An Overview of Transportation Data

Introduction

Transportation data is the foundation for informed policy decision making. Transportation data is collected and managed as an asset. These data provide insight into many different aspects of the transportation system, including:

- Transportation system assets and their physical condition.
- Safety, system operation, and performance.
- Travel behavior, demography, and modal data.
- Transportation economics, finance, and programming.
- Freight movement, volumes, and modes.
- Project planning and development.
- Public opinion data (to reflect attitudes and awareness).

For example, transportation system asset inventories and conditions of buses and bridges are collected and reported to the Federal Transit Administration (FTA) National Transit Database (NTD) and to the Federal Highway Administration (FHWA) National Bridge Inventory (NBI). State DOTs use their own systems to collect and report their data to relevant federal agencies. In Texas, these include the Texas Department of Transportation's (TxDOT's) PTN 128 (the transit database) and TxDOT's Bridge Inventory, Inspection and Appraisal Program (BRINSAP).

Historically, these databases have been collected, stored, and managed as separate systems. As geographic information systems (GIS) have evolved, many of the data sets have been available in internet-based GIS. TxDOT maintains the website http://gis-txdot.opendata.arcgis.com/ that contains a broad range of data sets (See Figure 1).

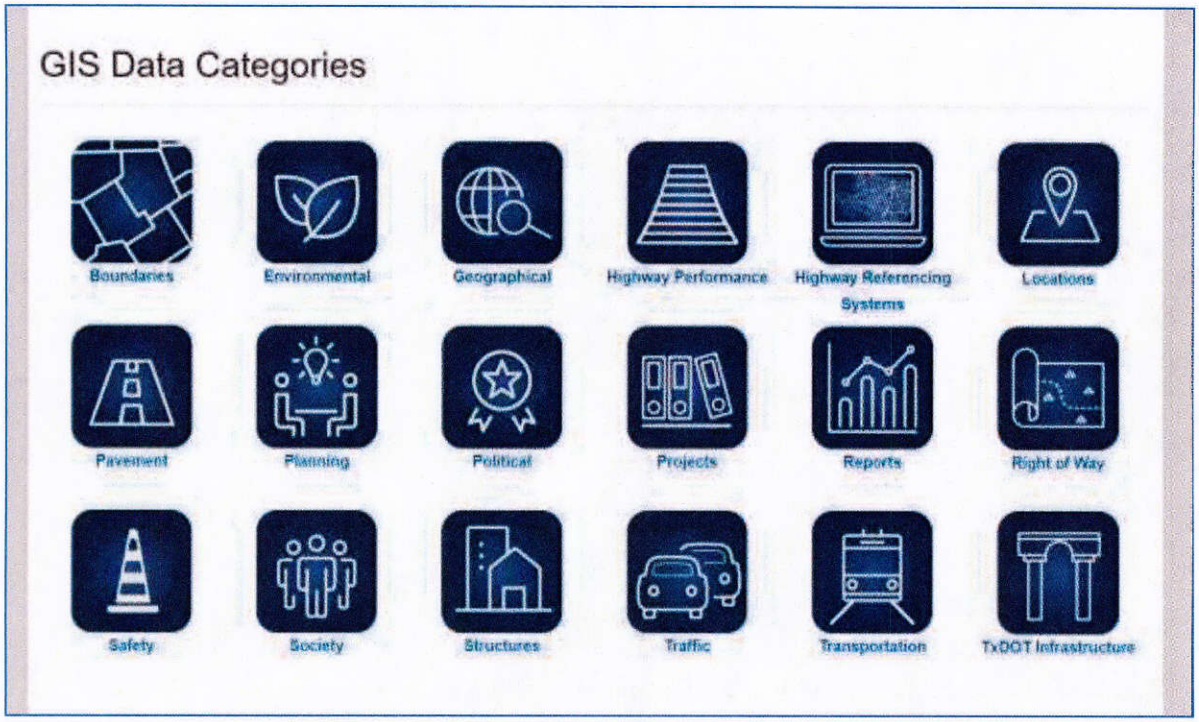


Figure 1. TxDOT GIS Categories from http://gis-txdot.opendata.arcgis.com/

The purpose of this brief is to provide an overview of the various transportation data requirements and current transportation public data sources. The brief concludes with an introduction to emerging trends that suggest opportunities for new data sources that will enhance research activities, including a discussion of emerging trends and Big Data.

Transportation Data Requirements

The most recent federal transportation funding authorization is the Fixing America's Surface Transportation Act (FAST Act). The FAST Act funds surface transportation programs—including, but not limited to, Federal-aid highways for fiscal years (FY) 2016 through 2020. Many of the data requirements, policies, and programs of the FAST Act are administered by the Federal Highway Administration (FHWA) and Federal Transit Administration.

The Moving Ahead for Progress in the 21st Century Act (MAP-21), the previous authorization enacted in 2012, also included data requirement provisions to support performance-based planning, improving safety, maintaining infrastructure condition, reducing congestion, and improving system performance and freight movement. FAST Act builds on the requirements from MAP-21 and includes, but is not limited to, the following databases:

- Highway Performance Monitoring System (HPMS).
- Travel Monitoring and Analysis System (TMAS).
- Vehicle Travel Reporting and Information System (VTRIS).
- National Bridge Inventory.
- Motor Fuels.

- State and Local Finance.
- National Household Travel Survey (NHTS).
- Tax Evasion.
- Motor Vehicles.
- Licensed Drivers.
- Certified Mileage.
- Toll Facilities.
- National Transit Database (NTD).

The FHWA Office of Policy Information (https://www.fhwa.dot.gov/policyinformation/) provides a comprehensive list of data sources, and reporting requirements and guides. The FTA maintains its National Transit Database (https://www.transit.dot.gov/ntd), which includes data sources, requirements, and guides for state and federal agencies.

Proper use of data is ensured through the use of standards, whether imposed structurally through the design of a data program or in a regulatory manner. Researchers conducted a review of Federal and Texas data standards, seeking to understand exactly what exists and at what level of detail, and how the standards help ensure the quality of the data sets in question, as well as credibility and clarity in reporting.

The review included data at both the federal and state levels, and the following elements were identified as essential for maintaining the value of data throughout its lifecycle, from compilation to archive, and especially for applications in policy studies:

- For data programs:
    - Standards specified through regulation should include proper citation on usage, to track the value of the data in all its applications.
    - Standards specified through compilation (i.e., in the construction of a data archive) should specify structure and content, as well as obtain meta-data on the methods and processes used to create the source data.
- When reporting data in research, include:
    - Data Source (including sponsor, study area, and collection time period).
    - Data collection methods.
    - Data processing steps (including rationale for including/excluding cases).
    - Data limitations (known strengths and weaknesses of the data).
    - Metrics and interpretive guidelines.

The Data Subcommittee of the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Planning has developed a set of core data

principles, included in **ATTACHMENT 1 on page 13**. These principles are intended to convey the importance of data in meeting information needs. More importantly, these principles convey the recognition that data is an asset and should be managed accordingly with respect to its availability, reliability, and clarity, and also its compliance with regulations. Benefits to employing such principles is that data is collected once and used for multiple purposes, and it is of the quality necessary to use in the decision-making process.

Examples of Texas Regulatory Data Requirements

Senate Bill 312 (2017, 85th Legislature) requires the Commission to adopt rules requiring TxDOT and Metropolitan Planning Organizations (MPOs) in the state to align their state and federal funding forecasts and project recommendation criteria for Performance Based Planning and Project Selection. The bill also requires the rules to govern the timelines and review process for the 10-year transportation plans, the TxDOT process for allowing MPOs access to relevant information for statewide transportation planning purposes, and the process for TxDOT collaboration with MPOs to regularly evaluate the data needed for a performance-based transportation planning and project selection system.

House Bill 3275 (2017, 85th Legislature) requires the Department of Information Resources (DIR) to include in its annual report on major information resource projects the current status of each major information resource project for all state agencies. HB 3275 requires the quality assurance team (QAT), which is composed of representatives from the Legislative Budget Board (LBB), the State Auditor's Office and DIR, to approve and review major information resource projects. The QAT is also required to monitor and report on performance indicators for each project, including schedule, cost, scope and quality for the entire life cycle of each major information resource project. The bill requires DIR, by rule, to develop the performance indicators the quality assurance team is required to monitor. HB 3275 requires DIR, in adopting rules, to consider applicable IT industry standards.

House Bill 20 (2015, 84th Legislature) requires changes be made to several of the planning and programming processes that the Commission, TxDOT, and "planning organizations" use to prioritize and finance transportation projects. These changes call for measures and metrics related to the following:

- Projected improvements to congestion and safety.
- Projected effects on economic development opportunities for residents of the region.
- Available funding.
- Effects on the environment, including air quality.
- Socioeconomic effects, including disproportionately high and adverse health or environmental effects on minority or low-income neighborhoods.
- Any other factors deemed appropriate by the planning organization.

Senate Bill 279 (2013, 83rd Legislature) requires Texas state agencies to provide the Department of Information Resources (DIR) with a link and description for their open data set(s) to

Texas.gov. Specifically, the act calls for all Texas agencies (including TxDOT) to have available via internet link certain data sets. TxDOT must provide additional reports as directed by the legislature and the Transportation Code:

In accordance with Section 201.810, **ATTACHMENT 2 on page 17** is a consolidated listing of reports produced by TxDOT in compliance with various provisions of the Transportation Code. This table provides the following data attributes as required by Texas State Code: **title, purpose, release year, and document format.**

Examples of Federal Data Requirements

The Federal Highway Administration's (FHWA's) Office of Highway Policy Information produces a series of annual reports called the Highway Statistical Series, which contains analyzed statistical information on various highway-related topics and issues. Topics include motor fuel, driver licenses, highway user taxation, highway mileage, travel, and highway finance.[1]

The FHWA, in consultation with the states, designed a series of **reporting forms** for states to consistently and uniformly account for the collection of transportation data related to highway use and funding. The FHWA uses these state reporting forms to compile statistics. According to the FHWA website, each state's data is analyzed for completeness, reasonableness, consistency, and compliance with data reporting instructions contained in *A Guide to Reporting Highway Statistics,* which provides guidance and procedures for reporting state motor-fuel, motor-vehicle, driver-license and motor-carrier data, as well as highway finance data of state and local governments.[2] State departments of transportation (DOTs) are asked to obtain and forward the following information:

- Supplemental tabulations concerning motor fuel, motor vehicles, and driver licenses.
- Miscellaneous traffic data.
- State executive budgets.
- Certain published reports.
- State highway and taxation laws.
- Reports of special transportation authorities.

Data collected using this process is analyzed, and the resulting reports are used to develop highway legislation and to keep Congress and State governments informed. Additionally, the resulting reports are used in the development of FHWA national tables and other publications, and they aid in highway planning, programming, budgeting, forecasting, and fiscal management. A list of "cross checks" is employed to ensure the information reported is consistent among the various forms. See **ATTACHMENT 3 on page 22** for an example of FHWA's provision of federally mandated data and reporting.

Transportation Data Sources

TxDOT OneDOT Data Shop

Various transportation-related data sets TxDOT utilizes in planning and decision-making are found on their web page titled "OneDOT Data Shop." Figure 2 shows the access page for the OneDOT Data Shop. The site is an example of a state effort to provide inventory information about its public data sets. It provides a set of basic identifying information about each data set, similar to that found in the statutory reports in the previous section. The OneDOT Data Shop website provides the following:

- Title.
- Description.
- Contact person.
- Source.
- Update frequency.

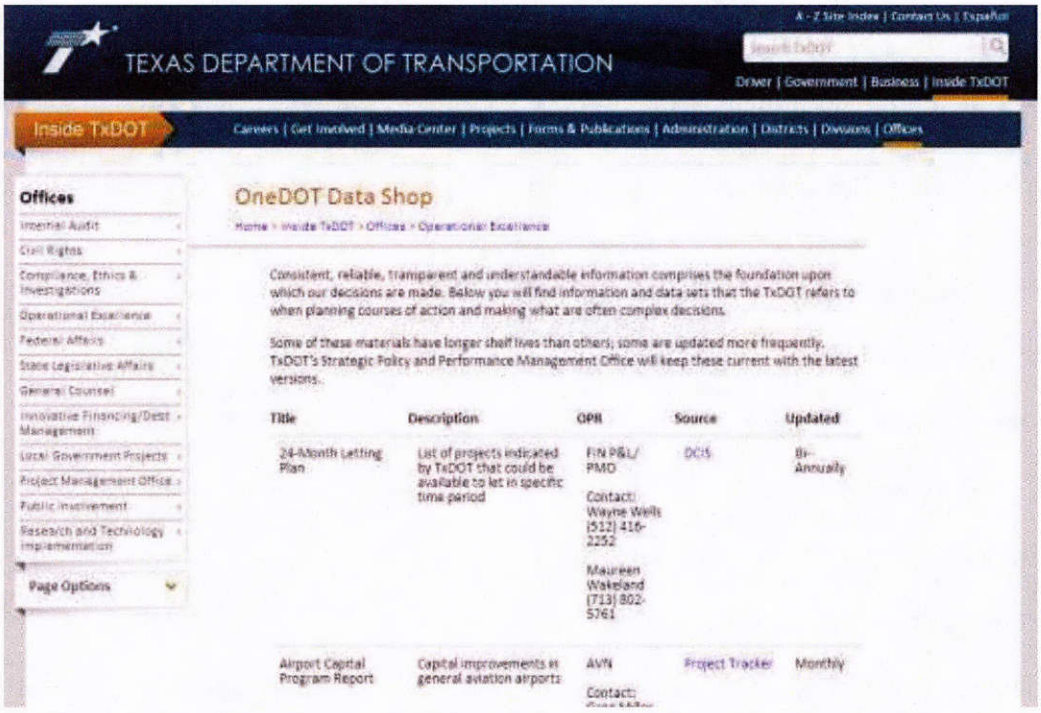


Figure 2: Access Page for OneDOT Data Shop. Source: http://www.txdot.gov/inside-txdot/office/excellence/one-data.html

TxDOT's Strategic Policy and Performance Management Office oversees the timeliness of the information by updating the website with the latest versions. **ATTACHMENT 4 on page 23** shows a sample of the files of transportation-related topics available for review and download.

Statewide Planning Maps

The Statewide Planning Map application contains a wide range of planning and geographic data. The site is available at http://www.txdot.gov/apps/statewide_mapping/StatewidePlanningMap.html. This TxDOT map application includes data for the following:

- Council of Governments (COG).
- Control Sections.
- Future Traffic Estimates.
- Highways.
- Imagery.
- Legislative and Congressional Boundaries.
- Metropolitan Planning Organizations (MPO).
- National Highway System.
- Planned Projects.
- Railroads.
- Texas Trunk System.
- Traffic Counts.

Roadway Inventory

TxDOT annually publishes its roadway inventory data in a variety of common GIS and tabular formats. Data includes GIS linework and all roadway inventory attributes. TxDOT submits this data annually to the FHWA as part of the Highway Performance Monitoring System (HPMS) program. See: http://www.txdot.gov/inside-txdot/division/transportation-planning/roadway-inventory.html.

Traffic Count Database System

TxDOT's Traffic Count Database System (TCDS) provides searchable and downloadable current and historical traffic count data for roadways on the state system. It allows you to upload data from a traffic counter; view graphs, lists, and reports of historic traffic count data; search for count data using either the database or the Google map; and print or export data to your desktop. Available at: http://txdot.ms2soft.com/tcds/tsearch.asp?loc=Txdot&mod=

Crash Records Information System (CRIS)

The following is as an example of how data standards ensure high quality and high value data, highlighting an important data set to many agencies and researchers across Texas and the United States.

As per Texas Transportation Code Chapter 550, TxDOT is responsible for the collection and analysis of crash data submitted by Texas law enforcement officers on form CR-3, Texas Peace Officer's Crash Report. TxDOT maintains a statewide, automated database for reportable motor vehicle traffic crashes received by TxDOT.

Motor vehicle crash data are some of the more frequently cited statistics, not only in Texas, but throughout the nation. In Texas, the Crash Records Information System (CRIS) is the repository for this data. CRIS is an automated database used to compile and track crash data statewide. In 2007, the 80th Texas Legislature transferred data collection responsibilities from the Texas Department of Public Safety (DPS) to TxDOT.

The TxDOT CRIS Public Interface contains all the data collected from the Texas Peace Officer's Crash Report (CR-3) that may be released to the public as per Texas Transportation Code (TTC) 550.065.[3] All crash records include the CR-3 data and interpreted data fields. Roadway attributes and location-specific data for crashes occurring on the state highway system are also appended to each crash record.[4] As such, TxDOT is responsible for the collection and analysis of traffic crash data including:

- Collecting and maintaining crash reports submitted by law enforcement and drivers.
- Classifying traffic crashes in accordance with national standards.
- Entering the information from each report into CRIS.
- Providing copies of crash reports as requested by the public.[5]

The network for reporting traffic fatalities in Texas is complex, and standards are critical for ensuring the capture of high quality data. Law enforcement officers at the scene gather information about the crash. Other entities must also report in certain circumstances, including a statutory requirement for medical examiners and justices of the peace to report information related to alcohol-involved fatal crashes. This information is important to support consistent reporting and research related to impaired driving across the multiple (13) medical examiner offices; 900 justices of the peace (JPs); and one DPS Crash Records Bureau.

In 2006, the Texas A&M Transportation Institute (TTI) conducted a study on the reporting of crash data by JPs. A survey revealed that 53 percent of JPs were unfamiliar with the reporting requirement, and 28 percent were not aware such laws existed. Additionally, some 62 percent of medical examiner offices failed to comply with the law. The study's results helped inform concerned lawmakers, and House Bill 423—which clarifies reporting responsibilities and requirements—passed the Texas Legislature in June 2007. According to the author of the bill, its purpose was to ensure accurate data for the implementation of necessary life-saving measures.[6]

Since 2007, TxDOT has continued to build and develop CRIS into a comprehensive electronic crash data system.[7] In 2011, TxDOT implemented the Crash Reporting and Analysis for Safer Highways (CRASH)[8] internet application to speed up the transfer of motor vehicle crash data from law enforcement agencies to TxDOT. CRASH collects the Texas Peace Officer's Crash Reports (CR-3) electronically. Use of CRASH allows for faster and more efficient submission of data from the office or a patrol car. Quality of data entry is ensured through CRASH training, which is scheduled as part of the set-up process for each agency.[9] The CRASH system includes the following features:

- Ability to enter crash data over any Internet connection.
- Process supplement reports easily.
- Integrated diagramming tool.
- Auto population of fields.
- Touch screen capability for Toughbooks.
- Use of intersection templates.
- Embedded help.

Emerging Trends and Big Data

Big Data has different meanings to different people but could typically be used to describe data sets so large and complex that they become difficult to process and store using traditional statistical analysis and database software. Data sets of this magnitude and complexity are proliferating in part because data is increasingly being continuously gathered by ubiquitous information-sensing mobile devices, GPS devices, remote sensing technologies, software logs, cameras, microphones, radio-frequency identification readers, and wireless sensor networks. Examples of Big Data sources in transportation research include probe data, GPS data, Bluetooth sensors, mobile devices, and cameras.

Big Data is notable because of its relational nature to other data. Due to advances in storage capacity and analytics that have allowed researchers to mine and aggregate data to degrees that were not previously possible, Big Data is fundamentally networked. Its value comes from the patterns that can be derived by making connections between pieces of data about an individual unit, about units in relation to others, or about groups of units.[10] With the application of the right analytical tools, researchers can use this inherent relational nature to find unexpected connections and correlations, which can help to make much more accurate predictions about the future. One Big Data application in Texas is the use of probe data to understand congestion. Private sector data providers compile cell phone and in-vehicle GPS data to describe traffic patterns across time and geography. The individual unit of data here is the vehicle documented on a roadway segment. When combined, these allow the comparison of traffic patterns on that corridor to those of other corridors, and further aggregation provides understanding about congestion trends across different groups of roadways or regions.

Relation to Specific Policy Topic Areas

Big Data is applicable to all transportation policy topic areas, but it is uniquely linked to the *technology* policy area. The advancement of information-sensing and wireless technologies has opened up a flood of new data sources. Understanding and accessing these technologies is a major focus of research.

Big Data and technology are also integral to understanding the emerging trends in *congestion*. Current research in Intelligent Transportation Systems is working towards the development of environments that support the collection, management, integration, and application of new data sources originating from connected travelers, connected vehicles, and the infrastructure itself. In the near future, active acquisition and systematic provision of this integrated, multi-source data will enable enhanced operational practices and transform future surface transportation systems management. The real-time acquisition of data, such as vehicle and truck status, infrastructure status, weather, and transit data, will enable coordinated real-time deployment of dynamic traffic management strategies, such as transit signal priority, route guidance, signal phase and timing adjustments, travel information, and variable speed limits.[11] In order to support such a dynamic traffic management program, FHWA is considering the replacement of traditional static databases of well-organized research with a cloud-based Research Data Exchange (RDE) concept that supports real-time feeds and facilitates stakeholder interaction.

In the realm of *public engagement*, the development and expansion of social media and integrated social networks presents a new source of Big Data that can be used in research. Historically, it has been a major challenge to elicit high levels of public participation or feedback in the planning process. Social media outlets represent one tool that can supplement traditional public outreach methods and offer access to a huge and relatively untapped collection of information. Social networks provide another way to access public opinion; they allow public agencies to present information, elicit input from the public, and actively involve citizens in a planning process with the potential to reach not only a broader audience, but new audiences. While micro-participation can provide nearly real-time access to public opinion, researchers point out that analysis techniques are undeveloped and labor-intensive, and the most effective use of the resulting data is still unclear.[12]

The emergence of Big Data sources is an overarching theme for *transportation data*. Combining multiple data sources from disparate realms leads to innovative insights. For example, researchers participating in a recent challenge led by the Big Data Initiative at the MIT Computer Science and Artificial Intelligence Lab are drawing on data sets as varied as transit ridership, local events, social media, weather records, and more than 2.3 million taxi rides in order to develop new tools to predict demand for taxis in downtown Boston.[13] The connections and correlations discovered from this aggregation of previously disparate types of data can point out potential policy solutions that can have wide-ranging effects across multiple types of problems.

Anticipating and understanding new data sources is not only a necessity for innovative solutions to policy problems, but it can also bring about the more efficient allocation of public funds. Passive data collection from probes, GPS, Bluetooth sensors, mobile devices, and cameras can replace traditional travel survey methods, reducing public agency costs. Similarly, insights gained about travel behavior from new Big Data sources can enable the more effective use of public funds. For example, analysis of the detailed travel behavior information gathered from GPS and mobile devices can serve to better prioritize traffic management projects.

Big Data Limitations

While policy makers should be aware of the opportunities presented by Big Data, it should not be mistaken as a replacement for more traditional research activities. Big Data does not equal *whole* data. For example, TxDOT conducts travel surveys that rely on random samples to document detailed travel patterns of households within a region, including time of day of travel, travel mode, trip purpose, and the demographic characteristics of who makes those trips. These travel surveys are used to create snapshots of daily travel that are used in developing traffic forecasts to guide investment decisions. These are relatively small samples of households (1,500–2,000 households on average).

In comparison, Big Data (in the form of traffic probe data) is available from private data providers who collect cell phone data traces from certain carriers and combine that with in-vehicle GPS data from other data sources to provide billions of records for travel along a specific corridor. This data is anonymized, so demographic characteristics are unknown, as are trip purpose and travel mode. So this Big Data provides millions of pieces of data obtained from certain carriers and vehicle manufacturers to provide information about a corridor that is used for congestion management, while travel survey data provides a random sample (statistically valid) of travel across the entire region for general planning purposes. The two sources of data complement each other to support transportation planning efforts, and each on its own is limited with respect to answering specific questions.

The potential data explosion due to these new forms of data will likely over-burden the conventional computational and storage systems of many agencies. The capture, transmission, cleaning, and storage of large volumes of data must be handled through innovative means to avoid incurring substantial costs. One potential tool for handling a large increase in electronic information is cloud computing. The availability of cloud computing resources opens up possibilities for more users to transition to purchasing access to computing power and storage space as a service instead of maintaining it themselves. This way, providers are responsible for the performance, reliability, and scalability of the computing environment, while users can concentrate on data analysis and production.[14] The FHWA is currently developing a cloud-based Research Data Exchange (RDE) concept that supports real-time data feeds from multiple, heterogeneous sources and facilitates stakeholder interaction. Other researchers have developed systems for managing heterogeneous, distributed sensor networks in which storage and computing are combined into one platform.

Big Data is also of limited use to organizations that do not possess the advanced analytic capabilities necessary to properly interpret it. Real-time processing systems similar to the Regional Transportation Commission of Southern Nevada's Freeway Adherence System for Transportation (FAST) dashboard are successful responses to this need. Hurdles related to data formats and frequency already exist with current data. The magnitude of Big Data sources may exacerbate this problem.

Attachment 1: AASHTO Standing Committee on Planning Core Data Principles (as of June 30, 2014)

The Data Subcommittee of the AASHTO Standing Committee on Planning developed the following Core Data Principles. The intention is to connect these core data principles to regulations where applicable and to serve as a standard across the transportation data community.

Core Data Principles

Principle 1 - VALUABLE: **Data is an asset**—Data is a core business asset that has value and is managed accordingly.

Principle 2 - AVAILABLE: **Data is open, accessible, transparent and shared**—Access to data is critical to performing duties and functions, data must be open and usable for diverse applications and open to all.

Principle 3 - RELIABLE: **Data quality and extent is fit for a variety of applications**—Data quality is acceptable and meets the needs for which it is intended.

Principle 4 - AUTHORIZED: **Data is secure and compliant with regulations**—Data is trustworthy and is safeguarded from unauthorized access, whether malicious, fraudulent or erroneous.

Principle 5 CLEAR: **There is a common vocabulary and data definition**—Data dictionaries are developed and metadata established to maximize consistency and transparency of data across systems.

Principle 6 - EFFICIENT: **Data is not duplicated** —Data is collected once and used many times for many purposes.

Principle 7 - ACCOUNTABLE: **Decisions maximize the benefit of data**—Timely, relevant, high quality data are essential to maximize the utility of data for decision making.

The following are supporting discussions for each principle.

Principle 1: **Data is an Asset**

- Rationale—Data is a core industry asset that has measureable value and is managed accordingly. Accurate, timely data is critical to accurate, timely decisions. Transportation agencies already manage many of their physical assets: roads, bridges, signs, lights, etc. Data is no different and must be treated like other physical assets. Data is the foundation of our decision-making, so we must also carefully manage and maintain data to ensure

that we know what we have and where it is, can rely upon its accuracy, and can obtain it when and where we need it. Where possible, data should be archived to maintain historical records.

- Implications— Treating Data as the asset that it is saves money, effort, and resources. When data is appropriately handled, it can have a long life with many uses beyond its original one, and serve projects yet to be planned.

Principle 2: **Data is open, accessible, transparent, and shared**

- Rationale—The value of data is increased when it can be used with other data and in a variety of applications. Users must have access to the data critical to their duties and functions. Wide access to data leads to efficiency and effectiveness in decision-making, and affords timely responses to information requests. Using data must be considered from an enterprise perspective (across the organizations or across multiple organizations) to allow access by a wide variety of users. Transportation agencies at all levels of government (federal to state to local) hold a wealth of diverse data sets, but it is often stored in different databases that are incompatible with each other or difficult to find. Timely access to accurate data is essential to improving the quality and efficiency of decision-making. It is less costly to maintain timely, accurate data and then share it, than it is to maintain duplicative data in multiple locations or processes. Shared data will result in improved decisions since we will rely on fewer sources of more accurate and timely managed data for decision-making. Sharing is also necessary to triangulate on subjects that may not be measured directly, and allows for serendipity. Insights often come from bringing fresh eyes to data. As transportation organizations work with more stakeholders and external partners, it is essential that data be shared. Making data electronically available will result in increased efficiency when existing data entities can be re-used. It is more effective to de-protect transportation data than it is to over-protect.
- Implications—Agencies are increasingly under an informal mandate to "do more with less." Sharing data is a key step in executing this mandate. Accessible data will ultimately reduce burdens on staff time as data becomes more accessible.

Principle 3: **Data quality is fit for purpose**

- Rationale—Data quality is acceptable and meets the need for which it is intended. Data that is collected, produced, and reported must be fit for purpose. That is, of sufficient accuracy and integrity proportional to its use and cost of collection and maintenance. Data is used in all areas of the transportation decision-making process from planning to design to operations to performance management. Furthermore, it is increasingly being used externally by citizens and customers to inform their personal decisions, and by stakeholders to assess the aggregate performance of a transportation organization. Significant human and system resources are consumed in the collection, manipulation and dissemination of data whether of high quality or not, so it is essential that the most

effective use of public funds is achieved through appropriately directed attention to data quality and the procedures to realize quality. Additionally, data must be archived appropriately to preserve both its usefulness and the historical record. When possible, data should be spatially oriented. Data quality increases as the application of the data increases. Data that has spatial orientation or attribution can easily be used in GIS systems. When data assets can be analyzed in a spatial context, not only can a greater analysis be completed in terms of geographic context, but also the data and any analysis results can be more easily communicated via mapping and other formats more applicable to public understanding.

- Implications—When data is fit for purpose, appropriate cost decisions are made in its collection and use. In cases where a rough sketch is appropriate, appropriate data collection and use may follow. Where large programs, investments, or systems are being developed and vetted, those data must be fit for that purpose. Data precision is matched to the task at hand.

Principle 4: **Data is secure and compliant with regulations**

- Rationale—Data is trustworthy and is safeguarded from unauthorized access, whether malicious, fraudulent, or erroneous. Open sharing of information and the release of information via relevant agreement must be balanced against the need to restrict the availability of classified, proprietary, and sensitive information.
- Implications—When data is secure and appropriately regulated, there is greater trust and confidence in its use.

Principle 5: **There is a common vocabulary and data definition**

- Rational—Both unstructured and structured data must have a common definition to enable sharing of data. However, data must not be compromised below the use of its original purpose. Commonality may take the form of relations, bridges and crosswalks between definitions.
- Implications—A common vocabulary will facilitate communications, enable dialogue to be effective, and facilitate interoperability of systems; however, utility must not be compromised.

Principle 6: **Data is not duplicated**

- Rationale—Development of information services should be made available to multiple users and stakeholders and is preferred over the development of information and data silos, which are only used for a single purpose or user.
- Implications—Duplicative capability is expensive and propagates conflicting data. It also goes against a policy of sustainability in the use of data and the infrastructure resources required to maintain the data, such as computer servers and data warehouses.

Principle 7: **Decisions maximize the benefit of data**

- Rationale—The purpose of data collection is to help support the decision-making process. Users of the data, as well as information derived from the data, are the key stakeholders in the data collection and analysis process. The data is being collected to address a certain policy goal or objective. In order to ensure information management is aligned with the purpose, users must be involved in the different aspects of the information environment. The decision makers, managers, and the technical staff responsible for developing and sustaining the information environment need to come together as a team to jointly define the goals and objectives of the data collection processes.
- Implications— Resources are limited. Maximizing existing resources is essential.

Attachment 2: TxDOT Reports

Transportation Code Provision	Title and Purpose	Report Date	Format
§51.007	**Gulf Intracoastal Waterway Report** Evaluates impact of Gulf Intracoastal Waterway on state; may include legislative recommendations.	2016	
§55.008	**Port Capital Program** Describes goals and objectives of department's Port Authority Advisory Committee concerning development of port facilities and state's intermodal transportation system.	2017-2018	
§201.107	**Annual Financial Report** A complete and detailed written report accounting for all funds received and disbursed by the department during the preceding fiscal year.	2016	HTML
§201.108	**Department Audits** Annual and periodic audits conducted by the department's Audit Division or contract auditors.	2016	HTML
§201.114	**Border Trade Advisory Committee Report** International trade and transportation planning; post-2010 reports to include maritime ports.	2017	
§201.207	**Cross-Border Transportation and Infrastructure Report** Summary of information obtained in meetings between department staff and their counterparts in the United Mexican States about issues relating to truck inspections and transportation and associated infrastructure.	2017	
§201.402	**Equal Employment Opportunity (EEO) Policy Statement** Ensures TxDOT adheres to EEO policies and procedures.	2016	

§201.601	**Statewide Transportation Plan** The 'Statewide Long-Range Transportation Plan 2035' serves as the state's 24-year "blueprint" for the planning process. Updated at least every four years, it guides collaborative efforts between TxDOT, local, and regional decision-makers, and other transportation stakeholders.	2015	https://www.txdot.gov/inside-txdot/division/transportation-planning/statewide-plan.html
§201.601(e)	**Annual SLRTP Progress Report** Annual analysis of department's progress in attaining long-term goals in Statewide Long-Range Transportation Plan.	2016	
§201.6011	**Border, Corridors, and Trade** The Border Corridors and Trade Report provides an update of Texas' trade, infrastructural projects, funding sources, studies, programs and other planning activities and initiatives in compliance with requirements set forth in sections 201.114 and 201.6011 of the Texas Transportation Code and Rider 14(a) of the General Appropriations Act (83rd session – HB 1).		
§201.6013	**State Passenger Rail Plan** Long-term plan for statewide passenger rail system. Includes description of existing and proposed passenger rail systems, status of systems under construction, analysis of potential interconnectivity difficulties, ridership projections for proposed projects, and statistics for existing systems.	2016	
§201.616	**Transportation Program Expenditures** Provides expenditure information on Unified Transportation Program (UTP), turnpikes, bonds, Regional Mobility Authorities (RMAs), and certain rail facilities.	2016	

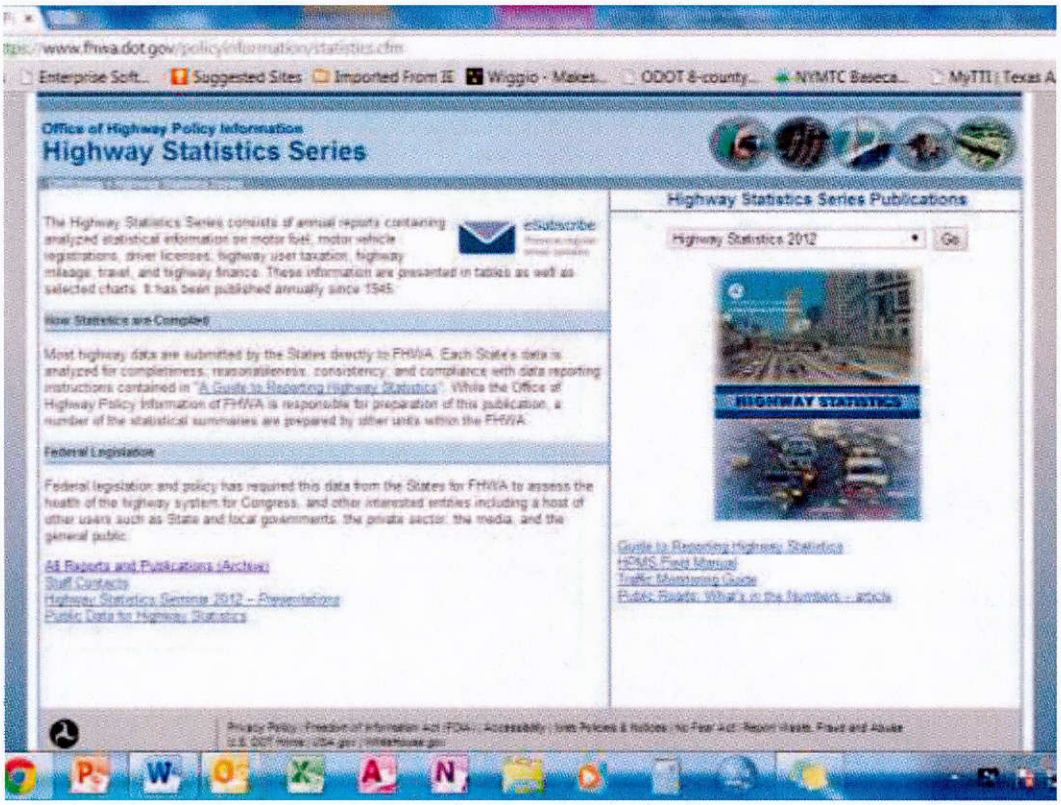
§201.762	**Environmental Review Process Reports** Documents implementation of streamlined environmental review process, including status report for preceding 12-month period.	2016	
§201.805(a)	**DISCOS (Statistical Comparison of Districts)** Provides a broad range of transportation-related statistics calculated on a per-capita basis for each of the state's 254 counties and 25 TxDOT districts.	2016	HTML
§201.805(c)	**Status of Texas Mobility Fund** Provides amount of money in Texas Mobility Fund by source and amount of money received by department itemized by source of funds vs. appropriated funds.	2016	HTML
§201.805(d)	**Outside Consultant List** List of TxDOT's contracts with Public Relations firms.	2016	
§201.806(a)(2)	**Texas Motor Vehicle Crash Statistics** Statistical information about the number, cause, and location of crashes, including information about number of accidents involving injury to, death of, or property damage to bicyclists or pedestrians. Provides electronic access to data.	2016	HTML
§201.807(b)	**Project Information Reporting System** Contains information about each department project, including: project status; each source of funding; benchmarks for evaluating progress; timelines for completion; list of department employees responsible for project with contact information; and results of annual review.		HTML
§201.808	**Expenditure Priorities Reporting System** Includes reports that evaluate effectiveness of TxDOT's expenditures on transportation projects to achieve certain transportation goals.		HTML

§201.809	**Statewide Transportation Report** Includes information about progress toward each long-term transportation goal identified in statewide transportation plan; status of individual projects identified as major priorities; summary of number of statewide project implementation benchmarks completed; and information about accuracy of previous department financial forecasts.	2014	
§201.811	**Public Involvement Policy** Policy targets different groups and individuals; encourages continuous contact between TxDOT and outside persons throughout the transportation decision-making process.		HTML
§201.991 and 201.992	**Unified Transportation Program and Annual Update** Unified Transportation Program covering a period of 10 years to guide development of transportation projects and authorize their construction. Identifies target funding levels and lists all projects that the department intends to develop or begin construction of during program period.	2017	HTML
§201.993	**Annual Funding and Cash Flow Forecast** Forecast of all funds TxDOT expects to receive, including funds from this state and the federal government used to guide planning for the Unified Transportation Program.	9/2016	
§201.998	**Department Work Program** Consistently-formatted work program for each of TxDOT's 25 districts based on Unified Transportation Program. Covers four-year period and contains all projects that the district proposes to implement during that period. Includes progress report on major transportation projects and other district projects.	2014	
§222.053(e)	**Economically Disadvantaged County Program** Report on program that enables	2016	HTML

	the Texas Transportation Commission to adjust the minimum local matching funds requirement for certain transportation projects after evaluating the local government's effort and ability to meet the requirement.		
§223.042(f)	**Highway Maintenance Contracting** Details of TxDOT's highway maintenance privatization contracts awarded during previous fiscal year.	2017	HTML
§455.001 (4)	**Comprehensive Master Plan for Public Transportation** The department currently helps local public transportation agencies develop public transportation plans on a regional basis. Currently, copies of the various regional plans are not posted on the TxDOT website but are available at the accompanying link to the Regional Service Planning website.	2006	HTML
§456.008	**Texas Transit Statistics** Report on performance of public transportation providers receiving any state or federal funding.	2016	HTML
§707.004	**Red Light Cameras - Annual Data Reports** Annual compilation of reports from local authorities that operate camera systems. Includes number and type of traffic accidents at camera-monitored intersections.	2016	HTML

Source: TxDOT website, page titled, "Statutory Reports." Located at http://www.txdot.gov/government/legislative/state-affairs/reports.html.

Attachment 3: FHWA Office of Policy – Highway Statistics Series



Source: https://www.fhwa.dot.gov/policyinformation/statistics.cfm

Attachment 4: Sample of OneDOT Files Available for Download

Title	Description	Contact	Source	Updated
Airport Capital Program Report	Capital improvements in general aviation airports	AVN Contact: Greg Miller (512) 417-4525	Project Tracker	Monthly
Bridge Status Report	Percentage of state bridges in a given condition	BRG Contact: Kelly Breazeale (512) 416-2278	Percent of Bridges in Good or Better (Sufficient) Condition Statewide	Bridge Status Report
Construction Index / Rate of Inflation	A weighted index of the cost of highway construction components	CST Contact: Mason Adam (512) 416-3470	Highway Cost Index	Monthly
Disadvantaged Business Enterprise (DBE) Activity	Report on DBE activity by TxDOT furnished to FHWA	OCR Contact: Eli Lopez (512) 486-5511	Semi-Annual Report of DBE Awards & Commitments	Semi-Annually
TxDOT Expenditures by Category (Graphic Report)	Annual summary of use of funds	FIN Contact: Mary Meyland (512) 416-2260	TxDOT Strategic Plan (Page 12)	Annually
Federal Rate of Return	Determine the expected ROR on federal motor fuels taxes collected from TX to assist in managing the State HWY Fund cash flow and project planning	FIN Contact: Trey Lusk (512) 486-5587	FHWA Highway Statistics (HDF Report)	Annually
TxDOT Performance	Multiple measures of TxDOT performance as related to strategic goals	SPPM		Annually
TxDOT Toll Road Revenue and Expenditure Rpt.	Financial data on TxDOT toll roads	TTA		Annually
Transportation Project Status	On-time and on-budget statistics	PMO Contact: Maureen Wakeland (713) 802-5761	Project Tracker	Monthly
Texas Transportation System Attributes	Various measures of the transportation system	TTP	Pocket Facts	Annually
Transportation System Operations	AADT highway, ridership rail, transit, aviation, ferry	TTP	Pocket Facts	Annually

Source: Texas Department of Transportation. "OneDOT Data Shop." Accessed December 4, 2013. http://www.txdot.gov/inside-txdot/office/excellence/one-data.html

Author

Kristi Miller

Publication Date

February 2018

References

1 *Highway Statistics Series*. USDOT. Federal Highway Administration. Office of Highway Policy Information. http://www.fhwa.dot.gov/policyinformation/statistics.cfm Accessed December 10, 2013.

2 *A Guide to Reporting Highway Statistics*. USDOT. Federal Highway Administration. Office of Highway Policy Information. http://www.fhwa.dot.gov/policyinformation/statistics.cfm Accessed December 10, 2013.

3 *CRIS Automated Interface Guide –Register Users, Create Interface Request, Reset Password.* Texas Department of Transportation, June 27, 2013. http://ftp.dot.state.tx.us/pub/txdot-info/trf/crash_statistics/automated/cris-guide.pdf Accessed December 2, 2013.

4 *CRIS Automated Interface Guide –Register Users, Create Interface Request, Reset Password.*

5 "Crash Reports and Records." *Safety and Laws*. Texas Department of Transportation. Accessed December 2, 2013, http://www.txdot.gov/driver/laws/crash-reports.html

6 "Legislature Clarifies Reporting Requirements for Fatal Crashes," *Texas Transportation Researcher*, 43(3), September 2007. Accessed December 2, 2013. http://tti.tamu.edu/2007/09/01/legislature-clarifies-reporting-requirements-for-fatal-crashes/

7 "TxDOT launches new web application to streamline crash data reporting," October 18, 2011. PanolaWatchman.com, http://www.news-journal.com/panola/news/txdot-launches-new-web-application-to-streamline-crash-data-reporting/article_93a91ed6-4fff-5758-8e98-5de97ad6fe28.html. Accessed on December 2, 2013.

8 Texas Department of Transportation. "CRASH." *Enforcement*. Accessed December 2, 2013, accessed http://www.txdot.gov/government/enforcement/crash-system.html

9 Texas Department of Transportation. "CRASH." *Enforcement*. Accessed December 2, 2013, accessed http://www.txdot.gov/government/enforcement/crash-system.html

10 Boyd, D., & Crawford, K. (2012). "Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon." *Information, Communication & Society*, *15*(5), 662-679.

11 ITS Research Fact Sheets. FHWA. (2013). Retrieved from http://www.its.dot.gov/factsheets/realtime_dcm_factsheet.htm. Accessed December 2, 2013

12 Evans-Cowley, J. S., & Griffin, G. (2012). "Microparticipation with Social Media for Community Engagement in Transportation Planning." *Transportation Research Record*, Vol. 2307, December 2012, pp. 90-98.

13 Abazorius, Abby. "MIT Big Data Initiative launches transportation challenge, privacy working group." *MIT News*. November 12, 2013. Retrieved from http://web.mit.edu/newsoffice/2013/mit-big-data-initiative-launches-transportation-challenge-privacy-working-group-at-white-house-event.html. Accessed December 2, 2013

14 Lei, H., Xing, T., Taylor, J. D., & Zhou, X. (2012). "Monitoring Travel Time Reliability from the Cloud." *Transportation Research Record: Journal of the Transportation Research Board, 2291*(1), 35-43.