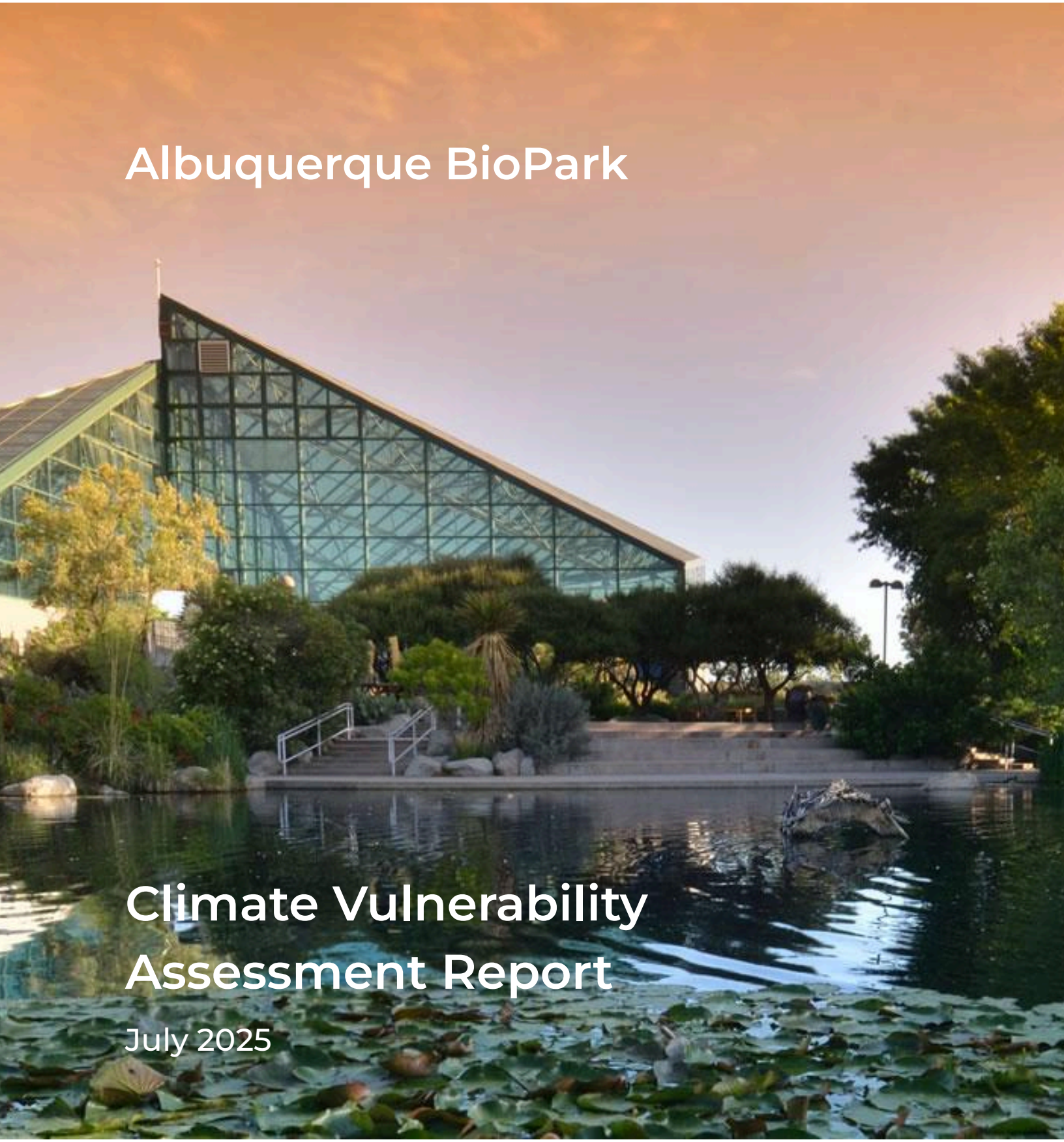
Albuquerque BioPark



Climate Vulnerability Assessment Report

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Albuquerque BioPark: Climate Vulnerability Assessment

Overview

A climate vulnerability assessment was conducted to identify the specific ways that climate change will likely affect the BioPark. The assessment highlighted key vulnerabilities by evaluating how climate change is projected to impact the Albuquerque community and the BioPark's ability to adapt to those changes, given present social and organizational characteristics.

The climate vulnerability assessment included the following steps:

1. Identify projected climate impacts
2. Determine potential and existing consequences of climate impacts on the BioPark
3. Assess the BioPark's adaptive capacity
4. Summarize the BioPark's vulnerability to the projected climate impacts and deliver recommendations to promote climate resilience

Results

The main takeaways from the climate vulnerability assessment are:

- Albuquerque's climate is and will continue to change. The region is **facing warming temperatures, increased drought and wildfires, and intensifying thunderstorms and flash flooding**.
- The BioPark will face several consequences as a result of the projected climate impacts, especially including **health and safety concerns for staff, guests, and animals, disruptions to regular operations and programming, infrastructure damage, and shifts in ecological integrity.**
- The BIoPark has demonstrated a **high degree of adaptive capacity** based on staff surveys.
- There are several opportunities for the BioPark to become more resilient to the changing climate, such as **developing a climate action plan, determining a pathway to decarbonization, and implementing comprehensive emergency protocols.**

Projected Climate Impacts

The city of Albuquerque is expected to experience warming temperatures, increased drought and wildfires, and intensifying thunderstorms and flashflooding as a result of climate change. Due to urban heat island concerns, urban/wildlands interfaces, and proximity to the Rio Grande River, Albuquerque residents face heightened vulnerability to heat, wildfire, and flooding hazards. Approximately 55% of the city's buildings are significantly threatened by wildfire, while around 35% face high flood risk[1]. Of paramount concern, the city is projected to experience very high heat and drought risks.

Warming Temperatures

Temperatures in Albuquerque are rising. By midcentury, the average annual temperatures are expected to be 5.8 degrees Fahrenheit warmer than they were in the 1990s. Across the state, summer temperatures are projected to increase more than winter temperatures, with minimum summer temperatures also increasing by nearly 6 degrees Fahrenheit by midcentury - meaning the coolest summer temperatures experienced will be 6 degrees warmer than current summer lows.

Extreme heat events are also on the rise. In the 1990s, 33.4 days a year had a heat index above 90 degrees fahrenheit; by midcentury it is expected to be over 90 days a year. Extreme temperatures can have negative impacts on human health. When temperatures are greater than 90 degrees fahrenheit, sunstroke, heat cramps, and heat exhaustion are possible with prolonged exposure and/or physical activity[2].

Projected temperature increases in the southwest region are also expected to raise the likelihood of natural events such as wildfires, drought, and summer precipitation. As these climate impacts compound, like the combination of drought and warmer temperatures, mountain snowpack that feeds water supply reservoirs is expected to continue to decrease[3]. Climate check lists heat as an extreme risk to The BioPark's properties.

Table 1: Breakdown of the BioPark's warmer temperature projections.

Warmer temperatures			
Projected climate impact	**Historic (1971-2000)**	**Mid-Century (2040-2069)**	**End-of-Century (2070-2099)**
Average annual temperature (°F)	56.7	62.5	66.1

[1] "Albuquerque, New Mexico Climate Change Risks and Hazards: Heat, Fire." *Climate Check*, https://climatecheck.com/newmexico/albuquerque. Accessed 11 March 2025.
[2] "Albuquerque/Bernalillo County 2022 Hazard Mitigation Plan." January 2022. Accessed 11 March 2025.
[3] Easterling, D. R., et al. "New Mexico State Climate Summary 2022." *NOAA Technical Report NESDIS 150-NM*, https://statesummaries.ncics.org/chapter/nm/. Accessed 11 March 2025.

Minimum Winter Temperatures (°F)	23.2	28.3	31.2
Minimum Summer Temperatures (°F)	60.5	66.3	70.2
Extreme Heat Days (heat index >90°F)	33.4	90.4	119.8

Increased drought and wildfires

Climate impacts can compound to make already challenging conditions worse. Increased drought and warming temperatures will lead to more frequent and intense wildfires. According to the Albuquerque/Bernalillo County Hazard Mitigation Plan, Bernalillo County has a 36% chance of experiencing severe drought conditions in any given week. From 2000-2020, New Mexico experienced 811 weeks in drought. In that same time period, New Mexico spent 35.7% of the time in severe drought conditions or worse. Drought can cause decreased soil moisture, dust storms, decreased irrigation for crops and livestock, large rivers running dry and more.

Climate check lists The BioPark's properties at high risk of wildfires. The combination of high temperatures, low moisture content in the air, accumulation of vegetation, and high winds create fire conditions. Between 1970 and 2016, Bernalillo County experienced 653 wildfire events averaging 42.7 acres per event. Five fires have resulted in a Federal Disaster Declaration since 2000[4].

Thunderstorms and Flooding

Although New Mexico typically experiences dry conditions, climate change is causing heavier downpours during the occasional rainfall, which raises the risk of flash floods. Albuquerque is already dealing with increased flooding due to climate change. In July of 2024, flooding led to rescues of a 100 people and left parts of the city covered in mud and debris[5]. During that same time, a severe thunderstorm brought flashflooding to the city and downed power lines, leaving up to 20,000 residents without electricity. Flashfloods can also lead to damaged infrastructure like sewer line breaks and can be costly to repair. The BioPark's properties are protected by levees which may reduce the risk of flooding. However, the levee system is aging and it is possible, though unlikely, that it could fail[6].

Potential Consequences

Research was done to identify potential consequences to the BioPark of the three primary climate impacts: warming temperatures, increased drought and wildfires, and thunderstorms

[4] "Albuquerque/Bernalillo County 2022 Hazard Mitigation Plan." January 2022. Accessed 11 March 2025.
[5] "Much of New Mexico is under flood watch after 100 rescued from waters over weekend." *AP News*, 1 July 2024, https://apnews.com/article/new-mexico-flooding-7dc3d692b7fcdc69e3086612961b9a79. Accessed 7 July 2025.
[6] "Albuquerque/Bernalillo County 2022 Hazard Mitigation Plan." January 2022. Accessed 11 March 2025.

and flooding. Each of the consequences identified falls under one or more the following categories:

- Infrastructure damage and vulnerability
- Negative health and safety impacts on staff and guests
- Operational interruptions and program disruptions
- Shifts in ecological integrity

A consequence level ranging from negligible to catastrophic was assigned to each of the climate impacts based on the extent to which the consequences named are expected to disrupt BioPark functions.

- **Catastrophic.** The BioPark will cease to exist or have functions permanently altered.
- **Major.** Functions of the BioPark may be dramatically altered, such that value is undermined.
- **Moderate.** Functions of the BioPark may be diminished, such that operations and guest experience is degraded, but still present.
- **Minor.** The BioPark will continue to function, but specific activities may be impaired.
- **Negligible.** The BioPark will not be visibly or functionally affected.

Warming Temperatures

Warming temperatures are expected to have a significant impact on people and operations. Health and safety of staff, guests, and animals is the biggest concern during high temperatures. Rising temperatures can lead to heat stroke or heat exhaustion for humans and animals. Guests may decide not to attend parks and may choose to be indoors instead to stay cool. Animals may need to stay indoors and alter enrichments to also stay cool. Staff working outside will be impacted and may need to shift working hours to early in the morning or late in the evening to avoid the hottest parts of the day.

Rising temperatures also impacts infrastructure and power supplies. High heat puts a strain on energy systems as more air conditioners are running at a higher rate and for longer[7]. The demand can also impact pricing and cooling costs may rise.

Assessed Consequence Level: Major

Drought and wildfires

Drought can have an impact on human health and safety. Low soil moisture can lead to dust and decreased air quality. Additionally, low water flow can lead to poor water quality. Droughts can put a strain on the local water supply and therefore can impact the BioPark's operations if there is a water shortage. This can impact landscaping along with potential disruptions of potable water for human and guest use.

[7] "Albuquerque/Bernalillo County 2022 Hazard Mitigation Plan." January 2022. Accessed 11 March 2025.

Wildfire risk increases with drought conditions. Wildfires are a severe threat to operations, human, guest, and animal health and safety, infrastructure and ecological integrity. Human and animal exposure to wildfire smoke can cause serious health problems, especially those with preexisting conditions. Infrastructure is extremely vulnerable to wildfires, especially if the material is flammable. Wildfires can cause pauses in operations, prohibit staff and guests from getting to the BioPark's facilities, and can destroy facilities and ecosystems.

Assessed Consequence Level: Catastrophic

Thunderstorms and Flooding

Thunderstorms and flooding will likely cause damage to infrastructure and operations. It may prohibit staff and guests from accessing BioPark facilities. Additionally, flooding can cause damage to buildings and infrastructure. Thunderstorms in the past have downed power lines causing power outages as well. Albuquerque has a levee system that helps alleviate flooding. However, the levee system is old and while it's unlikely, can fail.

Assessed Consequence Level: Major

Adaptive Capacity

Adaptive capacity is defined by the Climate Impacts Research Consortium (CIRC) as the "ability of a system to adjust to changes, manage damages, take advantage of opportunities, or cope with consequences." The BioPark invited staff to participate in a series of virtual sessions. The virtual sessions were designed to review the projected climate impacts for Albuquerque, clarify the use of adaptive capacity for assessing organizational resilience, and provide dedicated time for participants to provide input on the BioPark's adaptive capacity through an online survey. The survey was modified from CIRC's adaptive capacity assessment tool, to obtain a rating of its adaptive capacity. The survey assessed staff perception of the BioPark's social potential, organization capacity, and management potential. Staff were asked to respond to a variety of questions associated with each dimension, and provide a rating on the following 5-point scale:

- **Nonexistent.** Not functional or does not exist.
- **Poor.** Not adequate, but provides modest function.
- **Fair.** Could easily be improved.
- **Good.** Better than adequate, but could use improvement
- **Superior.** This is the ideal condition.

Ratings were then assigned a value of Low (1 - 2.3), Moderate (2.4 - 3.6), or High (3.7 - 5). **The BioPark's adaptive capacity overall is rated as High (3.75 overall score).**

Table 3: The BioPark's adaptive capacity assessment results.

Dimension	Description	Rating
Social Potential	Relationships between ABQ BioPark and the community that allow employees to make collective decisions about the future.	3.88 **High**
Organizational Capacity	Individual ABQ BioPark employee capacity combined with others in the organization and to make organizational choices in the face of change.	3.63 **Moderate**
Management Potential	Rules, regulations, and management styles that allow ABQ BioPark and its employees to adapt to changing conditions.	3.74 **High**

The BioPark has navigated disruptions before like the COVID-19 pandemic and Bird Flu. With these in mind staff wrote about the BioPark's strong relationship with city departments to help during an emergency, along with staff's ability to come together during a crisis. Staff also identified the BioPark's ability to respond effectively to emergencies and have scientific support through the AZA community for technical guidance. AZA and USDA-mandated protocols are in place, giving the BioPark strong emergency protocols.

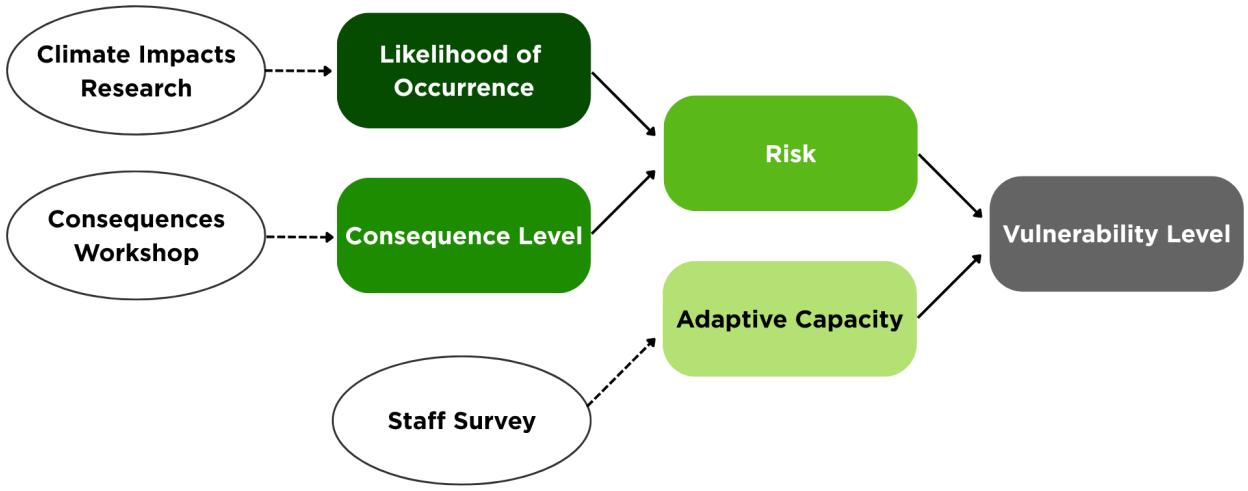
Opportunities proposed by the staff to increase adaptive capacity at the BioPark include:

- **Proactive planning:** Shift from reactive to proactive emergency preparedness.
- **Staff retention**: Address turnover issues and create more permanent positions.
- **Communication**: Improve both internal communication between departments and external community outreach.
- **Training consistency**: Develop more structured, mandatory training programs.

Vulnerability Level

The vulnerability level is assessed for each climate impact as a function of the likelihood that the impact will occur, the expected consequence level if and when the impact occurs, and the adaptive capacity of the organization (Figure 1). The vulnerability level for each climate consequence will be ranked on a scale from low, moderate, or high.

Figure 1. The figure below outlines the key inputs used in the climate vulnerability assessment (rectangles) and the processes used to identify and assign values to the inputs (ovals).



Albuquerque BioPark exhibits a moderate vulnerability to two if the identified climate impacts: warmer temperatures and drought and wildfires and a low vulnerability to thunderstorms and flooding. This moderate and low level of vulnerability can largely be attributed to the organization's strong adaptive nature. Its adaptability helps reduce vulnerability to climate impacts by enabling prompt and effective responses to both emerging threats and potential opportunities.

Table 4: BioPark's Climate Vulnerability Assessment results.

Climate Impacts	Likelihood	Consequence Level	Risk	Adaptive Capacity	Vulnerability Level
Warmer Temperatures	Very Likely	Major	Extreme	High	Moderate
Drought and Wildfires	Very Likely	Catastrophic	Extreme	High	Moderate
Thunderstorms and flooding	About as likely as not	Moderate	Moderate	High	Low

Adaptation Strategies

There are numerous opportunities for The BioPark to develop adaptive capacity in response to the identified climate consequences. To proactively build resilience against climate consequences, The BioPark has several opportunities:

- **Develop comprehensive emergency protocols** for extreme weather events, including heat waves, flooding, thunderstorms and wildfires, with clear staff training procedures for each scenario.
- **Upgrade infrastructure systems** to withstand increased temperature, including improved drainage solutions, HVAC capacity, and structural reinforcements for roofs and animal enclosures.
- **Implement flexible programming options** that can quickly adapt to changing weather conditions, with indoor alternatives for outdoor activities and clear temperature thresholds for cancellations.
- **Create a dedicated maintenance response team** focused on trail repairs, fallen tree removal, flood mitigation, and erosion control across the property.
- **Address heat and fire risks** through the development and implementation of Heat and Wildfire Mitigation Plans.
- **Install renewable energy systems** to offset rising cooling costs and provide backup power during outages caused by severe weather events.
- **Establish water management strategies** to address both drought and flooding conditions, including pond level maintenance and runoff controls to protect river access points.
- **Update educational exhibits and programs** to reflect changing ecosystems and incorporate climate resilience education for visitors.
- **Build financial contingency reserves** specifically allocated for climate-related repairs, program cancellations, and infrastructure improvements.
- **Create a climate action plan** that outlines The Biopark's steps towards its determined sustainability goals.
- **Determine a pathway to decarbonization** (90% reduction in Scope One and Scope Two emissions) that identifies feasible emissions reduction methods by an identified goal date.
- **Identify ongoing opportunities to educate staff and guests** on climate change and climate resilience strategies.