



INFRASTRUCTURE
TEXAS
REPORT CARD

2021

ASCE
TEXAS SECTION



TEXAS GRADES



AVIATION
B-



BRIDGES
B-



DAMS
D+



DRINKING WATER
C-



ENERGY
B+



FLOOD RISK MITIGATION
C-



LEVEES
D



PARKS AND RECREATION
C-



HIGHWAYS AND ROADS
D+



SOLID WASTE
B



TRANSIT
B-



WASTEWATER
D

ABOUT THE GRADES

Infrastructure is graded based on eight criteria: capacity, condition, funding, future need, operation and maintenance, public safety, resilience, and innovation.



EXCEPTIONAL,
FIT FOR THE
FUTURE



GOOD,
ADEQUATE
FOR NOW



MEDIOCRE,
REQUIRES
ATTENTION



POOR,
AT RISK



FAILING/CRITICAL,
UNFIT FOR
PURPOSE

Contact Us: (512) 472-8905 | TexASCE.org | office@TexASCE.org



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2021 INFRASTRUCTURE TEXAS REPORT CARD



As civil engineers in the state of Texas, we have a responsibility to protect the health, safety, and welfare of the public. ASCE believes part of this responsibility includes providing the public and our elected leaders with critical information about the current state of our infrastructure—the backbone of Texas’ economy, which has grown to the 9th largest in the world. With this knowledge, the public will increase support for infrastructure improvement and maintenance and subsequently urge elected leaders to prioritize funding, so our vital infrastructure meets the current and future needs of all Texans.



AVIATION



Texas continues to be a geographically critical hub to the nation’s domestic and international passenger travel and air freight, boarding 90 million passengers and moving 5.8 million tons of cargo in 2019. Though the physical condition of the state’s airfield infrastructure is good overall, the increase in traffic from previous years puts strain on the aging system. Timely airfield pavement rehabilitation has occurred at airports through continued investments from the Federal Aviation Administration (FAA), the Texas Department of Transportation (TxDOT), and local municipalities. While airfield infrastructure is in good condition, too many airports around the state are overcrowded, cramped, and operate inefficiently at peak travel times due to outdated terminals and support facilities, including baggage and package handling systems. Six of Texas’ commercial airports rank in the top 50 nationwide for annual passenger enplanements with Dallas Fort Worth (DFW) International Airport as the 4th busiest and George Bush Intercontinental Airport as the 14th busiest. The aviation industry is changing in a variety of ways, driven largely by fluctuations in consumer behavior, expectations, and rapid shifts in the characteristics and structure of logistic supply chains. Texas’ general aviation airports serving private and small aircraft charter operations are a significant component of aviation infrastructure, conducting 5.7 million operations annually that generate \$9.3 billion in economic impact. Texas’ inevitable aviation change will need to be met with increased economic investments, ongoing airport redesign, capacity expansion, and service improvement projects throughout the state—leading to an estimated \$11.2 billion in airport infrastructure demands over the next 5 years.



BRIDGES



Texas maintains the largest bridge inventory in the nation, has the smallest percentage (1.3%) of structurally deficient bridges along with Nevada, and, according to TxDOT, achieves a level of safety where zero crashes are caused annually by poor bridge conditions. However, to accommodate Texas’ growth and continue this good standing, estimates show \$3.6 billion needed annually for bridges and culverts over the next 10 years, while \$18 billion is still needed over the same timeframe to erase the backlog of deficient bridges. Public initiative and legislative leadership led to the passing of Propositions 1 and 7 in 2014 and 2015, respectively, to raise funds, but heavier trucks, a growing population, and some bridges in flood-prone areas, exert increasing demand on the system, requiring continued priority and resources for maintaining and improving the state’s assets.



DAMS



Dams in Texas serve many purposes including recreation, flood risk mitigation, irrigation, water supply and fire protection, among others. About 1 in 3 of the state’s dams are for flood risk mitigation and 1 in 7 dams are for irrigation or water supply. Dams have great value and great consequence. The consequences of a dam failure far exceed the loss of a water supply or your favorite fishing hole. When a dam fails, the area downstream faces loss of life or property, or both. Of the about 7,200 non-federal dams in our state, approximately 25% could result in loss of life should they fail. Furthermore, underfunded and understaffed regulatory agencies impact dam safety and increase risk. More than 3,200 Texas dams are exempt from dam safety requirements by State legislation.

In 2019, the Association of State Dam Safety Officials estimated the cost to rehabilitate all non-federal dams in Texas at around \$5 billion. The Texas State Soil and Water Conservation Board estimates about \$2.1 billion is needed to repair or rehabilitate dams included in the Small Watershed Programs.



DRINKING WATER

Texas' drinking water sector has improved in the conservation, planning, management, and increases in State funding and financing support.



Texas' commitment to fund safe, adequate, and reliable drinking water is critically important for continuing growth and prosperity. Texas' population is projected to grow by more than 1,000 people per day—from 29.7 million in 2020 to approximately 51.5 million by 2070. Meeting these increasing water demands is imperative to the state's economy.

The Texas Water Development Board (TWDB) developed the first State Water Plan (SWP) in 1961 for Texas legislators. Updated every 5 years since 1992 and incorporating 16 regional water plans since 2002, the SWP guides state water policy. Current and anticipated shortages are addressed in areas with limited surface water supplies or areas concerned about groundwater resource conditions. Water conservation currently adds 1.07 million acre-feet per year of supply and is projected to increase by 140% by 2070. The total capital cost of water supply strategies identified in the 2017 water plan is \$63 billion with an expected \$26.8 billion funding gap to be filled by water utility revenues.



ENERGY

Two categories make up energy in Texas: oil & gas and electricity. Texas serves as an important hub for North America, leading the U.S. in oil & gas energy production, at more than 20% of nationally produced energy. Texas has established itself as the energy innovation capital of the world. Innovation has led to dramatic growth of oil production from about 1 million barrels per day in 2011 to over 5.4 million barrels per day in 2019. Texas energy contributed to US energy production being greater than consumption for the first time in 62 years. Building on the status quo will require continued innovative infrastructure investments to maintain Texas' global energy leadership position.



On the electricity front, the Electric Reliability Council of Texas (ERCOT) system is comprised of 46,500 miles of transmission lines and more than 680 generation resources. This infrastructure is sufficient to meet current demands. However, electricity demands in Texas have continuously increased and are expected to continue growing. Over the past decade, energy use in ERCOT increased by 20% due to a strong economy and population growth.



FLOOD RISK MITIGATION

Roughly 1 in 10 Texans are exposed to moderate or high annual riverine flood risks, which will increase as our population exponentially grows. Eliminating the riverine or coastal flood risks from extreme storm events is impossible, but local communities and state leaders are taking initiatives to reduce flood risks through better planning, improved asset management, and new bonding measures for funding flood risk mitigation infrastructure. Greatly influenced by the Governor's Commission to Rebuild Texas November 2018 report¹, in 2019 the Texas Legislature passed significant legislation initiating the State Flood Plan and increasing funding by over \$1.8 billion for new, statewide flood risk mitigation. The State identified three key pillars of comprehensive flood risk management: 1) mapping, 2) planning, and 3) mitigation. However, as documented in the TWDB 2019 Texas State Flood Assessment Report to the 86th Texas Legislature, the magnitude of Texas' need is significant, exceeding \$31.5 billion over the next decade.



¹ Eye of the Storm: Report of the Governor's Commission to Rebuild Texas, 2017

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HIGHWAYS AND ROADS



Texas' highway network is the nation's largest and critical to our economy. The State's economic growth depends on the efficiency, reliability, and safety of our highway system, supporting individual mobility, commerce, and industry needs. From 2015 to 2020, Texas' population grew by nearly 9% and roadway conditions saw modest improvements pointing to positive outcomes and a continued need for infrastructure expansion and updates. From 2010 to 2016, daily vehicle travel rose nearly 16%, resulting in many Texas motorists are seeing increased delays, limited roadway capacities, and deteriorating conditions. Auto commuters in Austin, DFW, and Houston face significantly more congestion than the national average. The average Texan spends 54 hours in traffic at a cost of \$1,080 annually.

However, current funding levels and resources from the state's gas tax are inadequate to keep up with Texas' projected growth, leaving a \$15 billion annual gap through 2040. While some of Texas' urban centers are seeing trail and bikeway improvements and voters supported transportation funding increases in 2014 and 2015, a continued, collaborative effort from the public, state legislators, and professionals is needed to "keep the foot on the gas" in guiding the state's roads in the right direction.



LEVEES



Many areas of Texas are protected by a system of levees, man-made structures that provide hurricane, storm, and flood protection. There is no state levee program, yet more than 1 million Texans and \$127 billion dollars' worth of property are protected by levees. The Texas 2018 Levee Inventory Report lists 327 levee systems total, including U.S. Army Corps of Engineers (USACE) and known non-USACE levee systems, extending a combined 567 miles and protecting a population of 999,000. Nearly 90% of the levees in Texas are constructed, inspected, and maintained by local governing agencies that oftentimes lack adequate resources for routine assessments. The average age of the state's levees is 47 years, while the national average is 56. Five levee systems (about 100 miles of levees) out of 41 assessed to date are classified as high to very high risk. Although levee failures in Texas are rare, increasingly frequent and intense storms have recently tested the capacity of the state's levees multiple times. Largely, condition-related data is unknown as most of the levees and the associated consequences from failure or poor performance is not well documented. More than 75% of Texas levee systems are without screened risk classification compared to 81% nationally. Without a clearer picture of the state's levee infrastructure and concerted funding to assist private owners, the vast majority of the state's levees will remain in the presumed deficient status, leaving it impossible to estimate needed funding.



PARKS AND RECREATION



Texas contains some of the most diverse public lands in the country, including 14 national parks and 88 state parks, covering 630,000-plus acres that showcase natural treasures, numerous county and city parks, and many community public green spaces. The Texas State Park System's funding includes multiple allocations and appropriations passed by the Texas Legislature. The Texas Parks and Wildlife Department (TPWD) is the state agency whose mission is to manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing, and outdoor recreation opportunities for the use and enjoyment of present and future generations. The TPWD Fiscal Year 2021 budget is \$444.6 million. These funds are required to adequately operate, maintain, and protect parks. Unfortunately, history shows funding is all too often diverted. Texans, however, passed Proposition 5 in 2019, ensuring that 100% of sporting goods sales tax helps fund TPWD and the Texas Historical Commission. Parks and green spaces energize communities and serve as retreat venues, creating memories and enjoyment of the outdoors. State parks serve as emergency shelters during crisis events, such as hurricanes and floods. Parks also preserve scenic natural treasures and conserve wildlife and their habitats, while allowing the public to enjoy recreational resources. With over 96% of Texas land privately owned, counties and cities depend upon donations to acquire properties and designate them for public use. Proposition 5 funding will help secure the future of local parks, state parks, and historic sites for generations to come. Dedicated park funding is extremely important given the \$800 million remaining in deferred maintenance projects.



SOLID WASTE

Texans generated approximately 40.2 million tons of solid waste in 2015. Per capita each Texan generated 8 pounds of solid waste per a day, significantly higher than the national rate of 4.5 pounds. That same year, the recycling rate in Texas was 23%, marginally below the national rate of 26%.



The United States Environmental Protection Agency (US EPA) delegates the authority to permit and regulate all solid waste facilities in the state to the Texas Commission on Environmental Quality (TCEQ). Solid waste management in Texas is provided by a combination of public and private entities. Texas has a reasonable amount of waste disposal capacity in reserve, with the statewide average of 51 years of capacity in reserve. However, continued population growth will result in an uneven distribution of Texas' reserve waste disposal capacity. While there are parts of the state that have robust recycling collection programs and access to infrastructure to divert material from disposal, there is a significant portion in both urban and rural areas without access to these programs. The application of new solid waste management technology and techniques is very limited in Texas and largely applies to only waste disposal operations, not recycling.

Unlike other infrastructure, solid waste does not receive funding from the Federal government. Texas collects tipping fees from each ton of waste disposed. A portion of these funds are retained in reserves. With a reserve balance of \$112 million, as of January 2020, Texas could fund more innovative and resilient solid waste management practices for public and private industries, stretching existing landfill capacity by increasing reserve spending.



TRANSIT

Public transportation (transit) infrastructure in Texas predominantly includes roadway vehicles like buses and vans, while rail lines serve some of the state's more densely populated areas, namely Austin, DFW, and Houston. From 2015 to 2019, reductions in asset failures were seen across the state with metropolitan transit authorities reporting an 8.9% reduction, urban transit systems a 7.1% reduction, and rural transit systems a 43% reduction. Although transit infrastructure provides safe and effective service—a trend that is expected to continue—the system competes with individually-owned vehicles and users' preference to drive themselves. However, public support for transit has contributed to growing networks of interconnected urban centers in DFW, Houston, San Antonio, and other areas. These expansions are driven by significant local funding for regional initiatives to match Federal grants, increasing the steady growth in capacity, service type, and system improvements. Maintaining services and expansions desired by Texans will continue to require increased local investment in transit infrastructure.



WASTEWATER

Texas has an escalating population that depends on the state's wastewater infrastructure to protect public health and the environment. Wastewater infrastructure includes a system of pipes to collect wastewater from homes and businesses and a network of treatment plants to clean the water before it is discharged to our rivers and bayous. The condition of these systems continue to decline, primarily because of their age. Federal and State funding is deficient, with a shortfall of more than \$200 million. Local resources for system expansions and planning are limited, and when tested by extreme events, many wastewater systems are not resilient. From 2016 to 2019, the number of sanitary sewer overflows (SSO) more than doubled from 2,500 to almost 6,000. Furthermore, some major municipalities have entered into consent decrees with the US EPA to address SSO. As wastewater system performance decreases, Texas' lakes, rivers, and beaches continue to suffer poor health due to ongoing threats from SSO. However, some initiatives are helping to curb the wastewater sector's downturn by increasing SSO reporting and incentivizing fiscal and technical training for Asset Management Program for Small Systems.



STEPS WE CAN TAKE



LEAD WITH VISION

Leaders from all levels—public and private—must come together to ensure investments are spent wisely and mechanisms are in place for maintenance, rehabilitation, and inspections. Identifying collaborative opportunities across state and federal programs, offering corporate partnerships, and removing the red tape between public/private partnerships will increase exposure for funding opportunities.



EDUCATE THE PUBLIC

Promote public education with all planned infrastructure projects. These outreach campaigns can also educate Texans about risk in flood prone areas, downstream of dams, or areas protected by levees. Educating the public on enhanced traffic safety protocols will result in fewer roadway accidents. Sponsoring education programs that focus on reducing solid waste, combined with recycling, will create a greener Texas, extending the life of landfills.



PREPARE FOR THE FUTURE

Leveraging material reuse, improved standards, and emerging technologies ensures infrastructure is resilient and sustainable. As more extreme weather events are anticipated, modernize guidance on resilience planning to include natural and engineered systems. Prioritize highways adaptable to new technology along with expansion of ports is critical to the flow of goods in Texas. Increased amounts of energy storage resources is a greener way to require new market rules ensuring the lights stay on.



MAINTAIN THE BALANCE

When considering local land use planning, the function of existing and new infrastructure must preserve the balance between the built and natural environments. Zoning and development reforms should be considered to improve strategic land planning. A blend of shovel ready and planning projects is recommended to show dedicated public dollars at work.



COLLECT AND UTILIZE DATA

Infrastructure designs need to consider environmental and climate impacts and future population growth. Using existing data and scientific projections can be key to providing the right infrastructure now and ensuring Texas remains a leader in climate adaptation. Increase the collection of data for the State's dams and levees to efficiently allocate available resources. Utilize the most recent information about rainfall patterns within a watershed to address future flooding concerns.



LEVERAGE ASSET MANAGEMENT

Streamline asset management across all infrastructure. This can be accomplished by communicating long-term needs by incorporating maintenance costs into the initial investment cost, while recognizing funding focused on security and safety, may also be warranted in the life cycle costs. Comprehensive risk assessments should be incorporated into the operations and maintenance for drinking water infrastructure.



INVEST NOW TO REALIZE DIVIDENDS LATER

Infrastructure needs increased and consistent investments at all levels or we jeopardize future growth, losing our status as an American economic powerhouse. Drinking water and wastewater investment is needed to reduce issues of non-compliance and update existing infrastructure. Significant investment is also needed for the State's flood plan and by increasing the Passenger Facility Charge, airports gain capital to support and improve infrastructure. An increased Fuel Tax or the like will allow state and local agencies to maintain and expand highways, bridges, and roads. Existing tax programs generate funds, such as the Sporting Goods Sales Tax for parks, and these funds should never be redirected.

About ASCE Texas

ASCE Texas Section is one of the largest and most active sections of the American Society of Civil Engineers. Established in 1913, the Texas Section represents nearly 10,000 members across Texas. Headquartered in Austin, the Texas Section unites 15 Branches, 7 Technical Institute Chapters, and 20 Student Chapters—including one at each major Texas university. ASCE Texas Section belongs to ASCE's Region 6, which includes the Mexico, New Mexico, and Oklahoma Sections. ASCE has 150,000+ global members. **We support & encourage the equitable opportunity for participation by all.**