will require intentional changes in both process and policy that are guided and influenced by the experience and expertise of impacted communities at all project stages – from scoping to implementation, and post-production. We offer a set of process and policy recommendations – grounded in the spirit of the Principles of Environmental Justice - that strike to prevent the degradation of the physical environment and reduce the negative health impacts on communities living near or at the fence-line of manufacturing facilities.

Process Recommendations

The Stellantis Plant Expansion in Detroit is example that demonstrates the importance of Scoping before any project is implemented. Scoping includes a series of inquiries to understand the current community context from an environmental, public health, and policy standpoint. It is usually conducted at the start of a project and can involve traditional and non-traditional forms of data collection – from existing stationary air monitors or body monitors to collecting stories, experiences, and potential solutions from impacted community members. The balance and use of both types of data collection can create the basis for a more productive for any emerging community benefits agreements.

As a part of scoping, we offer two practical actions that decision-makers should consider throughout the life of a project: (1) activating a **High-Level Equity Analysis**, and, (2) conducting a **Data Visualization**. Each action requires collecting information and data to demonstrate the current and/or potential environmental and health baseline of the community that can inform any immediate or long-term actions, and creates thoughtful policy solutions. Both actions are described below.

Foundational Questions for Preliminary High-Level Equity Analysis

An equity, people-centered transition to electric vehicles will require inclusive planning (i.e. involving a diverse set of voices), creating metrics and systems of accountability that both industry and government will subscribe to, and shaping a process for an equity analysis. While there are many forms or ways to conduct an equity analysis, for this work, an equity analysis is defined as “a structured process by which you can weigh the benefits and the potential risks/unintended consequences, that can either decrease or increase harm to a certain group of people, community, or geographic area as the result of a change in policy, practice or process.”

(www.empower4people.com). As a starting point for local, state and federal decision-makers that are responsible for leading planning and making decisions about all aspects of the vehicle electrification ecosystem, we offer seven questions that can be adjusted to fit various scenarios. Additionally, these questions should be answered collectively (and re-defined as needed) with grassroots community leaders and community-based organizations that will be impacted - directly or indirectly - by the proposed change. (Note: the questions are at a high level and can serve as a foundation for more specific questions for multiple scenarios).

Table 6: High-Level Equity Analysis (7-questions) to support equitable transitions (www.empower4people.com)

1	Who/whom will benefit from this change?
2	Who/whom could be negatively impacted by the proposed change?
3	Are there other pathways that offer a more equitable solution?
4	Have we engaged all the voices we need - at all stages of the process - to ensure that all perspectives are represented and influence the solution?
5	Have we set up a process to ‘check in at various frequencies’ to ensure the process is working?
6	What is the data that we need to collect or begin collecting to validate ‘no harm’ is being caused by our actions?
7	What is the frequency of communication - and to who/whom - that is needed to ensure an inclusive process from start to finish?

Data Visualization

The second action is using tools to visualize current and potential impacts. For example, the Environmental Protection Agency's Environmental Justice Screening Tool (EJSCREEN) allows users to access high-resolution environmental and demographic information for locations in the United States, and compare their selected locations to the rest of the state, EPA region, or the nation. In addition to the EPA, some states have developed or are developing their own screening tools (California, Washington, Colorado, North Carolina, Maryland, Michigan). Data visualization can be useful for crafting policies and decisions related to resource distribution or the siting of eV charging infrastructure, taking into account the historical and current spatial inequities that drive environmental injustice and health disparities in low-income populations and communities of color.

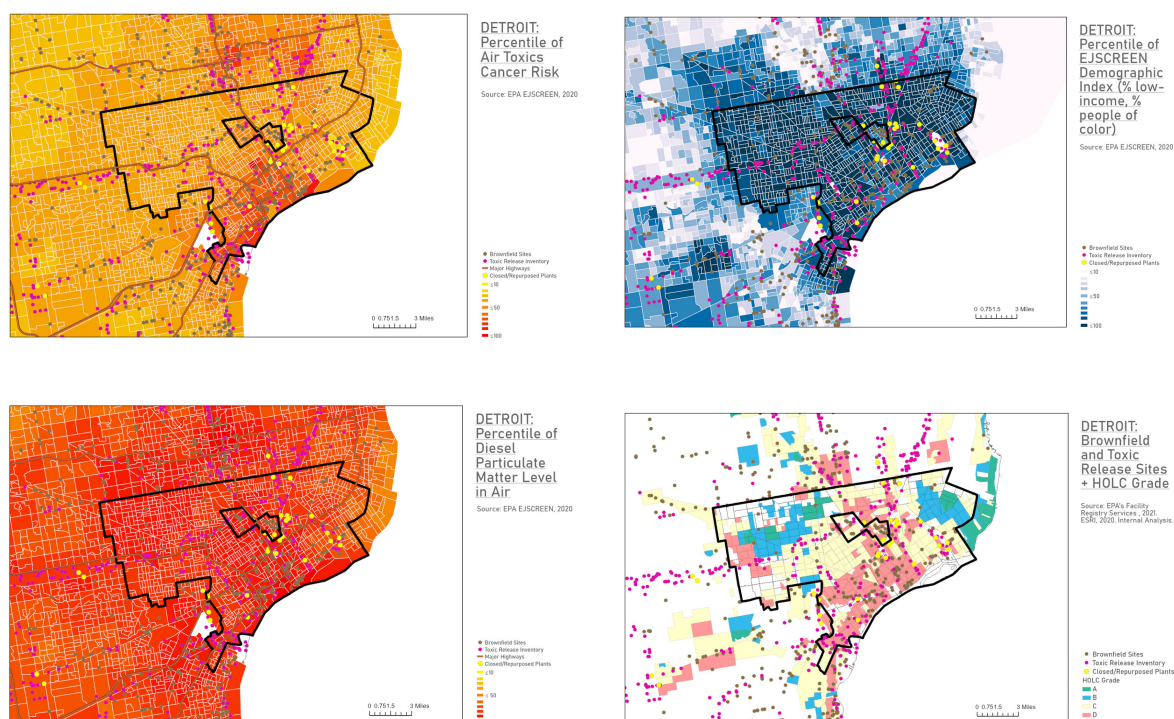


Figure 5A-D: Spatial analysis of environmental, health and social data in Detroit, Michigan.

The first set of figures 5A-5D show the Detroit city limits. Figure 5A shows high levels of Particulate Matter, which is an indicator of reduced air quality, primarily from diesel vehicles. The deeper reds (i.e. higher levels) dominate the southeastern portion of the figure. Figure 5B shows the historical red-lined communities, used for racial segregation), that have clusters of Brownfields and toxic release points, again, concentrated in the southeastern area of the city. Adding in another layer of Figure 5C, 5D, cancer risks, and the percentile of low income and people of color, the concentrated exposure or 'hot spots' is clear. These types of visuals and this use of data can be a useful visualization to help local decision-makers, policymakers and advocates understand the linkages between historical environmental and social concerns, with the health concerns of today. Additionally, the combination of these visuals and other data can help prioritize, for example, where public transportation should be prioritized for electrification, which communities should receive rebates of financial support to have access and afford eVs, as well as where clean energy sources should be available.

We conducted a similar exercise for Lima, Ohio. As shown in Figures 6A-D , the maps show a higher concentration of low-income and people of color, as well as high asthma prevalence in the center of the county. What is counterintuitive and different from the Detroit visualization is that the historical red-lined areas in Lima hosted fewer clusters of toxic release sites and designated brownfields.

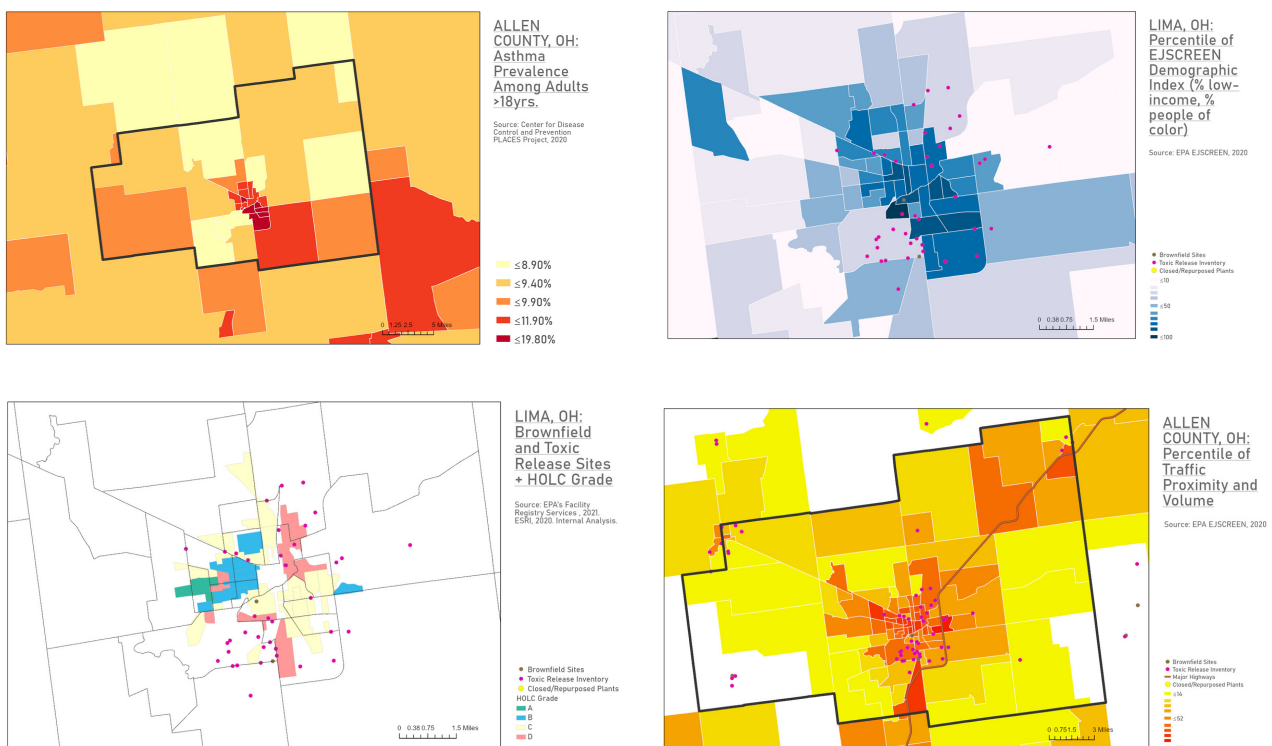


Figure 6A-D: Spatial analysis of environmental, health and social data in Lima, Ohio.

Each city has a unique story. The right data – coupled with the right tools, and the experience of community experts and scientists – can help provide an equitable transition, and narrative, community by community.

Interviewees also suggested additional considerations that are important for an equitable process:

- Create the space for communities to engage in the process of a Community Benefits Agreement that will actually benefit the community: For the Stellantis example, the community benefits ordinance that was codified by the City of Detroit was not legally binding which did not protect the communities interest. A strong CBA process will require transparency, coordination, and collaboration across city leadership, state and federal government actors, and the industry partner.
- Taking time to understand the entire community context: Impacted communities have not been sufficiently included in the full eV transition process. The process must go beyond the plant walls, and consider the full ecosystem of opportunities. For example, an equitable transition must not be limited to personal vehicles, but also public transportation options (buses, trains, subways, shared cars/bikes); it must intentionally consider electrifying main trucking lines that frequently travel and emit considerable pollution in low-income communities and communities of color; and, solutions should not increase pollution and/or exacerbate other exposures that increase climate vulnerability and drive negative health outcomes for populations living near and on the fenceline of operations.

Policy Recommendations

Robust policy recommendations are critical to advancing an equitable eV transition. Table 6 shares a set of broad policy recommendations that can be tailored and operationalized at the local, state, and federal levels. Each recommendation is accompanied by an example on how it can be implemented.

Table 6: Policy recommendations to operationalize an equitable eV transition

Policy Recommendations for eV Transition	
<i>Policy (What)</i>	<i>Process (How)</i>
Prioritize Worker Safety (e.g., in EV Supply Chain and Manufacturing)	Linking Climate and Environmental Health Outcomes to Clinical Settings, Health Promotion, and Health Education
EV Corporate Responsibility for EJ: (e.g., collective Industry Waste Management Infrastructure, and Lemon Laws)	Justice Based Planning and Deployment of eVs into the Transport Ecosystem/ Planning for Mobility Equity: Moving beyond tokenism in decision-making & bringing People of color Leadership to the front
Equitable EV Incentive Program (e.g., used EV Incentives, Income-Based Rebates, and Immediate Discounts)	Community Engagement Prior to Decision Making, Defining Benefits, Creating Metrics, and Taking Action to Deploy Changes
Ensure Quality Jobs, Quality Benefits, and Livable Wages for Frontline Auto Communities	Community Needs Assessments: Learning from Past Industrial Divestment: Long Range Planning for Equitable Investment Strategies
Accounting for Environmental Injustice/ Pay to Pollute	Equitable Siting of eV Industrial Facilities; Addressing legacy pollution issues
Protective Energy Pricing	Equitable Deployment of charging stations and costs
Community Benefits Agreements	Building community readiness: Providing impacted community members with technical support (data capturing and analysis); employ a sufficient timeline for authentic, shared decision making between community and industrial partners; ensure any CBAs are legally binding
Intergenerational Workforce Investment and Development	Direct investments in the next generation workforce, that includes potential jobs in the manufacturing facilities, environmental scientists (to support monitoring and data capture), and public health practitioners
Transparency (Chemical Use, Process, Risk Assessment)	Disclose all chemicals being used in the manufacturing process (at least the Material Safety Data Sheets); finance a neutral scientific consultant providing risk assessment and modeling data; A process that is co-created by community and industry to support shared understanding and decision-making
Require a Cumulative Impacts Assessment on Environment & Community Health	Mandate a data visualization that requires demographic, environmental (current and past) to be used in the final permitting process by the governing entity and the CBA

Conclusion

The reach and impact of the auto industry transcend the walls of the plant, and particularly for our study communities, the environmental legacy and health concerns have been exacerbated by industry, over multiple decades. Our analysis revealed that for an equitable and just transition to occur as we electrify vehicles in the Midwest and beyond, community leaders of Color must be authentically, intentionally, and often engaged in the policies, processes, and practices associated with planning, deployment, and resource distribution. There is a need to broaden the scope of opportunities that can provide intersectional justice for Black and Brown communities that touch economic justice (e.g. jobs, community revitalization), social justice (e.g. inclusion in decision-making), health justice (e.g. ensuring technology is deployed and prioritized in areas with increased health disparities), and environmental justice (e.g. cleaning up past contamination and mitigating existing sources of dirty energy to power eVs). This research had some limitations: public health agencies, economic development groups, and local political and governmental leadership were particularly challenging to gain access; garnering access to historical health outcomes proved to be a challenge and constrained our abilities to conduct a comparative and geospatial analysis of environmental racism and risks, health inequities, or other burdens to LMI and COC neighborhoods over time. Despite those limitations, both peer-reviewed literature and the community leaders we interviewed underscored the necessity to involve low-income communities, People of Color, and those that stand to be most impacted by the eV transition in the entire process – from initial project scoping to the implementation of policies and processes. We must acknowledge past harms (environmental, public health), engage the right voices across the spectrum of the transition, holding the ecosystem of stakeholders (government, industry) accountable – while leaning on the Principles of Environmental Justice – to create an equitable, just transition where everyone – both the environment and community – can benefit for generations to come.

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Appendix

List of Stakeholders Interviewed

Interviewee	Organization
Alicia Smith	Freshwater Future and Junction Coalition
Alison Goebel	The Greater Ohio Policy Center
Amanda Dwelley	ILLUME, LLC
Anand Gopal	The Hewlett Foundation
Briana Dubose	EcoWorks
Celeste Smith	Health Partners of Western Ohio, A Federally Qualified Health
Denise Abdul-Rahman	NAACP Midwest Organizer
Diane Cheklich	D2 Solar, LLC
Donele Wilkins	The Green Door Initiative
Donna Givens Davidson	Eastside Community Network
Dustin Mulvaney	San Jose State University
Eric Zgodzinski	Public Health Commissioner, Lucas County, Ohio
Erma Leaphart	The Sierra Club, Detroit Chapter
Isa Gaillard	The Greenlining Institute
James Trice	Pontiac Auto Plant Worker
Jeff Wolfe	CEO, Veloce Energy
Jennifer Kanalos	The Detroit Economic Growth Corporation
Jerry King	UAW Member, Chairperson, Fiat-Chrysler Automotive
Robert Shobe	Justice for Beniteau Residents, Autoworker
Rhonda Theus	Detroit Resident, Autoworker, FCA Neighborhood Advisory Council
Myrtle Thompson Curtis	Board Member, Grace Lee Boggs Center
Eden Kasmala-Bloom	Detroit Peoples Platform
Rich Feldman	Board Member, Grace Lee Boggs Center
KT Andresky	Campaign Organizer, Breathe Free Detroit
Marnese Jackson	Midwest Building Decarbonization Coalition
Michael Dorsey	Club of Rome
Michael Keys	Director of Community Development, City of Warren, Ohio
Mona Monroe-Younis	Environmental Transformation Movement of Flint
Myra Tetteh	Detroit's Green Task Force
Pamela Oatis	Mercy Health
Peggy Berry	Certified Occupational Health Nurse Specialist, Member of the
Rick Stockburger	BRITE Energy Innovators
Rossie Tolliver	President, Kokomo NAACP Chapter
Shelley Francis	EV Noire/EV Hybrid Noire
Wendy Purcell	Harvard T.H. Chan School of Public Health

Resource List

Union of Concerned Scientists:

- Federal EV Policy
- Electric Vehicles Are Cleaner Than Gasoline--and Getting Better
- Infographic: Electric Vehicles — Oil Savings in Action
- Inequitable Exposure to Air Pollution from Vehicles in California

American Lung Association:

- The Road to Clean Air: Benefits of Nationwide Transition to Electric Vehicles
- Clean Air Future: Health and Climate Benefits of Zero-Emission Vehicles

Moving Forward Network:

- Zero-Emissions Technology for Freight: Heavy Duty Trucks; Tools to Advocate for Zero-Emission Technology
- Critical Mineral Supply Chains: America's Pathway to a Circular Economy and Responsible Mining (RealClear Energy)
- Mining is critical to a sustainable 21st-century economy (MinnPost)
- Minnesota can become a world leader in responsible mining (MinnPost)

The Greenlining Institute:

- Clean Mobility Equity: A Playbook Lessons from California's Clean Transportation Programs
- Factsheets: California's Electric Vehicle Equity Incentive and Mobility Programs
- Four Components of Sustaining Clean Mobility Equity Programs
- A Community of Practice for Equitable Electric Mobility

United Auto Workers:

- Taking the High Road: Strategies for a Fair EV Future
- Market forces, not mandates, should guide Minnesota's electric vehicle future (MinnPost)
- Commentary: To deliver justice, lift the cap on small-scale solar (Crain's Detroit Business)
- GM invests in 5 Michigan sites, taps third plant for electric vehicles
- Obama's EPA finds bias in Flint power plant case
- \$23 million project to bring 300 jobs, 140-acre development to Buick City site
- India's largest SUV maker still interested in Flint, but expansion plan 'on hold' over coronavirus

Imagine Flint:

- Imagine Flint Comprehensive Master Plan - 2013 Resources
- Choice Neighborhoods Initiative

Other Resources:

- Genesee County Intermodal Freight Technical Report
- Racer Trust: Home Properties Buick City Site
- EPA Found Culpable in Flint's Other Lead Crisis (Pacific Standard)
- Choma, Ernani F. et. al, "Assessing the health impacts of electric vehicles through air pollution in the United States." Environmental International. 144. 2020.
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