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MEASURING THE ECONOMIC IMPACT OF BROADBAND TOWARDS SECONDARY RESIDENTS OF DOOR COUNTY WISCONSIN

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Executive Summary

Internet access has a vital role in the daily activities of individuals and businesses with regards to sustainable economic growth. There are great regional differences in broadband deployment between rural and urban areas. Wisconsin's countryside is known for its Northwoods, secondary homes, and recreational activities, yet numerous regions lack the availability of high-speed Internet. This issue prevents secondary residents in the area from enjoying an extended stay due to an inadequate or non-existent Internet connection. In response to issues of access and changing technologies, the Federal Communications Commission (FCC) has recently increased the national fixed broadband from the 25/3 to 100/20 Mbps (FC News, 2024).

This study asks how improved broadband connectivity can assist in maximizing the value of a resource: secondary residents. The University of Wisconsin-Whitewater Fiscal and Economic Research Center (FERC) was tasked with conducting a study on the economic impact of improved Internet connectivity in Door County, Wisconsin. While there are many channels through which broadband Internet can have a positive effect in certain economies, we analyzed the effect that improved Internet access had on secondary residents' lengthened stay.

This report notes that there are more than 11,595 secondary homes in Door County compared to only 10,718 primary homes. Of the 11,595 secondary homes, this report considers 9,570 that would be defined as seasonal/secondary. The additional days used will benefit the local economy for secondary residents as these owners extend their stay (U.S. Census Bureau, 2020). By calculating the extra amount of time a secondary resident would be willing to spend in their vacation property and the daily expenses per household, we can evaluate the additional spending generated in the local economy. Using that information, we are able to estimate the number of

direct and indirect jobs created in the area, additional tax revenue, and other economic factors relevant to Door County and other similar areas throughout the country.

In order to calculate the value of secondary residents' time in Door County, the FERC employed IMPLAN, an input-output method of analysis. Both primary impacts (those impacts that are directly caused by the additional spending generated by the extended stay of secondary residents) and secondary impacts (those impacts indirectly generated by secondary residents in the area) were considered.

This study's primary findings include a relationship between broadband deployment and Door County's economic growth in. If Internet connectivity in the area were to be improved, Door County secondary home residents would lengthen their stay, which would generate an increase in spending and the impact on the overall economy. Specific findings of broadband deployment in Door County, which are detailed more thoroughly in the report, include:

- The Economic Impact of the 9,570 Secondary homes, based on their annual visits of over 100 days, is:
 - They currently support over 1,000 Full Time Equivalent Jobs, over \$110 million in Output and over \$40 million in labor income.
 - The Economic Impact is based on this Broadband Deployment Study.
- Secondary residents would stay in the area about **15 more days a year** if they had access to improved Internet.
- Stimulating the economy with **more than \$18.6 million in incremental annual economic impact.**
- Creation of **over 137 additional full-time equivalent jobs in Door County**, providing employees with **over \$5,500,000 in labor income.**

- Secondary residents would contribute an additional **\$750,000 in State and Local Tax Revenues**. This does not include property taxes.

I. Introduction

In the past decade, high-speed Internet has reached new levels of adoption and availability. However, consumer demand for bandwidth has outpaced investments in infrastructure throughout the country (UW-Extension, 2014). Many communications sector analysts agree that the potential to provide broadband technology is a major feature of the modern global communications infrastructure (Salamink, Strijker, & Bosworth, 2015; Crandall, Lehr, & Litan, 2007). Although all major metropolitan areas are widely covered with this service, adoption and deployment of broadband are behind in areas with low population density. Door County is competing in an environment where demand is growing every year. If the current growth trajectory persists, household data will grow by almost 50% by 2028. This is in an environment where the average upstream speed is 28 Mbps. According to AllConnect (2023), the Midwest receives the slowest speeds in the country. Some reasons for the Midwest's slow internet speeds are the higher share of rural populations, older populations, and lower median incomes. As our study determines, this is a challenge that limits the participation of a more affluent and younger population within the region.

Broadband is not deployed to all Americans and there could be several reasons for it. Some of the barriers for faster and more reliable broadband deployment in low-density areas include: the cost of extending broadband networks; lack of computers in households; lack of economic incentives for Internet providers; and digital literacy/understanding of the value of broadband. The last factor is the main reason for not adopting broadband but is not likely a factor for the wealthy second homeowners in Door County (Hill, 2010).

Research suggests that broadband has a considerable beneficial impact on individuals and on the economy. However, the actual impact of broadband accessibility in a region is still an enigma.

A broadband Internet survey was designed to gather information on the economic impact of broadband deployment in areas with a deficient or non-existent Internet connection. The area of focus is Door County, Wisconsin, since the number of secondary residents is high in that region. The FERC designed and conducted the survey to conclude the benefits of broadband availability in the region. Additionally, data on the socioeconomic demographics of Door County secondary residents was collected to estimate the potential economic benefit of these homeowners staying longer in their secondary homes. Finally, to estimate the economic benefits of secondary residents' in the area, we collected information on their daily spending in each major category.

This paper sheds light on the economic impact of improving the Internet in rural northeastern Wisconsin by estimating the extra number of days an individual would stay in their vacation home if they had a better and more dependable connection. By estimating the additional time a secondary resident stays in their home and the daily expenses per household, we can evaluate the additional spending generated in the local economy. Using that information, we can predict the number of direct and indirect jobs added to the local economy, labor income added in the region, and the increase in local output.

This report summarizes our methods and chief findings from the Door County broadband deployment economic impact study. The report is organized as follows:

- Section 1 provides a concise overview of the purpose of the study.
- Section 2 contains the literature review on the major benefits of broadband availability in a specific area.
- Section 3 describes the data collection phases of the project.
- Section 4 presents the main findings from the Door County broadband survey.
- Section 5 describes the economic impacts estimated to arise from broadband deployment in Door County Wisconsin and explains the IMPLAN economic impact analysis.
- Section 6 offers concluding discussions.
- Appendices and the attachment to this report contain data on nationwide adoption of broadband and a detailed description of the types of broadband available to consumers.

II. Literature Review

High-speed Internet, also known as broadband, has become a necessity in the lives of most individuals and businesses. Without broadband, communication is limited, innovation is restrained, productivity decreases, and quality of life is negatively affected (California Broadband Task Force, 2008). Kolko (2012) finds that there are expanded benefits to health care, education, and public safety from expanded broadband services. In addition, broadband offers the home subscriber improved educational opportunities, entertainment diversity, and improved access to peers and information (Wales, Sacks, & Firth, 2003).

The extraordinary level of interest in broadband among nations globally is due to the understanding that broadband will bring social and economic benefits (Firth & Kelly, 2001; Xavier, 2003). Commissioner Copps (2012) of the Federal Communications Commission stated “In this new century, we will work differently, learn differently, play differently, and probably even govern ourselves differently, all because of the transformative power of telecommunications. Broadband is already becoming key to your nation’s system of education, commerce, and jobs, and therefore, key to America’s future. Broadband is going to be front-and-center in America’s 21st Century transformation. Those who have access to advanced communications like broadband will win; those who do not will lose.”

To promote broadband deployment, many significant programs are in place or under consideration at the federal, state, and local levels. These programs ensure the competitive availability of broadband to all U.S. citizens, stimulate ongoing investment in broadband infrastructure, and facilitate the education and training that small business and residential customers need to make effective use of broadband capabilities (Gillet, Lehr, & Osorio, 2005).

The federal government has long supported critical infrastructure deployment in the United States; rural electrification and the universal service programs for telephones are only two important examples of this leadership. Similarly, investing in broadband will not only bring the benefits of this technology to all communities, but it can also help create immediate jobs and spur innovation. In 2021, the federal government announced an investment of \$42 billion as part of the 1 Trillion dollar Infrastructure Bill. The goal of this bill was economic stimulus, and the agencies granting financial assistance were directed to consider the effect of broadband on economic development.

A majority of Northeastern Wisconsin is covered with some form of Internet service; however, most users are discontented with their speed and unreliable connectivity. In fact, a recent residential broadband demand survey conducted by the Wisconsin Public Service Commission shows that only 46% of consumers feel they have an adequate broadband connection (Wisconsin Dash Board, 2014). A challenge in providing internet service to rural communities is the expanding expectations. Whereas an earlier goal was 5 Mbps, it continues to expand both in expectation and need. According to the World Bank, given a speed of 25 Mbps, 98% of the Urban areas in the United States had coverage. However, only 74% of rural areas were served. As a result, while the efforts to bring broadband to all Americans are significant, wireless and wireline broadband providers have made great progress, areas with low-population density still lag in connectivity and high-speed Internet access and these increased investments have not kept up with demand.

As shown in table XVII, 17.2% of Americans living in rural areas lack access to fixed broadband satisfying the benchmark of 25Mbps downstream/3Mbps upstream, compared to 1.2% of Americans in urban areas. It is important to note that the most basic broadband services (25Mbps

downstream/3Mbps upstream) are often shared by multiple devices – televisions, desktops, laptops, tablets, smartphones etc. And in recent times, peak-period Internet activity consists of delivering bandwidth-intensive content like video. Therefore, when those devices are in use at the same time, it is not difficult to completely overwhelm a 25Mbps connection since Internet connection is divided by the number of devices in use (Federal Communications Commission, 2012). Kolko (2011) suggests that policymakers are aware that broadband leads to job creation and economic growth, and many, especially in rural areas, put broadband investment at the core of their economic development strategy.

However, in rural or remote areas, such as Door County, broadband adoption and deployment may not be achieved through the current regulatory system, since providers are aware that the costs to deploy current or next-generation technologies in these areas may be higher than the potential economic benefits (California Broadband Task Force).

Broadband Benefits

The following analysis presents research on the benefits of broadband. They can be classified in terms of education, health, jobs, and prosperity.

i. Broadband and education.

Some broadband-based applications and services provide benefits for education.

Broadband services facilitate distance learning, enabling students to receive an education from the comfort of their home. This opens a variety of opportunities for students who for whatever reason cannot obtain an education in a traditional classroom, or for those students living in remote areas without easy access to a school. Many students during the COVID-19 pandemic transitioned to online schooling or a hybrid

format. Having reliable high-speed internet insures students are equipped for any educational tasks.

According to (Bauer et al, 2002), narrowband is adequate for simple e-learning configurations that do not need real time interaction between instructor and student. However, collaborative e-learning requires broadband. E-learning has been a boost to population with limited access to conventional learning such as rural or remote areas. According to Kiernan (2002), students embrace the Internet, but are not prepared to forgo their conventional classrooms. This suggests that e-learning enhances but cannot be a substitute to conventional classroom learning; however, it can be a complement to the education system.

ii. *Broadband and health*

Telemedicine applications allow doctors and hospitals to share and send video telecommunications, as well as X-ray, and digital images, to medical professionals located in other parts of the country. This offers patients, especially those living in remote communities, better quality of care and increased convenience. In recent years, information technology has advanced the potential of telemedicine. Rural patients have the enhanced access to care.

It has been argued that broadband internet significantly benefits from economic prosperity and computer penetration (Jakopin et al, 2011). (Bauer et al, 2002) argue that telemedicine specialties such as tele-diagnosis, tele-dermatology, tele-radiology, among others require the most bandwidth. Therefore, clinics, hospitals, surgeries, and patients require broadband if they are to enjoy the benefits of telemedicine. The potential for

broadband –based online medical applications (telemedicine) is described by Field & Grisby (2002); Hailey, Roine, & Ohinmaa (2002). They argue that broadband is especially beneficial for remote and rural communities that do not have access to a variety of medicine specialists and might need medical consultation. However, they also argue that telemedicine cannot substitute face-to-face consultation, and on occasions, telemedicine would only represent an unneeded cost.

iii. *Broadband and prosperity and jobs*

It is argued that high-quality broadband is associated with economic and social development (Zhou, et al; 2022; Firth et al. 2002). The emergence of the information economy suggests that broadband, as one of the building stones of that economy, has the capacity to drive economic growth (Sprintson and Oughton, 2024; Firth & Mellor, 2002). A World Bank study (2009) concludes that every 10 percent increase in broadband penetration accelerates economic growth by 1.38% in low-middle income countries (which are more comparable to rural economies than metropolitan economies in the state of Wisconsin).

There are three channels through which broadband affects employment (Pociask, 2002)

1. Direct labor associated with deploying and maintaining the infrastructure needed to provide broadband.
2. Direct labor associated with manufacturing the components and equipment needed to deploy the broadband network.
3. Indirect jobs associated with creating applications and services for broadband Internet users once the network is deployed.

Furthermore, Pociask, (2002) estimated that nationwide broadband deployment would expand U.S. employment by an estimated 1.2 million new and permanent jobs. In addition, unemployment rates are lower in counties with high speeds relative to counties with low speeds (Lobo, et al, 2020). At a more intricate level, employment in both manufacturing and services industries (especially finance, education, and health care) is positively related to broadband penetration (Crandall, Lehr, Litan, 2007).

When a broadband network is built, its direct economic impact will spill over into other sectors of the economy, which creates additional indirect jobs. This phenomenon is referred to as an employment multiplier. The employment multiplier measures the number of indirect jobs created for every direct job used to build the broadband network (Pociask, 2002).

Thereby, broadband investment does have an impact on American workers, the U.S economy, and consumers. However, in areas with low-population density, there is little economic incentive to deploy the infrastructure needed to provide broadband. As a result, policymakers need to create incentives for Internet service providers to invest in the next generation network. However, given that the demand for broadband is price elastic, the most effective policies are those that contribute to lower prices infrastructure (Crandall, Lehr, Litan, 2007).

III. Methodology

The FERC designed a survey questionnaire and surveyed secondary and primary residents of Door County, Wisconsin in order to estimate the benefits of broadband availability in the region. These surveys were sent to homeowners whose property tax bills went to addresses in Illinois, Minnesota, Michigan, Indiana, and Iowa. These are often secondary homeowners whose tax bills are sent to their primary residence. The survey was sent in the late summer and fall to capture their spending habits and activities in the summer. 2,535 homeowners received a packet

containing the survey, a cover letter, and a prepaid return envelope. These homeowners then received a follow up postcard survey with a QR code. The surveys were mailed between September and December of 2023. 438 completed surveys were returned, yielding a response rate of 15 percent.

This survey was sent to the population of secondary residents in the area, allowing us to obtain more accurate economic estimations. The FERC placed emphasis on the secondary residents' spending habits, demographics, and current Internet service characteristics.

The focus of this survey is to determine the additional number of days a secondary resident would stay in their vacation home if they had higher Internet speeds and a more dependable connection. The Broadband Survey included questions to measure daily spending by secondary residents in many categories. Using the information collected by the survey, the FERC estimated the economic impact of broadband deployment in Door County, Wisconsin

IV. Data Development

The data executive summary focuses on some major components of the broadband study that will be explored further in the Door County data analysis and economic impact section. This report is comprised of several distinct sections. The first section analyzes spending in Door County by secondary residents in various categories.

The survey included a question that would estimate annual spending in Door County. This estimate would shed light on the importance of secondary residents in the region's economy. The data was adjusted to obtain daily household average spending estimates.

Table I	
What is the average daily spending per household on each of the following?	
Category	Amount (\$)
Construction	688.99
Maintenance	40.62
Groceries	20.63
Dining Out	18.84
Shopping - General	12.84
Gasoline	7.80
Shopping - Tourism	7.16
Entertainment (movies, clubs, etc.)	4.30
Medical Care	4.10
Licenses	1.49
Launch Fees	0.73
Fishing	0.54
Total Without Construction	119.05
Total	808.03

A vast majority of the respondents' answers indicated that annual construction or remodeling of their home is the largest spending category. While we report this number, it is not included in our economic impact calculations due to its high standard deviation. Groceries and liquor are the

second highest category with an average daily spending of \$20.63 followed by dining out with an average daily spending of \$18.84.

The survey focused on socioeconomic demographics of the secondary residents that own a vacation property in Door, County, Wisconsin. Since over 9,570 dwellings are considered secondary residences (Door County Comprehensive and Farmland Plan—2045 Volume II), expansion of broadband can serve as a potential economic growth strategy. The first question on socioeconomic factors asked whether the residents were secondary or primary (Table II).

Table II		
What is your current living status at your Door County property?		
	Count	Percent
Primary	35	8.06%
Secondary	399	91.94%
Total	434	100.00%

91.94 % answered “yes” and were then prompted to the next questions of the survey.

Table III		
If you are not a primary resident, do you intend to become a full-time resident in Door County at some point?		
Table III	Count	Percent
Yes	195	48.39%
No	208	51.61%
Total	403	100.00%

Nearly half of the respondents affirmed that they have intentions of moving to Door County in the future, which could potentially bring extensive economic benefits to the region (Table III). However, the economic impact focused on secondary residents spending additional days in their “vacation” home rather than moving into that residence full time. The potential for a full-time move is a longer-term prospect. However, it can generate additional impacts. Many of the respondents specified that only 1-2 people live in the secondary residence (Table IV).

Table IV		
Including yourself, how many people live in your household?		
	Count	Percent
1-2	291	64.52%
3-4	82	18.18%
5-6	56	12.42%
>6	22	4.88%
Total	451	100%

Table V		
What are the reasons that prevent you from staying in the area longer than you currently stay?		
	Count	Percent
Family Obligations	166	24.52%
Employment Obligations	150	22.16%
Long Winter Season	132	19.50%
Internet Access	118	17.43%
School-aged Children	34	5.02%
Lack of Employment	23	3.40%
Other	54	7.98%
Total Responses	677	100.00%

From the respondents that indicated the specific reasons that prevent them from staying in the region for longer, family obligations were the most reported at 24.52%. 17.43% of the households in the study specified that Internet access is a major barrier that prevents them from enjoying the area for longer (Table V).). Each respondent was allowed to list multiple options. The maximum offered by a respondent was six, while the minimum was zero.

Table VI		
What is the highest level of education you have completed?		
	Count	Percent
High School	18	4.86%
Associate Degree	29	7.84%
Bachelors	135	36.49%
Masters	142	38.38%
Doctoral	46	12.43%
Total	370	100.00%

For this question, most of the respondents indicated that they have a post-secondary degree. 36.49%, 38.38%, and 12.43% indicated that they have a Bachelor's, Master's, or Doctoral degree, respectively (Table VI). It should be noted that the respondents' level of formal education exceeds Door County's average. In Door County, 35.3% of adults 25 years or older have a Bachelor's degree or higher (in our survey, this was 88%).

Based on the data collected by the U.S. Census Bureau, the median household income in Wisconsin was \$72,458 in 2022 (median household income in Door County was \$68,257). Over 90% of respondents (who are secondary residents) have a household income that surpasses the median in the state (Table VII).

Table VII		
What is your household's annual income		
from all sources?		
	Count	Percent
Below 34,999	4	1.18%
35,000-49,999	2	0.59%
50,000-74,999	22	6.51%
75,000-99,999	36	10.65%
100,000-149,999	72	21.30%
150,000-199,999	64	18.93%
200,000-299,999	54	15.98%
300,000-499,999	51	15.09%
Over 500,000	33	9.76%
Total	338	100.00%

Many of the remaining survey questions centered on collecting data related to Internet service, Internet connection dependability, Internet speed, and Internet cost in the area.

Table VIII		
What type of Internet service is currently utilized in your Door County home?		
	Count	Percent
Cable	83	21.84%
Cellular	78	20.53%
DSL	56	14.74%
Fixed Wireless	52	13.68%
HughesNet, Viasat	30	7.89%
Low Earth Orbit (e.g., Starlink)	29	7.63%
Other	9	2.37%
None	43	11.32%
I do not need internet access	3	0.79%
Total Responses	383	100.00%

11.32% of the respondents indicated that they do not have Internet service. Those who only have cellular Internet access constituted 20.53% of the respondents (Table VIII).

Table IX		
What are the download speeds provided		
by your Internet connection?		
	Count	Percent
Less than 5 Mbps	35	17.50%
Up to 10 Mbps	37	18.50%
Up to 25 Mbps	47	23.50%
Up to 50 Mbps	9	4.50%
Up to 100 Mbps	27	13.50%
More than 100 Mbps	45	22.50%
Total	200	100.00%

As of December 2023, the FCC requires “consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps” (Broadbandusa, 2023). “The speed of 25/3 is considered a ‘moderate’ speed suitable for browsing the internet, email, streaming videos, and playing basic online games” (Broadband and the Wisconsin Economy, 2021). Based on FCC guidelines, 60 percent of the Internet’s traffic at prime time is video. Since it takes 5Mbps to deliver video, this speed is inadequate for the 21st century (Federal Communications Commission, 2014).

In 2020, the FCC expanded this definition to reflect that fixed services with speeds of 25/3 Mbps meet the statutory definition of advanced telecommunications capability. In addition, it is argued (Common Cause, 2020) that the current benchmark speed of 25 Mbps downstream and 3 Mbps upstream falls woefully short of international broadband target of 100 Mbps downstream. While general email and social media can be accessed at 5Mbps, video conferencing and streaming video require 5 to 40 Mbps; Netflix access requires upwards to 40Mbps. In a more complex business environment, on-line education and database management require 100 Mbps or more (Broadband and the Wisconsin Economy, 2021). As a result, the 25/3 broadband threshold established in 2015 has come under scrutiny. If a household or business has multiple users accessing the connection at the same time, 25/3 may not be sufficient.

The FCC has since increased national fixed broadband from the 25/3 to 100/20 Mbps (FC News, 2024). This change in the broadband standard will better suit the needs of online schooling and infrastructure (University of Wisconsin – Madison Extension, 2021). According to the respondents, 64% of the secondary residents in the area possess the speeds required to satisfy the minimum 25 Mbps threshold. However, 36% meet or exceed the 2024 definition of residential broadband access for download speed (Table IX). The respondents' desire for access and speed are in concert with the guidelines, as over 90% are seeking speeds more than 25Mbps (Table XI). This response level for questions regarding Mbps speed (in both Table IX and X) represents the inability of some respondents to identify their current speed and desired speeds. However, the answers in Tables XI and XII should be considered regarding access and dependability.

Table X		
What kind of Internet would you like to have in your Door County residence home?		
	Count	Percent
Less than 5 Mbps	1	0.98%
Up to 10 Mbps	3	2.94%
Up to 25 Mbps	5	4.90%
Up to 50 Mbps	15	14.71%
Up to 100 Mbps	22	21.57%
More than 100 Mbps	56	54.90%
Total	102	100.00%

Based on data provided by Table X, most respondents want faster speeds and over half desire more than 100 Mbps internet speed. This is consistent with the comments provided by Common Cause.

Table XI		
Would access to broadband Internet service influence your decision to move permanently to Door County, Wisconsin?		
	Count	Percent
Yes	270	63.68%
No	154	36.32%
Total	424	100.00%

According to the respondents, 63.68% of secondary residents of the area state high speed broadband would have influence in a potential decision to move permanently to Door County, Wisconsin (Table XI).

Table XII		
How dependable is your Internet connection?		
	Count	Percent
Never Lose Connection	27	7.87%
Rarely Lose Connection	121	35.28%
Occasionally (few times a week)	84	24.49%
Frequently (multiple times a week)	45	13.12%
Consistently (multiple times a day)	31	9.04%
I cannot use my connection for video conferencing	35	10.20%
Total Responses	343	100.00%

The responses in Table XII varied in terms of connection loss and use for video conferencing. 24.49% of the respondents indicated that they lose connection a few times a week, 13.12% indicated that they lose connection multiple times a week, and 9.04% indicated that they lose connection multiple times a day. 10.20% reported being unable to video conference with their internet connection.

Table XIII		
How much longer would you stay at your Door County property each year if you had access to high-speed broadband Internet?		
	Count	Percent
Would not Stay Longer	149	43.19%
Less than a week	17	4.93%
1-2 Weeks	53	15.36%
Up to 1 Month	60	17.39%
Up to 3 Months	51	14.78%
Move Permanently	15	4.35%
Total	345	100.00%

While many respondents indicated that they would stay longer if they had high-speed internet, only 4.35% of respondents would move permanently (Table XIII). However, almost half of the respondents state they would stay between 1 week and 3 months more every year.

Table XIV		
How much do you currently pay per month for Internet in your Door County residence?		
	Count	Percent
\$0-\$25	21	7.22%
\$26-\$50	54	18.56%
\$51-\$75	65	22.34%
\$76-\$100	71	24.40%
Over \$101	80	27.49%
Total	291	100.00%

Most respondents indicated that they pay between \$26-\$75 (Table XIV). The University of Wisconsin Extension reports that the average Wisconsin household currently pays between \$61-\$80 per month for broadband Internet. In addition, the median cost of internet in the United States is \$74.99 with the majority paying between \$60-\$90 per month (Willingness to Pay for Broadband Internet, 2023).

There are numerous patterns that emerge when we analyze the socioeconomic conditions of Door County secondary residents. As Table VII indicated, secondary residents in the area have a higher-than-average household income as well as a higher level of education.

Some of the most relevant Internet issues of this study are the limited speeds and unreliable connection in the area. Note that, only 36% of the respondents currently have a speed that satisfies the international broadband target (see Table X). Furthermore, Table XIII illustrates that 56.85% of the respondents indicated that their Internet connection is unreliable, and they lose connection.

Finally, as seen in the data, customers in the area are unsatisfied with their Internet connection. Table V illustrates that 17.43% of the respondents would spend additional time in Door County if they had better connectivity and faster Internet speeds. Finally, Table XII shows that 64.84% of the respondents indicated that broadband would influence their decision to move permanently to the area. The demographics of the secondary residents are important as shown in the tables above. According to a report by the Pew Research Center (2014), wealthy and well-educated seniors adopt the Internet.

V. Data Analysis and Economic Impact (IMPLAN)

The available data used for the present analysis indicates that secondary residents provide considerable economic benefits to the area. The Broadband Survey contained several questions about secondary residents' use of their property in Door County. These questions focused on the number of days they currently used these secondary homes and their estimated change in usage given improved Internet connectivity. When reviewing the returned surveys, we analyzed each answer to create an estimate for the average respondent. Data from the study estimates that on average secondary residents would spend an additional 15 days in their Door County home if they had broadband Internet connectivity.

As shown in Table I, this study estimates the daily spending of secondary residents to be \$808.13. However, due to its volatility, construction spending was omitted from the data analysis. As a result, the study concluded that on average, secondary residents spend \$119.05 dollars a day (see Table I).

Economic Impact and IMPLAN

This paper's objectives are to estimate and to quantify the number of jobs, total wages, and total output generated because of broadband deployment. This study focused on the economic benefit of secondary residents staying in their secondary homes longer due to broadband availability in the area. The area under review is Door County, Wisconsin. The IMPLAN economic impact model (named for its attempt to analyze the impact for use in economic planning) is used to measure both direct and secondary impacts of additional spending by area's secondary residents.

For the economic impact of secondary residents, the input-output analysis model was used. This model will estimate the status and importance of secondary residents spending in Door County's economy. The input-output analysis methodology best measures both the relative sizes of sectors that make up the economy and the linkages among them. While this paper is unable to reveal the multiple economic iterations between the various economic players, the modeling available through IMPLAN produces a structural model that illuminates the interactions among sectors and measures impacts as they reverberate through the economy. By revealing these interactions, policy makers can develop a strategy that most efficiently stimulates regional economic growth.

The input-output analysis uses an economic model that traces the flow of goods and services, income, and employment among related sectors of the economy. The approach triggers a flow of activities. This paper uses IMPLAN Pro 2.0 software to evaluate the economic impact of broadband expansion in Door County and the flows created by additional visits by homeowners. The USDA Forest Service originally developed IMPLAN in 1979 and it has witnessed several generations of improvements in the model over the ensuing years. It is a sophisticated software package that makes regional input-output models and forecasts regional economic impact based on them. It is widely used by government agencies to develop regional economic forecasts. This evolution of the I/O model, developed by Wassily Leontief, through the University of Minnesota and the US Forest Service, and its application by IMPLAN is explained clearly in past literature (Miller and Blair, 1985; Bonn and Harrington, 2008). However, the following includes a brief description of the three components of the final impact. The I/O Model provides a means to capture and measure these effects. It uses the following three effects to measure economic impact.

i. Types of Effects

Direct effect refers to production change associated with a change in demand for the good itself. It is the initial impact on the economy, which is exogenous to the model. Direct effects include respective portions of the amount initially injected into the regional economy (non-local spending in the region).

Indirect effect refers to the secondary impact caused by changing input needs of directly affected industries (e.g., additional input purchases to produce additional output). It concerns inter-industry transactions. For instance, the grocery stores that have a demand for locally produced materials needed to produce their product.

Induced effects are caused by changes in household spending due to the additional employment generated by direct and indirect effects. The Induced Effect measures the effects of changes in household income and the spending of this increased household income on consumption items.

Table XV: IMPLAN Results: Economic Impact of Secondary Residents in Door County

Impact Type	Employment	Labor Income	Output
Direct	97	\$4,050,000	\$13,000,000
Indirect	25	\$820,000	\$3,400,000
Induced	15	\$630,000	\$2,200,000
Total Effect	137	\$5,500,000	\$18,600,000

The IMPLAN design is based on the direct spending of the participants. For example, the average secondary property owner directly spends \$18.84 on restaurants per household during their time in Door County. This is a daily household spend. Note that these are homeowners with kitchens—they also spend money at grocery stores. This spending estimate is applied to IMPLAN in the appropriate categories and is based on these property owners staying an additional 15 days per year. It is also based on the 9,570 secondary homes. The aggregate spend is ultimately less than the total of the average spend times the number of days and the number of secondary homes due to leakages.

Secondary residents in Door County spend most of the direct spending in the county. However, a portion of their money exits the local economy through leakages. Leakages are the flow of dollars leaving a community as residents engage in spending in places outside of the community. For instance, money spent on imports or goods manufactured in a different state are examples of money leaving the local economy. Also, if a household makes a purchase on-line for delivery to their home in Door County, that spend would leak out of the county.

One additional consideration of the economic impact is the realization that there are numerous communities within Door County. These include a City, Villages, and Towns. As a result, each of these communities radiate economic possibilities as their secondary residents stay longer. The impacts of the spending by these community residents are contained in Table XV-A, The total is less than the total effect of 137 as a result of omitted areas of the county and rounding.

Table XV-A**IMPLAN Results by Community**

	Employment	Labor Income	Output
Baileys Harbor (Town)	12	\$480,000	\$1,600,000
Egg Harbor (Town)	12	\$500,000	\$1,700,000
Egg Harbor (Village)	7	\$300,000	\$1,000,000
Ephraim (Village)	6	\$270,000	\$900,000
Gardner (Town)	7	\$300,000	\$1,000,000
Gibraltar (Town)	13	\$540,000	\$1,800,000
Jacksonport (Town)	6	\$260,000	\$890,000
Liberty grove (Town)	17	\$680,000	\$2,300,000
Nawewaupee (Town)	10	\$420,000	\$1,400,000
Sevastopol (Town)	9	\$360,000	\$1,200,000
Sister Bay (Village)	9	\$380,000	\$1,300,000
Sturgeon Bay (City)	5	\$200,000	\$700,000
Sturgeon Bay (Town)	4	\$160,000	\$550,000
Union (Town)	3	\$150,000	\$500,000
Washington (Town)	8	\$330,000	\$1,100,000

VII. Conclusion

If Door County improved the access to reliable, high speed internet, secondary residents would stay an additional 15 more days per year , with their spending habits generating **more than \$18,600,000 in annual economic impact**. This incremental spend would create over **137 full-time equivalent jobs in Door County**, providing employees with **over \$5,500,000 in labor income**. **This impact is in addition to the current impact of these property owners. They currently support over 1,000 full time equivalent jobs, over \$110 million in output and \$40 million in labor income.**

Additionally, the Door County's secondary residents would also generate **approximately \$750,000 in state and local taxes** in 2023. This total consists mainly of sales and other use taxes, reflecting the impact of heavily taxed tourism-related activities on the economic contribution of Door County residents.

The majority of homes in Door County are secondary homes, meaning that residents only spend a certain number of days there each year. Over 20% of survey respondents stated that a major barrier preventing them from spending more time in Door County was due to poor quality internet, making broadband deployment a rewarding investment. Broadband deployment provides numerous benefits, including education, health care, social relations, entertainment, and prosperity and jobs. Our research demonstrates that the investment in reliable would provide an economic boon to the Door County economy.

Policy makers must create economic incentives for Internet providers to invest in the infrastructure needed to deploy broadband in more rural areas. Based on the findings presented here, a policy implication could be made that areas prone to having a substantial number of vacation properties should adopt broadband technologies. Using the analysis provided, there is a

positive relationship between broadband deployment and local economic growth. Adopting these technologies would increase the number of days secondary residents spend in their domicile, thereby increasing their spending and generating greater economic impact.

References

- AllConnect. "Why are internet speeds so slow in the Midwest? (2023) Viewed on February 22, 2024 at <https://www.allconnect.com/blog/regional-broadband-report-midwest/>.
- Aronsson, Manne, et al. "Broadband services for residential and commercial tenants: a categorization of current and future services and a survey on tenants needs in Sweden." *Building and environment* 38.2 (2003): 347-358.
- Ars Technica. "AT&T and Verizon say 10Mbps is too fast for 'broadband', 4Mbps is enough" (2014) Viewed on October 1, 2014, at <http://arstechnica.com/business/2014/09/att-and-verizon-say-10mbps-is-too-fast-for-broadband-4mbps-is-enough/>.
- Bouckaert, Jan, Theon Van Dijk, and Frank Verboven. "Access regulation, competition, and broadband penetration: An international study." *Telecommunications Policy* 34.11 (2010): 661-671.
- Broadband USA, How Fast is Broadband. Viewed on December 12, 2023. [https://broadbandusa.ntia.doc.gov/about-us/frequently-asked-questions/how-fast-broadband#:~:text=The%20Federal%20Communications%20Commission%20\(FCC,See%20th%20BroadbandUSA%20Glossary.](https://broadbandusa.ntia.doc.gov/about-us/frequently-asked-questions/how-fast-broadband#:~:text=The%20Federal%20Communications%20Commission%20(FCC,See%20th%20BroadbandUSA%20Glossary.)
- California Broadband Task Force, "The State of Connectivity," 2008. Viewed on September 14, 2014, at www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf.
- Starlink Internet Review: Is Satellite Finally Worth the Cost? <https://www.cnet.com/home/internet/starlink-internet-review/>. Viewed on May 5, 2024.

Common Cause, Comments of Common Cause, Next Century Cities and Public Knowledge, 2020. Viewed on December 12, 2023. www.commoncause.org/wp-content/uploads/2018/03/2020-706-NOI-Comments_Formatted_Final-2.pdf

Crandall, Robert W., and Charles L. Jackson. The \$500 billion opportunity: The potential economic benefit of widespread diffusion of broadband Internet access.

Crandall, Robert W., William Lehr, and Robert E. Litan. The effects of broadband deployment on output and employment: a cross-sectional analysis of US data. Brookings Institution, 2007. Washington, DC: Criterion Economics, LLC, 2001.

Federal Communications Commission, "Eight Broadband Progress Report," 2012. Viewed on September 7, 2014, at <http://www.fcc.gov/document/progress-made-broadband-deployment-availability-gaps-remain>

Federal Communications Commission "Types of Broadband Connections," 2014. Viewed on September 12, 2014, at <http://www.fcc.gov/encyclopedia/types-broadband-connections>.

Firth, Lucy, and David Mellor. "Broadband: benefits and problems. "Telecommunications Policy 29.2 (2005): 223-236.

Flamm, Kenneth, and Anindya Chaudhuri. "An analysis of the determinants of broadband access." Telecommunications Policy 31.6 (2007): 312-326.

Fuhr, Joseph P., and Stephen B. Pociask. "Broadband services: economic and environmental benefits." The American 22 (2007).

Hill, Ellis/ "Wisconsin Consumer Broadband Survey" (2010)
<http://www.link.wisconsin.gov/lwi/docs/Consumer%20Market%20Research.pdf>

Holt, Lynne, and Mark Jamison. "Broadband and contributions to economic growth: Lessons from the US experience." Telecommunications Policy 33.10 (2009): 575-581.

Greenstein, Shane, and Ryan C. McDevitt. "The broadband bonus: Estimating broadband Internet's economic value." Telecommunications Policy 35.7 (2011): 617-632.

Grubestic, Tony H. "The US national broadband map: Data limitations and implications."

Telecommunications Policy 36.2 (2012): 113-126.

Grubestic, Tony H., and Alan T. Murray. "Waiting for broadband: Local competition and the spatial distribution of advanced telecommunication services in the United States."

Growth and Change 35.2 (2004): 139-165.

Hudson, Heather E., et al. "Toward Universal Broadband in Rural Alaska." (2012).

Jakopin, Nejc M., and Andreas Klein. "Determinants of broadband internet access take-up: country level drivers." *info* 13.5 (2011): 29-47.

Kolko, Jed. "Broadband and local growth." *Journal of Urban Economics* 71.1 (2012): 100-113.

Lee, Sangwon, Mircea Marcu, and Seonmi Lee. "An empirical analysis of fixed and mobile broadband diffusion." *Information Economics and Policy* 23.3 (2011): 227-233.

Lobo, Bento J., Md Rafayet Alam, and Brian E. Whitacre. "Broadband speed and unemployment rates: Data and measurement issues." *Telecommunications Policy* 44.1 (2020): 101829.

Oyana, Tonny J. "Exploring geographic disparities in broadband access and use in rural southern Illinois: Who's being left behind?" *Government Information Quarterly* 28.2 (2011): 252-261.

Pociask, Steve. "Building a nationwide broadband network: Speeding job growth." *TeleNomic Research, LLC* 29 (2002).

Prieger, James. "The Broadband Digital Divide and the Economic Benefits of Mobile Broadband for Rural Areas." (2012).

Salemink, Koen, Dirk Strijker, and Gary Bosworth. "Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas." *Journal of Rural Studies* 54 (2017): 360-371.

Smith, Aaron. "Older Adults and Technology Use." Pew Research Center, Washington, D.C.

(2014) http://www.pewinternet.org/files/2014/04/PIP_Seniors-and-Tech-Use_040314.pdf, Accessed October 3, 2014

Strover, Sharon. "The prospects for broadband deployment in rural America." Government Information Quarterly 20.2 (2003): 95-106.

U.S. Department of Commerce "Measuring Broadband's Economic Impact" 2006, Viewed on September 2, at http://cfp.mit.edu/publications/CFP_Papers/Measuring_bb_econ_impact-final.pdf

UW Extension "Increases in Bandwidth" (2014)

<http://blogs.ces.uwex.edu/cced/files/2014/09/Increases-in-bandwidth.pdf>

UW Extension "Broadband and the Wisconsin Economy" (2021).

<https://economicdevelopment.extension.wisc.edu/files/2021/06/2021-01-07-Broadband-Report.pdf>

UW Extension "Disconnected: Household without any Internet" (2021).

https://economicdevelopment.extension.wisc.edu/files/2021/06/EDAUC_BB_FS_03.pdf

UW Extension "Willingness to Pay for Broadband Internet A Case Study of Wisconsin" (2023).

https://economicdevelopment.extension.wisc.edu/files/2023/10/EDAUC_StudySeries_WTP_FINAL.pdf

Wisconsin Dash Board. "Economic and Social Impact of Broadband Investments in Wisconsin"

2014, Viewed on 6 Oct. 2014 at

http://wisconsindashboard.org/sites/wisconsindashboard.org/files/DRAFT_WI_IMPACT_MODEL_Jan14_2013_0.pdf.

Wisconsin Dash Board. "Residential Broadband Demand Survey Results: Statewide." 2014,

Viewed on 10 Oct. 2014 at

<http://wisconsindashboard.org/console/infograph/state/residential/55>.

World Bank “Information and Communications for Development” 2009: Extending Reach and Increasing Impact. Washington, DC: World Bank. Accessible at:
<http://issuu.com/world.bank.publications/docs/9780821376058>

World Bank “Information and Communications for Development” 2012: Maximizing Mobile. Washington, DC: World Bank. Accessible at:
<http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/IC4D-2012-Report.pdf>

Zhou, Wen, and Lee. “Broadband infrastructure and export growth”. Telecommunications Policy 46 (2022): 1-17.

Appendix

I. Nationwide Adoption of Broadband

Table XVII: Americans Residing in Rural and Non-Rural Areas		
Without Access to Fixed Broadband ¹		
Meeting the Speed Benchmark of Fixed 25/3 Mbps 2019		
	Respondents w/ Access (%)	Respondents w/o Access (%)
All Respondents	95.6%	93.2%
Rural Area Respondents	82.7%	78.2%
Non-Rural Area Respondents	98.8%	99.8%
Source: Federal Communications Commissions (2021)		

¹ High-speed data transmission that allows homes and institutions to use it for technologies such as FiOS, entertainment, sports, DSL, and cable (PCMag, 2024).

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II. Definitions

Broadband

High-speed data transmission that allows homes and institutions to access the Internet and Internet adjacent services such as FiOS, mobile networks, satellite internet, and cable.

Primary Residents

Residents who live in a home within the area for a majority of the year and spend most of their time there.

Secondary Residents

Residents who stay in their second home within the area for a small portion of the year.

Destination Visitors/Tourists

People who visit/tour an area for a short amount of time for particular events and activities.

Secondary homes

Homes only inhabited during a particular time of the year and for a certain amount of time.

III. Types of Broadband Connection

The Federal Communications Commission in 2014 defined broadband as high-speed Internet that is always on and faster than traditional dial-up access. Broadband includes several high-speed transmission technologies such as:

- Digital Subscriber Line (DSL)
- Cable Model
- Fiber
- Wireless
- Satellite
- Low Earth Orbit (e.g., Starlink)

Multiple factors will determine the broadband technology you choose. These may include whether you are in an urban or rural area, price, availability, and how broadband Internet access is packaged with other services (such as voice telephone and home entertainment).

Digital Subscriber Line (DSL)

DSL is a wireline transmission technology that transmits data faster over traditional copper telephone lines already installed to homes and businesses. DSL-based broadband provides transmission speeds ranging from several hundred Kbps to millions of bits per second (Mbps). Factors that affect the speed and availability of DSL broadband may depend on the distance from your home to the closest telephone company facility.

The following are types of DSL transmission technologies:

- Asymmetrical Digital Subscriber Line (ADSL) – Used primarily by residential customers, such as Internet surfers, who receive a lot of data but do not send much. ADSL typically provides faster speed in the downstream direction than the upstream direction. It allows faster downstream data transmission over the same line used to provide voice service, without disrupting regular telephone calls on that line.
- Symmetrical Digital Subscriber Line (SDSL) – Used typically by businesses for services such as video conferencing, which need significant bandwidth both upstream and downstream (Federal Communications Commission 2014).

Cable Modem

Cable modem service allows cable companies to deliver broadband Internet using the existing infrastructure that delivers pictures and sound to your TV set. Most cable modems are external devices that have two connections: one to the cable wall outlet, the other to a computer. They provide transmission speeds of 1.5 Mbps or more.

Subscribers can access their cable modem service by simply turning on their computers, without dialing an ISP. You can still watch cable TV while using it. Transmission speeds vary depending on the type of cable modem, cable network, and traffic load. Speeds are comparable to DSL (Federal Communications Commission, 2014).

Fiber

- Fiber optic technology converts electrical signals carrying data to light and sends the light through transparent glass fibers about the diameter of a human hair. The speeds provided by fiber optic are faster than DSL or cable mode, typically by tens or even hundreds of Mbps.
- A variety of factors determine the actual speed experienced by the user. They include how close your home is to the service provider that brings the fiber, how the provider configures the service, and the amount of bandwidth used. The same fiber providing your broadband can also simultaneously deliver voice (VoIP) and video services, including video-on-demand.
- Telecommunications providers offer fiber broadband in limited areas and have announced plans to expand their fiber networks and offer bundled voice, Internet access, and video services (Federal Communications Commission, 2014).

Wireless

- Wireless broadband can be mobile or fixed. To provide broadband Internet to the user, wireless broadband utilizes a radio link between the customer's location and the provider's facility.
- Wireless technologies using longer-range directional equipment provide broadband service in remote or sparsely populated areas where DSL or cable modem service would be costly to provide. Speeds are comparable to DSL and cable modem. An external antenna is usually required.
- Wireless broadband Internet access services offered over fixed networks allow consumers to access the Internet from a fixed point while stationary and often require a direct line-of-sight between the wireless transmitter and receiver. These services have been offered using both licensed spectrum and unlicensed devices. For example, thousands of small Wireless Internet Services Providers (WISPs) provide such wireless broadband at speeds of around one Mbps using unlicensed devices, often in rural areas not served by cable or wireline broadband networks.
- Wireless Local Area Networks (WLANs) provide wireless broadband access over shorter distances and are used to extend the reach of a fixed wireless broadband connection. This type of connection is regularly found within a home, building, or campus environment. These networks used unlicensed devices designed for private access such as a home or a business. In addition, they are used for public Internet access, also known as "hot spots," utilized in restaurants, coffee shops, airports, and hotels (Federal Communications Commission, 2014).

Satellite

Satellites orbiting the earth provide the necessary technology to bring telephone and television service to billions around the world. However, they can also provide broadband; satellite broadband is another form of wireless broadband and is commonly used in remote or low populated areas.

Downstream and upstream speeds for satellite broadband depend on several factors, including the provider and service package purchased, the consumer's line of sight to the orbiting satellite, and the weather. Typically, a consumer can expect to receive (download) at a speed of about 500 Kbps and send (upload) at a speed of about 80 Kbps. These speeds may be slower than DSL and cable modem, but they are about ten times faster than the download speed with dial-up Internet access. Service can be disrupted in extreme weather conditions (Federal Communications Commission, 2014)

Low Earth Orbit (e.g., Starlink)

Starlink is a wholly owned subsidiary of SpaceX. It provides mobile broadband service using small satellites in the low Earth Orbit (LEO) that communicate via ground receivers. Starlink has the potential to offer moderately faster speeds than other satellites based service with the ability to support data, online gaming and video calls. However, this improved access may be costly to the consumer (cnet.com, 2024)