planitulsa

environment and natural resources



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chapter 9 environment and natural resources

INTRODUCTION

Tulsa is the primary city within Green Country, which gets its name from the abundance of trees and water bodies that occupy the northeastern quadrant of Oklahoma. Being integrated into such a fertile and beautiful landscape, as well as being positioned beside the powerful Arkansas River, Tulsa has become a leader in the appreciation and the conservation of the natural environment. However, the conservation of Tulsa's natural resources has not always been the priority. For decades, Tulsa's livelihood depended nearly completely on the extraction and processing of oil and natural gas, and before that the land was largely used for ranching and farming. As the city developed over time, forests that had been removed began to grow back, and with it, valuable habitat for endemic species of Green Country. Improvement in the water quality of the Arkansas River and other streams, while still a concern today, has been dramatic as new sanitary forms of waste management have become standard practice.

Life Along a Prairie River

The Arkansas River and other water bodies in Tulsa create opportunities for residents to enjoy nature, but flooding remains a significant concern. Major flooding events in the 1980s, and most recently in 2019, have led to enormous investments in infrastructure and emergency preparedness. These investments have <u>mitigated</u> much of the localized flooding that occurred in the major floods of the 1980s, but there is little that can be done in the way



American Bald Eagles congregate along the tree-lined shores and bluffs of the Arkansas River.

of infrastructure as it relates to the flooding of the Arkansas River. Upstream from Tulsa, the Keystone Dam and Reservoir manages the flow of the Arkansas River to generate electrical power. In 2019, major rain events in the drainage basin of Keystone Lake led to significant dam releases, well above normal flow rates, and well beyond the lengths of time that existing levees are built to handle. The levee system survived this 500-year rain event, but another event of this magnitude could spell disaster for those land uses and residents of areas protected by the levee system. In addition to the flooding of the Arkansas River, these rain events caused tributaries like Bird Creek to overflow. This led to the inundation

of abandoned landfills in Oxley Nature Center, scattering refuse across the nature preserve and polluting important habitat. Moreover, this imagery of waste from the 1960s littering our nature preserve in 2019 illustrates that the work to protect our natural places is not done, and the effect of decisions we make today in Tulsa will be felt by future generations.

Natural Habitats

The Arkansas River and stream corridors in Tulsa are not just pathways for water to flow through the community, but they provide some of the strongest natural habitats for the wide array of local wildlife. Tulsa has a wealth of bird species, including the Bald Eagle, an emblem of the success of the <u>Endangered Species Act</u>, which can serve as a salient example of what can be done as a community if efforts are focused towards conservation.

Habitat is not strictly limited to the large undeveloped areas of the city; in fact, many areas of town have significant tree canopy that provides much needed habitat for birds, mammals, insects, and more. A well-developed urban tree canopy is of high importance to Tulsans, and, particularly in Oklahoma, is a major selling point for attracting new residents. Another benefit of a lush tree canopy is a reduced urban heat-island (UHI) effect, which helps mitigate against heat-related health risks. The impacts of extreme rain events are mitigated by trees, shrubs, grasses, and other flora that stabilize soils and uptake water, reducing erosion. Trees and other plants also improve local air quality, and many studies have shown that access to nature leads to improved mental health outcomes for residents. As the effects of global climate change continue to expand, the importance of a tree canopy likewise increases.

Concerns for natural environments arise regularly in discussions of new development what will the impact be on plants and wildlife? These are important considerations in the development review process, and there are opportunities for conservation through recommendations in the comprehensive plan.

Pollution in All of Its Forms

Issues of air quality and other types of pollution have been identified as problems at all levels of government. Whether considering the impact of neighborhoods adjacent to busy highways or the <u>remediation</u> of properties polluted in past



The Keystone Dam is upstream of Tulsa on the Arkansas River and presents many challenges with regard to flooding events in the Tulsa area and further downstream.

decades, where and how things are built has significant implications for the quality of life and health of Tulsans. Tulsa has historically been at the forefront of <u>energy resource management</u>. A city does not get labeled the "Oil Capital of the World" by sheer luck; early in its history, Tulsa positioned itself to be a processor of oil and gas, rather than simply focus on the extraction of the raw materials. This long-term approach to the energy industry ensured that, even after the wells dried up in the region, Tulsa's relevance to the success of the industry persevered. However, the polluting effects of the oil boom are still felt today with soil contamination in areas where active wells no longer exist.

Remediation of <u>brownfield sites</u> is a priority for the City of Tulsa, both to reduce the risk of negative health outcomes in the community and to improve properties to facilitate economic development in needed locations. Similarly, efforts by community groups like Up With Trees have led to buffering of major transportation corridors with vegetation, reducing the risks associated with ground-level ozone and particulate matter. These approaches are among the many remediation and mitigation solutions available to address pollution concerns in Tulsa.

Sustainability Planning

Presently, the City of Tulsa has no dedicated staff to work on issues of <u>sustainability</u>, whether internal policies of the City of Tulsa or broader community-wide issues. In the past, the City has had an Office of Sustainability, which led to the development of the 2011 Sustainability Plan; however, that office transitioned into a different function, focused primarily on social resilience and equity efforts. Both of these functions are important for achieving a more sustainable and equitable local government and community.

In order to have a consistent and focused approach to addressing sustainability concerns in Tulsa, dedicated staff and resources need to be re-established. An update to the 2011 Sustainability Plan is also needed to include issues that are missing in the current version of the plan, and to craft the plan in a way that is measurable, clear, and implementable.

Tulsa has a wealth of community members with a desire to address sustainability concerns who can provide excellent guidance on policy directions the City can take to be a successful steward of environmental resources, and to be prepared for issues related to climate change resiliency. Local organizations, such as Sustainable Tulsa, have laid the groundwork for the City of Tulsa to seamlessly join in with the community in addressing these issues to leave a better Tulsa for future generations.

KEY IDEAS

Subject Matter Experts

Tulsa Planning Office staff met with numerous subject matter experts in the fields of water and flooding, wildlife and habitats, energy resources, pollution, and sustainability. This included federal and state agencies, regional and local government staff, non-profits, private entities, and community organizations. Key ideas that were raised in these discussions to be addressed by plan recommendations include:

- Tulsa residents should be safe from and prepared for flooding events along the Arkansas River and other localized flooding.
- Existing wildlife and habitat should be protected and enhanced where possible.
- New forms of energy, such as solar and wind, as well as new transportation options like electric vehicles and buses, should be encouraged.
- Waste and pollution should be managed in ways that do not negatively impact residents or the environment.
- The City should update the 2011 Sustainability plan and set goals and metrics to monitor progress.

Community Members

Through numerous public engagement efforts, residents of Tulsa provided a great deal of input, much of which was in alignment with what was heard from subject matter experts. Key ideas heard through community engagement include:

- <u>Pollinator</u> populations (bees, butterflies, etc.) should be increased and maintained in both natural and urban spaces of Tulsa.
- The Arkansas River should be prioritized as a strong natural asset for the city.
- Tulsa should make efforts to use 100% renewable energy.
- Trees should be preserved and replaced if they are uprooted for development.
- Electric vehicles and <u>EV infrastructure</u> should be promoted more in Tulsa.
- <u>Environmental stewardship</u> education and training should be promoted and accessible for all Tulsans.
- Public transit should be promoted as a sustainable transportation option.

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Tulsa is prepared for flooding events from the Arkansas River, other streams, and heavy rain events.

The Arkansas River and other streams in Tulsa have flooded many times throughout the city's history. Major infrastructure improvements were made after devastating floods in the 1980s, but the flooding in 2019 shows that there is still reason to be vigilant in the approach to flood mitigation in Tulsa. Effective coordination with the many agencies that contribute to emergency response will be critical in the mitigation of flooding effects and the prevention of loss of life.

Strategy 1.1

Maintain strong relationships with agencies associated with emergency response actions related to the Arkansas River flooding or other flooding events.

Strategy 1.2

Ensure that Tulsa's Emergency Operations Center (EOC) and associated emergency response infrastructure is state-of-the-art and built to accommodate the needs of the Emergency Response team.

Strategy 1.3

Maintain the integrity of the shoreline of the Arkansas River to protect residents, businesses, and other community assets that are at risk of flooding and flood-related damages.

Strategy 1.4

Ensure a high-quality, informative, and accessible communications strategy to provide residents with the information they need to prepare for and respond to potential flood events.

Strategy 1.5

Work with the <u>Army Corps of Engineers</u>, the state's <u>federal delegation</u>, and other stakeholders to ensure the long-term integrity of the levee system.

Tulsa's stormwater systems continue to be a model for cities around the globe because of innovative approaches to increase effectiveness and efficiency.

How the City of Tulsa addresses stormwater flow has major implications for the city's ability to remain resilient during flooding events and heavy rains. Presently, the City of Tulsa is one of only two cities in the United States with a <u>Class 1 rating by the National Flood Insurance Program</u>, which grants residents some of the best rates for flood insurance in the country. New techniques and technologies will only help the City of Tulsa to enhance its position as a global leader in stormwater management.

Strategy 2.1

Identify and incorporate best management practices into Tulsa's system to continue to be a global leader in stormwater management.

Strategy 2.2

Continue to employ <u>GIS</u> to track assets and to help inform decision making..

Strategy 2.3

Champion policy as part of the OneVoice regional legislative agenda to advocate for better support for the state's stormwater program.

Strategy 2.4

Review and rewrite the stormwater ordinance to reflect current understanding, ensure maintenance and ownership of the system is adequately addressed, and provide clear policy for infill development.

Strategy 2.5

Incorporate elements of the <u>Low Impact Development (LID)</u> Manual into capital improvement projects.



Strategy 2.6

Continue to coordinate with Engineering Services on any project affecting the City's <u>stormwater infrastructure</u>.

Strategy 2.7

Maintain strong working relationships between the City of Tulsa Public Works department and other departments, authorities, and private vendors.



Tulsa's water resources are protected from environmental disruption and are managed in ways that promote conservation.

Tulsa has numerous water bodies, including the Arkansas River, streams, lakes, and reservoirs. Ensuring that these water bodies are uncontaminated and unobstructed will lead to reduced risks associated with pollution and flooding, as well as conserve wildlife habitat in the city.

Strategy 3.1

Promote educational opportunities to residents regarding best practices for managing water resources on their property.

Strategy 3.2

Ensure that new development includes design considerations to reduce the amount and rate of runoff and to reduce the amount of contaminants.

Strategy 3.3

Be proactive with approaches and technologies to identify sources of water pollution before streams become polluted.

Strategy 3.4

Ensure that the potential negative effects of construction and development in <u>floodplains</u> is mitigated through engineering guidance.

Strategy 3.5

Incorporate water quality features into all future flood management projects.

Strategy 3.6

Promote the importance of regional water bodies protection and public use, such as raft races, fishing, boating, and kayaking.

Tulsa's existing wildlife habitats are conserved and improved through enhanced stewardship and consideration during the development review process.

Many different species of wildlife call Tulsa their home. Whether species that are endemic to the region, or those that are passing through during a migration, Tulsa's natural environment provides viable habitats. Existing habitats should be conserved and enhanced where possible, including through consideration in the development review process.

Strategy 4.1

Seek ways to maintain and increase Tulsa's urban forest through programs and development guidance.

Strategy 4.2

Work with local partners to promote practices and standards that protect Tulsa's wildlife species and their corresponding habitats.

Strategy 4.3

Enhance stewardship of wildlife species and their habitats through targeted initiatives and educational opportunities.

Strategy 4.4

Support ongoing <u>pollinator</u> conservation efforts and develop pollinator-promoting initiatives and incentives.

Strategy 4.5

Encourage the planting of <u>native plants</u> throughout the city, and provide educational information to residents about harmful gardening and lawn management practices.





Tulsa works collaboratively to expand the regional portfolio of energy production options and to manage the region's carbon footprint.

In order to remain a leader in the energy industry into the next century, the Tulsa region will need to invest in <u>renewable energy</u> resources, much like it historically has with <u>fossil fuels</u>. Local energy production from renewable resources will lead to added economic and environmental benefits for Tulsa. As new efficient technologies are developed, the City should be well positioned to incorporate them into regulatory frameworks and public education campaigns.

Strategy 5.1

Seek ways to expand the utilization of renewable energy resources in the city, and work with state and private sector partners to reduce barriers and promote their deployment.

Strategy 5.2

Ensure that Tulsa is prepared for innovations in transportation by providing education and incentives to residents regarding electric vehicles (EV) and <u>alternative fuels.</u>

Strategy 5.3

Measure the City's existing <u>carbon footprint</u> and establish a <u>greenhouse</u> <u>gas emissions</u> reduction target and strategy.

Strategy 5.4

Promote green buildings and energy efficiency.

Strategy 5.5

Adopt regulations, standards, and policies that lead to greater energy efficiency in the construction and operational lifespan of new buildings.

Residents are protected from pollution and hazardous materials, and areas of existing environmental contamination and pollution are rehabilitated so that they are clean, usable, and productive.

Tulsa should reduce the risk of residents being exposed to pollution. Whether air, water, soil, or other forms of pollution, funding and mitigation activities should be pursued to achieve public health and economic development goals. These efforts should seek to achieve <u>environmental</u> justice for areas that suffer disproportionately from pollution issues.

Strategy 6.1

Pursue external funding opportunities for brownfield site remediation.

Strategy 6.2

Promote the <u>adaptive use</u> of existing buildings, <u>infill development</u>, and brownfield development as effective sustainability practices that take development pressure off of undeveloped areas.

Strategy 6.3

Evaluate air quality, and develop collaborative approaches to reduce contributing factors.

Strategy 6.4

Reduce the risks associated with the transport of <u>hazardous materials</u> to and through Tulsa.

Strategy 6.5

Continue ongoing mitigation efforts to reduce harmful pollutants and emissions.

Strategy 6.6

Develop responsible approaches to mineral extraction that respect the region's natural resources.

Strategy 6.7

Develop approaches to reduce noise pollution and light pollution.





Tulsa develops inclusive sustainability planning efforts and creates dedicated offices and positions to facilitate implementation of sustainable practices.

Planning and collaboration are needed to establish and achieve goals and outcomes related to sustainability in Tulsa. Efforts should be taken to update past plans and to reestablish an Office of Sustainability to implement updated plans with a focus on equitable and inclusive processes and outcomes. Metrics from national organizations can help to benchmark Tulsa's progress in years to come.

Strategy 7.1

Update the 2011 City of Tulsa Sustainability Plan.

Strategy 7.2

Establish an Office of Sustainability either internally at the City of Tulsa or regionally at INCOG.

Strategy 7.3

Work with tribal governments, other parallel government agencies, community groups, and Tulsa residents to evaluate progress toward the goals established in the City's Sustainability Plan.

Strategy 7.4

Use metrics and standards developed by national organizations to evaluate Tulsa's progress against peer cities across the country and the world. [THIS PAGE INTENTIONALLY LEFT BLANK]

ACTION TABLE

This table includes the goals and strategies outlined in the previous pages with specific actions that will help to achieve the intent of the goals and strategies. Each specific action includes what type of action it is and what parties should be involved in order to implement the action. All of these goals, strategies, and actions are derived from engagement with the Tulsa community and subject matter experts, past planning efforts conducted by the City of Tulsa and partner agencies, best practices from cities across the United States, and research and data analysis conducted by Tulsa Planning Office staff. Any action taken to implement a specific strategy or action included in this table or a policy recommended elsewhere in this chapter will be in accord with Oklahoma law.



Action ID	Action Required	Action Type	Involved Parties
EN 1	Tulsa is prepared for flooding events from the Arkansas River, other streams, a	nd heavy rain events.	
EN 1.1	Maintain strong relationships with agencies associated with emergency response actions related to the Arkansas River flooding or other flooding events.	Strategy	Multiple
EN 1.1.1	Continue to work closely with municipalities and counties in the region, the State, the Army Corps of Engineers, and the federal delegation to reduce risk associated with releases from the Keystone Dam.	Partnership	City of Tulsa
EN 1.1.2	Work with the Oklahoma Water Resources Board to identify dams that present a hazard for new and existing development.	Partnership	Public Works
EN 1.2	Ensure that Tulsa's Emergency Operations Center (EOC) and associated emergency response infrastructure is state-of-the-art and built to accommodate the needs of the Emergency Response team.	Strategy	Multiple
EN 1.2.1	Identify funding needs and sources to adequately budget for a modern EOC.	Capital	TAEMA Tulsa Fire Dept. Tulsa Police Dept.

Action ID	Action Required	Action Type	Involved Parties
EN 1.2.2	Replace the few remaining outdated sirens with modern fixtures that can interface with other technological components of the City of Tulsa emergency management response.	Capital	TAEMA
EN 1.3	Maintain the integrity of the shoreline of the Arkansas River to protect residents, businesses, and other community assets that are at risk of flooding and flood-related damages.	Strategy	Public Works
EN 1.3.1	Reduce the risks associated with erosion by strategically reinforcing the shoreline of the Arkansas River using approaches that are cost-effective, dependable, and have minimal environmental impacts.	Capital	Public Works
EN 1.3.2	Identify aged stormwater infrastructure that can be replaced or enhanced to more effectively convey water to the river.	Analysis	Public Works
EN 1.3.3	Continue to invest in <u>sluice gates</u> at stormwater outflows, particularly near high-density residential areas, to prevent backflow into the stormwater systems should the Arkansas River's water levels rise.	Capital	Public Works
EN 1.4	Ensure a high-quality, informative, and accessible communications strategy to provide residents with the information they need to prepare for and respond to potential flood events.	Strategy	Multiple
EN 1.4.1	Ensure all emergency notifications and other related communications are <u>multilingual</u> .	Engagement	TAEMA Communications
EN 1.4.2	Ensure all emergency notifications and other related communications are accessible for those with physical, mental, cognitive, and learning disabilities.	Engagement	TAEMA Communications
EN 1.4.3	Provide a publicly-accessible and up-to-date mapping platform to increase awareness of areas of potential danger.	Engagement	TAEMA Communications OPSI
EN 1.4.4	Limit the information in public service announcements to only those scenarios that are most likely, so as to not overwhelm residents with too much information.	Policy	City of Tulsa

Action ID	Action Required	Action Type	Involved Parties
EN 1.5	Work with the Army Corps of Engineers, the state's federal delegation, and other stakeholders to ensure the long-term integrity of the levee system.	Strategy	City of Tulsa
EN 2	Tulsa's stormwater systems continue to be a model for cities around the globe effectiveness and efficiency.	because of innovative	approaches to increase
EN 2.1	Identify and incorporate best practices into Tulsa's system to continue to be a global leader in stormwater management.	Strategy	Multiple
EN 2.1.1	Work with other departments, agencies, municipalities, counties, tribal governments, and the State to identify best management practices nationwide that can be incorporated into the City of Tulsa stormwater management approach.	Analysis	Public Works
EN 2.1.2	Holistically evaluate identified best management practices in terms of upfront cost and long-term cost impact on the City's stormwater system.	Analysis	Public Works
EN 2.1.3	Proactively seek funding to implement identified best management practices and other projects too large to be funded through the sale of <u>stormwater</u> <u>bonds</u> .	Capital	Public Works Finance
EN 2.2	Continue to employ GIS to track assets and to help inform decision making.	Strategy	Multiple
EN 2.2.1	Establish a data sharing agreement and procedures for collaboration with governmental and other entities.	Policy	Public Works OPSI
EN 2.2.2	Continuously update the <u>stormwater atlas</u> to ensure data is up-to-date to inform <u>capital improvement projects</u> and emergency management response and communications.	Policy	Public Works
EN 2.3	Champion policy as part of the OneVoice regional legislative agenda to advocate for better support for the state's stormwater program.	Strategy	City of Tulsa

Action ID	Action Required	Action Type	Involved Parties
EN 2.4	Review and rewrite the stormwater ordinance to reflect current understanding, ensure maintenance and ownership of the system is adequately addressed, and to provide clear policy for infill development.	Strategy	Public Works
EN 2.4.1	Identify elements of the existing stormwater ordinance that meet desired standards, and incorporate them into the new ordinance.	Policy	Public Works
EN 2.4.2	Research stormwater ordinances from around the globe to find language to incorporate into the new ordinance.	Analysis	Public Works
EN 2.5	Incorporate elements of the Low Impact Development (LID) Manual into capital improvement projects.	Strategy	Multiple
EN 2.5.1	Promote the LID Manual through education campaigns for residents, builders, developers, architects, and government agencies that emphasize the purpose of LID and the ways in which different entities can begin to incorporate elements of the manual.	Engagement	Public Works Development Services Tulsa Planning Office
EN 2.5.2	Continue to develop projects to demonstrate the ways the LID manual can be used as a component of public infrastructure and facilities design.	Policy	Public Works
EN 2.5.3	Continue to include LID projects in the stormwater permit to maintain the present rating.	Policy	Public Works
EN 2.5.4	Establish a role in the Public Works Department dedicated to the promotion of the practices outlined in the LID Manual.	Personnel	Public Works
EN 2.6	Continue to coordinate with Engineering Services on any project affecting the City's stormwater infrastructure.	Strategy	Public Works
EN 2.6.1	Assess conditions and needs for underground and above-ground infrastructure including underground pipes, <u>bar ditches</u> , creeks, <u>detention ponds</u> , catch basins, <u>control structures</u> , and <u>wetlands</u> .	Analysis	Public Works
EN 2.6.2	Prioritize the improvement of aged underground stormwater facilities that were built without consideration of a fully built-out <u>stormwater basin</u> .	Capital	Public Works

Action ID	Action Required	Action Type	Involved Parties
EN 2.6.3	Ensure stormwater needs are assessed during the capital funding project identification phase.	Capital	Public Works
EN 2.7	Maintain strong working relationships between the City of Tulsa Public Works department and other departments, authorities, and private vendors.	Strategy	Multiple
EN 2.7.1	Coordinate long-term planning goals with the Tulsa Planning Office to align with Strategic Planning priorities.	Partnership	Public Works Tulsa Planning Office
EN 2.7.2	Continuously evaluate contracts for performance, potential efficiencies, and economies of scale.	Policy	Public Works
EN 2.7.3	Work with Tulsa Parks to identify flooding and erosion concerns on park property.	Partnership	Public Works Tulsa Parks
EN 2.7.4	Work with the Water & Sewer department to mitigate their flooding and erosion concerns at water treatment facilities.	Partnership	Public Works Water & Sewer
EN 2.7.5	Collaborate with the Asset Management department to prevent flooding events and control erosion for creeks that run through City properties not maintained with Stormwater crews.	Partnership	Asset Management Public Works
EN 2.7.6	Continue to promote and support City environmental programs, such as the Partners for a Clean Environment (PACE) program and the Save Our Streams program.	Program	Public Works
EN 3	Tulsa's water resources are protected from environmental disruption and are m	nanaged in ways that j	promote conservation.
EN 3.1	Promote educational opportunities to residents regarding best practices for managing water resources on their property.	Strategy	Multiple
EN 3.1.1	Connect residents with the Oklahoma Water Resources Board workshops on the proper maintenance of wells.	Engagement	Tulsa Health Dept. Communications

Action ID	Action Required	Action Type	Involved Parties
EN 3.1.2	Promote the use of the LID Manual to residents and developers, focusing on the environmental benefits and improvement of water quality.	Engagement	Public Works Development Services Tulsa Planning Office
EN 3.1.3	Provide educational resources that explain practices to reduce contaminants that affect soil and watersheds.	Engagement	Public Works
EN 3.2	Ensure that new development includes design considerations to reduce the amount and rate of runoff and to reduce the amount of contaminants.	Strategy	Multiple
EN 3.2.1	Develop a program to implement <u>green infrastructure</u> improvements, starting with streets that contribute the highest rates of runoff volume and pollutants to the stormwater system.	Program	Public Works
EN 3.2.2	Continue to require stormwater solutions in new development and subdivisions that keep water on site, and provide natural habitat and recreational areas via easements and reserve areas.	Policy	Development Services Public Works
EN 3.2.3	Improve enforcement of construction stormwater management practices, such as <u>silt fences</u> for runoff control.	Policy	Development Services Public Works
EN 3.3	Be proactive with approaches and technologies to identify sources of water pollution before streams become polluted.	Strategy	Multiple
EN 3.3.1	Include information about animal waste and other <u>point source pollutants</u> in educational campaigns.	Engagement	Public Works Communications
EN 3.3.2	Compile a list of all known sources of local water pollution along with tools and techniques to identify and track each pollutant.	Analysis	Public Works
EN 3.3.3	Research best practices from around the country used for testing and tracking pollution sources.	Analysis	Public Works
EN 3.3.4	Work to implement tracking tools and techniques that improve efficiencies and provide cost savings where applicable.	Policy	Public Works

Action ID	Action Required	Action Type	Involved Parties
EN 3.4	Ensure that the potential negative effects of construction and development in floodplains is mitigated through engineering guidance.	Strategy	Multiple
EN 3.4.1	Provide leadership to other governments within the region by promoting stormwater standards that adequately mitigate the potential impact of new development on existing development, the stormwater system, and the natural environment.	Standards	Public Works Development Services Tulsa Planning Office
EN 3.4.2	Develop regulations and stormwater management standards for alternative methods of development that better retain natural site drainage and reduce <u>impervious surface</u> coverage, such as low-impact development and green infrastructure.	Standards	Public Works Development Services
EN 3.5	Incorporate water quality features into all future flood management projects.	Strategy	Public Works
EN 3.6	Promote the importance of regional water bodies protection and public use, such as raft races, fishing, boating, and kayaking.	Strategy	Multiple
EN 3.6.1	Ensure proper communication to recreational users of regional water bodies during water pollutant events or other recreational restrictions.	Policy	Tulsa Parks Public Works
EN 4	Tulsa's existing wildlife habitats are conserved and improved through enhance development review process.	d stewardship and cor	nsideration during the
EN 4.1	Seek ways to maintain and increase Tulsa's urban forest through programs and development guidance.	Strategy	Multiple
EN 4.1.1	Plant species that are diverse and resilient to storms, pests, and anticipated climate changes.	Policy	Tulsa Parks River Parks Authority Public Works
EN 4.1.2	Regularly update the Recommended and Prohibited Tree Species list to ensure tree canopy growth is sustainable.	Policy	Tulsa Planning Office

Action ID	Action Required	Action Type	Involved Parties
EN 4.1.3	Explore policies that will facilitate tree replacement when removal is necessary in public infrastructure projects and private development activities.	Policy	Public Works
EN 4.1.4	Evaluate the Tulsa Parks tree replacement policy to address canopy loss from storm damage, prioritizing native trees.	Analysis	Tulsa Parks River Parks Authority
EN 4.1.5	Maintain Tree City USA status annually, and apply for Growth Awards.	Policy	Tulsa Parks
EN 4.1.6	Establish a citywide tree inventory, and develop a <u>Street Tree Master Plan</u> in coordination with Up With Trees.	Planning	Tulsa Parks Public Works Tulsa Planning Office
EN 4.1.7	Formally establish the duties of the City <u>Urban Forester</u> to provide oversight for the maintenance of all trees in public spaces.	Personnel	Tulsa Parks Public Works
EN 4.1.8	Through collaboration with community members, address inequities in tree canopy cover in neighborhoods.	Policy	Public Works Tulsa Parks Community Development
EN 4.1.9	Develop educational materials related to tree health, tree selection, and proper maintenance that can be made publicly available to residents.	Engagement	Public Works Tulsa Parks Community Development
EN 4.2	Work with local partners to promote practices and standards that protect Tulsa's wildlife species and their corresponding habitats.	Strategy	City of Tulsa
EN 4.2.1	Comply with all state and federal regulations that protect endangered and migratory species and nesting birds, and collaborate with local organizations to enhance stewardship efforts.	Policy	City of Tulsa
EN 4.2.2	Expand collaboration and consultation efforts with the Tulsa County Conservation District and Tribal conservation, wildlife, and natural resources officials.	Partnership	City of Tulsa
EN 4.2.3	Engage with organizations in Tulsa that can provide information on practices and standards to better protect native wildlife species and habitats.	Engagement	City of Tulsa

Action ID	Action Required	Action Type	Involved Parties
EN 4.3	Enhance stewardship of wildlife species and their habitats through targeted initiatives and educational opportunities.	Strategy	Multiple
EN 4.3.1	Apply <u>integrated pest management (IPM)</u> strategies to determine appropriate responses to tree pests and <u>pathogen</u> s.	Policy	Tulsa Parks Public Works
EN 4.3.2	Preserve and protect as much Arkansas River corridor habitat as possible.	Policy	City of Tulsa
EN 4.3.3	Enhance the capacity and funding for <u>naturalist</u> positions and maintenance needs across all of Tulsa's parks and wildlife refuge facilities.	Personnel	Tulsa Parks
EN 4.3.4	Increase the amount of green space in Tulsa via conservation easements.	Policy	Public Works Tulsa Parks
EN 4.3.5	Promote a "Lights Out" campaign during peak bird migration periods to help prevent window strikes.	Engagement	Communications Surrounding Municipalities
EN 4.3.6	Explore a safe window policy for any new commercial buildings in Tulsa to prevent future bird strikes.	Analysis	Tulsa Planning Office Development Services
EN 4.3.7	Appropriately locate nest boxes in City of Tulsa parks.	Policy	Tulsa Parks
EN 4.3.8	Develop educational signage that details the various wildlife and vegetation species along the Arkansas River as well as recommendations for behaviors to ensure responsible stewardship.	Policy	River Parks Authority Tulsa Parks
EN 4.3.9	Develop strategies to responsibly mitigate the negative impacts of invasive animal and plant species on native species.	Policy	City of Tulsa
EN 4.4	Support ongoing pollinator conservation efforts and develop pollinator-promoting initiatives and incentives.	Strategy	Multiple
EN 4.4.1	Set measurable goals for an increase in pollinator-friendly spaces.	Policy	Tulsa Parks
EN 4.4.2	Pursue designation as a pollinator-friendly city through programs like <u>Bee City</u> <u>USA</u> , and continue the efforts related to the Mayor's Monarch Pledge Program.	Policy	Tulsa Parks

Action ID	Action Required	Action Type	Involved Parties
EN 4.4.3	Designate vacant City-owned land as <u>community gardens</u> , pollinator gardens, or opportunities for increased tree canopy.	Policy	Tulsa Parks Asset Management
EN 4.4.4	Incorporate pollinator-conscious practices into City policies and plans.	Planning	Tulsa Planning Office Tulsa Parks Public Works
EN 4.4.5	Host pollinator awareness events and educational workshops on raising native bee species.	Engagement	Tulsa Parks
EN 4.5	Encourage the planting of native plants throughout the city, and provide educational information to residents about harmful gardening and lawn management practices.	Strategy	Multiple
EN 4.5.1	Promote native plants through proclamations and educational outreach.	Engagement	Tulsa Parks City Council
EN 4.5.2	Work with electric and pipeline companies to encourage native wildflower planting along their rights-of-way.	Partnership	Tulsa Parks INCOG Environment
EN 4.5.3	Educate residents, homeowners associations, and other relevant groups about the benefits of <u>polyculture</u> vegetation, safer lawn options, and residential water management features, such as rain chains and drip irrigation.	Engagement	Tulsa Parks Public Works Communications
EN 4.5.4	Develop messaging to reduce rates of over-fertilization of lawns in the city.	Engagement	Public Works Tulsa Parks Communications
EN 5	Tulsa works collaboratively to expand the regional portfolio of energy production footprint.	on options and to man	age the region's carbon
EN 5.1	Seek ways to expand the utilization of renewable energy resources in the city, and work with state and private sector partners to reduce barriers and promote their deployment.	Strategy	City of Tulsa
EN 5.1.1	Increase municipal participation at the Oklahoma Corporation Commission to reduce regulatory barriers to renewable energy production.	Advocacy	City of Tulsa

Action ID	Action Required	Action Type	Involved Parties
EN 5.1.2	Work with State legislators to pass legislation that eases regulation that hinders the growth of the solar industry.	Advocacy	City of Tulsa
EN 5.1.3	Engage PSO to develop energy programs dedicated to renewable energy, energy efficiency, electric vehicles, battery storage, and <u>microgrids</u> .	Partnership	City of Tulsa
EN 5.1.4	Support PSO's ongoing integrated resource plan to add solar and wind capabilities.	Partnership	City of Tulsa
EN 5.2	Ensure that Tulsa is prepared for innovations in transportation by providing education and incentives to residents regarding electric vehicles (EV) and alternative fuels.	Strategy	Multiple
EN 5.2.1	Educate Tulsa residents and businesses about the Tulsa Clean Cities program and the incentives offered to alternative fuel vehicle drivers.	Engagement	INCOG Environment
EN 5.2.2	Modify building codes to include EV readiness criteria.	Code Changes	Development Services INCOG Environment
EN 5.2.3	Encourage electrification of non-road equipment used in City operations, such as golf carts, construction equipment, and landscaping equipment.	Policy	Asset Management Tulsa Parks Public Works
EN 5.2.4	Promote the use of low carbon and high fuel efficiency vehicles, as well as non-motorized transportation.	Engagement	INCOG Environment Communications
EN 5.3	Measure the City's existing carbon footprint and establish a greenhouse gas emissions reduction target and strategy.	Strategy	Multiple
EN 5.3.1	Create an inventory of greenhouse gas emissions in Tulsa, and work with community partners to develop target reductions and corresponding strategies.	Planning	City of Tulsa
EN 5.3.2	Assess the feasibility of <u>solar array</u> installations and the use of PSO's WindChoice program at municipal and municipally-owned buildings.	Analysis	Asset Management

Action ID	Action Required	Action Type	Involved Parties
EN 5.3.3	Work with utility providers to evaluate the feasibility of an off-site solar array.	Partnership	Asset Management
EN 5.3.4	Explore using the rooftops of public facilities and parking garages for renewable micro-power generation, such as solar and wind.	Policy	Asset Management
EN 5.3.5	Convert street lights across the city to more energy-efficient fixtures.	Analysis	Public Works
EN 5.3.6	Establish goals for renewable energy usage in Tulsa, and benchmark the goals and progress made against peer cities across the country.	Planning	INCOG Environment
EN 5.4	Promote green buildings and energy efficiency.	Strategy	Multiple
EN 5.4.1	Study and consider financial incentives to encourage home builders and home owners to install solar and other distributed generation technologies.	Incentives	TAEO Tulsa Planning Office INCOG Environment
EN 5.4.2	Focus education efforts for residents on improving energy efficiency first and then seeking renewable resources.	Engagement	INCOG Environment Communications
EN 5.4.3	Develop an environmental assessment handbook for property owners, developers, and planners.	Planning	INCOG Environment
EN 5.4.4	Promote the Oklahoma Commercial Property Assessed Clean Energy (C-PACE) program.	Policy	INCOG Environment
EN 5.4.5	Conduct energy efficiency audits of public facilities, and encourage energy efficiency audits of commercially owned properties.	Policy	Asset Management
EN 5.5	Adopt regulations, standards, and policies that lead to greater energy efficiency in the construction and operational lifespan of new buildings.	Strategy	Multiple
EN 5.5.1	Create an advisory group of climate and economics experts to review data and make recommendations.	Analysis	INCOG Environment

Action ID	Action Required	Action Type	Involved Parties
EN 5.5.2	Adopt the 2020 International Energy Conservation Code (IECC) for new construction.	Code Changes	Development Services
EN 5.5.3	Increase building code enforcement and building inspector education opportunities to ensure compliance with energy efficiency requirements.	Policy	Development Services
EN 5.5.4	Explore an accelerated permitting process or other administrative incentives for buildings that are built to higher energy efficiency standards than the minimum code.	Analysis	Development Services
EN 5.5.5	Assess the feasibility of <u>Leadership in Energy and Environmental Design (LEED)</u> requirements on new construction and <u>retrofits</u> of municipal building projects.	Analysis	Asset Management Development Services
EN 5.5.6	Evaluate whether to cease opting out of PSO's energy efficiency requirements.	Analysis	City of Tulsa
EN 5.5.7	Evaluate zoning and building code regulations to permit green roofs, vertical gardens, and other green building elements.	Code Changes	Tulsa Planning Office Development Services
EN 6	Residents are protected from pollution and hazardous materials, and areas of e are rehabilitated so that they are clean, usable, and productive.	existing environmenta	l contamination and pollution
EN 6.1	Pursue external funding opportunities for brownfield site remediation.	Strategy	Multiple
EN 6.1.1	Seek grants and governmental incentives to cover or reduce the cost of assessing and cleaning up sites.	Incentives	TAEO
EN 6.1.2	Promote ODEQ brownfield programs, such as the <u>Brownfields Certificate</u> <u>Program,</u> the <u>Targeted Brownfields Assessment Program</u> , and the Brownfields Revolving Loan Fund.	Policy	TAEO Community Development
EN 6.2	Promote the adaptive use of existing buildings, infill development, and Brownfield development as effective sustainability practices that take development pressure off of undeveloped areas.	Strategy	Multiple
EN 6.2.1	Create and maintain an inventory of publicly-owned brownfield properties.	Policy	TAEO Tulsa Planning Office

Action ID	Action Required	Action Type	Involved Parties
EN 6.2.2	.2 Include brownfield site remediation in the budget for corridor capital Policy Tulsa P Include brownfield sites exist.		TAEO Tulsa Planning Office Public Works
EN 6.3	Evaluate air quality, and develop collaborative approaches to reduce Strategy Multip		Multiple
EN 6.3.1	N 6.3.1 Increase public funding for the development of shared multimodal transportation systems that reduce vehicle emissions.		City of Tulsa
EN 6.3.2	6.3.2 Encourage employers to reduce emissions over time. Polic		TAEO INCOG Environment
EN 6.3.3	Promote the creation of an air quality non-profit organization in the Tulsa region to conduct community-based education and advocacy.		INCOG Environment
EN 6.3.4	.4 Emphasize the recruitment of employers that have demonstrated pollution Policy Policy		TAEO INCOG Ec. Dev.
EN 6.3.5	5Promote Ozone Alert and related programs through City of Tulsa platforms and events.EngagementINCOG Comn		INCOG Environment Communications
EN 6.3.6	Support existing work with local industrial employers to determine ways to reduce hazardous emissions through the Sustainable Tulsa <u>SCOR3CARD</u> .	Policy	INCOG Environment TAEO INCOG Ec. Dev.
EN 6.3.7	Develop strategies to evaluate air quality conditions at the neighborhood level to identify areas for specific mitigation interventions.	Policy	INCOG Environment
EN 6.4	Reduce the risks associated with the transport of hazardous materials to and through Tulsa.		Multiple
EN 6.4.1	Enforce requirements under the Hazardous <u>Materials Transportation Act</u> to ensure transporters are complying with the EPA's <u>Hazardous Waste Manifest</u> <u>System</u> , properly handling hazardous waste discharge, and obeying applicable U.S. DOT hazardous waste regulations.	Policy	TAEMA

Action ID	Action Required	Action Type	Involved Parties
EN 6.4.2	As the Gilcrease Expressway is completed, evaluate designating it as a <u>Hazardous Materials Route</u> and prohibit the transportation of hazardous materials on the <u>Inner Dispersal Loop (IDL).</u>	Policy	City of Tulsa TAEMA
EN 6.5	Continue ongoing mitigation efforts to reduce harmful pollutants and emissions.	Strategy	Multiple
EN 6.5.1	.5.1 Meet or exceed all industry standards for <u>flue emissions</u> in the range of 90% - Policy Policy		Asset Management Public Works
EN 6.5.2	I 6.5.2 Increase outreach efforts to promote the collection of hazardous materials through the <u>Household Pollutant Collection Program</u> , and evaluate for new pollutants to add to the program.		Public Works Communications
EN 6.5.3	Discourage fertilizer use near bodies of water to protect from possible <u>algal</u> <u>blooms</u> and decreases of aquatic animals and organisms.		Public Works Water & Sewer Communications
EN 6.6	6 Develop responsible approaches to mineral extraction that respect the region's Strategy Mul		Multiple
EN 6.6.1	Support educational efforts that inform residents about the process of mineral extraction, uses of such minerals in society, and what concerns are addressed before mining occurs.	Policy	City of Tulsa
EN 6.6.2	Encourage mining companies to reduce fossil fuel emissions as innovative technologies become applicable.		City of Tulsa
EN 6.6.3	Advocate for best practices for mining and land reclamation.	Policy	City of Tulsa
EN 6.6.4	Work with the mining industry to identify responsible and productive approaches for mineral extraction within the City limits, considering economic interest and potential pollution impacts.	Policy	TAEO Public Works

Action ID	Action Required	Action Type	Involved Parties
EN 6.7	Develop approaches to reduce noise pollution and light pollution.	Strategy	Multiple
EN 6.7.1	Work with Oklahoma Department of Transportation to identify areas in need of sound barriers along highways in Tulsa. Partnership		Public Works
EN 6.7.2	Provide educational information for residents about what is included in the noise ordinance and how to report violations.	Policy	Tulsa Police Dept.
EN 6.7.3	Plant trees and other vegetative elements or other barriers between noisy transportation corridors and residential areas.	Policy	Public Works Tulsa Parks
EN 6.7.4	Work with PSO to strategically replace outdated light fixtures in the city with modern directional LED fixtures.	Partnership	Public Works
EN 6.7.5	Work with universities and other organizations to understand the extent and impact of light pollution in Tulsa, and identify approaches to mitigate negative outcomes.	Analysis	City of Tulsa
EN 7	Tulsa develops inclusive sustainability planning efforts and creates dedicated o sustainable practices.	offices and positions t	o facilitate implementation of
EN 7.1	Update the 2011 City of Tulsa Sustainability Plan.	Strategy	Multiple
EN 7.1.1	Coordinate with the INCOG Environment division to develop a project scope for updating the plan.	Partnership	City of Tulsa
EN 7.1.2	Allocate funding for plan development and implementation.	Planning	City of Tulsa
EN 7.1.3	3 Work closely with community groups that have consistently worked to promote sustainability in the community, with a focus on including perspectives from areas identified as needing environmental justice by the EPA.		INCOG Environment

Action ID	Action Required	Action Type	Involved Parties
EN 7.2	Establish an Office of Sustainability either internally at the City of Tulsa or regionally at INCOG.	Strategy	Multiple
EN 7.2.1	Work with surrounding municipalities, counties, and tribal government partners to determine the feasibility of a regional Office of Sustainability, evaluating whether this approach would more effectively hold governments accountable to their sustainability goals.	Partnership City of Tulsa INCOG Environment	
EN 7.3	EN 7.3 Work with tribal governments, other parallel government agencies, community groups, and Tulsa residents to evaluate progress toward the goals established Strategy Mulin the City's Sustainability Plan.		Multiple
EN 7.3.1	Establish a committee or commission to meet regularly and engage with City staff working to achieve sustainability goals.		City of Tulsa
EN 7.3.2	Develop public education initiatives to promote sustainable practices to Engagement Public Engagement Tulsa		INCOG Environment Public Works Tulsa Parks
EN 7.4	Use metrics and standards developed by national organizations to evaluate Tulsa's progress against peer cities across the country and the world.		Multiple
EN 7.4.1	.1 Annually update the content for the <u>American Council for an Energy-Efficient</u> Policy INCOG Enviro		INCOG Environment
EN 7.4.2	Work with Sustainable Tulsa to promote their SCOR3CARD to businesses and other organizations across the city.		INCOG Environment
EN 7.4.3	elop sustainability measures for City departments as a part of annual Policy City of Tu formance reporting.		City of Tulsa

SELECTED CITY COMPARISON

Tulsa Planning Office staff selected this set of 6 cities from the review of more than 30 comprehensive plans from across the United States. These cities were selected to represent a variety of environmental contexts, and many of the cities have exceptional plan recommendations related to <u>extreme weather</u> and climate change mitigation. The metrics chosen for this chapter include measures related to pollution, climate change awareness and impact, and readiness for technological innovations that may lead to positive outcomes related to environmental concerns.

Most Favorable



Metric	Units	Tulsa, OK	Bakersfield, CA	Portland, OR	Denver, CO	Minneapolis, MN	Louisville, KY	New Orleans, LA
EV Charging Stations per Capita	U/pop*10,000	0.62	0.64	1.83	1.87	1.44	0.71	0.54
Air Quality	# of Unhealthy Air Days (3-year average 2019, 2020, 2021)	0.67	21.33	0.33	7.66	1.33	0	0
Toxic Release	RSEI Pounds	80	100	70	96	0	49	47
Global Warming Awareness	%	67%	71%	83%	82%	80%	72%	82%
GHG Emissions	Metric Tons of CO2 Equivalent	33	69	76	14	15	28	70

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Least Favorable

FEATURED METRIC Air Quality Tulsa Area Ground-Level Ozone Trend 100 95 90 Legend 85 Ozone Levels (3-yr Avg.) Current 70 PPB Standard 80 2008 75 PPB Standard 75 1997 84 PPB Standard 70 65 60 55 50 1991 1999 2001 2003 2005 2007 2011

Tulsa has one of the lowest numbers of unhealthy air days when compared to the selected cities. Unhealthy air days are a part of the <u>American Lung Association's Air Quality Index</u> and are days when EPA federal air standards are exceeded. Unhealthy air days are determined by undesirable levels of ozone, <u>smog</u>, particulate pollution (tiny particles from ash, factories, vehicle exhaust, pollen, power plants, etc.), as well as other common air pollutants. Tulsa's ozone alert days are forecasts of harmful air quality conditions and are one of the ways Tulsans can be informed and help mitigate the number unhealthy air days. Since the early 1990s Tulsa has maintained conformance with ozone concentration limits established by the EPA; however, the risk of <u>non-attainment</u> persists, and reductions in automobile air pollutants should continue.

Electric Vehicle Charging Stations per Capita

Tulsa has one of the lowest levels of electric vehicle charging stations per capita when compared to the selected cities. Tulsa residents are not only dependent on individually-owned vehicles to travel from place to place but are also very fossil fuel dependent. Tulsa's economy, both historically and presently, is dominated by the fossil fuel industry; however, as climate change concern spreads across the globe, alternative fuels will become more popular and more accessible. Over time, many Tulsans are making the choice to drive hybrid or fully electric vehicles, an important contribution toward lowering Tulsa's carbon footprint.

Toxic Release

Tulsa is among the highest of the selected cities for toxic release. Toxic release is measured in <u>Risk-Screening Environmental Indicators (RSEI)</u> <u>Pounds</u>, which accounts for the size of a release and various chemicals' toxicities. Mitigating pollution is key to protecting Tulsa's natural resources and ensuring that the natural environment is enjoyed not only in the present but also by future generations.

Global Warming Awareness

The Tulsa Metropolitan Statistical Area (MSA) has the lowest <u>global</u> <u>warming</u> awareness when compared to the selected cities. Global Warming Awareness was measured in 2021 as the percentage of Adults who think global warming is happening. The issue of global warming has become more pressing in recent years, and more and more people are aware of it. Tulsans should be informed on how their daily choices can intensify or mitigate the harmful effects of global warming and how they can work as a community to improve local practices.

Greenhouse Gas (GHG) Emissions

The Tulsa MSA is among the lowest of the selected cities for GHG emissions per capita. This metric is measured as metric tons of carbon dioxide equivalent per person. GHG emissions contribute to dangerous levels of ozone. It is important that Tulsans make efforts to lessen their GHG emissions to serve as an example for other cities.

EQUITY & RESILIENCE CONSIDERATIONS

NATURAL DISASTER AND EMERGENCY PREPAREDNESS

Oklahoma is well known for natural disasters. Tornadic events, flooding, ice storms, and earthquakes all occur with relative frequency, creating a culture that is accustomed to response and recovery. In order to maintain a resilient community in the face of acute stress events, communication between emergency response services and residents is critically important. To serve the diverse needs of Tulsa residents, emergency communications need to be delivered in consistent and predictable ways, utilizing technology to increase the breadth of communications. For residents for whom English is not their primary spoken language, as well as residents with physical and cognitive disabilities, there is an increased risk of danger during an emergency.

Recommendations

- *EN.ER.1* Enhance emergency communications by producing messaging in multiple languages, and distribute the messaging across a broad spectrum of media, including social media, websites, text messaging, television and print news reports, and in-person discussions.
- *EN.ER.2* Regularly upgrade the siren system in the region to be compatible with modern emergency management systems.

URBAN HEAT ISLAND/URBAN TREE CANOPY

Tulsa is located in the heart of Green Country, named for the lush forested landscape that covers the region. However, within the city limits the amount of tree canopy coverage is not consistent, with wealthier areas of the city having significantly more tree canopy coverage than lower-income areas. A lack of shade in urbanized areas exposes vast amounts of impervious surfaces such as pavement and rooftops, which absorb the sun's heat and increase the localized risk of heat-related health problems such as heat stroke and heat exhaustion. Additionally, areas without tree canopy coverage require greater air conditioning to maintain cool indoor temperatures, increasing the cost burden on populations who may already be economically disadvantaged.

Recommendations

- *EN.ER.3* Strategically increase tree canopy coverage in areas of the city that are at a higher risk of exposure to heat.
- *EN.ER.4* Ensure City properties and parks have shelter and free water available to mitigate against heat-related illness.

EXPOSURE TO POLLUTION

Pollution can manifest in many different forms that all have potential harmful impacts on humans and animals. Water, soil, air, noise, and light pollution, as well as exposure to hazardous materials spills or explosions all present risks to residents. In Tulsa many residents live in areas that are exposed to <u>particulate matter</u> and ground-level ozone that emanate from the highways. Industrial uses along the Arkansas River and historic rail alignments have led to discussions about the disparate conditions faced by those residents in comparison to areas of the city not exposed to these pollutants. Impaired water bodies also present a risk for children and recreational users who may be exposed to toxic conditions without knowing the status of the water body's quality.

Recommendations

- EN.ER.5 Strategically place vegetative buffers between sources of pollution and vulnerable communities.
- EN.ER.6 Distinguish between locations that are appropriate for non-industrial employment facilities and those that are suitable for more intense industrial purposes.
- EN.ER.7 Identify pollution source, and remove or reduce them as possible.



This map is generated using data from the Tulsa Planning Office's Neighborhood Conditions Index (NCI).

GEOGRAPHIC DISPARITIES

The above map shows areas of the city with natural resources that support wildlife habitat, provide shade, and mitigate pollution, and infrastructure that supports more sustainable transportation choices. The map also incorporates areas at risk of flooding. Undeveloped areas of the city, such as the northwest, far east, far south, and Turkey Mountain, have the highest levels of <u>environmental assets</u>. There are pockets in the city, primarily in affluent areas, where environmental assets exist. Areas that lack environmental assets include downtown and surrounding neighborhoods and where I-44 and Highway 64 cross.

INDICATORS USED IN MAP

- Exposure to Floodplain
- Tree Canopy Coverage
- % Impervious Surface

- % in Proximity of a Highway
- # of EV Charging Stations

RELEVANT EQUALITY INDICATORS*

No indicators in the Equality Indicator reports are related to environmental hazards. It is recommended that emergency preparedness, climate-related impacts, and exposure to pollution be added to evaluate environmental disparities.

RELEVANT RESILIENT TULSA ACTIONS**

ACTION 18: Develop Resilience Hubs in Comanche Park and River West neighborhoods while ensuring proper hazard response information is disseminated to the public.

ACTION 19: Prepare small businesses to reduce disruptions in operations.

ACTION 20: Utilize Emergency Mobility Plan technology.

VULNERABLE POPULATIONS

- Residents who speak a language other than
 English
- Households in flood-prone areas
- Households in proximity of a highway
- Older adults
- Youth
- Persons with respiratory ailments
- Persons with physical and/or cognitive disabilities
- Low-income households

*Equality Indicator reports are issued annually by the City of Tulsa. **Resilient Tulsa Strategy was adopted by the City of Tulsa in 2018.

HEALTH & WELLNESS CONSIDERATIONS

Hazardous Materials

Health Impact	Associated Health Outcome
Exposure to hazardous chemicals and materials	Increase in behavioral abnormalities, cancer, genetic mutations, birth defects, physiological malfunctions (e.g. reproductive impairment, kidney failure, etc.)

Tulsa Context

In Tulsa, hazardous material spill sites are primarily located in established industrially-zoned areas, along highways, and along rail lines. In particular, the industrial uses along the west bank of the Arkansas River, the railroad that connects the airport, Dawson, and downtown Tulsa, as well as at the interchange of I-44 and the Broken Arrow Expressway represent significant pockets of Tier 2 hazardous material sites. Additionally, there is a higher concentration of sites in areas of Tulsa north of I-244. This represents an increased risk for exposure for the residents North Tulsa, particularly around the Comanche Park housing site and along Dawson Rd. Further north into Tulsa County, numerous hazardous material spill sites cluster along the Highway 75 corridor.

Policy Recommendations

- *EN.HW.1* Inform the general public of what to do when a hazardous materials incident has occurred.
- *EN.HW.2* Reroute the shipment of hazardous materials along highways with fewer required maneuvers than the Inner Dispersal Loop (IDL) to reduce the risk of vehicle collisions resulting in the spilling of hazardous materials.

Water Quality

Health Impact	Associated Health Outcome
Exposure to water contaminants	Water-borne disease; habitat pollution and destruction; death of animal and plant populations

Tulsa Context

A significant portion of the streams in Tulsa, including the Arkansas River, are considered impaired due to contamination from various chemicals. In total, 65 miles of streams in all corners of the city are impaired. The most prevalent contaminants include cadmium, enterococci, and E. coli. The Mingo Creek watershed and streams are among the few non-impaired stream systems within the city limits. No lakes within the city limits are designated as impaired. The impairment of streams and water bodies can have devastating affects on wildlife and lead to the degradation of valuable habitat.

Policy Recommendations

- *EN.HW.3* Implement design recommendations from the Low-Impact Development Manual in streets projects and other public infrastructure projects.
- *EN.HW.4* Encourage low-impact development design features in development, such as pervious pavers and rain gardens.
- *EN.HW.5* Conduct research at wastewater treatment plants to determine any needs to increase treatment requirements for substances not currently tested (excess nutrients, pharmaceuticals, etc.).
- EN.HW.6 Continue to promote responsible fertilizer use.
- *EN.HW.7* Continue to expand the sewer utility service area to convert properties presently using septic systems within the city limits.
- EN.HW.8 Promote the usage of native plant species in landscaping.
- *EN.HW.9* Implement a water quality monitoring program for the Arkansas River and provide the findings to the public.

Natural Areas Conservation

Health Impact	Associated Health Outcome
Decreased flooding incidents due to water carrying capacity	Reduction in property loss, injury, and death
Increased opportunity to interact with nature	Decrease in stress, anxiety, and depressive disorders; benefits of increased physical activity

Tulsa Context

Tulsa has many areas of natural habitat ranging from the urban wilderness at Turkey Mountain, to the Arkansas River, creeks and streams, and the undeveloped areas in the northwest, far east, and far north areas of the city. These locations serve as the habitat for numerous species of birds, mammals, insects, reptiles, amphibians, and fish. Additionally, these areas serve a recreational purpose for the residents of Tulsa, with opportunities for hiking, mountain biking, disc golf, fishing, and more. As development pressures approach these areas, there is little that can be done to prevent habitat destruction without specific considerations in the development review process. These areas should be protected to ensure Tulsans to have opportunities to interact with nature.

Policy Recommendations

- *EN.HW.10* Consider the impact of development on natural areas in the development review process.
- *EN.HW.11* Promote <u>environmental stewardship</u> through educational campaigns focused on littering, erosion, and wildlife interactions.
- *EN.HW.12* Increase the urban tree canopy with a focus on <u>contiguous</u> canopy to support wildlife habitation.

Urban Heat Island (UHI)

Health Impact	Associated Health Outcome
Exposure to higher temperatures	Increase in heat exhaustion, heat stroke, death
Increase in greenhouse gas emissions and other air pollution	Increase in asthma and other respiratory diseases
Increase in energy usage	Further harmful emissions, decrease in money for healthful choices

Tulsa Context

Tulsa's vast urban area consists of significant areas of impervious surfaces such as streets, parking lots, and building roofs, with only 26% of the city being covered by tree canopy. When compared to surrounding rural areas, Tulsa's average temperature is consistently higher, particularly in the summer months and in the evenings, with an average high in July that is 2° higher at mid-day and 4° higher in the evenings. The temperature differential is less pronounced in winter months.

Policy Recommendations

- *EN.HW.13* Increase efforts to plant trees and other vegetative elements in and around areas with high rates of impervious surfaces.
- *EN.HW.14* Incentivize the use of <u>green roof</u>s, cool roofs, and other LID practices in all areas and land uses.
- *EN.HW.15* Promote the use of reflective and permeable pavement materials.
- *EN.HW.*16 Reduce <u>vehicle emissions</u> by investing in alternative transportation.
- *EN.HW.17* Encourage community involvement in volunteer efforts, including demonstration projects, urban forestry programs, outreach and education programs, and awards.
- *EN.HW.18* Evaluate policies to protect City employees from exposure to extreme weather while working.

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HEALTH & WELLNESS CONSIDERATIONS (cont.)

Urban Tree Canopy

Health Impact	Associated Health Outcome
Amount of tree canopy coverage	Increase in seasonal allergies; decrease in heat-related morbidity; Increase in wildlife habitat
Improved air quality associated with greater tree canopy coverage	Decrease in asthma and other respiratory diseases

Tulsa Context

Across the entire city, Tulsa is 26% covered by tree canopy. Among over 400 census block areas, 20% had 3-15% canopy, 54% had 15-30% canopy, and 26% had over 30% tree canopy. Most of the heavily wooded areas of the city are in the undeveloped fringe areas in the northwest, southeast, and far east; however, Midtown and South Tulsa have significant tree canopies. In contrast, North Tulsa, East Tulsa, and West Tulsa have substantially less tree canopy.

Policy Recommendations

- *EN.HW.*19 Ensure tree benefits for future generations through a sustainable planting program that encourages planting the right tree in the right place.
- *EN.HW.20* Incorporate urban forestry practices into the City's stormwater management efforts by planting trees and installing bioswales and other green infrastructure in the right-of-way.
- *EN.HW.21* Explore the development of a tree removal permitting system to track removals of trees in the public right-of-way.
- *EN.HW.22* Create public outreach materials to define when tree removal permits are required.
- *EN.HW.*23 Train local commercial arborists and landscaping companies to recognize when a tree removal permit is required.

FUNDING PRIORITIES

In order for Tulsa to be a resilient city in the face of natural disasters and climate change, consistent funding of capital improvements, operational funding, and dedicated personnel is critical. Significant capital needs include investment in flood mitigation efforts along the Arkansas River and other streams within the city limits. For the Arkansas River there are capital needs to reinforce the system of levees in partnership with Tulsa County, the State, and the federal delegation. Additionally, reinforcement of shorelines through the installation of <u>rip-rap</u> or other techniques is a significant capital need, particularly in locations of concern, such as the wastewater treatment facility near Turkey Mountain. If erosion is allowed to undermine the overflow pools or <u>treatment pools</u>, substantial environmental damage will occur to the Arkansas River, in addition to the damage done to the public facilities.

Another important capital need for resiliency is upgrades to emergency sirens. Presently the siren system includes several sirens that are obsolete, which limits Tulsa Area Emergency Management Authority (TAEMA) from utilizing all of the software available to better communicate emergency notifications. Upgrades to these sirens is a marginal cost compared to the costs associated with an increased risk of damage and loss of life.

Operational needs are primarily focused on the management of public facilities. Without adequate maintenance funding, as well as funding for energy-efficient upgrades to building components, costs are higher than necessary due to a reduced time frame for component replacement. Increased operational funding can move the City of Tulsa from a <u>"Run-to-Fail</u>" maintenance approach to one that is much more resilient over a longer time frame.

Dedicated funding is needed for personnel that focus on sustainability, both internal to the City of Tulsa and external in the community. By reestablishing an Office of Sustainability there will be substantial benefits to the environment, residents, and the City's bottom line.

REGIONALISM CONSIDERATIONS

Natural disasters require a regional approach, and the resources for such events should be pooled collectively to address needs such as an Emergency Operations Center, sirens and other notification technology, and communications capacity.

Pollution, whether air, water, soil, or other forms, is best addressed at the regional level, as these impacts are not limited by political boundaries. Coordination with counties, tribal governments, INCOG, the State, and federal agencies offers the most efficient venue for addressing issues. In particular, impacts to the Arkansas River and sources of drinking water should be addressed through regional collaboration.

New forms of energy production would benefit from regional partnerships and public-private partnerships to tap existing wind and solar capacity. These partnerships could lead to a more unified approach to lobbying State lawmakers to incentivize alternative fuels, or to prevent additional anti-competitive restrictions from being made into statute. This approach would also be beneficial for electric vehicles, for which the Tulsa region is well-positioned to be a leader but cannot if State action precludes the economic incentivization needed.

In order to address sustainability in the Tulsa area, a regional approach in tandem with local efforts would be preferable to several disparate groups working independently. Contributing members of INCOG could support the creation of a regional office of sustainability to update sustainability plans and lead implementation efforts across the region.

 ${\bf 500}\mbox{-}{\bf Year}\ {\bf Flood}$ - A flooding event with a 0.2% chance of happening in any given year.

Adaptive Use - Also known as adaptive reuse, which is the extensive alteration, restoration, and/or renovation of an existing building so that it will serve a new or modified purpose.

Algal Bloom - An occurance where colonies of algae grow out of control and produce toxic or harmful effects on people, animals, and marine life.

Alternative Fuels - Fuels that are derived from sources other than petroleum, such as hydrogen, natural gas, propane, ethanol, and electricity.

American Council for an Energy-Efficient Economy (ACEEE) Scorecard-Analyzes the energy efficiency efforts of all 50 States by tracking their policies and programs to reduce energy use.

American Lung Association's Air Quality Index - A system used to warn the public when air pollution is dangerous.

Army Corps of Engineers - A branch of the Army that specializes in engineering projects that oversee the nation's aquatic resources.

Bar Ditch - A roadside channel, or ditch, dug for drainage purposes.

Bee City USA - A growing program in various communities to sustain pollinators, in particular the more than 3,600 species of native bees in this country, by increasing the abundance of native plants, providing nest sites, and reducing the use of pesticides.

Brownfield Sites - A property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

Brownfields Certification Program - A program for private parties and government entities to voluntarily investigate and clean up contaminated properties.

Capital Improvement Project - A project where additions, or improvements, to a permanent structure, are implemented to enhance the lifespan of said structure.

Carbon Footprint - The amount of carbon dioxide and other carbon compounds emitted due to the consumption of fossil fuels by a particular person, group, vehicle, etc.

Climate Change - The long-term change in the average weather patterns that have come to define Earth's local, regional and global climates.

Community Garden - Plots of land, usually in urban areas, that are a shared, semi-public space where people in the surrounding neighborhood share the opportunity of maintaining a garden space to provide physical and social benefits.

Contiguous - Sharing a border, neighboring, e.g. the contiguous United States refers to the lower 48 states that share a border.

Control Structure - Engineered structures to provide defense against frequent flooding and coastal erosion.

Detention Pond - A pond, or also known as a stormwater basin, is a lowelevation area near rivers, creeks, or streams, that is designed to hold overflow water to protect areas surrounding it from flooding.

Dissolved Oxygen - Refers to the concentration of oxygen gas incorporated in water.

Drainage Basin - A site where water collects.

Electric Vehicle Infrastructure - The basic physical and organizational structures and facilities needed for the operation of electric vehicles (e.g. charging stations in buildings, supplies, personnel).

Endangered Species Act - The primary law in the United States to protect critically imperiled species from extinction, passed by Congress in 1973.

Endemic Species - Plants and animals that only exist in one geographic region.

Energy Resource Management - The use and management of energy resources through conservation.

Environmental Asset - The naturally occurring living and non-living components of Earth, and together constituting the bio-physical environment, which may provide benefits to humanity.

Environmental Justice - The fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Environmental Stewardship - The responsible use and protection of the natural environment through conservation and sustainable practices.

Equity - Just and fair inclusion into a society in which all can participate, prosper, and reach their full potential.

Extreme Weather - Weather events that are considered on the upper or lower threshold of historical measurements.

Federal Delegation - A group of elected officials at the federal level representing a state.

Floodplain - A low-lying region adjacent to rivers or streams in which during times of flooding stretches beyond the banks of the river/stream channels.

Flue Emissions - The gas exiting to the atmosphere via a pipe or channel for conveying exhaust gases from a fireplace, oven, furnace, boiler, or steam generator.

Fossil Fuel - A natural, non-renewable, source of energy such as coal, petroleum, and natural gas.

Geographic Information Services (GIS) - A computer-based spatial tool used to store, visualize, analyze, and interpret geographic data.

Global Warming - The long-term warming of the planet's overall temperature.

Green Buildings - A building that, in its design, construction or operation, attempts to reduce or eliminate negative impacts, and can create positive impacts, on our climate and natural environment.

Green Infrastructure - Ecological systems, both natural and engineered, that act as living infrastructure. Green Infrastructure elements are planned and managed primarily for stormwater control, but also exhibit social, economic and environmental benefits.

Green Roof - A layer of vegetation planted over a waterproofing system that is installed on top of a flat or slightly–sloped roof.

Greenhouse Gas Emissions - Gasses emitted by human activity (such as carbon dioxide, natural gas, or chlorofluorocarbons) that contribute to the trapping of heat in the atmosphere.

Ground-Level Ozone - Also known as Tropospheric Ozone, it is formed when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight.

Growth Awards - Given to participating Tree City USA communities that demonstrate higher levels of tree care and community engagement during the calendar year.

Habitat - The natural home or environment of an animal, plant, or other organism.

Hazardous Materials (HAZMAT) - Substances or material that could adversely affect society, such as toxic chemicals, fuels, nuclear waste, biological, chemical, and radiological agents.

Hazardous Materials Route - Designated transportation route by which hazardous materials get transported, either by rail, sea, or road.

Hazardous Waste Manifest System - A system designed to track hazardous waste from the time it leaves the generator facility where it was produced, until it reaches the off-site waste management facility that will store, treat, or dispose of the hazardous waste.

Household Pollutant Collection Program - A program of the City of Tulsa's Public Works Department with a year-round collection facility for the disposal of hazardous household waste.

Hydroelectricity - A renewable energy resource that uses the energy of running water to produce energy.

Impervious Surface - Surfaces where water cannot get through or absorbed, and runs off. Roads, streets, sidewalks are considered impervious surfaces.

Infill Development - New construction in existing areas of the city, particularly older parts of the city.

Inner-Dispersal Loop (IDL) - The highway system that wraps around Tulsa's downtown core.

Integrated Pest Management (IPM) - A science-based, common-sense approach for reducing populations of disease vectors and public health pests.

International Energy Conservation Code (IECC) - A model energy code that establishes and regulates the design and construction requirements for minimum energy conservation of new buildings.

Inundation - To be overwhelmed with water, e.g. floodwaters.

Keystone Dam - A engineering structure whose purpose is to control flooding of Keystone reservoir, provide hydroelectric energy, and recreation.

Leadership in Energy and Environmental Design (LEED) - A program for green building design, construction, operations, and performance to help building owners and operators to be as environmentally conscious as possible.

Levee - A man-made structure that runs parallel along the course of a river to keep the water within its banks.

"Lights Out" Campaign - A campaign to turn off lights in towns and cities to mitigate the threat to migratory birds that fly through the United States when they return each spring.

Low-Impact Development (LID) - A land planning and engineering design approach to manage stormwater runoff as part of green infrastructure, emphasizing conservation and use of on-site natural features to protect water quality. This includes green roofs, bioswales, rain gardens, permeable pavers, etc.

Materials Transportation Act - Also known as Hazardous Materials Transportation Act, it is a law regulating the transportation of hazardous materials to protect life and property.

Microgrid - A local energy grid with control capability, which means it can disconnect from the traditional grid and operate autonomously in times of crisis, like storms, or power outages.

Micro-Power Generation - Small-scale generation of heat and electric power by individuals, small businesses, and communities as an alternative to being connected to a centralized power grid.

Mitigate - To make something less harmful, or less severe and intense.

Multi-Lingual - In or using several languages.

National Flood Insurance Program Class 1 Rating - A classification based off of a community rating system (CRS) in which Class 1 receives a 45% premium discount on Flood Insurance policies based of public information, mapping and regulations, flood damage reduction, and warning and response.

Native Plants - Occurring naturally in a particular region, ecosystem, or habitat without human introduction.

Naturalist - A type of biologist who studies the impact of living species on each other and the environments in which they live.

Non-Attainment - Not meeting national standards for surrounding air quality.

Ozone Alert - Also called air pollution alerts, they are alerts that are activated on days when there is an unhealthy concentration of ozone pollution in the surrounding area.

Particulate Matter - All liquid and solid particles suspended in the air, many of which are hazardous.

Pathogen - An organism (such as bacteria or viruses) that causes disease.

Point Source Pollutants - Refers to pollution that occurs from a single identifiable source.

Pollinator - An insect or other agent that conveys pollen to a plant and so allows fertilization.

Polyculture - The practice of growing more than one crop species in the same space.

Remediation - The process of removing hazardous substances from the environment to lessen the effect it has on society.

Renewable Energy - Energy from a source that is not depleted when used, such as wind or solar power.

Retrofit - The process of modifying or improving an already existing structure.

Rip-Rap - A wall of rocky material to protect shoreline structures, bridge foundations, steep slopes from water, wave, and ice erosion.

Risk-Screening Environmental Indicators (RSEI) Pounds - Also called toxicity-weighted pounds, it is a result that accounts for the size of the release and the chemical's toxicity relative to other chemicals.

Run-to-Fail - When capital assets belonging to the City do not receive maintenance funding and are replaced rather than repaired.

SCOR3CARD - An online tracking and assessment tool for Tulsa organizations who want to track and improve their sustainability plans provided by Sustainable Tulsa.

Silt Fence - A temporary sediment barrier made of porous fabric.

Sluice Gates - A sliding gate for controlling the flow of water, or to hold back water.

Smog - Fog or haze combined with smoke and other atmospheric pollutants.

Solar Array - A collection of solar panels where sunlight is collected and converted into electricity.

Stormwater Atlas - An inventory of maps, tables, various data relating to infrastructure, permits, floodplain mapping, and the geography of a city or county's storm water layout.

Stormwater Basin - Excavated basins for the short term detention of stormwater runoff from a completed development area followed by controlled release from the structure at downstream, pre-development rates.

Stormwater Bonds - A form of public funding where an entity assumes debt through the sale of bonds from a dedicated revenue stream in order to advance payment for stormwater infrastructure.

Stormwater Infrastructure - Basic equipment and structures (roads, storm drains, pipes) that collect stormwater and carry it away from urban and suburban areas.

Street Tree Master Plan - A plan that focuses on policies and practices that reduced the tree canopies in city, and seeks to reverse the trend.

Sustainability - Managing resources to meet the needs of the present without compromising the ability of future generations to meet their own needs.

Targeted Brownfields Assessment Program - A program that helps states, tribes, and municipalities minimize the uncertainties of contamination often associated with brownfield sites.

Treatment Pool - A body of water that needs to be cleaned or treated for use.

Tree Canopy - The layer of leaves, branches, and stems of trees that cover the ground when viewed from above. In urban areas, tree canopy can refer to the amount of tree canopy coverage a city has.

Tree City USA - A designation for communities that meet minimum standards set by the Arbor Day Foundation for community forestry programs.

Tributary - Small streams or rivers feeding into a larger river system.

Urban Forester - A specialized branch of Forestry that deals with the cultivation and management of trees; From planting, maintenance, care and protection of trees in urban areas.

Urban Heat-Island (UHI) - A metropolitan area that is warmer than its rural surroundings.

Vehicle Emissions - Gasses emitted through a vehicle's exhaust system.

Vertical Gardens - A garden that grows upward (vertically) using shelving, trellis, or another support system, to maximize grow space.

Water Carrying Capacity - Refers to the maximum capacity of resources a regional water system can offer.

Wetlands - An area of land that is saturated with water, e.g. swamps, bayous, marshes.

RELEVANT CITY DEPARTMENTS, PROGRAMS, PLANS, AND EXTERNAL ORGANIZATIONS

<u>Asset Management Department</u> - A department of the City of Tulsa that manages and maintains City-owned facilities, fleet, and equipment.

Brownfields Revolving Loan Fund - A program that encourages the reuse and redevelopment blighted, contaminated lands so they can be returned to useful, tax producing properties that generate jobs, create sustainable community growth, and contribute to the local economy.

City of Tulsa Sustainability Plan (2011) - A plan that focused on implementing sustainable practices throughout the City of Tulsa, such as reducing energy costs, increasing efficiencies, improving air quality and becoming a leader in sustainable government.

<u>Communications Department</u> - A department of the City of Tulsa that aims to facilitate open and accountable access to city government for the citizens of Tulsa and assist in communicating the prioritized initiatives set by the administration and all other City departments.

Community Development Division - A division of the Department of City Experience that administers community and economic development programs and initiatives, supporting residents in creating economically viable and sustainable communities through neighborhood partnerships, housing programs, and community development initiatives.

Development Services Department - A department of the City of Tulsa that promotes safety, livability, and economic growth through efficient and collaborative application of building and development codes.

Emergency Operations Center (EOC) - The facility used to coordinate emergency and disaster response under the supervision of the Tulsa Area Emergency Management Agency (TAEMA).

Environmental Protection Agency (EPA) - A federal government agency created to protect the environment and its impact on human health.

<u>Finance Department</u> - A department of the City of Tulsa that maintains the finances of the City.

INCOG Community and Economic Development - A department of INCOG that provides grant writing and administration services to local governments related to programs for public infrastructure improvements, housing, and economic development projects.

INCOG Environment - A department of INCOG that works with state and federal governmental agencies to implement clean water, air quality, and energy programs for the region.

Low-Impact Development (LID) Manual - A City of Tulsa resource to guide the design and implementation of systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration, or use or stormwater in order to protect water quality and associated aquatic habitats.

<u>North Tulsa Brownfields Area-Wide Redevelopment Plan</u> - A City of Tulsa planning initiative to identify potential reuses for brownfield sites and to prioritize brownfield cleanup and redevelopment in North Tulsa.

Office of Performance Strategy and Innovation (OPSI) - A City of Tulsa office that utilizes data to enhance and streamline City service distribution to residents.

Oklahoma Corporation Commission - A regulatory agency for the State of Oklahoma that deals with the fuel, oil and gas, public utilities, and transportation industries.

Oklahoma Department of Environmental Quality (ODEQ) - A State of Oklahoma environmental department that oversees environment-based activities, such as air quality, water quality, waste management, hazardous waste, radiation management, solid waste management, and hazardous materials.

Oklahoma Department of Transportation (ODOT) - A State of Oklahoma transportation department that seeks to provide safe, economical, and effective transportation networks for the people, commerce and communities in Oklahoma.

Oklahoma Water Resources Board - An entity that manages the state of Oklahoma's water resources through water use appropriation and permitting, water quality monitoring and standards, financial assistance for water/ wastewater systems, dam safety, floodplain management, water supply planning, technical studies and research, and water resource mapping.

<u>OneVoice</u> - The legislative agenda of the Tulsa Regional Chamber of Commerce.

Oxley Nature Center - A nature center located in Tulsa that promotes the conservation of wildlife and the natural environment.

Public Service Company of Oklahoma (PSO) - Tulsa's local electricity utility provider, and a division of the national company American Electric Power.

Public Works Department - A department of the City of Tulsa that is responsible for planning, directing and coordinating the construction and maintenance of streets and public facilities, managing all related engineering services, and maintaining stormwater systems.

RELEVANT CITY DEPARTMENTS, PROGRAMS, PLANS, AND EXTERNAL ORGANIZATIONS

Recommended and Prohibited Tree Species List - A guide for which species of trees satisfy the tree planting requirement of the Tulsa Zoning Code.

<u>River Parks Authority</u> - An organization that aims to enhance community life through stewardship of parks and public spaces along the Arkansas River.

Sustainable Tulsa - A nonprofit organization in Tulsa that provides education, tools, and resources to inform and engage businesses and individuals in social responsibility, economic vitality, and environmental stewardship.

Tulsa Area Emergency Management Authority (TAEMA) - A government agency that ensures Tulsa will have the right infrastructure and procedures to prepare, mitigate, and recover from disasters.

Tulsa Authority for Economic Opportunity (TAEO) - The merger of five public entities to create a single, independent organization to lead the City of Tulsa's community and economic development efforts.

Tulsa Clean Cities Program - Tulsa's representation in a coalition with Department of Energy Clean Cities program to increase energy security, reduce fleet operating costs, and improve the environment by working locally to advance affordable, domestic transportation fuels, energy efficient mobility systems, and other fuel-saving technologies and practices.

Tulsa Fire Department - A department of the City of Tulsa that provides fire safety and paramedic services to Tulsa residents.

Tulsa Metropolitan Statistical Area (MSA) - A geographical area that consists of Tulsa and the surrounding counties that are linked by social and economical factors.

Tulsa Parks - A department of the City of Tulsa that aims to create, provide, and preserve quality parks and recreation opportunities that meet community needs for the health and wellbeing and for all Tulsans.

Tulsa Planning Office - A division of the Department of City Experience that administers the zoning and planning process for the City of Tulsa.

Tulsa Police Department - A department of the City of Tulsa that provides law enforcement and safety services to Tulsa residents.

<u>Water & Sewer Department</u> - A department of the City of Tulsa that manages, operates, and maintains the City's water and wastewater systems.

WindChoice - WindChoice is a renewable energy option through the Public Service Company of Oklahoma to power homes, businesses throughout the state, using wind to generate electricity.

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American Waste

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Community Engagement Activities

Resident Input Sessions Resident Input Survey Resident Input Emails and Phone Calls City Council-led Community Discussions Regarding Sustainability Sustainable Tulsa First Thursday Event OSU-Tulsa Environmental Sustainability Student Engagement

Existing Plans Reviewed and Incorporated

North Tulsa Brownfields Area Wide Redevelopment Plan River Design Overlay Sustainable Tulsa Plan Tulsa and West Tulsa Levee Feasibility Study Tulsa Parks and Recreation Master Plan Turkey Mountain Master Plan Urban Forestry Master Plan Hazard Mitigation Plan Small Area Plans

Selected City Metrics https://iopscience.iop.org/article/10.1088/1748-9326/aa5731/pdf https://www3.epa.gov/aircompare/ https://www.climatechangecommunication.org/climate-change-opinion-map/

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