AN INITIAL SCAN FOR ADVANCING EQUITY IN THE CLEAN TECHNOLOGIES FIELD: COMMUNITIES, BUILDINGS & POLICY

Prepared for

INSTITUTE FOR Sustainable Communities

IMT INSTITUTE FOR MARKET TRANSFORMATION

September 29, 2021

EGE² EMPOWERING A GREEN ENVIRONMENT AND ECONOMY
Delivering people-centered solutions to transform communities

Dr. Jalonne L. White-Newsome
Monica Martinez
Yasmin Romitti
Chrissy Beckwith

RESEARCH TEAM

Led by **Dr. Jalonne L. White-Newsome**, Empowering a Green Environment and Economy, LLC (EGE2) is a certified Minority Business Enterprise (MBE) and Women's Business Enterprise (WBE) providing strategic consulting services dedicated to delivering people-centered solutions that will transform communities and the environment, nationally and internationally. EGE2 works to advance equity by creating solutions that will always prioritize the needs of people, challenge how corporations, organizations and institutions work so they can exceed their expectations and deliver optimal service to communities, and empower communities to be able to adapt to changes in our natural and social environment. **Yasmin Rottimi** is currently a doctoral student at Boston University and provided the quantitative analysis for the project as a intern for EGE2.

Ms. Monica Martinez is principal and owner of Ruben Strategy Group LLC. She is a strategic regulatory and governmental affairs consultant with over 15 years of experience in regulatory, government, and business to business relations. She has a proven record of working across the political aisle and with diverse interests to achieve goals. In the Midwest and across the country, she has built connections with regulated utilities, consumer advocates, manufacturers, environmental groups, and key government stakeholders. With Ruben Strategy, she works with major national associations, non-profits, coalitions, and energy related businesses to help develop their markets, create strategic pathways to solutions, and grow their organizations. **Chrissy Beckwith** is a researcher for the Ruben Strategy Group.

ACKNOWLEDGEMENTS

We want to acknowledge the Boston University URBAN - Graduate Program in Urban Biogeoscience and Environmental Health that supported Yasmin Romitti. We want to also extend our appreciation to all of the community partners and leaders that participated in the qualitative interviews:

Donnel Baird, Blocpower
Natalie Brown, Catalyst Miami
Olivia Collins, The Cleo Institute
Alex Kragie, Coalition for Green Capital
Laura Gracia-Santiago, Communities for a Better Environment
Marnese Jackson, The Midwest Building Decarbonization Coalition
Katie Kaluzny, Illinois Green Alliance
Danielle Pierre, Miami-Dade NAACP
Susan Glickman, Southern Alliance for Clean Energy
Dana Johnson, WE ACT for Environmental Justice
Margaret Gordan, West Oakland Environmental Indicators Project

Table of Contents

01 - BACKGROUND

Historic social and political factors continue to drive the racial-ethnic pollution exposure disparities that have existed and are still prevalent in low-income (LIC), communities of color (COC). A 2021 study shows that most emission source types in the United States disproportionately affect racial-ethnic minorities from an environmental and health justice perspective. This systemic phenomenon is seen across nearly all major sectors, states, urban and rural areas, income levels, and exposure levels. As shown in Figure 1, industry, light-duty gasoline vehicles, construction, and heavy-duty diesel vehicles are often among the largest sources of disparity[1]. However, mobile sources and construction are not the only sources.
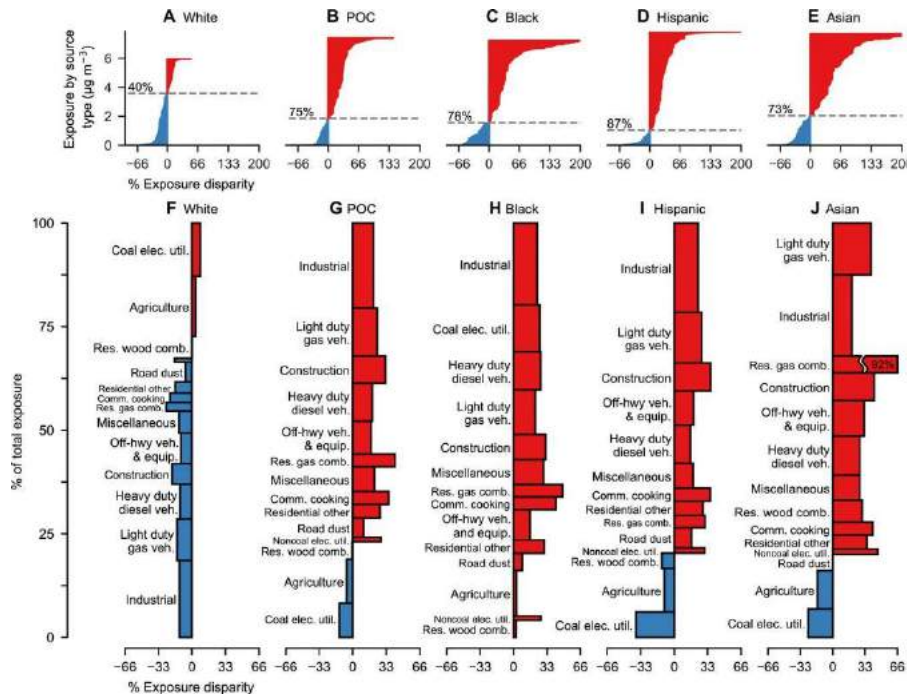

Figure 1: How PM2.5 polluters disproportionately and systemically affect people of color in the United States. Authors: Tessum et. al. *Science Advances*. April 28, 2021.

The Environmental Protection Agency (EPA) tracks total Greenhouse Gas (GHG) emissions by sector and in 2019, 13% of the 6,558 Million Metric Tons of CO_2 equivalent (CO2e) was derived from the Commercial and Residential buildings sector, primarily from fossil fuels burned for heat, the use of certain products that contain greenhouse gases, and the handling of waste[2]. For commercial buildings that use large amounts of energy for heating, cooling, lighting, and other functions, a range of green building techniques and retrofits can allow new and existing buildings to use less energy and emit fewer gases. A range of techniques from improving building energy efficiency to more efficient heating, cooling, ventilation, and refrigeration systems can reduce pollution.
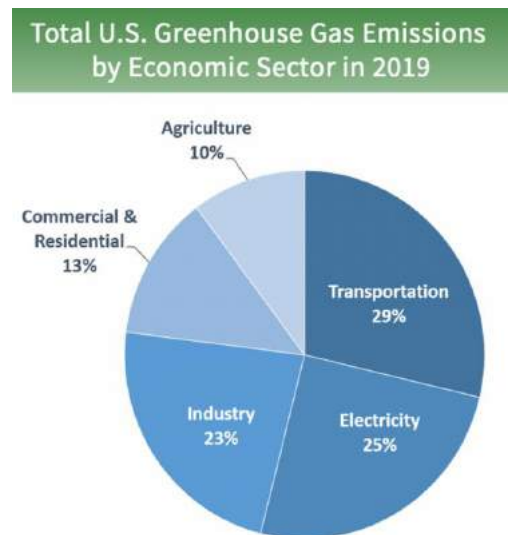

Figure 2: Total U.S. Greenhouse Gas Emissions, calculated by the Environmental Protection Agency

The variation of climate change impacts on building energy consumption to building type and spatiotemporal scale also play a critical role. Research shows that there are large variations found in the relationship between climate change and building energy consumption, highlighting the importance of assessing climate change impacts at local scales, and the need for adaptation/mitigation strategies to be tailored to different building types.

For example,

- Large increases in building energy consumption are found in the summer (e.g., 39% increase in August for the secondary school building), especially during the daytime (e.g., >100% increase for the warehouse building, 5e6 p.m.), while decreases are found in the winter.

- At the spatial scale of climate-zones, annual energy consumption changes range from 17% to 21%, while at the local scale, changes range from 20% to 24%. Buildings in the warm-humid (Southeast) climate zones show larger changes than those in other regions. The variation of impact *within* climate zones can be larger than the variation *between* climate zones, suggesting a potential bias when estimating climate-zone scale changes with a small number of representative locations.

According to the United States Global Change Research Program's Second State of the Carbon Cycle Report, the dominant source of carbon flux to the atmosphere from cities is associated with human activities and behaviors within the built landscape - fuel consumed in transportation (e.g., cars, airplanes, and rail), energy for manufacturing in factories, production of electricity, energy used to build and rebuild urban infrastructure, and energy use in buildings [3]. In addition to the combustion of fossil fuels, human activity within the built environment generates fluxes from (1) waste streams associated with the decomposition of materials containing carbon, (2) infrastructure leaking natural gas (composed primarily of CH_4), and (3) industrial processes that emit carbon without fuel combustion. In fact, carbon emissions from energy use in buildings can contribute as much as 80% of a city's total and primarily are controlled by private building owners.

To address this and other challenges in mitigating pollution sources, many states and local authorities in many North American cities are partnering with private building owners to integrate carbon mitigation and transition to low-carbon development within broader urban agendas. Some examples include:
- Energy-use benchmarking policies for the private sector are being promoted for North American cities, several of which have adopted these policies including New York City, Philadelphia, San Francisco, and Seattle
- New York City's Greener, Greater Buildings program benchmarks energy use in private buildings and mandates energy efficiency and conservation measures
- The National Resources Defense Council's City Energy Project, which is helping cities introduce benchmarking and conservation efforts of their own.
- Local authorities in Toronto are piloting a carbon credit trading program, and many cities have placed energy use and efficiency at the center of their climate change mitigation efforts.
- California's Title 24 building codes, first established in 1978, have required increasingly stringent energy conservation for buildings, including insulation, window glazing, and more. These codes are credited for much of the state's energy savings (CEC 2015).

According to a brief by The Center for Climate and Energy Solutions, improvements in energy efficiency have led to emissions reductions in the residential and commercial sectors of 17.3 and 11.4 percent, respectively, since a 2005 peak. And while further efficiency gains will moderate future emissions growth, the increased use of appliances and electronics is expected to result in a net increase in greenhouse gas emissions by 2050. Consequently, there are major opportunities to reduce emissions from buildings include increased electrification and greater energy efficiency, including using "intelligent efficiency" technologies. "Capitalizing on those opportunities requires aligning incentives among builders, owners and tenants to favor

up-front costs that reduce both emissions and long-term costs"[4].   However, a complete transformation of the energy system cannot rely on technological advances alone. In a recently convened committee of experts by the National Academies of Sciences, their report, *Accelerating Decarbonization of the U.S. Energy System: A Comprehensive Policy Approach to a Just Transition*, suggested four key socio-economic objectives alongside net-zero carbon emissions targets: strengthening the U.S. economy (growing the number of high-quality jobs); maximizing cost-effectiveness (reducing carbon emissions while avoiding any undue burdens on American households and businesses in this transition); support communities, businesses and workers that could be harmed by the transition; and, promoting equity and inclusion (U.S. policies promoting equitable access to the benefits of clean energy systems, new training, employment opportunities and opportunities for wealth creation, particularly for disadvantaged and historically marginalized and low-income populations.[5] In order to advance equity in the clean technologies field in communities, all proposed solutions must be taken through an equity analysis to ensure low-income communities, communities of color and/or building and business owners of color are not left behind and receive the benefits of cleaner air and the emerging green economy.

02 - PROJECT OVERVIEW & FINDINGS

In an effort to understand the mitigation opportunities for non-residential buildings, we set out to uncover challenges and opportunities to advance energy efficiency and clean energy improvements in minority-owned buildings in six cities: Chicago, IL; New York, NY; Los Angeles and San Francisco, CA; Miami and Orlando, FL. Below are the 5 project goals connected to this exploration and a high-level overview of the findings:

Project Goal #1: Compile a list of minority owned non-residential buildings
A list of existing minority-owned buildings was not available for any of the study cities. Consequently, we utilized the list of Minority Business Enterprises (MBE's) for each city and triangulated that list with the location of buildings that had reported GHG emissions. This final list was used as the best proxy that helped us identify what buildings MBEs were located in.

Project Goal #2: Determine the relationship of GHG emissions, by building and industry
Using data (where available) from city benchmarking databases, the GHG emissions were captured and compiled in three ways for each city: top 10 highest emitters, top 5 largest emitters (based on EPA data), and maps showing clusters of the highest emitters. Maps also showing these emissions based on income and demographics were produced.

Project Goal #3: Define GHG emission reduction opportunities
Using the data from the top emitters, GHG reduction opportunities are identified for each city. Other opportunities to advance decarbonization were illuminated through a set of interviews with community based/environmental justice/non-profit experts working on multiple facets of the building decarbonization movement.

Project Goal #4: Understand the status of energy efficiency and clean energy efforts
Using data (where available) from city benchmarking databases, the LEED status of each of the aforementioned buildings was determined. Specific details around building decarbonization efforts for each building was not available.

Project Goal #5: Explore financing, workforce development and policy opportunities
For each city, we identified potential clean energy policies, tools, and financial mechanisms that could impact building clean energy adoption. We examined the status of workforce development programs related to clean energy that could serve as an additional economic catalyst.

For clarity, here is an explanation of terminology you will see throughout the paper:

- Minority Business Enterprise (MBE): MBE's are businesses owned by minority group members are United States citizens who are Asian-Indian, Asian-Pacific, Black, Hispanic and Native American. Ownership by minority individuals means the business is at least 51% owned by such individuals or, in the case of a publicly owned business, at least 51% of the stock is owned by one or more such individuals (i.e. the management and daily operations are controlled by those minority group members.)

- Greenhouse Gas Emissions (GHGs): gases that trap heat in the atmosphere, including Carbon Dioxide, Methane, Nitrous Oxide and fluorinated gases.

03 - Methods & Key findings by City

We used both quantitative and qualitative techniques to begin to address the project goals. Our *quantitative* data exploration commenced with conducting a desktop scan to determine existing data sources on building emissions and building ownership. We explored peer-reviewed literature, industry publications, government sites (federal, state and local level) and reached out to personal contacts to determine what data sets were available. The final information sources we utilized are summarized in Table 1.

Table 1: List of data sources used to capture building energy, greenhouse gas emissions, LEED status and Minority-Owned Business Enterprises

Location	Building Energy Benchmarking Data (City, State)	National GHG Reporting Data (National, State, Metropolitan area)	LEED Project Directories (National, State)	Minority-owned Business Directories (geographic resolution and date vary)
Chicago, IL	Yes (City, 2019)	Yes (2019)	Yes (State)	Yes (City, County)
Orlando, FL	Yes (City, 2019)	Yes (2019)	Yes (State)	Yes (City)
Los Angeles, CA	Yes (City, 2019)	Yes (2019)	Yes (State)	Yes (State)
Miami, FL	No	Yes (2019)	Yes (State)	Yes (City)
New York, NY	Yes (City, 2019)	Yes (2019)	Yes (State)	Yes (City, State)
San Francisco, CA	Yes (City, 2019)	Yes (2019)	Yes (State)	Yes (City, State)

Because there is not one dataset that currently pulls together minority-owned buildings and businesses with GHG emissions, we used a two-step process that relies upon spatial data analysis and existing publicly available secondary data resources to support the critical part of this study. We spatially joined city energy benchmarking data to other datasets in order to identify 1) the current GHG emissions of buildings and large facilities in each case study city, 2) what buildings are also likely minority-owned business locations 3) the demographic and socioeconomic context of the location of buildings, and 4) the LEED status of building locations. A brief description of our process is shared below.

1) Identifying GHG emissions from buildings with Minority Business Enterprises

Minority-owned businesses in the U.S. are eligible to be certified as a minority business enterprise (MBE). Due to data limitations on information related to minority-owned *buildings*, we use MBEs as a loose proxy to identify current GHG emissions and potential for reductions pertaining to minority-owned buildings. Listings of MBE business directories for each city are identified and physical addresses geocoded for spatial merging. We then geospatially join MBE locations to building energy benchmarking data to approximate whether a building from the benchmarking data set is also likely the location of an MBE. We next geospatially join the merged MBE and benchmarking data with geocoded LEED data to determine the LEED status of buildings. We describe the overall energy performance of buildings where MBEs are located by performing summary statistics on variables such as benchmarking reporting compliance, total GHG emissions (metric tons CO_2e), Energy Star rating, and LEED status.

2) Identifying GHG emissions from buildings in low-income or majority-minority census tracts

To characterize GHG emissions from buildings in low-income or majority-minority communities in each of our study areas, we classify census tracts into 'low-income' or 'all other income' and 'majority-minority' or 'non-minority majority' using the 5-year 2015-2019 American Community Survey data. Following the U.S. HUD definition of low-income, we classify low-income tracts as census tracts where incomes do not exceed 80% of the median family income in the city. We classify minority-majority census tracts that identify as >50% non-white Hispanic or African American. We spatially merge census tract classifications with already geospatially joined LEED/building benchmarking data to identify the demography and income level of each building's location. We describe the overall energy performance of buildings located in low-income and majority-minority census tracts by performing summary statistics as described above. We also characterize the GHG emissions from large facilities across low-income and majority-minority census tracts in each study city. The U.S. EPA defines large emitting facilities as facilities whose annual emissions are $\geq 25,000$ metric tons of CO_2e. GHG emissions related to large facilities are available through the EPA FLIGHT database, which we use to identify the census tract designation for each large facility's location and then summarize their GHG emissions.

Further details of the data sources used, and methodology can be found in *Attachment #2*.

To compliment the quantitative analysis, we conducted interviews with one (1) international and ten (10) community-based experts and non-profits working in each of our study cities on issues related to climate justice, energy justice and building decarbonization. The purpose of these interviews was to better understand the capacity needs and barriers to advancing building decarbonization.

KEY FINDINGS BY CITY/REGION (DATA SUMMARIES)

For the quantitative portion of this study, we have compiled the following information for each city (where available):

- Total # of buildings required to submit energy benchmarking information (non-residential)
- The compliance status of non-residential buildings required to submit energy benchmarking data
- # of LEED certified buildings
- # of large facilities (as designated by the Environmental Protection Agency, defined as facilities emitting over 25,000 metric tons of CO_2e annually)
- Energy performance of non-residential buildings (energy star rating (range: 0 - 100, city-specific energy rating (where available))
- Non-residential buildings with Minority Business Enterprises
- # of LEED buildings in Majority Minority census tracts
- # of LEED buildings in Non-Majority Minority census tracts
- # of LEED buildings in Low-Income census tracts
- # of LEED buildings in all other Income census tracts
- Top Non-Residential Building Emission Sources
- Top Large Facility Emitters

As predicted, the availability of data varied by study city and level of participation. Additonal observations for each city were made using industrial classification codes and socio-demographic data. Key highlights are shared below.

Chicago
- Almost 1/2 of non-residential buildings submitted energy benchmarking data.
- The mean Chicago Energy Star rating was a 1.24 out of 4.

- Approximately 13% of LEED certified buildings can be found in non-majority minority census tracts compared to 4% found in majority minority census tracts.
- The Convention Center and Incarceration/Corrections facility were the top emitters.
- Metal Recycling, automotive assembly and educational institutional were the top 3 emitters characterized as large by the EPA.

Los Angeles
- 57% of non-residential buildings did not report.
- Less than 1% of non-residential buildings housed an MBE.
- Less than 1% of LEED buildings were in majority-minority census tracts.
- A slightly higher percentage of LEED buildings were found in non-majority minority census tracts.
- A strip mall, data center and manufacturing were the top emission sources.
- The largest EPA emissions sources in low-income areas was connected to the Petroleum Natural Gas sector.

Miami
- The city currently does not have required reporting of building emissions data.
- However, there are 61 LEED certified buildings in majority minority census tracts, compared to the 26 in non-majority minority census tracts.

New York
- 16% of non-residential buildings were connected with an MBE.
- 6.6% of LEED buildings were in non-majority minority census tracts compared to 1.5% LEED certified buildings found in majority minority census tracts.
- Top emitters were attributed to the following industries: incarceration, manufacturing.
- The top 5 largest EPA facilities were in non-majority minority census tracts and were power plants.

Orlando
- Only 34.2% of buildings submitted benchmarking data.
- About 2.9% of buildings have MBEs.
- There is a 4% increase in LEED buildings in non-majority minority census tracts compared to majority-minority census tracts.
- In the areas of inquiry, less than 1/2 of the buildings provided data.
- Based on known emissions, the top emitters are related to the following industries: Hospitals, Hotels and Manufacturing.
- There was only 1 EPA facility considered to be a large emitter.

San Francisco
- Non-residential buildings make up a significant majority of the buildings in San Francisco.
- Less than 1/2 of the non-residential buildings provided feedback on GHG emissions.
- LEED buildings made up less than 10% of the building stock.
- An Energy Star rating was not available for over half of all buildings (both residential and non-residential).
- Less than 8% of non-residential buildings were housed an MBE.
- Limited reporting in majority- minority census tracts.
- While only a little over 1/2 of buildings reported, almost 8% of the non-residential buildings were LEED certified.
- More EPA designated large facilities were present in non-majority minority census tracts.
- The property types of the highest emitters include Data Centers and Supermarkets located in non-majority minority census tracts.

- All of the top large emitters were located in non-majority minority census tracts.

Data visualizations of each city can be found in *Attachment 1.*

04 - TOOLS TO ADVANCE BUILDING DECARBONIZATION

In a recent publication, the Urban Land Institute outlined 10 Principles for Climate Mitigation Policies to Decarbonizing the Built Environment, with a focus on the role of the real estate sector in partnership with cities[6]. Several of the principles shared in this 2020 report directly align with tools that that we believe can better advance building decarbonization. We will focus our discussion on 4 key areas: Policies & Directives, Building Benchmarks, Financing, and Economic Development & Workforce Development.

Policies and Directives

Policies or directives can be helpful in setting up the stage for the movement to decarbonization, particularly as it relates to greenhouse gas emissions. For example, the Office of Sustainability & Energy with the City of Orlando commissioned a study – the Orlando City Energy Project Impact Study in 2015. This study[7] identified that building energy consumption represented 53% of the region's total energy use, with much of it being used inefficiently. The study further identified bill savings, air quality benefits, net jobs, and water savings if investments to building efficiency were made. A 2015 analysis from ALIGN-NY, an environmental group in New York City, found that just 2 percent of the City's buildings consumed 45 percent of its energy. In 2019 the NYC City Council passed the Climate Mobilization Act which, among other things, requires buildings 25,000 square feet or larger to meet new standards for reducing greenhouse gas emissions[8]. Both studies helped to draw support for the need for decarbonization policies in the respective city. In every city reviewed, there are policies either at the state, county, or local level that help to promote decarbonization. In addition, where noted, some of the ongoing projects or goals for building emission reductions have been included. While not every city is equal, there are tools and incentives available to help move in the direction of reducing carbon for buildings.

Table 2: City-level policies to promote building decarbonization

	Clean Energy Incentive	Citywide Policy	Climate Policy
Chicago	*Property Tax Incentives *Sales Tax Incentives *Corporate Tax Credits *Energy Efficiency Grants *Renewable Energy System Grants *EE/Renewable Rebates	Sustainable Chicago 2015	Goal of 26-28% carbon emission reductions by 2025 (from 2005). Climate and Equitable Jobs Act (Sept. 2021)
Miami	*Utility Incentives *Sales Tax Incentives	The final draft of a new policy is due Sept. 2021.	Goal of Carbon Neutrality by 2050.
Orlando	*Utility Incentives *Sales Tax Incentives	Building Energy and Water Efficiency Strategy (BEWES)	Green Works Orlando Initiative
New York	*Income Tax Credits *Corporate Tax Credits *EE/Renewable Rebates *Free Low-Income EE *Sales Tax Incentives *Property Tax Exemptions *Utility Incentives *Solar Rate Incentives *Feed-In Tariffs *Hybrid Vehicle Incentive	Office of Climate & Sustainability	Carbon Challenge: Reduce their greenhouse gas emissions by 30% or more over ten years.
Los Angeles	*Utility Incentives *Self-Generation Incentive Program	Existing Buildings Energy & Water Efficiency (EBEWE)	L.A.'s Green New Deal Climate Emergency Mobilization Office
San Francisco	*Utility Incentives *Self-Generation Incentive Program	SF Programs	San Francisco Climate Action Plan: Achieve zero GHG emissions by 2040

Building Benchmarking

Various policies exist within each city to support emission reduction measures in buildings. Each city has adopted a policy requiring or mandating building energy use benchmarking reporting at various levels. Some have included penalties. The concept behind building benchmarking is often to increase awareness, competitive goal setting, transparency & best practices, and eventually measured carbon reductions through attainment of established goals. Chicago's benchmarking was established back in 2013 under a city ordinance. It was the first city to establish a public building rating system in the United States.

Transparency is critical for benchmarking. Most of the cities we reviewed have public facing information for review and study. This allows access to information to determine who has complied with information submittal and who has not. Presumably, it also will demonstrate who is still working to comply with the benchmarking information. On the other end of the spectrum, Miami is still working to get their benchmarking underway. Information and emissions data is expected next year with hopefully a visible searchable site for information as well.

The chart below highlights the benchmarking for each study city and details key compliance dates as well as whether or not there is a penalty for non-compliance. While ordinances may change over time, it is important to note that the non-compliance penalties might not be significant enough to move the needle, however, it is likely that incentives and a business case are likely to be key determinants to success.

Table 3: City building benchmarking requirements

	Building Benchmarking	BB Implementation	BB Penalty
Chicago	*Track and report energy and water use annually via EPA benchmarking tool. *All properties: 50,000+ sqft.	*Reporting as of 2014	Owner subject up to $100 fine for 1st violation and additional fines up to $25/day
Miami	Building Efficiency 305 benchmarking Program is under development. * Limited, voluntary program is underway	* Parcipation is voluntary * Participation is limited	None
Orlando	* Track and report energy and water use annually via EPA benchmarking tool. *All properties: 50,000+ sqft.	* Reporting as of 2018. * Energy audit/retrofitting as of 2020.	Fine $2,000/yr. max.

New York	* Track and report energy and water use annually via EPA benchmarking tool. *All properties: 50,000+ sqft.	* Reporting as of 2010 *All properties: 25,000+ sqft.	$500 fine for missing May 1st benchmarking deadline, additional $500 fines for each subsequent quarter failing to benchmark (maximum: $2,000)
Los Angeles	*Track and report energy and water use annually via EPA benchmarking tool. *All properties: 20,000+ sqft.	* Reporting as of 2018 * In 2021 must demonstrate they are energy & water efficient, or on that path.	Public Disclosure of non-compliance, fees, and possible financing complications.
San Francisco	* Track and report energy and water use annually via EPA benchmarking tool. * Non-residential properties: 10,000+ sqft. * Residential properties: 50,000+ sqft.	* Reporting as of 2010 * Reporting as of 2018. * Energy audit/retrofitting every 5 years.	Warning, then public notice, then fines. Max fine $1,250 to $2,500/yr.

In reviewing benchmarking data online, there is noted an unusual number of instances of non-compliance with the submittal of data. This might be due to the COVID-19 pandemic, which likely contributed to various reasons for lack of data verification. Many cities have extended the time period or have indicated that such requirements would not be enforced until a later date. Of note, Los Angeles has a non-compliance or non-verification rate of nearly 53%. Although benchmarking is likely to be a positive mechanism that could result in building decarbonization, it is unclear if building owners have the requisite information, time, and means dedicated to having an energy expert on hand or if the non-compliance is strictly pandemic based. It also might mean a need for additional time for compliance at the onset of programs. Unlike Los Angeles, Chicago has a compliance reporting rate of 89%, notably better despite the pandemic but quite possibly the results of a more institutionalized program.

Financing through C-PACE

In every city examined, commercial property assessed clean energy (C-PACE) is an available financing tool that can be used to finance energy efficiency and renewable energy improvements on commercial properties. The overall benefit is that there are no upfront costs to the owner and it allows for payback over a period of time that traditional business projects might otherwise not be able to have. Unlike other project financing, the borrowed capital is repaid via a tax assessment. The security provided by the tax assessment can provide favorable terms and provide transferability of the repayment obligation to a new property owner.

Beyond the traditional renewable and energy efficiency improvements, California and Florida also allow C-PACE to include seismic and hurricane hardening, respectively. This can be seen as an additional benefit that increases the overall return and financial and environmental incentive for using the program, as well as allowing for potential insurance policy discounts. With the impact of climate change being felt everywhere, the C-PACE improvements are likely to be seen as an additional safety net to climate fallout protection.

One of the difficulties in examining C-PACE is the lack of a transparent information on properties that have utilized the program. Applicants typical contact a lender to receive the lending – and there does not appear to be a central repository of information related to applicants, those receiving financing, and demographic information on either. For some counties and taxing jurisdictions, there may be information available on C-PACE, but none which was easily attainable online and without having to look at via each individual parcel.

Table 4: City level financing opportunities

	C PACE	Eligible Properties	Allowable Projects
Chicago	Yes	Industrial & Manufacturing, Hotel & Lodging, Multi-family, Office, Retail	Alternative energy, EV charging, building envelope, energy efficiency, control systems, cool roofs, water use improvements, renewable energy and storage systems
Miami	Yes	Industrial, Office/Hotel, Retail, Mixed/Other, Multi-family	Solar energy, HVAC, roof replacement, building controls, high efficiency lighting, variable speed drives, water conservation, building envelope, storm resiliency
Orlando	Yes	Industrial, Office/Hotel, Retail, Mixed/Other, Multi-family	Solar energy, HVAC, roof replacement, building controls, high efficiency lighting, variable speed drives, water conservation, building envelope, storm resiliency
New York	Yes	Commerical, industrial & office properties, multi-family units, tax-exempt owned properties	Energy efficiency improvements and renewable energy systems
Los Angeles	Yes	Industrial, mixed use, hospitality, office, retail, multi-family	Solar, alternative energy, heating & cooling, building envelope, efficiency, and seismic hardening
San Francisco	Yes	Industrial, mixed use, hospitality, office, retail, multi-family	Solar, alternative energy, heating & cooling, building envelope, efficiency, and seismic hardening

Although C-PACE can provide various benefits as mentioned previously, it is important to note that Los Angeles County discontinued the similar PACE program for homeowners due to fraud, abuse, and unaffordable loans. The largest concern was that homeowners were trapped in unaffordable loans and were therefore at risk of losing their home. This might mean a need for more information and the need for consumer information in multiple languages and greater consumer protections.

Funding for C-PACE often comes from green banks that are present across the country. Green banks use public and philanthropic funds to boost private investment in clean energy technologies. The Connecticut Green Bank[9] is probably the best example of a Green Bank starting to examine reporting of what investment goes into communities of color. A large part of this is not only about investment, but also ensuring that contractor networks have the necessary representation and that they are extensively briefed on the value of diversity, equity, and inclusion.

Additional tools

Additional options in the toolbox for clean energy includes utility energy efficiency programs. Many of the programs vary in terms of improvements covered, however, all are rebate oriented. This limits the opportunity to alleviate immediate financial impact to the customer who would still be obligated for the upfront financing or

costs. This may hamper some building owners from taking on projects and continue to force them to have energy efficiency projects compete with other business projects in terms of capital availability.

Similar to the C-PACE program, the locations of improvements and potential demographics of those served is not available. Additionally, it is unclear if this data is collected and/or studied in evaluating the program's success. However, to the benefit of the user, it appears the energy efficiency and the C-PACE program might be able to work jointly in some cities and dependent upon the utility.

Economic Opportunity & Workforce Development

The economic opportunity for clean energy is clear. Not only does clean energy reduce energy, pollutants, and hazard vulnerability, it can generate economic benefits. A 2019 study examined the economic impact of PACE financing by the Ygrene Energy Fund, Inc over the period of 2013-2018[10]. Although the regional economic impact focused primarily on the residential sectors in California and Florida, the financing of the projects demonstrated positive impacts on key economic indicators. Over the study period, it was estimated that there was a net present value of gross domestic product benefits of over $666 million in California and over $602 million in Florida. In addition, the person-year jobs were 9,774 and 11,716 in California and Florida, respectively.[11]

As the use of clean energy continues to grow, ensuring the development and retention of qualified workers is crucial. An aging workforce adds an additional challenge to meeting the demand of new talent for current and future needs. This pivotal moment of workforce transformation brings great opportunity to diversify the industry's workforce. Because of new technologies and innovations, frontline utility jobs are not as labor-intensive as they used to be, so companies can recruit people from a variety of backgrounds vs. the traditional labor workers that historically filled these positions — resulting in a greater, more inclusive pool of talent. Policy makers, clean energy industry groups, utilities, and non-profits have taken different approaches to creating and supporting clean energy workforce development programs. Programs are often tailored to align with local workforce needs. Initiatives range from providing internships and in-class programs to help expose youth to the industry, to the creation of new associate degree programs at the local community college, to providing on the job training/continuing education for those in the workforce. To ensure that talent is representative and inclusive, many of these programs focus on impacted communities by implementing programs and initiatives that increase hiring, retaining, and service of communities and people of color.

In the six cities, some specific initiatives include:
- An Illinois law which dedicates funding to develop and establish three clean energy-related job training programs for Illinois citizens over the next 12 years to support clean energy workforce needs, specifically providing funding to community-based, diversity-focused organizations.[12]
- Miami and Orlando partnering with local community colleges for apprentice training programs and creation of new associate degree programs.[13][14]
- Continuing education/certification classes to meet demand created by new laws, rules and policies related to energy efficiency and greenhouse gas benchmarking, like Orlando's ENERGY STAR 101 and 102 workshops and webinars.[15]
- The New York State Energy Research and Development Authority (NYSERDA) Workforce Training Investment Plan, which will spend more than $100 million through 2025 on clean energy and energy efficiency workforce development and training. In disbursing funds, NYSERDA focuses first on projects that train and provide job placement services to priority populations, such as communities located near environmental hazards and low-income individuals.[16]
- The Southern California Regional Energy Network (SoCalREN) Workforce Education and Training (WE&T) Program which provides training, tools, and opportunities for diverse participants in disadvantaged communities to pursue careers and contracts in energy efficiency.[17]

- In California, organized labor will often negotiate "targeted hire requirements" that oblige contractors to make a good faith effort to hire an agreed-upon percentage of new workers from a targeted group. This has led to more diversity in apprenticeship programs by both increasing the pool of qualified workers from underrepresented communities and influencing hiring practices to ensure that underrepresented applicants actually are hired on jobs. [18]

Through diversity and inclusion strategies it's possible to introduce well-paying clean energy jobs to individuals who have historically been excluded from this sector of the economy. From supplier initiatives to internship programs, many workforce development programs demonstrate that diversity in the energy industry begins with equipping people with skills and connecting them with employment opportunities. Doing this requires a conscious, intentional effort to address the obstacles that have historically excluded women and people of color from the energy workforce and other paths of economic inclusion.

05 - INSIGHTS FROM LOCAL COMMUNITY-BASED LEADERS & NON-PROFITS

While it is important to undersatnd the policy and financing tools to advance clean energy and energy efficiency across our study cities, it is also important to garner an understanding of efforts led by community based, environmental justice and non-profits working on a range of decarbonization efforts that are focused in and for low-income communities and communities of color. To capture this perspective, the team conducted a set of interviews, via Zoom. A project overview and interview instrument (Attachment 3) was shared with each interviewee. All participants received an honorarium for their time. An initial list of interviewees was compiled by the IMT/ISC team, particularly from organizations that they had an existing relationship with. Others were added as a result of desktop research and recommendations from current interviewees (snowball sampling). While invitations and conversations were initiated with a larger group of potential invitees, some groups were not working directly on building decarbonization or simply did not respond. However, our conversations illuminated a set of challenges, opportunities and innovative ideas that are worth further discussion. The interviewees are shown in the Table 5.

Table 5: Non-profit, local community leaders Interviewed

Organization	Geography of Impact	Org. Description
The Illinois Green Alliance https://illinoisgreenalliance.org/	Chicago	A membership-driven nonprofit that works to promote green buildings and sustainable communities. We believe that green infrastructure is key to strengthening neighborhoods and improving the quality of life for everyone. We are the local affiliate of USGBC.
Midwest Decarbonization Coalition http://www.midwestdecarb.org/	Chicago	Supports equitable deep decarbonization strategies to address the regional challenges of cold climates and purple state politics. The Coalition engages in Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.
Southern Alliance for Clean Energy (SACE) https://cleanenergy.org/	Orlando, FL	Promotes responsible and equitable energy choices to ensure clean, safe, and healthy communities throughout the Southeast.
Catalyst Miami https://www.catalystmiami.org/	Miami, FL	Non-profit working to catalyze community-driven change and shift systems of injustice from the ground up.
Cleo Institute https://cleoinstitute.org/	Works across Florida	A 501(c)(3) non-profit, non-partisan organization exclusively dedicated to climate crisis education and advocacy. Founded in 2010, we work with communities across Florida to build climate literacy and mobilize climate action for a just, resilient future.
NAACP – Miami Dade http://miamidadenaacp.com/	Miami, FL	The mission of the (NAACP) is to secure the political, educational, social, and economic equality of rights in order to eliminate race-based discrimination and

		ensure the health and well-being of all persons.
BlocPower https://www.blocpower.io/	New York	BlocPower™ is a Brooklyn-based energy technology startup rapidly greening American cities. Since its founding in 2012, the company has completed energy projects in nearly 1,000 buildings and delivers results ahead of schedule and under budget. BlocPower™ utilizes its proprietary software for analysis, leasing, project management, and monitoring of urban clean energy projects and its customers are saving 20-40% on their energy bills each year.
WE ACT for Environmental Justice	New York	WE ACT's mission is to build healthy communities by ensuring that people of color and/or low-income residents participate meaningfully in the creation of sound and fair environmental health and protection policies and practices.
Communities for a Better Environment	California	The mission of CBE is to build people's power in California's communities of color and low-income communities to achieve environmental health and justice by preventing and reducing pollution and building green, healthy and sustainable communities and environments.
West Oakland Indicators Project	California	The West Oakland Environmental Indicators Project is a resident led, community-based environmental justice organization dedicated to achieving healthy homes, healthy jobs, and healthy neighborhoods for all who live, work, learn and play in West Oakland, California.
Coalition for Green Capital	National	A non-profit coalition of green banks with a mission to halt climate change by accelerating investment in clean technologies.

Findings

Interviewees offered feedback that centered around 5 major themes: challenges & barriers; funding and financing to advance building decarbonization; existing models to advance decarbonization; innovative paths forward; and, equity-focused considerations. For each theme, we provide a brief set of key observations from interviewees.

Challenges and Barriers
Interviewees identified a set of existing challenges that range from a lack of incentives, data to a limited presence of minority leaders and businesses in the sector as a whole. The solutions to these challenges range from policy to enhanced, authentic engagement.

Data:
- No existing database that has a list of minority-owned buildings.

- Limited understanding of the connection between the use of air conditioning, electricity uses and GHGs to spur advocacy and innovative decision-making.

Limited voice and access
- Black and brown voices have little to no representation in the building decarbonization movement e.g. Federal Policy Decarbonization Coalition (members include Waxman Strategies, RMI, Elevate Energy, WE ACT for Environmental Justice, etc.) has limited engagement and leadership by organizations led by People of Color.
- Lack of women, minority contractors that are positioned to thrive in the sector.
- Limited number of Black and Brown leaders in the energy business.

Financial Infrastructure
- There is an inadequate workforce pipeline for trades needed for the building decarbonization sector. Additional financial support is needed for workers to be certified in the trades.
- Convoluted and complex processes and policies for businesses and buildings to take advantage of clean energy options inhibit advancement.
- Building owners cannot afford to decarbonize. Subsidies are need.
- There is a need for administrative support for project development and financing efforts focused on Black and Brown communities and building owners to advance building decarbonization efforts.
- Government (specifically federal) does not know how to get funding to diverse contractors.

Regulatory
- Voluntary decarbonization is not enough. A bigger carrot is needed to encourage compliance.
- State laws that allow too much flexibility, particularly when funds allotted for infrastructure are utilized for other priorities (e.g., America Rescue Plan)
- Lack of recognition of the interconnectedness of building emissions and how they exacerbate existing climate impacts

Financing & Funding Building Decarbonization

An interviewee shared that, "90% of the solution will be financing". Many of the solutions offered depend on the access, availability, and awareness of financing for a range of building decarbonization efforts. Identifying a role for federal government, Green Banks and the use of existing initiatives show great promise, but again, need to be scaled to meet the need and intentionally earmarked for building decarbonization efforts.

Federal
- Federal Government should create a pool of money with requirements on how to spend it to advance building decarbonization and workforce development. Often when funds are not specifically earmarked for specific efforts, the funds get spent or allocated on other priorities.
- More Federal incentives for building decarbonization are needed.

Local
- Increase the funding and support of grass-roots organizing and advocacy so building owners understand decarbonization opportunities and benefits.
- Green Banks could support local efforts and workforce development programs.
- Created a targeted outreach consortium to foster relations between Green Banks, community organizations, and diverse Chambers of Commerce to provide better understanding of the potential of funding and to encourage identification of potential projects.

Funding Vehicles
- Creating a revolving loan fund for commercial scale buildings to advance energy efficiency measures. (Possibly set up a fund – with a seed funder (i.e. Justice40 Initiative – for buildings in LIC/COC, or a similar type of buildings, highest emitters w/ high health disparities, etc.)[19]

- Sustainable Capital Advisors (Black-owned firm) could be a partner. http://www.sustainablecap.com/
  - SCA structures complex infrastructure projects from the earliest stages of feasibility to contract negotiation and all the way through financial closing. They focus on areas of sustainable infrastructure and financing of innovative technologies, including building decarbonization.
- Justice40 Initiative: exploring pathways to complement funds that are aligned with the efforts of Federal agencies working with states and local communities to make good on President Biden's promise to deliver at least 40 percent of the overall benefits from Federal investments in climate and clean energy to disadvantaged communities.

Existing models to advance decarbonization

Interviewees offered several existing decarbonization programs that are active in the US and beyond that could potentially have significant impact if they were scaled and financed to meet the demand and need in our study communities. The examples range from larger community investment initiatives, cross-sector research collaboratives to technical assistance for building owners. Many of these initiatives focus on non-profit buildings and programming serving specific populations.

- Illinois Green Alliance Technical Assistance (Chicago)
  - The Alliance offers technical support to cities to help with tracking emissions and how to use the Portfolio Manager platform.

- Neighborhood Power Project (Chicago) (https://illinoisgreenalliance.org/initiatives/neighborhood-power-project/)
  - Neighborhood Power Project (NPP), a collaboration between the Environmental Defense Fund, Elevate Energy, and Illinois Green Alliance, is dedicated to supporting nonprofit buildings meet their sustainable operations goals. Their team provides pro-bono services to nonprofits to work towards building efficiency and sustainability, and promote environmental leadership in communities all over the city. NPP is serving community-based organizations around Chicagoland by providing FREE energy, water, waste, and air quality assessments, a building sustainability roadmap, and up to $10,000 in grant money to implement sustainable operations projects in their facilities.

- Invest Southwest (Chicago) - https://www.chicago.gov/city/en/sites/invest_sw/home.html
  - While not specifically focused on building decarbonization, this community improvement initiative is helping guide decision-making on concentration and alignment of public investments, as well as efforts to catalyze additional private investment for the 10 target neighborhoods in the Chicago-land area. These private sector investment opportunities are proactively being explored, including opportunities to create job opportunities, better housing, and more necessary amenities on and near the 12 commercial corridors. INVEST South/West will leverage $250 million in existing business development and infrastructure funding from the Department of Planning and Development (DPD) through programs to support improvement projects that align with local priorities. These new investments will build on more than $500 million in planned programming and infrastructure improvements that will provide enhancements that bolster the vitality of the corridors and surrounding blocks – enhancements that are aligned with the neighborhoods' Quality of Life priorities. Stakeholders believe that some of these investments could be used specifically for building decarbonization.

- Elevate Energy Non-profit Business Incentive, https://www.elevatenp.org/building-and-portfolio-consulting/

- o Elevate offers tailored services to multifamily and nonprofit property owners, managers, and developers to meet their property and portfolio performance and sustainability goals. Through an integrated approach, they provide an understanding of a property's current performance and implement solutions to reduce energy and water use, electrify systems, install renewables, improve building health and resilience, and lower operating costs.

- Resilience 350, Cross-sector research coalitions on building decarbonization (Miami)
  - o Dr. Tiffany Troxler of Florida International University provides leadership for the Resilient305 Collaborative, a joint academic-government research partnership among Florida International University (FIU), Miami-Dade College (MDC), University of Miami (UM), and government and non-government organization leaders. The Collaborative began in 2016 as an outcome of the MetroLab Network and was created to work together in support of comprehensive resilience research and learning. Within the universities, the team includes faculty across disciplines of physical, environmental, and social sciences, including public and mental health, information technology, communications, disaster risk management, engineering, architecture, planning, and education. They have collected a lot of granular level data on energy burden, socio-demographics, etc. that will be used to map potential solutions to the array of climate challenges in the Miami region.

- Miami Climate Alliance, https://miamiclimatealliance.org/
  - o As a coalition of organizations and individuals working to prioritize climate justice, mitigation, sustainability, and resilience in South Florida, the Miami Climate Alliance promotes a community that supports the well-being and prospects of all its current and future members. There is a Clean Energy Working Group is led by frontline communities, non-profits, and individuals who aim to bring 100% renewable energy to Miami-Dade County.

- White roof building Ordinance on all new building construction (Orlando)

- Green New Economy Report (Miami), https://www.miamigov.com/files/sharedassets/public/Miami-GHG-Reduction-Plan-DRAFT-2.docx.pdf
  - o As a part of the larger Miami Climate Action plan, there is a set of dedicated actions to targeting clean energy workforce development opportunities to historically marginalized communities.

- United Kingdom energy rating requirements for commercial buildings, https://www.forbes.com/uk/advisor/business-energy/business-energy-performance-certificates/
  - o Commerical buildings will need an Energy Performance Certificate (EPC) that measures the energy efficiency of a building on a rating system of A to G, with A being the most efficient and G being the least. EPCs were introduced in England and Wales in 2007 and in Scotland and Northern Ireland in 2008 (EPCs also exist for residential properties). You need a commercial EPC for three scenarios: (1) as the landlord, rent out or sell the premises, (2) a building under construction is completed, or (3) there are changes to the number of parts within the building used for separate occupation, involving changes or additions to the heating, air and ventilation systems. Since April 2018, if you want to lease a commercial property to a new tenant or renew a lease with an existing tenant, the property must have an EPC rating of 'E' or above.
  If the property has a rating of 'F' or 'G', you will not be able to lease it and will need to look into ways to improve its energy efficiency. From April 2023, these rules will apply to every lease, including existing ones. In addition, as part of the government's commitment to achieve an 80% reduction in CO_2 emissions by 2050, rental properties are likely to need to have a 'D' rating or above by 2025, and a 'C' rating or above by 2030.

- Solar and Energy Loan Fund (SELF), Martin County Septic to Sewer Loan, https://solarenergyloanfund.org/loan/martin-county-septic-to-sewer-loan/
  - In addition to providing PACE loans, Solar and Energy Loan Fund (SELF) works to rebuild and empower underserved communities by providing access to affordable and innovative financing for sustainable property improvements, with the primary focus on energy efficiency, renewable energy, and climate resilience in low- and moderate-income (LMI) neighborhoods. They strive to create positive social, economic, and environmental impacts by helping people improve the health, safety, and quality of life in their homes while reducing operating costs and greenhouse gas emissions. While this program is focused on septic to sewer conversions, this type of model could be retrofitted for building decarbonization efforts for commercial buildings. This particular program requires no down payment, an $1000 incentive and the option to apply for a fixed 10 year, $85/month payment plan through SELF.

Innovative Paths Forward

Interviewees identified a set of creative solutions that can remove barriers along the pathway to decarbonization. Requiring efforts to identify the 'hot spot buildings' to expanding the meaning of 'mentorship' through LEED certification support, offer realistic and reasonable actions.

- More visual imagery to help decisionmakers, communities and others connect and relate building emissions to the physical and health effects of climate.
- Create a program (requirement) that current LEED certified buildings are required to help a fellow business owner in their geography get certified.
- Create an interagency working group between EPA, HUD and EPA to create a set of pilot projects to figure out the proper infrastructure and pathway to get funds to minority building owners and to reduce emissions for those owners with buildings in LIC/COC.
- Encourage or enforce cities to share data on the 'worse performing buildings' so resources and support can be targeted at these buildings, particularly those in LIC/COC.

Equity-focused approaches

The realization that low-income communities and communities of color are disproportionately burdened by multiple emissions sources and the negative impacts of climate change, interviewees identified a set of specific ways to prioritize the voices and needs of these communities.

- Work with impacted communities to build solutions to meet the identified needs and unique nature of each community
- Focus workforce development opportunities in the decarbonization space on the unemployed and/or transitioning workers
- Create participatory processes for all decarbonization solutions being explored
- Ensure small, minority business and building owners are brought into the conversation

While the interview sample was limited, there were some common themes that are indicative of macro-level issues that – if not addressed – will limit the effectiveness and impact of building decarbonization, specifically on efforts to improve the health and well-being of Black and Brown communities. Specifically,

1. There is a need for people of color led, community-based, environmental justice, professional societies, project developers to shape solutions and be in leadership roles to advance building decarbonization. Overwhelming, the voice and presence of Black and Brown leaders within existing national coalitions and other tables working building decarbonization is insufficient.

2. Financing and funding for building decarbonization efforts needs to earmarked for specific projects and decarbonization uses. There needs to be an easier process for building owners to access funds from the federal government and for the federal government to develop a deployment infrastructure that will reach environmental justice communities to address the 'worst actors' (i.e. highly polluting buildings).

3. There is a need and a huge opportunity to build a pipeline of trade workers to meet the anticipated needs and market demand for decarbonization activities. This sourcing of this workforce should be from disenfranchised, transitioning workers, minority contractors and a percentage sourced from the particular communities.

4. Existing pilot programs and funding models should be scaled and deployed in environmental justice communities.

5. Most importantly, all solutions and pathways must be people-centered by engaging and/or creating the opportunity for Black and Brown community, business and building owners (particularly minority business/building owners) to lead building decarbonization discussions, project development and funding opportunities in their relevant communities.

6. Who's not involved in these conversations that should be? Home builder associations, Subcontractor Remodeler Association (NARI), minority focused industry associations (Hispanic working Construction Industry Association).

06 - CONCLUSIONS & RECOMMENDATIONS

The purpose of this research was to explore opportunities to advance building decarbonization, specifically for buildings owned by minority owners, located in low-income and communities of color. While identifying minority-building owners was a significant barrier, we attempted to re-orientate our approach to try and identify the locations of minority businesses and the higher levels of GHG emissions in low-income communities and communities of color. We hope that moving forward, there will be more intention to developing a data source that will allow that level of analysis of minority-owned buildings. However, we believe this exploration and our unique approach to address the project goals provides the following:

- A solid method to identify minority businesses that could be targeted to receive additional resources and financing to advance energy efficiency and ultimately reduce emissions,
- Underscore the challenge of trying to mitigate what you are not measuring (i.e. inconsistent benchmarking),
- A cursory identification of industries that are high contributors to emissions in our study cities
- An opportunity to target specific buildings and industries in each study city for potential pilots or focused mitigation efforts, and
- An opportunity to test a method that can be used to visualize the environmental and climate justice impacts due to building emissions.

In addition to the recommendations presented in the Community Insights section, we wanted to summarize a set of high-level thoughts for each area:

Policy & Enforcement
- Enact and support polices that provide access to capital, knowledge, and support of GHG emission reduction initiatives. To overcome economic barriers, minority owned businesses need direct investment or in-kind equity contributions, including grants, subsidies, loans, and revenue-participation agreements.
- Enforcement of reporting requirements.

Workforce Development
- Promote diverse contracting within the clean energy sector and require government entities to create guidelines and an outreach plan to get more diverse businesses involved in the projects it funds.

Partnerships
- Partnerships with local community colleges. universities, and institutions to provide education and job training opportunities that support local green initiatives and general GHG reduction.
- Issue a diversity challenge to encourage companies to make diversity and inclusion a core part of their cultural identity.

Financing
- Require reporting of information as it relates to financing and lenders so that information can be obtained as to whether or not the business is minority owned or located in a primarily minority or low-income community.

Data Needs
- Mandatory reporting (this quantitative analysis was limited by much of the benchmarking data having significant amounts of missing observations pertaining to GHG emissions related to building owners not reporting energy performance)
- Inclusion of other indicators of energy efficiency and decarbonization status in building energy benchmarking reporting: i.e. renewable energy consumed, community energy burden, etc.
- Consistency in building energy benchmarking data reporting: not all cities reported total GHG emissions, many did not include GHG intensity which is helpful in determining which buildings should be prioritized for efficiency and decarbonization efforts.

Sector-wide
- Having emissions numbers is helpful, however, it's an inadequate first step. While the goal is to reduce/minimize emissions as much as possible, there is an opportunity and need to create a framework that allows building owners (and business owners) to compare GHG emissions levels across cities and regions, particularly to determine what should be considered a good/safe level of emissions, versus an unsafe level of emissions, based on the community context. Complementing the pure emissions level with a health impact could be a powerful tool and incentive.
- Large emissions sources should be encouraged and supported to complete a cumulative impacts analysis, particularly those located in or near low-income communities, and/or communities of color. This analysis should inform – with community input – how resources and reduction opportunities are prioritized. Massachusetts has just passed policy to do this (the framing is for new development and current developers): https://www.mass.gov/doc/environmental-justice-policy6242021-update/download
- There is a need to create a framework to capture emissions levels of buildings/businesses <50,000 sq. ft. Not having this data leaves out potentially an important cluster of localized sources.

Lessons learned from ISC's India program that could influence project next steps

The conversation with ISC's India program uncovered some best practices that could be used for future iterations of this work. In thinking about the approach to this pilot exploration, there were some similarities and differences that are worth noting and could be useful moving forward, which echoes some themes from our interviews.

- **Training and Technical Assistance:** Providing training to workers & decision-makers about why reducing energy use and advancing energy efficiency is important. Embedding this knowledge into the culture – at the start – seems to be a prudent step. Increasing the baseline of need and knowledge for Minority building owners, minority business owners, and building owners with buildings in low-income communities, and/or communities of color that are suffering other environmental and climate challenges could be a good first step.

- **Pilot demonstrations:** Using initial emissions data, the India team determined one industrial cluster and one specific challenge to focus on within that industry. By starting with one cluster and addressing one specific issues (in this case, replacing existing pumping systems with more efficient motors), they were able to garner data with just a few sites, to make the economic and technical case for this mitigation effort. The specific data captured during these pilot projects ranging from emissions to reductions in electricity costs help to establish feasibility early on and scale across to other industries. For the United States, if there was a similar process that could be undertaken with a specific industry or building type in

environmental justice communities, creating that proof of concept could prove beneficial. As it relates to this study, a deeper dive into the highest-emitting sectors we identified in each city/region could be a starting point.

- **Creating the full-enabling environment:** The India program worked with a set of enabling entities – both on the financial and engineering side – that made it easier for the facilities to have stock for the correct engines and the financing necessary for these small to medium sized businesses. As this relates to this study, an ecosystem of support services is critical, depending on the industry that is targeted and the ability to navigate some of the sophisticated legal and political barriers that can make it challenging to deploy resources where needed to a set of mitigation actions.

STUDY LIMITATIONS & OBSERVATIONS

Having no data on minority building owners was definitely a limiting factor. Additionally, data availability on GHG emissions was a challenge due to low levels of compliance reporting (or no reporting) in each study city. There are not many community-based, environmental justice organizations working directly on non-residential building decarbonization. There is a need to explore and/or increase resources, support or create community-based/grassroots led movement around building decarbonization, where buildings are a major emission source. This limited the number of organizations that were available to interview.

While the public health implications of building emissions were not a direct point of analysis in this work, due to ISC's work in and with environmental justice communities, exploring the demographics of this cities/regions in relation to the building emissions and health should be a future vein of exploration.

POTENTIAL NEXT STEPS

In order to expand the number of minority building owners that have access to resources to advance building decarbonization efforts, there is a significant data gap. There are no definitive sources - at the national, state or local level - that we could identify that pulled together a list of minority building owners, a list of businesses in those buildings, and what businesses have taken advantage of clean energy financial resources. In this process, we developed a method to triangulate a city/regional list of buildings with the businesses that are certified as minority-owned. A potential next step could be reaching out directly to minority owned businesses in the buildings located within majority-minority census tracts to determine if the building is minority-owned, and/or the business is taking advantage of energy efficiency opportunities. While this approach is more extensive and time-consuming, until there is a consistent infrastructure across cities to collect and manage this information, it will be harder to direct resources and understand what policies are needed to advance building decarbonization.

07 - APPENDIX

- City Detailed Summaries
- Relevant Industrial Codes Used for this Analysis

Additional Attachments (separate documents)

Attachment 1: Study City Maps (by Income, by Minority-status, Cluster)
Attachment 2: Detailed Quantitative Research Methodology
Attachment 3: Qualitative Interview Instrument

Chicago

Total # of all buildings over 50,000 sq ft.	3438	
Non-residential buildings	2189	63.7%
Submitted benchmarking data	1089	49.7%
LEED Non-residential	226	10.3%
EPA large facilities (25000 metric tons of CO2eq/yr)	19	

Performance of non-residential businesses

Energy Star Rating		
Not available	1497	
Mean	58.23	
Chicago Energy Rating		
Not available	196	
Mean	1.23	
Total emissions (Mean, metric tons CO2)	4767.9	

Non-Residential Buildings with MBEs

Total Buildings	202	
LEED Buildings with MBEs	61	30.2%
Energy Star Rating		
Not Available	70	
Mean	60.86	
Chicago Energy Rating		
Not Available	16	
Mean	2.21	

Buildings in Majority Minority Census Tracts

Total # of buildings (out of non-residential)	750	34.3%
Not Available	625	
LEED buildings	30	4.0%
Large emitting facilities	11	
Total emissions (mean, metric tons CO2e)	3041.9	

Buildings in Non-majority minority census tracts		
Total # of buildings (out of non-residential)	1439	65.7%
Not Available	1003	
LEED buildings	196	13.6%
Large emitting facilities	8	
Total emissions (mean, metric tons CO2e)	5262.8	

Buildings in Low-income census tracts		
Total # of buildings (out of non-residential)	567	
Not Available	467	
LEED buildings	20	
Large emitting facilities	12	
Total emissions (mean, metric tons CO2e)	4245.9	

Top Non-Residential Building Emission Sources

Property Name	Primary Property Type	Building Square Ft	Total emissions (CO2e)	Energy Star Rating	Demographic	Income
Digital Lakeside	Data center	1222150	185162.1	1	Non-minority majority	All other income
Metropolitan Pier and Exposition Authority	Convention center	9245333	117038.7	NA	Non-minority majority	Low income
Cambria Hotel	Hotel	246313	90167.5	1	Non-minority majority	All other income
Willis Tower	Office	4483315	61257.8	58	Non-minority majority	All other income
Cook County Department of Corrections Campus	Prison/incarceration	4570149	54510.8	NA	Majority minority	Low income
NMH Feinberg Pavilion and Galter Pavilion	Hospital (General Medical & Surgical)	2200000	51611.6	47	Non-minority majority	All other income
Stroger Hospital Campus	Hospital (General Medical & Surgical)	1596300	45985.9	8	Non-minority majority	All other income
Keating Hall	College/University	53163	41682.1	NA	Majority minority	Low income
CCD	Hospital (General Medical & Surgical)	1205371	36451.7	5	Non-minority majority	All other income
600 W Chicago	Office	2146502	33538.5	41	Non-minority majority	All other income

Facility Name	Sector	Total emissions (CO2e)	Demographic	Income
The Peoples Gas Light and Coke Company	Petroleum & natural gas systems	177268	Non-minority majority	All other income
University of Illinois at Chicago	Other	145262	Non-minority majority	All other income
University of Chicago	Other	112859	Majority minority	Low income
American Zinc Recycling Corp. - Chicago	Metals	88993	Majority minority	Low income
Ford Motor Company - Chicago Assembly Plant	Other	56922	Majority minority	Low income

Los Angeles

Total # of all buildings over 50,000 sq ft.	11357	
Non-residential buildings (total #)	8402	74.0%
Reporting Status: Complied	1933	
Reporting Status: Not Complied	6469	57.0%
LEED Non-residential	135	1.6%
EPA large facilities (25000 metric tons of CO2eq/yr)	25	

Performance of non-residential businesses

Energy Star Rating		
Not available	7123	84.8%
Mean	64.25	
Total emissions (Mean, metric tons CO2)	560.6	

Non-Residential Buildings with MBEs

Total Buildings	8402	
Buildings with MBEs	58	0.7%
LEED Buildings with MBEs	10	
Energy Star Rating		
Not Available	37	
Mean	84.52	

Buildings in Majority Minority Census Tracts

Total # of buildings (out of non-residential)	3544	
Not Available	2595	73.2%
LEED buildings	26	0.7%
Large emitting facilities	9	
Total emissions (mean, metric tons CO2e)	686.4	

Buildings in Non-majority minority census tracts

Total # of buildings (out of non-residential)	4842	

Not Available	3343	
LEED buildings	109	2.3%
Total emissions (mean, metric tons CO2e)	483.3	
Large emitting facilities	16	
Total emissions (mean, metric tons CO2e)	333171	

Buildings in Low-income census tracts

Total # of buildings (out of non-residential)	5391
Not Available	3693
LEED buildings	89
Total emissions (mean, metric tons CO2e)	419.66
Large emitting facilities	22
Total emissions (mean, metric tons CO2e)	279027

Top Non-Residential Building Emission Sources

Property Name	Primary Property Type	Building Square Ft	Total emissions (CO2e)	Energy Star	Demographic	Income
Vert Energy Group, Inc.	Strip Mall	27129	370668	NA	Majority minority	Low income
Digital Realty	Data center	533828	20166.7	NA	Non-minority majority	All other income
Vert Energy Group, Inc.	Manufacturing/ Industrial Plant	42563	15579.5	NA	Non-minority majority	All other income
Kaiser Foundation Hospitals	Hospital (General Medical & Surgical)	814954	13882.5	6	Non-minority majority	Low income
Anheuser-Busch LLC.	Manufacturing/ Industrial Plant	937700	12403.7	NA	Majority minority	All other income
Children's Hospital Los Angeles	Hospital (General Medical & Surgical)	641010	11820.0	40	Majority minority	Low income

Facility Name	Sector				Demographic	Income
Los Angeles World Airports	Transportation Terminal/Station	3484679	11716.5	NA	Non-minority majority	All other income
CommonWealth Partners Management Services	Office	3607789	11050.9	82	Non-minority majority	All other income
F.I.T. Corporation c/o Westin Bonaventure Hotel and Suites	Hotel	1368248	8504.4	64	Non-minority majority	Low income
LSC Communications	Manufacturing/Industrial Plant	276000	8130.9	NA	Majority minority	Low income

Table 6 Top 5 Large facility emission points

Facility Name	Sector	Total emissions (CO2e)	Demographic	Income
Phillips 66 Los Angeles Refinery - Wilmington Plant	Refineries, chemicals	1792021	Non-minority majority	All other income
Southern California Gas Co End User Emissions (LDC)	Petroleum and natural gas systems	1307009	Non-minority majority	Low income
Ultramar Inc Wilmington Refinery	Refineries	1135682	Majority minority	All other income
Valley Generating Station	Power plants	865350	Non-minority majority	All other income
Air Products Wilmington Hydrogen Plant	Chemicals	819053	Majority minority	All other income

Miami

Total # of all buildings over 50,000 sq ft.	n/a	
Non-residential buildings (total #)	n/a	
Reporting Status: Complied	n/a	
Reporting Status: Not Complied	n/a	
LEED Non-residential	87	
EPA large facilities (25000 metric tons of CO2eq/yr)	0	

Performance of non-residential businesses		
Energy Star Rating	n/a	
Not available	1517	
Mean	73.31	
Total emissions (Mean, metric tons CO2)	130.3	

Non-Residential Buildings with MBEs		
Buildings with MBEs	818	
LEED Buildings with MBEs	17	

Buildings in Majority Minority Census Tracts		
LEED buildings	61	

Buildings in Non-majority minority census tracts		
LEED buildings	26	

Buildings in Low-income census tracts		
LEED buildings	14	

New York

Total # of all buildings over 50,000 sq ft.	26709	
Non-residential buildings	8309	31.1%
Submitted benchmarking data		
LEED Non-residential	436	5.2%
EPA large facilities (25000 metric tons of CO2eq/yr)	51	

Performance of non-residential businesses

Energy Star Rating		
Not available	2928	35.2%
Mean	57.67	
Total emissions (Mean, metric tons CO2)	1226.3	

Non-Residential Buildings with MBEs		
Total Buildings	8309	
Buildings with MBEs	1361	16.4%
LEED Buildings with MBEs	142	
Energy Star Rating		
Not Available	397	
Mean	61.49	

Buildings in Majority Minority Census Tracts		
Total # of buildings (out of non-residential)	2175	
Not Available	11	
LEED buildings	33	1.5%
Large emitting facilities	15	
Total emissions (mean, metric tons CO2e)	812.4	

Buildings in Non-majority minority census tracts		
Total # of buildings (out of non-residential)	6134	
Not Available	43	
LEED buildings	403	6.6%

Total emissions (mean, metric tons CO2e)	1373.3	
Large emitting facilities	36	
Total emissions (mean, metric tons CO2e)	295045	

Buildings in Low-income census tracts		
Total # of buildings (out of non-residential)	2550	
Not Available	11	
LEED buildings	50	2.0%
Total emissions (mean, metric tons CO2e)	841.2	
Large emitting facilities	10	
Total emissions (mean, metric tons CO2e)	33821	

Top Non-Residential Building Emission Sources

Property Name	Primary Property Type	Building Square Ft	Total emissions (CO2e)	Demographic	Income
Pratt S.I. Campus - Total	Manufacturing/ Industrial Plant	438530	138869.9	Non-minority majority	All other income
Buildings Served by Powerhouse	College/University	6766179	120616	Non-minority majority	Low income
BBL 2-02605-0040: Rikers Island, DOC (LL84)	Prison/ incarceration	5978573	98460.4	Majority minority	All other income
NYU: Washington Square CoGen Campus	Mixed Use Property	6852272	97078.9	Non-minority majority	All other income
Warren Weaver Hall	College/University	178324	80098.8	Non-minority majority	All other income
LL84 NYU Langone Health - Main Campus	Hospital (General Medical & Surgical)	3540298	79989	Non-minority majority	All other income
LL84 NYU Langone Smilow Building	Laboratory	260016	74049.5	Non-minority majority	All other income
Rockefeller Center (All Bldgs)	Office	8217513	64770.4	Non-minority majority	All other income
CEPSR Schapiro	College/University	219993	56507.8	Non-minority majority	Low income
CodeGreen- 111 8th Avenue	Office	2336329	51920.1	Non-minority majority	All other income

Top 5 Large facility emission points

Facility Name	Sector	Total emissions (CO2e)	Demographic	Income
Astoria Energy LLC & Astoria Energy II LLC	Power plants	2452393	Non-minority majority	All other income
East River	Power plants	1957842	Non-minority majority	All other income
Ravenswood Generating Station	Power plants	1135069	Non-minority majority	All other income
Poletti 500 MW CC	Power plants	988592	Non-minority majority	All other income
Brooklyn Navy Yard Cogeneration Project	Power plants	985919	Non-minority majority	All other income

Orlando

Total # of all buildings over 50,000 sq ft.	909	
Non-residential buildings	793	87.2%
Submitted benchmarking data	311	34.2%
LEED Non-residential	28	3.5%
EPA large facilities (25000 metric tons of CO2eq/yr)	1	

Performance of non-residential businesses		
Energy Star Rating		
Not available	624	78.7%
Mean	57.64	
Total emissions (Mean, metric tons CO2)	1311.7	

Non-Residential Buildings with MBEs		
Total Buildings	793	
Buildings with MBEs	23	2.9%
LEED Buildings with MBEs	3	
Energy Star Rating		
Not Available	16	
Mean	66	

Buildings in Majority Minority Census Tracts		
Total # of buildings (out of non-residential)	354	
Not Available	221	
LEED buildings	6	1.7%
Large emitting facilities	0	
Total emissions (mean, metric tons CO2e)	1272.9	

Buildings in Non-majority minority census tracts

Total # of buildings (out of non-residential)	439	
Not Available	286	
LEED buildings	22	5.0%
Total emissions (mean, metric tons CO2e)	1345.5	
Large emitting facilities	0	
Total emissions (mean, metric tons CO2e)	0	

Buildings in Low-income census tracts		
Total # of buildings (out of non-residential)	272	
Not Available	180	
LEED buildings	3	
Total emissions (mean, metric tons CO2e)	1742.6	
Large emitting facilities	0	
Total emissions (mean, metric tons CO2e)	0	

Top Non-Residential Building Emission Sources

Property Name	Primary Property Type	Building Square Ft	Total emissions (CO2e)	Energy Star	Demographic	Income
Amcor Rigid Plastics	Manufacturing/	512414	32076.6	NA	Majority minority	All other income
Orlando Regional Medical Center / UF Health Cancer Center	Hospital (General Medical & Surgical)	341638	20183.5	81	Majority minority	Low income
Loews Royal Pacific Resort	Hotel	590490	13200.9	4	Non-minority majority	Low income
Loews Portofino Bay Hotel	Hotel	773229	12707.6	12	Non-minority majority	Low income
Winnie Palmer Hospital for Women & Babies	Hospital (General Medical & Surgical)	437541	12311.4	11	Majority minority	Low income

Toufayan Bakery	Manufacturing/ Industrial Plant	197799	12288.3	NA	Majority minority	Low income
Loews Sapphire Falls Resort at Universal Orlando	Hotel	114245	10509	65	Non-minority majority	Low income
Conserv II	Wastewater treatment plant	NA	10451.6	NA	Non-minority majority	Low income
Arnold Palmer Child & Women Hospital	Hospital (General Medical & Surgical)	109090	9781.9	12	Majority minority	Low income
Coca Cola Refreshments	Manufacturing/ Industrial Plant	145069	9379.1	NA	Majority minority	Low income

San Francisco

Total # of all buildings over 50,000 sq ft.	2535	
Non-residential buildings (total #)	2173	85.7%
Reporting Status: Complied	985	
Reporting Status: Not Complied	911	
LEED Non-residential	164	7.5%
EPA large facilities (25000 metric tons of CO2eq/yr)	6	

Performance of non-residential businesses		
Energy Star Rating		
Not available	1517	69.8%
Mean	73.31	
Total emissions (Mean, metric tons CO2)	130.3	

Non-Residential Buildings with MBEs		
Total Buildings	2173	
Buildings with MBEs	161	7.4%
LEED Buildings with MBEs	14	0.6%
Energy Star Rating		
Not Available	96	
Mean	74.08	

Buildings in Majority Minority Census Tracts

Total # of buildings (out of non-residential)	15
Not Available	14
LEED buildings	1

Large emitting facilities	0	
Total Energy Use Intensity (EUI) kBtu/ft2	188.8	

Buildings in Non-majority minority census tracts

Total # of buildings (out of non-residential)	2158	
Not Available	1176	54.5%
LEED buildings	163	7.6%
Total energy use intensity (EUI) kBtu/ft2	130.24	
Large emitting facilities	6	
Total emissions (mean, metric tons CO2e)	88697	

Buildings in Low-income census tracts

Total # of buildings (out of non-residential)	928
Not Available	491
LEED buildings	80
Total energy use intensity (EUI) kBtu/ft2	123.2
Large emitting facilities	1
Total emissions (mean, metric tons CO2e)	60922

Top Non-Residential Building Emission Sources

Table 5 Top 10 Non-residential building EUI points

Property Name	Primary Property Type	Building Square Ft	Total EUI (kBtu/ft^2)	Energy Star Rating	Demographic	Income
630 3rd St	Data center	40340	3668.6	NA	Non-minority majority	All other income
365 Main St	Data center	266980	1779.2	32	Non-minority majority	All other income
Digital Realty Trust	Data center	679212	1381.9	10	Non-minority majority	Low income
375 Newhall St	Other - Technology/Science	42200	1006	NA	Non-minority majority	All other income
Mason O'Farrell Garage	Parking	384162	763.1	NA	Non-minority majority	Low income
1200 Irving St	Supermarket/ Grocery Store	31659	705.4	24	Non-minority majority	All other income
401 Mason St	Restaurant	10580	689.2	NA	Non-minority majority	Low income
245 Winston Dr	Strip Mall	33637	676.7	NA	Non-minority majority	Low income
Whole Foods Market	Supermarket/ Grocery Store	72621	671.4	74	Non-minority majority	All other income
4950 Mission St	Supermarket/ Grocery Store	35189	634.1	33	Non-minority majority	Low income

Table 6 Top 5 Large facility emission points

Facility Name	Sector	Total emissions (CO2e)	Demographic	Income
Pacific Gas and Electric Company	Petroleum and natural gas systems	284127	Non-minority majority	All other income
PG&E Transmission Blowdown	Petroleum and natural gas systems	103719	Non-minority majority	All other income
Energy Center San Francisco	Power plants	60922	Non-minority majority	Low income
University of California, San Francisco - Parnassus Campus	Other	54590	Non-minority majority	All other income
Pacific Gas and Electric Company (PG&E) - SF6 Emissions	Other	28824	Non-minority majority	All other income

RELEVANT INDUSTRIAL CODES USED FOR THIS ANALYSIS

SIC (Standard Industrial Classification Codes)		NAICS (North American Industry Classification System)	
10	Metal mining	21	Mining, Quarrying, and Oil and Gas Extraction
12	Coal mining	22	Utilities
13	Oil and gas extraction	23	Construction
15	General building contractors	31	Manufacturing
16	Heavy construction contractors	32	Manufacturing
17	Special trade contractors	33	Manufacturing
21	Tobacco manufactures	48	Transportation and Warehousing
22	Textile mill products	49	Transportation and Warehousing
23	Apparel and other textile products	56	Administrative and Support and Waste Management and Remediation Services
24	Lumber and wood products		
28	Chemicals and allied products		
		UNSPSC (Universal Standards Products and Service Codes)	
29	Petroleum and coal products		
30	Rubber and miscellaneous plastics products	20	Mining and Well Drilling Machinery and Accessories
31	Leather and leather products	22	Building and Construction Machinery and Accessories
32	Stone, clay, glass, and concrete products	23	Industrial Manufacturing and Processing Machinery and Accessories
33	Primary metal industries	24	Material Handling and Conditioning and Storage Machinery and their Accessories and Supplies
34	Fabricated metal products	26	Power Generation and Distribution Machinery and Accessories
35	Industrial machinery and equipment	71	Mining and Oil and Gas Services
36	Electrical and electronic equipment	72	Building and Construction and Maintenance Services
37	Transportation equipment	73	Industrial Production and Manufacturing Services
38	Instruments and related products	76	Industrial Cleaning Services
39	Miscellaneous manufacturing industries	77	Environmental Services
41	Local and interurban passenger transit	78	Transportation and Storage and Mail Services
42	Motor freight transportation and warehousing	83	Public Utilities and Public Sector Related Services

| 44 | Water transportation | | |
| 46 | Pipelines, except natural gas | | |

REFERENCES

[1] Source: https://www.science.org/doi/10.1126/sciadv.abf4491 , Page 1

[2] Source: https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions , Page 1

[3] Source: https://carbon2018.globalchange.gov/chapter/4/ , Page 2

[4] Source: https://www.c2es.org/site/assets/uploads/2018/06/innovation-buildings-background-brief-07-18.pdf , Page 3

[5] Source: https://www.nap.edu/catalog/25932/accelerating-decarbonization-of-the-us-energy-system

[6] Source: https://knowledge.uli.org/-/media/files/research-reports/2020/decarbonizing-the-built-environment_10-principles.pdf?rev=d9dfb76fd2344586aae0327fe7b03718, Page 7

[7] Source: http://www.cityoforlando.net/greenworks/wp-content/uploads/sites/9/2016/09/Orlando-Impact-Study.pdf , Page 8

[8] Source: http://alignny.org/wp-content/uploads/2015/04/ClimateWorks_Report_R5_LowerRes.pdf , Page 8

[9] Source: https://www.ctgreenbank.com/strategy-impact/reporting-transparency/ , Page 12

[10] Source: https://paceworks.ygrene.com/databook.pdf , Page 12

[11] Source: http://schwarzenegger.usc.edu/institute-in-action/article/impacts-of-the-property-assessed-clean-energy-program-on-the-economies-of-c , Page 12

[12] https://illinoissolar.org/FEJA-Workforce-Development-Programs , Page 13

[13] Source: https://net1.valenciacollege.edu/future-students/degree-options/associates/energy-management-and-controls-technology/ , Page 13

[14] Source: https://www.palmbeachstate.edu/academicservices/Documents/goal4_o1_jeanwihbey_creationofanenergyinst_050211.pdf , Page 13

[15] Source: https://www.orlando.gov/Initiatives/Building-Energy-Water-Efficiency-Strategy , Page 13

[16] Source: https://www.nyserda.ny.gov/all-programs/programs/clean-energy-workforce-development , Page 13

[17] Source: https://socalren.org/wet , Page 13

[18] Source: https://laborcenter.berkeley.edu/pdf/2017/Diversity-in-Californias-Clean-Energy-Workforce.pdf , Page 13

[19] Source: https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Revolving_Loan_Funds_in_CRE.pdf , Page 16