



Bicycle Tourism Trails Study

Technical Memorandum 1: Benefits of Bikeways and Trails

Jacobs for TxDOT Public Transportation Division

March 2018

Acknowledgements

Prepared for: TxDOT Public Transportation Division

Prepared by: Stephanie Lind and Shibiya Sulfikar Sabu

Quality Reviewers: Carl Seifert, Nishant Kukadia, Bonnie Sherman, and Teri Kaplan

Table of Contents

Introduction	1
Economic Benefits	2
Bicycle Tourist Spending	2
Events and Races	3
Bicycle-related Manufacturing and Retail Expenditures	4
Property Values	5
Bike Share/Bike Rental	5
Health Benefits	6
General Physical Health Benefits of Bicycling.....	6
Physical Health Concerns Associated with Bicycling.....	7
Benefits of Living in Proximity to Bicycle and Pedestrian Accommodations	8
Public Health Benefits and Opportunities	8
Trail Amenities and Usage.....	9
Environmental Benefits	9
Transportation and Travel Benefits	10
Preservation of Historic and Cultural Features	11
Conclusion	12
References	13

Tables

1: Summary of Research: Daily Expenditures by Bicycle Tourists	3
--	---

Figures

1: Bicycle Tourism Typology Spectrum	2
2: Changes in Trail Use Based on Amenities.....	9

Introduction

The purpose of the Bicycle Tourism Trails Study (BTTTS) is to investigate the development of a statewide bicycle tourism trail network. The study was initiated by the Texas Department of Transportation (TxDOT) Public Transportation Division (PTN) Bicycle and Pedestrian Program in response to 2005 legislation (Texas Transportation Code § 201.9025 Texas Bicycle Tourism Trails). TxDOT and its consultant, CH2M (now Jacobs), are working with TxDOT's Bicycle Advisory Committee (BAC) and TxDOT-PTN staff to propose recommendations for the development of bicycle tourism trails in Texas. This study applies BAC and TxDOT-developed quantitative and qualitative routing criteria to provide an example vision of a statewide network of tourism bikeways. The products produced, as a result of this study will serve as an initial high-level network analysis for statewide bicycle tourism consideration and future development.

Bicycle tourism can be defined as any travel or tourism-related activity that incorporates a bicycle. Bicycle tourism activities include, but are not limited to, long-distance bicycle touring, bike-packing, local day rides, urban cycling, and bicycle events that include races and or destinations. Bicycle tourism activities occur in urban, suburban, and rural locations on a variety of different on-road and off-road bikeways.

A network of bicycle tourism trails across Texas would highlight the natural, historic, and exceptional landscapes across the many unique regions of the state. These tourism trails could attract bicyclists from around the world, showcase communities across the state, and boost economic development. The bicycle tourism trail network could also provide recreational and travel opportunities for local Texans craving a Monday-night ride or perhaps a weekend family adventure.

The purpose of this technical memorandum is to document the economic, health, environmental, and transportation benefits of bikeways in Texas and highlight the benefits related to bicycle tourism. Communities across Texas have realized the importance of constructing dedicated bikeways to provide safer means to bicycle, walk, and exercise. The U.S. Department of Transportation (USDOT) supports bikeways and their many benefits. As stated in the USDOT Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations, *“walking and bicycling foster safer, more liveable, family-friendly communities; promote physical activity and health; and reduce vehicle emissions and fuel use.”*¹ Well designed and constructed bikeways benefit the health and safety of users, provide additional transportation options, and support the local economy. Local governments, state Departments of Transportation and bicycle advocates are promoting bicycling as an activity with economic, societal, health, and environmental benefits that contribute to an overall enhanced quality of life.

This technical memorandum will focus on the general trends and benefits of bicycling infrastructure and bicycle tourism as related to the economic, health, environmental, and transportation benefits of bicycling infrastructure and bicycle tourism identified in academic literature. Quantifying these benefits would be an involved process, requiring data collection, analyses, and detailed modeling which is beyond the scope of this study.

Economic Benefits

Spending associated with constructing bikeways which may one day comprise a future Texas Bicycle Tourism Trails network produces a local economic benefit. Bikeway design, right-of-way acquisition, purchasing materials, and hiring workers to build the bikeways will fuel the local economy. These construction activities along with maintenance activities (for example, sweeping, mowing, repairing cracks, and maintaining light fixtures) make up the project costs and will provide an economic benefit. This section will focus on literature associated with community benefits of tourism trails once they are established, including tourism-related spending, bicycle retail and manufacture, and property value impacts.

Bicycle Tourist Spending

The dollars spent by bicyclists can vary depending on such things as the type of trip, trip length, destination, household income, type of accommodations, and whether the trip is guided or non-guided. Examples of bicycle tourist expenditures for an overnight trip might include: over-night accommodations, meals, gasoline, trail fees, gear purchases, bicycle rental fees, etc. Figure 1 shows how some researchers classify bicycle tourism spending into typologies, which are based on tourists' perceived needs and willingness to spend.²

Figure 1: Bicycle Tourism Typology Spectrum



The variability in bicycle tourism-related spending is described herein and summarized in Table 1:

- In Arizona, a survey of bicycle tourists found that the average bicyclist spent as much as \$260.01 per day or \$638.28 per trip (2012 dollars).³ The Arizona survey amount is nearly double what other research has estimated, but the surveyed bicycle tourists tended to be more affluent and spent much more than the average tourist in Arizona.
- In Canada, a 2014 study by Université du Québec à Montréal's (UQAM's) Transat Chair in Tourism in Quebec Province found that bicycle tourists spent an average of \$214 per day (US \$163) while cycling La Route Verte network. Accommodations and restaurants account for the majority of this amount.⁴

- In Missouri, bicyclists using the Katy Trail spent an average of \$45 per day on trip-related expenses and \$56.82 per day on trail-related expenses, for a total average of \$101.82 in 2011.⁵
- In Wisconsin, research shows the average bicyclist's expenditure varied dramatically depending on the type of trip. For example, a Wisconsin resident bicyclist using a trail spends \$17.99 per day, whereas a bicyclist embarking on a multiday bicycling tour spends \$80.84 per day on average.⁶ This data is consistent with a 2014 survey of Great Allegheny Passage users (Pittsburgh, Pennsylvania to Cumberland, Maryland) that found that day users spent \$18 per day, while overnight users spent \$124.58 per day.⁷

Table 1: Summary of Research: Daily Expenditures by Bicycle Tourists

Average Daily Expenditure 2017 USD (a)	Type of User	Study Area (b)
\$90	Multiday bicycle tourists	Wisconsin ⁸
\$94	Out of state visitors who rode bicycles	Colorado ⁹
\$78 – 107	Multiday bicycle tourists	Montana ¹⁰
\$109	In-state bicyclists	Georgia – Silver Comet Trail ¹¹
\$101	Bicycle tourists, mostly in-state	Missouri – Katy Trail ¹²
\$124	Out of state bicycle event participants	Minnesota ¹³
\$127	Cyclists with overnight stay	Pennsylvania, Great Allegheny Passage Trail ¹⁴
\$152	Independent bicycle tourists	Oregon ¹⁵
\$158	Multiday bicycle tourists on guided tour	Maine ¹⁶
\$167	Bicycle tourists	Canada, La Route Verte ¹⁷
\$275	Out-of-state bicycle tourists	Arizona: Northern, Central & Phoenix, Tucson and Southern Areas ¹⁸

^a Daily expenditures were converted to February 2017 dollars using the US Bureau of Labor Statistics CPI Calculator [https://www.bls.gov/data/inflation_calculator.htm].

^b End notes indicate the specific study reference citation.

*Results from 11 studies reveal that bicycle tourist on average spend
\$136 per day (ranging from \$78 to \$275 per day).*

Events and Races

Bicycle related events attract bicyclists, their supporters, and spectators. If and when bikeways are established as part of a future Texas Bicycle Tourism Trail network, additional bicycling events will likely follow. Examples of events and races include the following:

- Events like *Tour de Fat*, a multicity carnival-like bicycle festival in the U.S. with an organized bicycle ride that attracts thousands of local and regional amateur bicyclists. Races and rides like these can draw people from all over the world. Charitable bicycling events provide an opportunity to combine bicycling, tourism, and fundraising.
- For seven days each summer, bicyclists from all over the world travel to Colorado to *Ride the Rockies*. The route changes each year to highlight different parts of the state. Bicyclists camp or stay in local hotels along the way.
- *Gran Fondo* in Europe is an exclusive long-distance, one-day bicycling event that draws a variety of ages and skill levels, and gives prizes for to bicyclists from different age groups. Bicycle races include road, mountain, cyclo-cross, track (velodrome), bicycle motocross (BMX), and triathlons.
- The Hotter 'n Hell Hundred, which takes place in Wichita Falls, Texas each summer, regularly brings in over 10,000 registrants.¹⁹

The amount of money spent by bicycle tourists participating in events or races varies. An online survey of non-local participants in 26 bicycling events in Minnesota found that an average bicycle event visitor spent a total of \$121 per day in 2015.²⁰ In addition to event attendees and race participants, spectators supporting participants also contribute to the local economy.

*An online survey of non-local participants in 26 bicycling events in Minnesota found that an average bicycle event visitor spent a total of \$121 per day in 2015.*²¹

Bicycle-related Manufacturing and Retail Expenditures

Sales of bicycles and accessories support the bicycling industry from small bicycle shops to large national retailers across Texas. Dollars spent on bicycles, apparel, mechanical equipment, and repairs are re-spent in the local economy, which creates a ripple effect, as successive spending occurs.

While there are currently no large bicycle manufacturers in Texas, there are a number of small, craft bicycle manufacturers across Texas that offer a variety of unique and custom bicycles. More detailed economic analysis featuring multiple data sets that describe observed local and regional consumer spending practices across many economic sectors would be necessary to adequately estimate the economic impact of bicycle-related manufacturing and retail expenditures in Texas.

Property Values

Being near or adjacent to a bikeway can be attractive to many home buyers and tenants. Previously, as bikeways were developed, many properties with access to the local bikeway network have realized increased property values. While some sources use the term “multi-use trails” or “trails.” TxDOT-PTN generally prefers the term “shared use path.”

- The National Association of Realtors & National Association of Home Builders documented in their “Consumer’s Survey on Smart Choices for Home Buyers,” publication that **36 percent of 2,000 home buyers designated multi-use trails as either an “important” or “very important” community amenity.** Having access to a walking and bicycling path outranked 16 other options, including security, parks, and access to shopping or business centers.²²
- Studies in Denver, Seattle, Minnesota, and other communities across the country have consistently found that **proximity to trails increases the value of homes from 1 to 6.5 percent.**²³
- In a study in Bexar County, Texas (where San Antonio is located), **homes near or abutting trails saw a 2 percent house price premium.**²⁴
- A study of property values near multi-use paths in the state of Delaware found that properties within 50 meters of a bicycle path sold for an average of \$8,800 more than other similar homes.²⁵

Despite much data indicating that bikeways have a positive correlation with increased property values, proper community engagement (including local government, advocates, and residents) is necessary to gain support and successfully implement bikeways.

*Studies in Denver, Seattle, Minnesota, and other communities across the country have consistently found that proximity to trails increases the value of homes from 1 to 6.5 percent.*²³

Bike Share/Bike Rental

Description

Bicycle rentals have been popular for decades. Throughout the world, bicycle rental companies have thrived by providing bicycle rental opportunities near popular trails. Bike share programs, a new model of bicycle rentals, offer easy access to bicycles for many types of users. Bike share programs generally use kiosks to dock bicycles in accessible locations that allow users to pay to use a bicycle for a limited period of time, and then return it to another kiosk in the system. Some bike share programs no longer use kiosks, but rely on mobile applications to locate and rent a bicycle. Bike share programs have become

increasingly popular over the last 10 years. These programs flourish in urban environments where bicycles will be rented by a number of people for short periods of time.

Details

- Most bike share programs are designed for shorter trips, point-to-point transportation, and/or as an extension of the public transit network. On average, bike share trips last 12 minutes for system members and 25 minutes for casual users.
- Typically, bike share programs anticipate frequent turnaround use of bicycles in high-use areas, and the fees for use increase after 30 minutes. This fee structure is not generally beneficial to long-distance bicycle tourists, who would be better served by bicycle rental operators; however, bike share might be a viable option for sightseeing in urban settings, where destinations may be in close proximity.
- Additionally, the bicycles used in most bike share programs have sturdy, hybrid bicycle designs that have adjustable seating, baskets, lighting, and mud guards. This type of bicycle may not be preferable for longer trips due to their size and weight. As a result, bike share systems have become a popular alternative mode of transportation for tourists visiting points of interest in urban areas.²⁶

Popularity

According to the National Association of City Transportation Officials (NACTO), bike share programs have grown from 4 systems in 2010 to more than 55 systems in 2016.

As of August 2017, there are bike share operations in at least 15 Texas cities. For example, San Antonio's Bcycle program provides bike share access along the Mission Trail and has at least 16 Bcycle stations along the trail. Users can dock their bicycles, access various Spanish colonial missions and transit or parking facilities, then continue exploring.

Health Benefits

In addition to the economic benefits of developing a bicycle tourism trail network, there are numerous health benefits for those that use the trail. The World Health Organization (WHO) defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease"²⁷.

General Physical Health Benefits of Bicycling

WHO and the Center for Disease Control (CDC) recommend a minimum of 150 minutes of physical activity like bicycling per week.²⁸ The National Park Service (NPS) and CDC in the *Parks, Trails and Health Workbook* note²⁹ that trails and parks can deliver the following health benefits:

- Provide opportunities to practice healthy lifestyles
- Create destinations and venues for physical activity

- Reduce stress and improve mental wellness
- Foster community interaction and social support networks
- Provide beneficial, low impact use of sensitive areas, reducing injury and property loss that could occur if the land was used for other functions
- Reduce air and water pollution
- Mitigate urban heat islands
- Preserve important habitat, environmental and cultural sites

Active transportation also supports mental health. **Spending time exercising in nature has been reported to reduce stress³⁰, improve attention³¹, and positively impact mental restoration and coping with attention deficits.³² Active commuting is inversely associated with high body mass index (BMI), obesity, triglyceride levels, blood pressure, and insulin levels³³.** Additionally, natural light is known for its therapeutic effects and research suggests being outdoors can have positive effects on everything from stress to attention disorders, to rates of healing to social cohesion, as well as, lower crime rates.^{34 35}

Physical Health Concerns Associated with Bicycling

As previously mentioned, individuals can realize a variety of physical health benefits from bicycling for physical activity; however, studies have indicated detrimental impacts to physical health associated with bicycling including the following:

- Some individuals may have concerns over inhaling more air pollutants while bicycling because of the increased breathing rates. Studies have shown that inhalation rates of air-borne particulates and elemental carbon are higher for bicyclists; however, this is highly dependent on travel routes, land use density, and trip duration.³⁶
- As compared to traveling in a car, the risks of being involved in traffic collisions, and the severity of such collisions, may increase for bicyclists. Indeed, the National Highway Traffic Safety Administration (NHTSA) reported 818 bicyclist fatalities and 45,000 bicyclist injuries in 2015 in the U.S. resulting from motor vehicle-bicycle crashes, accounting for 5 percent and 2.3 percent increases respectively over the previous 10 years.³⁷

After quantifying physical health benefits and costs for urban commuting in a car versus bicycle, one study found that on average, the estimated health benefits of cycling were substantially larger than the risks relative to car driving. Researchers measured benefits and costs as mortality impacts in life-years gained or lost. They found that the increased physical activity benefits of bicycling were nine times larger than the risks of bicycling, including exposure to increased air pollutants and increase in traffic collisions.³⁸

*Researchers found that the increased physical activity **benefits of bicycling were nine times larger than the risks** of increased air pollutants and increase in traffic collisions.*

Benefits of Living in Proximity to Bicycle and Pedestrian Accommodations

Regular physical activity lowers the risk of chronic diseases and is an important strategy for reversing the obesity epidemic.³⁹ Meanwhile, physical inactivity leads to negative health outcomes, alarming obesity rates, and other life-threatening diseases.⁴⁰ Increasing the likelihood or opportunities for individuals to maintain an active lifestyle can lead to positive public health outcomes. Constructing bikeway infrastructure has been shown to increase bicycling and encourage physical activity.

- People who live near shared use paths are **50 percent more likely to meet physical activity guidelines and 73 to 80 percent more likely to bicycle.**⁴¹
- A national survey of 3,700 U.S. adults found that 43 percent of regularly active adults reported using a shared use path at least once a week, whereas only 22 percent of irregularly active and 4 percent of inactive adults reported using shared use paths as often.⁴²

Public Health Benefits and Opportunities

The CDC reports that only 21 percent of American adults get the recommended level of physical activity.⁴³ From 2011 to 2014, 17 percent of youth and 36.5 percent of adults were classified as obese, which is defined as having a BMI greater than or equal to 30⁴⁴.

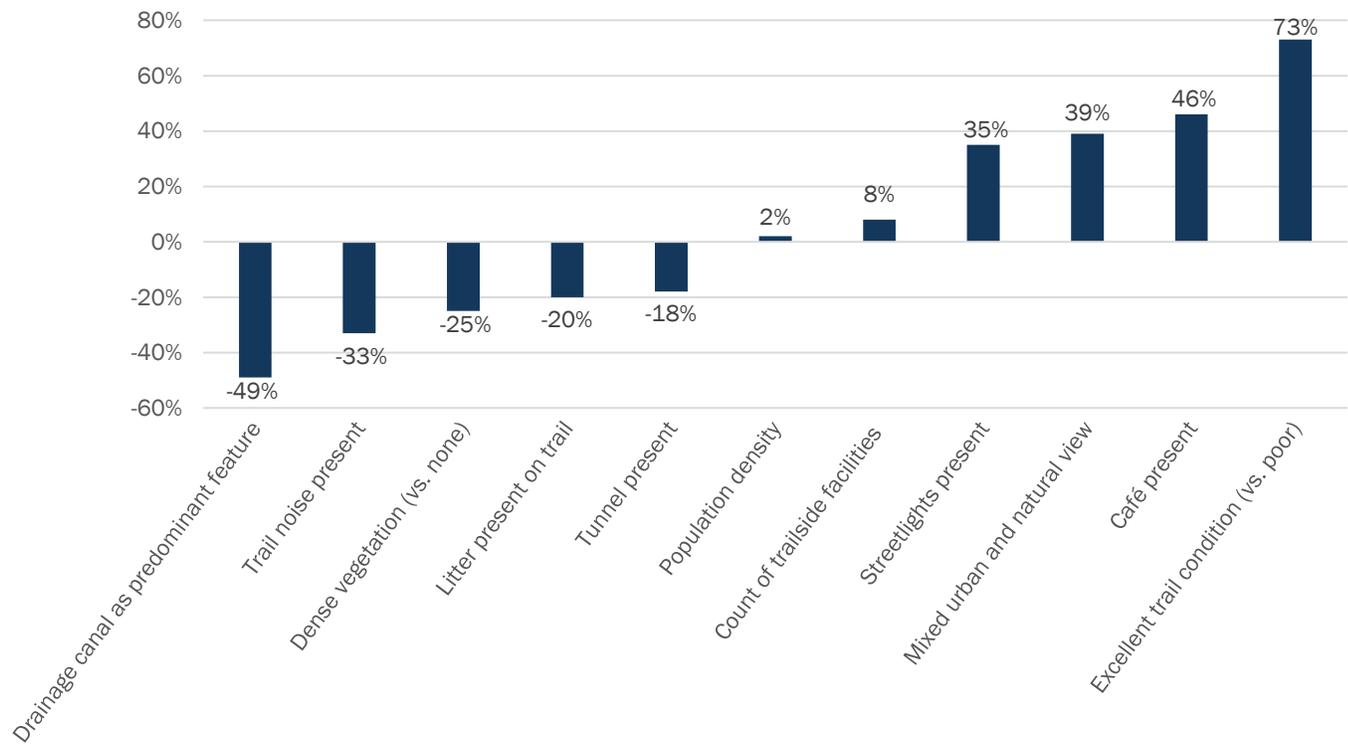
Collectively, the physical health benefits from bicycling activities can lead to significant societal benefits and contribute to reversing these negative and expensive national trends.

- Using data from the National Medical Expenditure Survey, one study in Nebraska found that **for every \$1 spent on trails, there was a \$2.94 savings in direct medical costs from a societal perspective.**⁴⁵
- One of the ways local administrators can measure the health benefits of walking and bicycling in their communities is to start with a community health profile that includes health statistics and demographic data on potential users. Community health profiles can help local communities identify baseline health data, measure benefits, and assist planners with constructing accessible walking and bicycling accommodations. As the Texas Bicycle Tourism Trail network is developed, local project sponsors can use community health profiles to measure the overall benefits of the trail to the community and state, identify more public health benefits of bikeway construction, and make even more compelling arguments for further implementation.

Trail Amenities and Usage

Not all trails are equally desirable to users. In one study examining shared use path usage in Chicago, Los Angeles, and Dallas, researchers found that shared use paths with well-maintained surface condition, mixed and urban views, lighting, and trailside amenities have higher rates of usage (Figure 2). Meanwhile, shared use paths with litter and excess noise were associated with lower rates of usage.⁴⁶

Figure 2: Changes in Trail Use Based on Amenities



Environmental Benefits

The environmental benefits of constructing bikeways or implementing a tourism trail network segment vary depending on the type of bikeways constructed and used. Overall, research shows that spending time in nature strengthens interest in environmental stewardship.⁴⁷

Many researchers have claimed that increasing the number of trips made by bicycle can improve air quality and reduce air pollution emissions on local roadways. Motor vehicle emissions currently constitute 27 percent of greenhouse gas emissions in the U.S.⁴⁸ If motor vehicle trips are replaced by bicycle trips, there could be air quality benefits (by reductions in motor vehicle emissions). However, significant air quality benefits may only be seen when a substantial proportion of travellers shift from using cars to bicycles. For instance, one such analysis of 11 Midwestern U.S. cities estimated that particulate concentrations would decrease by 1 to 2 percent and levels of nitrogen oxides (NO_x) would decrease by 5 to 12

percent. Particulate concentrations are air pollutants with a diameter of 2.5 micrometers or less, small enough to invade even the smallest airways. In this analysis, these changes would result in 608 fewer deaths annually because of improved air quality across the 11 cities. However, these air quality benefits could result if 50 percent of short trips (under 5 miles in length) during the summer months were taken by bicycle instead of car.⁴⁹ Since most Texas cities have less than 1 percent bicycle commuters and a small portion of all trips occur on bicycles, these air quality benefits would be challenging to achieve.

Increasing the number of trips made by bicycle can reduce emissions and improve air quality on local roadways

With proper planning and design, trails can provide a “buffer” space between the built and natural environments, and contribute to reduced pollution run-off and improved water quality. However, without proper planning and design, shared use paths can destroy habitat, create hazards to wildlife, and degrade water and air resources. Thoughtfully designed shared use paths can attract a wide variety of users that would both benefit and enjoy the natural environment and exceptional landscapes in Texas.

Transportation and Travel Benefits

Expanding the bikeway network can improve transit access and reduce traffic congestion across the state, which would improve overall quality of life for residents and users.

- **Congestion Reduction:** Although bicycles have a lower top speed than motor vehicles, the capacity for bicycle accommodations to move people is far higher than motor vehicle lanes. Their small size makes bicycles efficient users of space. Additionally, bicycles require about one tenth of the storage space at either end of a journey, which frees land for other uses besides vehicle storage. Indeed, one study, in Washington DC, showed a causal relationship between increased bicycle infrastructure (specifically increasing the availability of bike share stations) and reduced traffic congestion.⁵⁰ Another study, in New York City, that investigated the traffic effects resulting from construction of a variety of protected bicycle lanes along several heavily trafficked corridors found that average motor vehicle travel times throughout the day were either unchanged or fell as much as 35 percent at parts of the day. Additionally, travel speeds remained steady throughout the project area.⁵¹
- **Bicycles Complement Transit Access:** In many cases, well-integrated bikeways will become valuable transportation assets for local residents to access their communities. The expansion of bicycle networks will likely encourage additional trips by both bicycle and public transportation. A bicycle user can cover around 4 times the distance of a pedestrian in the same time. This mobility advantage can lead to significant efficiencies when paired with transit. The accessible distance of a train station is doubled, which significantly increases the number of people who can comfortably access transit without

a car. In this way, effectively integrating bicycling and walking with public transportation can lead to reducing the necessity of feeder bus services and increase use of public transportation in general.⁵² For congested bus and train transit networks, bike share programs and construction of bikeway infrastructure has the potential to alleviate transit congestions by increasing bicycle mode share.⁵³

- **Bikeways for All Ages and Abilities:** Bikeways that provide additional horizontal space or vertical barriers between motor vehicle travel lanes and bicycle travel lanes increase bicyclist safety. One study found that cycle tracks, as compared to bicycling in the street, attract a larger number of bicyclists and significantly lessen injury and collision rates.⁵⁴ Cycle tracks are on-street bike lanes physically separated from traffic that feature either one-way or two-way traffic. Another study analysed collisions involving bicycles with motor vehicles in two cities (Toronto and Vancouver, Canada) over the course of 1 year and the study revealed that a variety of dedicated bicycle infrastructure reduced bicyclist injury risk. As compared to bicycling with motor vehicle traffic, the researchers found that incidence of injury to bicyclist on cycle tracks was 90 percent lower, on bicycle lanes was 40 to 50 percent lower, and on paved shared use paths was 20 percent lower.⁵⁵ Off-street shared use path conflict points and visibility concerns may explain the relatively lower percentage associated with that bikeway type.
- **Usage Increases Visibility and Investment:** If bikeways are well integrated within a community's existing network and attract additional bicyclists, then the bikeway receives positive attention and greater visibility. Increased attention can help improve safety by creating a more compelling case for regular maintenance and can stimulate investment in supporting amenities (such as bathrooms, benches, lighting, and parking).

Preservation of Historic and Cultural Features

Throughout Texas, bicycle tourism trails can help highlight and provide access to historic and cultural resources. Some trails, such as those in historic rail corridors, have helped to preserve historically significant elements along transportation corridors. For example, the Katy Trail in Missouri follows a portion of Captain Meriwether Lewis and William Clark's expedition across the U.S. Visitors to the Katy Trail can trace the steps of these early American explorers while taking in scenic views.

One of the best ways to explore the San Antonio Missions is by accessing the shared use paths that follow the river between the missions. Users can walk, run, or bicycle on the shared use paths that run between the missions and provide a unique view of the area that cannot be seen from the road. When users take the shared use path to explore the river they get a better sense of what it was like for early settlers and the Native Americans that lived in the area. Shared use paths can link users to a shared past which helps to enhance cultural awareness and establish a community's identity.⁵⁶

Trails can link users to a shared past which helps to enhance cultural awareness and establish a community's identity.

Conclusion

This technical memorandum summarizes some of the available literature regarding the economic, health, environmental, transportation, and community benefits of bicycle tourism and shared use paths.

- From an economic standpoint, the literature reveals the various beneficial effects of bicycle tourism spending and how it can significantly contribute to local economies. The economic impacts resulting from bicycle repair, manufacturing, and retail sales also contribute to local, regional, and state economic prosperity. At a local level, increases in property values positively correlate with proximity to shared use paths/trails.
- From a health perspective, studies have revealed that bicycling contributes to better physical and mental health. Construction of shared use paths and bikeways leads to greater public use. Simply providing a bikeway can lead to increases in physical activity, reductions in sedentary behavior, and improved mental health outcomes for entire communities.
- From an environmental perspective, increasing the number of trips taken by those using bicycles reduces motor vehicle emissions, and over time, these reductions can lead to improved air quality.
- From a transportation and travel perspective, shared use paths and bikeways that connect bicyclists to retail, tourism, and recreational destinations support existing local transportation networks. Establishing dedicated space for bicycle travel is associated with reduced injury risk. Expanding bikeway networks can expand access and usability of transit infrastructure and increase the number of trips made by bicycle and potentially reduce congestion on local roadways.

Texans would benefit greatly from more connected bikeways across the state. The provision of bikeways can increase spending in local economies, improve the health of local residents, and improve the quality of life for all Texans.

References

- 1 U.S. Department of Transportation. 2010. Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/policy_accom.cfm
- 2 Beierle, Heidi. 2011. Bicycling Tourism as a rural economic development vehicle.
- 3 Arizona DOT. 2013. Economic Impact Study of Bicycling in Arizona: Final Report.
- 4 Velo Quebec. 2015. Bicycle tourists: Quality tourists for regions throughout Quebec. <http://www.velo.qc.ca/en/pressroom/20150428145143/Cycle-tourists-Quality-tourists-for-regions-throughout-Quebec>
- 5 Synergy/PRI/JPA et al. 2012. Katy Trail Economic Impact Report: Visitors and MGM2 Economic Impact Analysis.
- 6 University of Wisconsin. 2010. Valuing Bicycling's Economic and Health Impacts on Wisconsin.
- 7 Trail Towns. 2015. Trail User Survey and Business Survey Report: Great Allegheny Passage.
- 8 University of Wisconsin. 2010. Valuing Bicycling's Economic and Health Impacts on Wisconsin.
- 9 State of Colorado. 2016. Economic and Health Benefits of Bicycling and Walking.
- 10 University of Montana. 2013. Analysis of Touring Cyclists: Impacts, Needs and Opportunities for Montana.
- 11 Georgia Department of Transportation. 2013. Silver Comet Trail Economic Impact Analysis and Planning Study.
- 12 Synergy/PRI/JPA et al. 2012. Katy Trail Economic Impact Report: Visitors and MGM2 Economic Impact Analysis.
- 13 Minnesota Department of Transportation. 2016. Assessing the Economic Impact and Health Effects of Bicycling in Minnesota
- 14 Trail Towns. 2015. Trail User Survey and Business Survey Report. Great Allegheny Passage.
- 15 Travel Oregon. 2013. The Economic Significance of Bicycle-Related Travel in Oregon: Detailed State and Travel Region Estimates.
- 16 Maine Department of Transportation. Bicycle Tourism in Maine: Economic Impacts and Marketing Recommendations.
- 17 Velo Quebec. 2015. Bicycle tourists: Quality tourists for regions throughout Quebec. <http://www.velo.qc.ca/en/pressroom/20150428145143/Cycle-tourists-Quality-tourists-for-regions-throughout-Quebec>
- 18 Arizona DOT. 2013. Economic Impact Study of Bicycling in Arizona: Final Report.
- 19 Hotter than Hell 100, 2017. <http://www.hh100.org/history/>
- 20 Minnesota Department of Transportation. 2015. Assessing the Economic Impact of Health Effects of Bicycling in Minnesota.
- 21 Minnesota Department of Transportation. 2015. Assessing the Economic Impact of Health Effects of Bicycling in Minnesota.
- 22 National Association of Realtors and National Association of Home Builders. 2002. Consumer's Survey on Smart Choices for Home Buyers
- 23 National Park Service. 2008. Benefits of Trails and Greenways.
- 24 Asabere, P.K. and F.E. Huffman. 2009. The Relative Impacts of Trails and Greenbelts on Home Prices. *The Journal of Real Estate Finance and Economics*, Vol.38, No. 4, pp 408-419
- 25 Delaware Center for Transportation. 2006. Property Value/Desirability Effects of Bike Paths Adjacent to Residential Areas. <http://128.175.63.72/projects/DOCUMENTS/bikepathfinal.pdf>
- 26 National Association of City Transportation Officials, 2016. Bike Share in the US: 2010-2016. <https://nacto.org/bike-share-statistics-2016/>
- 27 World Health Organization, 1948. Constitution of the World Health Organization. <http://www.who.int/about/mission/en/>
- 28 Centers for Disease Control and Prevention. 2017. Physical Activity for Healthy Weight. https://www.cdc.gov/healthyweight/physical_activity/index.html. Accessed on January 9, 2018
- 29 Centers for Disease Control and Prevention and National Park Service. 2015. Parks, Trails, and Health Workbook. Washington, DC: National Park Service
- 30 Ulrich, RS; Simons, RF; Losito, BD; Fiorito, E; Miles, MA; Zelson, M. Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*. 1991, 11, 201-230. - See more at: http://www.parkrx.org/your-park-rx/health-benefits#_ftn2

- 31 Chang, C-Y; Chen, P-K. "Human responses to window views and indoor plants in the workplace". *Horticultural Science*. 2005, 40, 1354–1359. - See more at: http://www.parkrx.org/fill-your-park-rx/health-benefits#_ftn2
- 32 Hartig, TM; Evans, GW; Jamner, LD; Davis, DS; Gärling, T. Tracking restoration in natural and urban field settings. *Journal of Environmental Psychology*. 2003, 23, 109–123. - See more at: http://www.parkrx.org/fill-your-park-rx/health-benefits#_ftn2
- 33 Gorden-Larsen, P, et al., 2009. "Active Commuting and Cardiovascular Disease Risk" *Arch Intern Med*; 169(13):1216-1223
- 34 Cecily Maller, et al., 2009. "Healthy Parks, Healthy People: The Health Benefits of Contact with Nature in a Park Context". <http://www.georgewright.org/262maller.pdf>
- 35 Institute at the Golden Gate, 2017. "The Health Benefits of Park Prescription Programs." http://www.parkrx.org/fill-your-park-rx/health-benefits#_ftn2
- 36 Hartog, J.J., Boogaard, H., Nijland H., et al. 2010. "Do the Health Benefits of Cycling Outweigh the Risks?" *Environmental Health Perspectives*, 118(8): 1109-1116.
- 37 National Highway Traffic Safety Administration, 2017. "Traffic Safety Facts: Bicyclists and Other Cyclists" <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812382>. DOT HS 812 382.
- 38 Hartog, J.J., Boogaard, H., Nijland H., et al. 2010. "Do the Health Benefits of Cycling Outweigh the Risks?" *Environmental Health Perspectives*, 118(8): 1109-1116.
- 39 U.S. Department of Health and Human Service, Office of the Surgeon General, 2001. The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity. Rockville, MD. <http://www.surgeongeneral.gov/topics/obesity/calltoaction/toc.htm>
- 40 Sener, Ipek N., Richard J. Lee, and Zachary Elgart. "Potential health implications and health cost reductions of transit-induced physical activity." *Journal of Transport & Health* 3.2 (2016): 133-140.
- 41 Sallis J, Bowles, H, Bauman A, et al. 2009. Neighborhood environments and physical activity among adults in 11 countries. *American Journal of Preventative Medicine*, 36 (6): 484-490, June 2009.
- 42 Librett JJ, Yore MM and Schmid TL. "Characteristics of physical activity levels among trail users in a U.S. national sample." *American Journal of Preventive Medicine*, 31(5): 399–405., 2006.
- 43 Centers for Disease Control and Prevention. 2017. "Facts about Physical Activity". <https://www.cdc.gov/physicalactivity/data/facts.htm>. Accessed on 12/21/2017.
- 44 Centers for Disease Control and Prevention. 2017. "Adult Obesity Facts". <https://www.cdc.gov/obesity/data/adult.html>. Accessed on 12/21/2017.
- 45 Wang G, Macera CA, Scudder-Soucie B, et al. "Cost analysis of the built environment: the case of bike and pedestrian trials in Lincoln, Nebraska." *American Journal of Public Health*, 94(4): 549–553, 2004
- 46 Reynolds, Kim D., et al. 2007. Trail Characteristics as Correlates of Urban Trail Use. *The Science of Health Promotion*. March/April 2007, Vol. 21, No 4 Supplement.
- 47 Cecily Maller, et al., 2009. "Healthy Parks, Healthy People: The Health Benefits of Contact with Nature in a Park Context". <http://www.georgewright.org/262maller.pdf>
- 48 US Environmental Protection Agency. 2017. Climate Change: Causes of Climate Change. <http://www.epa.gov/climatechange/ghgemissions/sources.html>
- 49 Grabow, M.L., Spak, S., Holloway, T. et al. 2012. "Air Quality and Exercise-Related Health Benefits from Reduced Car Travel in the Midwestern United States. *Environmental Health Perspectives*, 120(1): 68-76.
- 50 Hamilton, T., and Wichman, C. 2016. "Bicycle infrastructure and traffic congestion: Evidence from DC's Capital Bikeshare. *Resources for the Future*.
- 51 New York City Department of Transportation, 2014. *Protected Bicycle Lanes in NYC*. nyc.gov/html/dot/downloads/pdf/2014-09-03-bicycle-path-data-analysis.pdf
- 52 Krizek, K., Stonebraker, E., and Tribbey, S. "Bicycling Access and Egress to Transit: Informing the Possibilities." Mineta Transportation Institute; 2011
- 53 Shaheen, S., Martin, E., and Cohen, A. 2013 "Public Bikesharing and Modal Shift Behavior: A Comparative Study of Early Bikesharing Systems in North America." *International Journal of Transportation*. 1(1). Pp 35-54. http://www.sersc.org/journals/IJT/vol1_no1/3.pdf
- 54 Lusk, A., et al. 2011. "Risk of injury for bicycling on cycle tracks versus in the street" *Journal of Injury Prevention*.
- 55 Teschke, K., et al. 2012. "Route infrastructure and risk of injuries to bicyclists: A Case-Crossover Study" *Am J Public Health*. 102: 2336-2343.

⁵⁶ Rails to Trails Conservancy. 2003. "Historic Preservation and Community Identity"
<https://www.railstotrails.org/resource-library/resources/historic-preservation-community-identity/>