THE WATER INSTITUTE OF THE GULF®

Technical Memorandum

CONSEQUENCE ANALYSIS OF A HYPOTHETICAL PORTFOLIO OF CLIMATE STRATEGIES

In Support of the Climate Initiatives Task Force's Development of a Louisiana Climate Action Plan

To:	Louisiana Governor's Office of Coastal Activities
From:	The Water Institute of the Gulf
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Date:	January 31, 2022
Re:	Louisiana Climate Initiatives Task Force Consequence Analysis of a Hypothetical Portfolio of Climate Strategies

INTRODUCTION

The Louisiana Climate Initiatives Task Force (Task Force) was established by Governor John Bel Edwards in August 2020 through Executive Order JBE 2020-18, which committed the state to reducing the state's greenhouse gas (GHG) emissions to net zero GHG emissions by 2050. The EO sets intermediate goals of reducing GHG emissions by 26-28 percent of 2005 levels by 2025 and by 40-50 percent of 2005 levels by 2030, and it also seeks to achieve these goals while improving the health and welfare of the people of Louisiana and advancing Louisiana's economic and energy profile. To better understand the magnitude of Louisiana's emissions challenge and to develop the actions and strategies needed to meet the goals of the EO, this effort engaged more than 135 multidisciplinary experts from the Task Force and its Advisory Groups (AGs) and Sector Committees (SCs; Figure 1). Many Task Force members also serve on AGs and SCs. The AGs specialize in four topics critical to the effort: Equity, Science, Finance, and Legal. The six SCs are comprised of individuals representing: Agriculture, Forestry, Conservation, and Waste Management; Land Use, Buildings, and Housing; Power Production, Distribution, and Use; Mining and Oil and Gas Production; Transportation; and Manufacturing and Industry.

The Water Institute of the Gulf (the Water Institute) brought its expertise in "Structured Decision Making" (SDM) to facilitate a collaborative planning process for the Task Force to question, evaluate, understand, and communicate the impact of potential policies and strategies on net GHG emissions as well as other goals identified by the Task Force related to Louisiana's quality of life, equity, economy, and environment. Representatives of the Governor's Office of Coastal Activities (GOCA) and personnel from the Water Institute comprised a Planning Team that facilitated and guided the development of the Louisiana Climate Action Plan. The final Climate Action Plan (Climate Initiatives Task Force, 2022) provides further information related to the overall Task Force planning process.

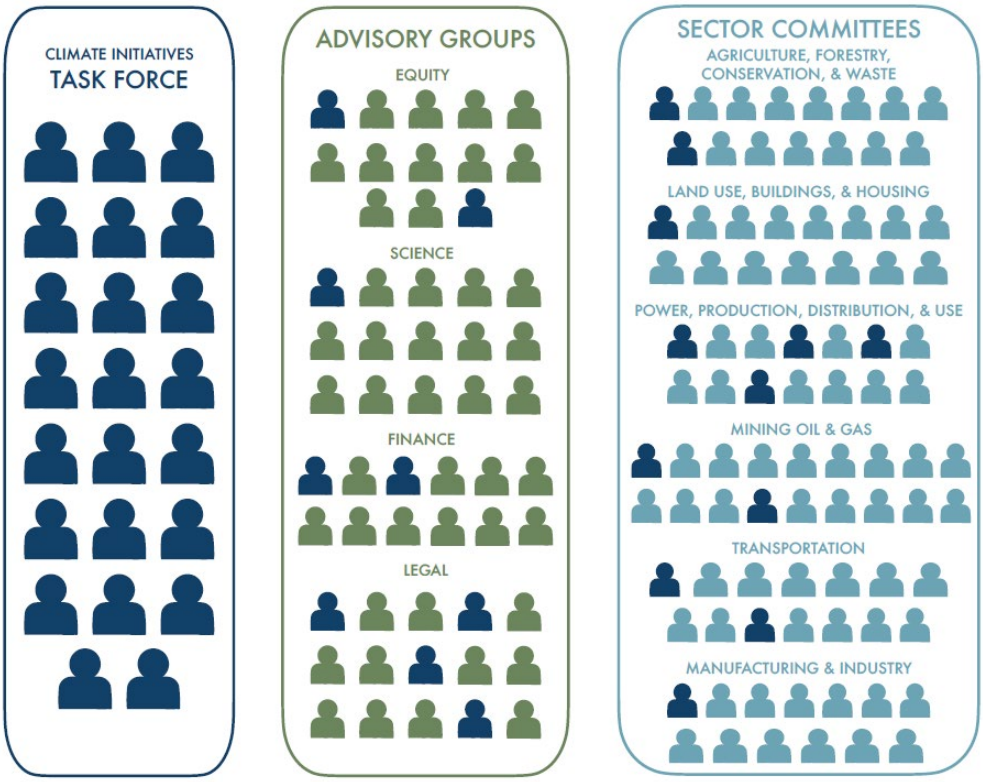

Figure 1. Structure of the Task Force. The Task Force provided recommendations to the Governor, with many members also serving on Sector Committees and Advisory Groups that supported the process by providing input and expertise.

STUDY OBJECTIVES

Two consequence analyses were conducted to investigate the impacts of climate action in Louisiana on the state's GHG emissions and on the state's people, economy, and environment. This Technical Memorandum details the results of the first of these analyses, which evaluated the likely outcomes of "hypothetical strategy portfolios," (hypothetical combinations of GHG reduction strategies; hereafter "portfolios" or "hypothetical portfolios") aimed to reduce net GHG emissions for the state of Louisiana, and the impacts of those portfolios on a set of "Fundamental Objectives" (FOs; Table 1). FOs were developed by the Task Force to refine and improve the strategies and actions that would eventually comprise the Louisiana Climate Action Plan (2022).

The purpose of this first consequence analysis was to evaluate how maximizing climate policy action in five different GHG-reduction hypothetical strategy portfolios might impact the people, economy, and environment of Louisiana. This analysis was also conducted to examine the potential outcomes of each portfolio in terms of net GHG emission reductions. This approach allowed for both the independent examination of the realistic GHG reduction potential of each portfolio and also allowed the Task Force to consider how each individual portfolio might impact the state.

Table 1. An initial set of draft Fundamental Objectives (FOs) developed for the Louisiana Climate Action Plan (2022). Note: the FOs for "Creating a More Equitable Society" and "Strengthening the Economy and Workforce" were modified with input from the Task Force midway through the planning process, therefore the text here varies slightly from the final Louisiana Climate Action Plan.

Category	FO
1. Reducing Net Greenhouse Gas (GHG) Emissions	Minimize net greenhouse gas emissions
2. Improving Quality of Life for Residents and Communities	Maximize quality of and access to essential goods, services, and infrastructure for residents
	Maximize positive public health outcomes and public safety
	Maximize the preservation of cultural heritage
3. Creating a More Equitable Society	Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes
	Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities
	Maximize engagement with and participation of communities in decision-making and implementation
4. Managing for Short- and Long-Term Success	Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation
	Maximize the efficiency and effectiveness of emissions-reduction strategies
	Maximize timely implementation of emissions-reduction strategies
	Maximize the durability of emissions-reduction strategies in an uncertain future
5. Strengthening the Economy and Workforce	Maximize job creation and support for Louisiana workers
	Maximize economic growth
6. Conserving Natural Resources & Protecting the Environment	Maximize preservation of natural resources and ecosystem services
	Maximize environmental stewardship and support of healthy ecosystems
7. Adapting to a Changing Climate	Increase resilience of the built and natural environment to climate change
	Increase the resilience of communities to climate change

ANALYSIS METHODS

HYPOTHETICAL STRATEGY PORTFOLIOS

Five hypothetical strategy portfolios were assessed in this analysis:

- Business As Usual (BAU);
- Intensive Electrification through Zero-Carbon Renewable Energy;
- Reduced Energy Demand, Consumption, and Waste Intensive;
- Industrial Carbon Removal, Capture, Use, and Storage Intensive;
- Natural Sequestration and Sinks Intensive.

These hypothetical strategy portfolios were developed by the Planning Team with input on GHG-reduction strategies from the SCs. Each portfolio represents a scenario in which climate policy action is maximized in one specific way (e.g., maximizing the possibility of shifting all energy use to renewable energy). Each hypothetical portfolio intentionally represents an extreme case. The exception is the BAU scenario, which represents a future in which current trends continue and no emissions reduction strategies or actions are implemented. Care was taken to ensure that no strategies were included in multiple hypothetical portfolios. A full description of each hypothetical strategy portfolio is provided in Appendix A.

GHG ANALYSIS

Introduction to the Energy Policy Simulator Tool

The GHG component of this analysis was conducted using a model developed by Energy Innovation termed the Energy Policy Simulator (EPS) modeling tool. EPS is designed to support decision makers by modeling the impacts of different kinds of climate policies. By turning policies on, off, or modulating intensity and implementation over a theoretical time period, the EPS tool user can visualize and quantify the impacts of climate policies on energy use and emissions from various sectors of the economy including transportation, electricity supply, buildings, industry, agriculture, and land use. The EPS tool can also model impacts of these policies on other sectors (i.e., jobs, gross domestic product [GDP], employee compensation, premature mortality, health-related outcomes, etc.). Analysis using the EPS tool can indicate the relative magnitude of GHG emissions reductions based on different policy options and can demonstrate the value of a broad suite of different policy options implemented over time to reach GHG emissions reduction goals.

The EPS tool was designed to support government officials and other policy makers in efforts to outline which policies could be implemented to reach GHG emissions reduction goals. It can also help identify how to design specific policies based on specified goals. The EPS tool is currently used by multiple states, and global versions of the tool are used in Canada, China, Mexico, and others. Energy Innovation has additionally developed EPS tools at the national level and for several other states. As part of their national tool, Energy Innovation built a scenario—the US Nationally Defined Contribution, or US NDC scenario—that, at the national level, would place the US in line with the goals of the Paris Climate Agreement. Energy Innovation's research note for the Louisiana EPS (Ashmoore et al., 2021) describes the state-level version of this scenario—which is built into the tool—as representing one set of potential policies that would come close to, but not quite, reaching net zero in Louisiana by 2050. The US NDC scenario built by Energy Innovation was used by the Planning Team to understand the

relative magnitude and relationships of different kinds of climate policies available to model in the EPS tool. The US NDC scenario was also used to establish certain initial policy settings that are difficult to fine-tune without specific local information, such as Industry Energy Efficiency Standards. The tool is fully open source and technical documentation is available on Energy Innovation's website.

Within the context of developing the Louisiana Climate Action Plan, the modelled EPS results provide the state with a general guide to inform policy design, implementation, and adaptive management. The built-in outputs within EPS include a comparison to a downscaled US NDC scenario for Louisiana, as well as many different breakdowns of emissions, fuel demand, generation, etc. by sector, and outputs related to economy, health, technology, cost estimates, and more. These outputs were reviewed by the Water Institute for their potential to inform decision making for the Task Force.

Establishing Policy Settings for the Energy Policy Solutions Tool

To analyze consequences of hypothetical strategy portfolios, this analysis began by developing a comparison table, also known as a crosswalk, between these portfolios and the available climate policies within the EPS tool. The EPS tool has a built-in business as usual (BAU) scenario which served as the basis for the BAU hypothetical portfolio as well as the point of comparison for the other four hypothetical portfolios. Each portfolio was modeled as a separate scenario in the EPS tool. The crosswalk of EPS policies and hypothetical portfolios, in addition to details for each policy setting are provided in Table 2. However, because the hypothetical portfolios were intentionally built at a high level, this table does not precisely match EPS policies to each hypothetical portfolio. All policy settings were modeled to be linearly implemented to 2050 unless otherwise specified.

Table 2. EPS tool policy settings used in the first round of GHG consequence analysis. Inputs related to schedule and intensity along with the rationale are also provided. Instances where US NDC scenario settings were used are noted. A full list of policy descriptions for the EPS is provided at https://us.energypolicy.solutions/docs/policy-design-index.html.

Portfolio	EPS Policies	Schedule and Intensity	Rationale
Business As Usual	• N/A (Built in)	N/A	The EPS BAU case is limited in its Louisiana-specific impacts, but was augmented with additional research and trends.
Intensive Electrification through Zero-Carbon Renewable Energy	• Electric Vehicle Charger Deployment: 150 • Electric Vehicle Range & Charging Time: 100% 'reduction in concern' by 2035 • Electric Vehicle Sales Standard: 100% for all modes by 2050 except passenger LDVs by 2035 • Electric Vehicle Subsidy: 25% (schedule at right) • Feebate: 50% • Low Carbon Fuel Standard: 20% • Building Component Electrification: 100% all by 2035 • Building Energy Efficiency Standards (see intensity at right) • Contractor Training: On • Distributed Solar Carve-Out: 24% • Distributed Solar Subsidy: 50% • Clean Electricity Standard: 100% by 2050 • Change Electricity Imports: Onshore Wind and Solar PV at 100% increase by 2050 • Early Retirement of Power Plants (see MW to the right) • Grid-Scale Electricity Storage: 50% • Increase Transmission: 50% • Reduce Transmission and Distribution Losses: 40% • Subsidy for Capacity Construction: Offshore Wind at 95% • Subsidy for Electricity Production: Offshore Wind at $60/MWh • Industrial Electrification and Hydrogen (see intensity at right) • Shift Hydrogen Production to Electrolysis: 75% by 2050	*Electric Vehicle Subsidy* • 25% subsidy immediately implemented in 2022; phaseout begins in 2035 and tapers to zero by 2050 *Building Energy Efficiency Standards:* • Heating: 22% by 2035 • Cooling and Ventilation: 38% by 2035 • Envelope: 75% by 2035 • Lighting: 40% by 2035 • Appliances: 38% by 2035 • Other Components: 11% by 2035 *Early Retirement of Power Plants:* • Hard Coal: 5500 MW/year • Natural Gas Nonpeaker: 6500 MW/year • Natural Gas Peaker: 8000 MW/year • Lignite: 650 MW/year *Industrial Electrification and Hydrogen* • All industries set to shift 50% to electricity and 50% to hydrogen by 2050	A wide variety of policies impacting electrification and renewable electricity generation were selected. Offshore wind subsidies and fossil fuel phaseouts combine for an enormous increase in offshore wind electricity generation. Aggressive building efficiency standards were selected to electrify the state's building stock. Generous subsidies for electric vehicles support a transition through 2035. Industrial production is powered by electricity as well as by hydrogen from electrolysis.

Portfolio	EPS Policies	Schedule and Intensity	Rationale
Reduced Energy Demand, Consumption, and Waste Intensive	• Mode Shifting: max shift % by mode by 2050 • Building Energy Efficiency Standards (see intensity at right) • Retrofit Existing Buildings: 37% for all building types • Electricity Demand Response: 100% • Reduce Transmission and Distribution Losses: 40% • Cogeneration and Waste Heat Recovery: 100% • Early Retirement of Industrial Facilities: 100% • Industrial Energy Efficiency Standards (see settings at right) • Improved System Design at 100% • Material Efficiency, Longevity, & Reuse: Cement at 70%, Iron and Steel at 65%, Water and Waste at 50& • Shift to Non-Animal Products at 20%	*Mode Shifting* • Passenger LDVs: 26% • Passenger Aircraft: 30% • Freight HDVs: 22% *Building Energy Efficiency Standards (all by 2050)* • Heating: 22% • Cooling and Ventilation: 38% • Envelope: 75% • Lighting: 40% • Appliances: 38% • Other Components: 11% *Industrial Energy Efficiency Standards* • Ag and Forestry: all fuels at 25% • Oil and Gas Extraction: all fuels at 25% • Wood Products: all fuels at 25% • Refined Petroleum and Coke: all fuels at 25% • Chemicals: all fuels at 25% • Cement: all fuels at 25% • Iron and Steel: all fuels at 25% • Other Metals: all fuels at 25% • Other Manufacturing: all fuels at 25% • Energy Pipelines and Gas Processing: natural gas at 25% • Water and Waste: electricity at 25% • Construction: all fuels at 25%	These policies were selected to address efficiency, waste, leaks, and reducing demand. Settings were largely derived from either EPS tool guidance, such as the Material Efficiency policy, or by maxing out the reductions available in the tool, such as the Mode Shifting policy. Building Energy Efficiency Standards are used again in this portfolio, but are not as aggressively implemented as they are in the Electrification portfolio. Shift to Non-Animal Products was only set at 20% as a total shift to vegetarianism would be out of step with Louisiana's culture and traditions.

Portfolio	EPS Policies	Schedule and Intensity	Rationale
Industrial Carbon Removal, Capture, Use, and Storage Intensive	• Electricity CCS at 100% for all fuels • Industrial CCS at 100% for energy emissions in Food/Beverage, Wood Products, Pulp and Paper, Rubber and Plastic, Glass, Cement, Iron and Steel, and Other Manufacturing (other settings at right) • F-Gas Substitution: 100% • F-Gas Destruction: 100% • F-Gas Recovery: 100% • F-Gas Equipment, Maintenance, & Retrofits: 100% • Methane Capture: 100% for Oil and Gas Extraction, and Energy Pipelines and Gas Processing • Direct Air Capture R&D at 100%	*Industry CCS additional settings* • Refined Petroleum and Coke: energy emissions at 20% • Chemicals: energy emissions at 20% • Chemicals: process emissions at 20% • Cement: process emissions at 100% • Iron and Steel: process emissions at 100% • Energy Pipelines and Gas Processing: energy emissions at 20%	The EPS tool guidance cautions that "Very few CCS-equipped industrial facilities exist today, so in a scenario where industry does not transition to clean energy, a value over 20% is likely very optimistic." In alignment with this guidance, CCS settings were turned down for Louisiana's most prominent industrial sectors, Refined Petroleum, Chemicals, and Energy Pipelines. An additional version of this portfolio was run with all the settings at 100%, instead of 20%, for comparison. Additional industrial policies for F-gases, methane capture, and Direct Air Capture were included as well, as these are components of industrial carbon removal.
Natural Sequestration and Sinks Intensive	• Afforestation and Reforestation at 100% • Forest Set-Asides at 100% • Cropland and Rice Measures at 100% • Improved Forest Management at 100%	N/A	These four policies were the only ones available to measure the natural sequestration potential of Louisiana's lands, so they were selected at the maximum intensity.

At the time of analysis, the Louisiana EPS tool was still in beta form; this offered an opportunity for the Planning Team to troubleshoot and test the tool while working closely with the EPS tool developers. Although this analysis with the EPS tool focused on GHG impacts, other kinds of outputs are available in the tool. These outputs were augmented with additional research into best practices, national and global pathway modeling studies, and other reports to contextualize the EPS tool outputs.

ANALYSIS OF IMPACTS TO OTHER FUNDAMENTAL OBJECTIVES

Questionnaire Development

To understand the consequences of the different hypothetical strategy portfolios, a questionnaire was created for the AGs that individually addressed each of the hypothetical portfolios. The questionnaire was not created to be representative of public opinion, but rather to gather the opinions and hypotheses of AG members. Respondents were asked to rank the outcome for each FO (Table 1) for each hypothetical portfolio on a defined impact scale of "very negative" to "very positive" (see Appendix B for the defined impact scales). AG members were provided with these criteria to provide guidance and standardization on factors to consider when ranking the outcomes of portfolios. AG members were also asked to assess the level of confidence they had in their own rankings, how widespread the impacts of each FO would be, a time range in which the expected outcome was likely to begin, and to provide short answer comments with additional feedback (Figure 2).

Business as usual impacts to...				
Improving Quality of Life for Residents and Communities	Outcome	How confident are you in this outcome?	How widespread?	Over what period of time?
Maximize quality of, and access to, essential goods, services, and infrastructure for residents	Neutral	Medium	Regional	10-20 Years
Maximize positive public health outcomes and public safety	Negative	Low	Widespread	0-10 Years

Figure 2. Example of opinion questionnaire answered by the AG as part of the first consequence analysis.

The format of the questionnaire was designed to utilize "verbal anchors" as possible responses. Verbal anchors are word responses, as opposed to strictly numeric options, which make questions easier to understand. Research has found that the use of verbal anchors leaves answers more open to interpretation (Goddard & Villanova, 2006). Additionally, adverbs, such as 'somewhat', were excluded from possible response options.

Table 3. Summary of the categories of FO for which each AG was asked to provide a ranking.

	Equity AG	Legal AG	Finance AG	Science AG
Improving Quality of Life for Residents and Communities	X	X	X	
Creating a More Equitable Society	X	X		
Managing for Short- and Long-Term Success	X	X	X	X
Strengthening the Economy and Workforce	X		X	
Conserving Natural Resources & Protecting the Environment	X	X		X
Adapting to a Changing Climate	X	X		X

The categories of FO that each AG was asked to provide responses regarding were based on each individual's specific area(s) of expertise (Table 3). In addition, individual AGs were advised not to provide a ranking or response to any FO they were not comfortable evaluating, so to preclude individuals from being obliged to provide responses on topics they may not be familiar with. While exclusionary questioning can be precarious because respondents are responsible for self-identifying their comfort level regarding a topic, the Water Institute team determined that in this scenario the practice was admissible because there were no expectations of this questionnaire being representative of any group other than the AG. As previously stated, the feedback provided was intended to serve as a reference to maximize co-benefits of GHG emissions, not as a statistical analysis of public opinion.

Analysis of Responses

The material presented here is derived from the questionnaire and reflects the input given by one or more AG member. The distribution of positive/negative responses for each FO is provided along with an overview of the predicted temporal and spatial scales of expected impact and a synthesis of the short-answer feedback and comments. Short-answer feedback and comments were collated and synthesized through a process that consisted of: (1) moving feedback received for one FO to another objective if it was better aligned there (e.g., if a comment provided on impacts to the economy also referenced jobs, the latter portion was moved to the "job creation" FO); (2) removing comments without specific content (e.g., "n/a"); and (3) combining comments across questionnaires with the same or similar content, streamlining text, and adding context for clarity based on additional information provided within the same questionnaires. Comments from AG members that did not require synthesis (using steps 1-3) are included verbatim in this document.

RESULTS

Results of the GHG emission analysis and evaluation of impacts to other FOs for the state of Louisiana are provided for each of the five hypothetical portfolios. Results from the GHG analysis are presented first and are based on analysis with the EPS tool. The GHG analysis results are followed by results of the analysis for the remaining FOs, consisting of a short paragraph summarizing the findings and a chart showing the range of outcomes predicted by the AG members (i.e., the distribution of positive, negative, and neutral responses). The feedback received on that portfolio for each FO is then provided, including narrative input on concerns, challenges, and considerations, as well as opportunities and potential benefits.

HYPOTHETICAL STRATEGY PORTFOLIO 1: BUSINESS AS USUAL

GHG Consequence Analysis

The EPS tool's BAU case shows steadily increasing emissions from Louisiana through 2050, dominated by emissions from the industrial sector (Figure 3). However, the EPS tool's built-in BAU case does not consider several important factors that could change Louisiana's future without action, including future disasters, coastal land loss and the associated loss of carbon sink potential, impacts from federal policy, or shifts in global demand. Notably, the BAU also does not consider the potential emissions of permitted, but not yet constructed or operational, industrial facilities and expansions.

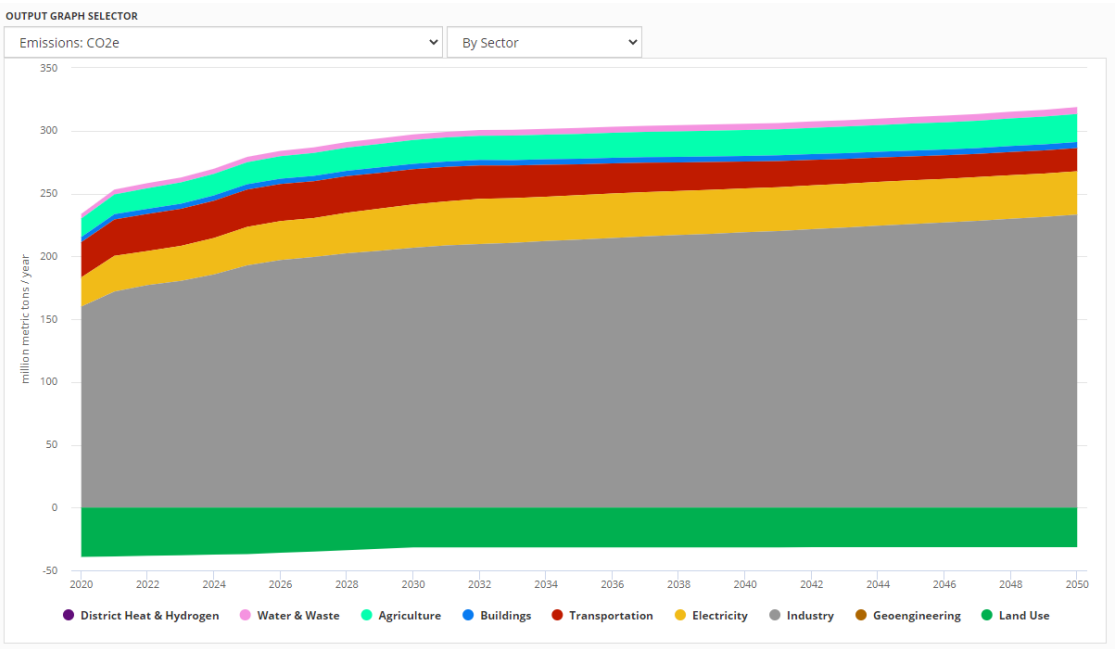

Figure 3: Sector breakdown of EPS tool BAU case, showing gross emissions at 287 MMTCO2E in 2050

The EPS tool data sources for this BAU case include the US Energy Information Administration Annual Energy Outlook, the US Environmental Protection Agency's Global Non-CO2 GHG Emissions Projections, and the National Renewable Energy Laboratory's Electrification Futures study. More information on Energy Innovation's datasets is available on their website.

Analysis of Impacts to Other Fundamental Objectives

Fundamental Objectives for the People, Economy, and Environment of Louisiana

BAU was identified as having negative outcomes across the FOs (Figure 4). These negative outcomes were generally anticipated to be regional or widespread and occurring within the next 0-10 years. Negative outcomes were associated with a negative trajectory for quality of life, equity, the economy, and the environment exacerbated by climate change and climate-related environmental disasters such as relative sea level rise, storms, and droughts.

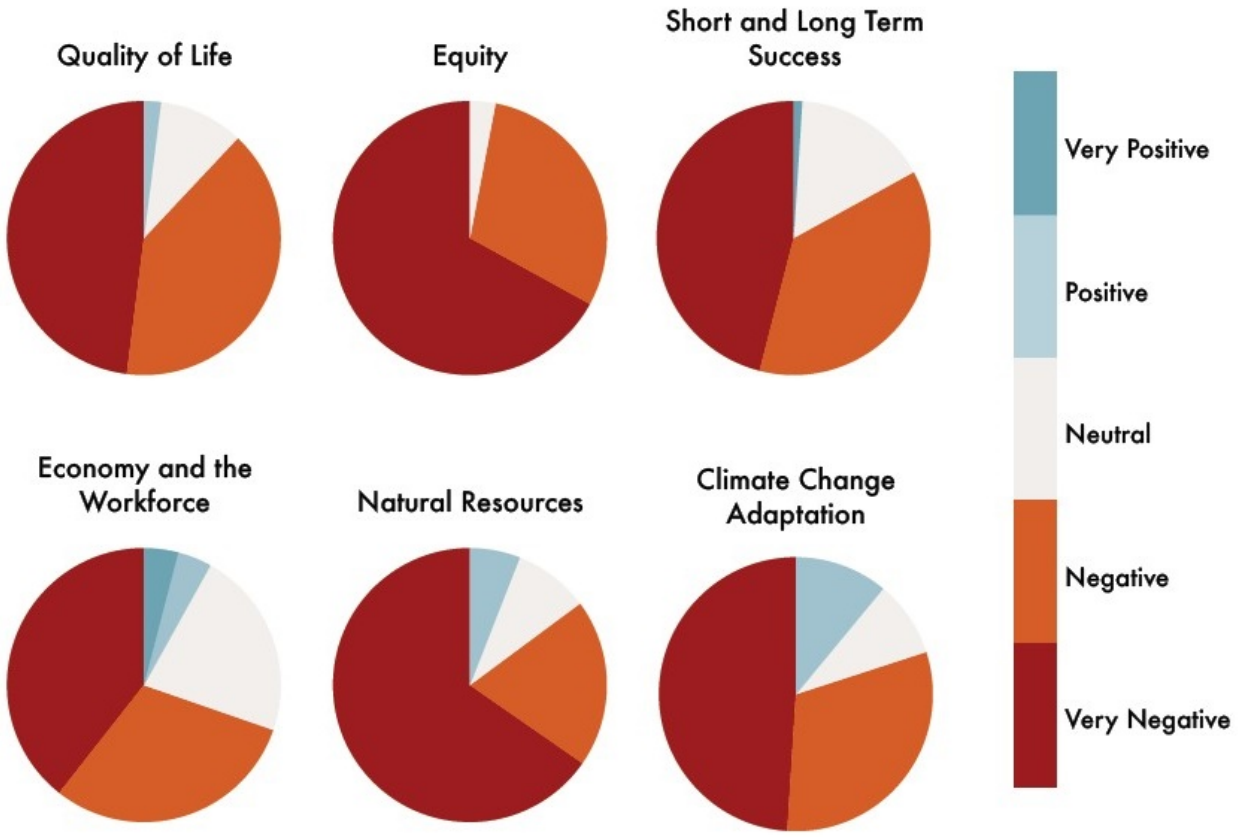

Figure 4. Distribution of responses for the BAU portfolio across the FO categories.

Improving Quality of Life for Residents and Communities

The FOs associated with this category include:

- Maximize quality of, and access to, essential goods, services, and infrastructure for residents
- Maximize positive public health outcomes and public safety
- Maximize preservation of cultural heritage

Negative outcomes were predicted from most respondents across all the FOs associated with quality of life (Figure 5). AG comments suggest these responses reflect concern about the current condition of infrastructure, public health, and protection of cultural heritage, and concern that climate change will exacerbate the existing issues.

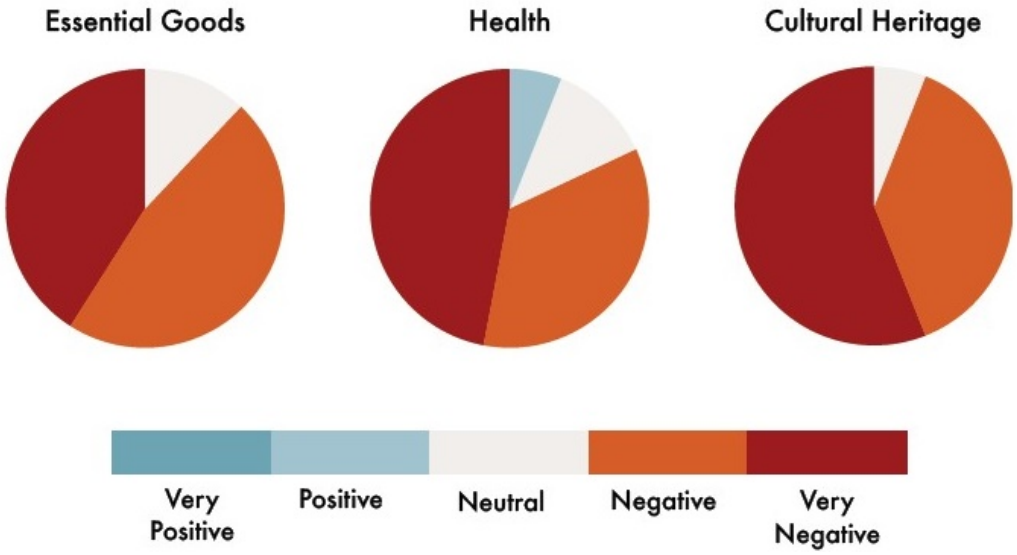

Figure 5. Distribution of responses of the outcomes of the BAU portfolio on FOs related to quality of life.

Identified Concerns, Challenges, and Considerations of Business as Usual on Quality of Life

- Does not break the cycle of the status quo which means falling behind:
    - Ongoing and expected climate impacts, including flooding and intense storms, strain public resources and reduce capacity for future public investment to continue to mitigate risk or provide essential services.
    - Full recovery of COVID-related job losses to take years, thus those affected by these job losses will not be able to enjoy essential goods and services.
    - Continued displacement and flight of Louisiana's residents
    - Energy and water will be increasingly unaffordable
- Limited/poor quality infrastructure:
    - Sprawl and destruction of transportation infrastructure will make it harder to access services
    - Louisiana infrastructure is in poor condition today, so BAU will do nothing to improve currently weak and worsening structures
- Worsening health outcomes, which already do not compare well to other states:
    - Insufficient current investment in public health
    - Worst air pollution and nutritional outcomes in the nation
    - High emissions in low-income areas
- Louisiana is already seeing major impacts from pollution and environmental changes (especially for communities along the coast), and vulnerability of LA residents to climate impacts will increase:
    - Heat, flooding, and drought, with regional variability across Louisiana
    - Climate disasters and associated displacement will significantly harm indigenous nations, long-standing Black communities and cultural sites.

- Certain parts of Louisiana cultural heritage, such as hunting and fishing along the coast, oil and gas operations and service companies along the coast and in the Gulf of Mexico, would be negatively impacted without proactive change.

Identified Opportunities and Benefits of Business as Usual for Improving Quality of Life

- Limited opportunities and benefits were identified and included:
    - A rise in remote work could influence companies to relocate here, which could result to more job opportunities
    - Energy costs to users likely to remain relatively low
    - If coal-burning plants retire, BAU would somewhat reduce exposure to harmful contaminants without additional action

Creating a More Equitable Society

The FOs associated with this category include:

- Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes
- Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities
- Maximize engagement with and participation of communities in decision-making and implementation

The consensus among respondents was that existing inequities, including disparity of opportunities and institutionalize harm, will continue to increase over time if proactive steps are not taken to limit the continued impacts of climate change on marginalized communities (Figure 6). Similarly, respondents expressed that communities have not historically been actively engaged in decision-making, and without deliberate effort that would continue to worsen with time.

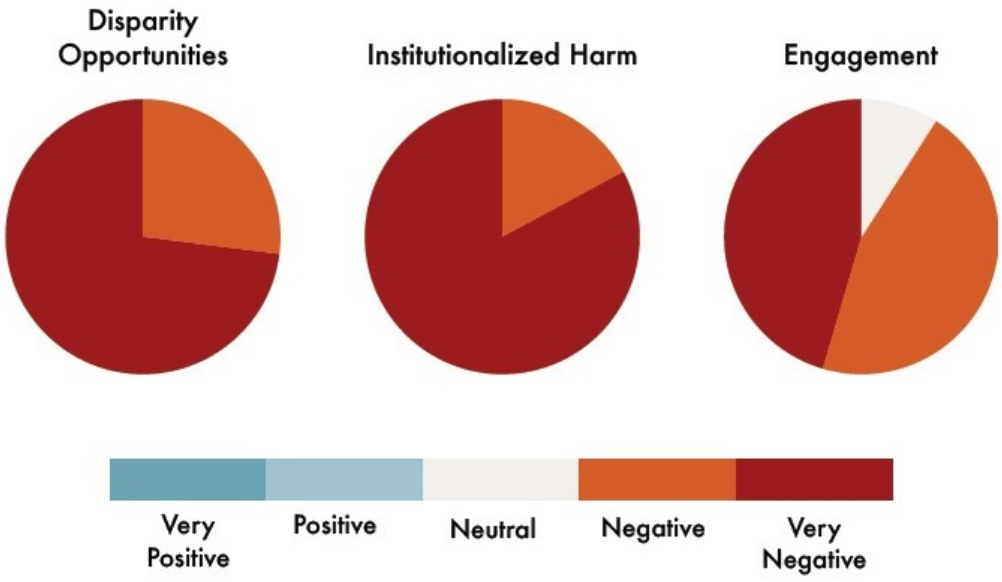

Figure 6. Distribution of responses of the outcomes of the BAU portfolio on FOs related to an equitable society.

Identified Concerns, Challenges, and Considerations of Business as Usual for Equity

- Physical destruction of existing housing stock as well as pre-impact gentrification in housing on high grounds will exacerbate inequity
- Fewer jobs will further increase disparities
- Existing inequities continue to increase with climate change; marginalized communities are more likely to:
    - Live and work in places where toxic petrochemical and industrial facilities have been placed and continue to expand, emitting pollutants that shorten and impact the quality of life;
    - Live in areas where there is more flooding, often because of racialized real estate valuation, predatory land acquisition, and variances in infrastructural investment;
    - Receive inadequate infrastructure investment to mitigate risks and prevent disasters and then also more likely to experience delayed and insufficient response and recovery investments and resources during and after emergencies

Identified Opportunities and Benefits of Business as Usual for Equity

No specific benefits or opportunities were identified within the equity fundamental objectives for the BAU portfolio

Managing for Short- and Long-Term Success

The FOs associated with this category include:

- Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation
- Maximize the efficiency and effectiveness of emissions-reduction strategies
- Maximize timely implementation of emissions-reduction strategies
- Maximize the durability of emissions-reduction strategies in an uncertain future

Because the BAU portfolio does not include proactive strategies for limiting climate change impacts, negative outcomes were predicted across the short- and long-term success objectives (Figure 7). Some respondents did note, however, that ongoing efforts which are not specifically targeted toward net GHG emission reduction (e.g., wetland restoration, coal plants coming offline as they reach end of life) could reduce GHG emissions over time.

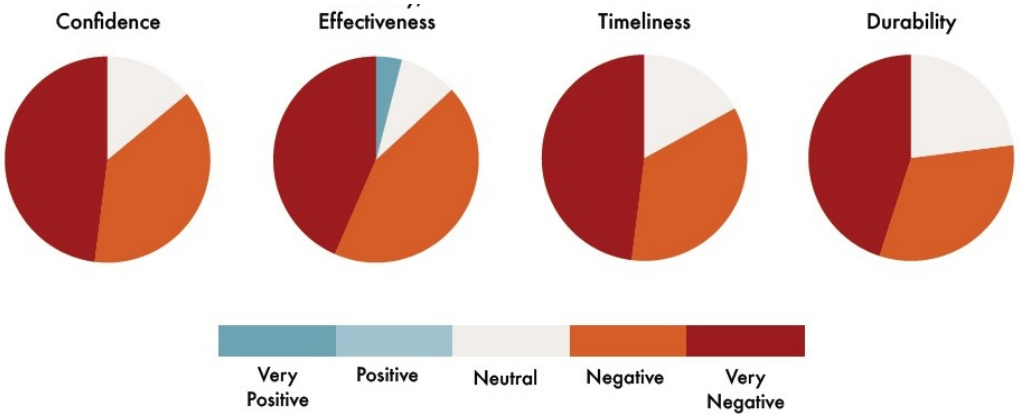

Figure 7. Distribution of responses of the outcomes of the BAU portfolio on FOs related to short- and long-term success.

Identified Concerns, Challenges, and Considerations of Business as Usual for Short- and Long-term Success

- Public opinion about taking climate change reduction actions are mixed, therefore there will be varying opinions about preserving the status quo:
    - Purely market-driven solutions to climate change should align with general public opinion; Louisiana public opinion/awareness may lag national/international trends
    - Many be people in the state would choose doing nothing versus taking action on climate change related issues, if forced to make a choice
    - Concern that there is limited understanding in the general public about climate change impacts or the strategies that may reduce those impacts
    - Climate disasters will displace people and make it harder for them to be reached
- Strategy is not consistent with the Coastal Master Plan and will put us on track for worst case scenario projections
- Conflicts between state and federal law may arise without proactive climate change mitigation
    - Potential for federal preemption
    - Tort lawsuits seeking to halt the major aspects of the BAU scenario
- Policy largely relies on national energy transitions to reduce state-wide GHG emissions
    - Markets are changing faster than policy
    - Maximizes uncertainty regarding greenhouse-gas reduction
    - Uncertainties in national energy policies could impact energy-related transitions here in Louisiana
- Lack of targeted consideration of emerging technologies or an evaluation process for measuring success in reaching benchmarks

Identified Opportunities and Benefits of Business as Usual for Managing Short- and Long-term Success

- Potential for market-driven reductions regardless of state action:
    - Overall, the energy and electricity sector changes seem compatible and in sync with the Governor's 2050 target date
    - If the nation as a whole transitions away from fossil fuels, then there is the potential for the business as usual strategies to lead to cuts in GHGs here in Louisiana

Strengthening the Economy and Workforce

The FOs associated with this category include:

- Maximize job creation and support for Louisiana workers
- Maximize economic growth

Negative impacts to the economy and job creation were identified for the BAU portfolio, with respondents indicating that market forces may reduce demand for oil, gas, and other carbon-intensive Louisiana products over time (Figure 8). However, there was disagreement over if and when that impact would be felt, with some respondents indicating neutral or positive outcomes for the Louisiana economy and workforce over time under BAU.

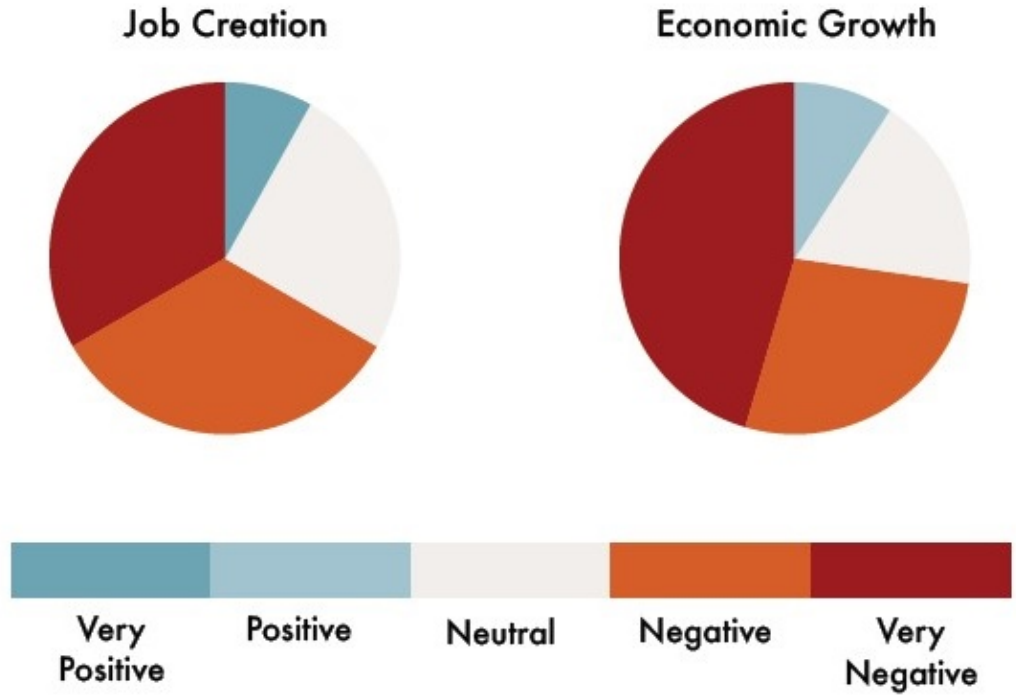

Figure 8. Distribution of responses of the outcomes of the BAU portfolio on fundamental objectives related to strengthening the economy and workforce.

Identified Concerns, Challenges, and Considerations of Business as Usual for Strengthening the Economy and Workforce

- Louisiana jobs are vulnerable to shifts in oil/natural gas demand:
    - Louisiana has led nationally as an energy state, especially with fossil fuels like oil and natural gas
    - Louisiana has also been extremely susceptible to global market shifts accordingly; the global market has shown that its already transitioning to the renewable energy sector
    - Success has relied on external entity's price setting and subsequent market needs. As such, the decline of oil production across the state, country, and world has positioned Louisiana as especially susceptible and vulnerable to these shifts
    - Negative overall trajectory likely for jobs in the long term
- BAU will perpetuate current low to negative job growth
    - The current economy has seen job losses in oil and gas as well as population loss
    - Lack of change will deter capital inflows
- Growing chorus from many different market segments (capital markets, banking, insurance, regulatory) to move to carbon neutral will have impact on growth of oil & gas sector and supporting industries
- Current economy relies heavily on tax expenditures such as property tax exemptions

Identified Opportunities and Benefits of Business as Usual for Strengthening the Economy and Workforce

- Preserving status quo is likely to preserve jobs in the short-term

The FOs associated with this category include:

- Maximize preservation of natural resources and ecosystem services
- Maximize environmental stewardship and support of healthy ecosystems

The consensus among respondents for ecosystems and associated natural resources was that there will be negative outcomes over time associated with the impacts of climate change, including relative sea level rise, storms, and drought (Figure 9). Ongoing efforts to preserve ecosystems for reasons other than climate change mitigation (e.g., restoration under the Coastal Master Plan) may have positive impacts on the environment, however, and some respondents indicated a positive outcome over time.

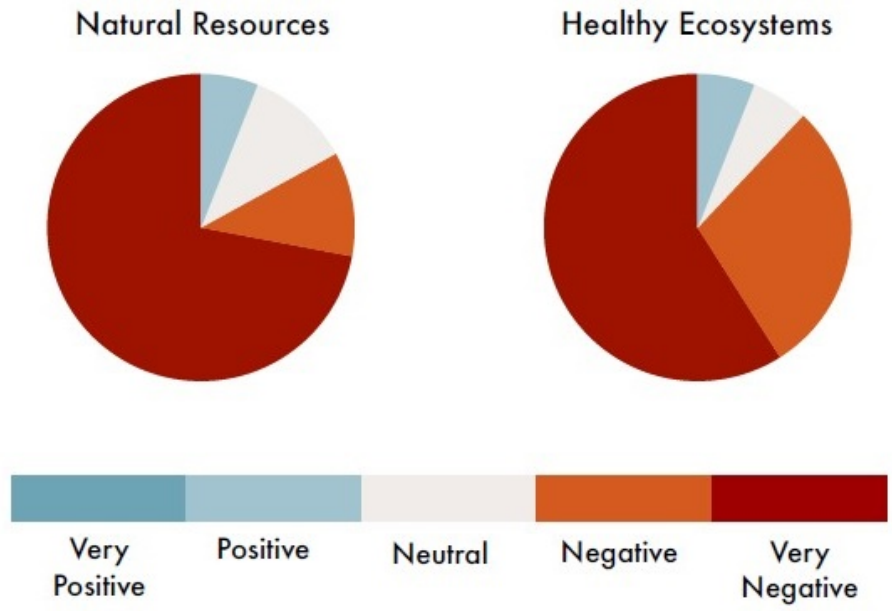

Figure 9. Distribution of responses of the outcomes of the BAU portfolio on FOs related to conserving natural resources and protecting the environment.

Identified Concerns, Challenges, and Considerations of Business as Usual for Conserving Natural Resources and Protecting the Environment

- Climate disaster and sea level rise will continue to wreak havoc on Louisiana's natural resources
    - Current strategy on natural resources and ecosystem is not in line with the Governor's 2050 goals
    - Portfolio relies largely on Louisiana's Coastal Master Plan to improve ecosystem services. On the plus side, that plan is scientifically robust, and supported by an aggressive effort. However, the Master Plan's success depends in part on the rate of global sea level rise
    -

Identified Opportunities and Benefits of Business as Usual for Conserving Natural Resources and Protecting the Environment

No specific benefits or opportunities were identified within the natural resources and protecting the environment objectives for the BAU portfolio

The FOs associated with this category include:

- Increase resilience of the built and natural environment to climate change impacts
- Increase the resilience of communities to climate change

Most respondents indicated negative outcomes for climate adaptation over time for the natural and built environment, as well as for communities (Figure 10). Several comments linked these negative outcomes to the impacts of climate change on the natural and built environment which will continue to increase without deliberate effort.

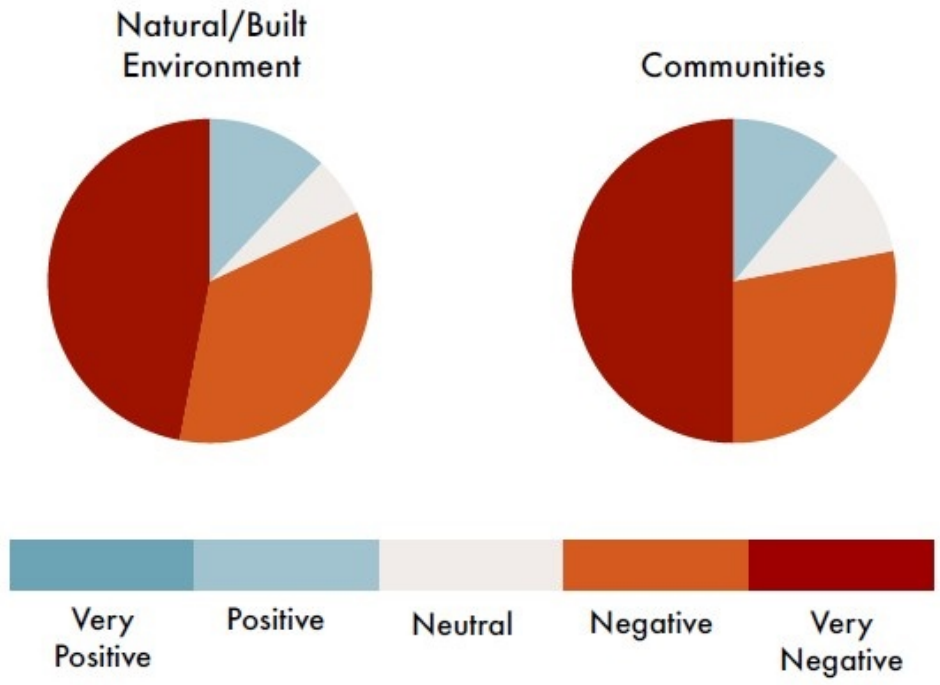

Figure 10. Distribution of responses of the outcomes of the BAU portfolio on FOs related to adapting to a changing climate.

Identified Concerns, Challenges, and Considerations of Business as Usual for Adapting to a Changing Climate

- No mitigation makes adaptation strategies more difficult; for example, gains from wetland rebuilding will be negated
- Without addressing climate change, communities and ecosystems will be less resilient
- Cost/benefit analysis will not support spending levels for adaptation under the BAU perspective
- No mitigation means no engagement with community resilience strategies
- Accelerating climate change is likely to increasingly stress Louisiana communities, reducing their resilience to climate change

Identified Opportunities and Benefits of Business as Usual for Adapting to a Changing Climate

No specific benefits or opportunities were identified within the climate adaptation objectives for the BAU portfolio.

HYPOTHETICAL STRATEGY PORTFOLIO 2: INTENSIVE ELECTRIFICATION THROUGH ZERO-CARBON RENEWABLE ENERGY

GHG Consequence Analysis

The EPS tool outputs for this portfolio show a decrease in GHG emissions to 72 MMTCO2E in 2050, as seen in Figure 11. This shows a strong improvement over the BAU case.

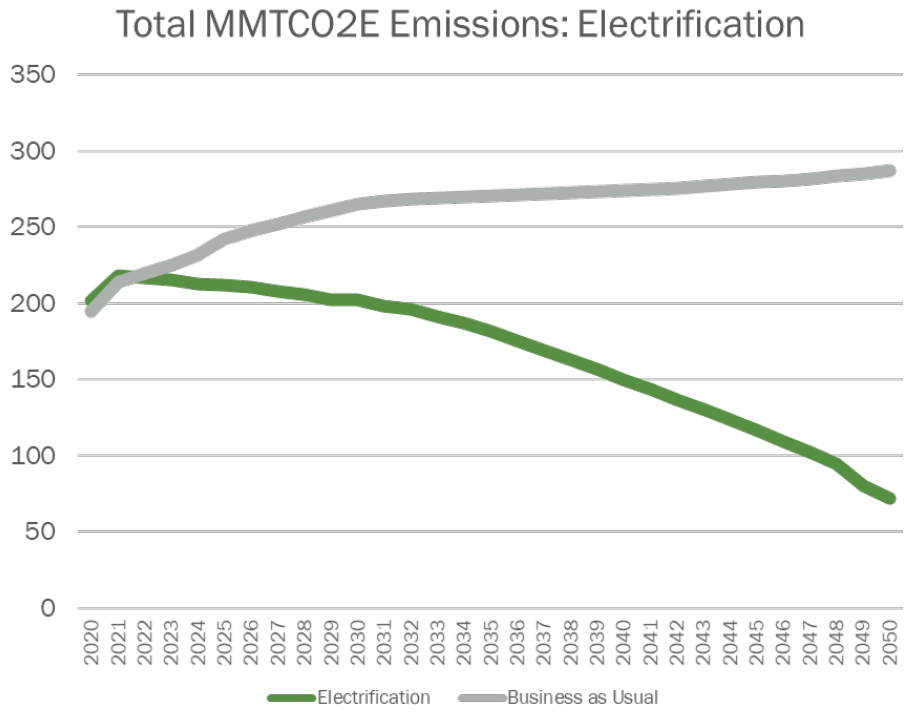

Figure 11: EPS outputs for Zero-Carbon Renewable Electrification showing decrease to 72 MMTCO2E

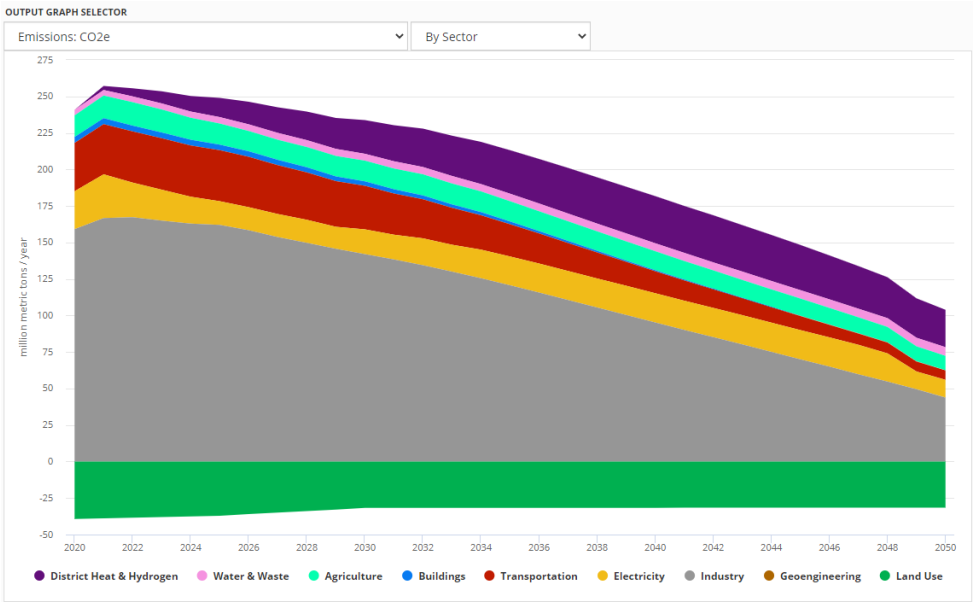

Figure 12: Sector breakdown of Zero Carbon Renewable Electrification portfolio emissions

The sector breakdown (Figure 12) shows that electrification and hydrogen production by electrolysis are important for reducing industrial emissions in this portfolio. Additionally, the transportation, buildings, and electricity sectors are nearly fully electrified by 2050.

Some limitations include the policy effective dates and phase-in, especially for standards and subsidies. EPS tool policies require user inputs. In this high level, hypothetical analysis, those user inputs can be broad, but as the planning process moves to policy design, choices will have to be made that require more specificity. Other limitations include policies not available in the EPS tool, such as biofuels, labor supply and training, and consumer affordability. Additional gaps include the viability and scale for hydrogen production by electrolysis, as well as how the pace of new building construction in Louisiana might impact the imposition of efficiency standards throughout the state's building stock.

Analysis of Impacts to Other Fundamental Objectives

Fundamental Objectives for the People, Economy, and Environment of Louisiana

This portfolio was identified as having opportunities for transformative societal change with co-benefits across the fundamental objectives (Figure 13). Respondents identified potential negative short-term (0-10 year) impacts to the economy and workforce associated with a loss of jobs and investment in the oil and gas sector. In the long term (5-30 years), regional or widespread benefits were predicted across the fundamental objectives.

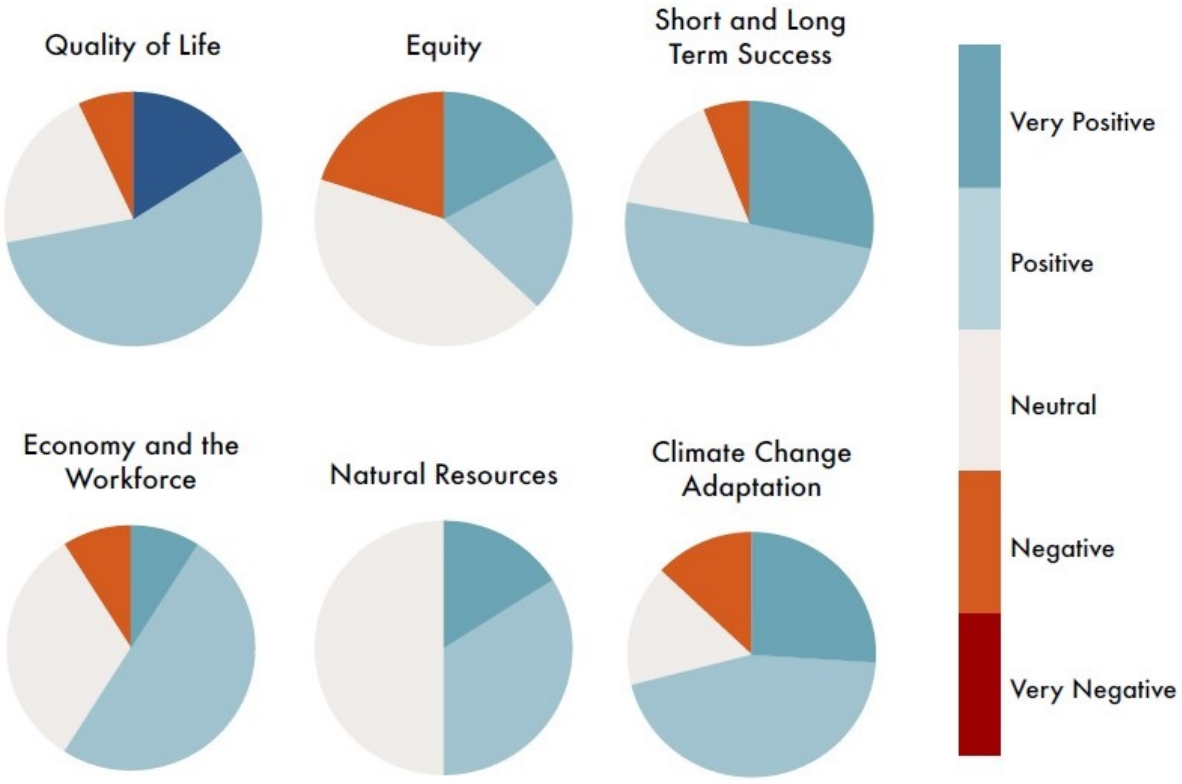

Figure 13. Distribution of responses for the Electrification Intensive portfolio for the fundamental objective categories.

Improving Quality of Life for Residents and Communities

The fundamental objectives associated with this category include:

- Maximize quality of, and access to, essential goods, services, and infrastructure for residents
- Maximize positive public health outcomes and public safety
- Maximize preservation of cultural heritage

The electrification and renewable energy portfolio was generally predicted to have positive outcomes for the quality of life objectives of preserving quality of, and access to, essential goods and services, as well as for health and safety (Figure 14). Comments indicate this outcome would be the result of opportunities to upgrade electrical and other infrastructure at the same time the strategies in the portfolio are implemented, as well as to the reduction of other pollutions beyond GHG emissions while switching to renewable energy. There was mixed feedback on the impacts of electrification and renewable energy on cultural heritage, with some respondents giving concern about a loss of way-of-life associated with Louisiana's oil and gas industry and culture, or the potential for retrofitting to damage historic structures.

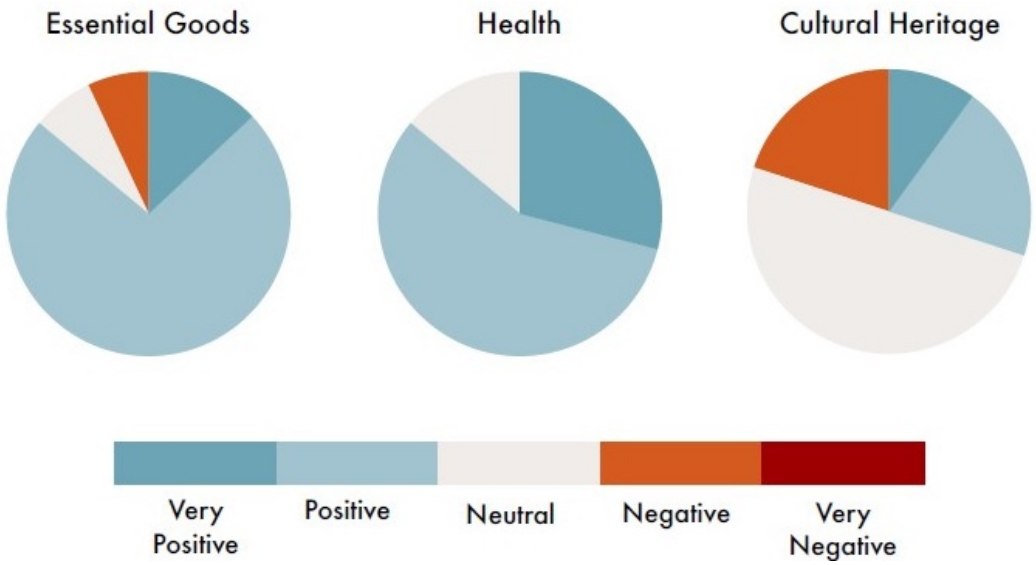

Figure 14. Distribution of responses of the outcomes of the electrification and renewable energy portfolio on fundamental objectives related to quality of life.

Identified Concerns, Challenges, and Considerations of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Improving Quality of Life

- Impacts to quality of life and continued access to goods and services depends on:
    - Cost of electricity generation and transmission after a transition to renewable energy when compared to current costs
    - Reliability of renewable energy sources, and particularly vulnerability to environmental disasters
    - Cost and performance of electric vehicles

- For there to be broad participation by consumers and continued access to goods and service, there would need to be a targeted and focused effort such as financial support for lower income people to electrify
- Access to goods and services, including reasonable consumer costs, must be maintained during the transition to renewable energies
- If there is a rush to retrofit buildings based on electrification and transition to renewable energy, it could negatively impact historic structures
- If Louisiana loses some of its traditional oil and gas history, that could influence the economic and hardhat culture along the coast
- Consumers habits and "way of life" would need to shift considerably (move to electric cars, etc.)

Identified Opportunities and Benefits of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Improving Quality of Life

- Opportunity to improve housing stock and increase public electrified transportation to reduce household costs for poor and marginalized people
- Some parts of Louisiana's electrical grid need an upgrade, so this portfolio presents an opportunity to provide needed maintenance and improvement to the electrical sector
- Louisiana could become a hydrogen hub for the United States
- Electric vehicle transition could quickly become a lower cost alternative to gas powered vehicles:
    - Charging networks need significant expansion, so a statewide policy to address this gap could unlock lower cost transport alternatives for widespread use
    - Proactive investments will have large ripple effect and avoid a scenario where we pay high transport costs for longer than is needed simply due to coordination failure in developing charging infrastructure
- Health benefits identified for the portfolio include:
    - A move away from carbon intensive energy reduces emissions from coal, natural gas and improves air quality / wastewater run-off
    - Reduction in vehicle emissions and negative health impacts
    - Fewer accidents on roads
- An identified cultural resource benefit is that this portfolio could lead to better management of archived materials

Creating a More Equitable Society

The fundamental objectives associated with this category include:

- Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes
- Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities
- Maximize engagement with and participation of communities in decision-making and implementation

There was a range of predicted outcomes for the equity objectives for the electrification and renewable energy portfolio (Figure 15). Respondents noted that higher income populations would be impacted first, and steps would need to be taken to ensure lower income populations were able to participate, including benefiting from new job opportunities that would be associated with this transition. There was also concern that electrification and renewable energy strategies would not naturally resonate with low-income and marginalized communities; therefore, there would need to be targeted outreach for participation and engagement.

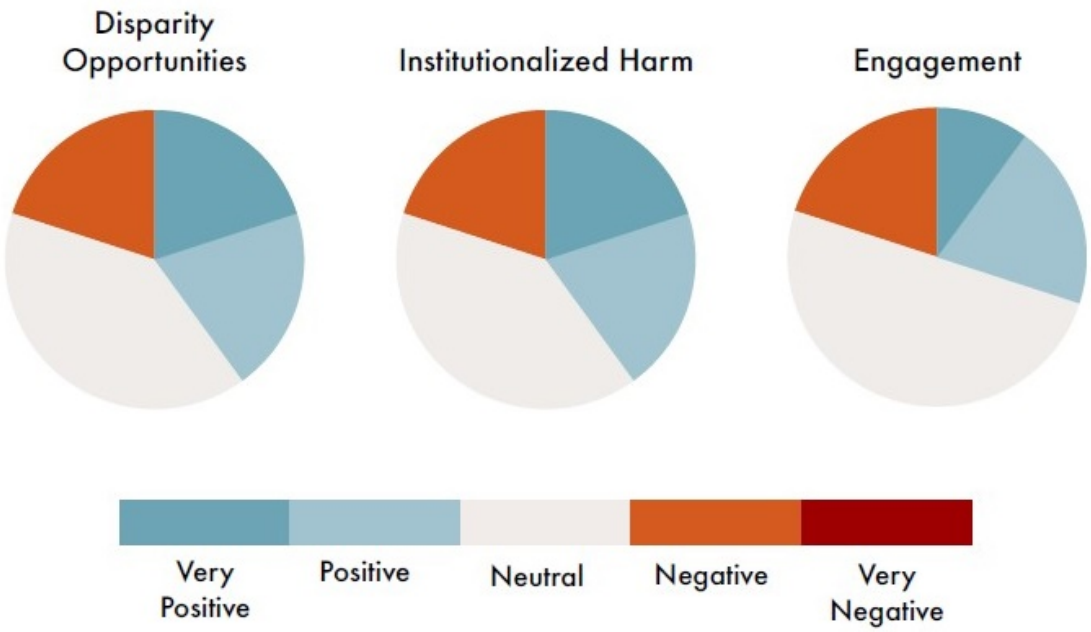

Figure 15. Distribution of responses of the outcomes of the electrification and renewable energy portfolio on fundamental objectives related to an equitable society.

Identified Concerns, Challenges, and Considerations of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Equity Considerations

- In the short term, this portfolio will impact higher income populations first. Deliberate effort would be needed to ensure access and affordability for low-income people and historically marginalized groups:
    - Equity will require distributing the benefits (tax advantages, jobs, reduction of co-pollutants) so they are shared in marginalized communities. This will require innovations in financing, tax structure, job training, and siting decisions
    - The state must invest in training programs and prioritize marginalized communities to achieve positive outcomes
- Concern was expressed that the strategies in this portfolio would not immediately resonate with low-income residents and marginalized communities, therefore programs that emphasize outreach and meaningful engagement will be vital for successful outcomes for the equity objectives

Identified Opportunities and Benefits of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Enhancing Equity

- Strategies in this portfolio could be a mechanism for reducing inequality if targeted to underserved communities and toward reducing disparities
    - Prioritizing poor and marginalized people for electrification jobs can help reduce economic inequality in Louisiana
    - Targeting overburdened and underserved communities for the most improvements could reduce inequity
- Historical impacts to marginalized communities from fossil fuel extraction/production may be mitigated relatively quickly by shift to electrification/renewable energy:
    - Electrification can address interconnected equity issues in housing, transportation, land use, and health outcomes
    - Zero-carbon energy sources would produce significant immediate benefits to the communities that would increase over time
    - High electrification scenarios will reduce the amount of new infrastructure such as pipelines in coastal indigenous communities
- Opportunities to make sure historically marginalized people are involved in the decision making and implementation of solutions

Managing for Short- and Long-Term Success

The fundamental objectives associated with this category include:

- Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation
- Maximize the efficiency and effectiveness of emissions-reduction strategies
- Maximize timely implementation of emissions-reduction strategies
- Maximize the durability of emissions-reduction strategies in an uncertain future

Predominantly positive outcomes were predicted across the fundamental objectives in the short- and long-term success category (Figure 16). Respondents indicated targeted outreach would be needed to educate stakeholders and the public given concerns that there was not widespread familiarity in the state with electrification and renewable energy, and because of impacts to the oil and gas industries. The portfolio of strategies was generally considered to be efficient and effective and quick to implement due to the reliance on existing technology, with concerns expressed about the costs and benefits and vulnerability to environmental disasters.

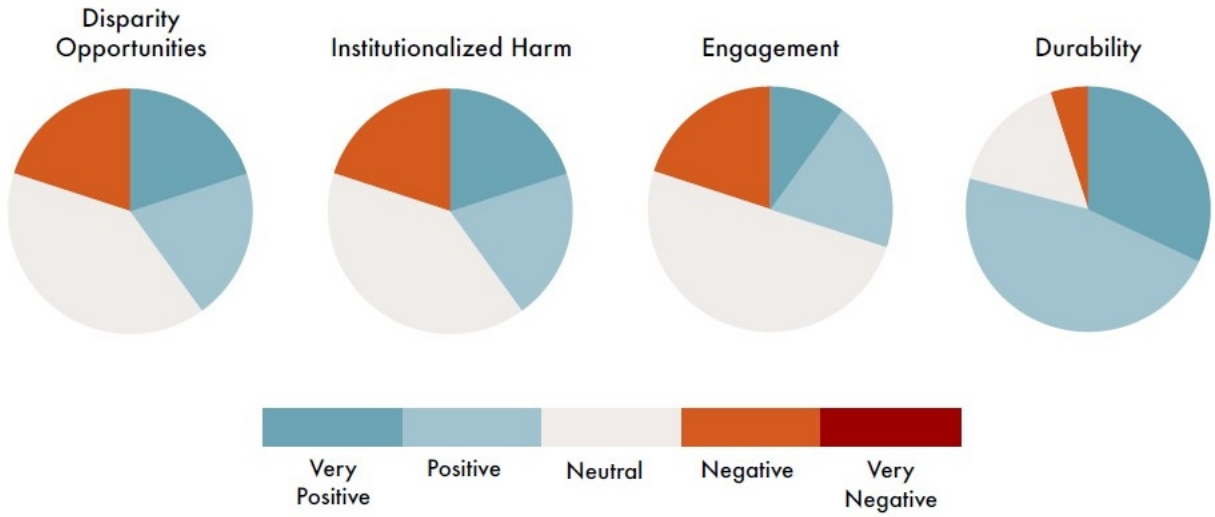

Figure 16. Distribution of responses of the outcomes of the electrification and renewable energy portfolio on fundamental objectives related to short- and long-term success.

Identified Concerns, Challenges, and Considerations of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Short- and Long-term Success

- Work will need to be done to educate the public and stakeholders to build confidence in doing things differently and to counter resistance that may occur from some sectors:
    - Potential for misinformation and disinformation with a need for active communication to negate
    - Target communication toward different groups (e.g., outreach needs to be multilingual, accessible, and proactive to reach underserved communities)
    - Public education of kids in school on the importance of zero-carbon energy
- Potential for lack of public confidence in this strategy because of the major changes required and the impacts to current jobs in the oil and gas industry
- Confidence of business/industry may be impacted because regulation of (for instance) offshore wind and hydrogen is relatively new territory
- The efficiency and effectiveness of the strategies in this portfolio will depend on:
    - Costs and benefits of portfolio strategies, specifically offshore wind
    - Availability and sourcing of raw materials and the potential increase of reliance on other countries for their acquisition
    - Reliability, in particular capacity to withstand environmental disasters
    - Availability of the technology
- The timeliness of implementation will depend on:
    - Need for governance changes at a local level
    - Funding to implement and upfront cost for infrastructure change
    - Level and speed of investment in major shifts in infrastructure:
        - Electrical transmission
        - Generation – offshore wind in particular may take a long time to implement

        - Use of green hydrogen relies on technologies that are not well developed or used in Louisiana, and which may require additional infrastructure investments
- Electrification may need coordinated efforts from federal, state, and local governments and industry leaders, and there is potential for regulations to be in conflict at different levels of government
- Concerns were expressed on uncertainty of these strategies in the face of severity of certain climate disasters:
    - Siting of offshore wind and solar farms, and the potential to put in places that could be unsuitable in the future due to climate change
    - Continued availability of building materials/resources for solar panels and windmills

Identified Opportunities and Benefits of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Managing Short- and Long-term Success

- Opportunities to build public confidence include:
    - Collaboration with across sectors, such as building more public transportation and using transit stations as places of outreach
    - Education on the use of biofuel
- Strategies identified as highly viable strategies with long-term benefits, thus highly effective and efficient to devote limited governmental resources
    - Electrification can be easily integrated with battery technologies to increase the overall resilience and energy storage
    - Potential in Louisiana for developing renewable sources like wind and solar (sunny state that often has strong winds)
    - Electrification with renewable energy is a strategy that is ready to be done now and will allow for long-term success of other strategies
    - Reduces/eliminates dependence on outdated and poorly maintained fossil fuel infrastructure and facilities, thus opportunities for ensuring resiliency in an uncertain future are many and well within reach
- Level of investment is important for this portfolio: go big and fast with electrification because other energy intensive pathways require a reliable source of excess energy being generated.
- Primed for rapid implementation, particularly solar:
    - The utility and EV car proposals submitted to date are generally more complete, detailed and thought out than most other categories
    - Progress underway on electrification across the country (including distributed generation), continued investments in storage capacities, utility models that can manage transition, commitments of auto manufacturers, and likely federal commitments to infrastructure support
    - Technology is proven and the prices have fallen

Strengthening the Economy and Workforce

The fundamental objectives associated with this category include:

- Maximize job creation and support for Louisiana workers
- Maximize economic growth

Most predictions for outcomes for job creation and the economy under this portfolio were positive (Figure 17). Respondents identified that renewable energy and electrification could result in the creation of new jobs that could be utilized by the Louisiana workforce with the right training. However, some respondents expressed concern about the loss of jobs in the oil and gas sectors and the state's capacity to be competitive in new markets on a regional and national scale.

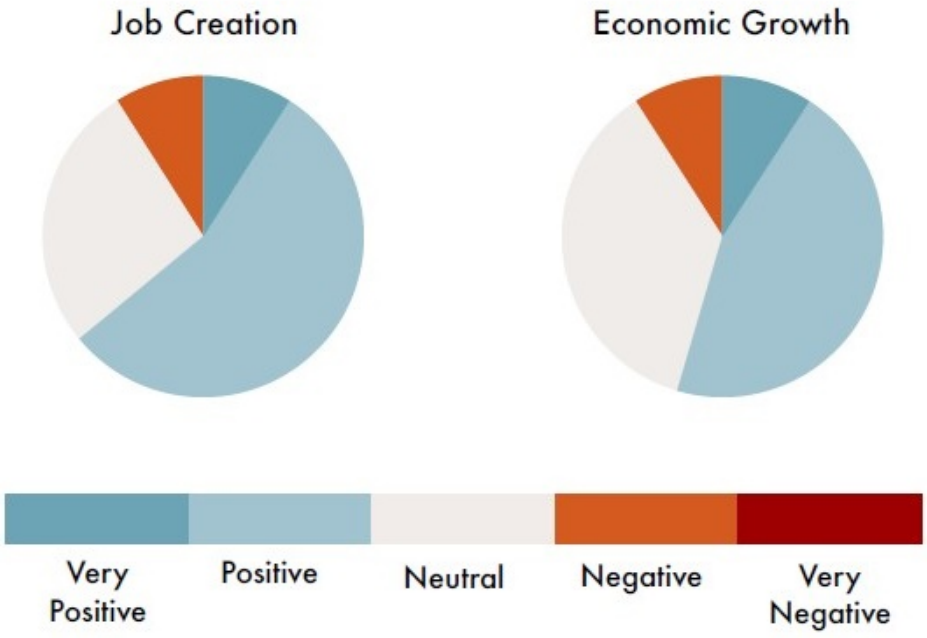

Figure 17. Distribution of responses of the outcomes of the electrification and renewable energy portfolio on fundamental objectives related to strengthening the economy and workforce.

Identified Concerns, Challenges, and Considerations of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Strengthening the Economy and Workforce

- Highly dependent on job creation tradeoffs and being able to create/fill jobs to offset losses in the oil/gas sectors:
    - If clean energy jobs from wind and solar can be a one-to-one replacement for traditional oil and gas extraction jobs that may be going away
    - Existing workforce must be prepared for transition
    - Louisiana must be competitive enough regionally/nationally to bring a commensurate number of jobs with commensurate pay
    - Who new jobs are available to is dependent upon who owns the generation / distribution facilities and supporting industries and where they are located

- Transition and timeline are key:
    - Early retirement of existing power plants and investments in renewable energy likely to have short term negative impacts to the economy and workforce
    - Unclear if it is possible to shift rapidly to new energy sources from a workforce perspective in short term without aggressive to unrealistic job creation/training strategies
- Requires supports for Louisiana based businesses who are more likely to hire local people
- Electrification economy may require tweaks to Louisiana's laws to achieve economic equality (e.g., raise the minimum wage, protect the right to organize, and make its tax code more progressive to create more equality)
- Need to be specific about corporate attraction and other economic factors that contribute to growth under this portfolio – the strategy would seemingly require heavy tax incentives

Identified Opportunities and Benefits of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Strengthening the Economy and Workforce

- Energy infrastructure change with workforce development could create jobs
    - Requires workforce development: can work with local schools, labor unions
    - Potential to enhance job creation with a broader economic development strategy to recruit manufacturing and expand research/education at universities
- Opportunities for leveraging of existing Louisiana workforce, capacity, and infrastructure:
    - Manufacturing capacity and expertise
    - Access to transportation hubs and energy sources
    - Potential to be global center for alternative energy sources like battery storage, solar panel, and wind turbine manufacturing
    - Offshore wind development in the Gulf of Mexico is a unique opportunity for the existing manufacturing industry, which has historically supported the oil and gas industry; manufacturing is the largest economic driver for offshore wind development
- Much of the technology already exists so adaption is more the hurdle than innovation; strong adaption could lead to great opportunity as an early adaption state
- Opportune timing: job creation and positive economic impacts from clean energy is the focus of the Biden Administration and environmental NGOs
- Opportunity to capitalize on investments being made from out-of-state
    - Global investments in the alternative energy spaces (wind, solar, battery)
    - Wall Street predictions that these investments will be more lucrative than fossil fuel investments as early as next year
- Opportunity to capitalize on major transition in energy/manufacturing by bringing them to Louisiana
    - Wind turbine manufacturing, next generation transmission/energy storage
    - Need to redefine Louisiana's brand/image and increase our success in establishing manufacturing to support this type of equipment
    - Economic benefits in long term

- Opportunity to improve industry diversification
- Potential for job growth and dual income from farmlands producing energy

Conserving Natural Resources and Protecting the Environment

The fundamental objectives associated with this category include:

- Maximize preservation of natural resources and ecosystem services
- Maximize environmental stewardship and support of healthy ecosystems

The bulk of responses on the impacts of this portfolio and natural resources and healthy ecosystems was positive (Figure 18). Specific positive outcomes that were identified include a reduction in oil and gas pipelines and opportunities to integrate with other conservation efforts. However, there were concerns identified that there can be negative unintended consequences of renewable technology (e.g., wind and solar farms) for wildlife, with respondents indicating environment policy should be appropriately enforced.

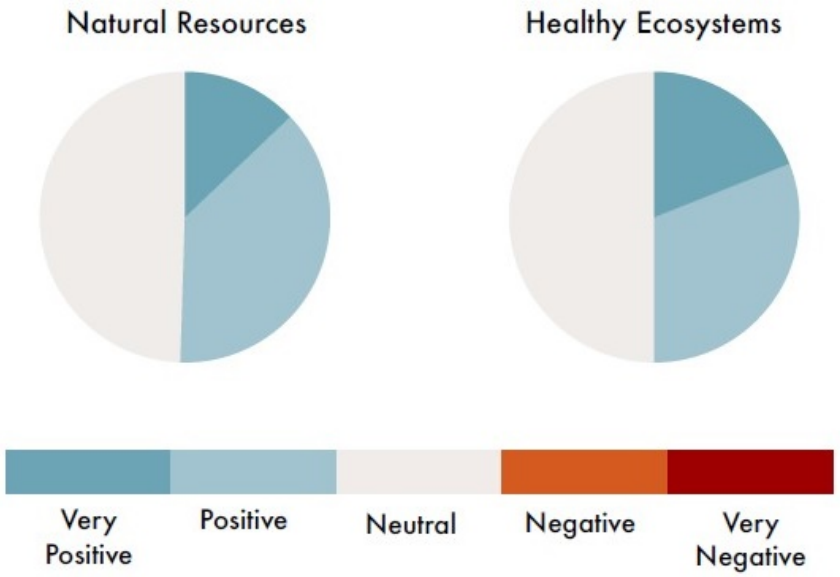

Figure 18. Distribution of responses of the outcomes of the electrification and renewable energy portfolio on fundamental objectives related to conserving natural resources and protecting the environment.

Identified Concerns, Challenges, and Considerations of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for the Conserving Natural Resources and Protecting the Environment

- Potential for renewable infrastructure to cause environmental harm and thus need to maintain/review environmental laws and procedures accordingly:
    - Displacement of key food webs
    - Impacts of large solar or wind farms
    - Impacts to wildlife (migratory bird patterns)
    - Negative impacts of building, facilities

    - "Green hydrogen" and potential for the classification of “green” to be driven by economic rather than environmental factors
    - Need for mitigation strategies, such as painting windmills to avoid bird collisions
- Concerns over the environmental impacts of accessing raw materials

Identified Opportunities and Benefits of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Conserving Natural Resources and Protecting the Environment

- Shifts to renewables can have environmental co-benefits:
    - Reducing the number of existing and new oil and gas pipelines leading to greater preservation of natural ecosystems and services
    - Less mining activity, which will likely lead to reduced impacts into Louisiana's coastal zone and other places across the state with intensive mining
- Opportunities to be comprehensive with other environmental planning:
    - State land use plan that makes sure we are making decisions consistent with the vision of the Task Force
    - Incorporation in a more global and comprehensive plan
- Input that there is a need to stress the linkage between green hydrogen and nuclear power
- Opportunities to mitigate potential negative impacts - for example, rooftop solar does not require new land that displaces agriculture, while it is possible for new solar farms to displace flora and fauna
- If shift away from automobile-based transportation and towards human powered transport is emphasized, it could lead to reduced paved area and increased ecosystem services in cities

Adapting to a Changing Climate

The fundamental objectives associated with this category include:

- Increase resilience of the built and natural environment to climate change impacts
- Increase the resilience of communities to climate change

Most of the responses for the outcomes of this portfolio on climate adaptation were positive (Figure 19). Respondents indicated that there were opportunities to enhance resilience while upgrading or retrofitting infrastructure as part of this portfolio, including in the development of community-deployed solar grids. However, some concerns were expressed about the vulnerability of new infrastructure, particularly renewable energy technology, to environmental disasters (e.g., storms, rising seas, etc.).

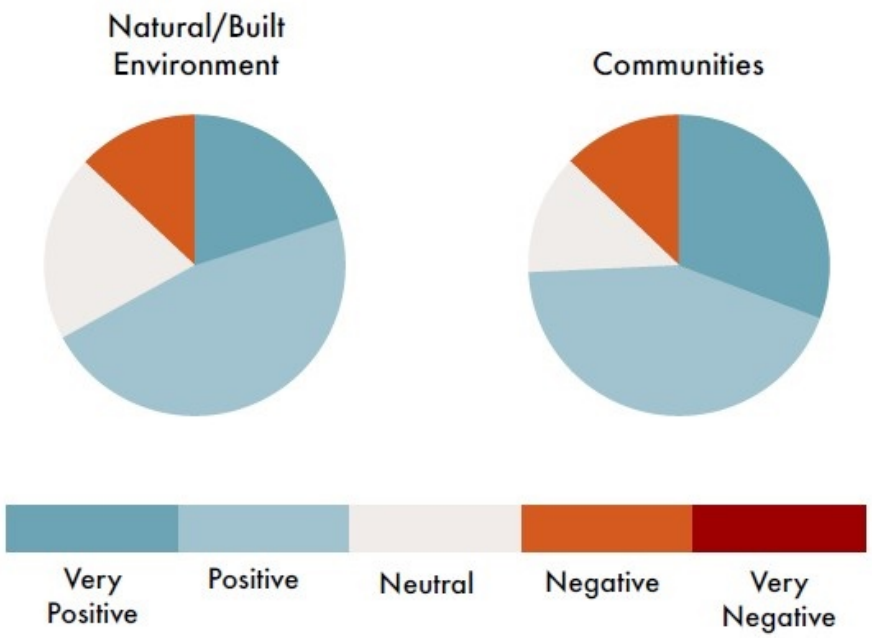

Figure 19. Distribution of responses of the outcomes of the electrification and renewable energy portfolio on fundamental objectives related to adapting to a changing climate.

Identified Concerns, Challenges, and Considerations of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Adapting to a Changing Climate

- Potential increased vulnerability of new infrastructure: expanded electrical grid and expanded renewable capacity are vulnerable to storms, rising seas, extreme heat and other atmospheric processes that could be impacted by climate change

Identified Opportunities and Benefits of an Intensive Electrification through Zero-Carbon Renewable Energy Portfolio for Adapting to a Changing Climate

- Opportunities to enhance infrastructure resilience during a transition:
    - Elevating transportation infrastructure as we electrify it
    - Wind and solar have in many cases proven to be more resilient in times of extreme events than fossil fuel systems; part of the advantage is that many forms of renewables are not dependent on supply chains of fuel
- Less disturbance of natural ecosystems from oil and gas extraction (pipelines) will lead to more resiliency to future climate change
- Community resiliency may be enhanced:
    - Communities with proper infrastructure reliant upon renewable resources will be more resilient during disasters (e.g. solar powered generators, etc.), and nanogrids and microgrids can insulate communities from overall grid failures
    - Diversifying economy will enhance community resilience
    - Homes can be elevated, winterized, etc. while preparing for electrification

- Electrify in conjunction with other programs such as requiring permeable surfaces to capture rainwater where it falls

References for Further Reading

Biomass Note: The Energy Information Administration asserts that biomass energy can be a carbon-neutral energy source in spite of its GHG emissions because the plants that are the source of the biomass capture almost the same amount of CO2 through photosynthesis while growing as is released when it is burned. (See sources: EIA, EIA 2). This can be contingent upon the emissions associated with the growing of the crops and the manufacturing of the biodiesel are accounted for.

HYPOTHETICAL STRATEGY PORTFOLIO 3: REDUCED ENERGY DEMAND, CONSUMPTION & WASTE INTENSIVE

GHG Consequence Analysis

The EPS tool outputs from this portfolio showed a slight decrease in GHG emissions from the BAU case to 226 MMTCO2E by 2050, as seen in Figure 20. However, this portfolio does not represent a decrease from current emissions levels, nor does it meet the goals of the Executive Order.

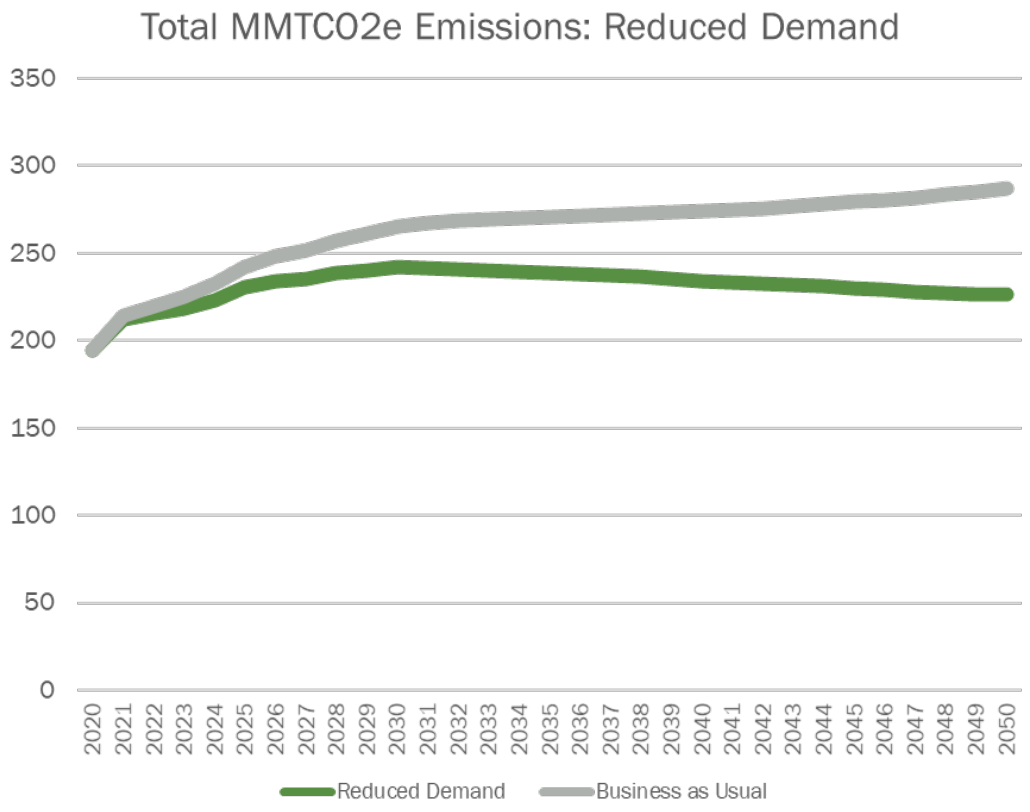

Figure 20: EPS output of Reduced Demand portfolio showing decrease to 226 MMTCO2E

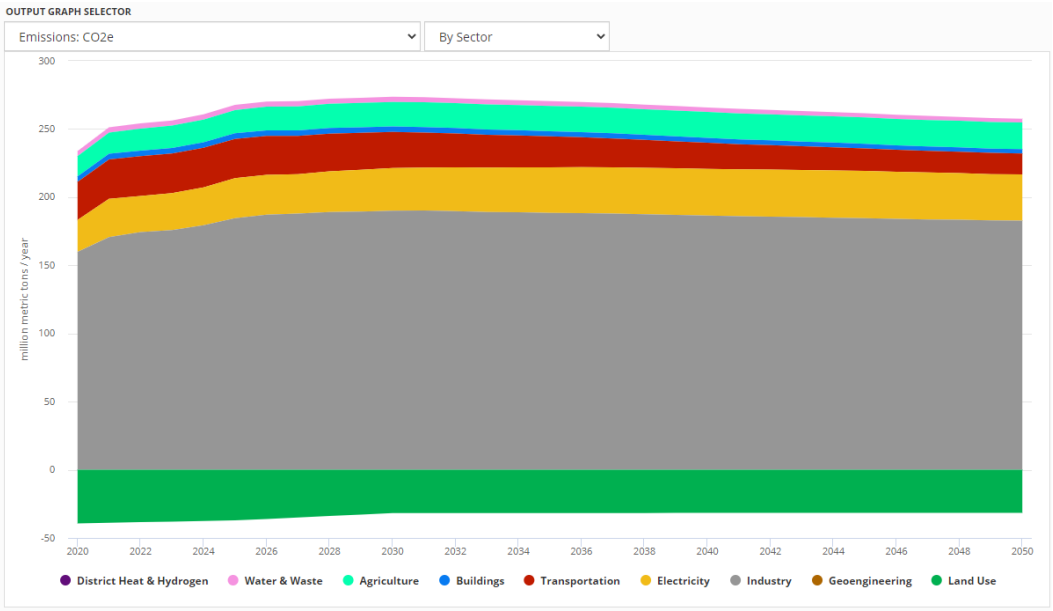

Figure 21: Sector breakdown of the Reduced Demand portfolio

A closer examination at sector emissions, seen in Figure 21, shows that industrial emissions are essentially unaffected by this set of demand reduction policies, in large part because the policies included in the previous portfolio (industrial electrification and hydrogen fuel switching) are not included in this demand reduction portfolio. Some small decreases in transportation sector emissions are seen here, in red. Electricity sector emissions are essentially unchanged.

The limited impact of this portfolio in the EPS tool is not surprising; many kinds of behavioral changes are outside of what the tool can model. For example, land use and planning changes related to streets, development, and transportation modes that may reduce energy demand are not modeled here. Product-related changes, like building materials, are also not included in this model, nor are actions or strategies related to reducing consumer waste or promoting local economies. The pace and role of behavioral change are difficult to predict, especially at a scale that could impact statewide emissions. However, it is important to consider the impact that changes to sectors like land use could have, as most new buildings and streets will be built to exist long past 2050.

Analysis of Impacts to Other Fundamental Objectives

Fundamental Objectives for the People, Economy, and Environment of Louisiana

For the reduced energy demand, consumption, and waste intensive, potential co-benefits were identified for quality of life, equity, the environment, and adaptation to climate change, with negative impacts to the economy and workforce identified as a concern due to a drop in demand for Louisiana goods and services (Figure 22). The economic impacts were anticipated to be limited or regional in nature (i.e., focused on certain sectors) and to begin in the near-term (next 0-10 years). The benefits across the other fundamental objectives were anticipated to be regional or widespread and to also begin with the next 0-10 years.

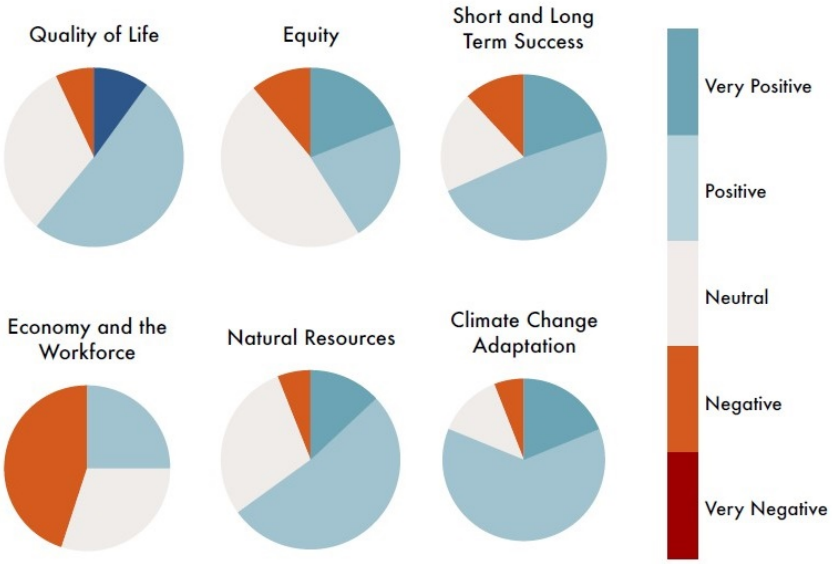

Figure 22. Distribution of responses for the reduced demand portfolio across the fundamental objective categories.

Improving Quality of Life for Residents and Communities

The fundamental objectives associated with this category include:

- Maximize quality of, and access to, essential goods, services, and infrastructure for residents
- Maximize positive public health outcomes and public safety
- Maximize preservation of cultural heritage

The impacts of reducing energy demand, consumption, and waste were predominantly identified as positive for maintaining access to essential goods and for human health (Figure 23). Respondents highlighted that local food production could be beneficial to local businesses and for residents, and that the strategies in this portfolio would result in improved indoor and outdoor air quality. The predictions of impacts to cultural heritage were mostly neutral, with concern that the strategies in this portfolio would have more implications for indigenous lands than others.

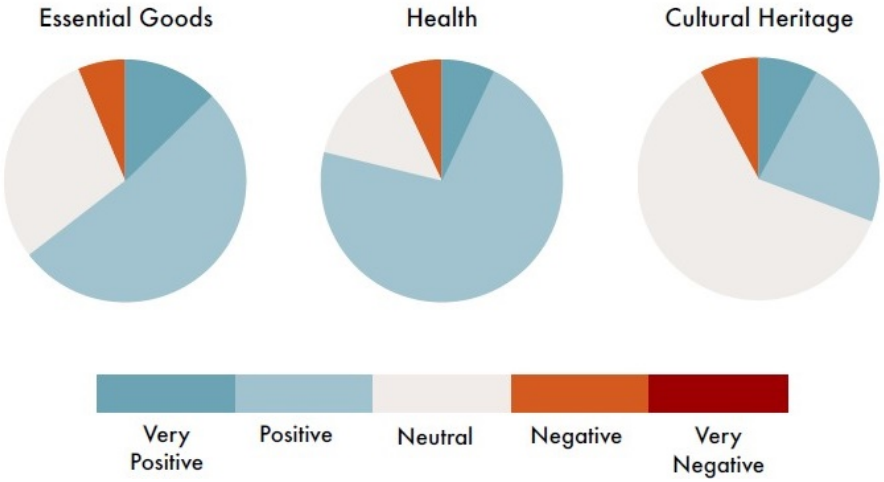

Figure 23. Distribution of responses of the outcomes of the reduced demand portfolio on fundamental objectives related to quality of life.

Identified Concerns, Challenges, and Considerations of Reduced Energy Demand, Consumption, & Waste on Quality of Life

- Maintaining access to goods/services:
    - Use of biking/walking severely challenged in Louisiana between mid-May through October when its 90+ degrees and 90+ humidity
    - Access to (implementation of) mass transit
- Concern that some of the actions mentioned in this strategy apply to indigenous lands more than others

Identified Opportunities and Benefits of Reduced Energy Demand, Consumption, & Waste on Improving Quality of Life

- Local food production could regenerate local truck farms
- Opportunities to lower people's utility bills and transportation costs through housing and transportation upgrades
- Land use and development planning and improved, more efficient and accessible transportation have the potential to make much more livable spaces allowing communities to thrive
- Minimally disruptive to people's lives
- Local food could improve diets, although may need more information on if Louisiana's climate can produce a balanced diet for Louisianans across the entire year
- Opportunities to improve health through housing, building upgrades:
    - Can remediate other housing problems such as lead and mold while doing efficiency upgrades
    - Decreases in indoor air pollution
- Opportunities to improve health through transportation upgrades
    - Less traffic will lead to decreases in outdoor air pollution
- Unlike other strategies, reduced demand requires few new land use conversions
- Improved community living and care with land and infrastructure is likely to support policies to preserve cultural heritage

Creating a More Equitable Society

The fundamental objectives associated with this category include:

- Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes
- Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities
- Maximize engagement with and participation of communities in decision-making and implementation

Most respondents predicted neutral or positive outcomes for equity under the reduced demand portfolio (Figure 24). Potential positive outcomes that were identified were that homes could be improved through retrofitting and, if efforts were targeted to marginalized communities, that could reduce inequity. However, there was concern that

the many of the strategies rely on individual action, which may be prohibitively expensive for low-income communities and does not provide a mechanism for system-level change.

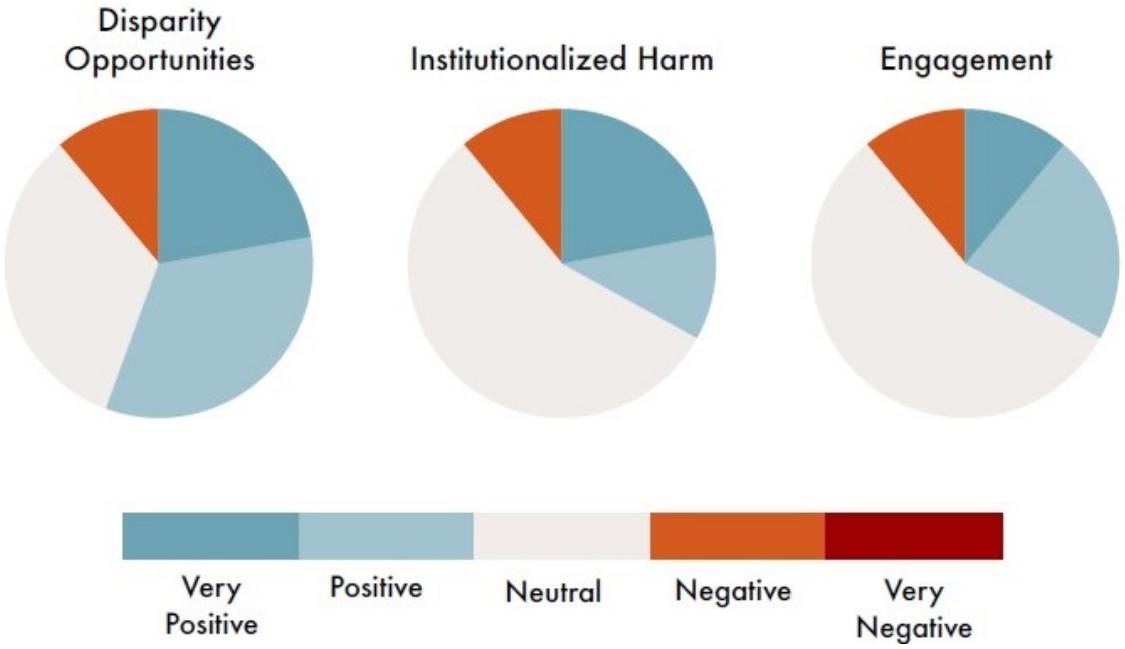

Figure 24. Distribution of responses of the outcomes of the reduced demand portfolio on fundamental objectives related to an equitable society.

Identified Concerns, Challenges, and Considerations of Reduced Energy Demand, Consumption, & Waste for Equity

- Potential to impact and reduce inequities if adequately funded, however:
    - Must ensure inclusion and prioritization of vulnerable communities
    - Requires distributing the benefits (cost savings, tax advantages, jobs, reduction of co-pollutants) so they are shared in marginalized communities
    - Require innovations in financing, tax structure, job training, and siting decisions
- Reducing demand puts the onus on individuals for most of these actions:
    - Often come with higher price tags that are unavailable to marginalized and low-income communities
    - Prohibits the ability for action at a systems level and avoiding the responsibility of government to affect institutional change

Identified Opportunities and Benefits of Reduced Energy Demand, Consumption, & Waste on Equity

- Improvement of homes, if targeted to marginalized communities, could reduce inequity and improve quality of life:
    - Retrofitting insulation and HVAC of poor and renters
    - Home upgrades and public transportation
    - Access to transportation, work, and essential services in underserved communities with the least access currently

- Opportunities to make sure historically marginalized people are involved in the decision making and implementation of solutions

Managing for Short- and Long-Term Success

The fundamental objectives associated with this category include:

- Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation
- Maximize the efficiency and effectiveness of emissions-reduction strategies
- Maximize timely implementation of emissions-reduction strategies
- Maximize the durability of emissions-reduction strategies in an uncertain future

The majority of predicted outcomes for the short- and long-term success of reducing demand were positive, with a higher level of neutral responses for public confidence than for other objectives in this category (Figure 25). The co-benefits that this portfolio could have for, e.g., cost-of-living were identified as likely to increase public confidence, and respondents indicated strategies within this portfolio could begin to be implemented immediately with minimal infrastructure investment in the short-term. However, concern was expressed that the reliance of the strategies on behavioral change may make it difficult to catalyze their implementation in practice.

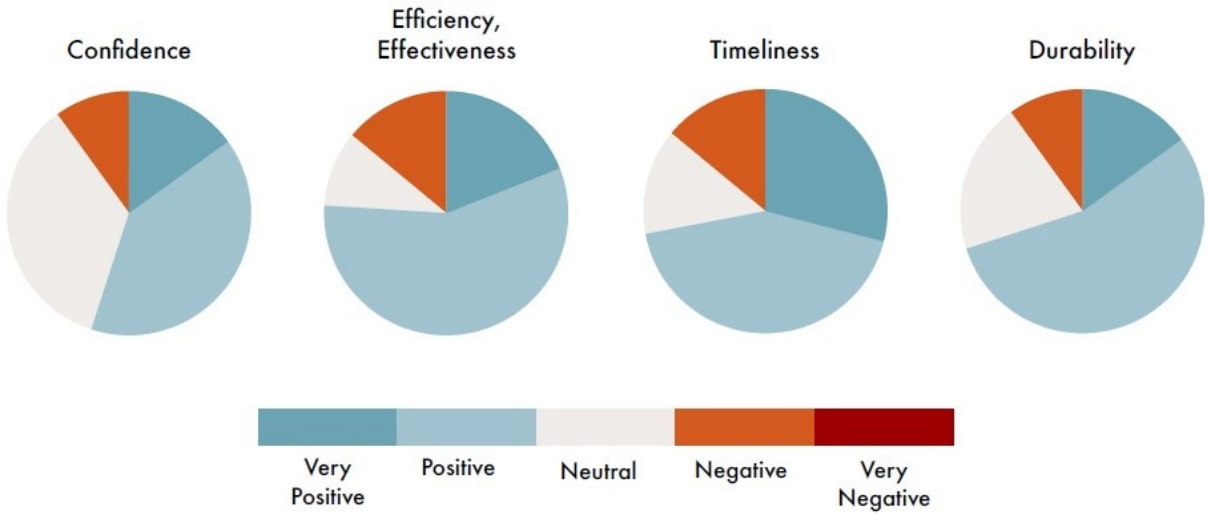

Figure 25. Distribution of responses of the outcomes of the reduced demand portfolio on fundamental objectives related to short- and long-term success.

Identified Concerns, Challenges, and Considerations of Reduced Energy Demand, Consumption, & Waste for Short- and Long-term Success

- Work will need to be done to educate the public to build confidence on why doing things differently makes sense:
    - Potential for misinformation and disinformation, with need for active communication campaign to negate
    - Demand reduction is not as visible as other forms of GHG reductions

    - Projects must be well publicized, so people understand the connection between climate action and material benefits
    - Government would need to be proactive in letting people know they can participate in programs
    - Locally produced products are not always the obvious answer, particularly in technically intensive businesses
    - Depends on maintaining economic stability in an era of emissions reduction, and the unclear trajectory may reduce public confidence
    - May be more difficult to gain confidence in rural areas where compact growth is less desirable
- Relies heavily on behavioral change, which may increase the length of time of successful implementation and/or inhibit success:
    - Need for support of local stakeholders
    - Need for local champions
    - History does not suggest demand reductions will be easy to implement in practice or that they are successful in practice
    - Relying heavily on individual actions to reduce emissions would seem to primarily promote othering and a reduced sense that residents are committing together to a specific action
    - High marks for "potential outcome" but low marks for "actual or most realistic outcome"
- Greatest impact will be in urban areas where public transit and alternate housing scenarios are more feasible
- Reliance on new materials and demand-side change has inherent uncertainties:
    - Relies on availability, cost, and access to alternative technologies that are less carbon-intensive (e.g., materials that don't rely on petrochemical products or byproducts)
    - Some of Louisiana's GHG emissions support industrial applications like fertilizers, and plastic production. Nationwide reductions in demands for non-power GHG emissions products (e.g. fertilizers and plastics) would be helpful to improve this sector
- Minimal political support
- Statewide codes but reliance on local enforcement can be problematic
- Need for available funding sources identified at the state or federal level
- Durability of solution has several areas of concern:
    - Actions need to be combined with adaptation to protect the investment from increasing climate disaster
    - Need to have long-term plan for monitoring and revision
        - Evaluation of success
        - Clear and defined process for future updates
    - Capital expenditures outlast political agendas

Identified Opportunities and Benefits of Reduced Energy Demand, Consumption, & Waste for Managing Short- and Long-term Success

- Some co-benefits may increase confidence:

- Help people buy into climate action because it can directly benefit all Louisianans materially through lowered utility bills
- Big boost to construction industry/more jobs/ greater sense of community and involvement
- Synergistic with education and outreach, incentive programs

- Opportunity to support projects included in LA SAFE
- Many demand-reducing strategies can be implemented quickly:
  - Earlier demand is reduced, the more benefit there is between now and 2050
  - If accepted early, could produce swift cascading consequences in the long-term
- Durability is a near certain outcome if widely adopted
- National plans to reduce demand for fossil fuels could lead to emission reductions here in Louisiana
- Non-reversible net reduction of GHG through new technology

Strengthening the Economy and Workforce

The fundamental objectives associated with this category include:

- Maximize job creation and support for Louisiana workers
- Maximize economic growth

Mostly negative and neutral outcomes were predicted for the reduced demand portfolio in the economy and job creation objectives (Figure 26). Respondents expressed concern that there would be loss of demand for Louisiana products and services, with resultant negative effects on the economy. Some respondents did note that the retrofitting strategies within this portfolio could be areas of job growth and opportunity, however.

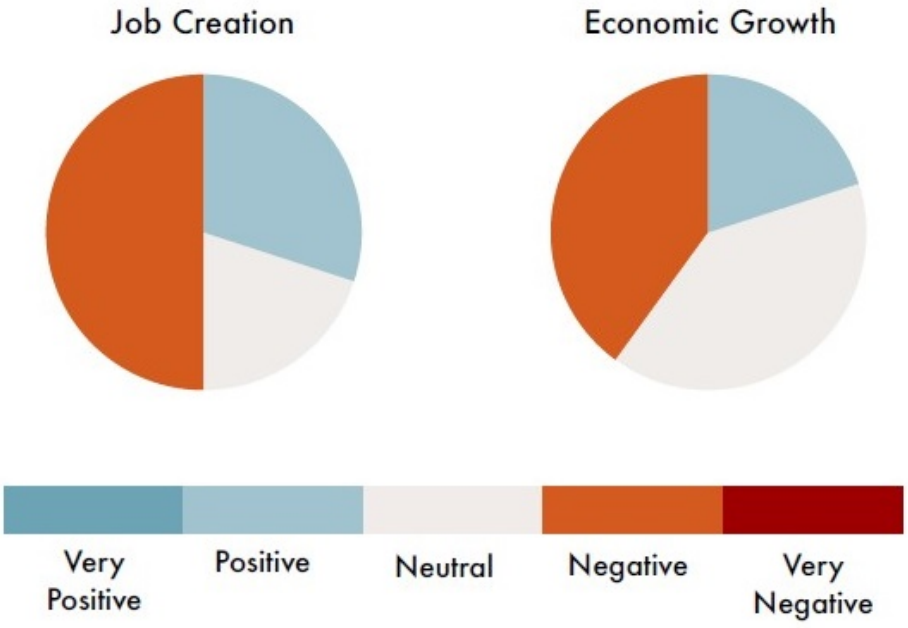

Figure 26. Distribution of responses of the outcomes of the reduced demand portfolio on fundamental objectives related to strengthening the economy and workforce.

Identified Concerns, Challenges, and Considerations of Reduced Energy Demand, Consumption, & Waste for Strengthening the Economy and Workforce

- Requires private sector investment
- Potential for impacts of reducing demand for Louisiana products and services with impacts to the workforce:
    - Oil and gas, if not replaced with demand from outside US or from new industry/technology
    - Goods developed by or with materials from our petrochemical sector
    - More bike riding, public transit, walking, freight efficiency, work from home would have a neutral to negative effect on job creation
- Need for broadband investment to support telework
- Requires training programs to new jobs
- Aspects improve quality of life, which is beneficial for economic growth, but alternative products also likely to be more expensive. Could potentially be a very costly path, lead to consuming far fewer goods, perhaps resulting in a net decrease in quality of life

Identified Opportunities and Benefits of Reduced Energy Demand, Consumption, & Waste for Strengthening the Economy and Workforce

- Housing and building upgrades can create large numbers of jobs that can be done by almost anyone, which can raise wages and reduce inequality
- Reduced reliance on non-renewable natural resources could help shield Louisiana's economy from fluctuations in global commodities markets

Conserving Natural Resources and Protecting the Environment

The fundamental objectives associated with this category include:

- Maximize preservation of natural resources and ecosystem services
- Maximize environmental stewardship and support of healthy ecosystems

Fewer comments were received on the specific impacts of reducing demand on natural resources and the environment, but the majority of predicted outcomes were positive (Figure 27). Concern was expressed that retrofitting could lead to a demand for construction materials and natural resources in the short-term, but that in the long term there could be environmental benefits associated with, for example, changes to land-use practice.

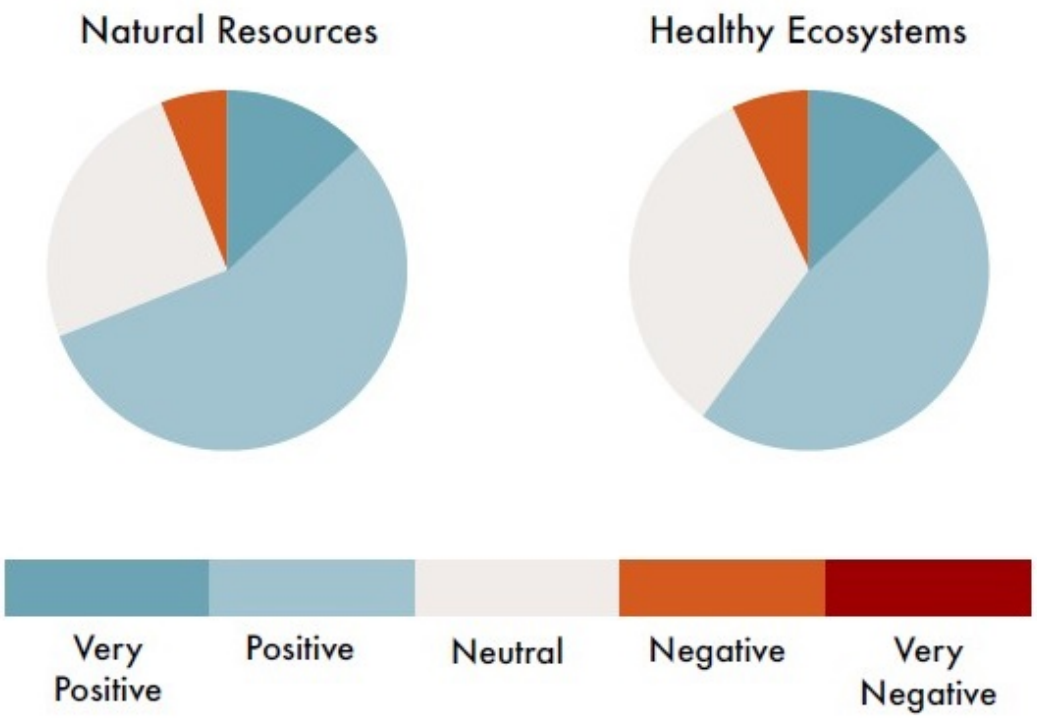

Figure 27. Distribution of responses of the outcomes of the reduced demand portfolio on fundamental objectives related to conserving natural resources and protecting the environment.

Identified Concerns, Challenges, and Considerations of Reduced Energy Demand, Consumption, & Waste for Conserving Natural Resources and Protecting the Environment

- Redesigning cities to emphasize walking may lead to reduced carbon footprints in the long run, but in the short run, they could lead to increased construction, and thus increased GHG emissions

Identified Opportunities and Benefits of Reduced Energy Demand, Consumption, & Waste for Conserving Natural Resources and Protecting the Environment

- Land-use planning for preservation of natural ecosystems
    - By restricting sprawl, the state can protect wetlands and agricultural land
    - Industrial facilities that are phased out can improve ecosystems and the public health of nearby communities
- Less mining activity, and less transport of oil, gas and coal, reduces environmental hazards associated with these activities
- Replacing industrial facilities with other low-GHG emitting industries or restoring as natural habitat

Adapting to a Changing Climate

The fundamental objectives associated with this category include:

- Increase resilience of the built and natural environment to climate change impacts
- Increase the resilience of communities to climate change

Most of the predictions of the impact of reduced demand on climate adaptation were positive (Figure 28). Potential co-benefits that were identified included the potential to improve the resiliency of communities and infrastructure as the strategies within this portfolio were implemented, and the potential for land-use planning to be optimized to enhance resiliency as well as reduce net GHG emissions.

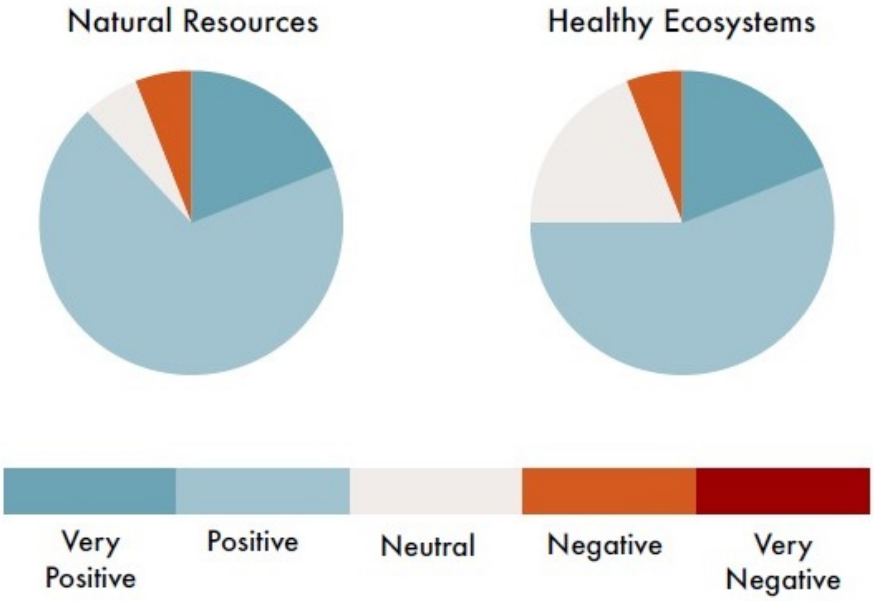

Figure 28. Distribution of responses of the outcomes of the reduced demand portfolio on fundamental objectives related to adapting to a changing climate.

Identified Concerns, Challenges, and Considerations of Reduced Energy Demand, Consumption, & Waste for Adapting to a Changing Climate

- Would want to ensure strategies align with floodplain management practices
    - Industrial facilities in flood plains and hurricane paths are threat multipliers
- Consistency (or inconsistency) with existing conservation and restoration plans

Identified Opportunities and Benefits of Reduced Energy Demand, Consumption, & Waste for Adapting to a Changing Climate

- With more energy efficient energy portfolio, travel/transport could become less costly and enhance resilience

- Depending on how development trends evolve, land use and transit planning could be paired with other land use planning, zoning, and development measures that ensure reduced flood risk or risk to climate impacts over time
- Housing and transportation upgrades can be combined with elevating infrastructure to increase resiliency
- Enhanced energy efficiencies could build resiliency at the community level
- Reducing industrial facilities and restoring them to coastal wetlands will improve resiliency
- Potential for flood risk reduction with robust land use and development planning
    - Increasing density of urban development has great benefit in terms of increased resiliency and ability to reduce flood risk, especially in coastal Louisiana
    - As transit and land use planning occurs to reduce trips taken and dependency on infrastructure, inclusive economic development could be prioritized in areas poised to remain high and dry over time, reducing economic losses from climate impacts and leveraging organic population movement trends towards multiple benefits
- Reducing toxic facilities will make coastal and flood-prone communities safer from toxic releases that occur during disasters
- Emphasis on grid functionality, as well as the development of transportation alternatives could result in improved climate resilience for many Louisiana communities
- Can be combined with adaptation strategies such as raising homes and roads

HYPOTHETICAL STRATEGY PORTFOLIO 4: INDUSTRIAL CARBON REMOVAL, CAPTURE, USE, AND STORAGE INTENSIVE

GHG Consequence Analysis

This portfolio was modeled twice, to illustrate two different approaches to industrial carbon removal. In the first analysis, the scenario was built in alignment with the EPS tool guidance. The guidance for the Industrial Carbon Capture and Sequestration Policy in the EPS tool reads, "very few CCS-equipped industrial facilities exist today, so in a scenario where industry does not transition to clean energy, a value over 20 percent is likely very optimistic. However, in scenarios in which industry mostly or entirely transitions to clean energy (i.e., due to other policies, such as industrial fuel switching and industrial energy efficiency), CCS settings as high as 100 percent (to capture the small amount of residual CO2 emissions, such as process CO2 from the cement industry) may be very feasible." Accordingly, this version set 20 percent values for Louisiana's largest industrial emissions sectors. The emissions reductions, seen in Figure 29, decrease from the BAU case to 203 MMTCO2E in 2050.

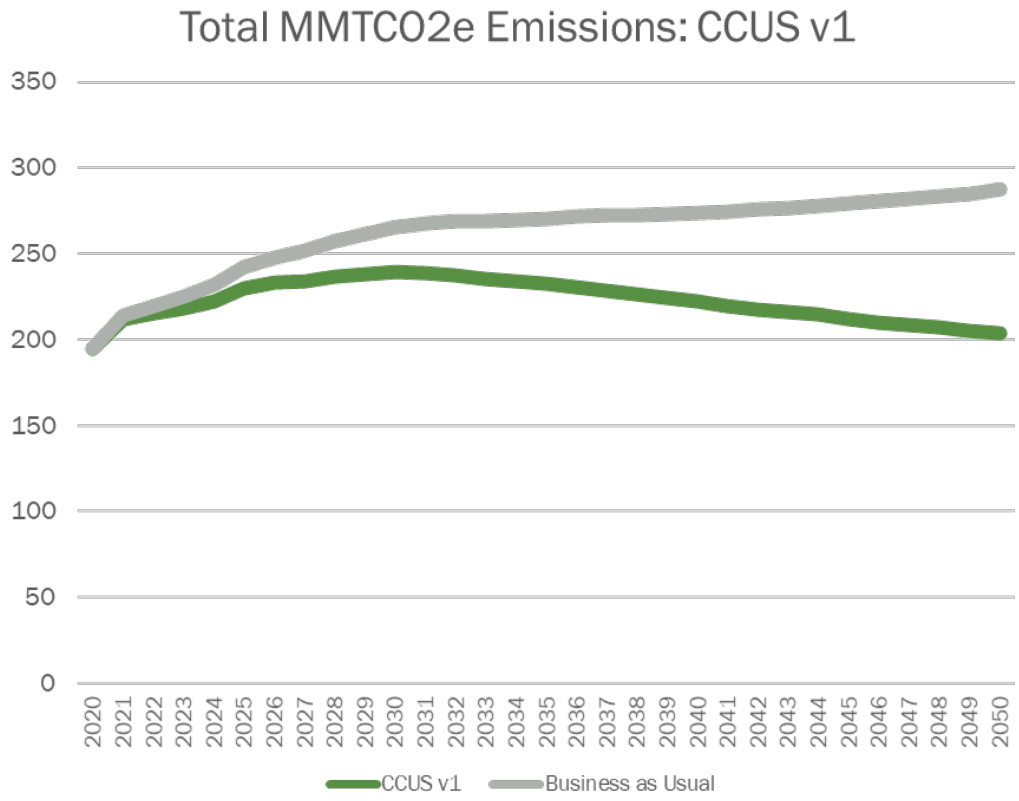

Figure 29: Industrial Carbon Removal v1, showing a decrease to 203 MMTCO2E

A sector breakdown of this v1 scenario, seen in Figure 30, shows that industrial emissions were essentially unchanged, and that all of the reductions in GHG emissions came from the electricity sector, where CCS policies were set at 100 percent.

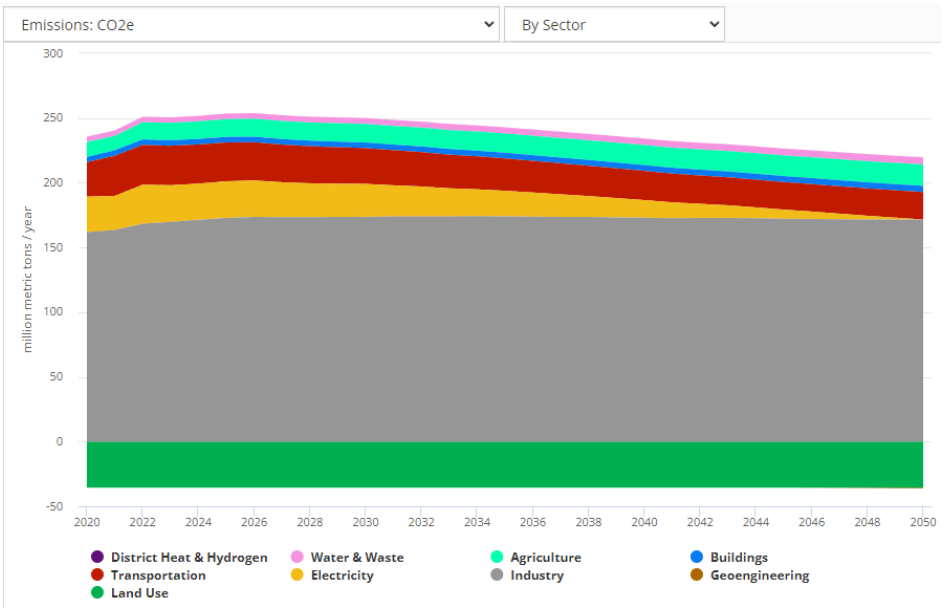

Figure 30: Sector breakdown of Industrial Carbon Removal v1, showing reductions only in the electricity sector

In the second analysis, the CCS settings were kept at 100 percent, to see the difference. And in this situation, the emissions reduction impact was strong. The emissions reductions, seen in Figure 31, were decreased from the BAU case to 70 MMTCO2E in 2050.

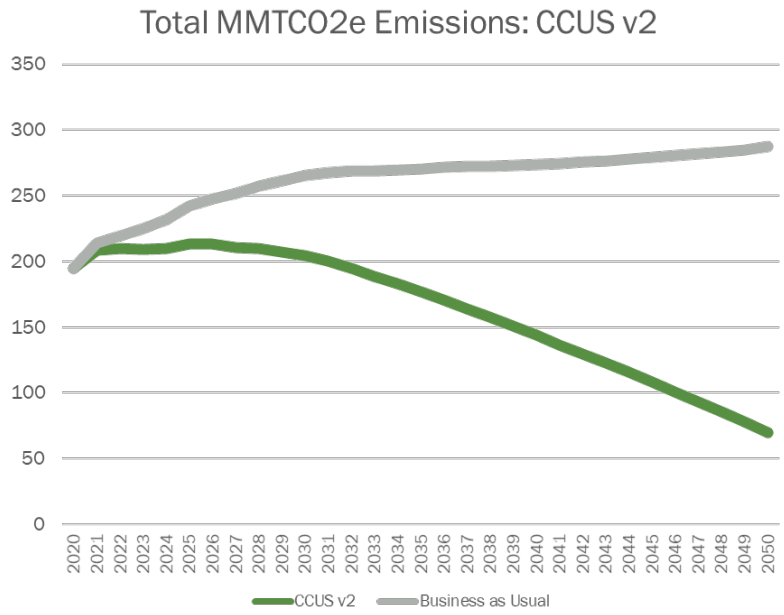

Figure 31: Industrial Carbon Removal v2, showing a decrease to 70 MMTCO2E

The sector breakdown confirms that this v2 analysis impacted industrial emissions as well as electricity sector emissions, as seen in Figure 32.

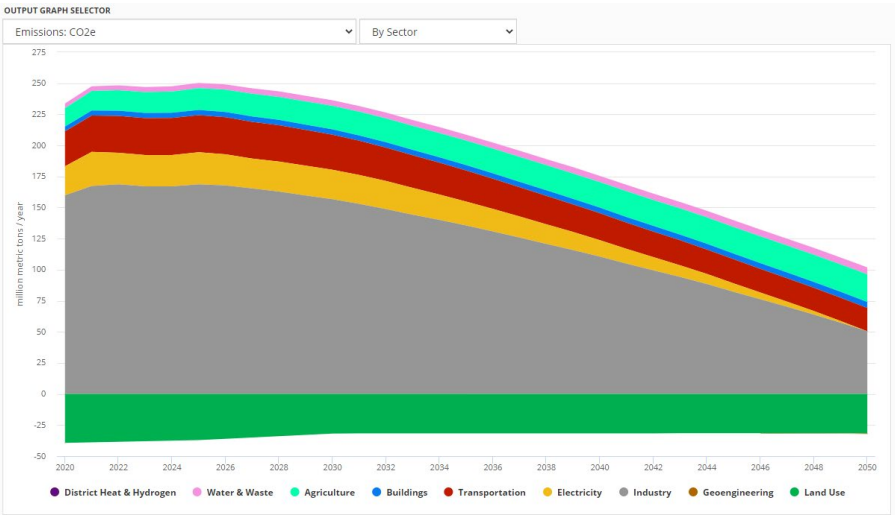

Figure 32: Sector breakdown of Industrial Carbon Removal v2, showing decreases in industrial and electricity sector emissions

These two analyses show that industrial carbon removal alone is insufficient for addressing Louisiana's GHG emissions. Setting the tool's maximum to 100 percent, which itself is based on user choice rather than a technological or cost feasibility, still leaves over 41 MMTCO2E of industrial emissions unabated. And the 20 percent settings for Louisiana's top industries did not meaningfully impact emissions at all.

The role of carbon removal, relative to other factors like domestic demand for industrial products, shifts in global demand, the pace and scale of electrification projects, the cost and scale of industrial hydrogen, is difficult to determine using these modeling scenarios alone. Future analyses should seek to determine which emissions are toughest to address and when they need or can be abated in sequence with other approaches to reducing industrial emissions.

Analysis of Impacts to Other Fundamental Objectives

Fundamental Objectives for The People, Economy, and Environment of Louisiana

The CCUS raised concerns for potential negative outcomes in the fundamental objective categories of equity, environment, and climate change adaptation, with a mix of positive and negative responses for the categories of quality of life and short- and long-term success and positive outcomes identified for economy and the workforce (Figure 33). Job creation on local or regional scale was identified as a short-term positive outcome. Concerns over negative outcomes for equity were predicted in both the short- and long-term, with respondents indicating effects could be felt over a variety of spatial scales.

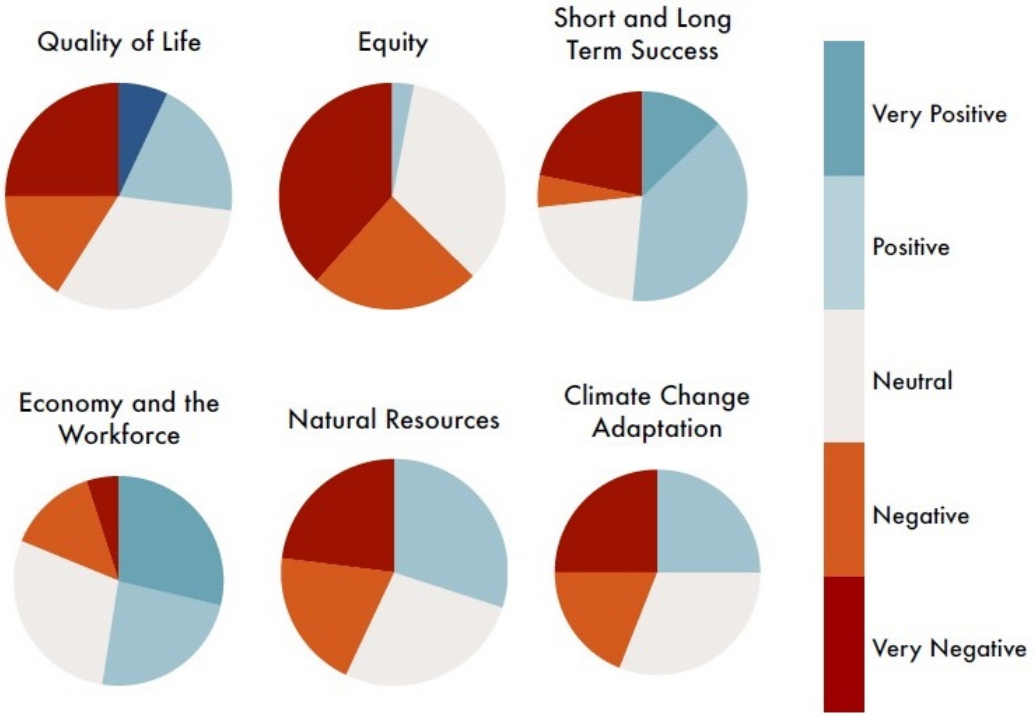

Figure 33. Distribution of responses for the CCUS portfolio across the fundamental objective categories.

Improving Quality of Life for Residents and Communities

The fundamental objectives associated with this category include:

- Maximize quality of, and access to, essential goods, services, and infrastructure for residents
- Maximize positive public health outcomes and public safety
- Maximize preservation of cultural heritage

There was a diversity of predictions made on the impacts of CCUS on access to essential goods and services and to human health, with predominantly neutral or negative impacts predicted to cultural resources (Figure 34). Responses indicated that a co-benefit of CCUS technology could be the potential for systems that could capture other types of air pollution, and that there would be overall health benefits of the strategy to reduce flaring and cap orphan wells. Concerns were expressed about pollution that CCUS might generate and the safety of the technology, as well as for the risks that additional pipelines would pose to cultural resources.

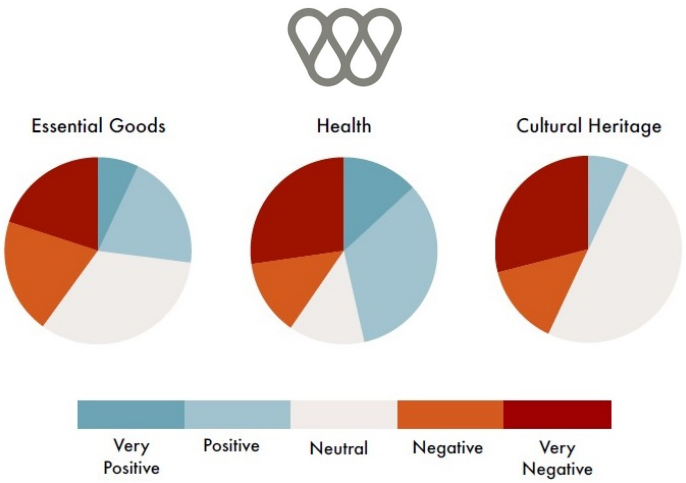

Figure 34. Distribution of responses of the outcomes of the CCUS portfolio on fundamental objectives related to quality of life.

Identified Concerns, Challenges, and Considerations of CCUS on Quality of Life

- Public investment in CCS/CCUS could take resources from other areas
    - Identified as better allocated to directly support communities through provisions for goods, services, and infrastructure
    - Limited co-benefits to communities
    - Reduce competitiveness of other, greener choices by competing against them
- Concern that CCUS requires large private capital expenditures and is energy intensive
    - Potential for increase in energy prices (note, also flagged by other reviewers as having the potential to reduce utility costs for consumers)
- No co-benefits to health and potential for negative impacts to health and safety
    - Carbon capture would allow for toxic facilities that emit carcinogens to continue operating in
    - CCUS will do not decrease air pollution by particulate matter, NOx, SO2, and other air pollutants caused by fossil fuel production and use
    - Subsidizing CCUS would make other options with better health outcomes less competitive
    - New technologies requiring significant industrial expansion and potential for negative health outcomes
    - Potential for catastrophic failures of storage facilities
    - Evidence indicates it would increase NOx as well as others because it requires more energy to capture carbon, and that will likely come from natural gas under this hypothetical strategy
- Risks to cultural resources:
    - Because CCS would require a massive infrastructure build-out, including pipelines; important cultural heritage is likely to be compromised
    - CCS presents risks of accidental release, earth tremors, and other disruptions and potential damage to cultural resources
    -

Identified Opportunities and Benefits of CCUS for Improving Quality of Life

- Potential for decrease in energy prices (note, also flagged by other reviewers as having the potential to increase utility costs for consumers)

- Reduced air pollution associated with monitoring, reduction of flaring and venting (illegal and legal), plugging of dormant wells, reduction of leaks (regardless of CCUS)
- Potential co-benefit of CCUS: the possibility of stripping CO2 and other GHGs out of the air-waste stream may also offer a way to reduce other forms of pollution

Creating a More Equitable Society

The fundamental objectives associated with this category include:

- Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes
- Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities
- Maximize engagement with and participation of communities in decision-making and implementation

The predicted outcome of CCUS for the fundamental objectives within the equity category were predominantly negative and neutral (Figure 35). Concerns were expressed that CCUS benefits the fossil fuel industry, and that inequity related to past development in that sector (jobs, health outcomes) would continue or worsen with time. Concerns were also expressed about the impacts of CCUS on future generations due to the need to maintain facilities once established. However, strategies within the proposal to reduce flaring and venting and to cap orphan wells were identified as potentially beneficial to marginalized communities.

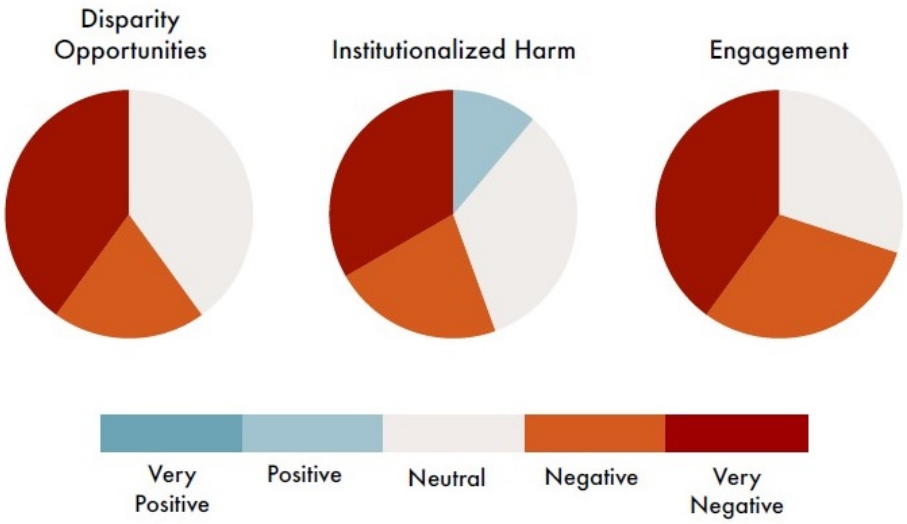

Figure 35. Distribution of responses of the outcomes of the CCUS portfolio on fundamental objectives related to an equitable society.

Identified Concerns, Challenges, and Considerations of CCUS for Equity

- CCUS benefits fossil fuel industry, thus doubling down on system that has led to inequities
    - Does not reduce impacts of current fossil fuel production and adds another layer of infrastructure that may drive additional pollution in environmental justice communities
    - Investment in the fossil fuel industry like to further perpetuate climate injustice, thus incompatible with equity
    - Worsened if strategies are not coupled with training and educational opportunities

- Industries involved have historically not maximized public engagement in decision making and implementation
    - Communities likely to be distrustful, skeptical, thus engagement and community participation is unlikely
- Drive or exacerbate intergenerational equity issues, including with health and safety
    - Requires future generations to maintain long-term monitoring and integrity of CO2 storage facilities
    - Pipeline infrastructure would be massive and likely burden EJ communities, including production of co-pollutants like soot, smog, and toxics
    - CCUS delays or permanently reduces the health benefits of a complete transition to renewables
    - CCUS presents risks of accidental release, earth tremors, and other disruptions

Identified Opportunities and Benefits of CCUS for Equity

- Carbon capture could have a role to play in removing carbon from the atmosphere after we are producing excess energy from fully renewable energy, but we would still have to address toxic emissions from the industrial sector that are poisoning poor, disproportionately Black communities
- Regardless of whether CCS or CCU is itself implemented, state should commit to: monitoring, reduction of flaring and venting (illegal and legal), plugging of dormant wells, reduction of leaks

Managing for Short- and Long-Term Success

The fundamental objectives associated with this category include:

- Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation
- Maximize the efficiency and effectiveness of emissions-reduction strategies
- Maximize timely implementation of emissions-reduction strategies
- Maximize the durability of emissions-reduction strategies in an uncertain future

There was a mix of positive and negative outcomes predicted for CCUS in the fundamental objective category of short- and long-term success (Figure 36). Challenges and concerns that were identified included the difficulty of building confidence in the technology given lack of familiarity with it, uncertainty in the effectiveness of the technology given that there are components that have not been developed and/or deployed at scale, and the difficulty of maintaining sites in the long-term. Opportunities were identified to develop new technologies that could see widespread use, and there was benefit seen in CCUS as a technology that could eventually support net-negative GHG emissions. Green hydrogen and strategies to reduce emissions from flaring and orphan wells were identified as having benefits regardless of the deployment of CCUS technology.

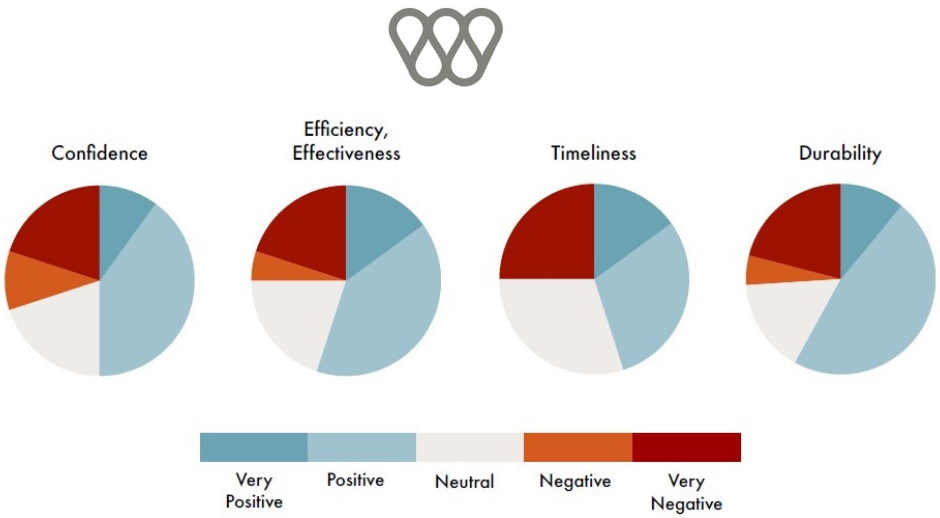

Figure 36. Distribution of responses of the outcomes of the CCUS portfolio on fundamental objectives related to short- and long-term success.

Identified Concerns, Challenges, and Considerations of CCUS for Short- and Long-term Success

- Challenges identified for building public confidence included:
    - Limited understanding CCUS, how it works, what the risks are, etc. - would require investment to achieve public confidence
    - CCUS negative impacts or incidents (leakage, increased air and water pollution, etc.) would alienate communities
    - Likely to erode public confidence if CCUS delays transition to renewables, particularly if health benefits, jobs, emissions reductions are seen in other states while Louisiana becomes the nation's carbon landfill
- Uncertainty identified in development of effective technologies and their cost-competitiveness:
    - Relies on technologies that appears to be at least a decade away
    - Atmospheric capture
    - Potential to "game" the system, with inaccuracies in measurements of CO2 reductions
- Concerns over the efficiency and effectiveness of CCUS include:
    - Potential for offsets/loses of gains (i.e., CCUS is extremely energy intensive and could lead to more usage of natural gas, undermining decarbonization gains in other sectors)
    - Regulations and policies for implementation and monitoring are lacking
- Concerns it is potentially a long time before benefits are realized:
    - CCUS at scale remains largely unproven and technologies still need to be developed, with uncertainty over that timeline
    - Requires financing and construction of large-scale CO2 transport infrastructure, with associated political, social, economic, and technical barriers
    - Lack of identified funding source
- Concerns raised over reliability of storage facilities in the long-term:
    - Safe, permanent, and verifiable storage of CO2 remains unproven
    - Underlying technology relies on coastal pipelines, which are vulnerable to storms

  - Well-selected, fully-characterized, properly designed, and appropriately managed CO2 storage sites are expected to be a limited resource; therefore likely that some CO2 storage will occur in lower quality sites, and it is reasonable to assume not all sites will be properly managed, thereby increasing leakage risk
  - Difficult to detect CO2 leaks
- Concerns over long-term sustainability of strategy and contribution to reaching net zero GHG:
  - Question of long-term market competitiveness without continued government subsidization and tax incentives
  - Does not include reduction in source (continued increase in need for storage)
  - Initial investments and energy cost will set back net GHG emissions in the short term
  - Financial and liability concerns – lack of government structure to maintain fiscal integrity of CO2 storage sites and of defined legal requirements for monitoring

Identified Opportunities and Benefits of CCUS for Managing Short- and Long-term Success

- Potential for people to be confident in this strategy because it requires little change on the part of the community
- Strategies within this portfolio highlighted as being opportunities:
  - Alternate fuels and production: green methane, Green Hydrogen via nuclear and electrolysis
  - Monitoring, reduction of flaring and venting (illegal and legal), plugging of dormant wells, reduction of leaks are effective reduction methods with limited ancillary impacts
- Exportability and portability of CCUS as a capacity:
  - Success in CCUS will attract industrial attention nation wide
  - New technologies could be developed and used elsewhere
- Potential to contribute to net negative GHG emissions in the long-term

Strengthening the Economy and Workforce

The fundamental objectives associated with this category include:

- Maximize job creation and support for Louisiana workers
- Maximize economic growth

The majority of responses regarding the outcome that carbon capture, utilization, and storage (CCUS) would have on job creation and the economy were positive or neutral (Figure 37). Identified benefits included the potential for new jobs in carbon technology and the development of skills and technology that could be exported elsewhere and lead to economic growth within Louisiana. CCUS builds on the strengths of the current workforce and both positive (relatively easy transition) and negative (lack of diversification of the workforce) implications were identified.

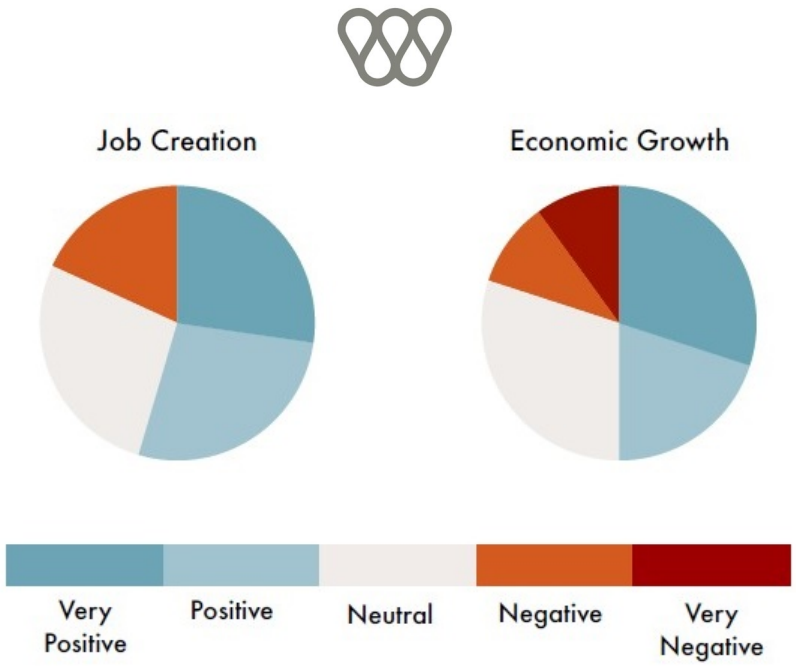

Figure 37. Distribution of responses of the outcomes of the CCUS portfolio on fundamental objectives related to strengthening the economy and workforce.

Identified Concerns, Challenges, and Considerations of CCUS for Strengthening the Economy and Workforce

- Limits flexibility and diversity of jobs in the future
- Requirement of substantial public investment or subsidization
    - CCUS currently requires and is predicted to continue to require large amounts of tax incentives for growth
    - Takes funding away from other efforts toward maximizing economic growth with direct investment in talent and workforce development, small business support, and procurement practices directly serving Louisiana people and businesses
- Pipelines required for CCUS will increase coastal vulnerability, meaning that population and economic instability will continue as trends in Louisiana

Identified Opportunities and Benefits of CCUS for Strengthening the Economy and Workforce

- Potential for new jobs in carbon technology, including for other states, if workforce training is a part of the portfolio
    - Catalyze inclusive economic opportunity with an existing workforce in Louisiana.
    - Transferable skills from other oil and gas-based jobs
    - Development of new technology needed, research opportunities, and associated jobs
- Potential to be a regional, national and global industry leader with associated economic benefits
    - Opportunity for innovation
    - Export of Louisiana skills and technology
- Builds from historical/current strengths
    - Keeps traditional oil and gas sector jobs going and adds carbon capture jobs

The fundamental objectives associated with this category include:

- Maximize preservation of natural resources and ecosystem services
- Maximize environmental stewardship and support of healthy ecosystems

There was a mix of positive, neutral, and negative outcomes predicted for CCUS and the environment (Figure 38). The dominant concern of this portfolio was that the build-out of pipelines and injection wells could negatively impact the environment, while reduced leakage of natural gas would have positive impacts.

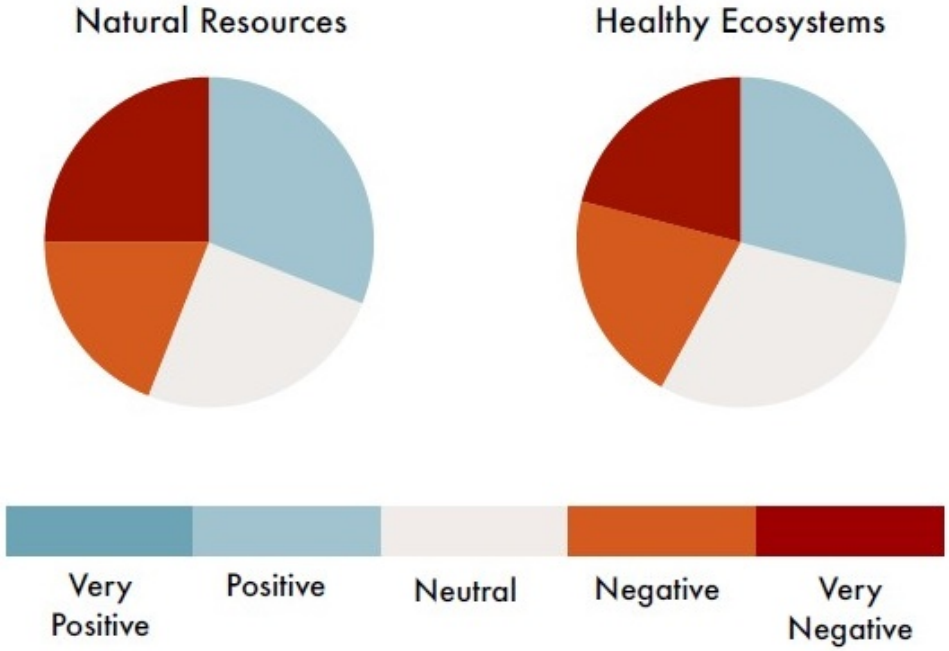

Figure 38. Distribution of responses of the outcomes of the CCUS portfolio on fundamental objectives related to conserving natural resources and protecting the environment.

Identified Concerns, Challenges, and Considerations of CCUS for Conserving Natural Resources and Protecting the Environment

- Concerns over potential negative impact of infrastructure build-out on natural resources:
    - Pipeline development and damage to wetlands
    - Injection wells increasing seismic activity (more research needed)

Identified Opportunities and Benefits of CCUS for Conserving Natural Resources and Protecting the Environment

- Emphasis on leak detection and reduced flaring of natural gas could result in increased preservation of subsurface resource

The fundamental objectives associated with this category include:

- Increase resilience of the built and natural environment to climate change impacts
- Increase the resilience of communities to climate change

There was a diversity of predictions on the potential impacts of CCUS on the resiliency of the natural and built environment and for communities (Figure 39). The reduced use of fluorinated gases was identified as potentially leading to increased resiliency of machinery to climate change, and an opportunity was expressed to engage a diverse set of communities in CCUS implementation. Concerns were expressed, however, about the long-term viability of CO2 storage facilities and on the impacts that new infrastructure could have on the resiliency of the natural and built environments.

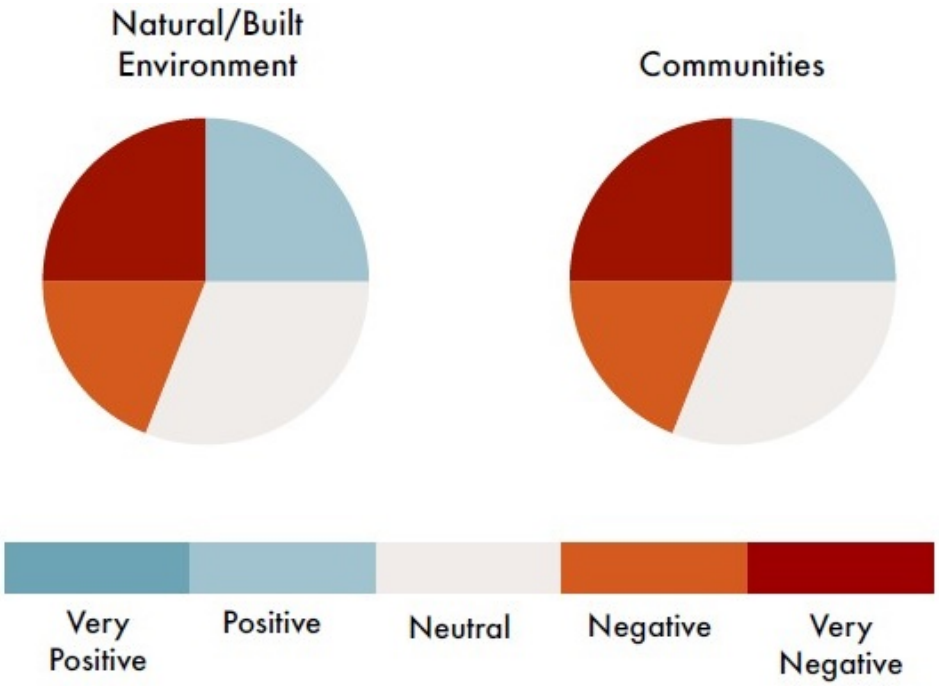

Figure 39. Distribution of responses of the outcomes of the CCUS portfolio on fundamental objectives related to adapting to a changing climate.

Identified Concerns, Challenges, and Considerations of CCUS for Adapting to a Changing Climate

- Concern about the long-term viability of sites given climate change and how to protect them moving forward
    - Viability of permanent underground storage in our state in the face of subsidence and sea level rise, noting analysis and project implementation regarding permanent underground storage within geologic conditions similar to Louisiana has not been done
    - Unsuitability of south Louisiana for CCUS due to likelihood of wetland loss

- Carbon capture would require new pipeline infrastructure with concerns that would destroy coastal wetlands and decrease coastal resilience
- Concern over limited opportunities for enhanced community resiliency in implementation:
    - Not transformative at the community level
    - Diverts resources from other areas

Identified Opportunities and Benefits of CCUS for Adapting to a Changing Climate

- Emphasis on reduced use of fluorinated gases may lead to opportunities for increased resilience of some machinery to climate change
- Opportunity to include diverse communities in its implementation

HYPOTHETICAL STRATEGY PORTFOLIO 5: NATURAL SEQUESTRATION AND SINKS INTENSIVE

GHG Consequence Analysis

The natural sequestration portfolio, as modeled in the EPS tool, is almost exactly the same as the BAU case; EPS tool outputs show this portfolio with 285 MMTCO2E of GHG emissions in 2050. This slight reduction is seen in Figure 40. The Y axis was adjusted in this figure for legibility and has a minimum value of 100 rather than zero.

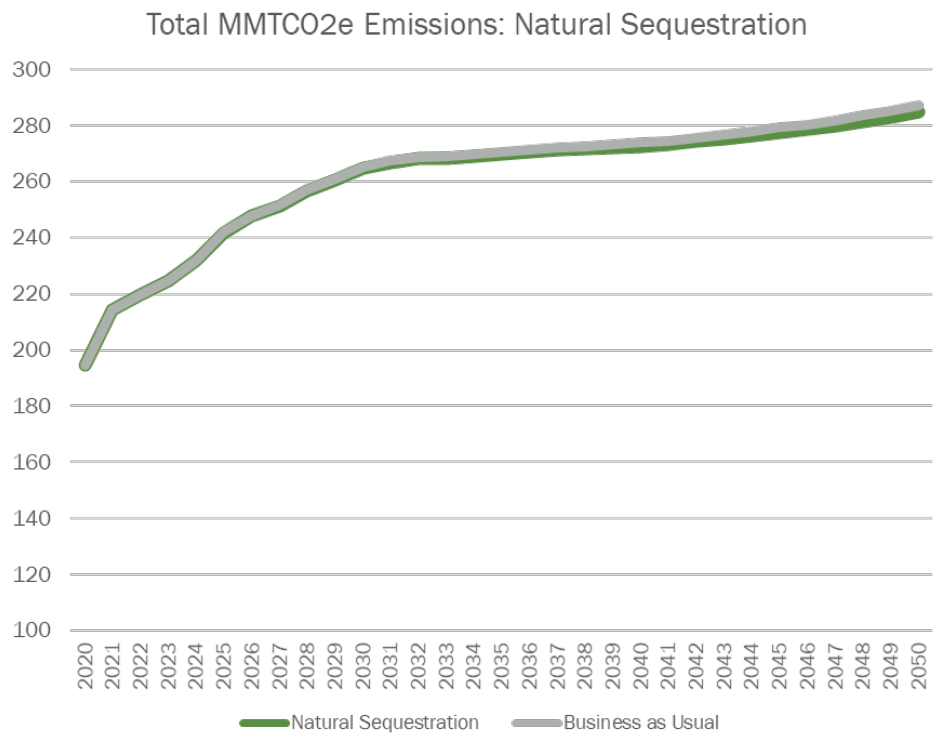

Figure 40: EPS Tool Outputs of Natural Sequestration Intensive, showing slight decrease to 285 MMTCO2E

The EPS tool is not capable of modeling Louisiana's natural lands and wetlands at the level of detail that would be useful for this analysis. Additional research is needed to determine the carbon sequestration impacts of natural sinks. The BAU case, notably, does not factor in any "future without action" scenarios of habitat loss from the Coastal Master Plan; this would greatly impact carbon sequestration potential in the coastal zone. Sea level rise and other climate impacts, such as pests and extreme heat, may impact carbon sequestration potential over time by impacting vegetation, salinity, tree health, and more. Habitat-specific projections of carbon sink potential may be needed to understand restoration and conservation priorities.

Analysis of Impacts to Other Fundamental Objectives

Fundamental Objectives for the People, Economy, and Environment of Louisiana

The natural sequestration and sinks portfolio was predicted to have co-benefits to enhancing resiliency in the face of climate change, improving quality of life, and preserving natural resources and the environment (Figure 41). Benefits in these objective categories were anticipated to be regional to widespread and occurring on time scales of 0-10 years, with impacts to the environment anticipated to continue in the long-term. The portfolio received generally positive feedback in terms of short- and long-term success, but concerns were raised on the durability of strategies over time given the vulnerability of ecosystems to climate change. Comments varied depending on the relative focus on coastal ecosystem restoration, with anticipated benefits to resiliency and the environment, or on urban green space, with anticipated benefits to quality of life for residents.

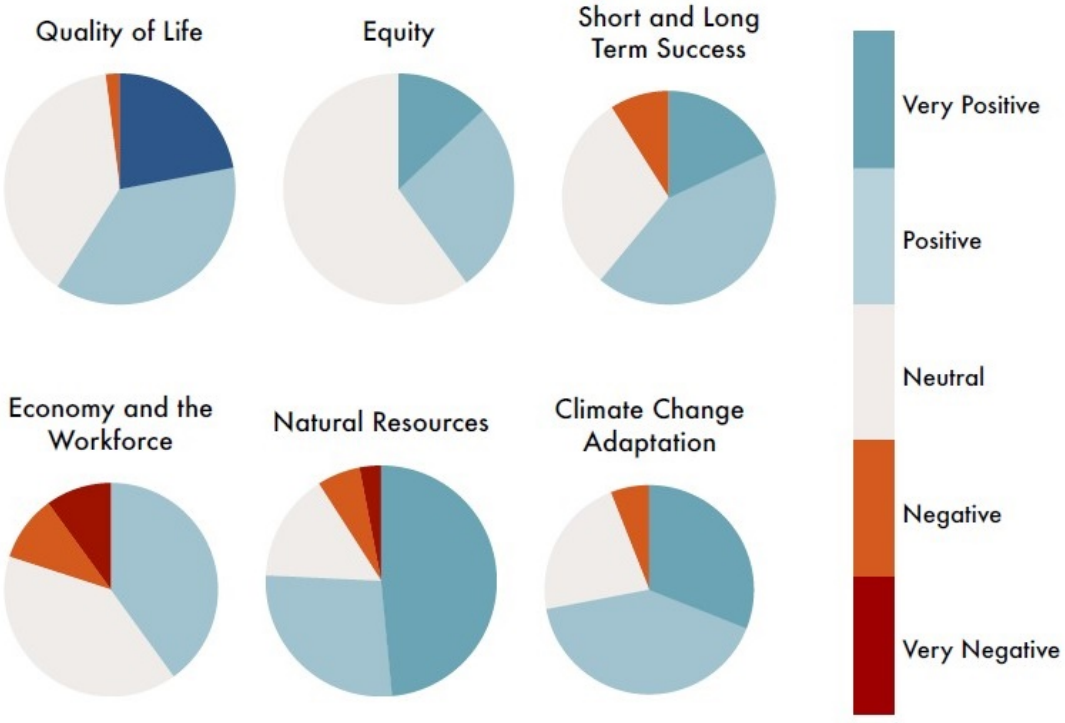

Figure 41. Distribution of responses for the natural sequestration portfolio across the fundamental objective categories.

Improving Quality of Life for Residents and Communities

The fundamental objectives associated with this category include:

- Maximize quality of, and access to, essential goods, services, and infrastructure for residents
- Maximize positive public health outcomes and public safety
- Maximize preservation of cultural heritage

The anticipated outcomes of the natural sequestration portfolio were generally positive or neutral across all of the fundamental objectives in the quality of life category (Figure 42). Respondents identified that green space in urban areas could provide recreational opportunities and improve air quality, with positive impacts to human health.

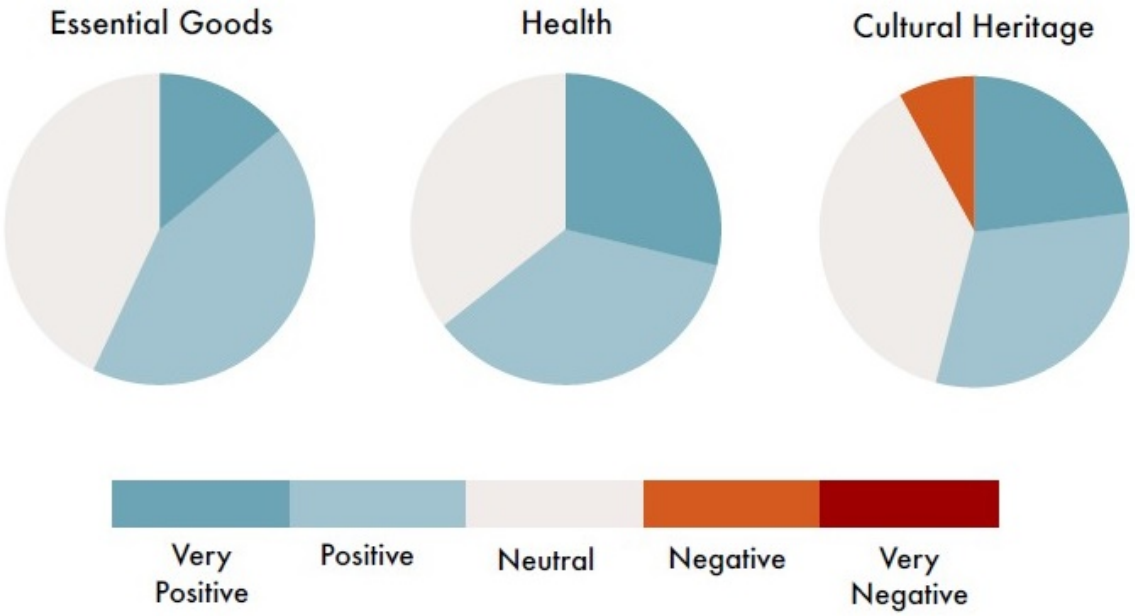

Figure 42. Distribution of responses of the outcomes of the natural sequestration portfolio on fundamental objectives related to quality of life.

Identified Concerns, Challenges, and Considerations of Natural Sequestration on Quality of Life

- Concerns regarding the impact to agriculture:
    - Negative impacts to agriculture and associated decline in productivity
    - Could erode traditional rural lifeways
- Impacts of green space/preservation on housing prices and affordability
- Impacts to coastal communities and cultural heritage

Identified Opportunities and Benefits of Natural Sequestration for Improving Quality of Life

- Long term benefits and lasting impacts:
    - More green space can improve housing conditions and improve air quality
    - Could provide some recreational opportunities and urban food security
- Minimally disruptive to residents and communities
- Potential health benefits identified:
    - Public access to green areas may benefit health

- Trees and natural vegetation can store carbon, catch rainwater, remove pollutants from the air and decrease temperatures on hot days
- Retiring lands where agricultural chemicals are currently in use might offer rural health benefits

Creating a More Equitable Society

The fundamental objectives associated with this category include:

- Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes
- Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities
- Maximize engagement with and participation of communities in decision-making and implementation

The natural sequestration perspective was predicted to have neutral or positive impacts to the fundamental objectives in the equity category (Figure 43). The potential benefits of the strategies in this portfolio included the development of green space in communities that may lack them and the opportunity for communities to participate in the redesigning of city landscapes.

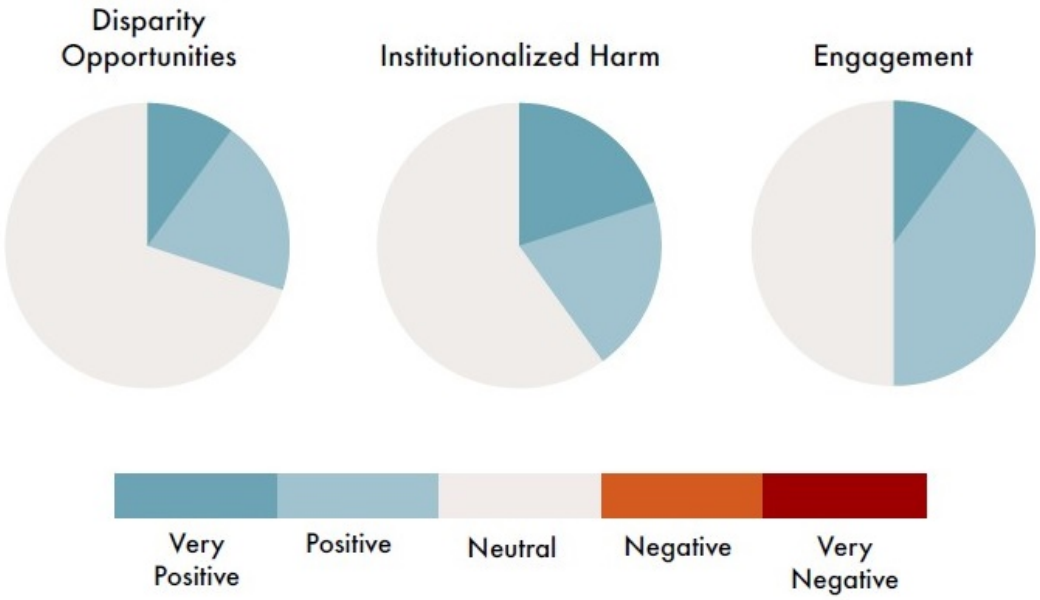

Figure 43. Distribution of responses of the outcomes of the natural sequestration portfolio on fundamental objectives related to an equitable society.

Identified Concerns, Challenges, and Considerations of natural sequestration for Equity

- Potential for benefits to go to industry, large land-owners
- Need for education to ensure there is awareness and ability to take advantage of opportunities for all people
- Little impact on institutions

- State must be proactive in prioritizing poor and historically marginalized communities. Equity outcomes are likely contingent on economic redistribution through the tax code and labor laws

Identified Opportunities and Benefits of Natural Sequestration for Equity

- Opportunity for urban poor to participate in redesigning cities and greening of city landscapes, including the creation of jobs
- Poor communities tend to have less green space, so there are opportunities to advance equity
- Bringing rural residents into conversation could produce new opportunities for engagement

Managing for Short- and Long-Term Success

The fundamental objectives associated with this category include:

- Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation
- Maximize the efficiency and effectiveness of emissions-reduction strategies
- Maximize timely implementation of emissions-reduction strategies
- Maximize the durability of emissions-reduction strategies in an uncertain future

The natural sequestration portfolio was predicted to have mostly positive or neutral outcomes in regard to public confidence, efficiency and effectiveness, durability, timeliness of implementation (Figure 44). Feedback that was provided was mixed, however. Respondents had concerns about the effectiveness of these strategies given factors such as the scale at which projects would need to be implemented for success, and expressed that there may be minimal benefits in the short-term given the time it would take for restoration or land use change to occur. There were also concerns expressed that factors outside of the state's control, such as natural and anthropogenic disasters, could erase gains made with natural sequestration by destroying the ecosystems on which they rely. However, some respondents indicated there could be potential ways to decrease the time to see results and thought natural sequestration solutions could be durable in the long-term.

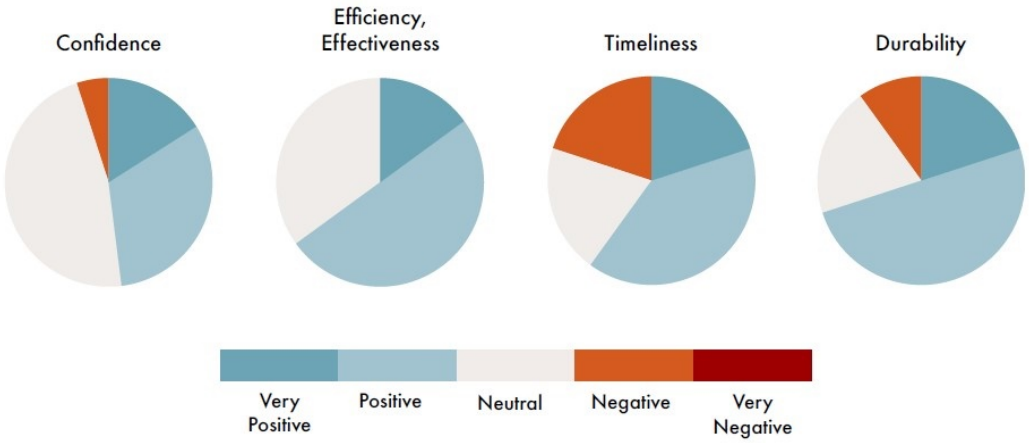

Figure 44. Distribution of responses of the outcomes of the natural sequestration portfolio on fundamental objectives related to short- and long-term success.

Identified Concerns, Challenges, and Considerations of Natural Sequestration for Short- and Long-term Success

- Concerns over public confidence:
    - Lack of public confidence or support for strategy and the Coastal Master Plan
    - Potential for disinformation
        - Need to separate value of natural sinks from ties to fossil fuel industry
        - Need communication of co-benefits and emphasis of standalone value
    - Lack of visibility of strategies in action (note, mixed feedback on if this strategy is visible or not)
- Challenges related to efficiency and effectiveness:
    - Need for scale to be effective; requires large investments in green spaces.
    - Lack of regulation and implementation pathways
    - Uncertainty in implementation due to behavior and priorities, particularly 'voluntary' or locally driven strategies (e.g., creating/enhancing green spaces, promoting and expanding afforestation and reforestation, retiring marginal lands from crop rotation, maximizing implementation of the CMP, etc.)
- Concern over minimal benefits in the short-term, given that decarbonization gains from regreening take time to take effect
- Concern over direct conflict with expansion of the state sponsored wood chip export market
- Concern over durability and long-term sustainability due to factors outside of state control (see below, there were conflicting opinions on the durability of this solution):
    - Pollution, including from outside of the state
    - Sea level rise and storms threaten coastal systems, wetlands
    - Forests are at risk of catching fire
    - Threats are likely to increase with climate change

Identified Opportunities and Benefits of Natural Sequestration for Managing Short- and Long-term Success

- Opportunities to build public confidence:
    - Positive impact on public sentiment if successful in practice
    - Public and stakeholders of natural lands confidentially enhanced because it also addresses resilience, with ties to National Flood Insurance Program and Community Rating System
    - Potential to change the narrative for how the world see us - sinking/losing coast exposed to the elements
- Potential for effectiveness in practice because there are minimal demands on normal practices
- Opportunities that may decrease the time of implementation:
    - Federal funding availability under current administration
    - Projects already identified through Louisiana's coastal Master Plan, as well as other environmental restoration strategies across the state
- Potentially a long-term solution with lasting benefits that is robust and durable against foreseeable threats (underlying technology is robust against storms, etc.)

Strengthening the Economy and Workforce

The fundamental objectives associated with this category include:

- Maximize job creation and support for Louisiana workers
- Maximize economic growth

There was a mix of predicted outcomes for job creation and economic growth under the natural sequestration portfolio (Figure 45). Concerns were expressed that there might be limited job opportunities associated with this portfolio, and that agricultural land use change would negatively impact that sector. Some respondents did see opportunities for job creation as part of urban green space development, and an opportunity for the state to see revenue if there was a system in place for selling credits for environmental projects conducted in Louisiana.

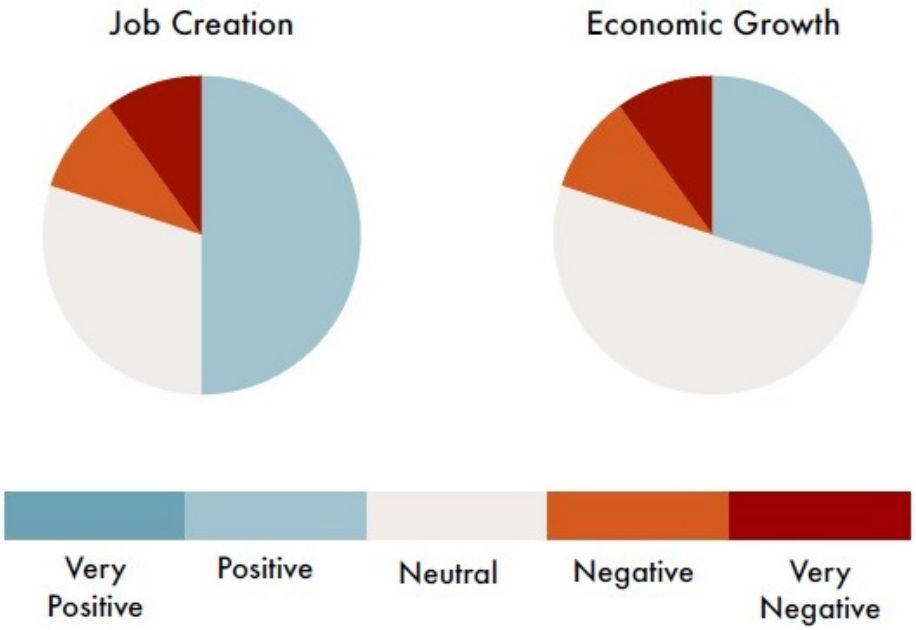

Figure 45. Distribution of responses of the outcomes of the natural sequestration portfolio on fundamental objectives related to strengthening the economy and workforce.

Identified Concerns, Challenges, and Considerations of Natural Sequestration for Strengthening the Economy and Workforce

- Limited statewide job opportunities (regional and local), with some rural ag work displacement
- Need for training in support of land management
- Little economic growth from conversion of rural or urban lands
- Challenges in valuing ecosystem services (i.e., that economic benefits may be difficult to quantify)
- Cascading impacts of conservation and implementation:
    - Industrial producers located here in large part due to the historical presence of oil, continued access to abundant low-cost natural gas

- Charging utilities and industrial users to offset emissions with environmental sinks here will make the cost of operating in Louisiana exceed other locations and likely drive much of this business from the state
- Transition from jobs lost due to coastal plan to jobs created

Identified Opportunities and Benefits of Natural Sequestration for Strengthening the Economy and Workforce

- Potential for urban jobs associated with development of green space
- Opportunities of selling credits for environmental projects due to potentially large carbon sink of coastal restoration
- Coastal restoration and ecotourism economy is strong and continues to grow with public support

Conserving Natural Resources and Protecting the Environment

The fundamental objectives associated with this category include:

- Maximize preservation of natural resources and ecosystem services
- Maximize environmental stewardship and support of healthy ecosystems

Most respondents predicted a positive outcome for natural resources and the environment as a result of the natural sequestration portfolio (Figure 46), consistent with this portfolio focusing on the restoration of ecosystems for carbon sequestration. There was concern whether there would be fully accrual of benefits in the long term, and it was noted that the state would need to be proactive in working with other states to reduce nutrient pollution that could negatively impacts ecosystems restored or maintained as part of strategies in this portfolio.

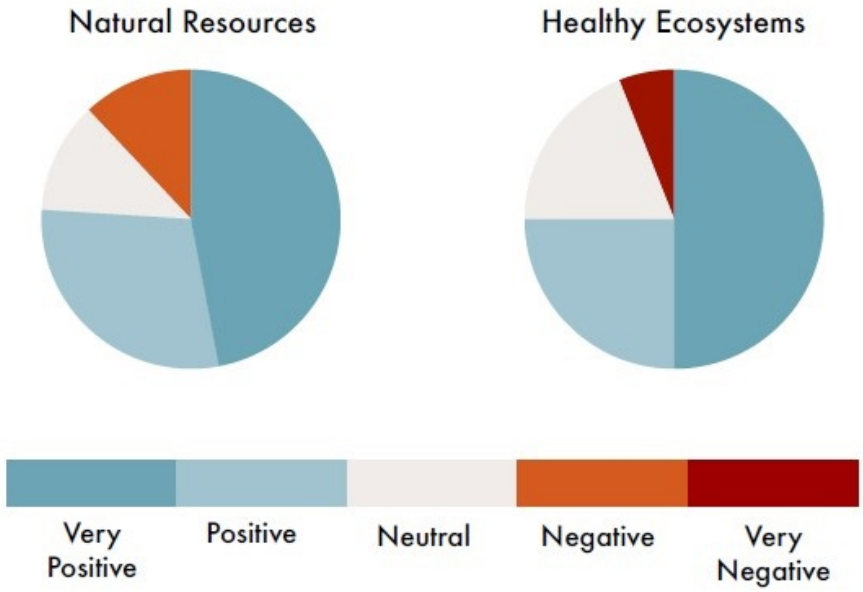

Figure 46. Distribution of responses of the outcomes of the natural sequestration portfolio on fundamental objectives related to conserving natural resources and protecting the environment.

Identified Concerns, Challenges, and Considerations of Natural Sequestration for Conserving Natural Resources and Protecting the Environment

- Fully accruing of benefits to the environment would occur in the long-term
- State must be proactive in working with other states to reduce nutrient pollution
- Concerns over safety/volatility (citation of Lake Nyos)

Identified Opportunities and Benefits of Natural Sequestration for Conserving Natural Resources and Protecting the Environment

- Restoring and re-greening rural lands could have lasting impacts on the environment
- Advances many ecological conservation measures that would expand ecosystem services:
    - State can support fishing and coastal economies through natural restoration
    - More green spaces for public use
- Opportunity to advance projects in Louisiana's coastal Master Plan, as well as other environmental restoration strategies across the state

Adapting to a Changing Climate

The fundamental objectives associated with this category include:

- Increase resilience of the built and natural environment to climate change impacts
- Increase the resilience of communities to climate change

Most of the questionnaires respondents indicated that there would be positive outcomes for communities and the natural and built environment enhancing their resiliency from this portfolio (Figure 47). Although limited feedback was received, respondents did note that green infrastructure could increase resilience to climate change by, for example, protecting the coast from storm events and filtering nutrient pollution.

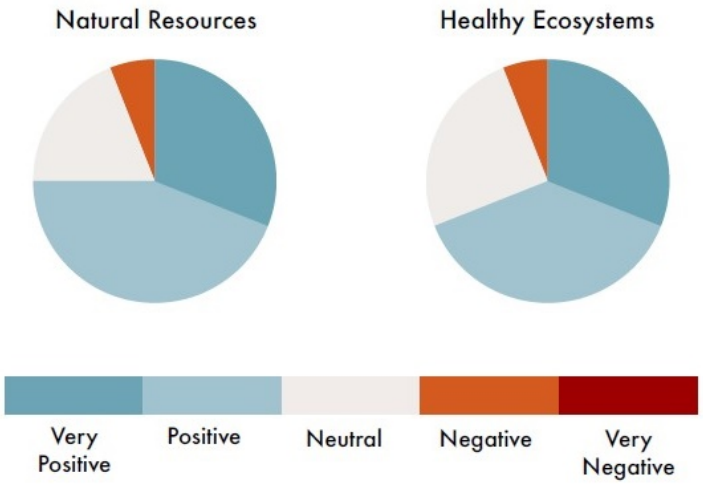

Figure 47. Distribution of responses of the outcomes of the natural sequestration portfolio on fundamental objectives related to adapting to a changing climate.

Identified Concerns, Challenges, and Considerations of Natural Sequestration for Adapting to a Changing Climate

- Identified as limited increase in resiliency for some communities (however, mixed input of coastal vs. inland, with responses indicating resiliency of coastal likely to increase)

Identified Opportunities and Benefits of Natural Sequestration for Adapting to a Changing Climate

- Ecosystem restoration sequesters carbon while protecting the coast from storms, filtering nutrient pollution, catching stormwater, and reducing extreme heat
- Expanding green infrastructure could increase resilience to climate change

CONCLUSIONS

A brief summary of the overall results for the GHG emissions analysis and evaluation of impacts to the people, economy, and environment of Louisiana is provided below. For the GHG analysis, this includes a short synthesis of results from the consequence analysis. For the non-GHG analysis, this includes a quick reference summarizing and comparing the results of the questionnaire across hypothetical strategy portfolios and fundamental objectives. In addition, a summary of overarching considerations that were identified by questionnaire respondents (i.e., factors, considerations, or concerns that were overarching across the hypothetical portfolios) along with a list of future needs for, e.g., technology development or research investment that questionnaire respondents identified as valuable to the furthering the goals of the Task Force.

CONCLUSIONS FROM CONSEQUENCE ANALYSIS OF NET GHG EMISSIONS

The overall conclusions from analysis of the five hypothetical portfolios are that to reach net zero by 2050, Louisiana will need to take action, and that no single portfolio or strategy is sufficient for addressing the state's emissions. Many strategies, both from these hypothetical portfolios and from other approaches beyond those available in the EPS tool, are needed to meet the ambitious emissions reduction targets set out in Executive Order JBE 2020-18.

The development and refining of the strategies that will form the Louisiana Climate Action Plan would benefit from further analysis of specific implementation approaches that will work in Louisiana, with consideration of factors such as sequencing and intensity.

Tackling the state's industrial emissions will be key to reaching net zero by 2050. As seen in the EPS outputs for the industrial carbon removal portfolio, techniques such as Carbon Capture and Storage (CCS) are not sufficient for reaching net zero; the hardest-to-abate emissions from industry may be able to be captured if electrification and fuel switching policies are also pursued. These industrial electrification projects, if sequenced appropriately with renewable electricity generation projects, can ensure that industrial facilities moving to electricity are powered by renewable energy.

Finally, additional research and assessment is needed to determine the emissions reduction potential of approaches outside the EPS tool, such as natural sinks. Continued growth of the state's understanding of climate approaches in our local context will enable models like the EPS tool to be augmented with other research adapted to Louisiana's unique context.

CONCLUSIONS FROM CONSEQUENCE ANALYSIS FOR OTHER FUNDAMENTAL OBJECTIVES

Summary of Consequence Analysis for Other Fundamental Objectives

There was consensus across questionnaire respondents that a BAU approach would result in negative outcomes across the FOs (Figure 48), with most respondents indicating they had high or medium confidence in that prediction. Opportunities for co-benefits across the FOs were identified for each of the GHG reduction

hypothetical portfolios, and in general there was favorable feedback on the potential outcomes. Concerns and challenges related to implementation and the potential negative impacts to the state of Louisiana were also identified and articulated, with the Industrial Carbon Removal intensive portfolio having the highest level of concern of negative impacts to marginalized groups and cultural resources (Table 4).

	Business as Usual	Electrification	Reduce Demand	CCUS	Natural Sequestration	
Essential Goods	17 Responses	15 Responses	14 Responses	15 Responses	14 Responses	Quality of Life
Health	17 Responses	14 Responses	14 Responses	15 Responses	14 Responses	
Cultural Heritage	16 Responses	14 Responses	13 Responses	14 Responses	13 Responses	
Disparity Opportunities	11 Responses	10 Responses	9 Responses	10 Responses	10 Responses	Equity
Institutionalized Harm	11 Responses	10 Responses	9 Responses	9 Responses	10 Responses	
Engagement	11 Responses	10 Responses	9 Responses	10 Responses	10 Responses	
Public Confidence	21 Responses	20 Responses	20 Responses	20 Responses	19 Responses	Short/Long Term Succes
Efficiency/Effectiveness	23 Responses	21 Responses	21 Responses	20 Responses	20 Responses	
Timeliness	23 Responses	19 Responses	21 Responses	20 Responses	20 Responses	
Durability	22 Responses	19 Responses	20 Responses	19 Responses	20 Responses	
Job Creation	12 Responses	11 Responses	10 Responses	11 Responses	10 Responses	Economy
Economy	11 Responses	11 Responses	10 Responses	10 Responses	10 Responses	
Natural Resources	18 Responses	16 Responses	16 Responses	16 Responses	17 Responses	Enivronment
Healthy Ecosystems	17 Responses	16 Responses	15 Responses	14 Responses	16 Responses	
Resilient Nat'l/Built Env.	17 Responses	15 Responses	16 Responses	16 Responses	16 Responses	Climate Adaptation
Resilient Communities	18 Responses	16 Responses	16 Responses	16 Responses	16 Responses	

Very Positive | Positive | Neutral | Negative | Very Negative

Figure 48. Average response received on the predicted outcomes of each portfolio on the fundamental objectives (left side of the graph) across six categories (right side of the graph). Also shown within each box are the number of questionnaire responses received providing a ranking for that portfolio and fundamental objective.

Table 4 Highlights of feedback received via questionnaires on the impact of hypothetical portfolios on the fundamental objectives.

Portfolio	Highlights

Business as Usual	• Status quo means losing ground due to climate change and global trends:
	  ○ Market pressure toward carbon neutral may impact LA economy and jobs
	  ○ Existing needs for infrastructure repair/upgrades will continue to grow
	  ○ Disparate outcomes for marginalized people will continue to worsen
	  ○ Loss of cultural heritage, particularly along the coast
	• Potential downward spiral: climate disasters and job losses increase need for investment to preserve quality of life, decreased available resources to do so, and may lead to population out-migration

Intensive Electrification through Zero-Carbon Renewable Energy	• Poised for rapid implementation due to technology availability and current national focus on infrastructure • Opportunity to be transformative for people, equity, economy, environment if done deliberately (e.g., workforce training) • Potential leveraging of Louisiana expertise/capacity and attracting investment to the state • Opportunity to modernize infrastructure and improve resiliency during a transition to renewables, electrification • Health co-benefits associated with reduced pollution • Concerns over the impacts on Louisiana jobs and economy in the short-term
Reduced Energy Demand, Consumption, & Waste Intensive	• Could reduce costs in transportation, housing, energy sectors, but decrease demand for some Louisiana goods/services • Potential new job creation and opportunities for other retrofitting to occur while improving energy efficiency and renovating infrastructure • Concern over the time it will take to realize benefits in net GHG reduction given reliance on behavioral change • Concerns over the complexity of implementation at different governance levels

CCUS Intensive	• Opportunities and benefits identified include:
	  ○ Developing/supporting new technologies with associated job and economic benefits
	  ○ Attracting attention of industry nationwide
	  ○ General benefit of plugging dormant wells etc.
	• Concerns over:
	  ○ Technology availability, cost, timeline to develop
	  ○ Negative impacts to communities, health/safety, and cultural resources (particularly effects of pipelines)
	  ○ Long-term sustainability (cost, site management)
	  ○ Offsets of gains due to energy required for implementation

Natural Sequestration Intensive	• Minimally disruptive to residents and builds on Coastal Master Plan • Co-benefits identified to resiliency, housing costs, safety (e.g., flood risk reduction), environment, cultural heritage • Opportunities for new jobs, green space, and community involvement in redesign • Concern that marginalized groups may be impacted due to climate gentrification and that the cost of emissions offsets could drive business elsewhere • Concerns over the cost and feasibility to implement, as well as threats to durability of solution from pollution, relative sea level rise and climate-related disasters

Key Considerations across All Portfolios and Fundamental Objectives

A set of overarching feedback was identified from AG input that bridged across the FOs and hypothetical portfolios and are provided below.

- **Opportunities for transformative change** exist to improve people's lives, reduce historical inequity, create jobs and strengthen the economy, benefit the environment, and enhance resiliency to climate change while reducing net GHG emissions.
    - Compounding co-benefit potential of "going big" with large-scale investment and change
    - Large positive (or negative) impacts in terms of economy, environment, improving resiliency of communities and the built environment associated with large-scale transformation
    - Similarly large potential positive (or negative) impacts to equity depending on both process (engagement of communities in active, decision-making/leadership role) and outcomes

- **Outreach and engagement** of the public and stakeholders are key to success.
    - The following need to be evaluated and communicated in detail throughout strategy development and implementation: implications on people and communities, particularly marginalized groups; the economy and job market; and the environment
    - Stakeholders and communities need to be engaged throughout the process with continued opportunity to provide meaningful input

- **Positive outcomes** for the equity objectives require **deliberate effort** and for marginalized communities to have a **leadership role in designing and implementing** strategies.
    - Policies, practices, incentives, etc. must be designed with equity in mind
    - Procedural justice practices ensuring communities impacted by a given decision are key designers and decision makers in/when/how those actions and strategies are implemented
    - Consent and participation of affected communities
    - Need to be proactive to prevent climate gentrification and to ensure the benefits of transformative strategies are equitably distributed

- **Regional and global trends**, including **environmental factors** exacerbated by climate change (e.g., relative sea level rise, heat waves, drought) and **economic factors** such as demand for Louisiana goods, should be considered in selecting strategies.

- The level of **public and private investment required** for implementation should be considered as actions are selected within strategies.

- Impacts to fundamental objectives will depend on details of implementation, including:
    - Availability of **technology, cost, and process** through which the strategies are executed
    - Level of investment in **workforce training, local businesses, and necessary infrastructure** to enable a successful transition

Identified Areas of Information and Technology Needs

In addition to the feedback provided on the outcomes of the hypothetical portfolios across the fundamental objectives, the AG members identified several areas where additional information could reduce the uncertainty associated with strategy outcomes and/or that were necessary for strategies to succeed.

These include:

- **Overarching:**
    - Estimates of net public investment cost for varying strategies
    - Additional cost/benefit analysis of the different strategies. This information could be used in both decision-making and for communication to stakeholders

- **For the BAU Portfolio:**
    - More information on Louisiana's vulnerability to a changing climate, particular for environments and sectors outside of the coastal zone
    - Estimate of the resiliency of the current electrical infrastructure in the face of climate change and climate-related disasters
    - Predictions of how national energy transition and trends will impact Louisiana

- **For the Intensive Electrification through Zero-Carbon Renewable Energy Portfolio:**
    - Estimates of the resiliency of renewable power to climate change and environmental disasters

- **For the Industrial Carbon Removal, Capture, Use, and Storage (CCUS) Intensive Portfolio:**
    - Realistic timeline of development and implementation of new technologies
    - Cost of CCUS technology development and implementation
    - Energy requirements of CCUS transition
    - Information on ancillary impacts of CCUS on fundamental objectives:
        - Efficiency and effectiveness of technology
        - Health impacts: risk/safety of long-term storage, pollution generated
        - Feasibility of implementation in Louisiana (geology, etc.)
    - Evaluation of regulatory process needs at all governance levels
    - Development of new, cost-effective technologies

- **For the Natural Sequestration and Sinks Intensive Portfolio:**
    - Sequestration capacity/potential of the natural environment
    - Potential economic benefits of natural sequestration and Louisiana opportunities in global marketplace
    - Cost/benefit analysis of land for sequestration vs. commerce
    - Impacts of varying land use strategies on storm water run-off and flooding

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REFERENCES

Climate Initiatives Task Force. (2022, February 1). Louisiana Climate Action Plan: Climate Initiatives Task Force Recommendations to the Governor.

APPENDIX A: HYPOTHETICAL PORTFOLIOS

HYPOTHETICAL PORTFOLIO 1: BUSINESS AS USUAL

Introduction to Portfolio 1

The BAU portfolio is distinct from the other hypothetical strategy portfolios. Rather than presenting new strategies formulated through the Task Force planning process, it offers a selection of existing trends that could be expected to continue through 2050 (the same time frame as the other portfolios) if Louisiana does not take action to significantly reduce emissions.

Predicting a 'future without action' is difficult, and this portfolio does not seek to capture the many possible paths that could unfold. Many of these trends are extrapolated from reports such as the Fourth National Climate Assessment and the 2017 Coastal Master Plan. The goal of evaluating this portfolio is not to assess whether this exact portrayal will come true; it is to assess the impacts of maintaining the status quo through a "strategy of inaction" in the same way that you will assess the other hypothetical portfolios with strategies to reduce GHG emissions. Trends towards decarbonization will continue, due to actions taken at the national and international scale, but at a slower pace due to in-state inaction.

Strategies in Portfolio 1

Population change

- Louisiana's population will continue to experience fluctuations of limited growth or marginal decline as out-migration continues. (The Advocate, LSU)
- Within the state, population will continue to shift sporadically away from the coast and rural areas and towards cities and areas of low-density suburban development. (The Advocate)
- Continued disaster events have potential to increase both out-migration from the state and internal migration to communities of perceived safety. (Quartz)

Economic change

- COVID-related job losses will take years to fully recover. (LSU)
- Economic changes will not impact all areas of the state in the same way. Rural parishes will be at risk of continuing to lose jobs as population shifts towards urban centers continue. (LSU)
- Slowdowns in industrial construction and the oil industry have potential to persist for several years. (Houma Today)
- The COVID-19 pandemic accelerated long-term industry trends, particularly in oil and gas, that make employment and investments uncertain in the long term. (Deloitte)

Housing and commutes

- Housing prices will continue to increase, particularly in city centers. (The Advocate)
- Development will continue to expand outward from city centers. (The Advocate)
- Job seekers and commuters will travel longer distances for work. Vehicle ownership will be necessary to maintain stable employment. (The Data Center)

- A rise in remote work opportunities will allow for some former commuters to work from home. (PWC)

Energy and electricity sector changes

- Coal-burning plants will likely be retired. (EIA)
- Existing nuclear generators continue to operate through 2045. (Entergy)
- Renewable energy, including solar and wind energy, will continue to decrease in cost. (Our World In Data)
- New and replacement power generation will be a mix of natural gas and renewable energy. (MISO)
- Energy costs to users will remain relatively low, but consumption will remain among the highest in the nation. (EIA)

Climate and disaster impacts

- Sea level rise will continue to consume Louisiana's coastal wetlands and habitats and increase "nuisance flooding" throughout coastal Louisiana. (CPRA)
- Flooding from heavy rainfall will continue to impact all areas of the state with increasing frequency. (WWNO)
- Extreme heat and humidity will become more common and persistent. (National Climate Assessment)
- Ecological and habitat changes will impact natural resource economies, including fishing, shrimping, and crabbing. (CPRA)
- Structural and natural defenses will require billions more in funding to maintain and complete. (CPRA)
- Hurricanes bringing storm surge, heavy rainfall, and winds will become more common each year. Destructive and disruptive winter storms will also become more common. Communities outside levee protection systems will experience devastating impacts. (IPCC, New York Times)

HYPOTHETICAL PORTFOLIO 2: INTENSIVE ELECTRIFICATION THROUGH ZERO-CARBON RENEWABLE ENERGY

Introduction to Portfolio 2

This portfolio focuses on the GHG emissions reduction benefits of a renewably-produced, zero-carbon electricity generation system and then passes those benefits on to users in other sectors including the transportation network, industry, and the built environment. Zero-carbon limits the energy forms available for electricity production to those derived from naturally reoccurring processes (solar, wind, hydro, or geothermal) and biomass sources both sustainably derived and carbon neutral (meaning they absorb as much carbon during the growing phase as they emit during combustion as energy).

"Renewable" energy is primarily concerned with the origin of the resource and whether it can be replenished through naturally occurring processes like wind, solar, or geothermal or management practices relating to the regrowth rate of forests or agricultural crops. "Clean" energy primarily concerns itself with the GHG emissions output and not with the origin of the resource.

This portfolio purposefully ignores external means of decarbonizing electricity production such as carbon capture or even the creation of "offsetting" natural carbon sinks equivalent to a facility's emissions (in whole or in part).

Carbon capture, storage, and use will be explicitly considered in a separate portfolio as will natural carbon sinks. It also assumes that the utilization of zero emission electricity is fully available for all sectors immediately regardless of the rate of adoption that is pursued. This portfolio also ignores measures to address energy efficiency, which are addressed in another portfolio.

The portfolio is agnostic in terms of the mechanisms to drive adoption of this switch to a zero-carbon renewable energy system. Those choices, such as carbon pricing, energy portfolio standards, or vehicle rebates, could clearly affect the costs and speed of adoption for government, electricity producers, or end users, but should not impact the overall environmental effects of a switch to zero-carbon renewables.

Strategies in Portfolio 2

Power (shift power sources)

- Increase percentage of utility-scale energy from clean/renewable sources
- Early retirement of fossil fuel power plants and existing nuclear power plants are retired at the end of their normal lifespan
- Increase distributed generation from renewable energy sources
- Increase generation of energy from offshore wind
- Increase clean/renewable energy procurement from out of state
- Expand the power infrastructure as needed to support renewable energy transmission
- Increase access to affordable and reliable clean energy for consumers
- Encourage local clean energy industry and job growth

Transportation (shift to electric and alt fuel vehicles)

- Expand the number of electric and alternative fuel vehicles by private consumers
- Encourage alternative fuel use by training mechanics and maintenance workers
- Encourage and support transition to electric vehicles
- Transition commercial/industrial/public sector medium- and heavy-duty vehicles to lower emissions
- Expand production and use of biofuels
- Build electrification and charging infrastructure to transition to electric vehicles

Buildings (shift to electrification of building components)

- Enhance the electrification of buildings through updates to building codes for new construction and remodels
- Electrify home and commercial systems and appliances

Industry (electrification and fuel switch)

- Increase use of green hydrogen
- Increase electrification of production processes and operations
- Incentivize local generation of electricity on agricultural lands and landfills

HYPOTHETICAL PORTFOLIO 3: REDUCED ENERGY DEMAND, CONSUMPTION & WASTE INTENSIVE

Introduction to Portfolio 3

This portfolio focuses on reduced emissions through demand-side measures. Broadly, this portfolio addresses behavioral changes, improvements in energy efficiency, and social, business, and technological innovations that reduce overall demand for energy.

To that end, we have maximized strategies in this portfolio related to transportation (mode shifting) and land use (compact development) to reduce trips taken. We have also maximized setting high efficiency standards and retrofitting buildings. Finally, we have targeted waste reduction and reuse in multiple sectors, as well as consumer shifts to low waste and low GHG footprint products.

Because this portfolio only focuses on demand-side measures, strategies targeting supply, such as clean electricity grid improvements, are not included. Emissions reductions in this portfolio only come from efficiency measures that reduce waste and demand. As such, supply is considered constant.

Strategies in Portfolio 3

Transportation (shift to alternative modes, logistics efficiency)

- Adapt roadways to accommodate alternative modes of transportation – complete streets
- Support expansion and use of local and regional public transit
- Encourage more bicycling, walking, and rideshare
- Expand access to goods, services, and work from home to limit trips to urban centers
- Increase efficiency of freight and shipping logistics and operations
- Reduce vehicle and fleet idling time through improved traffic flow, driver training, technology, and regulation

Land Use (compact development)

- Promote smart development approaches that enable walking, biking, public transit, and carpooling
- Minimize urban sprawl and encourage higher-density housing and transit-oriented development
- Coordinate planning for transit and housing
- Intensification of sustainable land use practices

Buildings (efficiency and retrofits)

- Increase reuse and adaptation of existing buildings, structures, and infrastructure
- Improve building efficiency and health
- Retrofit existing structures to lower GHG emissions and increase energy and water efficiency
- Update building and energy codes
- Reduce carbon footprint of building materials

Industry (energy, process, and operations efficiency; low-carbon product lifecycles)

- Increased efficiency standards for new industrial facilities
- Reduction of carbon-intensive products
- Reduce carbon footprint of building materials
- Increase heat and power production efficiency
- Increase process efficiency
- Reduce GHG footprint of supply chain logistics
- Design products with disposal or reuse in mind
- Reduce GHG footprint of facility construction and equipment
- Early retirement or retrofitting of existing high-emissions and inefficient industrial facilities
- Material efficiency, longevity, and re-use

Power (grid efficiency/reduced peak demand)

- Increase power grid efficiency
- Balance power load supply/demand to reduce peak energy needs

Agriculture & Waste (reduce, reuse, recycle)

- Reduce generation of consumer waste
- Increase beneficial reuse of waste materials and products
- Promote consumption of locally produced agriculture and forestry products
- Shift towards less resource intensive food systems and diets

HYPOTHETICAL PORTFOLIO 4: INDUSTRIAL CARBON REMOVAL, CAPTURE, USE, AND STORAGE INTENSIVE

Introduction to Portfolio 4

This portfolio maximizes the full deployment of mechanical carbon removal and capture technologies. Strategies in this portfolio assume a full deployment of carbon capture on natural gas power plants and industrial facilities and maximizes the storage and use potential of a carbon pipeline and class 6 well network. This infrastructure deployment offsets the hardest-to-avoid GHG emissions from within Louisiana, and can accommodate emissions from states and nations seeking to meet their own net zero goals. Carbon capture technology in this portfolio is applied to industrial facilities, natural gas power plants, and at well heads. It is also applied to bio-energy, blue hydrogen, and alternative fuels production. F-gas (fluorinated gases with a very high global warming effect) capture, recovery, and destruction is included as well. However, carbon can also be removed directly from the atmosphere. Deployment of direct air capture technology to remove ambient carbon is considered in this portfolio as well. This portfolio also includes strategies to capture fugitive emissions from productive and legacy infrastructure, including addressing leaks, venting, and flaring from upstream to downstream. Some assumptions were made in the construction of this portfolio, including that domestic natural gas production will continue and that the price of natural gas will stay relatively low. It assumes that carbon capture and carbon removal

technologies are cost competitive and scalable, and that full deployment to the maximum potential is feasible. This portfolio also assumes that some electrification is made possible through retrofitting of natural gas power plants.

Because natural sequestration and sinks are considered in a separate portfolio, they are not included here. Similarly, intensive electrification using zero-carbon renewable energy is not included in this portfolio.

Strategies in Portfolio 4

Carbon Removal from atmosphere

- Utilize direct air capture technology to remove carbon dioxide from the atmosphere
- Utilize bioenergy with carbon capture and storage (BECCS)

Carbon Capture Utilization and Storage (CCUS)

- Utilize carbon capture technology at industrial facilities and well heads
- Retrofit natural gas power plants with carbon capture technology
- Increase carbon use and storage from capture infrastructure
- Increase use of blue hydrogen technology and infrastructure

Mining, Oil, and Gas (reduced flaring, venting, and leaks)

- Increase monitoring and quantification of flaring, venting, and leaks
- Reduce flaring and venting of GHGs
- Increase the plugging of dormant and orphaned oil and gas wells
- Reduce leaks upstream, midstream, and downstream

F-Gas recovery and destruction

- Increase recycling and destruction processes
- Optimizing production to minimize emissions
- Replacing these gases with alternatives

References for further reading

- Carbon Capture, Use and Storage: https://www.c2es.org/content/carbon-capture/
- EPA Overview of F-Gases: https://www.epa.gov/ghgreporting/fluorinated-greenhouse-gas-emissions-and-supplies-reported-ghgrp
- Carbon Removal: https://www.american.edu/sis/centers/carbon-removal/explaining-carbon-removal.cfm
- Carbon Removal: https://cdrprimer.org/

HYPOTHETICAL PORTFOLIO 5: NATURAL SEQUESTRATION AND SINKS INTENSIVE

Introduction to Portfolio 5

This portfolio maximizes utilization of Louisiana's natural spaces for carbon sequestration potential. This occurs in every environment possible: urban spaces, forests, floodways and riparian corridors, coastal wetlands, and agricultural lands. This portfolio also halts development that infringes on natural spaces, prohibiting further deforestation and loss of floodplains and prime lands, fully implements and executes the Coastal Master Plan for maximum wetland carbon sequestration, and utilizes the most effective farming and foresting best management practices.

Some assumptions and boundaries were made in constructing this portfolio. For example, market forces, technical barriers, and education gaps are not a factor; it is assumed that we are knowledgeable of and able to implement all of these natural sequestration practices to their maximum extent. Another assumption is that natural disasters and sea level rise will not impact our current inventory of wetlands beyond what is currently forecasted, and that we have perfect knowledge of the best landscapes for sequestration potential within the state.

Because mechanical carbon capture strategies are in a different portfolio, they are not included here. This portfolio only focuses on natural sinks. The purchase and creation of offsets for industrial, electricity generation facilities, or commercial users are included, but they are limited to in-state use.

Strategies that might have an indirect connection to natural sequestration, such as strategies to coordinate land use that would lead to more compact development, were not considered in this portfolio.

Strategies in Portfolio 5

Land Use

- Create, preserve, and enhance green spaces
- Increase urban tree canopy and urban forests
- Increase natural sequestration on lease areas (mining, oil, and gas)
- Retrofit roadways and developed areas to include more green space

Agriculture and Forestry

- Utilize conservation tillage practices that allow for maximum carbon sequestration in agricultural lands
- Minimize loss of prime farmland and grazing lands to any development, and limit conversion of grasslands and forests to farm and grazing land
- Maximize preservation of and GHG capture in undeveloped lands and forests
- Promote and expand reforestation and afforestation in converted lands
- Retire marginal lands from crop rotation and conversion to conservation cover
- Afforestation and reforestation

Coastal and Wetland Sequestration

- Maximum investment in parish or municipal coastal wetland programs to minimize loss of wetlands and maximize blue carbon sequestration

- Maximum implementation of the state's $50 billion, 50-year Coastal Master Plan to restore and preserve Louisiana's coastal habitats

Floodplain Management

- Minimize loss of riparian corridors through preservation of inland and coastal floodplains
- Manage the river and floodplains holistically for wetland and riparian conservation and expansion

Industry and Electricity Generation Sector

- Industry and electricity producers compensate for greenhouse gas emissions through the investment in ecosystem restoration projects that naturally sequester carbon dioxide.

APPENDIX B: DEFINED IMPACT SCALES

Defined impact scales were developed to evaluate impacts of action on FOs. This appendix provides the guiding criteria used by AGs to qualitatively evaluate each FO via the questionnaire evaluation method.

CATEGORY 1: IMPROVING QUALITY OF LIFE FOR RESIDENTS AND COMMUNITIES

FO: Maximize quality of, and access to, essential goods, services, and infrastructure for residents

Evaluation criteria for this objective are given below (Table 5).

*Table 5. Evaluation criteria for FO "*Maximize quality of, and access to, essential goods, services, and infrastructure for residents*".*

Scale	Guidance

Very Positive	*Strategies result in **significant improvements** in one or more of:*
	• **Housing:** Access to high-quality healthy, safe, and affordable housing (rental and homeownership)
	  ○ Health, safety, and quality improvements to existing housing supply
	  ○ Construction of high-quality new housing that is safe, affordable to individuals and families of all income levels, and located near jobs and essential services
	  ○ Preserve existing supply and expand total supply of affordable rental and homeownership opportunities
	  ○ Reduce long-term housing costs (maintenance, repair, property taxes, flood insurance, etc)
	• **Transportation:** Access to high-quality affordable and reliable transportation that meets people's needs
	  ○ Increased safety, quality, and supply of infrastructure to support many modes of transportation (car, public transit, bike, walking) and types of users (urban, rural, people without cars)
	  ○ Reduced commute times and increase in transportation options that meet people's schedules
	  ○ Reduced reliance on transportation to meet daily basic needs
	  ○ Reduced transportation costs to individuals and families
	• **Consumer energy:** Access to reliable, resilient, and affordable energy sources for consumers
	  ○ Reduced utility costs for consumers
	  ○ Increased reliability and long-term resilience of energy infrastructure, especially in the face of extreme weather events and climate risks

Positive	*Strategies result in **small to modest improvements** in one or more of:*
	• **Housing:** Access to high-quality healthy, safe, and affordable housing (rental and homeownership)
	  ○ Health, safety, and quality improvements to existing housing supply
	  ○ Construction of high-quality new housing that is safe, affordable to individuals and families of all income levels, and located near jobs and essential services
	  ○ Preserve existing supply and expand total supply of affordable rental and homeownership opportunities
	  ○ Reduce long-term housing costs (maintenance, repair, property taxes, flood insurance, etc)
	• **Transportation:** Access to high-quality affordable and reliable transportation that meets people's needs
	  ○ Increased safety, quality, and supply of infrastructure to support many modes of transportation (car, public transit, bike, walking) and types of users (urban, rural, people without cars)
	  ○ Reduced commute times and increase in transportation options that meet people's schedules
	  ○ Reduced reliance on transportation to meet daily basic needs
	  ○ Reduced transportation costs to individuals and families
	• **Consumer energy:** Access to reliable, resilient, and affordable energy sources for consumers

Scale	Guidance
	○ Reduced utility costs for consumers ○ Increased reliability and long-term resilience of energy infrastructure, especially in the face of extreme weather events and climate risks
Neutral	*Strategies result in **virtually no change** in:* • **Housing:** Access to high-quality healthy, safe, and affordable housing (rental and homeownership) ○ Health, safety, and quality improvements to existing housing supply ○ Construction of high-quality new housing that is safe, affordable to individuals and families of all income levels, and located near jobs and essential services ○ Preserve existing supply and expand total supply of affordable rental and homeownership opportunities ○ Reduce long-term housing costs (maintenance, repair, property taxes, flood insurance, etc) • **Transportation:** Access to high-quality affordable and reliable transportation that meets people's needs ○ Increased safety, quality, and supply of infrastructure to support many modes of transportation (car, public transit, bike, walking) and types of users (urban, rural, people without cars) ○ Reduced commute times and increase in transportation options that meet people's schedules ○ Reduced reliance on transportation to meet daily basic needs ○ Reduced transportation costs to individuals and families • **Consumer energy:** Access to reliable, resilient, and affordable energy sources for consumers ○ Reduced utility costs for consumers ○ Increased reliability and long-term resilience of energy infrastructure, especially in the face of extreme weather events and climate risks
Negative	*Strategies result in **small to modest deterioration** in one or more of:* • **Housing:** Access to high-quality healthy, safe, and affordable housing (rental and homeownership) ○ Health, safety, and quality improvements to existing housing supply ○ Construction of high-quality new housing that is safe, affordable to individuals and families of all income levels, and located near jobs and essential services ○ Preserve existing supply and expand total supply of affordable rental and homeownership opportunities ○ Reduce long-term housing costs (maintenance, repair, property taxes, flood insurance, etc) • **Transportation:** Access to high-quality affordable and reliable transportation that meets people's needs ○ Increased safety, quality, and supply of infrastructure to support many modes of transportation (car, public transit, bike, walking) and types of users (urban, rural, people without cars) ○ Reduced commute times and increase in transportation options that meet people's schedules ○ Reduced reliance on transportation to meet daily basic needs ○ Reduced transportation costs to individuals and families • **Consumer energy:** Access to reliable, resilient, and affordable energy sources for consumers ○ Reduced utility costs for consumers ○ Increased reliability and long-term resilience of energy infrastructure, especially in the face of extreme weather events and climate risks
Very Negative	*Strategies result in **significant deterioration** in one or more of:* • **Housing:** Access to high-quality healthy, safe, and affordable housing (rental and homeownership) ○ Health, safety, and quality improvements to existing housing supply ○ Construction of high-quality new housing that is safe, affordable to individuals and families of all income levels, and located near jobs and essential services

Scale	Guidance
	○ Preserve existing supply and expand total supply of affordable rental and homeownership opportunities ○ Reduce long-term housing costs (maintenance, repair, property taxes, flood insurance, etc) • **Transportation:** Access to high-quality affordable and reliable transportation that meets people's needs ○ Increased safety, quality, and supply of infrastructure to support many modes of transportation (car, public transit, bike, walking) and types of users (urban, rural, people without cars) ○ Reduced commute times and increase in transportation options that meet people's schedules ○ Reduced reliance on transportation to meet daily basic needs ○ Reduced transportation costs to individuals and families • **Consumer energy:** Access to reliable, resilient, and affordable energy sources for consumers ○ Reduced utility costs for consumers ○ Increased reliability and long-term resilience of energy infrastructure, especially in the face of extreme weather events and climate risks

FO: Maximize positive public health outcomes and public safety

Evaluation criteria for this objective are given below (Table 6).

*Table 6. Evaluation criteria for FO "*Maximize positive public health outcomes and public safety*".*

Scale	Guidance
Very Positive	*Strategies **significantly reduce exposure** to contaminants or hazards that negatively affect human health, such as:* • Indoor and outdoor air co-pollutants (PM2.5, NOx, 5Ox, Ozone) • Hazardous or radioactive waste • Transportation accidents • Occupational hazards • Extreme weather events *Strategies **significantly increase access** to resources that improve human physical and mental health, such as:* • Healthy food access and improved nutrition • Increased options for safe physical activity • Access to open space and nature *Strategies result in a **significant net improvement** in health effects and health outcomes, such as rates of:* • Diseases: Asthma, cancer, cardiovascular disease, obesity, diabetes • Unintentional injury or premature death • Mental health and wellbeing • Overall life expectancy
Positive	*Strategies **somewhat reduce exposure** to contaminants or hazards that negatively affect human health, such as:* • Indoor and outdoor air co-pollutants (PM2.5, NOx, 5Ox, Ozone) • Hazardous or radioactive waste • Transportation accidents • Occupational hazards • Extreme weather events

Scale	Guidance
	*Strategies **somewhat increase access** to resources that improve human physical and mental health, such as:* • Healthy food access and improved nutrition • Increased options for safe physical activity • Access to open space and nature *Strategies result in a **modest net improvement** in health effects and health outcomes, such as rates of:* • Diseases: Asthma, cancer, cardiovascular disease, obesity, diabetes • Unintentional injury or premature death • Mental health and wellbeing • Overall life expectancy
Neutral	*Strategies result in **virtually no change in exposure** to contaminants or hazards that negatively affect human health, such as:* • Indoor and outdoor air co-pollutants (PM2.5, NOx, 5Ox, Ozone) • Hazardous or radioactive waste • Transportation accidents • Occupational hazards • Extreme weather events *Strategies result in **no change in access** to resources that improve human physical and mental health, such as:* • Healthy food access and improved nutrition • Increased options for safe physical activity • Access to open space and nature *Strategies result in **virtually no change** in health effects and health outcomes, such as rates of:* • Diseases: Asthma, cancer, cardiovascular disease, obesity, diabetes • Unintentional injury or premature death • Mental health and wellbeing • Overall life expectancy
Negative	*Strategies **somewhat increase exposure** to contaminants or hazards that negatively affect human health, such as:* • Indoor and outdoor air co-pollutants (PM2.5, NOx, 5Ox, Ozone) • Hazardous or radioactive waste • Transportation accidents • Occupational hazards • Extreme weather events *Strategies **somewhat decrease access** to resources that improve human physical and mental health, such as:* • Healthy food access and improved nutrition • Increased options for safe physical activity • Access to open space and nature *Strategies result in **modest net declines** in health effects and health outcomes, such as rates of:* • Diseases: Asthma, cancer, cardiovascular disease, obesity, diabetes • Unintentional injury or premature death • Mental health and wellbeing • Overall life expectancy

Scale	Guidance
Very Negative	*Strategies **significantly increase exposure** to contaminants or hazards that negatively affect human health, such as:* • Indoor and outdoor air co-pollutants (PM2.5, NOx, 5Ox, Ozone) • Hazardous or radioactive waste • Transportation accidents • Occupational hazards • Extreme weather events *Strategies **significantly decrease access** to resources that improve human physical and mental health, such as:* • Healthy food access and improved nutrition • Increased options for safe physical activity • Access to open space and nature *Strategies result in **significant net declines** in health effects and health outcomes, such as rates of:* • Diseases: Asthma, cancer, cardiovascular disease, obesity, diabetes • Unintentional injury or premature death • Mental health and wellbeing • Overall life expectancy

Additional sources used as reference in developing this guidance:
Guidelines for Modeling and Reporting Health Effects of Climate Change Mitigation Actions

FO: Maximize preservation of cultural heritage

Evaluation criteria for this objective are given below (Table 7).

*Table 7. Evaluation criteria for FO "*Maximize preservation of cultural heritage*".*

Scale	Guidance
Very Positive	• Strategies result in **significant overall benefit** to the preservation of tribal and indigenous lands and cultural sites • Strategies result in **significant overall benefit** to the preservation of objects, structures, lands, and waters important to local and state cultural heritage • Strategies **acknowledge, preserve, and celebrate** the tangible and intangible values and traditions of past generations in communities
Positive	• Strategies result in **marginal overall benefit** to the preservation of tribal and indigenous lands and cultural sites • Strategies result in **marginal overall benefit** to the preservation of objects, structures, lands, and waters important to local and state cultural heritage • Strategies **acknowledge and preserve** the tangible and intangible values and traditions of past generations in communities
Neutral	• Strategies have **no impact** on the preservation of tribal and indigenous lands and cultural sites

Scale	Guidance
	• Strategies have **no impact** on the preservation of objects, structures, lands, and waters important to local and state cultural heritage • Strategies have **no impact** on preserving the tangible and intangible values and traditions of past generations in communities
Negative	• Strategies **marginally harm** the preservation of tribal and indigenous lands and cultural sites • Strategies **marginally harm** the preservation of objects, structures, lands, and waters important to local and state cultural heritage • Strategies **marginally diminish** or detract from efforts to preserve the tangible and intangible values and traditions of past generations in communities
Very Negative	• Strategies **significantly harm** the preservation of tribal and indigenous lands and cultural sites • Strategies **significantly harm** the preservation of objects, structures, lands, and waters important to local and state cultural heritage • Strategies **significantly diminish** the tangible and intangible values and traditions of past generations in communities

CATEGORY 2: CREATING A MORE EQUITABLE SOCIETY

FO: Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes

Evaluation criteria for this objective are given below (Table 8).

*Table 8. Evaluation criteria for FO "*Reduce socioeconomic, demographic, and geographic disparities in future opportunities and outcomes*".*

Scale	Guidance
Very Positive	• **Benefits** of **many strategies** are **targeted** to historically underserved communities and communities most in need to reduce current disparities. • **Opportunities** associated with many strategies are **broadly accessible** to households and businesses throughout the community—particularly communities of color, low-wealth communities, and minority and women owned businesses. • Strategies **build community capacity** through funding, an expanded knowledge base, or other resources, and **cost of transition** is **minimal** or **fully mitigated** for historically underserved and low-wealth communities. • Strategies result in **significant decreases in disparities** across socioeconomic, demographic, and geographic groups in long-term outcomes for **many** of the following indicators: ○ *Health outcomes:* physical health, mental health, life expectancy, mortality rates ○ *Economic outcomes:* Employment rate, workforce participation, wages and incomes, business development, educational attainment ○ *Environment:* Air pollution, water systems and water quality, access to open space and nature ○ *Quality of life:* Housing cost burden, quality of housing, commute time, transportation costs ○ *Cultural preservation:* preservation of cultural heritage, resources, and practices ○ *Climate vulnerability:* exposure to hazards, ability to recover and adapt
Positive	• **Benefits** of **some strategies** are **targeted** to historically underserved communities and communities most in need to reduce current disparities.

Scale	Guidance
	• **Opportunities** associated with many strategies are **mostly accessible** to households and businesses throughout the community—particularly communities of color, low-wealth communities, and minority and women owned businesses. • **Cost of transition** is **minimal** for historically underserved and low-wealth communities. • Strategies result in **modest decreases in disparities** across socioeconomic, demographic, and geographic groups in long-term outcomes for **some** of the following indicators: ○ *Health outcomes:* physical health, mental health, life expectancy, mortality rates ○ *Economic outcomes:* Employment rate, workforce participation, wages and incomes, business development, educational attainment ○ *Environment:* Air pollution, water systems and water quality, access to open space and nature ○ *Quality of life:* Housing cost burden, quality of housing, commute time, transportation costs ○ *Cultural preservation:* preservation of cultural heritage, resources, and practices ○ *Climate vulnerability:* exposure to hazards, ability to recover and adapt
Neutral	• **Benefits** of strategies are **distributed** across segments of the community but are **not targeted** to historically underserved communities and communities most in need to reduce current disparities. • **Opportunities** associated with many strategies are **equally accessible** to households and businesses throughout the community. • **Cost of transition** is **equal** for all segments of the community. • Strategies result in **no impact to existing disparities disparities** across socioeconomic, demographic, and geographic groups in long-term outcomes for the following indicators: ○ *Health outcomes:* physical health, mental health, life expectancy, mortality rates ○ *Economic outcomes:* Employment rate, workforce participation, wages and incomes, business development, educational attainment ○ *Environment:* Air pollution, water systems and water quality, access to open space and nature ○ *Quality of life:* Housing cost burden, quality of housing, commute time, transportation costs ○ *Cultural preservation:* preservation of cultural heritage, resources, and practices ○ *Climate vulnerability:* exposure to hazards, ability to recover and adapt
Negative	• **Benefits** of **some strategies** are **disproportionately beneficial to resource-rich communities and institutions**, widening current disparities. • **Opportunities** associated with many strategies are **somewhat inaccessible** to households and businesses throughout the community—particularly communities of color, low-wealth communities, and minority and women owned businesses. • **Cost of transition** is **somewhat greater** for historically underserved and low-wealth communities. • Strategies result in **moderate increases in disparities** across socioeconomic, demographic, and geographic groups in long-term outcomes for **some** of the following indicators: ○ *Health outcomes:* physical health, mental health, life expectancy, mortality rates ○ *Economic outcomes:* Employment rate, workforce participation, wages and incomes, business development, educational attainment ○ *Environment:* Air pollution, water systems and water quality, access to open space and nature ○ *Quality of life:* Housing cost burden, quality of housing, commute time, transportation costs ○ *Cultural preservation:* preservation of cultural heritage, resources, and practices

Scale	Guidance
	○ *Climate vulnerability:* exposure to hazards, ability to recover and adapt
Very Negative	• **Benefits** of **many strategies** are **disproportionately beneficial to resource-rich communities and institutions**, widening current disparities. • **Opportunities** associated with many strategies are **inaccessible** to households and businesses throughout the community—particularly communities of color, low-wealth communities, and minority and women owned businesses. • **Cost of transition** is **significantly greater** for historically underserved and low-wealth communities. • Strategies result in **significant increases in disparities** across socioeconomic, demographic, and geographic groups in long-term outcomes for **many** of the following indicators: ○ *Health outcomes:* physical health, mental health, life expectancy, mortality rates ○ *Economic outcomes:* Employment rate, workforce participation, wages and incomes, business development, educational attainment ○ *Environment:* Air pollution, water systems and water quality, access to open space and nature ○ *Quality of life:* Housing cost burden, quality of housing, commute time, transportation costs ○ *Cultural preservation:* preservation of cultural heritage, resources, and practices ○ *Climate vulnerability:* exposure to hazards, ability to recover and adapt

FO: Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities

Evaluation criteria for this objective are given below (Table 9).

*Table 9. Evaluation criteria for FO "*Maximize reduction and mitigation of institutionalized harms to historically underserved and marginalized people and communities*".*

Scale	Guidance
Very Positive	• Strategies **acknowledge, account for, and repair** the legacy and current impacts of the historical, cultural, and institutional dynamics and structures that have routinely advantaged privileged groups in society and resulted in cumulative disadvantage or harm for marginalized groups, such as: ○ *Environmental Injustice:* Policies and systems that have resulted in disproportionate exposure of "fenceline" communities of color and low-wealth communities to pollution and its effects on health and environment ○ *Discriminatory housing and land use practices:* Policies and systems, such as redlining, urban renewal, and exclusionary zoning that perpetuate patterns of racial segregation, neighborhood disinvestment, housing insecurity, and racial wealth gaps within communities ○ *Climate Exposure and Vulnerability:* Policies and systems that have placed "frontline" communities at disproportionate exposure and risk to climate impacts ○ *Resource Extraction and Environmental Degradation:* Policies and systems that have resulted in destruction of native habitats and ecosystems and left Indigenous lands vulnerable to increasing climate impacts • Strategies result in **structural changes** in society and the state's economy that redress extractive and exploitative systems and redistribute power and wealth more fairly. • Strategies address the **interconnected impacts** of historical and current discrimination in land use, housing, transportation, access to health care and education.

Scale	Guidance
	• Strategies incorporate **appropriate mechanisms of accountability.** • Disproportionate impacts of **all** strategies to historically marginalized communities and current or historical fenceline and frontline communities are **avoided** or **fully mitigated**.
Positive	• Strategies **acknowledge and account for** the legacy and current impacts of the historical, cultural, and institutional dynamics and structures that have routinely advantaged privileged groups in society and resulted in cumulative disadvantage or harm for marginalized groups, such as: ○ *Environmental Injustice:* Policies and systems that have resulted in disproportionate exposure of "fenceline" communities of color and low-wealth communities to pollution and its effects on health and environment ○ *Discriminatory housing and land use practices:* Policies and systems, such as redlining, urban renewal, and exclusionary zoning that perpetuate patterns of racial segregation, neighborhood disinvestment, housing insecurity, and racial wealth gaps within communities ○ *Climate Exposure and Vulnerability:* Policies and systems that have placed "frontline" communities at disproportionate exposure and risk to climate impacts ○ *Resource Extraction and Environmental Degradation:* Policies and systems that have resulted in destruction of native habitats and ecosystems and left Indigenous lands vulnerable to increasing climate impacts • Strategies result in **minor reforms** in society and the state's economy. • Strategies address **some but not all linked impacts** of historical and current discrimination in land use, housing, transportation, access to health care and education. • Strategies incorporate **minimal mechanisms of accountability**. • Disproportionate impacts of **most** strategies to historically marginalized communities and current or historical fenceline and frontline communities are **avoided** or **fully mitigated**.
Neutral	• Strategies **acknowledge**, but do not account for or repair, the legacy and current impacts of the historical, cultural, and institutional dynamics and structures that have routinely advantaged privileged groups in society and resulted in cumulative disadvantage or harm for marginalized groups, such as: ○ *Environmental Injustice:* Policies and systems that have resulted in disproportionate exposure of "fenceline" communities of color and low-wealth communities to pollution and its effects on health and environment ○ *Discriminatory housing and land use practices:* Policies and systems, such as redlining, urban renewal, and exclusionary zoning that perpetuate patterns of racial segregation, neighborhood disinvestment, housing insecurity, and racial wealth gaps within communities ○ *Climate Exposure and Vulnerability:* Policies and systems that have placed "frontline" communities at disproportionate exposure and risk to climate impacts ○ *Resource Extraction and Environmental Degradation:* Policies and systems that have resulted in destruction of native habitats and ecosystems and left Indigenous lands vulnerable to increasing climate impacts • Strategies **acknowledge** extractive and exploitative economic and social systems but do nothing to change them. • Strategies **do not account for links between impacts** of historical and current discrimination in land use, housing, transportation, access to health care and education. • Strategies **acknowledge accountability is desired** but offer no mechanisms to implement. • Disproportionate impacts of **some** strategies to historically marginalized communities and current or historical fenceline and frontline communities are **somewhat mitigated**.

Scale	Guidance
Negative	• Strategies **ignore** the legacy and current impacts of the historical, cultural, and institutional dynamics and structures that have routinely advantaged privileged groups in society and resulted in cumulative disadvantage or harm for marginalized groups, such as: ○ *Environmental Injustice:* Policies and systems that have resulted in disproportionate exposure of "fenceline" communities of color and low-wealth communities to pollution and its effects on health and environment ○ *Discriminatory housing and land use practices:* Policies and systems, such as redlining, urban renewal, and exclusionary zoning that perpetuate patterns of racial segregation, neighborhood disinvestment, housing insecurity, and racial wealth gaps within communities ○ *Climate Exposure and Vulnerability:* Policies and systems that have placed "frontline" communities at disproportionate exposure and risk to climate impacts ○ *Resource Extraction and Environmental Degradation:* Policies and systems that have resulted in destruction of native habitats and ecosystems and left Indigenous lands vulnerable to increasing climate impacts • Strategies **maintain** extractive and exploitative economic and social systems. • Strategies **somewhat intensify links between impacts** of historical and current discrimination in land use, housing, transportation, access to health care and education. • Strategies incorporate **no mechanisms of accountability**. • Disproportionate impacts of **most** strategies to historically marginalized communities and current or historical fenceline and frontline communities are **not mitigated**.
Very Negative	• Strategies **perpetuate** the legacy and current impacts of the historical, cultural, and institutional dynamics and structures that have routinely advantaged privileged groups in society and resulted in cumulative disadvantage or harm for marginalized groups, such as: ○ *Environmental Injustice:* Policies and systems that have resulted in disproportionate exposure of "fenceline" communities of color and low-wealth communities to pollution and its effects on health and environment ○ *Discriminatory housing and land use practices:* Policies and systems, such as redlining, urban renewal, and exclusionary zoning that perpetuate patterns of racial segregation, neighborhood disinvestment, housing insecurity, and racial wealth gaps within communities ○ *Climate Exposure and Vulnerability:* Policies and systems that have placed "frontline" communities at disproportionate exposure and risk to climate impacts ○ *Resource Extraction and Environmental Degradation:* Policies and systems that have resulted in destruction of native habitats and ecosystems and left Indigenous lands vulnerable to increasing climate impacts • Strategies **maintain or advance** extractive and exploitative economic and social systems. • Strategies **significantly intensify links between impacts** of historical and current discrimination in land use, housing, transportation, access to health care and education. • Strategies incorporate **no mechanisms of accountability** and **ignore community desires** for accountability. • Disproportionate impacts of strategies to historically marginalized communities and current or historical fenceline and frontline communities are **not mitigated**.

FO: Maximize engagement with and participation of communities in decision-making and implementation

Evaluation criteria for this objective are given below (Table 10).

*Table 10. Evaluation criteria for FO "*Maximize engagement with and participation of communities in decision-making and implementation*".*

Scale	Guidance
Very Positive	*Decision-making and implementation of strategies and actions include* ***all of the following:*** • **Meaningful engagement:** Strategies and actions engage and empower communities of color and low-income populations in a meaningful, authentic, and culturally appropriate manner o Early and consistent engagement with affected communities o Concerns of community members are taken seriously o Varied meetings and broad community-wide outreach methods • **Inclusive governance and decision-making:** Communities have an ability to participate in and influence decision making in the design and implementation of strategies o Community input on identifying and mitigating any adverse impact o Steering/Advisory committees composed of members of affected communities • **Traditional Ecological Knowledge:** Incorporate Indigenous and other traditional knowledge of local resources into analysis and implementation approaches • **Alignment and partnership:** Strategies align with and support existing priorities of historically marginalized and affected communities, creating an opportunity to leverage resources and build collaborative partnerships • **Relationship building:** Strategies help foster the building of effective, long-term relationships and trust between diverse communities, state and local government, and other institutions • **Economic opportunity:** Strategies support communities of color and low-income populations through job training, apprenticeships, and contracting opportunities
Positive	*Decision-making and implementation of strategies and actions include* ***some of the following:*** • **Meaningful engagement:** Strategies and actions engage and empower communities of color and low-income populations in a meaningful, authentic, and culturally appropriate manner o Early and consistent engagement with affected communities o Concerns of community members are taken seriously o Varied meetings and broad community-wide outreach methods • **Inclusive governance and decision-making:** Communities have an ability to participate in and influence decision making in the design and implementation of strategies o Community input on identifying and mitigating any adverse impact o Steering/Advisory committees composed of members of affected communities • **Traditional Ecological Knowledge:** Incorporate Indigenous and other traditional knowledge of local resources into analysis and implementation approaches • **Alignment and partnership:** Strategies align with and support existing priorities of historically marginalized and affected communities, creating an opportunity to leverage resources and build collaborative partnerships

Scale	Guidance
	• **Relationship building:** Strategies help foster the building of effective, long-term relationships and trust between diverse communities, state and local government, and other institutions • **Economic opportunity:** Strategies support communities of color and low-income populations through job training, apprenticeships, and contracting opportunities
Neutral	*Decision-making and implementation of strategies and actions* ***superficially*** *include* ***a few of the following:*** • **Meaningful engagement:** Strategies and actions engage and empower communities of color and low-income populations in a meaningful, authentic, and culturally appropriate manner o Early and consistent engagement with affected communities o Concerns of community members are taken seriously o Varied meetings and broad community-wide outreach methods • **Inclusive governance and decision-making:** Communities have an ability to participate in and influence decision making in the design and implementation of strategies o Community input on identifying and mitigating any adverse impact o Steering/Advisory committees composed of members of affected communities • **Traditional Ecological Knowledge:** Incorporate Indigenous and other traditional knowledge of local resources into analysis and implementation approaches • **Alignment and partnership:** Strategies align with and support existing priorities of historically marginalized and affected communities, creating an opportunity to leverage resources and build collaborative partnerships • **Relationship building:** Strategies help foster the building of effective, long-term relationships and trust between diverse communities, state and local government, and other institutions • **Economic opportunity:** Strategies support communities of color and low-income populations through job training, apprenticeships, and contracting opportunities
Negative	*Decision-making and implementation of strategies and actions* ***actively ignore the following:*** • **Meaningful engagement:** Strategies and actions engage and empower communities of color and low-income populations in a meaningful, authentic, and culturally appropriate manner o Early and consistent engagement with affected communities o Concerns of community members are taken seriously o Varied meetings and broad community-wide outreach methods • **Inclusive governance and decision-making:** Communities have an ability to participate in and influence decision making in the design and implementation of strategies o Community input on identifying and mitigating any adverse impact o Steering/Advisory committees composed of members of affected communities • **Traditional Ecological Knowledge:** Incorporate Indigenous and other traditional knowledge of local resources into analysis and implementation approaches • **Alignment and partnership:** Strategies align with and support existing priorities of historically marginalized and affected communities, creating an opportunity to leverage resources and build collaborative partnerships

Scale	Guidance
	• **Relationship building:** Strategies help foster the building of effective, long-term relationships and trust between diverse communities, state and local government, and other institutions • **Economic opportunity:** Strategies support communities of color and low-income populations through job training, apprenticeships, and contracting opportunities
Very Negative	***Community voices are suppressed****, and decision-making and implementation of strategies and actions* ***prohibit many of the following:*** • **Meaningful engagement:** Strategies and actions engage and empower communities of color and low-income populations in a meaningful, authentic, and culturally appropriate manner o Early and consistent engagement with affected communities o Concerns of community members are taken seriously o Varied meetings and broad community-wide outreach methods • **Inclusive governance and decision-making:** Communities have an ability to participate in and influence decision making in the design and implementation of strategies o Community input on identifying and mitigating any adverse impact o Steering/Advisory committees composed of members of affected communities • **Traditional Ecological Knowledge:** Incorporate Indigenous and other traditional knowledge of local resources into analysis and implementation approaches • **Alignment and partnership:** Strategies align with and support existing priorities of historically marginalized and affected communities, creating an opportunity to leverage resources and build collaborative partnerships • **Relationship building:** Strategies help foster the building of effective, long-term relationships and trust between diverse communities, state and local government, and other institutions • **Economic opportunity:** Strategies support communities of color and low-income populations through job training, apprenticeships, and contracting opportunities

Additional sources used as reference in developing all criteria guidance in this category:
- Equity in Sustainability: An Equity Scan of Local Government Sustainability Programs
- Climate Action Through Equity: The integration of equity in the Portland/Multnomah County 2015 Climate Action Plan.
- National Equity Atlas. Policy Link
- Equality Indicators. CUNY Institute for State and Local Governance
- Community Guide to Environmental Justice and NEPA Methods.
- Equity Advisory Group presentation to the Louisiana Climate Initiatives Task Force. February 2021.

CATEGORY 3: STRENGTHENING THE ECONOMY AND WORKFORCE

FO: Maximize job creation and support for Louisiana workers

Evaluation criteria for this objective are given below (Table 11).

*Table 11. Evaluation criteria for FO "*Maximize job creation and support for Louisiana workers*".*

Scale	Guidance
Very Positive	*Strategies result in* ***large net increases*** *in one or more of:* • Number of new jobs created • Number of "low-carbon jobs" available to local workers transitioning from other industries or unemployment

Scale	Guidance
	• Average wages across new jobs created • Training, educational, and credentialing programs available for, and generally geographically consistent with, new jobs created
Positive	*Strategies result in* ***small to modest net increases*** *in one or more of:* • Number of new jobs created • Number of "low-carbon jobs" available to local workers transitioning from other industries or unemployment • Average wages across new jobs created • Training, educational, and credentialing programs available for, and generally geographically consistent with, new jobs created
Neutral	*Strategies result in* ***virtually no net change*** *in:* • Number of new jobs created • Number of "low-carbon jobs" available to local workers transitioning from other industries or unemployment • Average wages across new jobs created • Training, educational, and credentialing programs available for, and generally geographically consistent with, new jobs created
Negative	*Strategies result in* ***small to modest net losses*** *in one or more of:* • Number of new jobs created • Number of "low-carbon jobs" available to local workers transitioning from other industries or unemployment • Average wages across new jobs created • Training, educational, and credentialing programs available for, and generally geographically consistent with, new jobs created
Very Negative	*Strategies result in* ***large net losses*** *in one or more of:* • Number of new jobs created • Number of "low-carbon jobs" available to local workers transitioning from other industries or unemployment • Average wages across new jobs created • Training, educational, and credentialing programs available for, and generally geographically consistent with, new jobs created

FO: Maximize economic growth

Evaluation criteria for this objective are given below (Table 12).

*Table 12. Evaluation criteria for FO "*Maximize economic growth*".*

Scale	Guidance
Very Positive	*Strategies result in* ***large net increases*** *in one or more of:* • State Gross Domestic Product (GDP) • Diversification of industry mix *And/or* ***large net decreases*** *in one or more of:* • Reliance on tax incentives for industry growth and stability • Income inequality as measured by the Gini index *And/or a* ***high likelihood of:*** • Improving state and municipal bond ratings and insurability
Positive	*Strategies result in* ***small to modest net increases*** *in one or more of:* • State Gross Domestic Product (GDP)

Scale	Guidance
	• Diversification of industry mix *And/or* ***small to modest net decreases*** *in one or more of:* • Reliance on tax incentives for industry growth and stability • Income inequality as measured by the Gini index *And/or a* ***small to modest likelihood*** *of:* • Stable or improving state and municipal bond ratings and insurability
Neutral	*Strategies result in* ***virtually no net change*** *in:* • State Gross Domestic Product (GDP) • Industry mix • Reliance on tax incentives for industry growth and stability • State and municipal bond ratings and insurability • Income inequality as measured by the Gini index
Negative	*Strategies result in* ***small to modest net decreases*** *in one or more of:* • State Gross Domestic Product (GDP) • Diversification of industry mix *And/or* ***small to modest net increases*** *in one or more of:* • Reliance on tax incentives for industry growth and stability • Income inequality as measured by the Gini index *And/or a* ***small to modest likelihood*** *of:* • Stable or declining state and municipal bond ratings and insurability
Very Negative	*Strategies result in* ***large net decreases*** *in one or more of:* • State Gross Domestic Product (GDP) • Diversification of industry mix *And/or* ***large net increases*** *in one or more of:* • Reliance on tax incentives for industry growth and stability • Income inequality as measured by the Gini index *And/or a* ***high likelihood*** *of:* • Declining state and municipal bond ratings and insurability

CATEGORY 3: MANAGING FOR SHORT- AND LONG-TERM SUCCESS

FO: Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation

Evaluation criteria for this objective are given below (Table 13).

*Table 13. Evaluation criteria for FO "*Maximize confidence of the public and stakeholders in the outcome of emissions-reduction strategies to increase support for their implementation*".*

Scale	Guidance
Very Positive	• **Most members of the public and stakeholders (>80%)** are already familiar with and support the strategies and actions as proposed • **Frequent, varied** (targeted to reach different communities), and meaningful opportunities for stakeholder engagement on the implementation and continued refinement of GHG reduction strategies • **Very high diversity of engagement opportunities** to reach different stakeholders, such as public forums, targeted engagement of industry, etc.

Scale	Guidance
	• **Frequent** production and updating of online and printed updates on net GHG reduction progress, with plain language summaries • **Inclusion of comprehensive plan** for increasing information-sharing by non-state entities (local government, industry, scientific non-profits, academia, etc.) • **Prescribed process** for updating net zero GHG emissions strategies and actions that includes detail on how impacts to people, the economy, and the environment will continue to be evaluated
Positive	• **Many members of the public and stakeholders (60-80%)** are already familiar with and support the strategies and actions as proposed • **Regular, somewhat varied** (targeted to reach different communities), and meaningful opportunities for stakeholder engagement on the implementation and continued refinement of GHG reduction strategies • **Some diversity of engagement opportunities** to reach different stakeholders, such as public forums, targeted engagement of industry, etc. • **Regular production and updating** of online and printed updates on net GHG reduction progress with plain language summaries • **Some targeted strategies** to increase information-sharing by non-state entities to address specific high-priority opportunities (local government, industry, scientific non-profits, academia, etc.) • **Process for updating** net zero GHG emissions strategies and actions is given, with guidance on continuing to consider impacts to people, the economy, and the environment
Neutral	• **Some members of the public and stakeholders (40-60%) are already familiar** with and support the strategies and actions as proposed • Continued engagement of the public and stakeholders is **primarily for informational purposes only** (updating on ongoing implementation vs. providing opportunities for continued active engagement in refinement) • **Occasional** production and updating of online and printed updates on net GHG reduction progress with plain language summaries • **Few clear or targeted strategies** for facilitating information-sharing by non-state entities (local government, industry, scientific non-profits, academia, etc.) • There is **no specific process** prescribed for updating net zero GHG emissions strategies and actions, but guidance is given to consider impacts to people, the economy, and the environment
Negative	• **Few members of the public and stakeholders (20-40%)** are already familiar with and support the strategies and actions as proposed • Continued engagement of the public and stakeholders is **exclusively for informational purposes only** (updating on ongoing implementation, not providing opportunities for continued active engagement in refinement) • **Limited production** of online or printed updates on net GHG reduction progression that is accessible and understandable to the public; information sharing is sporadic/ad-hoc, primarily technical in nature, and/or targeted at a limited audience • **Limited number of strategies or actions for supporting or encouraging information sharing** by non-state entities (local government, industry, scientific non-profits, academia, etc.) • There is **no specific process** prescribed for updating net zero GHG emissions strategies and actions, and **limited reference** is made to future consideration of impacts to people, the economy, and the environment
Very Negative	• **Almost no members of the public and stakeholders (<20%) are already familiar** with and support the strategies and actions as proposed • **No engagement of the public or other stakeholders** in continued implementation or refinement of the net GHG emission reduction plan • **No educational outreach** to the public or stakeholders • **No strategies or actions for supporting or encouraging information sharing** by non-state entities (local government, industry, scientific non-profits, academia, etc.) • There is **no specific process** prescribed for updating net zero GHG emissions strategies and actions, and **no reference** is made to future consideration of impacts to people, the economy, and the environment

FO: Maximize the efficiency and effectiveness of emissions-reduction strategies

Evaluation criteria for this objective are given below (Table 14).

*Table 14. Evaluation criteria for FO "*Maximize the efficiency and effectiveness of emissions-reduction strategies*".*

Scale	Guidance
Very Positive	***Most (>80%)** strategies include:* • Defined legal requirements for monitoring and reporting • Clear lines of responsibility within state government and avoidance of known problems in efficient and effective policy implementation • Precedence within the state of Louisiana or elsewhere supporting their feasibility and/or effectiveness • Clear and executable implementation pathways (regulatory, legislative, etc.) • Defined mechanisms for interagency coordination, where necessary, and awareness and buy-in from all entities on their responsibilities *And are:* • Fully consistent with existing policies and laws • Fully consistent with existing climate adaptation strategies (e.g., the Coastal Master Plan) *In addition, the strategies in this portfolio are **sequenced appropriately** so that short term strategies maximize the effectiveness of long-term strategies*
Positive	***Many (60-80%)** of strategies include:* • Defined legal requirements for monitoring and reporting • Clear lines of responsibility within state government and avoidance of known problems in efficient and effective policy implementation • Precedence within the state of Louisiana or elsewhere supporting their feasibility and/or effectiveness • Clear and executable implementation pathways (regulatory, legislative, etc.) • Defined mechanisms for interagency coordination, where necessary, and awareness and buy-in from all entities on their responsibilities *And are:* • Somewhat consistent with existing policies and laws • Somewhat consistent with existing climate adaptation strategies (e.g., the Coastal Master Plan) *In addition, the set of strategies includes **some consideration of sequencing** so that short term strategies improve the effectiveness of long-term strategies*
Neutral	***Some strategies (40-60%)** include:* • Defined legal requirements for monitoring and reporting • Clear lines of responsibility within state government and avoidance of known problems in efficient and effective policy implementation • Precedence within the state of Louisiana or elsewhere supporting their feasibility and/or effectiveness • Clear and executable implementation pathways (regulatory, legislative, etc.) • Defined mechanisms for interagency coordination, where necessary, and awareness and buy-in from all entities on their responsibilities *And are:* • Consistent with existing policies and laws (some strategies are, some are not) • Consistent with existing climate adaptation strategies (e.g., the Coastal Master Plan) (some strategies are, some are not) *There is **no explicit consideration of sequencing of actions**, but there are near- and long-term actions identified*

Scale	Guidance
Negative	***Few strategies (20-40%)*** *include:* • Defined legal requirements for monitoring and reporting • Clear lines of responsibility within state government and avoidance of known problems in efficient and effective policy implementation • Precedence within the state of Louisiana or elsewhere supporting their feasibility and/or effectiveness • Clear and executable implementation pathways (regulatory, legislative, etc.) • Defined mechanisms for interagency coordination, where necessary, and awareness and buy-in from all entities on their responsibilities *And are:* • Somewhat inconsistent with existing policies and laws • Somewhat inconsistent with existing climate adaptation strategies (e.g., the Coastal Master Plan) *There is* ***no explicit consideration of sequencing of actions*** *and actions are generally* ***focused*** *in either the short- or long term*
Very Negative	***Almost none (0-20%)*** *of the strategies include:* • Defined legal requirements for monitoring and reporting • Clear lines of responsibility within state government and avoidance of known problems in efficient and effective policy implementation • Precedence within the state of Louisiana or elsewhere supporting their feasibility and/or effectiveness • Clear and executable implementation pathways (regulatory, legislative, etc.) • Defined mechanisms for interagency coordination, where necessary, and awareness and buy-in from all entities on their responsibilities *And are:* • Inconsistent with existing policies and laws • Inconsistent with existing climate adaptation strategies (e.g., the Coastal Master Plan) *There is* ***no consideration of short- vs. long-term implementation*** *of actions or strategies*

FO: Maximize timely implementation of emissions-reduction strategies

Evaluation criteria for this objective are given below (Table 15).

*Table 15. Evaluation criteria for FO "*Maximize timely implementation of emissions-reduction strategies*".*

Scale	Guidance
Very Positive	***Most*** *of the net GHG emission reduction strategies* ***(80-100%):*** • Can be conducted predominantly at the state level without requiring independent or coordinated federal or local action • Have low potential for federal preemption • Have a clear timeline and begin to phase in within the first five years • Protect individual rights and have low potential to result in tort lawsuits that could slow or halt their successful implementation • Have limited potential negative impacts to the environment or endangered/threatened species that would require National Environmental Policy Act (NEPA) review • Have existing, available funding sources identified at the state or federal level
Positive	***Many*** *of the net GHG emission reduction strategies* ***(60-80%):*** • Have a clear timeline and begin to phase in within the first five years • Can be conducted predominantly at the state level without requiring independent or coordinated federal or local action • Have low potential for federal preemption

Scale	Guidance
	• Protect individual rights and have low potential to result in tort lawsuits that could slow or halt their successful implementation • Have limited potential negative impacts to the environment or endangered/threatened species that would require National Environmental Policy Act (NEPA) review • Have existing, available funding sources identified at the state or federal level
Neutral	***Some*** *of the net GHG emission reduction strategies* ***(40-60%):*** • Have a clear timeline and begin to phase in within the first five years • Can be conducted predominantly at the state level without requiring independent or coordinated federal or local action • Have low potential for federal preemption • Protect individual rights and have low potential to result in tort lawsuits that could slow or halt their successful implementation • Have limited potential negative impacts to the environment or endangered/threatened species that would require National Environmental Policy Act (NEPA) review • Have existing, available funding sources identified at the state or federal level
Negative	***Few*** *of the net GHG emission reduction strategies* ***(20-40%):*** • Have a clear timeline and begin to phase in within the first five years • Can be conducted predominantly at the state level without requiring independent or coordinated federal or local action • Have low potential for federal preemption • Protect individual rights and have low potential to result in tort lawsuits that could slow or halt their successful implementation • Have limited potential negative impacts to the environment or endangered/threatened species that would require National Environmental Policy Act (NEPA) review • Have existing, available funding sources identified at the state or federal level
Very Negative	***Very few or none*** *of the net GHG emission reduction strategies* ***(0-20%):*** • Have a clear timeline and begin to phase in within the first five years • Can be conducted predominantly at the state level without requiring independent or coordinated federal or local action • Have low potential for federal preemption • Protect individual rights and have low potential to result in tort lawsuits that could slow or halt their successful implementation • Have limited potential negative impacts to the environment or endangered/threatened species that would require National Environmental Policy Act (NEPA) review • Have existing, available funding sources identified at the state or federal level

FO: Maximize the durability of emissions-reduction strategies in an uncertain future

Evaluation criteria for this objective are given below (Table 16).

*Table 16. Evaluation criteria for FO "*Maximize the durability of emissions-reduction strategies in an uncertain future*".*

Scale	Guidance
Very Positive	***Most*** *of the net GHG emission reduction strategies* ***(80-100%):*** • Identify relevant emerging GHG reduction technologies where applicable and, if necessary, enable future utilization • Have limited legal and policy uncertainties related to future implementation • Are robust and durable against foreseeable threats outside of state control (underlying technology is robust against storms, etc.) *In addition, the portfolio includes a* ***clear and defined process*** *for future updates that:* • Outlines a specific timeline for regular revisiting and updating the net GHG emission reduction strategies

Scale	Guidance
	• Provides a defined pathway for gathering critical information and data needs to assess the effectiveness of strategies/actions as they are implemented (i.e., data needs and entities to gather that information are identified) • Links updates to the net GHG reduction plan to achieving (or failing to achieve) defined thresholds of strategy/action effectiveness (i.e., adaptive management) • Includes a complete plan for regular evaluation and incorporation of best available science and data that becomes available • Incorporates specific approaches for revisiting, refining, or replacing strategies and actions based on effectiveness and/or changes in cost, legal requirements, national or state policy, etc.
Positive	***Many*** *of the net GHG emission reduction strategies* ***(60-80%):*** • Identify relevant emerging GHG reduction technologies where applicable and, if necessary, enable future utilization • Have limited legal and policy uncertainties related to future implementation • Are robust and durable against foreseeable threats outside of state control (underlying technology is robust against storms, etc.) *In addition, the portfolio includes a* ***process*** *for future updates that:* • Outlines criteria and methods for revisiting and updating the net GHG emission reduction strategies • Includes prescribed gathering of information and data to assess the effectiveness of strategies/actions as they are implemented • Links updates to the net GHG reduction plan to strategy/action effectiveness (i.e., adaptive management) • Includes mechanisms for evaluation and incorporation of best available science and data as it becomes available • Incorporates mechanisms for revisiting, refining, or replacing strategies and actions based on effectiveness and/or changes in cost, legal requirements, national or state policy, etc.
Neutral	***Some*** *of the net GHG emission reduction strategies* ***(40-60%):*** • Identify relevant emerging GHG reduction technologies where applicable and, if necessary, enable future utilization • Have limited legal and policy uncertainties related to future implementation • Are robust and durable against foreseeable threats outside of state control (underlying technology is robust against storms, etc.) *The portfolio also* ***includes****:* • Methods for revisiting and updating the net GHG emission reduction strategies • Recommendations for information and data gathering to assess the effectiveness of strategies/actions as they are implemented • Recommendations for linking updates to the net GHG reduction plan to strategy/action effectiveness (i.e., adaptive management) • Recommendations for evaluation and incorporation of best available science and data as it becomes available • Recommendations for revisiting, refining, or replacing strategies and actions based on effectiveness and/or changes in cost, legal requirements, national or state policy, etc.
Negative	***Few*** *of the net GHG emission reduction strategies* ***(20-40%):*** • Identify relevant emerging GHG reduction technologies where applicable and, if necessary, enable future utilization • Have limited legal and policy uncertainties related to future implementation • Are robust and durable against foreseeable threats outside of state control (underlying technology is robust against storms, etc.) *The portfolio has* ***limited consideration*** *of:* • Methods for revisiting and updating the net GHG emission reduction strategies based on effectiveness • Data or information that would be needed to evaluate strategy/action effectiveness • Mechanisms for evaluating and incorporating best available science and data as it becomes available
Very Negative	***Few or none*** *of the net GHG emission reduction strategies* ***(0-20%):*** • Identify relevant emerging GHG reduction technologies where applicable and, if necessary, enable future utilization • Have limited legal and policy uncertainties related to future implementation

Scale	Guidance
	• Are robust and durable against foreseeable threats outside of state control (underlying technology is robust against storms, etc.) *The portfolio* ***does not include mechanisms*** *for evaluating strategy effectiveness, collection of data or information that support that evaluation, or considerations for updates based on scientific or technological advancements.*

CATEGORY 4: CONSERVING NATURAL RESOURCES AND PROTECTING THE ENVIRONMENT

FO: Maximize preservation of natural resources and ecosystem services

Evaluation criteria for this objective are given below (Table 17).

*Table 17. Evaluation criteria for FO "*Maximize preservation of natural resources and ecosystem services*".*

Scale	Guidance
Very Positive	*Strategies result in* ***large net increases*** *in one or more of:* • Overall net productivity of commercial and recreational fisheries • Acreage and/or productivity of habitat supporting key food webs • Acreage of wetlands, mangroves, barrier islands, and other coastal ecosystems that mitigate storm impacts • Acreage of natural areas available for birding, hunting, camping, and other outdoor activities
Positive	*Strategies result in* ***small to modest net increases*** *in one or more of:* • Overall net productivity of commercial and recreational fisheries. • Acreage and/or productivity of habitat supporting key food webs. • Acreage of wetlands, mangroves, barrier islands, and other coastal ecosystems that mitigate storm impacts. • Acreage of natural areas available for birding, hunting, camping, and other outdoor activities
Neutral	*Strategies result in* ***virtually no net change*** *in:* • Overall net productivity of commercial and recreational fisheries. • Acreage and/or productivity of habitat supporting key food webs. • Acreage of wetlands, mangroves, barrier islands, and other coastal ecosystems that mitigate storm impacts. • Acreage of natural areas available for birding, hunting, camping, and other outdoor activities
Negative	*Strategies result in* ***small to modest net losses*** *in one or more of:* • Overall net productivity of commercial and recreational fisheries. • Acreage and/or productivity of habitat supporting key food webs. • Acreage of wetlands, mangroves, barrier islands, and other coastal ecosystems that mitigate storm impacts. • Acreage of natural areas available for birding, hunting, camping, and other outdoor activities
Very Negative	*Strategies result in* ***large net losses*** *in one or more of:* • Overall net productivity of commercial and recreational fisheries. • Acreage and/or productivity of habitat supporting key food webs. • Acreage of wetlands, mangroves, barrier islands, and other coastal ecosystems that mitigate storm impacts. • Acreage of natural areas available for birding, hunting, camping, and other outdoor activities

FO: Maximize environmental stewardship and support of healthy ecosystems

Evaluation criteria for this objective are given below (Table 18).

Table 18. Evaluation criteria for FO "Maximize environmental stewardship and support of healthy ecosystems".

Scale	Guidance
Very Positive	*Strategies result in **large net increases** in one or more of:* • Acreage of native Louisiana ecosystems including wetlands, forests, prairie grasslands, and others. • Acreage of critical habitat that supports threatened or endangered species • Habitat connectivity and wildlife corridors • Health and resilience of intact native ecosystems *And/or **large net decreases** in one or more of:* • Presence of invasive plant or animal species • Squeeze or threat from anthropogenic development • Excessive nutrient loading and/or eutrophication
Positive	*Strategies result in **small to modest net increases** in one or more of:* • Acreage of native Louisiana ecosystems including wetlands, forests, prairie grasslands, and others. • Acreage of critical habitat that supports threatened or endangered species • Habitat connectivity and wildlife corridors • Health and resilience of intact native ecosystems *And/or **small to modest net decreases** in one or more of:* • Presence of invasive plant or animal species • Squeeze or threat from anthropogenic development • Excessive nutrient loading and/or eutrophication
Neutral	*Strategies result in **virtually no net change** in:* • Acreage of native Louisiana ecosystems including wetlands, forests, prairie grasslands, and others. • Acreage of critical habitat that supports threatened or endangered species • Habitat connectivity and wildlife corridors • Health and resilience of intact native ecosystems • Presence of invasive plant or animal species • Squeeze or threat from anthropogenic development • Excessive nutrient loading and/or eutrophication
Negative	*Strategies result in **small to modest net decreases** in one or more of:* • Acreage of native Louisiana ecosystems including wetlands, forests, prairie grasslands, and others. • Acreage of critical habitat that supports threatened or endangered species • Habitat connectivity and wildlife corridors • Health and resilience of intact native ecosystems *And/or **small to modest increases** in one or more of:* • Presence of invasive plant or animal species • Squeeze or threat from anthropogenic development • Excessive nutrient loading and/or eutrophication
Very Negative	*Strategies result in **large net decreases** in one or more of:* • Acreage of native Louisiana ecosystems including wetlands, forests, prairie grasslands, and others. • Acreage of critical habitat that supports threatened or endangered species • Habitat connectivity and wildlife corridors • Health and resilience of intact native ecosystems

Scale	Guidance
	And/or ***large net increases*** *in one or more of:* • Presence of invasive plant or animal species • Squeeze or threat from anthropogenic development • Excessive nutrient loading and/or eutrophication

CATEGORY 5: ADAPTING TO A CHANGING CLIMATE

Note: *Potential climate change effects include rising temperatures and precipitation; increases in storm/hurricane frequency and intensity; relative sea level rise; and ocean acidification*

FO: Increase resilience of the built and natural environment to climate change impacts

Evaluation criteria for this objective are given below (Table 19).

*Table 19. Evaluation criteria for FO "*Increase resilience of the built and natural environment to climate change impacts*".*

Scale	Guidance
Very Positive	***Most (>80%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies* ***maintain or improve the overall resilience*** *of the built or natural environment. In addition, strategies are fully consistent and integrated with existing or planned climate adaptation programs as part of a complete and holistic approach to improve the resilience of* ***the built and natural environment,*** *including:* • Climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts on the natural and built environment (coastal land loss, increased urban temperatures/heat islands, impacts to agricultural crops, etc.) are identified and mitigated through design or other implementation measures • Operability of critical built infrastructure (power transmission lines, roads, etc.) is enhanced in spite of climate impacts • Safeguards to ensure natural habitat and species that are vulnerable to climate change have adaptation space (for example, coastal habitats have space to accommodate migration) • Consistency with existing conservation and restoration plans to mitigate climate-related increase loss of vulnerable habitat, such as marshes and barrier islands
Positive	***Many (60-80%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies* ***maintain or improve the overall resilience*** *of the built or natural environment. In addition, strategies are consistent with existing or planned climate adaptation programs as part of improving the resilience of* ***the built and natural environment,*** *including:* • Climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts on the natural and built environment (coastal land loss, increased urban temperatures/heat islands, impacts to agricultural crops, etc.) are identified and mitigated through design or other implementation measures • Operability of critical built infrastructure (power transmission lines, roads, etc.) is enhanced in spite of climate impacts. • Safeguards to ensure natural habitat and species that are vulnerable to climate change have adaptation space (for example, coastal habitats have space to accommodate migration) • Consistency with existing conservation and restoration plans to mitigate climate-related increase loss of vulnerable habitat, such as marshes and barrier islands
Neutral	***Some (40-60%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies* ***maintain or improve the overall resilience*** *of the built or natural environment. In addition, strategies have*

Scale	Guidance
	some consistency with existing or planned climate adaptation programs as part of maintaining the resilience of ***the built and natural environment,*** *including:* • Climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts on the natural and built environment (coastal land loss, increased urban temperatures/heat islands, impacts to agricultural crops, etc.) are identified and mitigated through design or other implementation measures. • Operability of critical built infrastructure (power transmission lines, roads, etc.) is enhanced in spite of climate impacts. • Safeguards to ensure natural habitat and species that are vulnerable to climate change have adaptation space (for example, coastal habitats have space to accommodate migration) • Consistency with existing conservation and restoration plans to mitigate climate-related increase loss of vulnerable habitat, such as marshes and barrier islands
Negative	***Few (20-40%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies* ***maintain or improve the overall resilience*** *of the built or natural environment. Strategies do not consider existing or planned climate adaptation programs as part of maintaining the resilience of* ***the built and natural environment****, with limited:* • Climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts on the natural and built environment (coastal land loss, increased urban temperatures/heat islands, impacts to agricultural crops, etc.) are identified and mitigated through design or other implementation measures. • Operability of critical built infrastructure (power transmission lines, roads, etc.) is enhanced in spite of climate impacts • Safeguards to ensure natural habitat and species that are vulnerable to climate change have adaptation space (for example, coastal habitats have space to accommodate migration) • Consistency with existing conservation and restoration plans to mitigate climate-related increase loss of vulnerable habitat, such as marshes and barrier islands
Very Negative	***Few (< 20%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies* ***maintain or improve the overall resilience*** *of the* ***built and natural environment****. Some strategies* ***increase damages to or operability of infrastructure and facilities*** *during climate-related events, or enhance the destruction of habitats and species.* *In addition, strategies include:* • **Limited or no consideration** of climate change adaptation needs for the built of natural environment. • **Limited or no integration** with existing climate adaptation initiatives, plans, and strategies.

FO: Increase the resilience of communities to climate change

Evaluation criteria for this objective are given below (Table 20).

*Table 20. Evaluation criteria for FO "*Increase the resilience of communities to climate change*".*

Scale	Guidance
Very Positive	***Most (>80%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies maintain or improve the overall resilience of Louisiana communities. In addition, strategies are* ***fully consistent and integrated*** *with existing or planned community adaptation approaches as part of a complete and holistic approach to improve community resilience, including:* • Identification of climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts to communities and livelihoods (agricultural crop vulnerability, increased drought, flooding, etc.) • Mitigation of flood risk and impacts to inland communities (e.g., maintains or expands adequate stormwater infrastructure)

Scale	Guidance
	• Mitigation of flood risk to coastal communities • Ensuring availability, accessibility, and effectiveness (rapid deployment, robust coverage, etc.) of insurance and other disaster recovery mechanisms • Mitigation of potential negative human health impacts associated with climate change (e.g., increased heat deaths/hospitalizations) • Inclusion of adaptation plans to support jobs, industries, and activities vulnerable to climate change (e.g., fishing, agriculture)
Positive	***Many (60-80%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies maintain or improve the overall resilience of Louisiana communities. In addition, strategies are* ***consistent*** *with existing or planned adaptation approaches to improve community resilience, including:* • Identification of climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts to communities and livelihoods (agricultural crop vulnerability, increased drought, flooding, etc.) • Mitigation of flood risk and impacts to inland communities (e.g., maintains or expands adequate stormwater infrastructure) • Mitigation of flood risk to coastal communities • Ensuring availability, accessibility, and effectiveness (rapid deployment, robust coverage, etc.) of insurance and other disaster recovery mechanisms • Mitigation of potential negative human health impacts associated with climate change (e.g., increased heat deaths/hospitalizations) • Inclusion of adaptation plans to support jobs, industries, and activities vulnerable to climate change (e.g., fishing, agriculture)
Neutral	***Some (40-60%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies maintain or improve the overall resilience of Louisiana communities. In addition, strategies are* ***somewhat consistent*** *with existing or planned adaptation approaches to improve community resilience, including:* • Identification of climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts to communities and livelihoods (agricultural crop vulnerability, increased drought, flooding, etc.) • Mitigation of flood risk and impacts to inland communities (e.g., maintains or expands adequate stormwater infrastructure) • Mitigation of flood risk to coastal communities • Ensuring availability, accessibility, and effectiveness (rapid deployment, robust coverage, etc.) of insurance and other disaster recovery mechanisms • Mitigation of potential negative human health impacts associated with climate change (e.g., increased heat deaths/hospitalizations) • Inclusion of adaptation plans to support jobs, industries, and activities vulnerable to climate change (e.g., fishing, agriculture)
Negative	***Few (20-40%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies maintain or improve the overall resilience of Louisiana communities. In addition, strategies are* ***inconsistent*** *with existing or planned adaptation approaches to improve community resilience, including:* • Identification of climate change related challenges (rising temperatures and precipitation, changes in storm/hurricane frequency and intensity, relative sea level rise, ocean acidification, etc.) and their potential impacts to communities and livelihoods (agricultural crop vulnerability, increased drought, flooding, etc.) • Mitigation of flood risk and impacts to inland communities (e.g., maintains or expands adequate stormwater infrastructure) • Mitigation of flood risk to coastal communities • Ensuring availability, accessibility, and effectiveness (rapid deployment, robust coverage, etc.) of insurance and other disaster recovery mechanisms • Mitigation of potential negative human health impacts associated with climate change (e.g., increased heat deaths/hospitalizations)

Scale	Guidance
	• Inclusion of adaptation plans to support jobs, industries, and activities vulnerable to climate change (e.g., fishing, agriculture)
Very Negative	***Few (< 20%)*** *of the net Greenhouse Gas (GHG) emissions reduction strategies maintain or improve the overall resilience of Louisiana communities. In addition, strategies include:* • **Limited or no consideration** of community adaptation needs • **Limited or no integration** with existing community adaptation initiatives, plans, and strategies