The Impacts of East Central Wisconsin's Bike and Pedestrian Facilities on the Regional Economy

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ESI ECONSULT SOLUTIONS INC.

economics | strategy | insight

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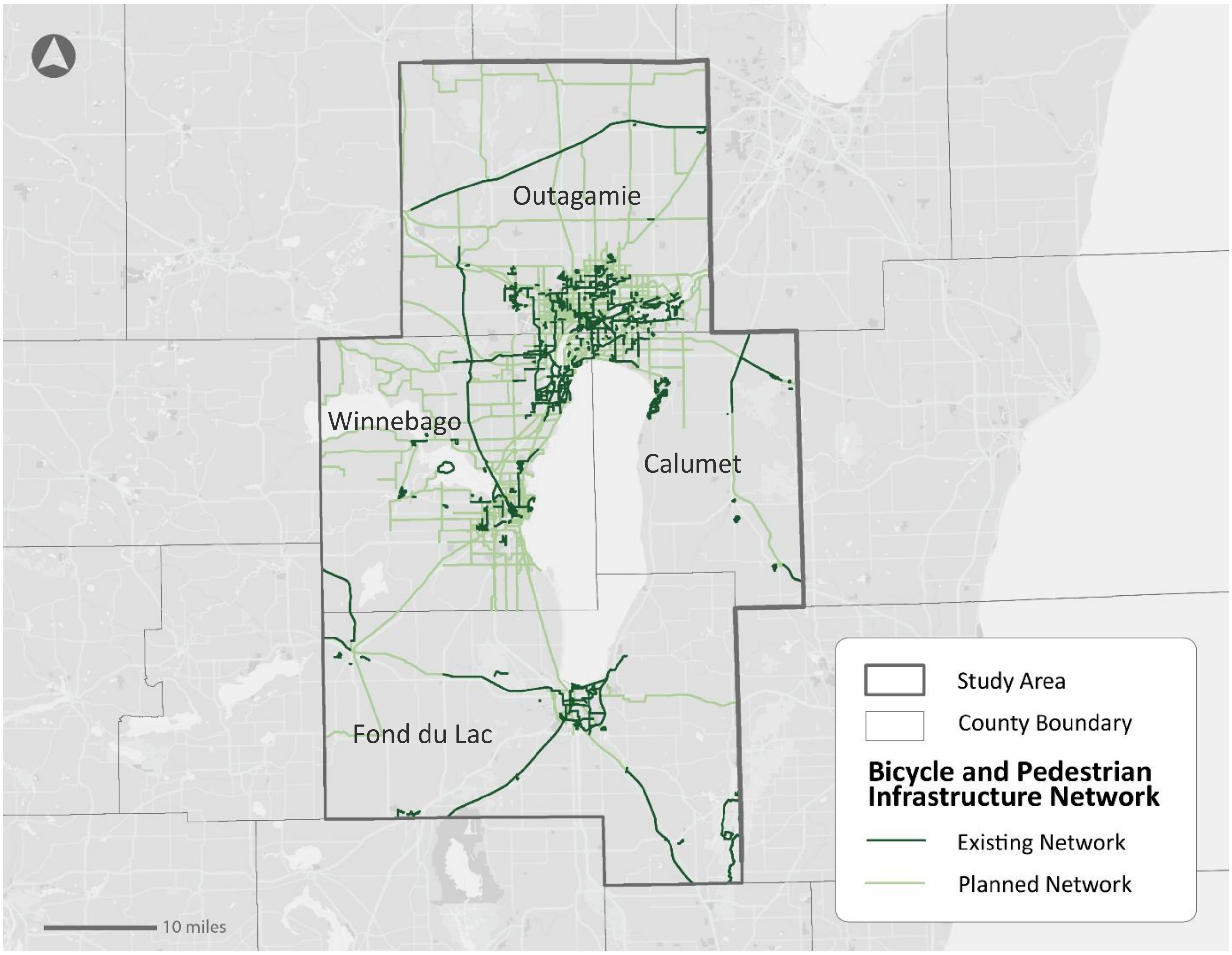
Executive Summary

The East Central Wisconsin bicycle and pedestrian infrastructure network is an extensive network of 622 miles of paved and unpaved off-road trails, bike lanes, and signed bike routes connecting neighborhoods throughout Calumet County, Fond du Lac County, Outagamie County, and Winnebago County. As part of East Central Wisconsin Regional Planning Commission's bicycle and pedestrian planning, the Commission created The Appleton (Fox Cities) Transportation Management Area and Oshkosh Metropolitan Planning Organization Bicycle and Pedestrian Plan in 2014 and updated the plan in 2021. This plan acknowledges the existing networks in Calumet, Outagamie, and Winnebago counties and discusses how ECWRPC can facilitate the creation of additional miles of bicycle and pedestrian infrastructure and new facilities. The City of Fond du Lac created City of Fond du Lac Bike & Pedestrian Plan in 2013 and updated the plan in 2018. Similarly, this plan discusses the construction of existing and proposed facilities within the municipality. This report's analysis focuses on the economic and societal impacts of the existing and proposed 1,633-mile network across the four-county study area.

In addition to their clear transportation, recreation, and health value, bicycle and pedestrian infrastructure also deliver multiple economic benefits:

- As an indicator of local reinvestment in a place, these networks can serve as a catalyst for additional economic and community development projects.
- As part of a region's green infrastructure—if completed in ways that support existing natural resources—the network can include the creation of a green buffer and tree cover that contribute to sustainable and resilient ecosystems.
- As a mode of active recreation for residents and out-of-town visitors, bike and pedestrian infrastructure networks also often serve as a way to encourage local tourism as well as attract visitors to spend more time in the region, in turn spending at businesses located nearby.
- Finally, as a critical social infrastructure, bicycle and pedestrian infrastructure networks support mental and physical health.

Figure ES.1: Map of the Existing and Planned Bicycle and Pedestrian Infrastructure Network in the Study Area



Source: ECWRPC (2021), Econsult Solutions, Inc. (2022)

Capital Investment

The completion of the bicycle and pedestrian infrastructure network in the East Central Wisconsin study area will represent a significant boost to the local and state economies through the upfront capital investments made to complete new bike lanes, off-road segments, and other pedestrian infrastructure. The anticipated $1.28 billion investment in the network within the four counties will generate direct construction activity in the study area, employing construction workers and professional service providers (e.g., architects, engineers, and environmental services firms) through the project development and implementation period. These direct expenditures are projected to generate $2 billion in total economic impact, supporting 11,550 jobs with $678 million in earnings in the four-county region's economy.[1]

Figure ES.2: Potential Aggregate Economic Impact from Construction of the Planned Network in the Study Area

Impact Type	Study Area	Per Mile
Direct Output ($M)	$1,274	$1.26
Indirect and Induced Output ($M)	$752	$0.7
Total Impact ($M)	**$2,026**	**$2.0**
Employment Supported (FTE)	**11,550**	**11.4**
Employee Compensation ($M)	**$678**	**$0.7**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

Public Health

The East Central Wisconsin bicycle and pedestrian infrastructure network supports healthy lifestyles for people in surrounding communities by providing an easily accessible and low-cost option for residents to engage in physical activity. Physically active people typically enjoy a variety of health benefits, including lower incidence of cardiovascular diseases, Type 2 diabetes, depression, and certain cancers compared to their sedentary counterparts. Additionally, physically active individuals tend to achieve higher rates of productivity at work. It is estimated that the completed network will support approximately 58,300 physically active users annually. Due to the health benefits associated with physical activity, these users could achieve aggregate annual health care cost savings of nearly $69 million in the study area. Workers who meet recommended physical activity levels using the completed network achieve associated benefits in workplace productivity, which could yield total productivity cost savings of $145.3 million annually upon full completion of the network.

Figure ES.3: Healthcare and Productivity Cost Savings from Active Users in the Study Area

	Existing Network	Planned Network	Total – Upon Full Completion	Per Mile of Completed Network
Estimated Regular Users	115,200	8,600	123,800	76
Users Meeting Activity Req. Due to Network	54,200	4,100	58,300	36
Mean Healthcare Savings Achieved, Active Users	**$64.0 M**	**$4.8 M**	**$68.8 M**	**$42,100**
Mean Productivity Savings Achieved, Active Users	**$135.0 M**	**$10.4 M**	**$145.3 M**	**$89,000**

Source: CDC (2018), ESRI (2019), Götschia and Lohb (2017), Econsult Solutions, Inc. (2022), Carlson et al. (2013), Chenoweth & Bortz (2005), US Census American Community Survey (2015-2019)

[1] IMPLAN generates job estimates based on the term "job-years", or how many jobs will be supported each year. For instance, if a construction project takes two years, and IMPLAN estimates there are 100 employees, or more correctly "job-years" supported, over two years, which represents 50 annual jobs. Additionally, these can be a mix of a full and part-time employment. Consequently, job creation could feature more part-time jobs than full-time jobs. To account for this, IMPLAN has a multiplier to covert annual jobs to full-time equivalent jobs.

Transportation and Safety

The East Central Wisconsin bicycle and pedestrian infrastructure network expands mobility options for people that live and work in the study area, providing a safe, extensive network for non-motorized transportation that is connected and routed through major destinations. The potential increase in users due to the proposed expanded network within the four counties provides crucial support for the region's transportation system, including the reduction of Vehicle Miles Traveled (VMT) and safety improvements. It is estimated that users of the completed network who replace automobile trips with biking and walking trips could reduce annual VMT in the study area by 17.5 million miles, yielding associated reductions in carbon emissions of 6,900 metric tons and avoided social costs of carbon emissions of over $351,900.

Figure ES.4: Potential Annual Reductions in VMT, Carbon Emissions, and Social Cost of Carbon in the Study Area

	Existing Network	Planned Network	Total - Upon Completion	Per Mile of Completed Network
Estimated Annual Reduction in VMT (M)	15.7	1.8	17.5	10,500
Metric Tons of CO2 Avoided	6,200	700	6,900	4
Social Cost of Carbon Avoided	$316,200	$35,700	$351,900	$200

Source: Econsult Solutions, Inc. (2022), US Census American Community Survey (2019), ECWRPC (2022), National Household Travel Survey (2017), US Environmental Protection Agency (2022)

Spending Due to Bicycle and Pedestrian Infrastructure

Beyond impacts generated by the development of the bicycle and pedestrian infrastructure network, local spending by active users will generate additional economic benefits for businesses located near the network as well as retailers selling recreational activity-related products. Residents and visitors who access the network often spend money on both goods and services during their trips. Much of this spending is happening at businesses in immediate proximity of the network. It is estimated that direct spending by estimated frequent users on the completed network in the study area will total over $45 million annually. These direct expenditures are projected to generate approximately $84 million in total economic impact in the study area each year, supporting 690 jobs in the county with $21.3 million in earnings annually upon full completion of the network.

Figure ES.5: Annual Economic and Fiscal Impacts of User Spending in the Study Area

	Existing Network	Planned Network	Total - Upon Completion	Per Mile of Completed Network
Estimated Frequent Users	58,200	4,400	62,600	38
Total Annual Visits	25.7 M	1.9 M	27.6 M	16,900
Total Direct Spending ($M)	$42.1	$3.2	$45.6	$0.03
Economic Impact ($M)	**$78.4**	**$5.9**	**$84.0**	**$0.1**
Employment Supported (FTE)	**641**	**48**	**689**	**0.4**
Employee Compensation Supported ($M)	**$19.9**	**$1.5**	**$21.3**	**$0.01**
Tax Revenue Supported ($M)	**$1.4**	**$0.1**	**$1.6**	**$1,000**

Source: ECWRPC (2022), US Census American Community Survey (2015-2019), Econsult Solutions, Inc. (2021), IMPLAN (2019), Wisconsin CAFR (2019)

Environmental Services

Bicycle and pedestrian networks such as those in East Central Wisconsin provide environmental benefits for the communities they serve by bolstering natural resource management through active environmental conservation efforts. These networks help to preserve the surrounding natural environment, which otherwise may be at risk for development or further loss of natural lands. The natural lands adjacent to the network provide environment benefits including air pollution removal, the provision of water supply, water quality improvement, flood mitigation, wildlife habitat conservation, and carbon sequestration and storage.

These benefits combined create ecosystem functions that would require costly measures to replicate if lost. In sum, the estimated economic value these ecosystems provide on an annual basis is $437.9 million. Additionally, the existing tree canopy on the fully completed network is estimated to be valued at $90.9 million over the lifespan of the tree canopy; in other words, it would cost $90.9 million to replicate carbon storage if the tree canopy did not exist.

Figure ES.6: Potential Environmental Benefits upon Full Completion of the Bicycle and Pedestrian Infrastructure Network in the Study Area ($ per Year)[2]

Ecosystem Service	**Existing Network**	**Planned Network**	**Total – Upon Full completion**
Total Annual Ecosystem Service Benefits ($M)	$168.2	$269.6	$437.9
Lifetime Carbon Storage ($M)	$59.9	$31.0	$90.9

Source: Costanza (2006), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

[2] Note that not every ecosystem generates an economic benefit, approximately 28 percent of the land cover classifications identified of the ~3,500 acres were used to generate an ecosystem service benefit.

Residential Property Values

Studies show that homeowners are willing to pay a premium with better access to amenities such as bicycle and pedestrian facilities. These networks serve as a type of active transportation route with safe spaces for walking, biking, and other creative and recreative commuting modes. A direct consequence of leveraging healthy living, active commuting, and an overall better quality of life is increased property values of residential properties within close proximity to bike paths and trails.

Studies in planning, economics, and development have found significantly higher real estate values associated with the proximity to bicycle and pedestrian infrastructure networks.[3] Homeowners are willing to pay a premium for access to amenities that provide active transportation options, recreational opportunities, improved community aesthetics, and an overall better quality of life.

According to the analysis, properties within a half mile of a trail within the 4-county region have an approximate 8 percent premium on their property. The current network's premium results in an aggregate increased property value of $507 million, producing $9.6 million in additional county property taxes each year. For the segments of the system that are still in planning stages, the total property value impact totals $137 million and would result in an additional $2.6 million in county property taxes each year upon completion of the whole network.

Figure ES.7: Potential Property Value Benefits upon Full Completion of the Bicycle and Pedestrian Infrastructure Network in the Study Area[4]

	Existing Trail Network		Planned Trail Network	
	Aggregated Premium (M)	**Increased Tax Revenue (M)**	**Aggregated Premium (M)**	**Increased Tax Revenue (M)**
Calumet	63.8	1.1	8.9	0.2
Fond du Lac	36.2	0.7	30.3	0.6
Outagamie	233.9	4.3	41.0	0.8
Winnebago	173.5	3.5	56.7	1.1
Total	507.4	9.6	136.9	2.6

Source: Great ECWRPC (2022), Econsult Solutions (2022)

3 Wachter, Susan M., and Grace Wong Bucchianeri. "What Is a Tree Worth? Green-City Strategies, Signaling and Housing Prices." May 2008.
[4] Note that not every ecosystem generates an economic benefit, approximately 28 percent of the land cover classifications identified of the ~3,500 acres were used to generate an ecosystem service benefit.

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1. Introduction

1.1. Purpose of Report

Bicycle and pedestrian infrastructure networks provide valuable economic, environmental, and public health benefits to the communities they serve. However, these impacts are often understated or overlooked when considering investment of these networks within communities. The Appleton (Fox Cities) Transportation Management Area (TMA) and Oshkosh Metropolitan Planning Organization (MPO) Bicycle and Pedestrian Plan was completed in 2014 and updated in 2021. The plan identified gaps in the bicycle and pedestrian network in the region and provided recommendations to create a comprehensive network. The purpose of this study is to quantify the potential range of benefits associated with building the recommended facilities within the Appleton TMA and Oshkosh MPO, while also understanding the economic benefits to the Fond du Lac MPO. This report will help stakeholders understand the estimated value created by completing the network, including opportunities arising for the community, workers, and local businesses.

Completion of the network will increase economic activity and jobs associated with construction of new segments across the region, will ultimately increase property values for residents located close to completed network, and will provide environmental service benefits in the form of flood mitigation, carbon sequestration, and other avoided costs due to the networks' presence and their surrounding tree cover. In addition to the benefits afforded to the region by the networks' presence, the usage of bicycle and pedestrian infrastructure by residents and visitors will support healthy lifestyles by expand walking, biking, and other active transportation options, while also improving connectivity in the region, generating greater economic activity for local businesses located near the network.

1.2. About the East Central Wisconsin Regional Planning Commission

The East Central Wisconsin Regional Planning Commission is the official planning agency for the ten counties of Calumet, Fond du Lac, Green Lake, Marquette, Menominee, Outagamie, Shawano, Waupaca, Waushara, and Winnebago in the East Central Region of Wisconsin. ECWRPC was created to transcend the political and fiscal limitations of the individual jurisdictions in its service area to provide comprehensive planning services for the region. These include environmental, economic development, open space, land use, housing, community, and transportation planning, as well as Geographic Information Systems services.

Within the East Central region, there are three metropolitan planning organizations (MPOs): Appleton (Fox Cities), Fond du Lac, and Oshkosh. Because the Appleton (Fox Cities) MPO has a population of over 200,000, it is also designated as a transportation management area (TMA).

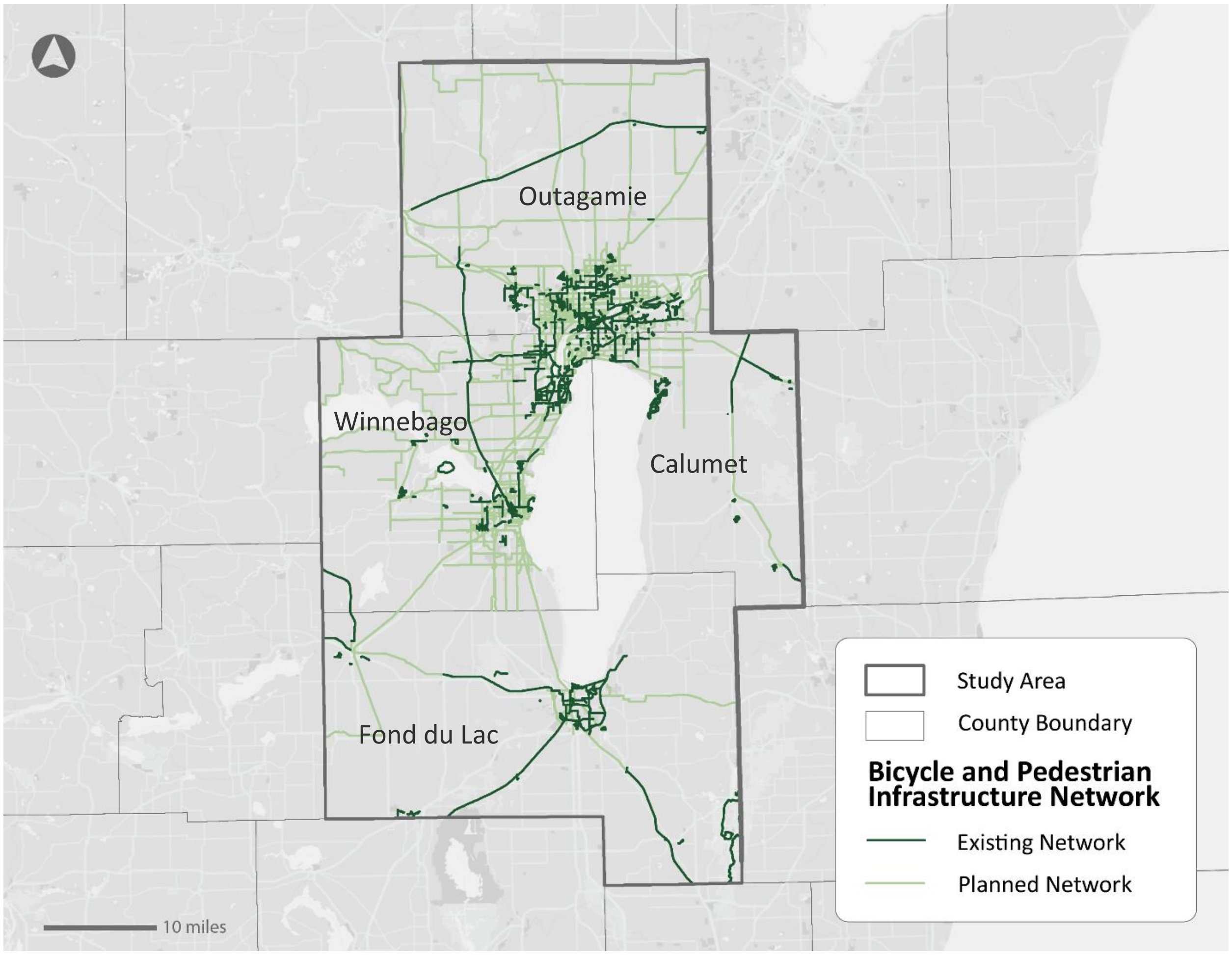
The Appleton (Fox Cities) Transportation Management Area includes the cities of Appleton, Neenah, Menasha, and Kaukauna; the villages of Kimberly, Combined Locks, Greenville, Harrison, Little Chute, and Sherwood; the towns of Buchanan, Grand Chute, Harrison, Kaukauna, Menasha, Neenah, Vandenbroek; and the counties of Calumet, Outagamie, and Winnebago. The Oshkosh Metropolitan Planning Organization encompasses the city of Oshkosh, the towns Algoma, Black Wolf, Nekimi, Oshkosh, Vinland, and Winnebago County. The Fond du Lac MPO includes the city of Fond du Lac; the villages of North Fond du Lac and Eden; the towns of Black Wolf, Eden, Empire, Fond du Lac, Friendship, Taycheedah; and the counties of Fond du Lac and a small portion of Winnebago.

As part of ECWRPC's bicycle and pedestrian planning, the Commission created The Appleton (Fox Cities) TMA and Oshkosh MPO Bicycle and Pedestrian Plan in 2014 and updated the plan in 2021. This plan acknowledges the 500 miles of municipal bicycle/pedestrian networks in each respective MPO and discusses how ECWRPC can facilitate the creation of a proposed 930 additional miles of bicycle/pedestrian trails and new facilities.

The City of Fond du Lac created City of Fond du Lac Bike & Pedestrian Plan in 2013 and updated the plan in 2018. Similarly, this plan discusses the construction of existing and proposed facilities within the municipality. Within Fond du Lac County, there are 124 miles of existing bicycle and pedestrian infrastructure, along with the 81 miles of proposed infrastructure to complete the network.

ECWRPC works to ensure that the regional network flows seamlessly between and within municipal boundaries, includes coherent wayfinding signage, and links well with commercial areas and the Valley Transit and Oshkosh Transit Systems.

Figure 1.1: Map of Existing and Planned Network in Calumet, Fond du Lac, Outagamie, and Winnebago Counties



Source: ECWRPC (2021), Econsult Solutions, Inc. (2022)

Figure 1.2: ECWRPC Bicycle and Pedestrian Facilities in the Study Area by Status of Segments in Miles

	Bike Lane (miles)	Off-Road Paved (miles)	Off-Road Unpaved (miles)	Signed Bike Route (miles)	Planned Network (miles)	Total - Upon Completion (miles)
Calumet County	17	24	36	1	86	164
Fond du Lac County	2	31	65	25	81	204
Outagamie County	65	90	69	13	422	659
Winnebago County	53	68	44	19	422	606
Total Study Area	137	214	214	58	1,011	1,633

Source: ECWRPC (2021)

1.3. Bicycle and Pedestrian Networks as a Driver of Regional Benefits

Research and practice show that bicycle and pedestrian infrastructure are essential infrastructure which improve the economic vitality of communities. These facilities create safe and easy access to a community's natural assets and connect destinations throughout a region. When developed as a network, they support healthy living, provide affordable transportation, and improve the quality of life for residents who live nearby. In addition to providing benefits to residents, investments in bicycle and pedestrian infrastructure increase the attractiveness of a community for businesses and out-of-town visitors. In addition to their clear transportation, recreation, and health value, these networks also deliver multiple economic benefits:

- As an indicator of local reinvestment in a place, bicycle and pedestrian infrastructure can serve as a catalyst for additional economic and community development projects. Studies show that homeowners are willing to pay a premium to live within close proximity to greenways. As a result, certain facilities may add to the overall value of the region's housing stock.
- As part of a region's green infrastructure, bicycle and pedestrian infrastructure networks—if completed in ways that support existing natural resources—can include the creation of a green buffer and tree cover that contribute to sustainable and resilient ecosystems.
- As a mode of active recreation for residents and out-of-town visitors, bicycle and pedestrian infrastructure networks also often serve as a way to encourage local tourism as well as attract visitors to spend more time in the region, in turn spending at businesses located nearby.
- Finally, as a critical social infrastructure, bicycle and pedestrian infrastructure networks support mental and physical health.

1.4. Organization of Report

This report analyzes the potential economic, environmental, and public health impacts of building out the planned bike and pedestrian facilities and trails in the Appleton (Fox Cities) TMA, the Oshkosh MPO, and Fond du Lac MPO, and is organized as follows:

- **Section 2: Economic Impacts from Construction of the Region's Planned Bike and Pedestrian Facilities:** estimating the potential upfront impacts during construction of the network;
- **Section 3: Environmental Benefits**: quantifying the benefits associated with maintaining the tree cover and green infrastructure along the network corridors;
- **Section 4: User Spending Impacts:** calculating the potential spending generated due to bicycle and pedestrian infrastructure network users, particularly spending that supports local businesses;
- **Section 5: Public Health Impacts from the Use of East Central Wisconsin's Bike and Pedestrian Facilities:** valuing the benefits associated with users increasing their physical activity and fitness due to the presence of the network;
- **Section 6: Benefits for the Region's Transportation Network**: evaluating the ways in which, once complete, the network will enhance the safety and connectivity in the four-county study area;
- **Appendix:** providing additional analytical results at more granular level than what is presented in the main body of the report along with results for Fond du Lac County.

1.5. Notes about Data and Terminology

The following lists the data sources and concepts used and discussed throughout the report. For each piece of analysis, ESI obtained the most recently available datasets, but it is possible that there many have been other potential datasets that were not used. Impacts for the study area are included in each section. When applicable, impacts for the State of Wisconsin are also calculated.

Multiple data sources are used throughout each section of this report, including academic papers, model frameworks, and surveys. The specific methodologies are included in each section. However, there are a few data sources, methodologies, and models that are used throughout the report, which are defined here:

American Community Survey: Data tracking characteristics of the population and region immediately surrounding the network and in the four counties at large are drawn from the latest available complete release of the American Community Survey (ACS) product from the US Census Bureau.

IMPLAN: Impact Analysis for Planning. An industry standard input-output model used to estimate the economic impacts from capital investments and user spending.

Input-output modeling: This economic modeling technique is used to represent the flow of money in an economy. In an inter-connected economy, every dollar spent generates two spill-over impacts: First, some proportion of spending on locally purchased goods and services is circulated back into an economy. This represents an "indirect effect" and reflects the fact that local purchases of goods and services support local vendors, who in turn create business-to-business transactions when they purchase from their own set of vendors. Second, some proportion of that expenditure that goes toward employee salaries is circulated back into an economy when those employees spend some of their earnings on goods and services. This represents what is called the "induced effect" and reflects that fact that some of those goods and services will be purchase from local vendors, further stimulating a local economy.

MRLC: Multi-Resolution Land Characteristics (MRLC) Consortium. A group of federal agencies who coordinate and generate consistent and relevant land cover information at the national scale for a wide variety of environmental, land management, and modeling applications. MRLC manages the land cover and tree canopy data in order to estimate environmental benefits.

In addition to the data sources listed above, the following terms and acronyms are used throughout the report and defined here:

Active transportation: Also referred to as active commuting, refers to transportation by human physical activity or non-motorized means, including walking, bicycling, using a mobility assist device like a wheelchair or walker, or using a small-wheeled device such as a skateboard, foot scooter, or inline skates.

Ecosystem services: Any positive benefit that wildlife or ecosystems provide to people as a result of their natural functions. This report estimates the economic benefits associated with the ecosystem services of provision of water supply, water quality improvement, flood mitigation, wildlife habitat, air pollution removal, and carbon sequestration and storage that results from the natural environment on natural lands adjacent to the network.

Employee absenteeism: In the context of this analysis, employee absenteeism is defined as hours of work lost by employees staying home / missing work due to health issues.

Employee presenteeism: In the context of this analysis, employee presenteeism is defined as hours of work lost by employees being less productive while at work / working due to health issues.

Environmental benefits: The economic benefits derived from ecosystem services—often represented the avoided cost of building infrastructure to achieve the same environmental benefits.

Geographies: The primary geographies of interest in this analysis are Calumet, Fond du Lac, Outagamie, and Winnebago counties in Wisconsin. Most metrics through the report are developed for the four-county study area. It should be noted, however, that the sections that quantify economic and tax revenue impacts from spending in these counties present results for the study area and statewide.

Hard costs: Hard costs are any costs associated with the physical construction of the network, including equipment used, and any labor associated with the construction of the project.

Hard goods: Also referred to as durable goods, hard goods are goods that yield utility over time rather than being consumed in one or few uses. In the context of this analysis, hard goods refer to equipment, clothing, and accessories purchased by users.

Land cover: Patterns of vegetation or fabricated features that occur on the earth's surface. Examples of land cover include forest, pasture, wetland, and developed area.

Physically active: In this analysis, "physically active" is defined as meeting the Centers for Disease Control and Prevention recommended level of physical activity of at least 150 minutes per week of moderate-intensity equivalent physical activity for adults. Active users in this analysis are defined as those who use the network four or more times a week and meet recommended levels of physical activity due to bicycle and pedestrian infrastructure alone.

Social Cost of Carbon (SCC): The economic cost in terms of the resulting damage to the atmosphere associated with each metric ton of carbon emissions. While researchers have produced a wide range of estimates, for the purposes of this report, the social cost of carbon refers to the calculation set by the Biden Administration in February 2021.

Soft costs/Design costs: Soft costs are any costs that are not considered direct construction costs or "hard costs." These costs typically are associated with non-tangible items, such as design, fees, taxes, and insurance. Soft costs can be a significant part of a project's budget.

Soft goods: Also referred to as non-durable goods, soft goods are goods that are intended to be consumed. In this analysis, soft goods refer to food and beverage consumables.

Value transfer: An estimation method that assigns a monetary value to something non-monetary to gauge how much people value the asset/service and would be willing to pay for it if they had to. This method is used where data collection proves too costly or time consuming. An example of value transfer is asking someone how much they would be willing to pay to remove a ton of carbon from the atmosphere.

2. Impacts from Capital Investments in the Region's Planned Bicycle and Pedestrian Facilities

The completion of the bicycle and pedestrian infrastructure network in the four-county study area of East Central Wisconsin will represent a significant boost to the local and state economies through the upfront capital investments made to complete new bike lanes, off-road segments, and other pedestrian infrastructure. Direct construction activity of the network will employ construction workers and professional service providers (e.g., architects, engineers, and environmental services firms) through the project development period; those workers, in turn, will spend a portion of their salaries and wages within the local and state economies. This construction activity will also catalyze the procurement of a wide range of goods and services translating into new economic opportunities for local and state vendors. These direct expenditures are projected to generate $2.03 billion in total economic impact, supporting 11,550 jobs with $678 million in earnings in the study area.

2.1. Methodology

The impact of this direct investment in the construction of the bicycle and pedestrian infrastructure network does not end with the initial investment but is recirculated through the economy in two ways:

- First, a portion of that direct spending, which goes to the purchase of goods and services, gets circulated back into an economy when those goods and services are purchased from local vendors. This is the "indirect effect," and reflects the fact that local purchases of goods and services support local vendors, who in turn require additional purchasing with their own set of vendors.
- Second, a portion of that direct spending, which goes to labor income, gets circulated back into an economy when those employees spend some of their earnings on various goods and services. This is the "induced effect," and reflects the fact that some of those goods and services will be purchased from local vendors, further stimulating the local economy.

Figure 2.1: Economic Impact Methodology

Source: Econsult Solutions, Inc. (2022)

By determining linkages across industries, input-output models estimate both the magnitude and composition of spillover impacts to all industries associated with a dollar spent in any one industry. Thus, the total economic impact for the expansion of the East Central Wisconsin bicycle and pedestrian infrastructure network is the sum of the direct construction investment plus the indirect and induced effects generated by that direct investment (see Figure 2.1). These impacts are only calculated for construction occurring for the planned network. It does not capture any previous capital investments into the existing network.

2.2. ECWRPC's Current and Planned Network of Bicycle and Pedestrian Facilities

A significant investment has been made in East Central Wisconsin to date, but a substantial amount of work is still required to establish a connected network of bicycle and pedestrian infrastructure within each of the four counties and throughout the region. Currently, there are 622 miles of bike lanes, signed bike routes, off-road paved trails, and off-road unpaved trails, with an additional 1,011 miles of bicycle and pedestrian facilities to be built in the future. The following estimates are based on the remaining costs to build out the East Central Wisconsin bicycle and pedestrian infrastructure network in Calumet, Fond du Lac, Outagamie, and Winnebago counties.

Budgets for segments of the planned network[5] provided by ECWRPC were used to calculate an estimated both hard cost per mile of new construction and design costs per mile. The average cost of the investment in the new segments is $1 million per mile in construction costs, $216,000 in design costs, and $88,000 in non-modeled costs. Applying these average values to the remaining planned segments of the network yield a total of $1.3 billion (see Figure 2.2).

Figure 2.2: Estimated Construction Costs of the Planned network in the Study Area

Planned Network Location	**Planned Network (Miles)**	**Construction Cost ($M)**
Calumet County	86.1	$109.1
Fond du Lac County	80.9	$102.5
Outagamie County	421.9	$534.9
Winnebago County	422.1	$535.1
Total	1,010.9	$1,282
Average Cost per Planned Mile ($M)		**$1.27**

Source: ECWRPC (2021)

[5] Budgets from Village of Kimberly - Kennedy Ave/Marcella St 10' Wide Multimodal Trail Project, WeEnergies Trail: Phase 2 - Probable Estimate of Construction Costs, CTH GV - Multi-use Trail (McCarthy Road to N. Casaloma Drive), and WIS 76 Pedestrian Tunnel were used to calculate a per mile cost that was applied to the planned network.

2.3. Potential Economic Impact from Investments in East Central Wisconsin's Bicycle and Pedestrian Network

Direct expenditures attributed to the completion of the bicycle and pedestrian infrastructure network are estimated to total $1.3 billion.[6] These direct expenditures are projected to generate $2 billion in total economic impact to the four-county study area, supporting 11,550 full-time (FTE) jobs and $678 million in total earnings (see Figure 2.3).[7] For Wisconsin, the investment is projected to generate $2.3 billion in total economic impact, supporting 12,970 jobs with $776 million in earnings.

On average, each mile of additional bicycle and pedestrian infrastructure in the State of Wisconsin supports:
13 jobs during construction
$2.3 million in economic output.

Figure 2.3: Potential Aggregate Economic Impact from Construction of the Planned Network in the Study Area and the State of Wisconsin

Impact Type	Study Area	Wisconsin
Direct Output ($M)	$1,274	$1,274
Indirect and Induced Output ($M)	$752	$1,066
Total Impact ($M)	**$2,026**	**$2,340**
Employment Supported (FTE)	**11,550**	**12,970**
Employee Compensation ($M)	**$678**	**$776**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

2.4. Completion of the Region's Bike and Pedestrian Facilities Will Support a Diversity of Jobs

Capital investment in future bicycle and pedestrian facilities throughout the study area will support jobs in many industries beyond the building trades and engineering. Direct employment in construction of the network will account for approximately 54 percent of all jobs supported by these investments; the remaining 46 percent of jobs supported indirect and induced jobs, including retail sector, healthcare and social services, administrative services, food services, professional and technical services, and manufacturing.

[6] This analysis does not include any additional spending associated with upkeep or maintenance after the initial capital investment.
[7] IMPLAN generates job estimates based on the term "job-years", or how many jobs will be supported each year. For instance, if a construction project takes two years, and IMPLAN estimates there are 100 employees, or more correctly "job-years" supported, over two years, which represents 50 annual jobs. Additionally, these can be a mix of a full and part-time employment. Consequently, job creation could feature more part-time jobs than full-time jobs. To account for this, IMPLAN has a multiplier to covert annual jobs to full-time equivalent jobs.

These indirect and induced jobs are supported through the spillover spending that occurs from the upfront construction of the network. For example, the retail industry is supported when a general contractor purchases materials from a local building supply store; this is considered an indirect impact. Additionally, the accommodations and food sector is supported when construction workers spend their earnings having lunch at a restaurant; this is considered an induced impact.

Figure 2.4: Industry Distribution of Employment Generated from Construction of the Planned Network

Industry	Distribution
Retail Trade	15.0%
Health Care and Social Assistance	12.6%
Administrative and Support and Waste Management and Remediation Services	9.7%
Accommodation and Food Services	8.4%
Professional, Scientific, and Technical Services	8.3%
Manufacturing	7.3%
Other Services (except Public Administration)	6.9%
Transportation and Warehousing	6.3%
Wholesale Trade	5.8%
Finance and Insurance	5.6%
Real Estate and Rental and Leasing	4.9%
Arts, Entertainment, and Recreation	2.2%
Management of Companies and Enterprises	1.9%
Information	1.6%
Educational Services	1.6%
Construction	0.6%
Agriculture, Forestry, Fishing and Hunting	0.5%
Mining, Quarrying, and Oil and Gas Extraction	0.3%
Public Administration	0.3%
Utilities	0.2%

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

2.5. Potential Tax Impacts from the Completion of the Region's Bicycle and Pedestrian Facilities

The cumulative capital investment also generates tax revenue impacts in the respective localities during the period of construction. To estimate these tax revenue impacts, ESI created a custom fiscal impact model to translate total economic impacts into their commensurate tax revenue gains. Output from the IMPLAN model determines its impact on the relevant tax types and tax bases associated with the jurisdictions in which revenue impacts reside. These include income, sales, and business taxes at the state level, which are modeled in this report. The resulting property tax gains from the network development are later discussed in Section 7 of this report.

The direct construction activity of the bicycle and pedestrian infrastructure network, as well as its indirect and induced economic impacts, is estimated to generate approximately $84.7 million to the State of Wisconsin (see Figure 2.5). In the four-county study area, it is estimated to generate approximately $360,000 in sales tax revenue. Tax revenue generated from planned construction is approximately $83,800 per mile for the State of Wisconsin and $360 per mile for the four-county study area.

Figure 2.5: Potential Tax Revenue from Construction of the Network

Tax Type	Study Area	State of Wisconsin
Income ($M)	-	$37.0
Sales ($M)	$0.36	$38.7
Business ($M)	-	$9.1
Total Tax Revenue ($M)	**$0.36**	**$84.7**
Tax Revenue Per Mile of Planned Network ($)	**$360**	**$83,800**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022), State of Wisconsin CAFR (2019)

3. Benefits from Environmental Services Attributed to the Region's Bicycle and Pedestrian Facilities

Bicycle and pedestrian infrastructure networks such as East Central Wisconsin's provide environmental benefits for the communities they serve by bolstering natural resource management through active environmental conservation efforts. These networks help to preserve the surrounding natural environment, which otherwise may be at risk for development or further loss of natural lands. The natural lands adjacent to the network provide environment benefits including air pollution removal, the provision of water supply, water quality improvement, flood mitigation, wildlife habitat conservation, and carbon sequestration and storage. This section draws upon established research to evaluate the economic benefits in monetary terms of the ecosystem services provided by the network.

Bicycle and pedestrian infrastructure networks bolster natural resource management by preserving open space and active environmental conservation efforts. If designed in ways that are mindful of existing ecosystems, the upkeep of the network will ensure the value of the services from the ecosystems are retained. If these ecosystems were removed, municipalities would incur additional costs to recoup their value. It is important to note that this analysis includes the areas directly surrounding the infrastructure network and does not include any paved surfaces of the network.

These benefits combined create ecosystem functions that would require costly measures to replicate if lost. In sum, the estimated economic value these ecosystems provide on an annual basis is $168.2 million for the existing network. Additionally, the tree canopy on the existing network is estimated to be valued at $59.9 million over the lifespan of the tree canopy; in other words, it would cost $59.9 million to replicate carbon storage if the tree canopy did not exist.

3.1. Methodology

ESI calculates the land cover variation for each network segment and applies the values associated with each of the ecosystem services to produce total value of the environmental impact of the bicycle and pedestrian infrastructure, upon full completion of the network in these four counties in East Central Wisconsin. Dollar values approximating the economic value of each of these services are based on peer-reviewed estimates of value on a per-acre basis. These total value estimates represent the costs avoided by not having to artificially replicate the ecosystem services currently provided by the bike and pedestrian infrastructure network.

First, acreage of ecosystems within the network was determined using the land cover imagery from the Multi-Resolution Land Characteristics (MRLC) 2016 National Land Use Land Cover file.[8] The acreage of each ecosystem type is used to calculate environmental services benefits using values from a 2006

[8] The Multi-Resolution Land Characteristics (MRLC) consortium is a group of federal agencies who coordinate and generate consistent and relevant land cover information at the national scale for a wide variety of environmental, land management, and modeling applications. These federal agencies include the Bureau of Land Management, LANDFIRE, National Agricultural Statistic Services, National Oceanic and Atmospheric Administration, US Forest Service, and United States Geological Survey.

study, which estimated the average value of various ecosystem services.[9] The estimated benefits were derived by determining the acreage type for the ecosystem services and multiplying the acreage by the ecosystem service benefit. Each ecosystem provides different services and has associated value per acre, determined by the Constanza study, and applied to the bike and pedestrian infrastructure network, upon full completion of the network in the study area.

The i-Tree model developed by the U.S. Forest Service is used to estimate the air pollution removal and carbon sequestration and storage benefits of the network within the four counties of Calumet, Fond du Lac, Outagamie, and Winnebago. The resulting values for air pollution benefits reflect the amount society would have to pay in areas, such as healthcare, if trees did not remove these pollutants. The model uses National Land Cover Datasets (NLCD) to first estimate the amount of tree canopy and then uses pollution removal rates to estimate the total amount of pollutant removal that results from this canopy coverage. It also estimates the lifetime amount of carbon stored within trees and how much carbon is sequestered by trees on an annual basis.[10] The i-Tree model has the advantage of allowing for the adjustment of the per-acre pollution removal values.

3.2. How Bicycle and Pedestrian Facilities Support Local Ecosystems

The ecosystem services surrounding a bicycle and pedestrian infrastructure network include benefits such as air pollution removal, replenishing water supply, water quality improvement, preservation of wildlife habitat, and carbon sequestration and storage. It should be noted that some types of landscapes are more valuable than others for a particular type of benefit: air pollution removal and carbon sequestration are primarily a function of tree cover, while wetlands and riparian forests are major drivers of water supply, water quality, and flood mitigation benefits. Thus, the upkeep of the network ensures the ecosystems are protected, providing significant benefits.

Specifically, constructing networks for recreational and transportation uses can be used as a tool to preserve natural lands and hinder further development. These networks can be developed successfully and address the potential concerns of human impact and over usage on natural lands through proper trail management, maintenance, and a robust collaboration among stakeholders with competing interests.

3.3. Analysis of Potential Environmental Services Benefit Upon Completion of the Region's Bicycle and Pedestrian Facilities

Upon full completion of the bicycle and pedestrian infrastructure network in the counties of Calumet, Fond du Lac, Outagamie, and Winnebago, the associated ecosystem services will generate significant economic benefits to the extent that these ecosystems within a quarter mile of bike trails, paved and unpaved off-road trails, and other pedestrian infrastructure and its 50,000 acres of tree cover are preserved and managed. While the majority of this network is paved, the ecosystems surrounding the

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[9] Costanza, Wilson, Tory, Voinov, Liu, and D'Agostino (2006), *The Value of New Jersey's Ecosystem Services and Natural Capital*. New Jersey Department of Environmental Protection, Division of Science, Research, and Technology.

[10] i-Tree calculates the social cost of carbon at $177; however, for the purposes of this study, ESI used the Biden Administrations recommended $51 per ton as the social cost of carbon.

network (within a quarter mile) generate ecosystem services benefits, which will be protected by the existence and upkeep of the network.

Air Pollution Removal

Poor air quality is common in many urban and suburban areas and can lead to a variety of human health problems, including asthma and other respiratory ailments. The pollutants that affect air quality also can damage buildings and plants, give rise to smog, and contribute to climate change.

Emissions reductions can be a major contributor to positive trends in air quality. Additional investments in the network can further support improved air quality by providing alternative transportation options for residents (as discussion in Section 6) and by maintaining tree coverage that further mitigates the ecological damage from pollution. Trees mitigate significant amounts of air pollution through botanic respiration processes that remove pollutants from the air. This naturally occurring air pollution removal process contributes to environmental quality and health.

The analysis of how tree cover can enhance air quality includes benefits derived from the removal of five different pollutants: carbon monoxide, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.[11] Figure 3.1 below shows the value generated for the removal of each pollutant.

Figure 3.1: Potential Annual Air Pollution Removal Benefits of the Network in the Study Area

		Existing Network		Planned Network		
Pollutant	**$/Ton Removed**	**Tons Removed**	**Estimated Benefit**	**Tons Removed)**	**Estimated Benefit**	**Total Upon Completion**
CO	$144	5.9	$843	3.1	$487	$1,330
NO2	$28	60.5	$1,687	20.1	$678	$2,365
O3	$211	657.8	$138,700	340.0	$72,400	$211,100
PM10	$588	111.2	$65,400	58.0	$37,800	$103,200
PM2.5	$8,149	24.7	$201,600	10.9	$93,800	$295,400
SO2	$12	41.0	$478	24.6	$301	$779
Total	**$9,100**	**901.1**	**$408,700**	**456.5**	**$205,500**	**$614,200**

Source: i-Tree (2022), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

Upon completion of the network, East Central Wisconsin Regional Planning Commission will help to preserve the existing 50,000 acres of tree canopy within a quarter mile of the network.[12] Using this total tree canopy acreage and established estimates of the per-ton benefits of removing various airborne pollutants, it is estimated that trees within a quarter mile of the network in this four-county region will provide $614,200 in air pollution removal services.

[11] Abbreviations: carbon monoxide (CO), nitrogen dioxide (NO^2), ozone (O^3), particulate matter (PM10), and sulfur dioxide (SO^2)
[12] As described in Section 4.2, ESI used land cover spatial files to analyze various uses; this data identified the volume of tree canopy within a quarter mile of all network segments.

Water Supply

The soil of undeveloped land stores water and replenishes streams, reservoirs, and aquifers. This natural system provides the continuous recharge of groundwater and streams. Forests and wetlands are particularly productive land covers for water provision. The larger the land cover, the greater the benefits derived. Were this ecosystem to fail, water would need to be imported from elsewhere or local water would to be more extensively treated, both of which are costly. Within a quarter mile of the completed network in the study area, $183.8 million in annual cost savings from natural water supply services will be generated.

Water Quality

Forests and wetlands provide a natural protective buffer between human activities and water supplies. This service is driven largely by the proportion of forest, wetland, and riparian buffer located along the network. This riparian buffer filters and stops several types of waste, including pathogens, excess nutrients, metals, and sediments, from entering the water supply. Without the riparian buffer, residents would be forced to pay for alternative groundwater filtration or water treatment methods. In sum, the buffer provided by network upon full completion will generate approximately $18.3 million annually, in water quality benefits from the ability to naturally maintain water quality.

Flood Mitigation

Many natural landscapes serve as a buffer protecting people and properties from destructive natural events. The absorptive capacity of protected open space helps to mitigate the risk of flood during storm events by trapping and containing stormwater. If the study area were to be deprived of this natural service, residents, and local governments would be forced to undertake costly measures to protect the built environment from further damage as a result of flooding, such as constructing dams or reservoirs. In sum, the buffer provided by the network will generate approximately $138.2 million annually, roughly $83,100 per mile, from natural flood mitigation services.

Wildlife Habitat

The network serves as habitats for a diverse array of plants and animals. Intact forests and wetlands harbor species that people value for both aesthetic and functional purposes. Values for this ecosystem service estimate the amount of money that people would be willing to pay to preserve wildlife. It is important to note that the value associated with wildlife habitat is of a different nature than the values associated with the other ecosystem services included in this section–it does not represent an avoided cost. To ensure a conservative valuation of the benefit derived from the preservation of wildlife habitat on protected open space, the estimates in this section are based on minimum willingness-to-pay values from the research literature.[13] In sum, the wildlife habitats located within a quarter mile of the network will have an estimated annual value of $70 million, approximately $42,000 per mile.

[13] Costanza, Wilson, Tory, Voinov, Liu, and D'Agostino (2006), The Value of New Jersey's Ecosystem Services and Natural Capital. New Jersey Department of Environmental Protection, Division of Science, Research, and Technology.

Carbon Sequestration and Storage

Trees mitigate the impacts of climate change by sequestering and storing atmospheric carbon from carbon dioxide. Carbon storage is an estimate of the total amount of carbon stored in the existing biomass of trees, both above and below ground. In other words, if the carbon currently stored in trees on protected trails were released into the air, it would cause damages that would require a significant cost to mitigate, such as damages to agricultural productivity, human health, and property damages. It is important to note that the estimate of the value of stored carbon is not annual. The storage of carbon in a tree represents a one-time benefit—the carbon is kept out of the atmosphere until the tree dies.

The social cost of carbon, which is an estimate of the monetized damages associated with an incremental increase in carbon emissions each year, is $51 per ton.[14] Using this social cost of carbon, it is estimated that within a quarter mile of the completed network, trees will store 1.8 million tons of carbon, equating to $93.7 million within existing biomass. In other words, if carbon currently stored in trees within the network were released into the air, it would cause climate change damages that will cost approximately $93.7 million, or $56,300 per mile, to mitigate.[15]

As a tree grows, it pulls carbon from the air. New growth on trees is responsible for carbon sequestration, which is measured on an annual basis. This estimate controls for the yearly release of stored carbon through the death and decay of trees. Like the carbon storage estimate, this estimate measures the monetary damages associated with each ton of carbon that is sequestered. Because this carbon is taken out of the air by trees on the bike and pedestrian infrastructure network, these damages are avoided, representing savings for communities across the network. Every year, new growth on the trees within the network will sequester an additional $11.9 million, approximately $7,100 per mile, in cost savings.

Figure 3.2 shows potential estimates of the tons of carbon annually sequestered and tons stored by trees for their lifetime within a quarter mile of the network, upon full completion, along with the benefits derived from the storage and sequestration of carbon by these trees. The existing tree canopy within a quarter mile of the existing and planned network were obtained from the National Land Cover Database (NCLD) 2016's Tree Canopy file.[16]

[14]Biden Administration recommended social cost of carbon as of 2021.
[15] This is an approximation based on the average lifespan of the trees within the tree canopy.
[16] *National Land Cover Database*, NLCD 2016 USFS Tree Canopy Cover, https://www.mrlc.gov/data/nlcd-2016-usfs-tree-canopy-cover-conus.

Figure 3.2: Potential Amounts of Annual Carbon Sequestration and Lifetime Carbon Storage and Associated Benefits from Bicycle and Pedestrian Infrastructure in the Study Area

	Existing Network		Planned Network		Total	
Pollutant	Tons	Cost Savings ($M)	Tons	Cost Savings ($M)	Total	Cost Savings ($M)
Annual Carbon Sequestration	131,400	$6.7	101,300	$5.2	232,700	$11.9
Lifetime Carbon Storage	1,174,400	$59.9	607,700	$33.8	1,782,000	$93.7

Source: i-Tree (2022), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

Aggregate Environmental Benefits

In sum, the ecosystem services and environmental benefits within a quarter mile of the network (upon completion) are $437.9 million in annual benefits from a variety of sources (see Figure 3.3) and $90.9 million in the lifetime cost savings of carbon storage from tree coverage, where these estimates are based on the lifespan of the tree coverage.[17]

Figure 3.3: Potential Environmental Benefits by Type and Locality of Bicycle and Pedestrian Infrastructure in the Study Area ($ per Year)[18]

Ecosystem Service	Existing Network ($M)	Planned Network ($M)	Total Upon Completion ($M)
Water Supply	$75.2	$108.8	$183.8
Water Quality	$11.1	$19.8	$33.2
Flood Mitigation	$56.3	$81.9	$138.2
Wildlife Habitat	$16.1	$53.9	$70.0
Air Pollution Removal	$0.4	$0.2	$0.6
Carbon Sequestration	$6.7	$5.2	$11.9
Annual Total Ecosystem Service Benefits	**$165.8**	**$269.6**	**$437.9**
Lifetime Carbon Storage	**$59.9**	**$31.0**	**$90.9**

Source: Costanza (2006), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

[17] The lifespan of the trees in the ecosystem depends on the varieties of trees in the ecosystem. Average lifespans can range from 50 years to several hundred years depending on the species of the tree.
[18] Note that not every ecosystem generates an economic benefit, approximately 28 percent of the land cover classifications identified of the ~3,500 acres were used to generate an ecosystem service benefit.

4. Impacts from Spending by Users of Bicycle and Pedestrian Facilities in the Region

Beyond impacts generated by the development of bicycle and pedestrian infrastructure, the local spending by users will generate additional economic benefits for the businesses located near and businesses that sell related products. Residents and visitors who access the region's bicycle and pedestrian infrastructure network often spend money on both goods and services related to active recreational activity during their trips. Much of this spending is happening at retailers in immediate proximity of the network.

This section quantifies the impacts realized from local business spending and the resulting tax revenue impacts to local and state governments. While a portion of this spending will be due to visitors using the network from outside of the area, the majority of this local business spending will be generated by residents in the area adjusting their spending patterns as part of trips. For example, the current and expanded network will enable visitors from communities within the network to travel and patronize shops in neighboring communities they may not have otherwise visited.

It is estimated that direct spending by users on the completed network in the study area will total over $45 million annually. These direct expenditures are projected to generate approximately $74 million in total economic impact in the study area each year, supporting 650 jobs in the county with $19 million in earnings annually.

4.1. Methodology

To quantify the local spending from bicycle and pedestrian infrastructure users, a spending profile is created based on online surveys of East Central Wisconsin bicycle and pedestrian infrastructure users. An estimate of spending by users on "soft" goods, such as beverages, snacks, and meals, is established on a per-visit basis and an estimate of spending on "hard" goods, such as bicycles and exercise clothing and accessories, is developed on an annual basis. It is estimated, based on survey data, that users spend approximately $11.46 on "soft" goods when they choose to purchase these types of goods as part of a visit to a trail or on a bike path. It is estimated that frequent users spend $125.36 on "hard" goods each year.

These direct expenditures by users support local businesses and generate spillover effects in the local and regional economy. Industry standard input-output modeling software IMPLAN is used to model the economic impacts of this direct user spending. Fiscal modeling is undertaken to estimate the additional tax revenues to jurisdictions associated with this economic activity.

4.2. Estimated Annual Spending by Users

To estimate annual spending on "soft" goods (e.g. beverages, snacks, etc.), the number of annual visits by local users is first estimated using the 2022 East Central Wisconsin Planning Commission: Bike and Pedestrian Facilities Survey, matched with data regarding the number of working age adults with walking/biking access to the network from the US Census to estimate the number of frequent (four or more times a week) users. Estimates are developed for the existing network, the proposed portion of the network, and the total network upon completion. Then, the number of these visits during which spending on "soft" goods would occur is estimated based on survey data and assumptions scaled to the frequency of use (to avoid frequent users skewing up the estimated number of spending visits). The number of annual "soft" goods spending visits are then applied to the spending profile on "soft" goods established by the 2022 survey data to estimate the total annual spending on "soft" goods by network users (See Figure 4.1).

Figure 4.1: Estimated Direct Spending on "Soft" Goods by East Central Wisconsin Network Users

Category	Existing Network	Planned Network	Total - Upon Completion
Working Age Residents with Walking/Biking Access to Network	275,467	20,638	296,105
Average Number of Visits Per Year per Resident with Walking/Biking Access	93	93	93
Share who Purchased "Soft" Goods During Last Visit	14%	14%	14%
Estimated Number of "Soft" Goods Spending Visits	3,533,700	264,700	3,798,500
Average Amount Spent on "Soft" Goods	$11.46	$11.46	$11.46
Estimated Total Direct Spending on "Soft" Goods ($M)	**$40.5**	**$3.0**	**$43.5**

Source: US Census American Community Survey (2015-2019), ECWRPC (2022), Econsult Solutions, Inc. (2022)

To estimate annual spending on "hard" goods (e.g., equipment, clothing, etc.), the number of annual visits by local users is first estimated using the 2022 East Central Wisconsin Planning Commission: Bike and Pedestrian Facilities Survey and US Census data referenced above. The proportion of frequent users who report purchasing "hard" goods in relation to their use within the last year is then applied to these estimates of frequent users. Then, these estimates are applied to the average expenditure amount on "hard" goods referenced in the spending profile above to yield the total annual spending on "hard goods" by network users (see Figure 4.2).

Figure 4.2: Estimated Direct Spending on "Hard" Goods by East Central Wisconsin Network Users

Category	Existing Network	Planned Network	Total - Upon Completion
Working Age Residents with Walking/Biking Access to Network	275,467	20,638	296,105
Share of Frequent (4+ times a week) Users	21%	21%	21%
Estimated Frequent Users	58,100	4,400	62,600
Share who Purchased "Hard" Goods in Last Year	53%	53%	53%
Average Amount Spent on "Hard" Goods	$125.36	$125.36	$125.36
Estimated Total Direct Spending on "Hard" Goods ($M)	**$3.8**	**$0.3**	**$4.1**

Source: US Census American Community Survey (2015-2019), ECWRPC (2022), Econsult Solutions, Inc. (2022)

Local spending by users on the existing East Central Wisconsin bicycle and pedestrian infrastructure network is estimated to total $44.3 million annually. Upon completion, the network is estimated to support approximately $47.6 million in local user spending annually (see Figure 4.3). However, it is important to adjust for the fact that some of this spending immediately leaves the four counties and therefore does not have a multiplier effect within the regional economy. For example, a considerable proportion of retail spending goes to manufacturers and wholesalers, most of which are outside the region, and so the modeling approach used in this analysis includes only the retail margin (the difference between the purchase price for the retailer and the sales price for the customer). Based on this adjustment, the amount of annual local spending modeled in our analysis is $42.1 million supported by the existing network and $45.6 million annually supported by the completed network.

Figure 4.3: Potential Annual Local Spending by East Central Wisconsin Network Users ($M)

	Existing Network	Planned Network	Total - Upon Completion
User Spending on "Soft" Goods	$40.5	$3.0	$43.5
User Spending on "Hard" Goods	$3.8	$0.29	$4.5
Total User Spending	$44.3	$3.3	$48.0
Amount of Spending Leaving the Study Area	*-$2.2*	*-$0.2*	*-$2.4*
Total Modeled User Spending	**$42.1**	**$3.2**	**$45.6**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

4.3. Potential Annual Economic Impact from User Spending

Input-output modeling is used to estimate the potential economic impacts in the region and statewide associated with this local spending by network users. The modeled local direct expenditures associated with user spending on the completed network will generate approximately $74.4 million in economic impact in the study area, supporting nearly 645 jobs and approximately $19 million in wages (see Figure 4.4). Statewide, the total economic impact generated by this spending is over $84 million, supporting almost 700 jobs and approximately $21.3 million in wages.

Figure 4.4: Potential Annual Economic Impact from Local Spending by East Central Wisconsin Network Users ($M)

	Existing Network		Planned Network		Total - Upon Completion	
Impact Type	Study Area	Wisconsin	Study Area	Wisconsin	Study Area	Wisconsin
Direct Output ($M)	$42.1	$42.1	$3.2	$3.2	$45.6	$45.6
Indirect and Induced Output ($M)	$26.8	$35.7	$2.0	$2.7	$28.8	$38.4
Total Impact ($M)	**$69.2**	**$78.1**	**$5.2**	**$5.9**	**$74.4**	**$84.0**
Employment Supported (FTE)	**600**	**640**	**45**	**50**	**645**	**690**
Employee Compensation ($M)	**$17.7**	**$19.9**	**$1.3**	**$1.5**	**$19.0**	**$21.3**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

4.4. Potential Annual Tax Impact from Spending by Users

On an annual basis, the total economic activity (including direct, indirect, and induced impacts) associated with bike and pedestrian infrastructure user spending produces increases in various tax bases. To estimate these increases, ESI created a tax revenue impact model to translate total economic impacts into their commensurate tax revenue gains. This analysis estimates the potential increases in income, sales, and business tax revenues to the State of Wisconsin due to user spending on the bicycle and pedestrian infrastructure in Calumet, Fond du Lac, Outagamie, and Winnebago counties.

In total, the direct, indirect, and induced economic impacts generated by user spending could generate annual tax revenues of $0.03 million to the four counties and $1.6 million to the State of Wisconsin (see Figure 4.5). On average, each mile of the completed network could support up to $21.1 in tax revenue to the study area and $954 to the State of Wisconsin. Additionally, localities stand to benefit from additional revenues supported by this economic activity.

Figure 4.5: Potential Fiscal Impact Generated from Economic Impact from User Spending ($M)

	Existing Network ($M)		Planned Network ($M)		Total Upon Completion ($M)	
Tax Type	**Study Area**	**State of WI**	**Study Area**	**State of WI**	**Study Area**	**State of WI**
Income	-	$0.698	-	$0.052	-	$0.751
Sales	$0.032	$0.608	$0.002	$0.046	$0.034	$0.654
Business	-	$0.143	-	$0.011	-	$0.154
Total Tax Revenue	**$0.032**	**$1.450**	**$0.002**	**$0.109**	**$0.034**	**$1.558**

Source: Wisconsin CAFR (2019), IMPLAN (2019), Econsult Solutions, Inc. (2022)

5. Public Health Impacts from Bicycle and Pedestrian Facilities Use

The East Central Wisconsin bicycle and pedestrian infrastructure network supports healthy lifestyles for people in surrounding communities by providing an easily accessible and low-cost option for residents to engage in physical activity. Physically active people typically enjoy a variety of health benefits, including lower incidence of cardiovascular diseases, Type 2 diabetes, depression, certain cancers, and obesity compared to their sedentary counterparts. Additionally, physically active individuals tend to achieve higher rates of productivity at work. This section estimates health-related cost savings associated with the network's physically active users.

Due to the health benefits associated with physical activity, network users could achieve aggregate annual health care cost savings of nearly $69 million in the study area once the network has been completed. Workers who meet recommended physical activity levels using the completed network achieve associated benefits in workplace productivity, which could yield total productivity cost savings of $145.3 million annually.

5.1. Estimated Active Users of the Region's Bicycle and Pedestrian Facilities

ESI utilized data from the US Census regarding residents with walking/biking access to the network as well as survey data from users of the ECWRPC bicycle and pedestrian infrastructure network. There were 925 respondents of the survey from across the four counties: 39 percent live in Outagamie County, 25 percent in Winnebago County, 24 percent in Calumet County, and 12 percent in Fond du Lac County. Over 40 percent of respondents identify as frequent users of the network, stating they use the bicycle and pedestrian infrastructure in the four counties four or more times per week.

It is estimated that the completion of the full network will support approximately 58,300 active residents in the study area (see Figure 5.1). The following steps were taken to arrive at this count:

- First, ESI estimated the number of local residents who are/will be frequent (four or more times a week) users. Data regarding usage from the 2022 East Central Wisconsin Planning Commission: Bike and Pedestrian Facilities Survey in conjunction with data regarding the number of working-age adults with walking/biking access to a trail or bike lane from the US Census were used to develop these estimates. Estimates are developed for the existing network, the proposed additions to the network, and the total network upon completion.
- Next, the number of frequent users who meet recommended physical activity levels established by the CDC due to usage is calculated. Research on the physical activity levels of trail users from Götschia and Lohb (2017) is used to estimate the number of frequent users who are considered active and are indeed experiencing the health benefits associated with their healthy habits.[19]

[19] Götschia and Lohb (2017*), Advancing Project-Scale Health Impact Modeling for Active Transportation: A User Survey and Health Impact Calculation of 14 US Trails*. https://www.sciencedirect.com/science/article/pii/S2214140516303255.

- Then, ESI applied a reduction to this estimate based on the proportion of users who would be considered active even without access to the network.[20] This approach yields a more conservative estimate that accounts only for users that can attribute their increased activity and associated health benefits to the presence of the bicycle and pedestrian infrastructure in their community.

Figure 5.1: Estimated Number of Users Located within Walking/Biking Distance and Meeting Physical Activity Requirement Due to the Bike and Pedestrian Infrastructure Network [21]

	Working Age Adults	Estimated Regular Users	Users Meeting Activity Req. Due to Network
Existing Network	275,000	115,200	54,200
Planned Network	20,600	8,600	4,100
Total - Upon Completion	**296,100**	**123,800**	**58,300**

Source: CDC (2018), ESRI (2019), Götschia and Lohb (2017), Econsult Solutions, Inc. (2022)

The existing network supports an estimated 54,200 residents to meet recommended levels of physical activity each year. It is estimated that the completed network will support over 123,800 active residents annually and each mile of network will support approximately 75 physically active users annually on average.

5.2. How Bicycle and Pedestrian Infrastructure Contribute to Positive Public Health Outcomes

According to the 2018 *Physical Activity Guidelines for Americans*, individuals who engaged in at least 150 minutes of moderate to strenuous physical activity each week are considered to be physically active.[22] In order to quantify the health benefits for users, this section will measure the impacts of frequent network users who are healthy and active because of the presence of trails, bike lanes, and other pedestrian infrastructure within their community in East Central Wisconsin. ESI utilized data from the US Census regarding residents with walking/biking access to the network as well as survey data and research from the Journal of Transport and Health to estimate frequent trail users and active adults. Measures from the CDC's report *Inadequate Physical Activity and Health Care Expenditures in the United States* were used to quantify the estimated value of an active lifestyle.[23] These statistics were used as the basis for estimating the potential savings in the form of health care expenditures that are avoided as a result of increased physical activity on the network.

Additionally, the health benefits achieved by physically active individuals are associated with benefits in terms of workplace productivity and employee retention. Physically active workers tend to have lower rates of absenteeism (employees missing work) and presenteeism (employees less productive while at

[20] Proportions are drawn from Götschia and Lohb (2017), *Advancing Project-Scale Health Impact.*
[21] Note that columns may not sum due to rounding.
[22] Centers for Disease Control and Prevention (2021), *Physical Activity Basics*. https://www.cdc.gov/physicalactivity/basics/adults/index.htm.
[23] Carlson et al. (2013), *Inadequate Physical Activity and Health Care Expenditures in the United States*. https://www.cdc.gov/nccdphp/dnpao/docs/carlson-physical-activity-and-healthcare-expenditures-final-508tagged.pdf.

work) than their physically inactive counterparts.[24] Lost productive work hours due to absenteeism and presenteeism represent direct costs associated with physical inactivity. Using the approach established in Chenoweth and Bortz, *Physical Inactivity Cost Calculator*, the productivity cost savings realized by estimated number of workers who will meet recommended levels of physical activity using the bicycle and pedestrian infrastructure network in the study area, once completed, are quantified.[25]

5.3. Potential Public Health Value of the Completed Network

Residents who achieve physically active lifestyles due to the completed network in East Central Wisconsin yield a range of personal health benefits as well as broader public health benefits for the region. Physically active lifestyles are linked to positive health outcomes including reduced risk of chronic diseases, improved mental health, and reduced prevalence of rheumatic conditions and injury.[26] These positive individual outcomes yield public health value by reducing strain on the health system and lowering overall health care expenditures.

The economic value of these health benefits can be quantified in terms of the healthcare costs avoided by physically active users. ESI developed lower bound, mean, and upper bound estimates of the potential health care expenditure reductions achieved by active users on network. These estimates were developed by applying potential healthcare expenditure savings per active individual from the CDC study to the number of active users supported by pedestrian and biking infrastructure.[27] It is estimated that physically active users of the existing network could achieve annual healthcare cost savings between $38.2 million and $98.5 million in total. On average, each mile of the completed network is estimated to support between $23,400 and $60,300 in annual healthcare cost savings in the study area.

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[24] Chenoweth and Leutzinger (2006), *The Economic Cost of Physical Inactivity and Excess Weight in American Adults*. https://www.huffinesinstitute.org/Portals/0/Chenoweth_JPAH_3_06.pdf and Chenoweth and Bortz (2005), *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed*.
[25] Chenoweth and Bortz (2005), *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed*.
[26] Centers for Disease Control and Prevention (2021), *Benefits of Physical Activity*. https://www.cdc.gov/physicalactivity/basics/pa-health/index.htm.
[27] Carlson et al. (2013), Inadequate Physical Activity and Health Care Expenditures in the United States. https://www.cdc.gov/nccdphp/dnpao/docs/carlson-physical-activity-and-healthcare-expenditures-final-508tagged.pdf.

Figure 5.2: Estimated Value of Healthcare Savings from Active Users in the Study Area

	Lower Bound	Mean	Upper Bound
Average Annual Savings per Active Individual ($)	$656	$1,181	$1,691
Annual Savings - Existing Network ($M)	$35.5	$64.0	$91.6
Annual Savings - Planned Network ($M)	$2.7	$4.8	$6.9
Annual Savings - Total Network Upon Completion ($M)	**$38.2**	**$68.8**	**$98.5**
Per Mile of Completed Network	**$23,400**	**$42,100**	**$60,300**

Source: Götschia and Lohb (2017), Carlson et al. (2013), ESRI (2019), Econsult Solutions, Inc. (2022)

Productivity Benefits Achieved by Active Users

To quantify productivity in the workplace, a series of steps are taken to estimate the number of physically active workers supported by the network. The approach to this estimation is consistent with that set forth in Section 4.2; however, data from the US Census tracking the number of *workers* with walking/biking access to the network are used as the base for this calculation.[28] As outlined in Figure 5.3 below, it is estimated that the existing network supports 46,800 physically active workers in the study area and the completed network will support approximately 50,400 physically active workers in the study area in total.

Figure 5.3: Estimated Number of Workers Located within Walking/Biking Distance and Meeting Physical Activity Requirement Due to the Bike and Pedestrian Infrastructure Network in the Study Area

	Workers Aged 16+ within Buffer	Estimated Regular Users	Estimated Workers Meeting Activity Req. due to Network
Existing Network	238,000	46,800	22,000
Planned Network	18,300	3,600	1,700
Total - Upon Completion	**256,300**	**50,400**	**23,700**

Source: CDC (2018), ESRI (2019), Götschia and Lohb (2017), Econsult Solutions, Inc. (2022)
Columns may not sum due to rounding.

The approach established in Chenoweth and Bortz, *Physical Inactivity Cost Calculator*, presents productivity cost calculations in terms of the annual average costs per worker associated with physical inactivity. The benefits calculated in this section should, therefore, be thought of as the costs that are avoided by workers utilizing the network in the region to meet recommended levels of physical activity and the associated health and productivity benefits. Lower bound, mean, and upper bound values for the hours lost from absenteeism and presenteeism due to physical inactivity are drawn from the Chenoweth and Bortz study.[29] These inputs are used to estimate the corresponding share of a typical

[28] Active workers (rather than working-age residents) are considered in this portion of the analysis because the productivity savings calculated are achieved by employed residents only.
[29] Chenoweth and Bortz (2005), *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed*.

employee's annual workload lost due to absenteeism and presenteeism associated with physical inactivity (see Figure 5.4).[30]

Workplace productivity cost savings achieved by active workers are then calculated by combining:

- The estimated number of active workers with walking/biking access to the network who meet physical activity guidelines due to trails or bike lanes,
- The percent of an employee's annual workload lost due to physical inactivity from absenteeism, presenteeism, and in total (combined absenteeism and presenteeism), and
- The median earnings of a worker in the four-county region (based on data from the US Census Bureau).

It is estimated that, in aggregate, workers who maintain recommended levels of physical activity using the existing network could achieve between $114.7 and $148.6 million in annual productivity cost savings, due to reduced levels of absenteeism and presenteeism in physically active workers. Upon completion, it is estimated that the total network could support physically active workers to achieve between $123.5 and $160 million annually in productivity cost savings. On average, potential productivity cost savings achieved per mile of the completed network range from $75,600 to $98,000.

Figure 5.4: Workplace Productivity Cost Savings Achieved by Active Users in the Study Area (in $M)

	Lower Bound	Mean	Upper Bound
Absenteeism: Lost Hours / Worker / Year due to Physical Inactivity	3.5	18.08	24.88
Percent of Annual Workload	0.2%	0.9%	1.2%
Presenteeism: Lost Hours / Worker / Year due to Physical Inactivity	131.5	140.75	150
Percent of Annual Workload	6.6%	7.0%	7.5%
Absenteeism Cost Savings Achieved by Active Workers ($M)			
Existing Network	$3.0	$15.4	$21.1
Planned Network	$0.2	$1.2	$1.6
Total - Upon Completion	$3.2	$16.5	$22.8
Presenteeism Cost Savings Achieved by Active Workers ($M)			
Existing Network	$111.8	$119.6	$127.5
Planned Network	$8.6	$9.2	$9.8
Total - Upon Completion	$120.3	$128.8	$137.3
Total Productivity Cost Savings Achieved by Active Workers ($M)			
Existing Network	**$114.7**	**$135.0**	**$148.6**
Planned Network	**$8.8**	**$10.4**	**$11.4**
Total - Upon Completion	**$123.5**	**$145.3**	**$160.0**
Per Mile of Completed Network	**$75,600**	**$89,000**	**$98,000**

Source: Chenoweth & Bortz (2005), US Census American Community Survey (2015-2019), Econsult Solutions, Inc. (2022)

[30] A typical employee's scheduled annual workload is assumed to be 2000 hours.

6. Benefits for the Region's Transportation Network

This section highlights how the study area's bicycle and pedestrian infrastructure facilities contribute to a vibrant transportation system and sustainable transit options. The network provides an alternative commuting mode in the four counties, which subsequently alleviates the auto-dependency and enhances regional connectivity. With more travelers accessing the bicycle and pedestrian infrastructure network, individuals in the household would enjoy equitable commute and enhanced mobility to travel nearby on the neighborhood level. A well-planned bicycle and pedestrian network would further enhance road safety and boost healthy travel and living styles for the residents. Decreased reliance on automobiles would lower carbon emissions and contribute to a greener and healthier environment in the study area.

6.1. Methodology

Many studies have shown that a robust network of pedestrian and bicycle trails encourage more sustainable travel mode choices among residents, especially when traffic-separated pathways that are safe, comfortable, and convenient are available. [31] This "mode shift" means residents may choose to shift from driving a single-occupancy vehicle to biking, walking, or taking public transportation.

To evaluate the impact the East Central Wisconsin bicycle and pedestrian infrastructure network brings to the study area's transportation network and individual residents' travel behaviors, ESI estimated the number of miles shifting from motorized to active transportation because of the presence of the network. The purpose was to unveil residents' willingness to use the bicycle and pedestrian infrastructure network instead of cars, which leads to reduced auto-dependency and consequently, reduced carbon emission. The number of active transportation miles attributable to the network were estimated by utilizing the 2022 East Central Wisconsin Regional Planning: Bike and Pedestrian Facilities Survey.

Based on survey responses, residents from the region living within a one-mile buffer of the network who were willing to replace their commuting or errands from cars to biking or walking were quantified and the potential vehicle miles traveled (VMT) replaced were calculated. Reduced VMT further leads to less fuel consumption and carbon emission and, therefore, lower social costs of carbon. Baseline statistics for VMT of the study area, fuel consumption, and carbon costs were obtained from relevant national agencies, such as Department of Transportation (DOT) for VMT and Environmental Protection Agency (EPA), for gallons of fuel consumed per mile and greenhouse gas emissions.

6.2. Existing Mobility and Transportation Conditions

A completed bicycle and pedestrian infrastructure network along the study area will highly compensate the transportation system along with highways, roads, and public transits. In the urban setting with high population density, the network serves as an important option for people's daily commuting, and leisure

[31] *Active Transportation Transforms America,* Rails to Trails Conservancy, 2019

and recreation, which significantly reduced the area's reliance on automobiles. Figure 6.1 shows the current commuting patterns of the residents in the four counties. As demonstrated, around 85% of the working population rely on automobiles for daily commuting while only about 3% of the commuters bike or walk to their workplace.

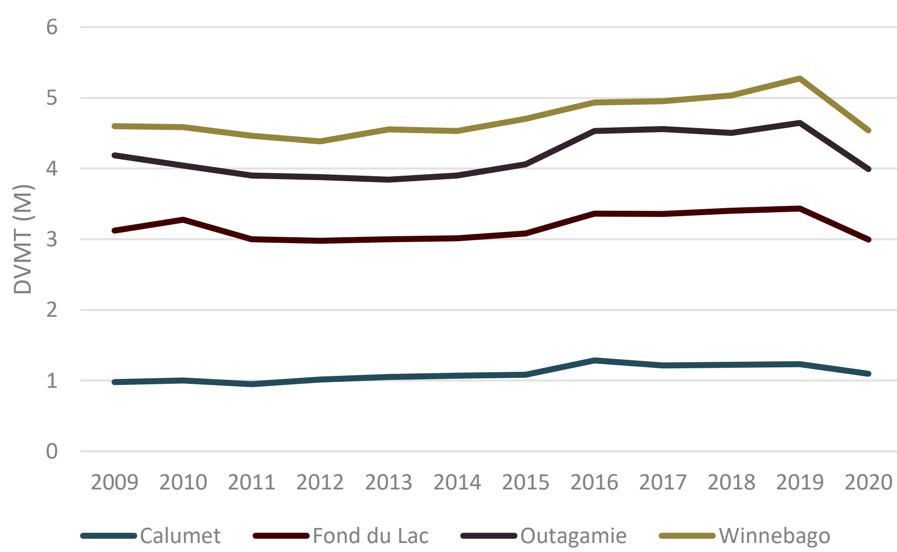
Figure 6.1 Distribution of Commuters in the Study Area, Mode Split

	Calumet County	Fond du Lac County	Outagamie County	Winnebago County
Drove alone	23,718	44,294	84,601	73,561
Carpooled	1,669	4,148	6,355	6,260
Public transportation (excl. taxicab)	82	106	496	609
Taxicab, Motorcycle, or Other	191	425	695	696
Bicycle	55	266	397	609
Walked	274	1,702	2,383	1,913
Worked from home	1,368	2,233	4,270	3,391

Source: US Census American Community Survey (2019)

Despite fluctuations, the study area on a whole has seen overall growth in daily VMT since 2009, reaching a 10-year high of 14.58 million in 2019, before dropping dramatically to 12.63 million in the year of 2020, which can be attributed to decreased travel during the COVID-19 pandemic (see Figure 6.2).

Figure 6.2: Daily Vehicle Miles Traveled (Millions) in the Study Area, 2009-2020



Source: Wisconsin Department of Transportation (2022)

Based on assumptions developed by the Environmental Protection Agency (EPA) on average gallons of fuel used per mile, the 2019 daily VMT estimates for the study area would consume about 648,000 gallons of fuel leading to 5,761 metric tons of CO^2 emissions a day.[32] Transportation is a significant source of carbon emissions in the U.S. (contributing approximately 28 percent of all U.S. greenhouse gas emissions) and light-duty vehicles, like cars, represent a large portion of that transportation sector.[33] To encourage residents to shift their transportation preferences to sustainable modes where possible, a region needs to actively invest in infrastructure that enables residents to safely choose these modes.

With residents averaging a commute of 20 minutes each way in the study area, providing opportunities to either walk or bike – even for a portion of the journey – could have significant impacts on reducing VMT and congestion (see Figure 6.3).

Figure 6.3: Average Commute Time for Residents in the Study Area

	Calumet County	**Fond du Lac County**	**Outagamie County**	**Winnebago County**
Less than 15 minutes	9,399	22,627	33,144	35,090
15 to 29 minutes	10,302	16,433	42,992	34,169
30 to 34 minutes	2,683	4,194	9,191	6,806
35 to 59 minutes	2,774	5,267	7,046	4,968
60 or more minutes	820	2,442	2,648	2,510

Source: US Census American Community Survey (2019)

Transportation Expenses by Household

Another indicator of the study area's general reliance on automobiles is the average household spending on automobile-related transportation costs each year. Car ownership and the attendant maintenance expenses cost an average household around $11,000 a year (see Figure 6.4).[34] For a typical household, this cost represents approximately a quarter of household income. Increased options to travel using active transportation (walking and biking) can help households to reduce their reliance on, and annual use of, automobiles and achieve associated savings.

[32] The EPA emissions calculator estimates an average of 22.5 miles per gallon for a typical vehicle. https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references.
[33] US Environmental Protection Agency, *Fast Facts on Transportation Greenhouse Gas Emissions*. https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.
[34] Data from the Center for Neighborhood Technology Housing and Affordability Index measured average spending for the Region. Expenditures represent average expenditures by a typical household in the study area, meaning that costs are averaged across all households.

Figure 6.4: Average Annual Household Expenditures on Automobile-Related Transportation Costs and Median Household Income in the Study Area

	Calumet County	Fond du Lac County	Outagamie County	Winnebago County
Automobile Ownership	2.06	1.93	1.93	1.74
VMT Expenses	$3,493	$3,256	$3,291	$3,559
Total Automobile-Related Costs	**$11,748**	**$10,490**	**$10,993**	**$11,469**
Share of Household Income on Automobile Costs	**25%**	**25%**	**24%**	**24%**

Source: US Census American Community Survey (2015-2019), Center for Neighborhood Technology Housing and Affordability Index (2022)

Comparatively, on a per-mile basis, the costs associated with walking and biking are significantly cheaper than automobile travel. Research indicates that the per-mile cost of walking is $0.00 and the per-mile operating cost of biking is $0.04.[35] Operating costs for a medium sedan (not accounting for ownership costs) are approximately $0.18 per mile.[36] While most households may not forego vehicle ownership entirely due to additional active transportation options, even reduced annual usage of a vehicle can provide savings on operating costs like fuel and maintenance that accrue on a per-mile basis. The ability to use other means of transportation that are low, or no expense also improves equitable access to destinations and job opportunities for residents for whom single occupancy vehicle travel is not a viable option.

6.3. Potential Benefits of the Region's Bike and Pedestrian Facilities on Regional Mobility

Reductions in Vehicle Miles Traveled

The total number of miles shifted from private vehicle travel to active transportation due to access to the bicycle and pedestrian infrastructure network is estimated based on the following steps:

- Data drawn from the US Census Bureau and a shapefile of the existing and planned network are used to estimate the number of workers (16 years and older) who will have walkable/bikeable access to the existing network, the proposed portion of the network, and the total network upon completion (up to a mile away from their residence).
- Next, based on data from the 2022 East Central Wisconsin Planning Commission: Bike and Pedestrian Facilities Survey, the share of users who use network for commuting and/or errands is estimated. Among those who use bicycle and pedestrian facilities for commuting/errands, the share who replace automobile trips with biking or walking is estimated based on additional survey data.
- These shares are applied to the estimates of workers who will live within walking/biking distance of the existing, proposed, and completed network to estimate the potential number of

[35] Values are drawn from Victoria Transport Institute (2007), *Transportation Cost and Benefit Analysis II*. https://www.vtpi.org/tca/tca0501.pdf Values were presented in 2007$ and are inflated to 2021$ for this analysis.
[36] Data drawn from AAA (2019), *Your Driving Costs*. https://exchange.aaa.com/wp-content/uploads/2019/09/AAA-Your-Driving-Costs-2019.pdf

residents who replace (or would replace) commuting/errand automobile trips with biking or walking trips (see Figure 6.5).

Figure 6.5: Estimated Residents Replacing Commute/Errand Auto Trips with Bicycle and Pedestrian Infrastructure Use[37]

	Existing Network	Planned Network	- Upon Completion
Workers in Walking/Biking Distance of Completed Network	219,400	24,800	244,200
Share who Use Network for Commuting / Errands	26%	26%	26%
Share of These Users who Replace Auto Trips with Biking/Walking	35%	35%	35%
Estimated Residents Replacing Commuting/Errand Auto Trips	27,500	3,100	30,600

Source: Econsult Solutions, Inc. (2022), US Census American Community Survey (2015-2019), East Central Wisconsin Planning Commission: Bike and Pedestrian Facilities Survey (2022)

Next, using data from the Wisconsin Department of Transportation on aggregate daily vehicle miles traveled (DVMT) in the four counties and population data from the US Census Bureau, DVMT per capita in the four counties is estimated. Then, using data from the National Household Travel Survey, the portion of DVMT per capita on commuting- and errands-related trips is estimated. These estimates are annualized to yield average annual VMT per capita on commuting/errands (see Figure 6.6).

Figure 6.6: Estimated Annual VMT Per Capita on Commuting/Errands in the Study Area

Aggregate DVMT	14,584,616
Total Population	508,636
Per Capita DVMT	28.7
Share of DVMT on Commuting/Errands Trips	35.30%
Per Capita DVMT on Commuting/Errands Trips	10.1
Annual VMT Per Capita on Commuting/Errands Trips	**3,694**

Source: Econsult Solutions, Inc. (2022), Wisconsin Department of Transportation (2022), National Household Travel Survey (2017), US Census American Community Survey (2015-2019)

Analysis of the 2022 East Central Wisconsin Planning Commission: Bike and Pedestrian Facilities Survey data yields minimum, mean, and maximum estimates of the share of automobile trips replaced with biking or walking among commuting/errands users. The minimum, mean, and maximum shares are applied to the average VMT per capita on commuting/errands trips to yield minimum, mean, and maximum estimates of VMT avoided per network user on these types of trips. These per-user estimates are then applied to the above detailed estimate of the number of workers who will live within walking/biking distance (up to a mile from their residence) of the existing portion, proposed portion, and completed network who will potentially replace commuting/errand automobile trips with biking or

[37] Note: column totals may not sum due to rounding; the numbers have been adjusted based on a conservative scenario in reflection of the long winter in Wisconsin.

walking. The result of this calculation yields the estimated vehicle miles traveled avoided by users on the completed bicycle and pedestrian infrastructure network.

Figure 6.7 shows results for each portion of the network based on the minimum estimated share of automobile trips replaced; the associated supplemental table in the Appendix details the calculation for each portion of the network based on the minimum, mean, and maximum share of auto trips replaced.[38]

Figure 6.7: Estimated Vehicle Miles Traveled Avoided by Network Users in the Study Area [39]

	Existing Network	Planned Network	Total - Upon Completion
Annual VMT Per Capita on Commuting/Errands Trips	3,694	3,694	3,694
Share of Auto Trips Replaced by Commute/Errand Users	15%	15%	15%
Estimated Residents who Replace Commute/Errand Auto Trips w/ Trail Use	27,500	3,100	30,600
Estimated Annual Reduction in VMT (M)	15.7	1.8	17.5
Per Mile of Network	25,200	1,700	10,500

Source: Econsult Solutions, Inc. (2022), Wisconsin Department of Transportation (2022), National Household Travel Survey (2017), US Census American Community Survey (2015-2019)

On the existing network, residents from the study area achieve an estimated reduction in vehicle miles traveled of approximately 15.7 million annually. Each mile of the planned network could deliver an additional annual reduction in VMT of approximately 1,700 on top of the VMT avoided by users of the existing network. In total, residents using the completed network (including proposed segments) could achieve annual reductions in VMT of 17.5 million, which has important implications in terms of cost savings and reduced greenhouse gas emissions. Overall, the reduction in VMT achieved by users across the completed bicycle and pedestrian facilities could be over 10,500 per mile of network.

Impacts of Reducing Vehicle Miles Traveled

Reductions in vehicle miles traveled yield associated savings in fuel consumption, carbon dioxide emissions, and congestion. Active transportation associated with the existing East Central Wisconsin bicycle and pedestrian infrastructure network in the four counties yields an estimated annual reduction in fuel consumption of over 700,000 gallons (see Figure 6.8). In addition to the savings delivered by users of the existing network, each mile of the planned network could support an additional reduction in fuel consumption of 100 gallons per year. As such, the total network could support an annual reduction in fuel consumption of 800,000 gallons—a reduction of approximately 500 gallons of fuel per mile of network. Additionally, reduced commute congestion means that workers waste less time sitting in traffic, yielding additional benefits in productivity.

[38] Estimates included in this table and the subsequent tables in this section are based on the minimum range estimate of the share of automobile trips replaced by trail users, as reported in the 2019 Trail User Survey. Minimum estimates are used to account for the likelihood of self-reporting and/or social desirability bias among survey respondents. See: Caputo (2017), *Social desirability bias in self-reported well-being measures: Evidence from an online survey*. https://psycnet.apa.org/record/2018-19560-023

[39] Impacts shown are based on the minimum estimated share of auto trips replaced; within the supplemental table in the Appendix, the minimum, mean, and maximum share of automobile trips replaced and associated results are shown. Note: column totals may not sum due to rounding; the numbers have been adjusted based on a conservative scenario in reflection of the long winter in Wisconsin.

Figure 6.8: Estimated Annual Reduction in Fuel Consumption due to Network Users in the Study Area[40]

	Existing Network	Planned Network	Total - Upon Completion
Estimated Annual Reduction in Gallons of Fuel Consumed	700,000	100,000	800,000
Per Mile of Network	1,100	100	500

Source: US Environmental Protection Agency (2022), Wisconsin Department of Transportation (2022), National Household Travel Survey (2017), US Census American Community Survey (2015-2019), Econsult Solutions, Inc. (2022)

These impacts to fuel consumption are associated with substantial reductions in greenhouse gas emissions. On the existing network, it is estimated that active transportation by local tail users saves the four counties approximately 6,200 metric tons of CO_2 emissions annually. Each mile of the planned network could support an additional annual reduction in CO_2 emissions of approximately 0.7 metric tons. As such, active transportation on the completed network could support an annual reduction in CO_2 emissions in the study area of approximately 6,900 metric tons each year (see Figure 6.9). To put this quantity of emissions avoided into context, 6,900 metric tons CO_2 is equivalent to the emissions from burning 7.6 million pounds of coal, 1.4 wind turbines running for an entire year, or the carbon sequestered each year by 8,454 acres of US forest.[41] On a per-mile basis, carbon emissions avoided on the completed network could be 200 metric tons.

Furthermore, each ton of carbon emitted generates an economic cost in terms of the resulting damage to the atmosphere, referred to as the "social cost of carbon" (SCC).[42] As such, the metric tons of carbon emissions avoided by network users can be expressed in terms of the savings that would result from this reduction in emissions. Active transportation by residents on the existing network save the four counties an estimated $316,200 in avoided social costs of carbon per year. Each mile of the planned network could support additional savings of approximately $34. In total, users of the completed network could save the four counties $351,900 each year in terms of avoided costs of carbon emissions (see Figure 6.9). On average, each mile of the completed network could support savings of $200 annually in terms of the social cost of carbon emissions avoided.

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[40] Impacts shown are based on the minimum estimated share of auto trips replaced; within the corresponding supplemental table in the Appendix, the minimum, mean, and maximum share of automobile trips replaced, and associated results are shown. Note: column totals may not sum due to rounding; the numbers have been adjusted based on a conservative scenario in reflection of the long winter in Wisconsin.

[41] US Environmental Protection Agency (2021), *Greenhouse Gas Equivalencies Calculator.* https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

[42] US Environmental Protection Agency (2016), *EPA Fact Sheet – Social Cost of Carbon*. https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf ; Brookings Institution (2022), https://www.brookings.edu/bpea-articles/the-social-cost-of-carbon/

Figure 6.9: Estimated Metric Tons of CO_2 and Associated Costs Avoided Annually Due to Network Users[43]

	Existing Network	Planned Network	Total - Upon Completion
Metric Tons of CO_2 Avoided	6,200	700	6,900
Per Mile of Network	10.0	0.7	4.1
Social Cost of CO_2 Emissions Avoided	$316,200	$35,700	$351,900
Per Mile of Network	$500	$34	$200

Source: US Census American Community Survey (2014-2018, 2019), INRIX (2018), US Environmental Protection Agency (2017), Brookings Institution (2022), Econsult Solutions, Inc. (2022)

[43] Impacts shown are based on the minimum estimated share of auto trips replaced; within the corresponding supplemental table in the Appendix, the minimum, mean, and maximum share of automobile trips replaced and associated results are shown. Note: column totals may not sum due to rounding; the numbers have been adjusted based on a conservative scenario in reflection of the long winter in Wisconsin.

7. Residential Property Value Impacts

Studies have revealed that homeowners are willing to pay a premium with better access to the recreational open space. A bicycle and pedestrian infrastructure network serves as a type of active transportation routes and safe spaces for walking, biking along with other creative and recreative commuting modes. A direct consequence of the bicycle and pedestrian infrastructure network leveraging healthy living and commuting has been demonstrated in the housing values in the immediate neighborhoods. This section estimates the increased property values within buffers of both a 2-miles and a half-mile, as these two thresholds indicates 15 minutes biking and walking distances, respectively, at an average person's pace.

7.1. Measuring Property Value Premiums Associated with Bicycle and Pedestrian infrastructure Networks

An actively used bicycle and pedestrian infrastructure network shows a close association of higher property values proximate to it. This is because people living close to the network have more options for multi-modal commuting and recreation which directly associate with healthier and convenient lifestyles and therefore entailing a better quality of living.

Studies in planning, economics, and development have found significantly higher real estate values associated with the proximity to bicycle and pedestrian infrastructure networks, landscaping, and open space.[44] The property value premium for properties near bicycle and pedestrian infrastructure networks across a metropolitan region, according to relevant studies, ranges from 3.75 percent to 6 percent in different communities. Hedonic regression analysis has been used in these studies to explore potential correlation of the value of properties and the proximity to the network.

- A study of the Greater Philadelphia region's greenways identified a 5 percent premium for properties within ¼ mile of a trail.[45]
- An economic analysis completed by ESI on the effect of the Ecusta Rail-to-Trail project in North Carolina indicated that home values within a quarter mile of the trail increased by an average of 4 percent.[46]
- A regional study completed by ESI and NV5 of the economic impact of the East Coast Greenway in the Greater Philadelphia region estimated that properties within ¼ mile of the network benefited with an average of 5 percent increase in property value compared to comparable properties that do not have access to the trail network.

Similarly, our analysis on the East Central Wisconsin bicycle and pedestrian infrastructure network employed hedonic regression analysis to explore potential correlation of the value of surrounding properties and proximity to the network. Regression analysis revealed that property transactions

44 Wachter, Susan M., and Grace Wong Bucchianeri. "What Is a Tree Worth? Green-City Strategies, Signaling and Housing Prices." May 2008.
[45] The Potential Economic, Environmental, Health, and Quality of Life Benefits of a Fully Connected Waterfront Greenway in Philadelphia," Econsult Corporation (2010)
[46] https://www.carolinathreadtrail.org/wp-content/uploads/2018/08/CTT_Economic_Study.pdf

occurred after the nearest network session's completion demonstrated statistically significant 8% higher in property values as compared with other properties without the presence of the network. Community-based characteristics such as income level, race, population density, average household units, median number of rooms, along with property features such as the proximity to the waterfront, and the sale year and season controlled for in the regression models. The analysis further confined to the 2-mile buffer around the bicycle and pedestrian infrastructure network to better unveil a significant correlation– this is because by dropping out properties in farther away rural area, the regression model can be better explained in terms of the variation of different factors being analyzed.

7.2. The East Central Wisconsin Bicycle and Pedestrian Infrastructure Network's Property Value Impacts

To quantify the land premium as associated with the network, both aggregated and average values of properties within a 2-mile and half-mile buffer were obtained using sales and parcel records from ECWRPC and public records[47]. Figure 7.1 and Figure 7.2 demonstrate values of land premium based on our regression analysis. A remark here is that the results of regression analysis can be interpreted in twofold: it is promising that the presence of the bicycle and pedestrian infrastructure network has positive spilt over effects on the property values in the proximity; on the other hand, there may also be underlying causal effects that residents/developers embraced a better quality of living as contributed by the green and open space near the network, which has been reflected by the housing prices.

For the existing network segments, the 8 percent premium is isolated from the aggregate and average house values these houses already have a premium attached to them due to the existing network. For the planned network segments, the 8 percent premium is multiplied to the aggregated and average house values to estimate the total property value premium impact. This assumes after completion of the planned segments, properties in proximity to the proposed segments will realize an 8 percent premium.

Figure 7.1: Land Premium of Property Value in the Existing Network, 0.5-mile Buffer

				Existing Network 0.5-mile Buffer		
	No. or Parcels	**Aggregated Value (M)**	**Average Value**	**Premium**	**Aggregated Premium (M)**	**Average Premium**
Calumet	3,599	$797.3	$221,540	8%	$63.8	$17,720
Fond du Lac	3,146	$452.5	$143,840	8%	$36.2	$11,510
Outagamie	15,050	$2,923.9	$194,280	8%	$233.9	$15,540
Winnebago	13,320	$2,168.1	$162,770	8%	$173.5	$13,020

Source: Econsult Solutions, Inc. (2022)

[47] Here the term of property value has been used as an equivalent of land parcel values, as our initial sorting process has confined to land parcels that have houses built on them.

Figure 7.2: Land Premium of Property Value in the Planned Network, 0.5-mile Buffer

				Planned Network 0.5-mile Buffer		
	No. or Parcels	Aggregated Value (M)	Average Value	Premium	Aggregated Premium (M)	Average Premium
Calumet	676	$111.05	$164,282	8%	$8.88	$13,140
Fond du Lac	2,824	$378.78	$134,128	8%	$30.30	$10,730
Outagamie	2,585	$512.16	$198,128	8%	$40.97	$15,850
Winnebago	3,052	$709.19	$232,370	8%	$56.74	$18,590

Source: Econsult Solutions, Inc. (2022)

The total property value premium of the existing segments within close access of the East Central Wisconsin network is $507 million with the total property value premium of the planned segments with upon completion ss $137 million within the 0.5-mile buffer. Combined, the network upon completion would result in a property value premium of $644 million.

This additional land premium would bring in additional fiscal revenues for the local governments. The current network's premium results in an aggregate increased property value of $507 million, producing $9.6 million in additional county property taxes each year. For the segments of the system that are still in planning stages, the total property value impact totals $137 million and would result in an additional $2.6 million in county property taxes each year upon completion of the network.

Figure 7.3: Aggregate Potential Property Value and Tax Revenue Benefits upon Full Completion of the Bicycle and Pedestrian Infrastructure Network in the Study Area[48]

	Existing Trail Network		Planned Trail Network	
	Aggregated Premium (M)	Increased Tax Revenue (M)	Aggregated Premium (M)	Increased Tax Revenue (M)
Calumet	$63.8	$1.1	$8.9	$0.2
Fond du Lac	$36.2	$0.7	$30.3	$0.6
Outagamie	$233.9	$4.3	$41.0	$0.8
Winnebago	$173.5	$3.5	$56.7	$1.1
Total	$507.4	$9.6	$136.9	$2.6

Source: Great ECWRPC (2022), Econsult Solutions (2022)

[48] Note that not every ecosystem generates an economic benefit, approximately 28 percent of the land cover classifications identified of the ~3,500 acres were used to generate an ecosystem service benefit.

8. Appendix

8.1. Input-Output Models

Economic impact estimates are generated by utilizing input-output models to translate an initial amount of direct economic activity into the total amount of economic activity that it supports, which includes multiple waves of spillover impacts generated by spending on goods and services and by spending of labor income by employees. This section summarizes the methodologies and tools used to construct, use, and interpret the input-output models needed to estimate this project's economic impact.

Input-Output Model Theory

In an inter-connected economy, every dollar spent generates two spillover impacts:

- First, some amount of the proportion of that expenditure that goes to the purchase of goods and services gets circulated back into an economy when those goods and services are purchased from local vendors. This represents the "**indirect effect**," and reflects the fact that local purchases of goods and services support local vendors, who in turn require additional purchasing with their own set of vendors.
- Second, some amount of the proportion of that expenditure that goes to labor income gets circulated back into an economy when those employees spend some of their earnings on various goods and services. This represents the "**induced effect**," and reflects the fact that some of those goods and services will be purchased from local vendors, further stimulating a local economy.

The role of input-output models is to determine the linkages across industries in order to model out the magnitude and composition of spillover impact to all industries of a dollar spent in any one industry. Thus, the total economic impact is the sum of its own direct economic footprint plus the indirect and induced effects generated by that direct footprint.

Figure A.1: Economic Impact Methodology

Source: Econsult Solutions, Inc. (2022)

Input-Output Model Mechanics

To model the impacts resulting from the direct expenditures Econsult Solutions, Inc. developed a customized economic impact model using the IMPLAN input/output modeling system. IMPLAN represents an industry standard approach to assess the economic and job creation impacts of economic development projects, the creation of new businesses, and public policy changes within a county and its surrounding area.

IMPLAN has developed a social accounting matrix (SAM) that accounts for the flow of commodities through economics. From this matrix, IMPLAN also determines the regional purchase coefficient (RPC), the proportion of local supply that satisfies local demand. These values not only establish the types of goods and services supported by an industry or institution, but also the level in which they are acquired locally. This assessment determines the multiplier basis for the local and regional models created in the IMPLAN modeling system. IMPLAN takes the multipliers and divides them into 440 industry categories in accordance with the North American Industrial Classification System (NAICS) codes.

The IMPLAN modeling system also allows for customization of its inputs which alters multiplier outputs. Where necessary, certain institutions may have various levels of demand for commodities. When this occurs, an "analysis-by-parts" (ABP) approach is taken. This allows the user to model the impacts of direct economic activity related to an institution or industry with greater accuracy. Where inputs are unknown, IMPLAN is able to estimate other inputs based on the level of employment, earnings, or output by an industry or institution.

Employment and Wages Supported

IMPLAN generates job estimates based on the term "job-years", or how many jobs will be supported each year. For instance, if a construction project takes two years, and IMPLAN estimates there are 100 employees, or more correctly "job-years" supported, over two years, which represents 50 annual jobs. Additionally, these can be a mix of a full and part-time employment. Consequently, job creation could feature more part-time jobs than fulltime jobs. To account for this, IMPLAN has a multiplier to convert annual jobs to full-time equivalent jobs.

Income to direct, indirect, and induced jobs is calculated as employee compensation. This includes wage and salary, all benefits (e.g., health, retirement) and payroll taxes (both sides of social security, unemployment taxes, etc.). Therefore, IMPLAN's measure of income estimates gross pay opposed to just strictly wages.

Tax Revenue Impact

The economic impacts in turn produce one-time or ongoing increases in various tax bases, which yield temporary or permanent increases in various tax revenues. To estimate these increases, Econsult Solutions, Inc. created a tax revenue impact model to translate total economic impacts into their commensurate tax revenue gains. These tax revenue gains only account for a subset of the total tax revenue generation that an institution or industry may have on the economy. Furthermore, where institutions are tax exempt, only the tax revenue generation from supported indirect and induced industries is accounted for.

8.2. Supplemental Tables

Additional analysis was undertaken for Fond du Lac County separate from the four-county study area. These sections are analogous to the analysis undertaken in Section 2 (Impacts from Capital Investments in the study area's Planned Bicycle and Pedestrian Facilities), Section 3 (Benefits from Environmental Services Attributed to the study area's Bicycle and Pedestrian Facilities), Section 4 (Impacts from Spending by Users of Bicycle and Pedestrian Facilities in the study area), and Section 5 (Public Health Impacts from Bicycle and Pedestrian Facilities Use).

Figure 8.1: Potential Aggregate Economic Impact from Construction of the Planned Network in Fond du Lac and the State of Wisconsin

Impact Type	Fond du Lac County	Wisconsin
Direct Output ($M)	$95	$1,274
Indirect and Induced Output ($M)	$69	$1,066
Total Impact ($M)	**$164**	**$2,340**
Employment Supported (FTE)	**910**	**12,970**
Employee Compensation ($M)	**$49**	**$776**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

Figure 8.2: Potential Annual Air Pollution Removal Benefits of the Network in Fond du Lac County

Pollutant	$ / Ton Removed	Existing Network (tons)	Air Pollution Removal Benefit	Planned Network (tons)	Air Pollution Removal Benefit	Total Upon Completion
CO	$95	1.7	$162	0.2	$20	$182
NO2	$22	38.1	$850	4.7	$105	$955
O3	$204	198.6	$40,100	24.2	$4,900	$45,000
PM10	$386	32.4	$12,500	4.0	$1,500	$14,000
PM2.5	$7,282	10.8	$78,800	1.3	$9,700	$88,500
SO2	$8	6.3	$47	0.8	$6	$53
Total	**$8,000**	**286.1**	**$132,500**	**35.2**	**$16,200**	$148,700

Source: i-Tree (2022), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

Figure 8.3: Potential Amounts of Annual Carbon Sequestration and Lifetime Carbon Storage and Associated Benefits from Bike and Pedestrian Infrastructure in Fond du Lac County

	Existing Network		Planned Network		Total	
Pollutant	Tons	Cost Savings	Tons	Cost Saving)	Total	Cost Savings
Annual Carbon Sequestration ($M)	10,900	$0.6	2,590	$0.1	13,530	$0.7
Per Mile	90	$4,500	30	$1,100	66	$3,400
Lifetime Carbon Storage ($M)	350,210	$17.9	43,130	$2.2	393,340	$20.1
Per Mile	2,850	$220,500	520	$27,200	$1,930	$98,300

Source: i-Tree (2022), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

8.4: Potential Environmental Benefits by Type and Locality of Bike and Pedestrian Infrastructure in Fond du Lac County ($ per Year)[49]

Ecosystem Service	Existing Network	Planned Network	Total – Upon Completion
Water Supply ($M)	$30.4	$9.4	$39.8
Water Quality ($M)	$5.5	$1.7	$7.2
Flood Mitigation ($M)	$23.0	$6.9	$29.9
Wildlife Habitat ($M)	$4.3	$5.1	$9.5
Air Pollution Removal ($M)	$0.1	$0.0	$0.1
Carbon Sequestration ($M)	$0.6	$0.1	$0.7
Annual Total Ecosystem Service Benefits ($M)	**$64.0**	**$23.2**	**$87.2**
Per Mile of Network	**$665,500**	**$313,400**	**$525,700**
Lifetime Carbon Storage ($M)	$17.9	$2.2	**$20.1**

Source: Costanza (2006), Multi-Resolution Land Characteristics Land Cover (2016), ECWRPC (2021), Econsult Solutions, Inc. (2022)

[49] Note that not every ecosystem generates an economic benefit, approximately 28 percent of the land cover classifications identified of the ~3,500 acres were used to generate an ecosystem service benefit.

Figure 8.5: Estimated Direct Spending on "Soft" Goods by Fond du Lac County Users

Category	Existing Network	Planned Network	Total - Upon Completion
Working Age Residents with Walking/Biking Access to Network	49,840	3,542	53,382
Average Number of Visits Per Year per Resident with Walking/Biking Access	93	93	93
Share who Purchased "Soft" Goods During Last Visit	14%	14%	14%
Estimated Number of "Soft" Goods Spending Visits	639,356	45,437	684,793
Average Amount Spent on "Soft" Goods	$11	$11	$11
Estimated Total Direct Spending on "Soft" Goods ($M)	**$7.3**	**$0.5**	**$7.8**

Source: US Census American Community Survey (2015-2019), ECWRPC (2022), Econsult Solutions, Inc. (2022)

Figure 8.6: Estimated Direct Spending on "Hard" Goods by Fond du Lac County Users

Category	Existing Network	Planned Network	Total - Upon Completion
Working Age Residents with Walking/Biking Access to Network	49,840	3,542	53,382
Share of Frequent (4+ times a week) Users	21%	21%	21%
Estimated Frequent Users	10,530	748	11,278
Share who Purchased "Hard" Goods in Last Year	53%	53%	53%
Average Amount Spent on "Hard" Goods	$125	$125	$125
Estimated Total Direct Spending on "Hard" Goods ($M)	**$0.70**	**$0.05**	**$0.75**

Source: US Census American Community Survey (2015-2019), ECWRPC (2022), Econsult Solutions, Inc. (2022)

Figure 8.7: Potential Annual Local Spending by Fond du Lac County Users ($M)

	Existing Network ($M)	Planned Network ($M)	Total - Upon Completion ($M)
User Spending on "Soft" Goods	$7.32	$0.52	$7.84
User Spending on "Hard" Goods	$0.70	$0.05	$0.80
Total User Spending	$8.02	$0.57	$8.65
Amount of Spending Leaving the Study Area	*-$0.40*	*-$0.03*	*-$0.43*
Total Modeled User Spending	**$7.62**	**$0.54**	**$8.22**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

Figure 8.8: Potential Annual Economic Impact from Local Spending by East Central Wisconsin Network Users

	Existing Network		Planned Network		Total - Upon Completion	
Impact Type	Fond du Lac County	Wisconsin	Fond du Lac County	Wisconsin	Fond du Lac County	Wisconsin
Direct Output ($M)	$7.6	$7.6	$0.5	$0.5	$8.2	$45.6
Indirect and Induced Output ($M)	$3.6	$35.8	$0.3	$2.5	$3.9	$38.4
Total Impact ($M)	**$11.3**	**$78.4**	**$0.8**	**$5.6**	**$12.1**	**$84.0**
Employment Supported (FTE)	**102**	**643**	**7**	**46**	**110**	**689**
Employee Compensation ($M)	**$2.7**	**$19.9**	**$0.2**	**$1.4**	**$2.9**	**$21.3**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

Figure 8.9: Estimated Number of Users Located within Walking/Biking Distance and Meeting Physical Activity Requirement Due to the Bike and Pedestrian Infrastructure Network in Fond du Lac County [50]

	Working Age Adults	Estimated Regular Users	Users Meeting Activity Req. Due to Network
Existing Network	49,800	20,900	9,800
Planned Network	3,500	1,500	700
Total - Upon Completion	**53,300**	**22,400**	**10,500**

Source: CDC (2018), ESRI (2019), Götschia and Lohb (2017), Econsult Solutions, Inc. (2022)

Figure 8.10: Estimated Value of Healthcare Savings from Active Users in Fond du Lac County

	Lower Bound	Mean	Upper Bound
Average Annual Savings per Active Individual ($)	$656	$1,181	$1,691
Annual Savings - Existing Network ($M)	$6.4	$11.6	$16.6
Annual Savings - Planned Network ($M)	$0.5	$0.8	$1.2
Annual Savings - Total Network Upon Completion ($M)	**$6.9**	**$12.4**	**$17.8**
Per Mile of Completed Network	**$33,700**	**$60,700**	**$86,900**

Source: Götschia and Lohb (2017), Carlson et al. (2013), ESRI (2019), Econsult Solutions, Inc. (2022)

[50] Note that columns may not sum due to rounding.

Figure 8.11: Estimated Number of Workers Located within Walking/Biking Distance and Meeting Physical Activity Requirement Due to the Bike and Pedestrian Infrastructure Network in Fond du Lac County[51]

	Workers Aged 16+ within Buffer	Estimated Regular Users	Estimated Workers Meeting Activity Req. due to Network
Existing Network	43,400	8,500	4,000
Planned Network	3,200	600	300
Total - Upon Completion	**46,600**	**9,100**	**4,300**

Source: CDC (2018), ESRI (2019), Götschia and Lohb (2017), Econsult Solutions, Inc. (2022)

Figure 8.12: Workplace Productivity Cost Savings Achieved by Active Users in Fond du Lac County (in $M)

	Lower Bound	Mean	Upper Bound
Absenteeism: Lost Hours / Worker / Year due to Physical Inactivity	3.5	18.08	24.88
Percent of Annual Workload	0.2%	0.9%	1.2%
Presenteeism: Lost Hours / Worker / Year due to Physical Inactivity	131.5	140.75	150
Percent of Annual Workload	6.6%	7.0%	7.5%
Absenteeism Cost Savings Achieved by Active Workers ($M)			
Existing Network	$0.5	$2.8	$3.8
Planned Network	$0.0	$0.2	$0.3
Total - Upon Completion	$0.6	$3.0	$4.1
Presenteeism Cost Savings Achieved by Active Workers ($M)			
Existing Network	$20.1	$21.5	$22.9
Planned Network	$1.5	$1.6	$1.7
Total - Upon Completion	$21.5	$23.1	$24.6
Total Productivity Cost Savings Achieved by Active Workers ($M)			
Existing Network	**$20.6**	**$24.2**	**$26.7**
Planned Network	**$1.5**	**$1.8**	**$2.0**
Total - Upon Completion	**$22.1**	**$26.0**	**$28.6**
Per Mile of Completed Network	**$108,200**	**$127,300**	**$140,200**

Source: Chenoweth & Bortz (2005), US Census American Community Survey (2015-2019), Econsult Solutions, Inc. (2022)

[51] Note that columns may not sum due to rounding.

Figure 8.13: Potential Vehicle Miles Traveled Avoided by Users in the Study Area

	Existing Network	Planned Network	Total - Upon Completion
Annual VMT Per Capita on Commuting/Errands Trips	3,694	3,694	3,694
Share of Auto Trips Replaced by Commute/Errand Users	15%	15%	15%
Potential Residents who Replace Commute/Errand Auto Trips	27,500	3,100	30,600
Estimated Annual Reduction in VMT (M)	15.7	1.8	17.5
Per Mile of Network	25,200	1,700	10,500

Source: Econsult Solutions, Inc. (2022), Wisconsin Department of Transportation (2022), National Household Travel Survey (2017), US Census American Community Survey (2015-2019)

Figure 8.14: Potential Annual Economic Impact from Local Spending by Users in Fond du Lac County

	Existing Network		Planned Network		Total - Upon Completion		
Impact Type	**Fond du Lac**	**State**	**Fond du Lac**	**State**	**Fond du Lac**	**State**	**Statewide Impacts Per Mile of Completed Network**
Direct Output ($M)	$23.9	$23.9	$1.7	$1.7	$8.2	$45.6	**$0.2**
Indirect and Induced Output ($M)	$3.6	$35.8	$0.3	$2.5	$3.9	$38.4	**$0.2**
Total Impact ($M)	**$11.3**	**$78.4**	**$0.8**	**$5.6**	**$12.1**	**$84.0**	**$0.3**
Employment Supported (FTE)	**102**	**643**	**7**	**46**	**110**	**689**	**2.4**
Employee Compensation ($M)	**$2.7**	**$19.9**	**$0.2**	**$1.4**	**$2.9**	**$21.3**	**$0.1**

Source: IMPLAN (2019), Econsult Solutions, Inc. (2022)

About Econsult Solutions, Inc.

This report was produced by Econsult Solutions, Inc. ("ESI"). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighborhood development, planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process and extensive consulting experience.

ESI ECONSULT SOLUTIONS INC.

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RESOLUTION NO. 32-22

APPROVAL OF ECONOMIC IMPACT STUDY OF BICYCLE AND PEDESTRIAN FACILITIES IN CALUMET, FOND DU LAC, OUTAGAMIE, AND WINNEBAGO COUNTIES

WHEREAS, the East Central Regional Planning Commission is the designated Appleton (Fox Cities) Transportation Management Area (TMA) and designated Oshkosh Urbanized Area Metropolitan Planning Organization (MPO); and

WHEREAS, the East Central Wisconsin Regional Planning Commission entered into a contract with Econsult Solutions, Inc. from August 2, 2021 to June 30, 2022 to conduct the Economic Impact Study of Bicycle and Pedestrian Facilities in Calumet, Fond du Lac, Outagamie, and Winnebago Counties; and

WHEREAS, the consultant collected local data, modeled impacts, and worked with an advisory committee and ECWRPC staff to examine the economic impacts of bicycling and pedestrian facilities; and

WHEREAS, the findings of the study showcase the positive economic impacts of current and planned bicycle and pedestrian facilities in the urbanized areas of these counties.

Now, therefore:

BE IT RESOLVED BY THE EAST CENTRAL WISCONSIN REGIONAL PLANNING COMMISSION:

Section 1: That the Commission, approves the Economic Impact Study of Bicycle and Pedestrian Facilities in Calumet, Fond du Lac, Outagamie, and Winnebago counties.

Effective Date: October 28, 2022
Submitted By: Transportation Committee
Prepared By: Kim Biedermann, Principal Planner

Jeff Nooyen, Chair – Outagamie Co.

Melissa Kraemer-Badtke – ECWRPC Executive Director