Equity Metrics to Support the Louisiana Climate Action Plan:
A Framework

February 2023

THE DATA CENTER
Independent Analysis for Informed Decisions in Southeast Louisiana

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About The Data Center

The Data Center is the most trusted resource for data about greater New Orleans and Southeast Louisiana. Since 1997, The Data Center has been an objective partner in bringing reliable, thoroughly researched data to conversations about building a more prosperous, inclusive, and sustainable region. The Data Center became the local authority for tracking post-Katrina recovery with The New Orleans Index, developed in partnership with the Brookings Institution, and has continued to be a leading neutral and independent voice on the issues that are most pressing to greater New Orleans and Southeast Louisiana.

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Executive summary

In 2022, the Louisiana Climate Initiatives Task Force unanimously approved the state's first ever Climate Action Plan (CAP). One of the CAP's fundamental objectives is to create a more equitable society. To support progress on this objective, this document outlines an **equity metrics strategy**. The availability of accessible, timely, high-quality data can foster shared understanding of climate equity issues and facilitate problem-solving by diverse actors across state and local government, private industry, and nonprofits and community-based organizations. Data transparency can motivate action and accountability. Focused analysis can inform *how* to implement CAP actions to drive equitable outcomes.

Climate equity in particular invokes a complex and wide range of concerns. This is especially true in Louisiana, where climate equity goals must contend with a unique combination of severe and uneven climate risks, emissions overwhelming concentrated in the state's industrial sector, and intersecting challenges stemming from historic and ongoing racial and economic inequity. Even as more data resources related to environmental justice and climate risk come available nationally, presenting data and analysis in a manner grounded in local context can help to meet the specific needs of communities and decisionmakers in Louisiana.

In simple and measurable terms, equity can be defined as the condition where race, gender, and other demographic characteristics are no longer predictive of life outcomes. However, when put into practice, the concept of equity encompasses more than any set of quantitative measures can capture. Indeed, an equity lens urges reflection on how data is generated, analyzed, communicated, and acted upon. These practices can either reinforce inequities or help to fuel more equitable decisionmaking.

Building on best practices for equity-informed data and analysis, insights from stakeholder feedback, and a thorough review of available data sources and methodological approaches, the recommendations summarized below describe a multi-pronged, long-term approach to leveraging data for climate equity. While the recommendations identify a publication strategy built around a few specific data resources, tool sets, and opportunities to build capacity, the main intention is to outline a pragmatic framework that can grow and adapt as Louisiana proceeds toward its climate goals.

The task of leveraging available data to measure climate equity occupies a rapidly evolving field. For example, the federal "Justice40" initiative, which directs 40 percent of the benefits of investment to disadvantaged communities, and the growing numbers of climate and environmental justice initiatives among state and local governments have led to a flurry of data products. These include "screening tools" to help inform more just and equitable allocation of resources and benefits. Federal agencies, nonprofits, and private companies also continue to release new data relevant to climate equity.

In addition to surveying the current landscape of climate equity metrics, the report outlines a framework based on three core sets of recommendations. Together, these recommendations chart a path toward a statewide "data intermediary" capacity for climate equity – embedding a set of practices that facilitate greater access to and use of data for equitable decisionmaking. More than any single research study or data product, this capacity is critical to leveraging data and mobilizing evidence toward meeting Louisiana's climate goals equitably. Rather than "reinventing the wheel" or proposing costly new data collection efforts, the recommendations prioritize facilitating access to existing data with equity breakdowns, leveraging available data sources to their fullest extent, and identifying ways to advance equitable approaches to data in government and evidence-based policy assessment.

1. Develop and maintain a core set of resources to make climate equity data available on an ongoing basis.

- *Develop, publish, and regularly update a user-friendly collection of climate equity indicators capable of meeting a wide range of uses for different audiences.*
- *In conjunction with the climate equity indicator collection, publish a series of accessible briefs to provide context for interpreting the indicators, as well as deeper dives into specific climate equity issues.*
- *The indicators should be designed and developed to ensure the durability of these core equity metrics resources.*

The **climate equity indicator collection** is envisioned as a web-based data "hub" for essential indicators for understanding climate equity in Louisiana. The indicators will include written narrative context and will also be presented in standalone, interactive charts or maps featuring the data at multiple levels of geography and with any available equity breakdowns (i.e., race and gender). The collection is intended to provide an accessible reference point to level-set the state of climate equity in Louisiana. Rather than a comprehensive survey of all available climate equity data, a curated selection of indicators will provide an accessible, rigorous, and compelling point of reference for discussions and decisionmaking around climate equity.

As proposed in the report, the indicator collection will cover three major themes: *Income and Wellbeing, Exposure to Hazards, and Inclusive Economic Growth.* The report also details an initial set of indicators for inclusion that will document the factors most crucial to understanding the story of climate equity in Louisiana while reflecting the needs and interests described by stakeholders. For example, each indicator connects to the larger story of climate equity in Louisiana while allowing users flexibility to explore the full set of indicators for a specific parish or at a specific geographic level.

To accompany updates of the data collection (or at other regular intervals), **a series of briefs** are intended to be published to provide a deeper dive into more

specific topics related to climate equity and to highlight actionable, evidence-based insights relevant to CAP actions. Example topics proposed by stakeholders include health outcomes in communities exposed to environmental pollutants and climate stresses; housing quality and affordability (including home insurance); and issues for workers in industries most directly affected by CAP actions.

2. Build capacity for equitable data and decision-making in government.

- *Assess local capacity for climate equity, including ways to use data to more effectively drive partnerships across jurisdictions and levels of government.*
- *Develop a "toolkit" for using EJScreen and other federal screening tools to identify vulnerable and priority communities.*
- *Identify opportunities to leverage administrative data in state government to support accountability and enable actionable insights on climate equity and CAP actions.*

Local action is likely to be a key driver or barrier to equitable outcomes, but **local capacity** was a key issue raised by stakeholders. Essentially, many of the decisions around the implementation of the CAP are carried out by local political jurisdictions and parish governments. However, many of Louisiana's localities have limited capacity to evaluate or modify policies and practices to promote equity. Greater availability and use of data can work toward alleviating these barriers.

The use of climate and environmental justice screening tools is expanding. Federal agencies encourage the use of these tools in grant applications and analysis, and several screening tools have been developed. Given the diversity of these existing resources, as well as their limitations as decisionmaking tools, a **screening tool "toolkit"** would help users to more effectively leverage available resources. Such a toolkit would provide guidance on navigating these screening tools for a Louisiana context, reducing barriers to entry for local users.

Finally, state government itself houses an enormous volume of frequently underutilized data. **Administrative data** can be leveraged to support procedural equity, cutting-edge research, accountability and transparency, and a public infrastructure of equitable data. Addressing technical and organizational barriers to open data sharing and data-driven decisionmaking in government is considered a best practice for enhancing data equity. Strategies include mapping potential open data sources to the owning departments in State or local government and adjusting policy to allow for data to be collected and disaggregated to a greater extent, e.g., by race, gender, and location.

3. Commit to rigorous assessment of equity impacts throughout the process of CAP implementation.

- *Commit to advancing the state of evidence- and theory-based policy assessment within and outside of government.*
- *While many opportunities exist to innovate on evidence-based assessment before implementing CAP actions, at a minimum, distributional analysis should be conducted for CAP actions with significant equity concerns.*
- *Assess the equity impacts of CAP actions after they are taken with rigorous policy evaluation methods.*

Equitable policymaking requires robust equity assessments of the impacts of government actions. **Before implementation**, attempts to quantify the impact of a policy change, program, or other intervention on critical outcomes and impacts can provide critical insight to help prioritize and assess alternative courses of action. Evidence-based approaches may include adoption of standardized screening and assessment frameworks, equity-informed benefit-cost analysis, or extrapolations based on available data, among others. Likewise, evaluating the impacts of policies and programs **after implementation** fosters accountability and contributes to knowledge about equitable decisionmaking.

In describing frameworks for assessment before and after an intervention has occurred, the full report reviews challenges with such assessments, such as inequitable distortions that can occur in benefit-cost analysis and why counting jobs can be misleading. While the main recommendation is to commit to rigorous equity assessment of government actions, a mix of practical and more ambitious opportunities to adopt new methods for assessing climate equity in relation to CAP actions are proposed.

1 Introduction

In 2022, the Louisiana Climate Initiatives Task Force unanimously approved the state's first ever Climate Action Plan (CAP) to limit the severity of climate change and position the state for a low-greenhouse gas (GHG) future. Creating a more equitable society is a fundamental objective of the CAP, along with improving the health and quality of life of Louisiana residents, strengthening the economy, and other equity-informed objectives. The Louisiana Climate Action Plan defines climate equity as:

> A people-centered approach to addressing the global climate crisis through action that seeks to achieve long-term equality of outcomes by acknowledging institutionalized harms to historically marginalized people and communities and by holding accountable those who benefit from the root cause of climate change that disproportionately impact the most vulnerable.[1]

Adapting to a changing climate and reducing emissions imply large investments and deep shifts in the ways that state and local governments manage economic development, the built environment, infrastructure, energy, and environmental resources. These changes can yield co-benefits, improve quality of life, expand economic opportunities, and redress past harms. However, differential exposure to climate hazards and its economic and societal disruptions can also hinder efforts to advance shared prosperity for all Louisianans.

Given the scope and complexity of climate adaptation, data has an important role to play. Accessible data and targeted analysis can illuminate critical dimensions of climate equity and their links to long-standing issues of environmental justice and economic and racial inequality; inform priorities for investments and initiatives across a range of decisionmaking settings; assess the distribution of impacts of climate vulnerability, mitigation, and adaptation; and empower communities to shape their own climate futures.

This report offers a "climate equity metrics" strategy to support CAP implementation. The challenges of measuring climate equity and the distribution of impacts of CAP actions motivates the need for a cohesive, multi-pronged data strategy. By proposing an initial set of climate equity indicators and principles, data resources, and frameworks for climate equity measurement, the strategy covers largely practical and technical considerations for quantifying and reporting on CAP equity objectives. These specific recommendations are informed by broader reflections on equitable data practices at all stages of the data life cycle, from creation to analysis, dissemination, and use.[2] The CAP targets net-zero emissions by 2050, and this report similarly aims to outline the first concrete steps toward a long-term, adaptive approach to climate equity data in Louisiana.

When compared with other states, Louisiana's economy generates a uniquely high combination of emissions and income inequality

As of 2021, Louisiana ranked 8th among states in total emissions and 7th in emissions per capita, largely owing to its high share of emissions from industrial sources, which exceeds that of any other state. Louisiana also ranks second among states in income inequality (as measured by the Gini Index). At a basic level, this unique combination of a highly skewed distribution of income and high emissions from industrial sources underscores the urgency of an equitable climate and energy transition in Louisiana.

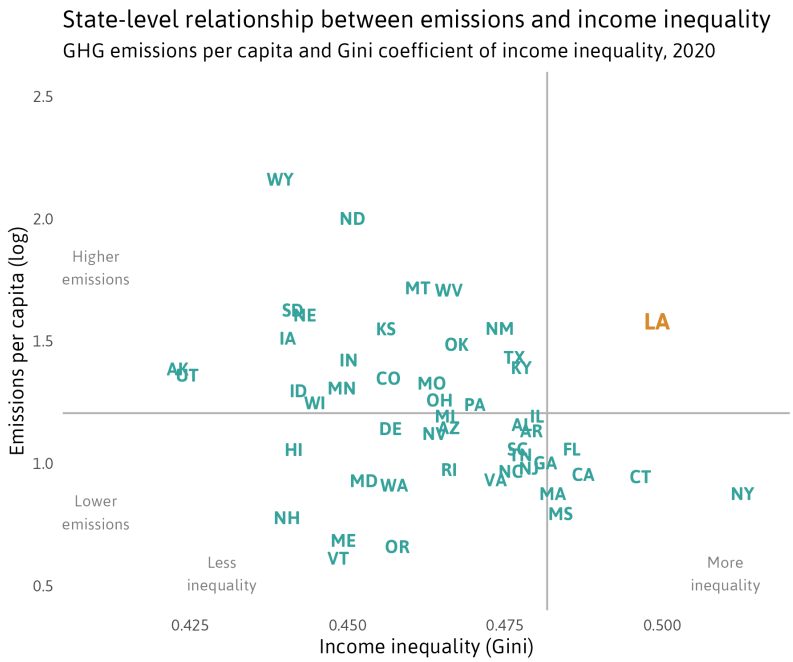


Figure 1: Louisiana has a unique combination of high income inequality and high emissions

The "Recommendations" section elaborates a three-part agenda for future work:

1. Develop and maintain a core set of resources to make climate equity data available on an ongoing basis.
2. Build capacity for equitable data and decision-making in government.
3. Commit to rigorous assessment of equity impacts throughout the process of CAP implementation.

Together, these recommendations chart a path toward enhancing a broad capacity for using data to support equitable decisionmaking and accountability. More than any single research study or data product, sustaining this capacity is critical to leveraging data and mobilizing evidence toward meeting Louisiana's climate goals equitably.

The landscape of climate equity is broad, and its function in decisionmaking at all levels of government is rapidly changing. Focusing only on the federal level, recent developments include guidelines to prioritize investments in disadvantaged communities (Justice40 initiative), an executive order leading to agency-level equity and racial justice plans, organizational changes within federal agencies (e.g., Environmental Protection Agency's Office of Environmental Justice and Department of Energy's Office of Economic Impact and Diversity), and major infrastructure legislation (Inflation Reduction Act). However, much of the leadership on climate action in government continues to occur at the state and local levels. With the CAP's adoption, Louisiana joins many other state governments, hundreds of local governments, and many more private sector companies in formally adopting a climate strategy. Yet Louisiana remains the only southern state to adopt a net zero target and stands as an outlier in its share of emissions from industrial sources. At the same time, many of Louisiana's communities are on the frontlines of adapting to climate-intensified coastal hazards and struggling for environmental justice. To be useful on the local level, climate equity data should be targeted to Louisiana's unique climate vulnerabilities, industry-intensive emissions profile, and historical legacy of systemic racial inequity that continues to shape access to resources and prosperity.

Selecting data sources and indicators relevant to climate equity requires immense care and difficult choices. Data sources vary in quality and availability at meaningful geographic scales and in a timely, reliably updated fashion. Even if comparable and consistent data were readily available to cover the full range of climate equity questions, measuring climate equity implies limitations and tradeoffs. Such data alone can at best only partially capture the intersections between climate vulnerability and the experience of marginalized and overburdened groups, place-based processes of under- and disinvestment, access to systems like health care and education, inequities and distortions in housing and labor markets, and exposure to disasters.

What are climate equity indicators?

There is no "standard" set of climate equity indicators. Approaches can vary depending on specific questions, uses, and local context, and examples of this variation are reviewed below. In practice, climate equity indicators:

- Cover a range of health, socioeconomic, and environmental topics.
- Can be disaggregated by race, gender, income, or place to measure disparities.
- Can be tracked over time.
- Can be used to develop policy, demonstrate effectiveness, and highlight areas where more action is needed.
- Reflect past and present drivers of systemic inequity.
- Capture progress toward inclusive prosperity.

The first section reviews guiding principles for equity measurement, including the need for multiple approaches to address limitations and meet the needs of different users and address different kinds of questions. Its main conclusion is the need for a multi-pronged approach. The second section details three sets of recommendations. The recommendations include both broad-based frameworks for monitoring and assessing climate equity and a specific agenda for publications and data resources. The third section reviews an initial set of suggested indicators to be made accessible on an ongoing basis. Readers should be advised that portions of this report, especially the second and third sections, include a mix of general discussion and notes about data sources and methodology that are relatively technical in nature.

2 Background and approach

Advisory and stakeholder feedback process

The project kicked off with a short presentation by The Data Center at the Climate Task Force quarterly meeting on July 12, 2022. Staff of the governor's office convened a small project advisory group consisting of staff from Taproot Earth and Environmental Defense Fund, including members of the Climate Task Force Equity Advisory Workgroup. Beginning in late July, the technical team from The Data Center, the governor's office team, and the advisory group met regularly to coordinate on project development and stakeholder feedback.

A series of structured discussions and exercises were hosted at two public stakeholder meetings to facilitate input into the development of the equity metrics strategy. Approximately 50 stakeholders – representing media, industry, academia, advocacy, activism, philanthropy, government, and other affiliations – participated in public feedback opportunities. Both meetings used "data storytelling" as a framing concept to identify key climate equity topics and lines of inquiry, clarify audiences and uses for climate equity data, and inform practical considerations for potential data sources and indicators.

The first meeting was held in New Orleans on November 1, 2022. Breakouts focused on identifying potential audiences and key stories about climate equity that could be linked to potential indicators. The second meeting was held in Baton Rouge on January 17, 2023. Based on initial feedback, literature review, and development, the technical team presented a draft version of the recommendations and suggested indicators (updated and revised versions of the recommendations and suggested indicators are detailed in this report). Discussion focused on reactions to the indicators and refining a publication agenda based on priority issues, key audiences, and stories to highlight with available data.

The Appendix reviews the feedback received in these vibrant conversations in greater detail. To summarize briefly, stakeholders highlighted and added nuance to areas where data could help to illuminate climate equity challenges, barriers, opportunities, and successes at the state and local levels. In addition, participants helped to identify specific audiences, as well as their needs and motivations. Given the immense scope of Louisiana's climate equity questions, the diversity of feedback proved critical to strategically balancing urgency and potential for impact with technical and design concerns for data availability, measurement, and resources to enhance accessibility to high-quality data and analysis. The remainder of this report is directly informed by insights, concerns, priorities, and open questions elicited from stakeholders.

Linking equity frameworks to equity measures

This section briefly summarizes contemporary discourse around equity measurement. While not comprehensive in scope, the review helps to situate the CAP equity metrics strategy in the context of current practices for equity definition and measurement. The CAP's encompassing definition of climate equity reflects these practices.

> A people-centered approach to addressing the global climate crisis through action that seeks to achieve long-term equality of outcomes by acknowledging institutionalized harms to historically marginalized people and communities and by holding accountable those who benefit from the root cause of climate change that disproportionately impact the most vulnerable.[3]

Since the nominal adoption of equity, diversity, inclusion, and related values by public and private sector organizations after the Civil Rights era, the discourse around how to put equity into practice has continued to evolve. Common use of the term *equity* emphatically stresses its difference from *equality*: Equality frames fairness as the equal provision of resources while equity implies actively redressing past wrongs and frames current disparities as symptoms of chronic, cumulative conditions grounded in underlying structural causes.[4] Beyond this basic but crucial distinction, the way equity is defined and linked to quantitative measures varies across sectors and depends on local context. Each of these conceptual issues has implications for how equity might be measured.

Some formal definitions of equity tie the concept directly and primarily to measurable outcomes. For example the Local and Regional Government Alliance on Race and Equity define racial inequity in terms of a predictive relationship between race and outcomes: "Race can be used to predict life outcomes, e.g., disproportionality in education (high school graduation rates), jobs (unemployment rate), criminal justice (arrest and incarceration rates), etc."[5] In other words, the condition of equity is achieved through the erasure of measurable disparities, such that race, gender, or other social group identities and demographic categories no longer predict, in a statistical sense, how one fares.[6]

Other approaches elaborate a broader, more explicitly normative basis for equity, encompassing measurable outcomes while also hinting at less directly measurable notions of equity, the limits of a purely quantitative framing of equity, and the importance of *how* equity is pursued. Ways of parsing out normative dimensions of equity vary, but most share overlapping concepts. Procedural equity is frequently distinguished from distributional equity in terms of substantive outcomes.[7] Procedural equity refers to diverse, inclusive engagement in planning, decision making, and execution that gives voice to marginalized, disempowered, or overburdened groups. While procedural equity is about the *means* by which an outcome is achieved, distributional equity refers to the *ends*: policies and

programs distribute costs and benefits fairly and in a manner that remedies existing inequities.[8]

The Environmental Protection Agency's (EPA) definition of environmental justice reflects this distinction between procedural and distributional equity: "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, policies, and regulations." Conventional descriptive data (e.g., measures of differential exposure to environmental hazards or racial disparities in economic or health outcomes) might inform the application of both procedural and distributional equity to decisionmaking. However, from a monitoring and evaluation perspective, procedural and distributional equity are likely to require fundamentally different approaches to measurement.

Procedural and distributional equity may be further differentiated from recognitional equity, which aims to explicitly acknowledge the histories and needs of specific groups.[9] Some equity frameworks also identify systemic, structural, or institutional equity to highlight the need for decisionmakers to build accountability into the everyday practices of their organizations and to acknowledge that institution- and system-level processes routinely work to benefit privileged groups. Finally, and especially relevant to climate policy, inter-generational equity reflects the potential for actions in the present to displace burdens onto future generations.

The strategy outlined in this document does not elaborate a measurement strategy for each of these dimensions of equity. Rather, its focus on quantitative measures most closely addresses the phrase "long-term equality of outcomes" in the CAP's definition of climate equity. The current best practice for government data providers and researchers aims to disaggregate data – or to break down and analyze differences by race and ethnicity, gender, income, and other key dimensions – where possible. Disaggregation is a core principle of equity-informed data and research that has, for example, been woven into recent efforts to enhance federally published data sources, especially since the 2021 executive order on "advancing racial equity and support for underserved communities throughout the federal government."[10]

Challenges and limitations of demographic disaggregation

To disaggregate data means to break down data on a larger population into some set of "parts" based on group identity. Race/ethnicity and sex[11] are common dimensions of data disaggregation, but not all data is available with such breakdowns. Even less widely available is data that includes race/ethnicity *and* sex, such as "employment rates for Hispanic females." The recommendations in this report prioritize data with available racial and ethnic breakdowns. Some of the recommended data is also reported with sex or race/ethnicity and sex breakdowns.

The ability to disaggregate can be limited by privacy concerns and sample size, which in turn increases our uncertainty about the accuracy of group-specific estimates. Especially for small geographic areas (e.g., "zooming in" from parish-level and to census tract-level data), decisions about the detail of racial/ethnic disaggregation must be made. For example, a measure may be reported with a high level of precision at the parish level for White, Black, Hispanic, and Asian people, but the same measure may have much higher uncertainty when reported at the census tract level, as there will be fewer people of each race/ethnicity living in those smaller geographies. Some research responds to this problem by reducing the level of disaggregation, perhaps from the 4-way breakdown just described to a simpler White/non-White breakdown, or a breakdown of only the largest racial/ethnic shares of that tract's population. Since such decisions must be made in response to the specific analysis at hand, we recommend that care should be taken to disaggregate to the furthest level that is feasible and appropriate.

In Louisiana, these issues are especially acute for people the Census Bureau designates American Indian/Alaska Native (AIAN). Historical ties between Louisiana residents who may identify with this categorization and the state's actions and policies on environment, industry, and disaster response call for meaningful attention to equity for AIAN people as the CAP is implemented. But data on this population is rarely reliable enough to be reported at smaller geographies. It is likely that the analysis recommended by this report will require the data's full Louisiana sample of AIAN residents to yield reliable results, meaning that local analysis of equity for AIAN people will only be available for a select few geographies and will otherwise be reported at the state level only.

While disaggregated data can bring attention to inequities, the way such data is presented also matters. For example, a narrow focus on disparities carries some risk of downplaying the assets and agency of marginalized and disinvested communities. When reasonable but purely disparity-based definitions of equity are boiled down to single indicators without adequate context, these indicators can risk contributing to a deficit-based framing. Though rarely a clear-cut dis-

tinction, over-reliance on deficit-oriented indicators can downplay the systemic roots of inequity and – in the extreme – contribute to harmful narratives that individualize social problems or stigmatize communities. To mitigate this risk, indicators and analysis should aim to interrogate the systems that drive inequities and seek to shed light on the assets and strengths of low-income communities and communities of color, not just the challenges.

Given the current state of practice in equity measurement, the aim is not to articulate a comprehensive or determinative measure for equity but a pragmatic starting point, which includes recognizing the limits of quantitative data. Conventional quantitative data sources cannot fully reflect the unique the historic roots of present day inequities, the lived experiences of overburdened communities, or the processes of reshaping institutions. In addition, the CAP involves a wide range of actions by diverse stakeholders inside and outside of government, and measurement approaches for one action might not apply to others. Sound approaches to quantifying climate equity risks, outcomes, or policy processes may rely on data sources or methods beyond those discussed in this report. The strategy presented here is not to the exclusion of prevailing equity frameworks or other forms of knowledge and is offered in the spirit of complementing lived experience, qualitative research, and other approaches to quantitative measurement not discussed here.

Equitable data initiatives within the federal government

As part of the whole-of-government effort to advance the principle of equity through the federal government, the Biden Administration released a "Vision for Equitable Data" in 2022.[12] The vision identifies five broad practices, which echo many of the recommendations included in this report.

- Make disaggregated data the norm while protecting privacy
- Catalyze existing federal infrastructure to leverage underused data
- Build capacity for robust equity assessment for policymaking and program implementation
- Galvanize diverse partnerships across levels of government and the research community
- Be accountable to the American public through transparency and progress toward serving underserved population and building data access tools that are user-friendly

Summary of potential audiences and purposes for climate equity metrics

Equity data resources and analysis tend to have greater impact when their development is guided by specific audiences and purposes. Who is the immediate user or ultimate recipient of the information? What task are they trying to accomplish, or what question are they trying to answer? Based on early discussion with the advisory group, four main audiences for climate equity indicators had been identified prior to public input. These were:

- State policy-makers, leadership, and regulatory bodies
- Community advocates and NGOs, faith leaders
- Government agencies involved in implementation
- Decision-makers in key sectors identified by the CAP, including private industry.

At the first public meeting, participants also identified the following audiences:

- Small business owners and industry workers
- Parish government workers
- Scientific and academic communities
- Federal Emergency Management Agency (FEMA)
- Journalists and average citizens
- Fishing and farming communities
- Voices outside of the state

When discussing how various audiences would be able to use this climate equity data, stakeholders highlighted the important roles for NGOs in countering harmful narratives; the need for greater integration among the researchers, community-members, and climate advocates; the importance of decisionmaking at the local or parish level to the CAP's goals; and the key roles of various private sector industries and small businesses.

At the most general level, data can be used to describe existing disparities. This helps to bring attention to inequity and to motivate action by establishing a common baseline of evidence. Descriptive summaries of data are most effective when they validate and illuminate lived experiences and when presented in context and on a recurring, readily available basis. The audience and purpose may be relatively general, such that the availability of data answers common questions and provides a reference point for data-driven dialog and shared understanding in a wide range of settings. Often, when such data is provided in a broadly usable, consistent, and trustworthy manner, it can help to fuel awareness, advocacy, and sustained commitment to addressing systemic inequities and help to counter misconceptions. While descriptive data alone cannot explain how or why a disparity came to exist, compelling data points often work to facilitate dialog and to provoke deeper explorations of underlying causes and solutions. A key

objective of this document is to develop an approach to providing an impactful general data resource for climate equity (figure 2).

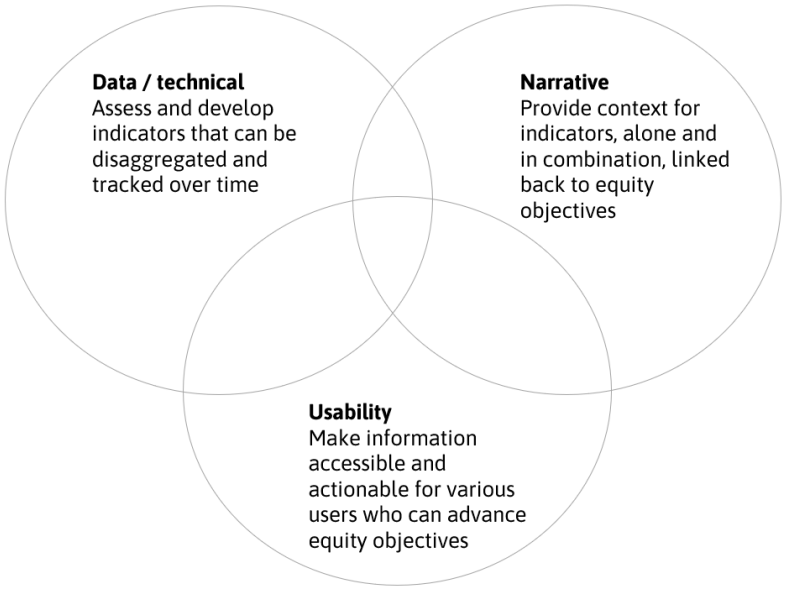


Figure 2: Impactful data is usable, story-driven, and rigorous

Descriptive data can also be leveraged to directly inform specific decisions over policy and program interventions and resource allocation. This "use case" is narrower. For example, though an explicit use case is often not elaborated at the point of inception,[13] screening tools have an implicit use case of identifying communities to prioritize for beneficial investment to reduce unfair burdens. Descriptive data can also provide insight for the design of programs and policies. Descriptive estimates might help to quantify the scale of a specific problem and the potential demand for services or might suggest intersecting challenges that should be weighed when designing a program. However, the limitations of purely descriptive data point toward the potential for formal policy evaluation and assessment methods, requiring more focused research questions.

Based on literature review and stakeholder feedback, we identify several of potential uses for climate equity metrics resources:

- Describing the impacts of CAP actions
  - Identify CAP actions with a greater potential for impact on equity
  - Identify equity implications for each CAP action
  - Measure the equity impacts of CAP actions
- Describing or prioritizing geographies

  - Identify geographies most severely impacted by climate change or contributors to climate change
  - Identify geographies with an existing heightened vulnerability, e.g. due to existing patterns of disinvestment or economic and environmental burden.
  - Describe the relative vulnerability of small areas in the state
  - Identify priorities for public outreach, engagement, and participation
- Providing general information to motivate action and explore issues related racial equity
  - Summarize the state of equity in Louisiana as it relates to climate change
  - Collect a baseline set of general equity data across Louisiana
- Storytelling and accountability
  - Narrate the connection between equity and climate change using data to support advocates and policy makers
  - Narrate specific aspects of climate change-related advocacy, including health and housing
  - Document historical context of existing vulnerabilities
  - Document data that may not exist or be too biased or incomplete to use
  - Document CAP stakeholders' ability to implement CAP actions; e.g. as determined by local government capacity

The importance of a local perspective

Stakeholder feedback stressed the importance of local applications for climate equity data and the link between local decisions and the equity objectives and broader efficacy of the CAP. This relationship translates to the uses of climate equity data and the geographic scale of analysis. The recommendations outlined below support both a state-level and local-level "lens" on climate equity.

As reflected in the neighborhood scale of climate and environmental justice screening tools, exposure to climate and environmental hazards varies significantly across different regions of the state, different parishes and municipalities, and even across neighborhoods. Similarly, place-based processes dictate patterns of investment, resilience in the built environment, racial inequity, economic prosperity, and access to resources for community self-determination. Co-benefits of climate mitigation, adaptation, and infrastructure investments are likely to occur in a manner specific to the local level. Better accounting for local climate costs and benefits at the regional, parish and local government, neighborhood, and even property levels remains technically challenging but critical to the effective allocation of resources.[14]

Just as the local scale is central to describing racial inequity and climate justice, decisions at the local scale play a critical role in the CAP's equity objectives.

Illustrating the multilevel nature of climate governance and the role of policy networks, local government action has in many cases preceded climate policies at the national and international level.[15] However, local climate action is determined not only by local emissions or climate risks but also by capacity.[16] Smaller towns, rural areas, and fiscally constrained places may have less capacity or will to invest in equitable climate resilience. Moreover, important decisions about land use and planning, building and permitting requirements, economic development, and housing occur at the local level – and thus can be subject to constraints of jurisdictional fragmentation and local competition for economic and fiscal resources.

Lessons from existing indicator resources: The case of screening tools

Recently, climate equity and environmental justice indicator tools and resources have proliferated. Many of these tools are linked to initiatives to prioritize equity, environmental justice, and climate change in federal, state, and local governments. While this remains a rapidly changing landscape at the time of writing, examples abound of screening tools, maps, dashboards, reports, composite indexes, and related presentations of data relevant to climate equity and environmental justice.

Our review in this section focuses on the special case of map-based screening tools. These tools help to illustrate the use cases, technical challenges, and conceptual issues with comprehensive approaches to climate equity and environmental justice indicators. To do so, we draw from recent reviews of screening tools that aim to assess and enhance their impact on equitable decisionmaking.[17]

To be clear, such screening tools are not necessarily new. CalEnviroScreen was created after California's adoption of an environmental justice action plan in 2004, and the EPA's EJScreen was first released to the public in 2015. However, the pace at which screening tools are being developed and released has quickened. Within the federal government alone, the Council of Environmental Quality released the Climate and Economic Justice Screening Tool (CEJST), and the EPA updated EJScreen in 2022. The Departments of Energy and Transportation have released similar resources, all in response to the Justice40 Initiative. An Indiana University report reviewed 19 screening and mapping tools in July, 2021, and an Urban Institute report reviewed 31 tools in November, 2022.[18]

As suggested by their growing numbers, map-based screening tools have emerged as a primary method of compiling and communicating environmental justice data for formal purposes in government regulatory and investment policies and to satisfy a variety of potential uses. However, these tools vary in their use of methods to communicate data on maps, which include direct reporting, percentile scores, rankings, indexes, and thresholds.[19] Each approach implies tradeoffs that might be more or less appropriate for specific uses. For example, direct data might best serve users who are at least a little familiar with the data they are looking at and are seeking details about a specific geography. Rankings may be better

suited to a less data-savvy audience that wants to understand how a geography of interest compares to another, or to their state overall. For some uses, mapping may not be the best approach – instead, charts and/or explanatory text might suit users' needs better.

Screening tools also vary in their degree of interactivity and the extent to which they provide access to unique state-level data in addition to more readily available national data. Fifteen of the 19 tools reviewed by researchers at Indiana University were interactive. The report points out that "[i]nteractive tools generally require some familiarity with the underlying data and comfort manipulating GIS-like platforms."[20] Though less flexible, static tools can be more accessible and easier to disseminate. The inclusion of state-specific administrative or other data can also help to capture state and local features beyond what is available from federal data sources. Ten of the 19 reviewed tools provided such data.

In a general sense, the implicit use case of screening tools is to identify overburdened and under-resourced communities for priority in decisions that may distribute potential benefits and harms unevenly. However, prioritization tasks can occur in different settings and by different users and audiences, and the diversity of ways that screening tools might be put into practice at the point of decision-making tends to amplify their limitations as usable, analytically rigorous tools. In short, ways to prioritize or identify eligible communities rely on strong assumptions and limited data, leading to difficult tradeoffs. These tradeoffs can have real stakes for the ability of communities to access benefits and to demonstrate that local priorities align with the policies of screening tools' sponsors in government.

Given the context, it is not surprising that screening tools often vary in terms of their key findings – the set of communities that are identified as vulnerable or overburdened and thus intended as priorities for investment.[21] Arguably no screening tool to date has proven to be deeply satisfying to all of its users, stakeholders in government, subject matter experts, or the communities described by the tools. In the appendix, we summarize some common challenges with the development of screening tools at a greater level of technical detail.

Even as the field of screening tools continues to develop rapidly, the following list summarizes best practices derived from recent reviews.

- Leverage public participation to prioritize community co-creation and engagement. Identifying disadvantaged communities and measures of benefit should be informed by community experience. The extent to which a screening tool validates lived experiences of disadvantaged communities is likely to be the primary criterion for success.
- Apply the right scale of analysis to the greatest extent possible (e.g., census block groups versus census tracts). Geographic analysis implies tradeoffs, and decisions should be made with careful considerations for the limitations and costs for usability.
- Include ways to assess relative disadvantage, not merely a binary classification such as a disadvantaged community or EJ community.

- Base analysis methods and information design choices on specific thresholds for determining which communities are identified as disadvantaged and defined targets for investment directed to these communities. To narrow their use case, screening tools should be aligned with specific policies that define how communities should be eligible and that establish how the screening tool will be tied to specific investments of resources.
- Incorporate the tools more deeply into government decision-making beyond targeting the benefits of investments. Screening tools can be used for regulatory compliance and enforcement, land use and zoning decisions, permitting, and other long-term plans.[22]
- Acknowledge limitations of data and aggregation methods and commit to regular, iterative improvement of the tool versions, as well as regular maintenance and updating based on the availability of current data.
- Include administrative data from state and/or local governments if possible.[23]

Screening tools are an increasingly important part of the landscape for data on climate equity and environmental justice. However, given the technical and political challenges of implementing them effectively, we highlight the importance of a broader approach to climate equity indicators rather than a single resource to meet all needs. The Recommendations section describes other frameworks for assessment that may provide more rigorous or comprehensive evidence in some decisionmaking settings.

Different resources for different purposes

To be a meaningful objective, climate equity must contend with historic patterns of environmental injustice and economic and political exclusion; differential exposures to immediate impacts and risks; and deep uncertainties about the way society and the economy will be organized in the future. Similarly, the actions outlined in the CAP affect a range of actors in government, as well as households, workers, and private companies that live, make a living, and do business in Louisiana. The potential applications for climate equity metrics are similarly wide-ranging, and no single resource is likely to meet all needs for promoting accountability, well-designed policies, and collective problem-solving.

Helping to frame the recommendations detailed below, the following two broad questions provide guidance for considering applications of climate equity data:

- What is the *use case* of the data – how does the audience engage with the data, and what are they supposed to do with the information?
- What *research question* does the analysis of data seek to answer?

Without articulating a clear, compelling use case or research question, any data-driven resource is likely to suffer from “scope creep” and to risk a poor balance

of tradeoffs and limitations that must be weighed during the process of its design and development. Such a study or data resource will likely fail to connect with, or even frustrate, its intended audience, whether that audience includes public- and private-sector decision-makers, advocates, service providers, members of the public, or academic researchers. Data becomes useful when focused on important questions and specific use cases.[24]

Table 1: Example of use cases and research questions for different kinds of equity metrics resources.

	Use case	Research question
Screening tool	Explore burdens and vulnerabilities and identify priority communities with respect to specific investments or regulations.	Where are overburdened/vulnerable communities that might benefit from policies or investments?
Impact assessment	Estimate the impact of actions.	What is the effect of action X on outcome Y? How is this effect distributed across different groups?

Thorough consideration of these questions informs the recommendations below. However, the CAP equity metrics strategy does not attempt to identify *every* possible use case and every research question. Rather, an effective strategy will:

1) Take a multi-pronged approach to broadly support CAP equity objectives.
2) Provide a bedrock of data and data-driven narrative as connective tissue to allow diverse research and data projects to flourish in an additive manner.
3) Establish a robust framework that can evolve as climate impacts, the policy landscape, and relevant data sources, current research, and policy and program questions change.

Specific resources meeting these criteria can be mapped onto a typology for climate equity data resources, as summarized in figure 3. In their relationship to equity-informed decision-making, resources may be either prospective or retrospective: they either analyze distribution of impacts in a future scenario or measure trends or impacts in the past or present. While these orientations to the past and future may not be mutually exclusive, they help to illustrate different kinds of evidence with different use cases. Further, the uses of climate equity data may range from broadly applicable resources – with an emphasis on accessibility, regular updates, and sustainability – to one-off analyses tailored to specific questions.

Together, the recommendations aim to advance a cohesive statewide "data intermediary" capacity for climate equity – embedding a set of practices that facilitate greater access to and use of data for equitable decisionmaking. More than any single research study or data product, this capacity is critical to leveraging data and evidence toward meeting Louisiana's climate goals equitably.

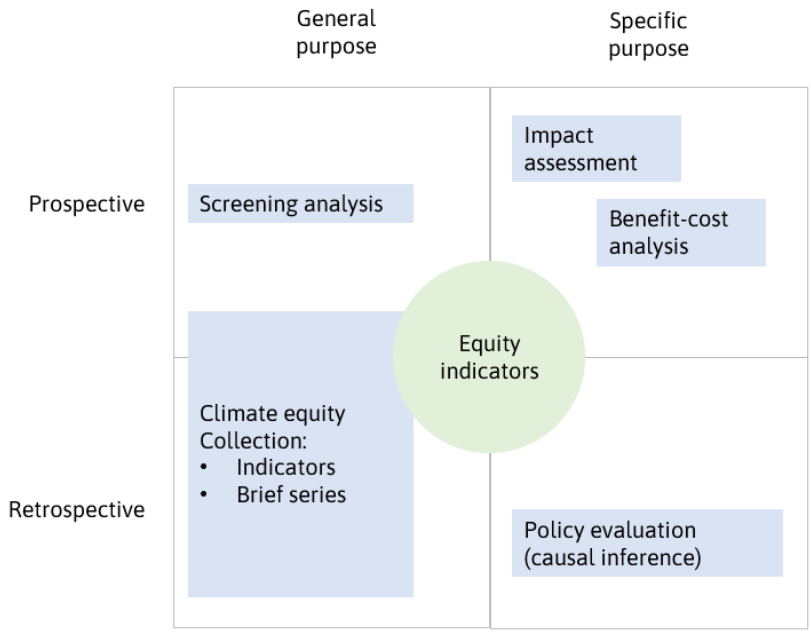


Figure 3: Taxonomy of equity data resources

The recommendations presented below reflect a view of decision-making as a complex, non-linear, and cyclical process. The policy process around climate equity specifically is characterized by actors with diverse interests, incentives, assumptions, and worldviews, all within a context of deep uncertainty around climate impacts and economic change and their implications for equity. This implies balancing ready accessibility of data and analysis on an ongoing basis with more formal methods of policy and impact evaluation.

3 Recommendations: An agenda for CAP Equity Metrics resources and research

1. Develop and maintain a core set of resources to make climate equity data available on an ongoing basis

The Data Center publishes a variety of indicator index reports or dashboards that feature a selection of indicators related to a research area or specific question. The data are presented as visualizations paired with explanatory text. These publications allow for access to a relatively comprehensive set of high-demand indicators that can be maintained and updated over time. More in-depth and topically-focused narrative "briefs" that tell precise research stories can also be an effective communication strategy for targeted recommendations or creating a shared understanding of a complex environment. We propose a similar pairing of an **indicator collection** with a **series of topical briefs** guided by the broad question, "What is the state of climate equity in Louisiana?" This general question corresponds with a range of use cases.

Decisionmakers across the state could benefit from access to a baseline collection of accessible, contextually relevant equity data. Many states have elected to create their environmental justice data tools in response to policy requirements such as executive orders issued by the governor, e.g., requiring that wood-burning industrial activities be located further than five miles from designated "EJ communities." An example of this kind of data-based vulnerability designation is Colorado's Environmental Justice Act, which legally defines a "disproportionately impacted community" as one that is low-income, a community of color, or housing cost burdened. Such criteria motivate a core purpose of screening tools. However, Louisiana has not adopted a similarly generalized standard at this time. Without a policy requirement that defines and prioritizes communities in specific, measurable terms, a climate equity and environmental justice data resource can best be framed as a way to inform conversations and advocacy around policy-making and the implementation of CAP actions.

Louisiana's unusually high level of industrial emissions creates a unique landscape for climate change mitigation policy, where mitigation actions will necessarily have a predominant focus on industry. Data can be used to show differential impact of industrial activity through an equity lens, connecting population and demographic data to data on environmental burdens. A collection of data that accomplishes this could further be used to focus mitigation actions on creating an outsized benefit to these historically and currently overburdened communities.

With these aspects in mind, we recommend first a level-setting, web-based collection of basic environmental and equity data to create a foundation for conversations around equity for many types of users. Second, to expand the depth and usability of this tool, we recommend publishing data-rich narrative briefs around certain domains of climate equity, including healthcare and housing.

Climate equity data collection

At the core of our recommendations is a "living" indicator collection that will lay out the state of environmental equity in Louisiana. This web-based "hub" resource will provide a baseline of descriptive indicators and shared understanding about the differential impact of climate change and adaptation. The section "**Suggested Climate Equity Indicators**" below proposes an initial set of indicators to be included in the collection, along with detailed data sources, links to CAP actions, and additional context for each indicator.

Some of the data collection will focus on Louisiana as a whole. Due to the availability of data at the statewide level, the detail of disaggregation by demographics will be more robust. This portion of the analysis will tell a cohesive story about climate equity for at the state level, with analyses like statewide pollution burden by race.

To support more localized exploration, users will also be able to approach the data collection from a particular parish using a feature like a drop-down menu. Once a user has specified a parish of interest, the state-level analysis may expand, populating with data and analysis specific to that parish. Alternatively, users can be taken to a separate page specific to a given theme and/or parish. Where possible, users would also be able to view and interact with data on the census tracts and census block groups within their parish of interest. This setup will allow for analysis of small area data to be presented in context of parish or state trends. This presentation also can facilitate the communication of caveats about data availability and reliability for small or rural geographies.

Available geographic detail varies by data source

A review of the possible geographies for each indicator is provided with in the section "Suggested Climate Equity Indicators." The geographies presented and analyzed for each indicator will depend on a variety of factors including reliability of the data and relevance of a given geographic aggregation to the narrative of climate equity.

The climate equity data collection's primary aim is to promote a shared, evidence-based understanding of climate equity issues across the state by providing access to a curated set of indicators on an ongoing basis. While broad, the scope of this understanding is necessarily limited by practical considerations to a manageable set of indicators, such as the *initial* set proposed in the section "Suggested Climate Equity Indicators." While it does not directly assess policies or identify overburdened or disadvantaged communities, the data collection aims to provide access to a baseline set of data relevant to these more specific use cases and applied research questions. Mainly, the indicator collection provides a point of reference for efforts to identify priority communities in a holistic manner.

The proposed indicator collection covers three major themes: **Income and Wellbeing**, **Exposure to Hazards**, and **Inclusive Economic Growth**. The final slate of indicators included under each theme aims to document the factors most crucial to understanding the story of climate equity in Louisiana while reflecting the needs and interests described by stakeholders. Other considerations included the ability to produce disaggregated indicators that can be updated over time. Due to the variation in data sources, each indicator differs in its specific limitations and availability of breakdowns by geographic level. Due to the complexity and variability of these measurement issues, some indicators included in the collection require additional development and iteration. Indeed, additional attention to these issues can have spillover benefits by focusing attention on the need for better measurement and more actionable data.

For some indicators, especially within the Income and Wellbeing theme, the data sources and method of reporting is straightforward – indicators are based on consistent methods of measurement and presented based on standard census geographies (e.g., census block groups and tracts, parishes, and the state as a whole). For others, the data's underlying measurement and presentation is more complex and less standardized. While specific suggestions are provided below under "Suggested Climate Equity Indicators," we flag the following indicators as requiring additional feedback from stakeholders and technical experts as a critical component of the design phase of the indicator collection.

Exposure to pollutants and climate hazards. The landscape of data on emissions, exposure to pollutants, and other climate hazards is vast. For example, depending on the resource, it is possible to measure the presence of over 100 pollutant types or access a composite index which combines the presence of particularly dangerous toxins. Most air pollutant data is available at the point-source level, so in order to compare air emissions to data about demographics or socioeconomic status, it must be aggregated to census boundaries. Air pollutants exposure data is often found in the form of an index which combines vulnerability to pollutants with socioeconomic variables to identify places which are particularly vulnerable to the negative impacts of climate change and pollution. Despite the apparent wealth of data, community-members and scientists frequently raise valid concerns about the credibility of practices for measuring and summarizing exposure to environmental hazards.

Measuring pollutants and air emissions

While it is possible to measure the concentration of dangerous toxins in a specific geography, measuring cumulative *exposure* to pollutants requires combining disparate and often inadequately measured data. Air emissions can be monitored through *ambient air quality monitoring* and *stationary source emissions monitoring*. Ambient air quality monitoring measures samples of ambient air pollutants to assess the state of the atmosphere in a specific geographic area. Stationary source emissions monitoring collects data at the source of emissions, such as a facility or plant to determine whether the source meets emissions requirements.[25]

This variability can lead to comparability and completeness issues. For example, the majority of methane data is calculated rather than directly measured.[26] Methane emissions can be estimated either from multiplying facility presence and activity by emission factors, or by measuring atmospheric methane presence with satellite sensors to infer emissions. According to the International Energy Agency (IEA), "some of the largest emitting events are the result of accidents and unpredictable process failures" but these events are rarely included in the emissions inventories.[27]

When using air pollutants data, it is important to note the variety of ways that emissions data is collected and that most often, the numbers are an underestimate. The most accurate measurement of air pollutants data is contained in localized monitoring of a specific facility or pollutant to measure the quality of the emissions data. Examples of this include an EPA study investigating the reported amount of benzene released from a Valero Energy refinery in Houston in 2017 and a 2021 investigation by multiple environmental groups into the EPA's measurement of greenhouse gas emissions from US landfills.[28]

Inclusive access to jobs. Data on employment typically does not directly align with efforts to understand the consequences of climate adaptation and energy transitions in the industrial sector. A key step involves defining these jobs in ways that can be measured, as climate and energy transitions do not map nearly onto standard industry and occupation categories available in conventional data sources from federal sources.[29] Nationally and in other local areas, various definitions of "green jobs" and related concepts have been offered. These definitions might have less relevance for Louisiana due to the distinctive nature of its energy and coastal economies. Clear definitions of jobs can help to illustrate the stakes of an industrial transition in concrete terms for workers and local economies. Moreover, the ability to disaggregate the composition of segments of the workforce by demographics, industry and occupation, geography, and job quality depends on how these segments align with available data sources.

Finally, the indicator collection should be designed and developed in a modular format. Such a format would ensure that additional indicators can be added as new data comes available or as new priorities emerge, while helping to ensure that the collection as a whole endures as a resource for tracking climate equity. From the start, the resource should be implemented in a sustainable manner, such that its content can be updated and iterated over time. Thus, like other effective indicator resources, the climate equity indicator collection is envisioned as a "living" product.

For illustration purposes, the appendix describes a possible structure for the climate equity indicator collection and mode of navigation.

Series of briefs accompanying updates of the data collection

Climate equity is a layered topic, and there are countless ways to configure just about any data to relate to climate equity. Feedback from stakeholders helped to sift through some of this abundance. During public feedback meetings, many concepts for stories about climate equity in Louisiana were surfaced, including "Overall health and well-being, including education, are part of the story of LA outmigration," and "Lack of access to safe housing (free of pollution, climate resilient) and property values plummeting especially in Cancer Alley and other industrial corridors." The premium on accessibility and regular updates for the indicator collection may struggle to convey the richness of these stories without a deliberate effort to provide deeper context for the data.

To accompany updates to the climate equity indicator collection, we recommend an ongoing series of very short briefs that dive into particular stories. Rather than a comprehensive narrative of the data, each brief would focus on a specific topic, and we would anticipate releasing new briefs as new issues become relevant. For example, new policy ideas, updates on implemented policies, or summaries of storm/disaster responses could be featured in the briefs.

Because the briefs will "live" on the same site as the indicator collection, the intention is that both resources reinforce one another. At a minimum, briefs would be released to coincide with annual updates of the data collection, providing an opportunity to refocus attention on the data and a lure for stakeholders and media to engage with updates. Salient topics can be identified with initial stakeholder feedback as well as ongoing participation from the Climate Equity Taskforce and the public. Data cited in the briefs may focus on the baseline data collection described above, though it need not be limited to indicators published and updated on an ongoing basis in the collection. The briefs could also include highlights of additional research on climate equity in Louisiana.

Based on stakeholder feedback, an agenda of suggested topics may include:[30]

- Housing quality and access, including home insurance and property values
- Impacts on and expectations of workers most impacted by CAP actions

- Health and healthcare access and outcomes
- Issues with measuring climate and environmental hazards
- Parish capacity
- Zoning and permitting

To aid in accessibility, the briefs should have a consistent format to provide a deeper dive into a specific issue while touching on the set of climate equity indicators more generally, all while retaining a concise length. To that end, each brief might include:

- A short narrative recap of a subset of indicators drawn from the climate equity indicator collection. Attention might focus on changes, long-term trends, or new indicators.
- If possible, concise highlights of any newsworthy developments or recent research relevant to climate equity in Louisiana. Include links to new articles, policy briefs, or research studies if possible.
- The brief's "deeper dive" topic, which would account for most of the brief's length. This portion should be relatively comprehensive and aim to provide story-driven insights and nuances beyond descriptive indicators, such as elevating critical barriers and opportunities. Review and/or co-authorship with experts can greatly facilitate the relevancy and nuance of the story. This section might draw from existing research studies or include new analysis that presents data in a more tailored way, complementing the standardized presentation on the climate equity indicator collection.
- Every brief should include examples of promising initiatives or stories of action, empowerment, and innovation within Louisiana communities. If relevant, inspiring experiences drawn from outside of the state could also fit well.

Potential timeline for product releases

Core data collection	Briefs	Timeframe
Core data collection "hub" website	Executive summary/"State of Climate Equity in Data" brief	Initial launch

Core data collection	Briefs	Timeframe
New indicators from story briefs as appropriate (robust, updatable, relevant to the purpose of the core data collection, and/or available for range of geographies)	Short briefs on key climate equity stories; e.g., housing, healthcare, and specific industry and worker interests	3-month intervals over first year after launch
First data update	Executive summary/brief reviewing update	One year to 18 months after initial launch
Rolling consideration of additional indicators	Briefs on timely or novel topics; e.g. new policies, progress of CAP, outcomes of new disasters	Every 6 - 8 months after first year or as-needed
Annual data updates	Executive summaries of updates	Life of project

Summary of recommendations for the core set of climate equity data resources

- *Develop, publish, and regularly update a user-friendly collection of climate equity indicators capable of meeting a wide range of uses for different audiences.* These indicators should be collected into a "hub" website that provides accessible navigation and context on what is being measured by each indicator and why it is important.
- *In conjunction with the climate equity indicator collection, publish a series of accessible briefs to provide context for interpreting the indicators.* The topics should summarize changes in specific indicators and highlight specific issues in an engaging, accessible format.
- *The indicator collection should be designed and developed to ensure the durability of these core equity metrics resources after their initial creation.* These resources should be planned, designed, and supported in a manner that supports regular updates, robust iteration of design and content over time, and a sufficiently modular design that it can be served to websites inside and outside of government.

2. Build capacity for equitable data and decisionmaking in government

Assessing local capacity

Local capacity was a key issue raised during stakeholder feedback. Essentially, many of the decisions around the implementation of the CAP (and equity generally) are carried out by parish governments and employees. However, many of Louisiana's parishes have limited capacity to evaluate or modify policies and practices to promote equity. Structural barriers, jurisdictional fragmentation, and administrative burden may also be obstacles to parishes' full participation in furthering CAP objectives, including climate equity. There may also be interest in training government employees of all types in how their job tasks relate to equity. While resources exist to address government capacity issues around equity (e.g., Government Alliance on Race and Equity), local governments vary in the extent to which they pursue these goals.

While local capacity remains a critical issue worthy of further study, we specifically highlight local *data* capacity as a related symptom experienced by under-resourced governments. Improving data capacity does require an investment of time and effort on the front end, something already-strapped governments may only have in short supply. However, resources exist to help local governments over these hurdles to establishing good data practices, and as a government's use if its own data improves, an outsize payoff in improvements to efficiency and processes can follow. Many of these resources and the principles they promote are also relevant to state government.

A common strategy for improving government data capacity involves leveraging administrative data (data collected as part of management or operations), which can be made available to the public and applied to decisionmaking. Local governments can follow a path that at this point is fairly well-traveled, taking guidance from other local governments and the non-profit organizations that support their data infrastructure development to identify and publish data that benefits the public and increases government transparency. Sunlight Foundation, for example, provides a framework called "Tactical Data Engagement" aimed at local governments. The framework outlines a range of stages of deploying open data locally, from actions that improve data for public consumption to applying this data to improve operations. The implementation of the framework is concerned with the reality that local governments must generally balance between feasibility and desired impact, and provides tools such as self-assessments and workshop plans. The Tactical Data Engagement approach is counted among best practices for the What Works Cities Certification, which Baton Rouge and New Orleans have received for their open data work. What Works Cities provides free support to cities pursuing certification. There is a trove of free support documentation on the Sunlight Foundation's archived website, including examples of open data plans and policies, technical insight on software, and answers to legal questions about licensing and liability.

This data capacity problem also exists in state government, where many agencies operate with independent data systems, policies, and standards. To improve state-level data capacity, it is important to first map the administrative data to the departments that own them; stakeholders must know where the data they need should be coming from, including technical details like the software system used to generate, store, or analyze the data. From this foundational understanding of Louisiana's administrative data landscape, greater efficiency and transparency can be developed. For example, once stakeholders have a clear picture of available data for equitable decisionmaking, they can take steps to adjust policies and practices to allow for the disaggregation of data by race, ethnicity, and sex, e.g., for business procurement data. Such a baseline analysis could also serve as a starting point for detailed policy that sets out the types of analyses we need to perform, and the data they would require, as we strive for climate equity.

Sometimes, the path to improve open data is simply to modernize the existing web interface to access that data. While preparing this report, we heard from one climate expert who recounted developing a complex web scrape to access some environmental data – data that was already public, just very cumbersome to access. Situations like this leave the majority of stakeholders disconnected from information that could improve their engagement with high-impact initiatives like the CAP.

Related work in open contracting through organizations like the Open Contracting Partnership could help governments and community members build trust and evaluate equity around contract work related to the implementation of the CAP.

Municipalities, parishes, and the State alike can approach improvements to data transparency with executive-led policies or as administrative policies that endure across administrations. One more accessible goal of a government can be to shift the stance on public data to one in which data is "open by default;" that is, government executives already have the authority to set department policies around when and how public data is made available to constituents. As it stands now, this data is generally only available via public records requests, a burdensome process that can be greatly reduced by good open data practices. When more data is accessible, operations may also see an improvement. Citizens can engage in using that data, and public conversations around governance can shift from confrontational to collaborative.

Analysis on the topics of government capacity and data capacity alike will aim to provide context that supports special consideration of or allocation of resources to low-capacity parishes as the CAP actions are implemented. This topic may also be appropriate to cover in the brief series detailed earlier.

Toolkit for screening tools

As described above, many screening tools already exist and have even undergone multiple rounds of public feedback. Though they typically serve a more specific,

technically advanced audience in practice, they have a trove of data points and useful functionality. Federal tools offer nationally consistent data sets that allow for comparison to communities outside Louisiana. These tools may be useful when applying for federal dollars, communicating with local or external stakeholders, or in regulatory decisionmaking.

While these tools can support a range of decisions at the state and local level, short of a binding requirement for defining and prioritizing specific communities, there is not a single sufficiently well-defined use case to design an effective state-level screening tool. Indeed, previous reviews have noted that many tools lacked a defined purpose at the time of their creation.[31] An explicit use case informs critical decisions about which indicators and data sources to include, how to engage community-members and experts in the creation of the tool, and how the tool should function.

The lack of a well-defined use case is also likely to amplify the inherent limitations of screening tools when put into practice for complex decision-making (see Appendix). Still, a range of potential use cases at the state and local levels might benefit from guidance on exploring climate, environmental, and economic burdens across geographies or assessing impacts on vulnerable areas in a way that balances limitations with practical usefulness.

We recommend creating a toolkit for Louisiana users with different needs to get the most out of these robust tools. For stakeholders in state government, a central objective of the toolkit would be to enhance capacity to use screening tools in alignment with evolving federal guidelines for regulatory review and demonstration of benefits for disadvantaged and overburdened communities (i.e., Justice40). Guidance could include highlighting relevant variables, suggesting meaningful comparisons, and outlining the best use of features like side-by-side maps or selecting thresholds and other options with a flexible tool like EJScreen. The toolkit should be:

- Designed around the needs of specific audiences.
- Regularly updated, especially as the landscape of screening tools continues to evolve.
- Tailored to different, high impact use cases that require accomplishing specific tasks.
- Grounded in the limitations of screening tools, such as those reviewed above and in the Appendix.

Opportunities to better use administrative data for accountability, transparency, and assessment

Most of the indicators suggested below rely on conventional federal government data sources. The State of Louisiana also collects a wide range of data for administrative purposes. Undoubtedly, some of this data could be leveraged to develop equity indicators. At the start of the COVID-19 pandemic, for example,

some state agencies stood up new data reporting tools in response to equity concerns in an emergent situation. The Department of Health and Hospitals published disaggregated vaccination data, and the Workforce Commission published expanded summaries of unemployment insurance claims data. The Data Center used both in its own COVID data resources and briefs.

The mere act of making this kind of data more accessible, e.g., in a single data portal and with consistent metadata, can promote transparency and further equity goals, especially when the data provides greater insight into government services, policies, and programs or issues where data is otherwise sparse. This is why cities like New Orleans and Baton Rouge maintain their own open data portals. Some states do the same. In Louisiana, administrative information is often published by individual departments and agencies (Health and Hospitals, Environmental Quality, Transportation and Development, etc.), but this information may be difficult to discover and inconsistent across the publishing agencies. Much of what could in theory be published is not in practice; in many cases, this is likely because the data is maintained in a way that cannot be easily published in a searchable portal with consistent metadata. The disconnected, resource-constrained nature of government data systems can hinder the ability to leverage open data as a public good.[32][33]

Increasingly, policymakers and researchers also recognize the value of linked administrative data that, for example, tracks an individual's administrative record across multiple programs, agencies, or databases. By partnering with researchers, this data can shed light on interconnected dynamics that cut across focus areas of individual agencies and deliver insights beyond the purview of a single agency. Linking administrative data remains a complex process, but advances in database design, record linking procedures, machine learning and causal inference, and privacy protection continue to lower the costs and enhance the potential benefits of administrative data linking initiatives. Recently, the emphasis on co-production in both public services and research studies (especially research on environmental issues) can provide opportunities for innovative ways to activate administrative data in collaboration with government, research, and community stakeholders.

Given the range of programs that generate administrative data and procedures for data management in place across state government, unlocking administrative data faces barriers ranging from technical challenges, to the capacity of staff and other resources, to privacy and confidentiality restrictions. While a full accounting of opportunities, best practices, and use cases for more open administrative data is beyond the scope of this report, our recommendation is merely to highlight that opportunities to further equity and transparency with administrative data likely exist now and will continue to be more feasible in the future. Government and stakeholders should continue to explore the potential of more comprehensive, integrated, and equity-informed data practices in government.

Summary of recommendations for building capacity for equitable data and decision-making in government

- *Assess local capacity for climate equity, including ways to use data to more effectively drive partnerships across jurisdictions and levels of government.* Local action can be both a key driver and barrier to equitable outcomes, but capacity for equitable decision-making and access to resources designed to promote equity varies. Data can help drive equity outcomes and effective partnerships across jurisdictions and across levels of government.
- *Develop a toolkit for using EJScreen and other federal screening data resources to identify priority communities and conduct screening assessments.* The terrain of climate and environmental justice tools continues to evolve rapidly. Available resources can be harnessed in a way that balances integration with federal priorities and state and local context.
- *Identify opportunities to leverage administrative data in state government to support accountability and enable actionable insights on climate equity and CAP actions.* Administrative data can help to support procedural equity, cutting edge research, accountability and transparency, and an infrastructure of equitable data.

3. Commit to rigorous assessment of equity impacts throughout the process of CAP implementation

As with the impacts of any policy change, analysis of the equity impacts of climate actions can be performed *before* or *after* implementation.[34] However, these kinds of assessments use different methods and serve different purposes. Below, we discuss each individually in relation to equity objectives of the CAP and from a perspective that is primarily quantitative and focused on distributional (rather than procedural) outcomes. Since quantitative assessments can play an important role in evidence-based decisionmaking, they should aspire to be transparent with regard to their methods and assumptions, key limitations, and practical strengths and weaknesses for different applications. Given the breadth and evolving nature of approaches to equity assessment, it is worth repeating a key finding from a 2021 report from the federal Office of Management and Budget:

> A broad range of assessment frameworks and data and measurement tools have been developed to assess equity, but equity assessment remains a nascent and evolving science and practice.[35]

Assessing equity impacts before implementation

Attempts to quantify the impact of a policy change, program, or other intervention on critical outcomes and impacts can provide critical insight into decisionmaking before an intervention occurs. This type of analysis is a fundamentally forward-looking, future-oriented, and speculative exercise, occurring without the benefit of data on what happened after the intervention. The aim is to provide actionable insight into the prospects of alternative courses of action,[36] given uncertainty about how those alternatives might play out in the future.

Assessment can address critical questions during the process of CAP implementation:

- How should various CAP actions be prioritized in a manner that accounts for the distribution of impacts?
- How should various CAP actions be designed and implemented to reduce the potential for inequitable impacts and to optimize benefit for marginalized and overburdened communities?
- What future needs, costs and benefits, and other consequences might arise in response to CAP actions?

Assessment methods can be wide-ranging, both with respect to their conceptual underpinnings and their approach to providing recommendations. All involve careful consideration of uncertainty and assumptions behind the analysis, which provide opportunities for stakeholder feedback.

In a sense, the use of climate and environmental justice screening tools form a kind of general-purpose, surface-level assessment – as implied by the term *screening*. Screening tools emphasize location in evaluating exposure to costs and benefits. On the other end of the spectrum are methods that attempt to account for and quantify all potential costs and benefits. Below, we briefly discuss three general approaches to assessing policies before implementation that have some relationship to CAP actions. This is intended not as a comprehensive summary of policy analysis methods but as a way to highlight the strengths and weaknesses of existing frameworks for policy assessment in relation to climate equity.

Screening analysis

In addition to their main function of identifying priority communities, screening tools can be used to explore the potential impacts of a decision based on the location of its effects. Typically, climate and environmental justice screening tools – and related map-based presentations of data – identify areas with climate vulnerability or other environmental burdens. Their advantage is that they provide access to a wide range of population and environmental data in a consistent format and often summarized in a manner that combines data from different sources. Many screening analyses also attempt to quantify the important but hard-to-measure notion of cumulative burden in an actionable way. The combination of measures in CalEnviroScreen is described as an attempt to allow for assessments of *cumulative* impact from environmental hazards and population factors like health and socio-economic status.

The term *screening* is apt. Tools of this nature are broad but not deep and best used to identify potential equity concerns or as one preliminary component of a more thorough assessment of equity impacts. For example, on the EJScreen website, the EPA is transparent about the tool's limitations. Environmental indicators are only "screening-level proxies for actual health impacts." Along with the considerable uncertainty and incompleteness of included indicators, the tool's authors conclude that "it is generally not appropriate to rely on any screening tool as the basis for a key decision." Rather these tools are intended to be supplemented with additional information and local knowledge. The main benefit of these tools is their comprehensiveness and consistency.

The most well-defined use case for screening tools is for adherence to regulations and for demonstrating need in grant applications. Screening tools may also identify the potential for disparate or inequitable impacts that should be subjected to further study, as in a more thorough impact assessment.

Impact assessment

Impact assessments attempt a more in-depth and structured analysis tailored to specific decisions – we use the term "impact assessment" here in a broad manner to differentiate it from screening analysis. Impact assessments attempt to provide information for making decisions on proposed interventions and their

alternatives and to promote transparency. These assessments may be required by regulation or statute, as with Environmental Impact Statements required by the National Environmental Policy Act. However, they may also be initiated in a less formal or elective manner in order to support decision making, which we discuss here. For example, the Louisiana Energy Policy Simulator, which was designed to support the development of the CAP, is an example of an assessment tool. It was designed for a specific use case: to facilitate data-driven comparison of alternatives for charting a path to reduced GHG emissions.

As another example, **Health Impact Assessment** (HIA) is a decision-support tool being utilized by EPA to promote sustainable and healthy communities.[37] According to the EPA, HIAs consider the full range of potential of positive and negative impacts of a decision. They:

- Determine the potential effects of a proposed decision on the health of a population and the distribution of those effects within the population;
- Consider input from stakeholders, including those impacted by the decision;
- Use different types of qualitative and quantitative evidence and analytical methods;
- Are flexible based on available time and resources; and
- Provide evidence and recommendations to decision-makers in a timely manner.

A natural application of screening tools, the first step of HIA is screening to determine whether potential health impacts warrant further assessment. However, the actual assessment is not prescriptive with respect to method, and a range of quantitative and qualitative data may be used to profile a community and assess impacts.

Practices vary, but there is a wealth of literature recommending best practices in executing HIAs. Best practices stress the engagement of stakeholders, especially vulnerable populations; consideration of the comprehensive effects of a proposal on social determinants of health and health equity in addition to health outcomes; and planning for ongoing monitoring and evaluation. While HIAs provide a framework for equity assessment, they also experience challenges from data gaps, inconsistent application across different levels of government, and variable approaches to methodology and transparency.[38]

In a review study, the EPA noted that most HIAs are conducted voluntarily, either on behalf of the sponsor of a proposal for "decision-support" purposes or conducted for "advocacy" purposes by external groups (e.g., non-governmental organizations) or by affected community-members who are not decision-makers but that wish to ensure health concerns are adequately addressed. However, in some cases, HIAs may also be mandated by regulatory or statutory requirements.[39]

Economic impact analysis is another common type of impact assessment with a very different set of key assumptions and practices. Economic impact analysis

seeks to quantify the effect of a change on an area's economy. These studies may be conducted on major investments in infrastructure or private facilities, often to make a case in favor of the investment or to assess the consequences of economic development projects and incentives. The impact estimates are based on "input-output" models that describe the trade relationships among industries within an economy, which can be used to estimate a "multiplier effect" of changes as they reverberate through an economy. Economic impact analysis often reports short-term estimates of the number of jobs created, business revenue, or tax revenue that would result from a change in the economy.

While economic impact analysis can provide useful insight into the effects of a change on planning, economic development, and workforce development concerns, they also have limitations when used to assess policy decisions. These models are often least helpful when substantial changes are occurring, as changes in market conditions and the structure of local economies can distort estimates based on data from the past.[40] More importantly, these studies often are sponsored by proponents of a project or action and used to generate summary projections of large numbers of jobs or earnings impacts without sufficient nuance or effort to compare alternatives or quantify costs. Questions about the quality of jobs, who might fill them, and spillover impacts on other industries, public services, and infrastructure are often left unaddressed by economic impact studies. Counting jobs and economic impacts can be compelling for decisionmakers and communities alike, giving an impression of benefit without further attempts to assess the economic value of benefits *and* costs in a rigorous way.

Both HIAs and economic impact analysis imply a weighing of costs and benefits without necessarily rendering net benefits explicit – or their distributional impacts. In practice, health, economic, and environmental justice screening assessments may be presented alongside formal benefit-cost analysis rather than formally integrated, partly due to the complexities of accounting for costs and benefits.

Benefit-cost analysis

As a formal, theoretically grounded, widely used, and long-standing method of policy assessment with significant applications to climate and other environmental policies, benefit-cost analysis (BCA) provides an illustrative baseline for considering the practical challenges of equity-informed policy assessment. In general terms, BCA seeks to quantify in monetary terms the benefits and costs of an intervention to all members of society. Many of the technical challenges of BCA ultimately stem from attempting to convert health, well-being, and enjoyment – or "utility" in the language of economics – into dollar values that can be compared with more easily measured monetary costs and benefits. However, with its potential for bias against equitable outcomes, distorted and imprecise accounting of costs and benefits, and contradictions with rights-based frameworks for policy assessment, BCA also illustrates the challenges of incorporating equity into formal decisionmaking frameworks. Nonetheless, BCA remains a

mainstream framework for assessing environmental policies and regulations, and it plays a role in climate policy assessment. Ways to better incorporate equity into BCA and related decision-support methods remains an active and evolving field of debate and practice, and these issues are reviewed here at a high level.

BCA provides a way to evaluate alternatives when market failures or distortions lead to socially inefficient outcomes. Excessive GHG emissions exemplify such a market distortion: the market price to producers and consumers of fossil fuel energy does not capture social costs to others, leading to emissions exceeding socially optimal levels. However, specific challenges to incorporating equity and climate change into a BCA framework also illustrate some of the most common general criticisms of BCA.[41] First, BCA stands on a foundation of utilitarian efficiency, not equity. Maximizing aggregate social welfare often implies uncomfortable tradeoffs in distributing benefits for some at the cost of others. Because benefits and costs are quantified based on willingness or ability to pay, conventional benefit-cost calculations can place more value on the interests of those with more assets or higher incomes, (i.e., a greater willingness to pay). Second, BCA requires strong assumptions to convert many benefits and costs to monetary values, such as health, quality of life, access to amenities and exposure to disamenities, and the present value of costs and benefits that occur in the future. With significant costs and benefits likely to occur in the future, BCA for climate change policy is especially sensitive to uncertainties concerning what impacts might happen over time, how to value these impacts, and how to describe tradeoffs between the present and the future. Third, while BCA aims to offer an objective way to assess remedies for market failures and imperfections, the rigid, quantification of BCA often departs from the realities of political priorities and decisionmaking processes. Finally, practical limitations of data on costs and benefits and uncertainty about how they will occur in the future can undermine the ability of BCA to find optimal social benefits. Partly due to these limiatations, BCA in practice is often applied to a limited set of metrics – for which there is data and a clear a decision criteria – rather than a more complete accounting of social welfare.

inequity in valuing costs and benefits

Traditional BCA is motivated by an efficiency criterion: a change has a net benefit if those who benefit could hypothetically fully compensate those who lose (i.e., the Kaldor-Hicks criterion). If this criterion is met, an intervention passes the BCA test. To assess this criterion, BCA must assign values to anticipated costs and benefits in a consistent unit, such as a dollar; but this determination typically does not take into account how the costs and benefits are distributed among those better or worse off in terms of initial income, wealth, health, or other measures of well-being. One example of how this bias can play out is in BCA for flood protection infrastructure: areas where most residents are low-income people and people of color tend to have lower property values and thus are weighted less than well-resourced areas when accounting for the cost of flooding and the benefit of investments in risk reduction. Since this pattern of inequitable asset valuation stems from processes of residential segregation, uneven investment, and disproportionate exposure to environmental hazards, a naive application of BCA can have the consequence of exacerbating inequity.

In addition to normative and ethical justifications, there are also economic arguments for incorporating equity into cost benefit analysis.[42] Income has a diminishing marginal utility: one dollar of benefit is worth more to an individual with less income and wealth than it is to an individual with more financial resources. Conventional BCA, however, does not account for this diminishing utility. By giving greater weight to the preferences of people with high levels of income and assets, BCA can bias the evaluation in favor of high-income and wealthy individuals. In addition, growing income and wealth inequality has a cost on society as a whole. Poverty, financial precarity, lack of economic opportunity, and exposure to environmental hazards and disasters impose direct costs on government services at all levels. Many studies have also highlighted a negative link between income inequality and health outcomes and labor productivity.[43]

The practice of BCA is often governed by different regulatory requirements and norms in different areas of government, but several methods have been proposed to correct BCA's distortion of equity outcomes. While the lowest bar involves simply breaking out and attempting to quantify distributional impacts when assessing policy alternatives, more explicit methods for incorporating equity into BCA and related decision-support tools merit further exploration.

Equity or distributional weighting attempts to correct for the fact that a dollar is worth more to people with fewer financial resources. While equity-weighting can be performed as a supplement to traditional BCA without major changes to regulatory requirements, the extent of its use depends on policies governing regulatory review. Several methods to determine equity weights have been proposed,[44] but these approaches are not necessarily common or standardized at the time

of writing. Indeed, incorporating equity into regulatory review is also currently being assessed at the federal level as part of a whole-of-government equity agenda.[45] There remain practical and political barriers to implementing equity weights in mainstream BCA practice, which often departs in important ways from BCA theory.[46] Generally, equity-weighting methods are recommended when a policy change implies a tradeoff between efficiency and inequality in the income or wealth distribution.[47]

An additional challenge for using BCA to assess climate actions is the use of discount rates to quantify costs and benefits in the future. Over long time horizons on the scale of climate policy impacts, BCA is sensitive to the choice of discount rate. The stakes of the discount rate question are well illustrated by the response to the influential 2008 *Stern Review on the Economics of Climate Change*, which used a relatively low social discount rate to establish an economic case for strong climate policy, and again more recently in changes to the social cost of carbon adopted by the federal government, which hinged on politically charged choices of discount rate.[48] Since climate impacts will likely grow in the future, low discount rates lead to lower present values in the calculation of costs and benefits.

In short, the way equity and climate policy factor into a BCA framework remains an evolving landscape and an active field of research. At the same time, application of BCA is uneven within state and local government. BCAs and related policy assessments are often conducted when required by state or federal law for permitting or funding authorization, and often simplified such that they do not attempt to provide a full accounting of the social welfare impacts of a project. Given clear barriers to assessing CAP actions and related decisions in a full, equity-informed BCA framework, a pragmatic approach is recommended. In an ideal scenario, a BCA framework aims to provide a decision criterion. However, when conducted with transparency and sensitivity to the systemic drivers of inequity, BCA can be just as useful as a tool for mapping out distributional impacts and clarifying sources of uncertainty. Sensitivity to the equity concerns that have been raised regarding BCA is likely to point the way toward pragmatic methods of assessing equity outcomes, capable of comparing alternatives, addressing uncertainty, and avoiding biases that can undermine equity objectives.

Pragmatism and innovation in equity assessment

Incorporating equity into decision-making is an end-to-end task that occurs primarily through participatory planning and policy processes, yet there are often critical moments when analysis is conducted, impacts are quantified, and evidence is weighed in decisions. These assessments may be sponsored or commissioned by government or stakeholder groups, required components of processes governed by regulations and procedures, or led by impacted communities. Opportunities exist to extend and deepen the manner that equity is incorporated into the way decisions are assessed and alternatives are weighed. Some of these might be entail significant initiatives to develop and deploy innovative technical approaches. Others might involve more incremental ways

to mitigate bias in existing methods, to help communities arm themselves with data and evidence, and to enhance the way existing assessment practices engage with equity impacts. Table 3 summarizes strengths and weaknesses of some of the current methods for assessing equity issues related to the CAP.

Table 3: Strengths and weaknesses of assessing climate action alternatives.

framework	strengths	weaknesses
Screening analysis	Provide accessible data from disparate sources to identify equity concerns or justify action, summarize intersecting equity issues	Surface-level, broad use case leaves them imprecise
Health impact assessment	View health comprehensively (social determinants of health), prioritize health equity and stakeholder input, leverage multiple kinds of evidence (qualitative, quantitative, lived experience), can include retrospective evaluation plan, can be used to assess alternatives	Often project-based and more common for local decisions, not necessarily mandated, costly and not necessarily easy to replicate
Economic impact analysis	Provides useful descriptive insight into the interconnected nature of local and state economies, can be used to asses alternatives	Often used to "count jobs" or other benefits to generate support for projects or incentives without assessing costs, rarely tied to retrospective evaluations, rarely address the dynamic nature of economies, rarely use alternative scenarios

framework	strengths	weaknesses
Cost-benefit analysis	Based on rigorous links to decision and public welfare theories and established quantitative methods, illuminate tradeoffs, often used to asses alternatives systematically, provides clear and measurable decision criteria	Requires strong assumptions about uncertainty and valuation, does not necessarily account for – and can distort – equity, methods for addressing equity are less well-established, does not necessarily incorporate qualitative analysis and lived experience, can narrowly impose utilitarian decision criteria

CAP actions should be examined for their potential distributional effect, even if the analysis is limited to simplified and short-term effects and uses available simulation and modeling tools where applicable. For example, economic impact analysis (or input-output modeling) is already widely used to motivate policy decisions. While the standard practice of "counting jobs" can distort beneficial impacts, the principles of input-output modeling can be extended to explore impacts by race, gender, and occupation; to include environmental inputs and outputs; and to account for price changes due to the changing cost of energy or other resources. The Louisiana Energy Policy Simulator tool was designed to evaluate different proposed greenhouse gas mitigation policies for meeting Louisiana's climate goals. Combining its simulations with other sources of data can be used to generate illustrative extrapolations of the distributional impacts of emissions reduction scenarios. Even with their limitations, such evaluations can serve as "next best" equity assessments, informing CAP implementation and sparking progress toward rigorously considering distributional impacts as a standard practice in designing regulations, policies, and programs. What is most required is an iterative, sustained commitment to growing and using the toolbox of equity assessment.

Assessing equity impacts after implementation

After a policy or program has been implemented, assessing its impact using data from before and after the intervention can contribute to good governance, accountability, and evidence-based policy-making. Retrospective policy and program evaluations attempt to directly assess the impact of a given intervention, contributing to knowledge about what works and what doesn't. Indeed, the most compelling evidence often comes from evaluations conducted in other places that

have implemented a policy or program under consideration. In this manner, evaluations play a key role in modifying, scaling up, and transferring policies and programs.

To be clear, tracking and communicating indicators on an ongoing basis can also be useful, but such a resource provides only descriptive information insufficient to assess the impacts of climate actions or climate-related stressors. If measures of racial disparities in housing cost burden or income inequality change in the future, it could be due to climate impacts or related policy, or it could be due to underlying changes in the economy or demographic composition. These problems require approaches to evaluation with methods tailored to specific research questions.

Mainstream quantitative evaluation uses techniques of causal inference to disentangle correlation from causation.[49] These techniques are often used to investigate questions like the following:

- How much did a given CAP action impact a given equity outcome, or how were its impacts distributed across different population subgroups or places?
- How have key measures of racial inequality, economic prosperity, and health outcomes improved since the implementation of the CAP?
- Did a pilot program have its intended effect, and how can it be scaled up?

Causal inference can also be used to quantify the effects of climate stressors on equity measures (e.g., how does differential exposure to risk, chronic stressors, or acute disaster events exacerbate inequity?). However, the discussion here focuses on policy and program interventions.

Conceptually, causal inference can be thought of as a formal way of asking and answering "what if?" questions. How does the world in which the policy has been adopted differ from the alternative world – or counterfactual – in which the policy has not been adopted? If we can approximate what would have happened *but for* the policy, then we can interpret the difference between what would have happened and what did happen as a *causal effect* of the policy.

The fundamental problem of causal inference is that we can never observe this alternative world – no data can directly measure something that did not happen. To answer causal questions, analysts must quantify a credible counterfactual for comparison. However, identifying comparison groups can be difficult.

In fields like health care, experimental researchers get around this problem by randomizing the assignment to "treatment," such as a new medicine or health intervention, and comparing this group with a "control" group. In a well-run randomized control trial, the control group and treatment groups should look statistically similar on relevant characteristics like age, race, gender, education, etc. The only difference is that one group receives a conventional treatment (or placebo) and the other receives the experimental treatment.

Real-world policies create few opportunities to randomize, so policy and program questions often depend on purely observational data. Indeed, randomizing the

application of social or economic policy would be costly, impractical, or unethical in most cases, precisely because policies often have unfair outcomes. Instead, exposure to "treatment" is determined *non-randomly* by geography or by political, demographic, social, and economic processes – confounding simple comparisons.

Such "selection bias" and other causal inference problems are ubiquitous in observational data, so policy researchers have developed a variety of methods for causal inference in different contexts. Most of these tools attempt to adjust available data make valid comparisons. While they can range from relatively simple and intuitive to extremely complex, all require careful consideration of potential biases in order to produce credible findings.

To put the fundamental problem of causal inference into terms relevant for evaluating the CAP, "How do we approximate a counterfactual for Louisiana where the CAP was never adopted and its actions never implemented?" Although there are a number of ways to tackle this question, the synthetic control method (SCM) has become a popular method for state policy evaluation.[50] SCM creates a hypothetical counterfactual for state-level trends, or a "synthetic Louisiana," by taking a weighted average of pre-intervention trends from other states, often using a range of predictors to ensure a good match of trends. After the enactment of a policy, the difference in outcomes between observed Louisiana and "synthetic Louisiana" provides an estimate of the impacts of the policy.

As a quasi-experimental method for causal inference, SCM has distinct advantages for state-level analysis, which have aided in its growing popularity over the past two decades. SCM can be used to create comparative case studies for single units, such as a state, in absence of large samples. It is also relatively robust to the assumptions of the analyst and transparent about what goes on "under the hood" when compared with other mainstream causal inference methods. Moreover, SCM produces intuitive estimates that can be summarized or communicated graphically in a compelling and accessible way. The appendix further illustrates SCM with a simplified, worked example derived from Louisiana's Medicaid expansion – *not intended as an actual policy evaluation*.

Causal inference is an art, a science, and a large and evolving toolbox. While SCM has become common in state-level applications, other methods may be more appropriate to evaluate specific actions depending on their potential causal pathways and the availability of data. Extending these methods to disaggregate causal effects across population sub-groups and to provide rapid remains an active area of advancement. The key point is that the equity outcomes of the CAP should be evaluated rigorously and transparently, not merely tracked as in the climate equity collection described above. Tracking indicators on an ongoing basis supports broad uses: focusing attention, clarifying issues, and providing ready accessibility to actionable information on local context. Periodic evaluations provide deeper evidence of the impacts of changes that occur in the state on equity outcomes. Both have a role to play in a long-term strategy for climate equity metrics and research.

This document mostly describes quantitative evaluation using causal inference. To be clear, these methods do not provide the optimal approach for every worthy research question about climate equity. For example, while quantitative evaluations can measure effects on baseline measures of housing and the economy, they only provide partial insight on equity in processes, procedures, and access during CAP implementation. Qualitative research and evaluation also has a role to play. Qualitative methods have advantages for revealing inherent power dynamics that shape periods of economic and policy change; systemic drivers of inequity for people of color and low-income people; and the complexity of lived experience within vulnerable, differently impacted, and overburdened communities. A further advantage of a shared agenda for climate equity research is to bring a diversity of evidence into a dialog that is actionable for decision-makers and communities.

Summary of recommendations for assessing CAP actions and related interventions

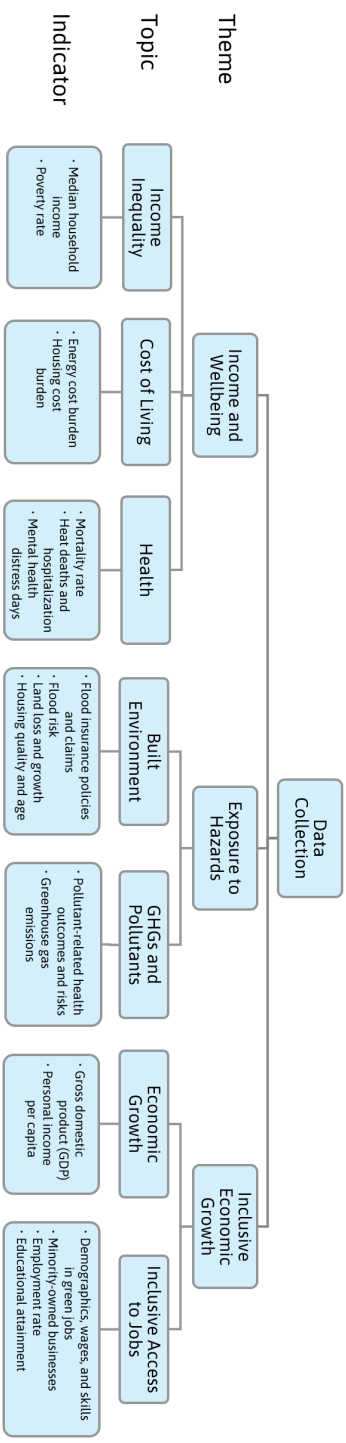
- *Commit to advancing the state of evidence- and theory-based policy evaluation within and outside of government*. Cultivate opportunities to assess equity impacts before and after a given intervention is taken, and just as importantly, remain conscious about the potential for bias against equity in conventional practices for reviewing state and local policies.
- *While many opportunities exist to innovate on evidence-based assessment before implementing CAP actions, at a minimum, distributional analysis should be conducted for CAP actions with significant equity concerns.* Where permitted by statutes and regulations, distributional impacts should be quantified as a component of formal policy evaluation. In some cases, modest extensions of existing data and analysis tools can be used to assess the distributional impacts of CAP actions.
- *Assess CAP actions after they are taken with rigorous policy evaluation methods.* Rigorous evaluation is critical to ensure lasting success and to adapt to new evidence. Such evaluations provide the most compelling evidence of quantitative impact.

4 Suggested climate equity indicators

This section describes the climate equity indicators recommended for inclusion in the data collection described earlier in this report. The indicators are organized into themes and topics. Within each theme and topic, we define each of the indicators, describe their relationship to climate equity, and list the CAP strategies each indicator is relevant to.

The data collection is organized into three themes: **Income and Wellbeing**, **Exposure to Hazards**, and **Inclusive Economic Growth**. Each theme covers two to three broad topics, and the data on each topic is presented as indicators. For example, "Income Inequality" is a topic under the **Income and Wellbeing** theme, and this topic's indicators are median household income and poverty rate.

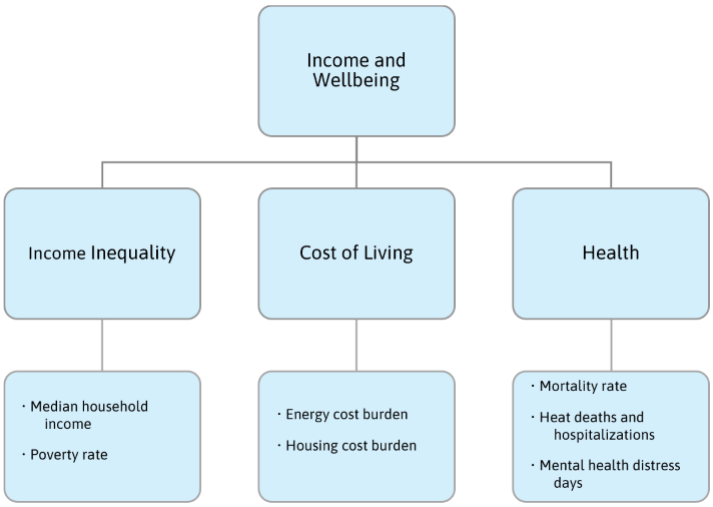
At the end of each theme's subsection is an informational table detailing how the indicators are measured, where to get the data, available equity breakdowns, the frequency of updates, and the geographic levels for which the data is reported. The indicators of the data collection are organized into the themes and topics as shown below.


Theme
Topic
Indicator
Data Collection
Income and Wellbeing
Exposure to Hazards
Inclusive Economic Growth
Income Inequality
Cost of Living
Health
Built Environment
GHGs and Pollutants
Economic Growth
Inclusive Access to Jobs
· Median household income
· Poverty rate
· Energy cost burden
· Housing cost burden
· Mortality rate
· Heat deaths and hospitalization
· Mental health distress days
· Flood insurance policies and claims
· Flood risk
· Land loss and growth
· Housing quality and age
· Pollutant-related health outcomes and risks
· Greenhouse gas emissions
· Gross domestic product (GDP)
· Personal income per capita
· Demographics, wages, and skills in green jobs
· Minority-owned businesses
· Employment rate
· Educational attainment

Theme

Income and Wellbeing

The indicators within the Income and Wellbeing theme of the data collection can be grouped under three topics: Income Inequality, Cost of Living, and Health. The chart below describes how the indicators in this theme fit into these three topics. Following the chart, we describe each indicator and how the indicator relates to CAP strategies.



Topic

Income Inequality

Indicator

Median household income

Why is this important?
Household income is a basic measure of the extent to which a household can provide for itself and build wealth. Household income growth is an important measure of increasing family well-being, but is also key to driving overall economic growth, boosting tax bases, and supporting local businesses.[51]

Median household income by race of the householder is a common way to illustrate racial disparities in income. Income inequality is also frequently depicted with measures of the distribution of income, and research on income inequality has underscored the relevance of income distribution to tracking standards of living.

Note on measures of income inequality

Traditionally, the most common measure for standards of living is per capita gross domestic product (GDP), but a large body of research highlights the limitations of this measure, particularly its failure to track widening inequality.[52] Alternative measures of human development, well-being, and income mobility have been advanced in specific research settings, but the field is not sufficiently established to recommend a specific, regularly updated indicator. Likewise, a range of approaches have been used to describe inequality. For example, the Gini index provides a single measure of income dispersion in a local economy, ranging from 0 (perfect equality) to 1 (perfect inequality). According to the American Community Survey, Louisiana is second among states in income inequality based on the Gini index. Alternatively, income inequality is often represented as a trend over time across income quantiles, as ratios among those quantiles, or as the total income going to households in each quantile. These quantile approaches have the additional benefit of containing information that describes the experiences of actual households,[53] but the quantiles chosen and how they are presented are best tailored to the story that emerges from actual trends in the data.

Relevance to CAP strategies
Data on median household income support 9 CAP strategies:

- Increase access to and deployment of energy resources
- Accelerate adoption and accessibility of low- and zero-emission vehicles and fuels
- Reduce vehicle miles traveled and increase transportation efficiencies
- Increase urban, rural, and regional public transit service
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Build a more inclusive and resilient economy for all Louisiana residents
- Improve engagement with a track progress on outcomes for disadvantaged communities and Indigenous peoples

Measuring median household income will give particular insight to the equity implications of CAP strategies that relate to increasing access to resources and technologies that may be easier for households with more disposable income. Households with higher incomes are also more resilient in the face of disasters such as hurricanes, pandemics, and chemical spills.[54]

Indicator **Poverty rate**

Why is this important?
A high share of residents living below the poverty level indicates the economy is not providing many residents with the ability to meet their most basic needs, including food, housing, and transportation.

Measures based on the federal poverty threshold have limitations. The Census still uses the federal definition for poverty that was first created in 1964. The original calculations were based on studies from the early 1960s that indicated that family food costs were about one-third of a family's budget. But housing costs have risen much faster than food costs since 1964. Also, the current calculations don't count non-cash government aid, like Child Tax Credits or housing subsidies, as income. And they aren't adjusted for differences in costs of living in different parts of the country. Given these limitations, the Census began publishing a Supplemental Poverty Measure that incorporates up-to-date data on regional housing costs as well as several kinds of government aid. According to the Census, the 2020 Supplemental Poverty Rate for the U.S. was 9.1 percent. The Official Poverty Rate that same year was 11.4 percent.[55] The Census Bureau does not calculate Supplemental Poverty Rates for geographies smaller than the nation as a whole.[56] We recommend including an estimate of the SPM at the state level for additional context within the poverty indicator analysis.

Various ratios of the federal poverty level (FPL) are commonly used to determine eligibility for means-tested government programs. For example, children in households at 212 percent of the FPL or lower are eligible for Medicaid.[57] In Louisiana, the living wage for a single-person household falls between 225 and 250 percent of the FPL.[58] [59] For the presentation of poverty data, we recommend providing numbers on people living at the FPL as well as certain percents of the poverty level in order to provide a deeper look at the distribution of people in relation to the FPL.

Tracking poverty rates in an equity evaluation of CAP strategies will give insight about important potential obstacles, especially if communities with higher poverty rates are also impacted by pollutants or natural disasters.

Relevance to CAP strategies
Data on poverty rates support 8 CAP strategies:

- Increase access to and deployment of energy resources
- Reduce vehicle miles traveled and increase transportation efficiencies
- Increase urban, rural, and regional public transit service
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Build a more inclusive and resilient economy for all Louisiana residents
- Improve engagement with and track progress on outcomes for disadvantaged communities and Indigenous peoples
- Advance an equitable, efficient, and sustainable siting and permitting process for new energy and infrastructure projects

Many of the strategies and actions outlined by the CAP focus on the accessibility of resources such as efficient public transit, an inclusive workforce for Louisiana residents, and access to and deployment of energy resources. Data on local poverty rates contextualized within the state or parish can help communities and policy-makers understand what areas may be prone to the special environmental and economic hardships associated with poverty. This data can also inform outreach for community feedback on policies' effects on people living in poverty.

Topic

Cost of Living

Indicator

Energy cost burden

Why is this important?
In the U.S., low-income households spend a larger portion of their income on home energy costs such as electricity, gas, and home heating fuels than higher-income households.[60] Energy costs disproportionately burden Black, Hispanic, and Native American households, as well as people living in older or manufactured housing.[61] Energy cost burden is the percentage of a household's total income which is absorbed by energy costs. The average energy cost burden among low-income households in the U.S. is 8.6 percent.[62] A standard threshold used to define a high energy cost burden is 6 percent of a household's income.[63]

Relevance to CAP strategies
Data on high energy cost burden support 6 CAP strategies:

- Shift towards a clean, renewable, and resilient power grid
- Increase access to and deployment of energy resources
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Build a more inclusive and resilient economy for all Louisiana residents
- Advance an equitable, efficient, and sustainable siting and permitting process for new energy and infrastructure projects

By tracking the rate of energy cost burden in localities and state-wide, communities and policy-makers can consider how the strategies of the CAP may influence energy costs. Data on high energy cost burden can give insight into which communities are already currently most burdened by energy costs and may have lower capacity to cover other types of expenses.

Different ways of summarizing energy costs

An example analysis of IPUMS energy cost data demonstrates various thresholds that can be used in an energy cost burden analysis. In the period from 2017 - 2021, the mean energy cost burden for White householders in Louisiana was 2.9 percent, while it was 4.6 percent for Black householders. During the same time period, 45.4 percent of Black householders experienced high energy cost burden, or energy costs that were 6 percent or more of household income, while 22.5 of White householders experienced the same problem.

Indicator **Housing cost burden**

Why is this important?
Housing is a large monthly expense for most American households, and the ability to afford stable housing can significantly impact a family's well-being. It is also the most significant contributing factor for determining a region's cost of living. A common measure of affordability is the percent of households paying more than 30 percent of their pre-tax income on all housing costs.[64] Housing expenses include energy costs; reducing energy cost burden will reduce housing cost burden, assuming other housing costs do not increase. Housing costs exceeding 50 percent of a household's pre-tax income is considered severe housing cost burden.

Higher housing costs have a disproportionate impact on low-income households as the total value of these households' incomes remaining after paying out monthly housing costs is less than for higher-income households.

Relevance to CAP strategies
Data on housing cost burden support 5 CAP strategies:

- Increase access to and deployment of energy resources
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Build a more inclusive ad resilient economy for all Louisiana residents
- Advance an equitable, efficient, and sustainable siting and permitting process for new energy and infrastructure projects

The above strategies emphasize access to energy resources and improving the built environment through upgrading homes, reducing sprawl, and supporting healthy communities. These can have consequences for housing affordability. As CAP strategies regarding energy efficiencies and infrastructure projects are implemented, tracking housing cost burden will provide context about current

burdens on household income in communities, as well as how these energy and community infrastructure projects impact people's monthly housing costs.

Transportation as a component of cost of living

Transportation can be a large household cost, and CAP actions such as those that call for coordinated land use planning to reduce sprawl may go a long way in reducing those costs.[65] Even so, we do not currently recommend any indicators on transportation. Personal vehicles and public transit have different roles to play in different parts of Louisiana.

Representing transportation needs and costs across the whole state in a single indicator is problematic due to the contradictions between urban, suburban, and rural transportation patterns. For example, long commute distances in an urban area may be a result of unaffordable housing near job centers, while the same conclusions could not be drawn about rural commute times. Especially as CAP actions relating to transportation are implemented, we may have meaningful opportunities in the future to produce a brief on this topic, which may lead to the identification of a comprehensive transportation indicator or small set of indicators for the data collection.

Topic **Health**

Indicator **Mortality rate**

Why is this important?
Disparities in the leading causes of death for Black people compared with White people are closely related to disparities in life expectancy by race.[66] Disparities in mortality rates may indicate lack of access to health care, differing risk factors such as nutrition and exposure to air pollutants, and also poorer quality of care. Lesser quality of care has been shown to be influenced by racial bias in how medical professionals interact with Black patients – much of it unconscious.[67] Research also highlights that segregated neighborhoods increase mortality due to exposure to toxins, substandard housing, and violence.[68] Identifying disparities and targeting appropriate interventions is important for creating equal opportunities for health.[69]

Relevance to CAP strategies
Data on mortality rates support 7 CAP strategies:

- Increase access to and deployment of energy resources
- Monitor, inventory, certify, and support industrial decarbonization

- Accelerate industrial electrification, switching to low- or no-carbon fuels and low- or no-carbon feedstocks
- Monitor and regulate methane emissions
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Improve engagement and track progress on outcomes for disadvantaged communities and Indigenous peoples

The above CAP strategies discuss energy resources and limiting the amount of dangerous greenhouse gases in the atmosphere. Progress on these CAP strategies directly relates to current and future mortality rates, especially in areas that are most exposed to industrial pollutants, heat, and other exposures related to health risk that could result in higher mortality rates.

Indicator **Heat deaths and hospitalization**

Why is this important?
As the climate changes and temperatures rise, it is important to be aware of how it can disproportionately impact some people and areas. Anyone's health can be impacted by heat, and heat is the number one weather-related cause of death in the United States.[70] According to the US Centers for Disease Control and Prevention, "Hot weather is associated with an increase in heat-related illnesses, including cardiovascular and respiratory complications, renal failure, electrolyte imbalance, kidney stones, negative impacts on fetal health, and preterm birth."[71] Death rates also rise around heat waves.

Relevance to CAP strategies
Data on heat deaths and hospitalizations support 4 CAP strategies:

- Increase access to and deployment of energy resources
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Improve engagement with and track progress on outcomes for disadvantaged communities and Indigenous peoples

Improvements in each of the above CAP strategies impact the protection individuals and communities have against extreme heat which could lead to death or hospitalization. Particularly when it comes to energy resources, urban sprawl, and home efficiency, disparate exposure to good resources and infrastructure can result in some communities being more susceptible than others to severe health consequences during hot weather.

Indicator **Mental health distress days**

Why is this important?
Mental health distress days can be measured as the amount of days during the previous month an individual experienced poor mental health. Reporting 14 or more mentally unhealthy days is considered "frequent mental distress" for an individual.[72]

While this indicator doesn't relate specifically to CAP strategies in the same way other indicators do, it provides compelling context for the quality of life impacts of climate change, disasters, and policies.

Summary of Income and Wellbeing indicators:

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Income Inequality	Median household income	U.S. Census Bureau, American Community Survey (ACS)	Race/ethnicity, gender	Yearly	*1-year ACS:* State, parish, place, MSA, PUMA; *5-year ACS:* State, parish, census tract, block group, MSA, PUMA, 5-digit ZIP code Tabulation Area	
Income Inequality	Poverty rate	U.S. Census Bureau, American Community Survey (ACS)	Race/ethnicity, gender	Yearly	*1-year ACS:* State, parish, place, MSA, PUMA; *5-year ACS:* State, parish, census tract, block group, MSA, PUMA, 5-digit ZIP code Tabulation Area	

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Cost of Living	Energy cost burden	Department of Energy LEAD tool, IPUMS USA	LEAD variables break down the type of energy cost and whether the household rents or owns; IPUMS variables can be broken down by race/ethnicity	Yearly	*Department of Energy:* State, county, census tract, city; *IPUMS USA:* PUMA	
Cost of Living	Housing cost burden	U.S. Census Bureau, American Community Survey (ACS)		Yearly	*1-year ACS:* State, parish, place, MSA, PUMA; *5-year ACS:* State, parish, census tract, block group, MSA, PUMA, 5-digit ZIP code Tabulation Area	
Health	Mortality rate	CDC Wonder, County Health Rankings Yearly from County Health Rankings, from CDC the most recent measure is from 2016		National Center for Health Stats Mortality Files (in CDC wonder it is "Compressed Mortality Rates").	State, Parish	

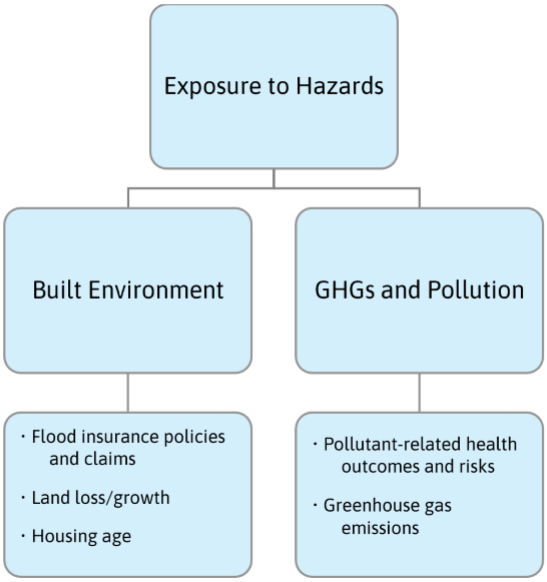
Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Health	Heat deaths and hospitalization	CDC Wonder, CDC Heat & Health Tracker	Race/ethnicity, age	CDC Wonder: Most recent measure is from 2016; CDC Heat & Health Tracker: Weekly	State, Parish	"Cause of Death" variable in Mortality Rates
Health	Mental health distress days	County Health Rankings		Yearly	State, Parish	

Theme

Exposure to Hazards

The indicators for the Exposure to Hazards theme of the data collection are organized into two topics: Greenhouse Gases (GHGs) and Pollution, and the Built Environment. The chart below describes how the indicators in this theme fit into these two topics. Following the chart, we describe each indicator and how it relates to CAP strategies.

Data on several indicators in this theme must be selected with guidance from subject matter experts, especially indicators related to pollutants and associated health impacts. For example, several reliable sources of data on cancer risk, air quality, and C02 and methane emissions are available, and each has nuances that distinguish the possible interpretations of the data as well as their general usability.



Topic

Built Environment

Indicator

Flood insurance policies and claims

Why is this important?
Louisiana has a higher rate of participation in the National Flood Insurance Program than any other state. The National Flood Insurance Program (NFIP) is managed by FEMA and provides insurance in an effort to reduce the socio-economic impact of floods. The public accesses NFIP flood insurance either directly or through a network of over 50 insurance companies. NFIP flood insurance is available to property owners, renters, and businesses in the 23,000 participating

NFIP communities. Homes and businesses with government-backed mortgages in high-risk flood areas are required to have flood insurance.[73][74]

Relevance to CAP strategies
Data on flood insurance policies and claims support 4 CAP strategies:

- Restore and conserve Louisiana's coastal wetlands to maximize climate mitigation and adaptation goals
- Ensure Louisiana is prepared to maximize potential federal funding opportunities
- Align climate action approaches across state government
- Coordinate action with local government

Flood insurance policy rates and access provides information about the cost of living in flood-prone areas and can also give insight about the current infrastructure in flood risk zones. The CAP strategies which relate to resilient communities, efficiency of homes and other buildings, and coastal restoration should consider flood insurance access before and during CAP implemenation to ensure that structures and communities which are more susceptible to storm damages are not being further disadvantaged by the associated insurance or rebuilding costs.

Indicator **Flood risk**

Why is this important?
Much of Louisiana is vulnerable to flooding. Storm surge puts coastal Louisiana at intense risk, but each of the state's watersheds may see intensified flood risk due as climate change increases the frequency of severe rain events. Planning for flood resiliency and investing in flood protection infrastructure and nature-based solutions will be central to climate adaptation.

Flooding can lead to the loss of life, property, and the disruption of public services and jobs. It is important not only to know which communities continue to be at risk of flooding, but also to monitor the communities at risk of future flooding.[75] Tracking exposure to current and projected flood risk, as illustrated by the Louisiana Coastal Master Plan for storm surge flooding, shows which communities are most vulnerable.[76]

Relevance to CAP strategies
Data on flood risk support 4 CAP strategies:

- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Improve the efficiency and resilience of homes and non-residential buildings
- Preserve and expand natural lands and urban green spaces to maximize climate mitigation and adaptation goals
- Support the sustainable management and conservation of working agricultural and forestry lands

Considering current and projected flood risk while implementing CAP strategies related to infrastructure will better position communities to obtain the resilient and efficient buildings and land use planning that will last as climate circumstances change over time.

Indicator **Land loss and growth**

Why is this important?
Many of Louisiana's assets – waterways and wetlands, ecosystems, infrastructure, and unique culture – are vulnerable to the coastal land loss crisis. This crisis will continue to be fueled in part by climate change and relative sea level rise. Coastal land also reduces the impact of storm surge and flood risk further inland. Data on land loss and growth along the Louisiana coastline reflects progress and future plans for land loss mitigation. The data is provided in the Coastal Protection and restoration Authority's Coastal Master Plan, which is updated every 6 years. This data can provide context for the disproportionate impact of climate change on people's security and livelihoods as frontline communities consider various adaptation strategies. It can also serve to highlight the larger effort to reduce the impacts of hurricanes by restoring natural buffers against storm surges.

Relevance to CAP strategies
Data on land loss/growth support 3 CAP strategies:

- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Preserve and expand natural lands and urban green spaces to maximize climate mitigation and adaptation goals
- Restore and conserve Louisiana's coastal wetlands to maximize climate mitigation and adaptation goals

Keeping the CAP strategies in conversation with other actions the state takes through CPRA to mitigate land loss will show a fuller picture of how coastal land loss elevates climate risks and impacts on residents and businesses.

Indicator **Housing quality and age**

Why is this important?
America's aging housing stock represents both a potential problem and an opportunity. Older homes are less energy-efficient and more expensive to maintain.[77] Moreover, research has shown that lead poisoning in children is correlated strongly with residing in pre-1950 homes.[78] When preparing homes to be more energy-efficient as well as resistant to disaster, considering the age and quality of the house is important.

Housing quality and age is closely related to a household's protection against climate change and the potential cost of flood insurance and repairs after disasters.

If many houses in one area are older or more vulnerable, then a community may be particularly vulnerable to wind and flood damages.

Relevance to CAP strategies
Data on housing quality and age support 3 CAP strategies:

- Increase access to and deployment of energy resources
- Improve the efficiency and resilience of homes and non-residential buildings
- Improve engagement with and track progress on outcomes for disadvantaged communities and Indigenous peoples

Data about housing quality and age will inform the CAP strategies which increase the resiliency of homes and improve engagement with and progress for disadvantaged communities. Knowing whether some groups or communities are differentially exposed to risks associated with older homes (e.g., lead paint or decay) is critical in implementing the above CAP strategies.

Topic **GHGs and pollution**

Indicator **Pollutants exposure**

Why is this important?
Exposure to pollutants has been linked to worse health outcomes and higher mortality rates. Air quality and pollutants data is often broken down by pollutant type. Some common measures of pollutants exposure are: particulate matter 2.5 levels (particles/droplets in the air that are 2.5 microns or less in diameter), air toxics cancer risk, carbon, and methane.

There is variation in how harmful each specific pollutant is to health outcomes, but connecting exposure to various pollutants with other demographic characteristics of communities will give insight to the equitable implementation of CAP strategies which aim to reduce emissions. Public health research has shown, for example, that Black, Asian, and Hispanic people as well as people with low incomes have a higher exposure to as well as a higher risk of death from PM2.5 than other groups.[79] A national study of pollutant exposure and demographics from 1990 to 2010 found that reductions is air pollutants was accompanied by reductions in exposure disparities over the thirty-year period, indicating that outsize benefit of an improving environment to the most impacted communities is possible.[80]

Measuring inequity in exposure to pollutants

It is common for screening tools to measure how pollutants exposure aligns with communities of color and socioeconomic status through developing an index, such as the Environmental Justice Indexes in EJScreen or Pollution Burden in CalEnviroScreen.[81] These measures multiply exposure to environmental hazards such as pollution with population characteristics to get one number that indicates the extent to which a community is both disadvantaged or vulnerable economically and differentially exposed to environmental hazards. This intersection cannot be measured without developing a specialized methodology, which is beyond the scope of this report. Adopting an adequate methodology, with review from community experts and scientific experts as needed, forms a special aspect of implementing the climate equity data collection and lies beyond the scope of this report. See the discussion of screening tools for additional context.

Most pollutant data is available at the point level, with a latitude and longitude, meaning that it can be aggregated to census geographies to compare with demographic and socioeconomic characteristics. Including this data will increase the background knowledge around the geographies most impacted by air emissions before and during CAP strategy implementation.

Relevance to CAP strategies
Data on pollutants exposure support 10 CAP strategies:

- Accelerate industrial electrification, switching to low- or no-carbon fuels and low- or no-carbon feedstocks
- Increase and mobilize resources for decommissioning legacy oil and gas infrastructure
- Monitor and regulate methane emissions
- Accelerate adoption and accessibility of low- and zero-emission vehicles and fuels
- Reduce vehicle miles traveled and increase transportation efficiencies
- Increase urban, rural, and regional public transit service
- Coordinate land use planning to reduce sprawl and support healthy and resilient communities
- Preserve and expand natural lands and urban green spaces to maximize climate mitigation and adaptation goals
- Improve engagement with and track progress on outcomes for disadvantaged communities and Indigenous peoples
- Advance an equitable, efficient, and sustainable siting and permitting process for new energy and infrastructure projects

Many CAP strategies focus on supporting healthy and resilient communities. Increased reliance on low- and zero-emission vehicles and fuels and decarbonization of industrial facilities will impact communities' air quality. Data about pollutant exposure, whether via air or otherwise, will allow us to monitor the extent to which disadvantaged communities are disproportionately exposed to pollutants and how that changes as Louisiana develops and increases reliance on infrastructure and energy sources that create less pollution.

As mentioned in the Recommendations section, the data source recommendations for the Exposure to Hazards theme are especially preliminary and the specific pollutant and pollutant-related health indicators will be refined with experts and described upon inital release of the data collection.

Summary of Exposure to Hazards indicators:

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Built Environment	Flood insurance policies and claims	FEMA National Flood Insurance Program (NFIP)		Every 40-60 days	State, Parish, Census Tract, Latitude and Longitude (rounded to 1 decimal place)	
Built Environment	Flood risk	First Street Foundation Flood Model, FEMA National Flood Hazard Layer (NFHL), Louisiana Coastal Protection and Restoration Authority (CPRA) Coastal Master Plan		NFHL: Monthly; CPRA: Every 6 years	GIS map	
Built Environment	Land loss and growth					

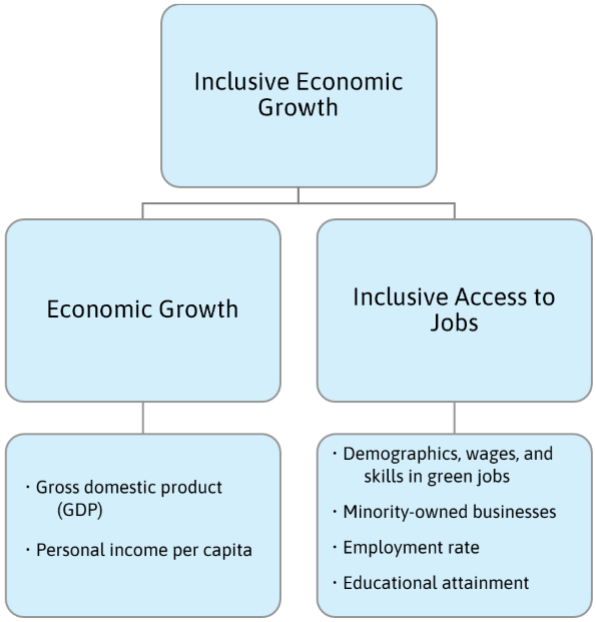
Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Built Environment	Housing quality and age	U.S. Census Bureau, American Community Survey (ACS)		Yearly	1-year ACS: State, parish, place, MSA, PUMA; 5-year ACS: State, parish, census tract, block group, MSA, PUMA, 5-digit ZIP code Tabulation Area	
Built Environment	Storm Damage	FEMA disaster claims		Daily	State, Parish, place, designated area (geography description)	

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
GHGs and Pollution	Pollutant-related health outcomes and risks	EPA AirToxScreen		2017-2018	County, census tract	Snapshot of outdoor air quality regarding emissions of air toxics and suggests long-term risks to human healht if the emissions are steady over time. It also estimates cancer risks and noncancer health effects for some pollutants.
GHGs and pollution	Greenhouse gas emissions	InMap, EPA AirToxScreen, Emissions Database for Global Atmospheric Research (EDGAR)			Gridmap	

Theme

Inclusive Economic Growth

The indicators relating to the Inclusive Transition theme within the data collection are organized into two topics: Economic Growth and Inclusive access to Jobs. The chart below describes how the indicators in this theme fit into these two topics. Following the chart, we describe each indicator and how it relates to CAP strategies.



Topic

Economic Growth

Indicator

State GDP/personal income per capita

Why is this important?
Gross Domestic Product (GDP) is the total value of all goods and services produced in a geography over a year. GDP is important because when the economy grows or declines, jobs and businesses are impacted. GDP can be calculated for the entire US and compared with other countries, but it can also be calculated for states, counties, and metro areas to compare on smaller levels.[82]

Personal income per capita is the income which individuals receive from paychecks, insurance, business ownership, property, and government benefits. It does not include gains from stock prices. When aggregated by state, it can be used to compare the economic well-being of residents between states. Similarly, it can be used at the county and MSA-level to compare the economic well-being at these levels.[83]

Relevance to CAP strategies
Data on State GDP and personal income per capita support 2 CAP strategies:

- Shift towards a clean, renewable, and resilient power grid
- Accelerate industrial electrification, switching to low- or no-carbon fuels and low- or no-carbon feedstocks

The above CAP actions involve state-wide shifts in current energy and production processes. These large-scale efforts will drive shifts in industry that will impact the state economy as a whole. Tracking both state and local GDP as these CAP strategies are implemented will give good insight into how the economy is impacted by changes to state infrastructure and production processes.

Topic **Inclusive Access to Jobs**

Indicator **Demographics, wages, and skills in green jobs**

Why is this important?
"Green jobs" focus on restoring or enhancing environmental quality, such as reducing pollution and greenhouse gas emissions, building capacity for renewable energy, and conserving healthy ecosystems. These might include jobs such as solar panel installers, recycling workers and coordinators, environmental engineers, and landscape architects. Some green jobs may be generated indirectly as efforts to reduce greenhouse gas emissions, shift to renewable energy, and create sustainable infrastructure reverberate throughout the economy. These might include construction and building inspectors, commercial and industrial designers, and transportation managers.

Workers in traditional occupations (e.g., engineering) might need to acquire new skills specific to green projects to keep up with changing demand (e.g., design for green infrastructure).

Assessing the breakdown of who is employed in green jobs as well as the associated wages and skills needed for these jobs helps to understand whether the transition toward more green jobs is available equally. It is also important to track which new skills are desired for new job opportunities and communicate these opportunities.

Defining green jobs

There is no standard definition for environmentally sustainable or "green" jobs. With the Bureau of Labor Statistics' "Green Goods and Services" and the Employment and Training Administration's (O*net) green jobs, even different federal sources adopt different definitions. Previous reports by The Data Center have combined these federal definitions with local definitions of coastal and water management employment to describe a broader "blue-green" economy.

- *Existing skills with increased demand*. Occupations involve a traditional skillset (e.g., building and construction) that might see increased demand (e.g., installing residential solar panels) without significant changes to their specific tasks and skills.
- *Green enhanced skills*. Workers in traditional occupations (e.g., engineering) might need to acquire new skills specific to green projects to keep up with changing demand (e.g., design for green infrastructure).
- *New or emerging skills*. Emerging green occupations might involve entirely new, or new combinations, of tasks and skills. Examples of emerging jobs include climate change analyst, instrument operator for emissions measurements, environmental restoration planner, brownfield redevelopment site manager, and carbon sequestration system installer.

Relevance to CAP strategies
Data on demographics, wages, and skills in green jobs support 9 CAP strategies:

- Shift towards a clean, renewable, and resilient power grid
- Increase access to and deployment of energy resources
- Accelerate industrial electrification, switching to low- or no-carbon fuels and low- or no-carbon feedstocks
- Increase and mobilize resources for decommissioning legacy oil and gas infrastructure
- Support the sustainable management and conservation of working agricultural and forestry lands
- Build a more inclusive and resilient economy for all Louisiana residents
- Strengthen climate education, research, and innovation as a focus of Louisiana's energy transition
- Prioritize Louisiana workers and businesses in the transition to a low carbon economy
- Improve engagement with and track progress on outcomes for disadvantaged communities and Indigenous peoples

Demographics, wages, and skills in green jobs relate to many CAP strategies with associated state and local industry shifts. Tracking demographics, wages, and skills in green jobs will help determine the equity of CAP strategies about shifting to a clean, renewable, and resilient power grid and providing more clean energy jobs. During this transition, it is important to make sure that the energy jobs that become available as well as their associated skill profiles are equally accessible to Louisiana workers.

Indicator **Minority-owned businesses**

Why is this important?
Minority-owned businesses offer various benefits to the communities within which they are located. They are more likely than other employers to hire minorities, especially low-income Black people. They tend to invest in their local communities and foster additional economic growth.[84] Also, minority-owned businesses can be key sites where information about jobs is exchanged and informal financial assistance is provided.[85] Receipts are an important indicator of the scale of positive impact that minority-owned businesses can have in their communities.

Relevance to CAP strategies
Data on minority-owned businesses support 2 CAP strategies:

- Build a more inclusive and resilient economy for all Louisiana residents
- Prioritize Louisiana workers and businesses in the transition to a low carbon economy

Data about minority-owned businesses will determine the success and equity of the above CAP strategies by assessing whether minority-owned businesses will be included in this shift toward building a more inclusive, low-GHG economy.

The above CAP strategies emphasize the priority to have the local- and state-level shifts in industry include Louisiana workers and businesses. Including data about minority-owned businesses will give insight about the success of these strategies. If the industrial shifts associated with the CAP disproportionately impact some workers and businesses, then that is valuable information regarding equity.

Indicator **Employment rate**

Why is this important?
Employment rates indicate the percent of the working age population that did any work for pay, including self-employment. Employment rates are a more comprehensive measure of labor market conditions than official "unemployment" rates, because they not only reveal the share of the population that are unemployed but also those who are no longer in the labor force at all—many of whom are "discouraged workers."[86] Employment rates by race and gender suggest the extent to which structural economic changes have benefited different groups.

Relevance to CAP strategies
Data on employment rates support 3 CAP strategies:

- Shift towards a clean, renewable, and resilient power grid
- Increase access to and deployment of energy resources
- Accelerate industrial electrification, switching to low- or no-carbon fuels and low- or no-carbon feedstocks

Measuring employment rates in relationship to the above CAP strategies will monitor how the shift to more renewable resources and processes might impacts current disparities in employment by race and gender. This data will also indicate whether the state-wide shifts in industry impact employment differentially in smaller geographic levels.

Indicator **Educational attainment**

Why is this important?
Education is a lynchpin of economic development. High-wage states tend to have educated workforces. Research has shown that jobs tend to follow skilled labor, and the skill level of the workforce contributes more to explaining regional growth than other factors like amenities.[87] Educational attainment is also strongly predictive of lifetime earnings, and wages increase for workers for each additional year of education they accumulate.[88] Between 1973 and 2011, national wages for workers with a college degree rose, while wages for less educated workers stagnated or dropped.[89] Skilled cities are also more resilient to economic shocks because they have the skills and capacity to adapt to change.[90]

Relevance to CAP strategies
Data on educational attainment supports 1 CAP strategy:

- Strengthen climate education, research, and innovation as a focus of Louisiana's energy transition

Considering educational attainment when expanding climate research and innovation gives insight to the accessibility of green jobs to communities as well as any barriers people may face in accessing climate research and skills needed for Louisiana's energy transition.

Summary of Inclusive Economic Growth indicators:

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Economic Growth	GDP	Bureau of Economic Analysis (BEA)		Yearly	State, County, MSA	
Economic Growth	Personal Income per Capita	Bureau of Economic Analysis (BEA)		Yearly	State, County, MSA	
Inclusive Access to Jobs	Demographics, wages, and skills in green jobs	Lightcast, BLS		Quarterly, Yearly	State, county, zip code, census tract	
Inclusive Access to Jobs	Minority-owned businesses	Annual Business Survey	Race of business owner	Yearly	State, MSA	
Inclusive Access to Jobs	Employment rate	U.S. Census Bureau, American Community Survey (ACS)	Race/ethnicity and gender	Yearly	1-year ACS: State, parish, place, MSA, PUMA; 5-year ACS: State, parish, census tract, block group, MSA, PUMA, 5-digit ZIP code Tabulation Area	

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Inclusive Access to Jobs	Educational attainment	U.S. Census Bureau, American Community Survey (ACS)	Race/ethnicity and gender	Yearly	1-year ACS: State, parish, place, MSA, PUMA; 5-year ACS: State, parish, census tract, block group, MSA, PUMA, 5-digit ZIP code Tabulation Area	

Additional indicators for consideration:

Topic	Indicator	Source	Breakdowns	Updates	Geographies	Notes
Built Environment	Flood Risk	FEMA National Flood Hazard Layer (NFHL), FEMA Risk MAP			GIS map	
Built Environment	Sea Level Rise	NOAA		Most recent update is from March 2022	Pixel	Land at risk of permanent flooding when the sea level rises at 1-, 2-, and 6-feet.
Built Environment	Storm frequency and intensity					
Built Environment	Land cover/land use	C-CAP Regional Land Cover NOAA		Every 5 years	30-meter pixel size	
Inclusive Access to Jobs	Reliance on tax incentives					
Inclusive Access to Jobs	Municipal bond ratings					
Inclusive Access to Jobs	Diversification of industry mix					
Exposure to Hazards	Facility compliance with environmental regulations	EPA ECHO		3- and 5-year periods, generally updated biweekly	Parish	

Appendix

Summary of stakeholder feedback

Staff from The Data Center and the Office of the Governor led 2 public stakeholder feedback sessions. Over thirty stakeholders attended the first feedback meeting, held in New Orleans on November 1, 2022. These attendees represented a range of affiliations, including media, industry, academia, advocacy, activism, and philanthropy. Stakeholders identified priorities for measuring equity in relation to the Louisiana CAP as well as many audiences that would utilize climate equity data.

This feedback guided decisions for how to group indicators together and how to present the equity indicators to be most useful for specific audiences. Following the in-person feedback meeting, we sent a follow-up survey to give community stakeholders another chance to share their feedback and priorities regarding the equity indicators for Louisiana's CAP.

Based on early discussion with the advisory group, four main audiences for climate equity indicators had been identified prior to public input. These were:

- State policy-makers, leadership, and regulatory bodies
- Community advocates and NGOs, faith leaders
- Government agencies involved in implementation
- Decision-makers in key sectors identified by the CAP, including private industry.

Stakeholders identified the following other audiences who would utilize the climate equity indicators:

- Small business owners and industry workers
- Parish government workers
- Scientific and academic communities
- Federal Emergency Management Agency (FEMA)
- IT and data acquisition companies
- Journalists and average citizens
- Fishing and farming communities
- Voices outside of the state

The first community feedback meeting incorporated two breakout sessions: the first aimed to identify various audiences for climate equity data, and the second session focused on linking important stories and narratives about climate equity to potential indicators. These breakout sessions helped to illuminate and prioritize the diverse use cases for CAP equity data. Stakeholders highlighted special considerations for climate equity data with respect to:

- Role of NGOs in countering harmful narratives
- Integration of the research community with community-members and climate advocates
- Decisionmaking at the local or parish level to the CAP's goals
- Private sector industries and small businesses

Participants gave ideas for equity and climate indicators that they found important to tell the stories that they care about. Overall, recurring themes included the need for affordable and safe, climate-resistant housing protected from the harmful effects of climate stressors and pollution. Many of these concerns are closely related to housing access more generally, as well as place-based determinants of health and disinvestment, concentration of GHG and pollution-intensive land uses along the state's industrial corridors, and acute experiences of coastal hazards and flooding during disasters. Multiple people brought up concerns for housing cost burden as well as the risk of eviction and foreclosure related to insurance and property values.

Many noted the need for data on exposure to pollution and GHGs, especially when focusing on equitable access to housing free of pollution and access to clean air, water, soil, and food. Related to air toxins, stakeholders mentioned a broad need for health data in underserved communities and included mental health indicators and stressors along with life expectancy disparities.

Participants also focused on job access and income inequality. In response to the economic transition brought up in discussions, people were curious about the number of people involved in the green economy by demographic breakdowns and also wanted information about access to training programs for these jobs. Many expressed the importance of having locals employed in these jobs, as well as concerns for wages and job quality.

During the time between the two stakeholder feedback meetings, The Data Center developed recommendations for how to track equity in the CAP based on feedback from the first meeting. The second stakeholder feedback meeting, held in Baton Rouge on January 17, 2023, focused on the proposed recommendations and gave further insight about audiences for the data and important stories to be highlighted with equity data. Over a dozen stakeholders attended this meeting, with a stronger turnout from State government than the first meeting.

The second stakeholder feedback meeting identified priority audiences for the CAP equity metrics: state legislators, local legislators and decision-makers, and regular community members. Attendees explained that legislators are not necessarily the target audience, but the text should make it easily accessible for community members to use this product when communicating and advocating with legislators. For this same reason, community members emphasized the importance of presenting data and brief stories at both at the state and local levels. Language around policy should be accessible to all readers, and all briefs should be written to emphasize the empowerment of communities, rather than simply highlighting their disadvantages.

Technical limitations of screening tools for assessment

This appendix lists several challenges with applying screening tools to a policy and decisionmaking setting, drawing from literature on spatial analysis in general and screening tools in particular. The aim is to underscore the complexities of measurement for general-purpose decision-support tools to advance climate equity and environmental justice.

Relevance to community and resident experiences. Reviews have found that many screening tools lacked an explicit use case at the time of their creation.[91] The use case should affect how, when, and to what end communities are engaged in the tool's development.[92] Ideally, decisions about which indicators are included and how they are analyzed within the tool should reflect input from – and converge toward – local knowledge about which issues should be prioritized and how benefits should be defined. In a screening tool with statewide (or national) scope, local perceptions of priorities and benefits are likely to vary from place to place. Further, standard census geographies (tracts and block groups) commonly fail to align with residents' own perceptions of the boundaries of their communities or with administrative jurisdictions. Ultimately, since no tool can comprehensively reflect a community's local circumstances, some reviewers have recommended the option to allow communities to self-identify as a community in need of resources instead of leaving this distinction solely to a ranking, index, or threshold measure.[93]

Methods for combining multiple disparate measures from multiple domains. Screening tools employ a range of methods for combining many indicators into a basis for prioritization. Indeed, a broad range of indicators across diverse topics is a defining feature of screening tools.[94] Indicators may be considered separately or aggregated into composite measures, and these indicators may in turn be converted into a binary threshold for designation/eligibility or a tiered or ranked summary that compares communities to others.[95] As an example of the binary method, CEJST provides criteria in eight domains through which a tract may qualify as disadvantaged -– as long as a tract has at least one very high climate or environmental burden (at or above 90th percentile) and a relatively low income (at or above 65th percentile), it is coded as disadvantaged. In contrast, the CalEnviroScreen score averages percentile ranking scores of indicators across four domains to give a composite index. Census tracts with the highest 25 percent of CalEnviroScreen scores are coded as disadvantaged. Other tools may use similar weighted average methods but based on normalized scores rather than percentile rankings. The choice of a binary determination in CEJST can fail to identify communities in proportion to their need, which carries some risk of distorting the use of the tool. For example, communities that meet the criteria for designation but are relatively well-resourced may "out compete" more disadvantaged communities for beneficial investment.[96] While index methods (CalEnviroScreen) can more appropriately approximate cumulative impacts and the interaction between environmental hazard exposure and economic and public

health burden, methods for index construction do not necessarily closely align in all cases with such complex, conditional, and multifaceted relationships.

Inclusion or exclusion of specific measures. Screening tools are more than collections of indicators; they select and combine measures into criteria that are factored into decision-making. The choice and weighting of different indicators can have implications for how communities are prioritized.[97] Notably, CEJST does not include racial demographics in its identification of disadvantaged communities, despite the role of historical and ongoing discrimination in determining place-based economic resources and exposure to environmental hazards.[98] EJScreen includes racial demographics, but the tool's authors note that the relationship between demographics, differential exposure, and susceptibility to harm from exposures are complex.[99] This can lead to non-intuitive results in some cases when using EJScreen to identify communities at higher environmental risk.[100] In short, weighting and inclusion decisions should be made with care.

Geographic scale. Typically, screening tools utilize census tracts. However, in less urbanized areas, census block groups may be preferred, as they align more closely with community identity and geographies of exposure.[101] Environmental impacts can vary at a hyperlocal scale, poorly matched to larger, less dense census tracts.[102] There is a cost to block groups, such as large sample errors in the American Community Survey and fewer available data sources. More generally, the use case of screening tools leaves them especially vulnerable to common issues in spatial analysis, such as ecological fallacy, aggregation bias, and the modifiable areal unit problem. In addition, rankings or relative indicators are produced on a state level may be less useful to decision-makers at the scale of a parish or metropolitan area, and supporting both use cases could produce conflicting findings and costs to usability.

Aggregation problems in spatial analysis. Demographic data is generally provided by the Census Bureau and is available at the census block group, census tract, and parish levels within Louisiana. When planning to use data for smaller geographies, note that many smaller geographies, especially census block groups or rural tracts, may have their data suppressed due to small population size, meaning rural parishes especially may have missing data. A further issue to contend with is error, which increases as population sizes (and therefore sample sizes) decrease. One approach to addressing error in the data available for small geographies is a small-scale aggregation where neighboring tract or block-group measures are averaged together to smooth out the estimates and decrease the error. However, this approach can worsen issues already present in spatial analysis.

When data is aggregated, trends or patterns in the underlying data can be muted or even distorted. This is known as the modifiable areal unit problem and occurs when data taken on individuals (such as in a census survey) is aggregated to arbitrary boundaries.[103] The consequence is that reported indicators can tell an incomplete or incorrect story about the people an aggregated measure actually describes, such as glossing over a low-income neighborhood in a well-off census

tract, potentially denying those residents a needed intervention. Figure 4 shows an example of this issue, where lower-income areas in western Slidell become apparent only as the geographic boundaries of the analysis become smaller. Using parish- or even tract-level estimates, one might overlook St. Tammany Parish for some resource or intervention due to its apparent relative affluence, which would leave these residents overlooked. Smaller area data can work to remedy misapprehensions like these.

A related problem is the ecological fallacy, in which users may wrongly apply the experience indicated by the published estimate, e.g. being high income, to every resident in the area the estimate describes. However, as described above, reporting data at the smallest available geography presents a catch-22 where this more detailed data is less reliable due to higher error. These spatial problems will also impact the way that point data on environmental factors such as pollution is summarized, requiring caution with the approach to geographic boundaries.

Link between targeting for benefit and actual experience of benefit. To help direct resources to overburdened communities, screening tools focus on identifying eligible places and make implicit assumptions about how costs and benefits to communities are determined by proximity or location. However, an investment made in a specific area does not necessarily yield benefits for those who live there. This is especially true for investments in infrastructure networks or economic development, where costs and benefits are likely to be spatially diffuse. Moreover, dollars spent do not necessarily equate to the same dollar equivalent of benefits, and screening tools do not measure the degree of benefit.[104] Moreover, residential location is not the only way that environmental harms are experienced, e.g., workers may not work in the same census tract where they reside but may be exposed to pollution or climate-related risk at their workplace.[105]

Climate equity indicator collection: A potential structure and navigation

The data collection portion of the website will have three main components: a summary analysis of climate equity in Louisiana ("The State of Climate Equity in Louisiana"); "theme pages" for each of the three climate equity indicator themes; and a central "foundation page" from which all indicators are accessible. The foundation page populates with data according to a users' selected theme, parish, CAP strategy tags, or brief topic tags. Theme pages will be built from this foundation page. These theme pages will be components of "The State of Climate Equity in Louisiana" and will feature specific analysis connecting and perhaps expanding the theme indicators in the context of the Louisiana narrative.

This structure will allow every indicator to have both a modular and a bespoke presentation: each indicator must be able to stand alone as it is presented alongside any other indicator that may share a tag with it, and each indicator must serve the larger story of climate equity in Lousiana. For illustration, details on how the layout of the data collection might function are outlined below.

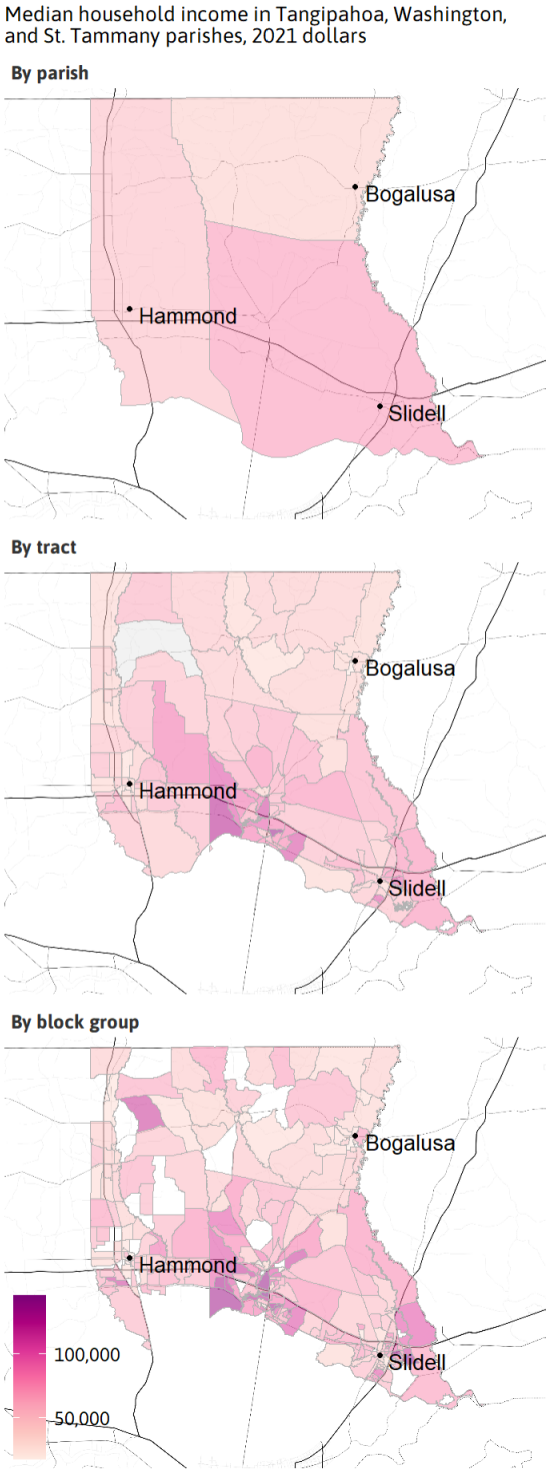


Figure 4: Issues with units of geography

1. State-level summary landing page: "The State of Climate Equity in Louisiana"

- First-time visitors and presentations on the project will start here
- Introduces and justifies the project
- Contains high-level context and narrative that tells a story of climate equity in Louisiana
- Contains any state-level data and analysis
- Begins with introductory overview text and any summary analysis that is not constrained to a theme section
- Follows with theme sections (upon scrolling down)
  - Contain each theme's indicators contextualized within the state
  - May contain additional, special analysis only presented on this state-wide analysis page
  - Features clickable section headers for themes that take users to theme pages with parish- and smaller-grain data (Question of usability – we may choose to have "theme pages" simply serve as expanded theme sections; i.e. the pages would not be separate from the "State of Equity" page. In that case, an example arrangement is that the first view of theme section is at the summary level, and users can select parish from a dropdown within the theme section, which will expand the section's analysis to contain all indicators for that theme.)

See Figures 5 and 6 for an example of a "landing page" that briefly introduces the project from The Data Center's Coastal Index Dashboard:

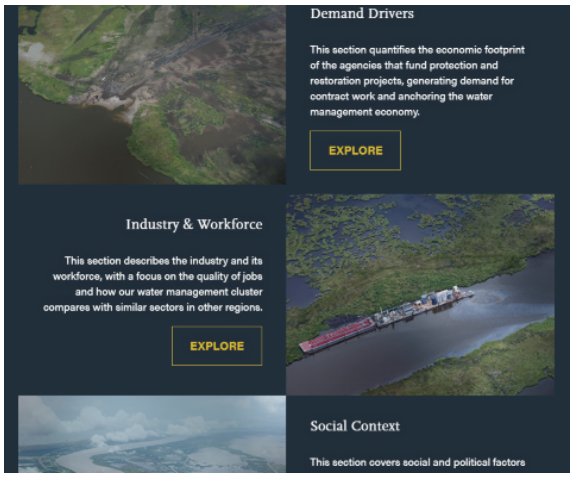


Figure 5: An example of a "landing page" that briefly introduces the project from our Coastal Index Dashboard

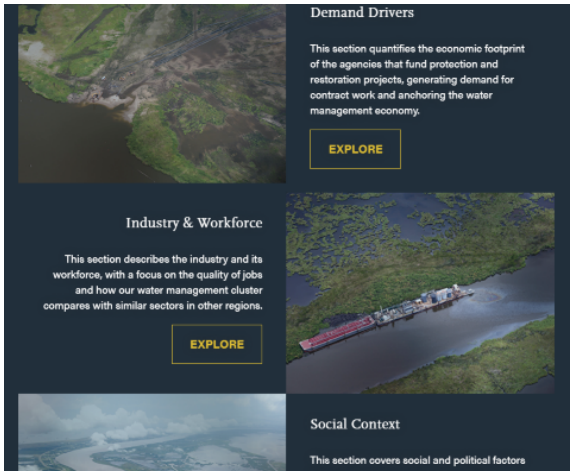


Figure 6: An example of a "landing page" that briefly introduces the project from our Coastal Index Dashboard

See Figure 7 for an example of text linking together data from featured graphs in The Data Center's *Placing Prosperity* report. The example shows explanatory text on the left-hand side and interactive charts on the right-hand side.

2. Theme pages (user interface may appear as an expansion of theme sections in "The State of Climate Equity in Louisiana" as described above)

- Contain all indicators for a theme (three pages total, one for each theme)
- Represent one specialized view of the "foundation" page
- Contain the theme's narrative/analysis
- Prioritize a connection to the overall narrative; users can flow between the "State of Equity" page and three theme pages and remain within the same story
- Accessible only by clicking through state page or selecting a theme from the foundation page

3. "Foundation" page

- Foundation of the site where all data can be accessed
- "Back door" entry point for users who know what specific data point they are looking for
- First/"clean" view of page:
  - No data; message says "Please select a theme or tag to view data, or search for an indicator"
  - Sticky bar at top of page contains search bar; dropdown for theme, including "any theme" option (choose only one); dropdown for parish,

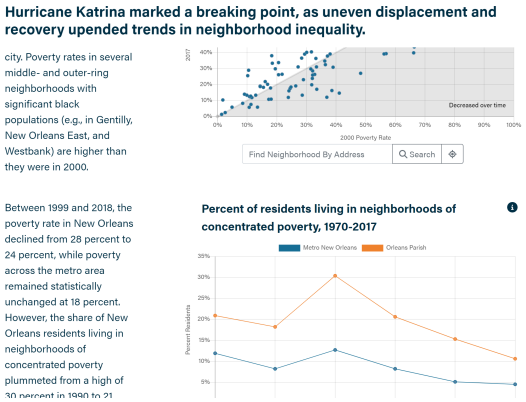


Figure 7: An example of text linking together data from featured graphs in our Placing Prosperity report. Explanatory text on the left-hand side and interactive charts on the right-hand side" that briefly introduces the project from our Coastal Index Dashboard

including "all parishes" option; selection box for CAP strategy and brief topic tags

- Page populates with indicators filtered by chosen theme and/or tags (or single indicator the user searched)
- For data provided by geography:
  - If no parish is selected, first view depends on indicator: may be all parishes in Louisiana or a single default parish (include some nudge message to select a specific parish from the dropdown)
  - If a parish is selected, first view depends on indicator: may be that parish highlighted on the state map, may be the tracts or block groups within that parish
  - Geographic grain toggle available on maps (view parish within state, tracts in parish, block groups in parish – specific to indicator)
- If only a theme is chosen, the user is shown that theme page
- Narrative layer will not be provided for tags or combinations of tags with themes or other tags (A very maximalist version of this recommendation might include narratives for tags; e.g., the "housing brief" tag could include a trimmed-down version of the brief analysis to knit together multiple indicators used in the brief, but more likely we'd simply have some way to acccess the brief itself from the page where indicators with that tag are displayed.)

Notes on indicators: All indicators will have the option of a modular presentation. When presented on its "theme page," an indicator may have a slightly different format to serve the more narrative structure of that feature. All indicators will belong to a theme; not all indicators will have a strategy or brief tag.

The final suite of products and publications on climate equity in Louisiana will likely all be accessible from the same website, which will contain the data collection and all briefs, executive summaries, and reports.

Synthetic control method: An illustrative example from Medicaid expansion

This appendix provides an illustration of the synthetic control method (SCM) for state-level policy evaluation. The analysis below is provided *for illustration only*. The results have not been reviewed or subjected to robustness testing and should not be interpreted as evidence or used for decision-making. Rather, the intent is to illustrate one common approach to the challenges of policy evaluation in greater detail via a simplified "worked example."

SCM has grown popular, in part, due to its relatively intuitive, transparent, and accessible nature. As shown below, the results and limitations can be effectively communicated in intuitive graphics, and understanding how effects are measured does not require advanced knowledge of statistics or causal inference. Additionally, SCM is well-suited to a common setup in policy evaluation where the research question focuses on an intervention's impact in a single jurisdiction – the treated unit – and where only aggregate data is available and no control unit is readily available.[106]

SCM has been widely applied to state and local policy changes. One of the most well-known applications of SCM is Abadie, Diamond, and Hainmueller's study of the effect of California's 1988 increase in cigarette taxes on cigarette purchases per capita.[107] While this study is often used to introduce SCM, we provide a more localized example here: the impact of Medicaid expansion in 2016 on the rate of uninsured residents in Louisiana. SCM has previously been used to examine the impacts of Medicaid expansion in other states, but what was its effect on Louisiana's population?

Among its many provisions for expanding access to care, the Affordable Care Act allowed states to expand Medicaid coverage to adults with incomes up to 138 percent of the federal poverty level and increased the level of matching funds available. As part of a second wave of states to opt in, Louisiana began the process of expanding Medicaid by executive order of Governor John Bel Edwards in 2016. As of this writing, 11 states have not adopted Medicaid expansion. Most of these states are in the southeast.

To which state should Louisiana be compared? The 39 states that have adopted the policy are ruled out because they received a similar "treatment" as Louisiana. Of the 11 "never treated" states, one option is to compare changes in Louisiana with changes in a neighboring state, which may have a different baseline rate of insured residents. However, this "difference-in-differences" approach, though closely related to SCM, depends on a questionable assumption that trends with respect to the outcome were on similar trajectories in both states before the

intervention. In other words, it may fail to satisfy the parallel trends assumption. SCM overcomes these challenges by borrowing information from never-treated states to construct a "synthetic Louisiana" where trends before expansion closely match observed trends in Louisiana.

To apply SCM, we first select a "donor pool" of eligible states from which to form a counterfactual trend for synthetic Louisiana. We select Texas and the seven other southeastern states that have not adopted Medicaid expansion. Next, we source data from the American Community Survey on the key outcome, health insurance coverage, as well as other data that might also predict trends in coverage. We use median household income, percentage of the population that is Black, and percentage of the population that is Hispanic or Latino (note that a full analysis might condition on additional state-level characteristics, but we are keeping it simple for this illustration). Finally, we conduct a matching procedure to generate weights such that coverage trends in "synthetic Louisiana" closely match trends observed in Louisiana prior to 2016.

Figure 8 shows the main results. Between 2009 and 2016, the trends match closely. Both trends show a large expansion in coverage around 2014, when most of the provisions of the Affordable Care Act went into effect. This occurred both in Louisiana and in the synthetic control, suggesting a good match between observed and synthetic Louisiana. After 2016, coverage continued to expand in Louisiana whereas coverage gains in the synthetic control flattened out. Based on the difference, it is inferred that Medicaid expansion increased the rate of total coverage in Louisiana by about 3 percentage points on average over the post-expansion years.

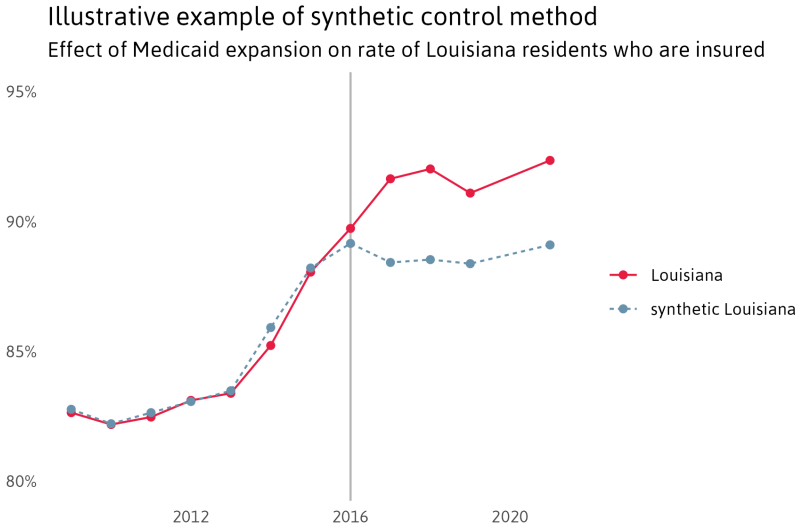


Figure 8: Synthetic control method example for illustrative purposes

This is a stylized example, but a similar approach could be applied to other policy questions relevant to evaluating the impact of CAP actions on outcomes related to disparities in income and well-being, exposure to hazards, and inclusive opportunities in the state's economy. While other methods might be more appropriate for evaluating climate equity at geographic levels smaller than the state, challenges like finding a suitable counterfactual for comparison are likely to remain.

Notes

[1]Louisiana Climate Initiatives Taskforce, *Louisiana Climate Action Plan* (Louisiana, 2022), 132.

[2]Marcus Gaddy and Kassie Scott, *Principles for Advancing Equitable Data Practice* (Urban Institute, 2020), https://www.urban.org/sites/default/files/publication/102346/principles-for-advancing-equitable-data-practice_0.pdf.

[3]Louisiana Climate Initiatives Taskforce, *Louisiana Climate Action Plan*, 132.

[4]Carlos Martin and Jamal Lewis, *The State of Equity Measurement: A Review for Energy-Efficiency Programs* (Urban Institute, 2019), 2.

[5]Julie Nelson and Lisa Brooks, *Racial Equity Toolkit: An Opportunity to Operationalize Equity* (Local; Regional Government Alliance on Racial Equity, 2016), 15.

[6]Valerie Wilson, *Guiding Principles for Anti-Racist Research, the "Bodycam" for Racial Economic Injustice* (Economic Policy Institute, 2022), https://www.epi.org/anti-racist-policy-research/.

[7]Georgetown Climate Center, *Equitable Adaptation Legal and Policy Toolkit*, n.d., https://www.georgetownclimate.org/adaptation/toolkits/equitable-adaptation-toolkit/introduction.html.

[8]Further, distributional equity may occur at different points of an intervention, leading to different measurement approaches. Consider the example of a workforce training program or a similar intervention. Equity could be measured in terms of access to the program (e.g., barriers to participation), outputs for participants (e.g., experiences within the program), or impacts on participants (e.g., long-term employment and income after completion). Ultimately, an equitable long-term impact of the program might be to reduce measurable disparities in labor market outcomes.

[9]Sara Meerow, Pani Pajouhesh, and Thaddeus R Miller, "Social Equity in Urban Resilience Planning," *Local Environment* 24, no. 9 (2019): 793–808; Martin and Lewis, *The State of Equity Measurement*.

[10]Equitable Data Working Group, "A Vision for Equitable Data: Recommendations from the Equitable Data Working Group" (whitehouse.gov, 2022), https://www.whitehouse.gov/wp-content/uploads/2022/04/eo13985-vision-for-equitable-data.pdf.

[11]The U.S. Census Bureau collects data on sex in the American Community Survey, one of the main sources recommended in this report. The Census Bureau states that data on sex "intends to capture current sex" only. (US Census Bureau, "Why We Ask Questions about Sex" (Census.gov, 2023), https://www.census.gov/acs/www/about/why-we-ask-each-question/sex/) As is the case for all sources recommended in this report, data on gender is not collected. Equity data for marginalized gender identities may be added to this report's recommended publications as it becomes available.

[12]Equitable Data Working Group, "A Vision for Equitable Data."

[13]Chitra Balakrishnan et al., *Screening for Environmental Justice: A Framework for Comparing National, State, and Local Data Tools* (Urban Institute, 2022), 19.

[14]Joseph W. Kane, Sophie Abo, and Adie Tomer, "Taking Climate Action Demands Better Local Accounting of Costs and Benefits" (Brookings, 2021), https://www.brookings.edu/blog/the-avenue/2021/08/18/taking-climate-action-demands-better-local-accounting-of-costs-and-benefits/.

[15]Michele M Betsill and Harriet Bulkeley, "Cities and the Multilevel Governance of Global Climate Change," *Global Governance* 12 (2006): 141.

[16]Sammy Zahran et al., "Risk, Stress, and Capacity: Explaining Metropolitan Commitment to Climate Protection," *Urban Affairs Review* 43, no. 4 (2008): 447–74.

[17]David Konisky, Daniel Gonzalez, and Kelly Leatherman, *Mapping for Environmental Justice: An Analysis of State Level Tools* (Environmental Resilience Institute, O'Neill School of Public And Environmental Affairs, Indiana University, 2021); Gradient Corp., "Analysis and Evaluation of Environmental Justice Programs and Screening Tools," 2022; Aimee Narmes, Angela Luh, and Matthew

Gobin, *Mapping Environmental Justice in the Biden-Harris Administration* (Center for American Progress, 2021); Balakrishnan et al., *Screening for Environmental Justice*; Sara McTarnaghan et al., "Comment Letter on CEQ's Climate and Economic Justice Screening Tool Beta Version," 2022.

[18]Konisky, Gonzalez, and Leatherman, *Mapping for Environmental Justice*; Balakrishnan et al., *Screening for Environmental Justice*.

[19]Konisky, Gonzalez, and Leatherman, *Mapping for Environmental Justice*.

[20]Konisky, Gonzalez, and Leatherman, 7.

[21]Corp., "Analysis and Evaluation of Environmental Justice Programs and Screening Tools."

[22]Narmes, Luh, and Gobin, *Mapping Environmental Justice in the Biden-Harris Administration*.

[23]Konisky, Gonzalez, and Leatherman, *Mapping for Environmental Justice*.

[24]To be clear, not every climate equity resource needs to articulate both a strict use case and research question. One or the other may suffice. For example, screening tools (e.g., CEJST, EJScreen) have straightforward use cases, but these tools' relationship to rigorous research questions are general and indirect at best. In contrast, a thorough analysis of the the impact of a particular climate action need not elaborate a detailed use case but should have a clear research question with direct relevance to policy and decision-making. See table 1 for an example of how use cases and research questions might vary for different data products.

[25]US Environmental Protection Agency, "Basic Information about Air Emissions Monitoring" (United States Environmental Protection Agency, August 2022), https://www.epa.gov/air-emissions-monitoring-knowledge-base/basic-information-about-air-emissions-monitoring.

[26]"Hitting the Mark: Improving the Credibility of Industry Methane Data," *Environmental Defense Fund Business*, January 2021, https://business.edf.org/insights/hitting-the-mark-improving-the-credibility-of-industry-methane-data/.

[27]International Energy Agency, "Estimating Methane Emissions – Global Methane Tracker 2022 – Analysis" (International Energy Agency, n.d.), https://www.iea.org/reports/global-methane-tracker-2022/estimating-methane-emissions.

[28]Environmental Defense Fund, "EPA Finds Valero Energy "Significantly Underestimated" Release of Pollution in Houston" (Environmental Defense Fund, September 2017), https://www.edf.org/media/epa-finds-valero-energy-significantly-underestimated-release-pollution-houston; Environmental Integrity Project, "EPA Underestimates Greenhouse Gas Emissions from u.s. Landfills by at Least 25 Percent" (Environmental Integrity Project, December 2021), https://environmentalintegrity.org/news/epa-underestimates-greenhouse-gas-emissions-from-u-s-landfills-by-at-least-25-percent/.

[29]Amy Teller and Robert Habans, *Toward an Equitable Blue-Green Economy in Southeast Louisiana* (The Data Center, 2022); Robert Habans, *Changing Coast, Evolving Coastal Economy: The Water Management Cluster in Southeast Louisiana in Retrospect and Prospect* (The Data Center, 2019).

[30]The topics reflected an early initial brainstorming session, and the order listed here reflects the results of a subsequent voting exercise during a stakeholder feedback conversation.

[31]Balakrishnan et al., *Screening for Environmental Justice*, 19.

[32]A parallel example at the federal level lies in the 2021 Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government, which launched a "whole-of-government" effort to align equity throughout the federal government. Data collection policies, programs, and infrastructure are an important component of this effort.

[33]Equitable Data Working Group, "A Vision for Equitable Data."

[34]Carl Patton, David Sawicki, and Jennifer Clark, *Basic Methods of Policy Analysis and Planning* (Routledge, 2015), 22.

[35]Office of Management and Budget, "Study to Identify Methods to Assess Equity: Report to the President," 2021, https://www.whitehouse.gov/wp-content/uploads/2021/08/OMB-Report-on-E013985-Implementation_508-Compliant-Secure-v1.1.pdf.

[36]Alternative scenarios may simply be the difference between adopting a policy or intervention or doing nothing.

[37]US Environmental Protection Agency, "Health Impact Assessments" (United States Environmental Protection Agency, 2022), https://www.epa.gov/healthresearch/health-impact-assessments.

[38]Justicia Rhodus et al., *Review of Health Impact Assessments in the u.s.: Current State-of-Science, Best Practices, and Areas for Improvement* (United States Environmental Protection Agency, 2013).

[39]Rhodus et al., 16.

[40]Joshua Drucker, "Problems with Economic Impact Analysis: Examples from Base Communities," 2016, https://www.planetizen.com/node/84094/problems-economic-impact-analysis-examples-base-communities.

[41]Anthony E Boardman et al., *Cost-Benefit Analysis: Concepts and Practice* (Cambridge University Press, 2006), 2.

[42]Boardman et al., 2.

[43]Federico Cingano, "Trends in Income Inequality and Its Impact on Economic Growth," *Social, Employment and Migration Working Papers*, no. 163 (2014); Raj Chetty et al., "The Association Between Income and Life Expectancy in the United States, 2001-2014," *Jama* 315, no. 16 (2016): 1750–66; Samuel L Dickman, David U Himmelstein, and Steffie Woolhandler, "Inequality and the Health-Care System in the USA," *The Lancet* 389, no. 10077 (2017): 1431–41.

[44]Matthew D Adler, *Measuring Social Welfare: An Introduction* (Oxford University Press, USA, 2019).

[45]The President's 2021 executive order on "Advancing Racial Equity and Support for Underserved Communities" directed the administration to begin the process of modernizing regulatory review, which includes BCA.

[46]Dan Farber, "Equity Weighting: A Brief Introduction," *LegalPlanet*, 2022, https://legal-planet.org/2022/06/20/equity-weighting-a-brief-introduction/.

[47]Including impacts on health and mortality, which unlike income and assets are typically valued in a uniform way ("value of a statistical life" or "quality-adjusted life years"), also can have the effect of partially correcting for inequitable distortions.

[48]Nicholas Stern and Nicholas Herbert Stern, *The Economics of Climate Change: The Stern Review* (Cambridge University press, 2007); William D Nordhaus, "A Review of the Stern Review on the Economics of Climate Change," *Journal of Economic Literature* 45, no. 3 (2007): 686–702.

[49]Susan Athey and Guido W Imbens, "The State of Applied Econometrics: Causality and Policy Evaluation," *Journal of Economic Perspectives* 31, no. 2 (2017): 3–32.

[50]Robert McClelland and Sarah Gault, *The Synthetic Control Method as a Tool to Understand State Policy* (Urban Institute, 2017); Alberto Abadie, Alexis Diamond, and Jens Hainmueller, "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *Journal of the American Statistical Association* 105, no. 490 (2010): 493–505; Alberto Abadie, Alexis Diamond, and Jens Hainmueller, "Comparative Politics and the Synthetic Control Method," *American Journal of Political Science* 59, no. 2 (2015): 495–510.

[51]Allison Plyer and Lamar Gardere, *The New Orleans Prosperity Index: Tricentennial Edition* (The Data Center, 2018), https://www.datacenterresearch.org/reports_analysis/prosperity-index/.

[52]Dennis J Fixler, Marina Gindelsky, and David S Johnson, *Measuring Inequality in the National Accounts* (US Department of Commerce, Bureau of Economic Analysis, 2020).

[53]Thomas Piketty, *A Brief History of Equality* (Harvard University Press, 2022).

[54]Ted Hsuan Yun Chen and Boyoon Lee, "Income-Based Inequality in Post-Disaster Migration Is Lower in High Resilience Areas: Evidence from US Internal Migration," *Environmental Research Letters* 17, no. 3 (2022): 034043.

[55]The latest Supplemental Poverty Measure report can be found at https://www.census.gov/content/dam/Census/library/publications/2021/demo/p60-275.pdf.

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