June, 2009

Broadband Opportunities for Sussex County

Troy D Mix, *University of Illinois at Urbana-Champaign*
David Beauchamp
Matthias Wendt

An IPA Economic Development Report

Broadband Opportunities for Sussex County

June 2009

written by

Troy Mix

David Beauchamp

Matthias Wendt

Institute for Public Administration
College of Education & Public Policy
University of Delaware

www.ipa.udel.edu

An IPA Economic Development Report

Broadband Opportunities for Sussex County

June 2009

written by

Troy Mix

David Beauchamp

Matthias Wendt

Institute for Public Administration
College of Education & Public Policy
University of Delaware

www.ipa.udel.edu

Preface

As Director of the Institute for Public Administration (IPA) at the University of Delaware, I am pleased to provide the *Broadband Opportunities for Sussex County* report. Its development was supported by the University's Coastal Community Enhancement Initiative (CCEI), a collaborative effort among the College of Education & Public Policy, the College of Agriculture & Natural Resources, and the College of Earth, Ocean, and Environment. CCEI is an approach for addressing growth, land use, and environmental impacts in southern Delaware.

Infrastructure has long been a critical component for regional economic development, and the evolving nature of the economy has made high-speed telecommunication technologies, such as broadband, increasingly valuable pieces of the infrastructure puzzle. This report addresses the opportunities related to expanding and enhancing the provision of broadband in rural areas, with a particular focus on opportunities for Sussex County, Delaware.

Chapter 1 defines broadband by describing the wired and wireless technologies that provide high-speed Internet services. Chapter 2 reviews the general community benefits that broadband can bring to a region and examines specific applications of broadband for a variety of household, business, and government purposes. Chapter 3 describes the state of broadband infrastructure deployment and use in Sussex County and rural areas in general. Finally, Chapter 4 reviews several initiatives that have sought to expand and enhance regional broadband offerings, in an effort to provide guidance for policy discussions regarding the future of broadband in Sussex County and rural areas in general.

It is my hope that this report provides Sussex County's residents and business and government officials with the background necessary to address the critical topic of broadband infrastructure deployment. Ideally, the policy guidance this document offers will be used to frame a discussion that leads to the provision of a world-class, high-speed broadband network—competitively positioning Sussex County for economic growth.

Jerome R. Lewis, Ph.D.
Director, Institute for Public Administration

Institute for Public Administration

The Institute for Public Administration (IPA) prepared this report. A unit within the College of Education & Public Policy at the University of Delaware, IPA links the research and resources of the University with the management and information needs of local, state, and regional governments in the Delaware Valley. IPA provides assistance to agencies and local governments through direct staff support and research projects as well as training programs and policy forums.

IPA Assistant Policy Scientist Troy Mix researched and authored this report with assistance from research assistants Matthias Wendt and David Beauchamp.

Institute Director
Jerome R. Lewis, Ph.D.

Project Team
Troy D. Mix, AICP, Assistant Policy Scientist
David Beauchamp, Research Assistant
Matthias Wendt, Research Assistant

Editorial Review
Mark Deshon, Assistant Policy Scientist

Acknowledgments

A sincere thank you goes to the coordinators of the University of Delaware's Coastal Community Enhancement Initiative (CCEI), Bill McGowan from the College of Agriculture & Natural Resources, Jim Falk from the College of Earth, Ocean, and Environment, and IPA's Bernie Dworsky from the College of Education & Public Policy, for supporting the development of this report. Funding from the state of Delaware made this research, and other CCEI efforts, possible. Research assistant Matthias Wendt performed initial research that laid the groundwork for the eventual completion of this report. Finally, much gratitude is owed to the numerous Sussex County residents, businesspersons, and local government officials who provided formal and informal feedback on the prospects for expanded and enhanced broadband in Sussex.

Table of Contents

Executive Summary

Infrastructure is a key ingredient in the recipe for regional economic prosperity—a constant requirement as the U.S. economy evolves. Roads and rail connect cities, the electric grid connects industry with energy, and telephone lines connect businesses with customers. The current economy places a premium on the high-speed transfer of data that broadband infrastructure makes possible. Broadband—defined by the Federal Communications Commission (FCC) as "advanced communications systems capable of providing high-speed transmission of services such as data, voice, and video over the Internet and other networks"—has become a staple infrastructure in the diet of competitive regional economies (Federal Communications Commission, February 2009).

This report highlights the opportunity for Sussex County, Delaware, to harness broadband infrastructure for economic development and urges policy action in that regard. Broadband technologies are described and defined in terms of their speed, availability, and future promise. Chapter 2 reviews selected community benefits and specific applications of broadband. Chapter 3 summarizes the status of broadband infrastructure and use in rural areas of the United States, with a particular focus on Sussex County. Finally, Chapter 4 provides a framework for policy discussions aimed at enhancing and expanding broadband infrastructure and use in Sussex County.

Broadband Technologies

Broadband is not a singular technology. A variety of wired and wireless solutions provide broadband services to consumers and businesses. Speed sets broadband connections apart, as they allow for Internet connections at least four times faster than conventional dial-up (Federal Communications Commission, February 2009). The two most prevalent forms of wired broadband in the U.S., cable and digital subscriber line (DSL) connections, account for approximately 97 percent of lines nationally (Federal Communications Commission, January 2009). Emerging forms likely to gain increased U.S. market share in the coming years include fiber-optic broadband and broadband over power line (BPL). An example of this trend is Verizon's ongoing deployment of FiOS™, a fiber-optic broadband network.

With the notable exception of satellite broadband, nearly all forms of wireless broadband require a terrestrial hub from which to broadcast a signal. Wi-Fi, a common wireless broadband source, provides connections in "hot-spots" that radiate for about 500 feet from a wired source. WiMAX, an emerging wireless technology, provides connections up to 30 miles from a central source (Lane n.d.). Cellular-phone companies also provide a growing variety of wireless service options. In general, wireless connections provide for slower speeds than what wired service can offer. However, wireless solutions have the decided advantage of offering Internet connections to those using mobile devices and also have the potential to offer broadband service to areas not easily reached by traditional, wired solutions.

Broadband Benefits and Applications

Economic impact studies consistently conclude that access to broadband infrastructure measurably enhances prospects for regional economic growth. Broadband availability has been positively correlated with increases in indicators such as total employment and the number of businesses. The widespread provision of broadband infrastructure holds great potential to narrow the long-standing gap in economic performance that separates rural and metropolitan areas. Rural areas traditionally suffer from economic effects associated with relatively small, local markets and significant distances to the larger consumer and labor pools present in metropolitan areas. The connections broadband affords to a region can, at least partially, address many of the most persistent rural-development issues—lack of high-paying jobs, limited options for health care and education, and the out-migration of youth.

Public, private, and nonprofit groups use broadband to enhance the efficiency and impact of their operations. Governments use broadband to inform the public and communicate real-time condition updates to in-the-field personnel—saving time and improving service quality in the process. Businesses use broadband to interact with their customers, expand their labor pools by offering telecommuting options, and save time and money by videoconferencing with clients and satellite offices. Residents in rural communities can tap into the growing range of educational opportunities available over the Internet and remotely access medical care from off-site specialists.

The State of Broadband

Rural areas lag behind urban and suburban areas in terms of the provision and use of broadband infrastructure and services. According to the Pew Institute's 2009 survey on Internet usage, approximately 46 percent of households in rural areas use a broadband connection in the home. By contrast, this figure stands at roughly 67 percent of households in non-rural areas (Horrigan 2009). This gap is thought to exist due to the economic and demographic characteristics common to rural communities. Simply put, fewer people per square mile makes private providers less willing to install broadband infrastructure in rural areas. The demographic characteristics of rural populations have also kept demand at lower levels than in urban and suburban areas. Compared to the population in urban and suburban locales, residents in rural areas tend to be older, less wealthy, and less educated—all characteristics associated with lower rates of household broadband adoption.

While detailed assessments of broadband availability are few and far between, it can be fairly stated that deployment in Sussex County has lagged behind that of its more suburban counterparts. Incorporated areas in Sussex tend to have broadband service provided by cable or telephone companies while service in unincorporated areas is spottier. Some areas of the county have no access to wired broadband services and emerging wired solutions have generally been deployed more slowly than in urban and suburban areas. Wireless options in Sussex County include satellite and cellular broadband services. Additionally, a 2008 inventory of public access

Wi-Fi sites in Sussex revealed at least 60 Wi-Fi hotspots throughout the county—a figure that is likely to increase over time and demonstrates a recognition of the importance of such amenities.

Framing a Broadband Policy Discussion in Sussex County

The American Recovery and Reinvestment Act of 2009 designated several billion dollars to address the provision of broadband in rural areas. Exactly how this money will be invested is unclear, but it is evident that the opportunity to address the rural-broadband-access gap has never been greater. This report recommends that businesses, communities, and governments in Sussex County enter into a dialogue to craft a regional broadband policy and, ultimately, a business plan for enhanced broadband infrastructure and services. Discussion should focus on improvements that will enhance the region's economic and educational competitiveness.

Localities have pursued a variety of methods to improve regional broadband offerings, with no alternative yet to emerge as the "best" option. This report reviews several case-study examples that provide insight on successes and missteps. The "best" approach for Sussex should be one that speaks to the unique demands and constraints of the region, while avoiding the mistakes of others. Examples reviewed in this report can help frame a conversation about broadband policy. More particularly, discussion can be focused on the following, not mutually exclusive, options:

1) **Status Quo**—The most common approach, as many localities have not developed a formal broadband policy. Private telecommunications companies are relied upon to build, supply, and upgrade broadband infrastructure and services. In many cases there are no problems with this approach, as evident regional market demand spurs the private sector to provide adequate broadband service. However, in regions where market demand is less obvious, such as rural areas, broadband service has often not been made widely available at speeds competitive with connections in more urban areas.

2) **Aggregate Demand**—This approach relies upon private provision of infrastructure and services, but effectively gives the market a nudge by actively demonstrating and pooling demand for broadband offerings. Broadband coverage and speeds are inventoried and user groups are educated on the potential utility of broadband. The community in question works to build demand for broadband around those "killer apps" that can most benefit regional users. Finally, community stakeholders demonstrate collective demand for broadband offerings to providers in an effort to spur private investment in infrastructure and services.

3) **Form Broadband Cooperatives**—The use of cooperatives has long been common practice for the provision of electricity in rural areas. Regions have adapted this model to provide cutting-edge broadband infrastructure in underserved areas, with the laying of high-speed fiber-optic lines often being the result. For this approach, public and private actors pool resources to plan, construct, and manage a regional broadband network.

4) **Create Local Networks**—This approach often involves the formation of public-private partnerships to provide wireless networks in defined geographic areas. Typically, localities lease access to public property, such as street lampposts, in exchange for the provision of free broadband access in selected areas and subscription service available to a larger area. Successful initiatives tend to include anchor-tenant agreements that obligate local governments or large institutions to purchase a set number of broadband subscriptions—improving the chances of private-operator success, much as the presence of an anchor store does for a shopping mall. Networks promising "free Internet for all" have tended to prove unsustainable, particularly if careful thought was not given to ongoing sources of revenue.

Chapter 1. Broadband Technologies

Ask ten people what broadband is and you're likely to get multiple answers with a few blank stares mixed in for good measure. The Federal Communications Commission's (FCC) definition of broadband as "advanced communications systems capable of providing high-speed transmission of services such as data, voice, and video over the Internet and other networks" suffices for this report. Put more succinctly, broadband is a multi-platform telecommunications solution that is relatively fast and feature-rich when compared with options such as dial-up connections to the Internet.

This chapter focuses on the multi-platform and speed components of broadband, while Chapter 2 describes some of the applications broadband makes possible. Rather than a single technology, broadband instead refers to a variety of ways to connect to the Internet, and other media sources, that are at least four times faster than typical dial-up connections (Federal Communications Commission, February 2009). This chapter categorizes technologies into "wired" and "wireless" forms of broadband. For each technology, characteristics such as speed, pricing, and availability are reviewed.

Kilobits per second (Kbps) and megabits per second (Mbps) are terms used to report the relative speed of broadband technologies. They refer to the number of bits of data that can be transferred per second, with Kbps translating to 1,024 bits per second and Mbps translating to 1,048,576 bits per second (or 1,024 Kpbs). Eight bits of data are equivalent to one byte, so these data transfer rates can be used to calculate the time it takes to transmit files of various sizes. For instance, a five megabyte (5 MB) file is equivalent to 41,943,040 bits. Under optimal conditions, a 5 Mbps connection would take approximately eight seconds to transfer a file of this size, while a 56 Kbps connection—a typical dial-up speed—would take just over twelve minutes to transmit the same file. Speeds reported in this section are generally for downloading activity only. The speed for a user to upload data often varies significantly from download speeds.

This chapter should be read with the knowledge that broadband technologies and the availability and pricing of broadband services change on a regular basis. The information presented in the following sections was compiled during 2008 and 2009, and represents the culmination of research aimed at presenting a snapshot of broadband services in the United States, Delaware, and, especially, Sussex County. Providers of broadband service should be contacted directly for the most up-to-date and detailed data on service characteristics.

1-1. Wired Broadband

Wired broadband refers to technologies that transmit data to and from end users over some variety of cable or line. Technologies examined in this section include digital subscriber line (DSL), cable, fiber optic, and broadband over power line (BPL).

DSL

DSL is a data transmission technology that uses existing copper telephone lines. Telephone companies provide DSL over their networks by using capacities not required by traditional voice service. DSL technology requires phone companies to invest in additional equipment in order to eliminate problems of signal interference. Generally, DSL service can extend only three miles from a central office to the customer's location. DSL-based broadband provides transmission speeds ranging up to several Mbps.

There are two types of DSL transmission technologies, Asymmetrical Digital Subscriber Line (ADSL) and Symmetrical Digital Subscriber Line (SDSL). ADSL typically provides faster speed in the download direction than in the upload direction and is used primarily by residential customers, who tend to receive more data than they send. SDSL is typically used by businesses for services such as videoconferencing, since significant bandwidths are needed for both upload and download operations.

Currently, Verizon is the primary telephone company that offers DSL service in Delaware. While coverage is generally complete, DSL's need for proximity to a central office means that there are most likely pockets within rural areas, such as western Sussex County, that are likely to have spotty DSL coverage. Although DSL has been one of the most common broadband connection types for residential users, current DSL technologies may eventually be superseded by next generation DSL, fiber-optic, and other high-bandwidth solutions.

Table 1-1 summarizes characteristics of DSL.

Table 1-1. Broadband Technology Characteristics: DSL

Access Technology	Local Speed	Local Pricing per Month	Local Providers	Reach	Notes
DSL	1 to 7.1 Mbps	$18 to $43	Verizon	Residence must be within about 18,000 ft. of a DSL central office	Available in New Castle, Kent, and Sussex counties

Cable

Cable television companies have provided Internet connections via cable modems since the late 1990s. Cable operators provide broadband by using the same coaxial cables that deliver pictures and sound to the television set. Transmission speeds vary depending on the type of cable modem, cable network, and data traffic load. Cable broadband offers high download speeds up to 12 Mbps that are comparable, and sometimes superior, to DSL. Together with DSL, cable broadband is one of the most prevalent broadband technologies. Comcast and Mediacom provide cable broadband services in Sussex County. As with DSL, incorporated areas in Sussex are likely to be well served, while unincorporated and less populated regions might not be able to access cable broadband services.

Table 1-2 summarizes characteristics of cable broadband.

Table 1-2. Broadband Technology Characteristics: Cable

Access Technology	Local Speed	Local Pricing per Month	Local Providers	Reach	Notes
Cable	6 to 16 Mbps	$33 to $53	Comcast, Mediacom	Reaches to areas that have cable service	

Fiber Optic

Fiber optic, or fiber, is a newer technology that has the ability to transmit data at much faster speeds than current DSL or cable-modem speeds. Because the deployment of fiber-optic networks is costly, telecommunications providers have begun offering fiber-optic broadband in relatively limited areas. However, providers have announced plans to expand their fiber networks and offer bundled-Internet access and video services. Japan and South Korea are two examples of countries where high-speed, fiber-optic cables have been widely deployed.

Locally, Verizon has deployed a fiber-optic network that is available in parts of the state. The company has built a network supporting its FiOS™ family of fiber-optic services. FiOS™ is available in most of New Castle County, in the greater Dover area in Kent County, and in the Angola area and the Heritage Shores development in Bridgeville, Sussex County (Allan, William R., President, Verizon Delaware LLC 2008).

Table 1-3 summarizes characteristics of fiber-optic broadband.

Table 1-3. Broadband Technology Characteristics: Fiber Optic

Access Technology	Local Speed	Local Pricing per Month	Local Providers	Reach	Notes
Fiber Optic	10 to 50 Mbps	$50 to $150	Verizon	Deployment is limited, but spreading	Available in most of New Castle County, and parts of Kent and Sussex Counties

Broadband Over Power Line (BPL)

BPL allows for the delivery of broadband over the existing low- and medium-voltage electric power–distribution network. BPL speeds of up to 3 Mbps are comparable to DSL and cable-modem speeds. Service can be provided to homes using existing electrical connections.

The FCC has hailed BPL as a potential "third wire" that may help increase the availability and affordability of broadband services in a market dominated by DSL and cable. BPL is an emerging technology and is only available in very limited areas. It has significant potential because power lines are installed virtually everywhere, alleviating the need to build new

broadband facilities for every customer and making it substantially easier to reach rural areas with broadband.

While BPL use has been limited to date, there are recent signs of efforts to harness BPL for mass use. In November 2008, IBM signed a $9.6 million contract with International Broadband Electric Communications to bring BPL to rural America (McDougall 2008).

Table 1-4 summarizes characteristics of BPL.

Table 1-4. Broadband Technology Characteristics: BPL

Access Technology	Speed	Pricing per Month	Local Providers	Reach	Notes
BPL	Residential- up to 3 Mbps; Commercial- 5 Mbps or more	No local service. $28 to $39 elsewhere	Not yet deployed in Delaware	Ubiquitous electric distribution network	As of 2006 fewer than 5,000 nationwide customers used BPL

1-2. Wireless Broadband

Wireless broadband refers to technologies that transmit data to and from end users without the need for direct connections to wired broadband. Wireless signals typically originate from a transponder connected to a terrestrial broadband source. This section reviews wireless fidelity (Wi-Fi), worldwide interoperability for microwave access (WiMAX), cellular, and satellite versions of wireless broadband.

Wi-Fi

Wi-Fi networks provide broadband service in so called "hot-spots," offering connections within 300 feet of a central source. Wi-Fi's bandwidth is shared among multiple users. Devices within signal reach of a Wi-Fi-equipped base station or access point can send and receive data.

To date, it has not been common for people to subscribe to Wi-Fi services. However, households and businesses often subscribe to a wired service and then create their own Wi-Fi hotspot for personal or business use. Most people encounter Wi-Fi when visiting public spaces or businesses, such as coffee shops or hotels that offer free or pay-by-the-hour service. However, some cities, such as Philadelphia and Minneapolis, have experimented with providing area-wide Wi-Fi services to which households and businesses can subscribe.

In Minneapolis a wireless network is being constructed that will cover 59 square miles and provide Wi-Fi services that are free for many non-profits and available for a reduced, monthly rate for residents and businesses (City of Minneapolis, Minnesota 2008). The service offers speeds of up to 6 Mbps and the monthly rate is $19.95 for residents and $29.95 for businesses (USI Wireless 2009). To date, Wi-Fi networks in Delaware tend to be limited to localized networks based at a particular business site and available to customers and employees. One

notable example in Sussex County is a Wi-Fi network available free of charge at The Circle in Georgetown.

Table 1-5 summarizes characteristics of Wi-Fi.

Table 1-5. Broadband Technology Characteristics: Wi-Fi

Access Technology	Local Speed	Local Pricing per Month	Local Providers	Reach	Remarks
Wi-Fi	3 to 11 Mbps	No local service. $17.95 to $29.95 elsewhere	No widespread local service. Philadelphia and Minneapolis have area-wide Wi-Fi services.	300 to 500 ft.	Weather and line of sight can affect ability to reach customers

WiMAX

WiMAX can provide broadband service for up to 30 miles surrounding a signal tower. Due to its range, WiMAX is a particularly intriguing option for rural areas that lack access to wired broadband.

In September 2008, Sprint/Nextel launched a WiMAX hotspot in Baltimore, providing city residents with broadband access at speeds of up to 6 Mbps. Sprint/Nextel plans to follow up its Baltimore initiative with WiMAX service in Chicago, Washington, D.C., Philadelphia, and Dallas (Reardon 2008). WiMAX is not currently available in Delaware.

Table 1-6 summarizes characteristics of WiMAX.

Table 1-6. Broadband Technology Characteristics: WiMAX

Access Technology	Local Speed	Local Pricing per Month	Local Providers	Reach	Remarks
WiMAX	1 to 6 Mbps	No local service. $25 to $50 elsewhere	None in Delaware	6 to 30 miles	Deployed in Portland, Ore. and Baltimore, Md.

Cellular

Cellular phone–service packages increasingly offer access to wireless broadband networks. In addition to cellular phones, these networks can often be used with laptops. Several providers in Delaware offer cellular broadband service. Speeds range from 700 Kbps to 1.2 Mbps, with Wi-Fi connections and speeds made possible depending on the cellular device used. The number of subscriptions to this type of wireless broadband service is likely to grow as increasingly sophisticated mobile devices are developed and adopted by consumers and businesses. Table 1-7 summarizes characteristics of cellular broadband.

Table 1-7. Broadband Technology Characteristics: Cellular

Cellular Provider	Local Speed	Local Pricing per Month	Reach
Verizon Wireless	3G: 700 Kbps to 1.2 Mbps	$1.99 per megabyte, $5.00 per monthly access; plus charge for device	3G Network: Verizon Wireless Broadband covers almost all of U.S. (All of Del.)
AT&T	Edge Network: 70-135 Kbps 3G Network: 700 Kbps to 1.2 Mbps	$30-$60 depending on Internet applications used; plus charge for device	Edge Network available in 13,000 U.S. cities; 3G Network available in most major metropolitan areas (Delaware beaches, Wilmington)
T-Mobile	Edge Network or 3G: 700 Kbps to 1.2 Mbps	$20-$50 depending on amount of web access and Internet applications used; plus charge for device	Edge Network available in most of Delaware (spotty Sussex County coverage); 3G available only in certain metropolitan areas (Wilmington)
Sprint/Nextel	Wi-Fi speeds or 700 Kbps to 1.2 Mbps	$50 - $100 depending on service; plus charge for device	Sprint Mobile Broadband Network reaches 230 million people (includes all Delaware)

Satellite

Satellite broadband is especially useful for serving remote or sparsely populated areas. An estimated 463,000 U.S. households subscribed to satellite services in 2006, and that number is expected to nearly double to approximately 900,000 households by 2010. Four providers—WildBlue Communications, Hughes Network Systems, and Spacenet—currently offer satellite services that collectively cover the entire U.S. (Belson 2006).

Satellite broadband providers use satellites that orbit in a fixed position above the equator, requiring the user's reception dish to have a clear view of the southern sky. Download speeds are about 500 Kbps and upload speeds are about 80 Kbps. Even though satellite broadband is significantly slower than wired technologies, download speed is still about ten times faster than that offered by dial-up connections.

Although satellite broadband covers large areas, it has drawbacks. Transmission of data via satellite results in a time lag, rendering this service less than ideal for telephony or online-gaming applications, for example. The price for satellite broadband is generally higher than for terrestrial options. Additionally, extreme weather conditions can disrupt service.

Table 1-8 summarizes characteristics of satellite broadband.

Table 1-8. Broadband Technology Characteristics: Satellite

Access Technology	Local Speed	Local Pricing per Month	Local Providers	Reach	Remarks
Satellite	1 to 5 Mbps	$60 to $350 plus $400 for satellite dish and installation	HughesNet, WildBlue, Skyway USA, Spacenet	Requires clear line of sight and clear view to the south	No Delaware-based office or branch

1-3. Comparative Summary

Table 1-9 lists typical data transfer speeds for the variety of broadband technologies reviewed in this report. All broadband technologies offer significant speed advantages relative to dial-up Internet connections. Currently, wired broadband options tend to offer higher speeds than wireless options can. While the comparative speed advantage of wired options may not shift, existing and future wired and wireless broadband options are likely to advance in terms of range and availability, speed, security, and data capacity.

From a regional perspective, the choice between wired and wireless options should not be a one-or-the-other proposition. From a broadband perspective, attractive regions will offer households and businesses a range of access options for mobile and stationary applications.

Table 1-9. Comparison of Broadband Technology Speeds

Technology	Low End Speed	High End Speed	10MB File Download Time		Notes on Speed
			Low End	High End	
DSL	1 Mbps	7.1 Mbps	1 min. 20 sec.	11 sec.	Based on Verizon's offerings in Delaware, April 2009
Cable	6 Mbps	16 Mbps	13 sec.	5 sec.	Based on Comcast's offerings in Delaware, April 2009
Fiber Optic	10 Mbps	50 Mbps	8 sec.	2 sec.	Based on Verizon's offerings in Delaware, April 2009
BPL	1 Mbps	3 Mbps	1 min. 20 sec.	27 sec.	Based on Current Communications' Cincinnati, Oh. offerings, April 2009
Wi-Fi	1 Mbps	6 Mbps	1 min. 20 sec.	13 sec.	Based on wireless offerings in Minneapolis, April 2009
WiMAX	2 Mbps	4 Mbps	40 sec.	20 sec.	Based on Sprint's offerings in Baltimore, Md., April 2009
Cellular	700 Kbps	1.2 Mbps	1 min. 57 sec.	1 min. 7 sec.	Based on various carriers' offerings in Delaware, April 2009
Satellite	1 Mbps	5 Mbps	1 min. 20 sec.	16 sec.	Based on various carriers' national offerings, April 2009
Dial-up	56 Kbps		24 min. 23 sec.		

Chapter 2. Broadband Benefits and Applications

This chapter reviews the general benefits that access to and use of broadband can help to bring about for communities and regions. Also included are descriptions of various household, business, and government applications of broadband. In general, the availability of broadband can yield positive economic impacts similar to those afforded by more traditional infrastructure forms, such as sewer service and quality public schools. Businesses may be more likely to locate in areas with quality infrastructure in place, since they are able to tap into the efficiency, effectiveness, and quality-of-life gains that infrastructure provides.

Broadband specifically offers households, businesses, and governments a degree of connectedness that previous telecommunications solutions could not. This connectedness allows for a variety of applications ranging from access to an increased array of higher-education and healthcare options to telecommuting and teleconferencing capabilities.

2-1. Economic Benefits

Infrastructure has long been recognized as an important determinant of regional economic competitiveness. The presence of infrastructure such as roads, telecommunications networks, and public drinking water and sewer systems makes it possible for companies to do business in certain locales. Access to parks, cultural amenities, and high-quality public schools and healthcare facilities can further set regions apart in the eyes of potential residents and entrepreneurs.

Economic research has consistently demonstrated that "public infrastructure investment is a powerful driver of business productivity, investment, and economic growth (Ford and Koutsky 2005)." Furthermore, there is a "widespread view that broadband is indeed essential infrastructure (Crandall, Lehr and Litan 2007)." This section reviews a sampling of research that speaks about the community impacts of broadband. Research is divided into two categories, those that address the generalized impacts of broadband and those that examine case studies of broadband's local and regional impacts.

General Impacts of Broadband

Measuring Broadband's Economic Impact

According to a 2006 study completed for the U.S. Economic Development Administration, "broadband access does enhance economic growth and performance, and…[the] economic impacts of broadband are real and measurable (Gillett, et al. 2006)." This study concluded that, between 1998 and 2002, municipalities with available mass-market broadband experienced significantly stronger economic growth than comparable communities lacking broadband. The impact of broadband availability on the number of jobs and business establishments was shown to be particularly high. Broadband added about 1-1.4 percent to the employment growth rate and 0.5-1.2 percent to the growth rate of business establishments. While the analysis did not find a statistically significant impact of broadband on the average level of wages, the effects of high-

speed Internet availability could be observed in 6 percent higher property values and a slightly higher share of establishments in IT-intensive sectors for zip code areas where broadband was available. (Gillett, et al. 2006)

Table 2-1. Estimated Magnitude of Broadband's Economic Impacts, 1998-2002

Economic Indicator	Results
Employment (# of jobs)	Broadband added about 1.0-1.4% to growth rate
Business Establishments (Proxy for Number of Firms)	Broadband added about 0.5-1.2% to growth rate
Housing Rents (Proxy for Property Values)	More than 6% higher in 2000 in zip codes where broadband available by 1999
Industry Mix	Broadband added about 0.3-0.6% to share of establishments in IT-intensive sectors

Source: Gillett, Lehr and Osorio

The Effects of Broadband Deployment on Output and Employment

A 2007 Brookings Institution study examined the effects of broadband penetration on state-level employment and output. Based on FCC data, broadband penetration was defined as the number of broadband lines per capita. Research proceeded by testing the significance of broadband penetration and other variables, such as union membership, education, tax climate, and average annual temperature, on private non-farm employment and gross domestic product at the state level. (Crandall, Lehr and Litan 2007)

The report concludes that "the effect of broadband [penetration] is most significant in explaining employment growth in education, health care, and financial services, but it is also significant in the…growth of manufacturing employment (Crandall, Lehr and Litan 2007)." Specifically, the research pointed to an annual 0.2 to 0.3 percent increase in non-farm, private employment for each one percentage point increase in state broadband penetration—a potential increase of about 300,000 jobs nationally. The study also found that "state output of goods and services is positively associated with broadband use (Crandall, Lehr and Litan 2007)."

Closing the Rural Broadband Gap

A 2007 article in the journal *Telecommunications Policy* addressed the potential benefits of increased broadband use for rural areas. These benefits spoke specifically to the chief economic disadvantages of rural areas: "distance and small market size." (LaRose, et al. 2007) Among the potential benefits cited were the following:

- Stimulated development of home businesses
- Improved access to health care and educational offerings
- Increased social interactions that can reduce out-migration and strengthen attachments to rural communities

(LaRose, et al. 2007)

Case Studies of Broadband's Impact

Florida

A case study from Florida explored the effects of broadband infrastructure investments on economic growth. Employing an econometric model, researchers compared numerous counties in Florida. The researchers focused on Lake County, Florida, which is located on the edge of the Orlando Metropolitan Statistical Area and contains rural and suburban areas, but no major urban center. The findings of the study were that:

- Since making its municipal fiber-optic network available, Lake County experienced significantly greater growth than comparable Florida counties.
- Lake County's rate of economic activity grew at nearly twice the rate of comparable Florida counties (0.52% compared to 0.28% per month).
  (Ford and Koutsky 2005)

Iowa

Another case study looked at the effects of telecommunications infrastructure on economic development by examining two Iowa municipalities—Cedar Falls and Waterloo. With the two communities similar in many ways, the effects of a municipally owned and operated telecommunications infrastructure were closely observed. In 1994 Cedar Falls decided to deploy a citywide fiber-optic network that would provide high-speed Internet connections, while Waterloo's communications services are made available through the private sector. The study found that:

- Cedar Falls experienced strong growth in its industrial and technology park, while other technology parks of the region, which lack fiber-optic network access, failed to attract new businesses.
- Cedar Falls experienced substantial increases in population and tax revenue due to its strong economic growth.
  (Kelley 2004)

2-2. Broadband Applications

Broadband applications have a high potential to enhance economic growth and provide significant quality-of-life benefits for residents in rural areas. These applications include practical and easy teleconferencing and telecommuting, remote diagnosis and medical services, interactive distance education, rich multimedia entertainment, and increased public safety via broadband. This section summarizes some of the useful applications of broadband for household and community, business, and government purposes.

Household and Community Applications

Broadband provides numerous productivity benefits to households and communities. Households can access websites that are increasingly used to plan and book trips and bank online. In addition, community members can access online multimedia encyclopedias and health references and make use of certain telephone applications that offer competitive rates and features. Two

specific broadband applications for household and community purposes—eHealth and Education & Distance Learning—are described in more detail below.

eHealth – Telemedicine

Technology has always played an integral role in medicine, and it is regarded as a key solution for providing healthcare in remote areas. E-health refers to health services and information that are delivered or enhanced through the Internet and related technologies. E-health applications, such as video-conferencing or interactive examination devices, require telecommunications technologies appropriate to the significant bandwidths these services require.

There are many potential benefits of eHealth and telemedicine—especially with regard to costs. eHealth can help to reduce the administrative and delivery costs of healthcare. It holds the potential to improve efficiency through better retention and retrieval of records, better management of chronic diseases, shared staffing of health professionals, reduced travel times, and fewer or shorter hospital stays. eHealth also helps to address one of the most critical complaints about U.S. health care, discrepancies in quality and availability of care based on location. The use of broadband-enabled eHealth services can alleviate the disadvantages of physical distance by supplanting physical visits to a facility with virtual visits and follow-up monitoring. Additionally, eHealth streamlines communication applications. Doctors and hospitals can share videos, X-rays, and digital images with doctors and hospitals located in other parts of the country, providing those in remote communities with more convenience and access to specialists outside the region.

The applications of telemedicine are diverse. The University of Kansas Telemedicine Program has been used to provide for health care in rural jails, hospice care, and, most recently, to augment school health services by allowing school nurses to consult with physicians (University of Kansas Medical Center 2009). The Kentucky Telecare Network, comprising healthcare providers across the state, is connected via high-speed Internet connections and allows providers to remotely access care and services for their patients (University of Kentucky College of Medicine 2008).

Education and Distance Learning

Traditionally, education has been limited to students and teachers in a classroom setting. The need for direct interaction has always demanded physical proximity. Communications technology has expanded the reach of education to homes, offices, and a variety of other non-school settings. Distance learning has become a new tool in education, bringing teachers and materials to students regardless of location and increasing opportunities for lifelong learning. Distance learning is one of the most heavily promoted applications of broadband—enabling students from any geographic location to take advantage of a wide array of educational opportunities.

The Delaware Center for Educational Technology (DCET) was established to create a modern educational technology infrastructure in Delaware's public schools. It provides information-

technology resources that enable Delaware students to acquire and develop computer skills (State of Delaware 2008).

Many of Delaware's higher-education facilities offer distance-learning options. The University of Delaware has a technology network that connects campus locations and enables distance learning (University of Delaware n.d.). At Delaware Technical and Community College (DTCC), online courses are provided for students who are unable to come to campus on a regular basis. Interactive video courses also allow students to attend their home campus and communicate with students on other DTCC campuses (Delaware Technical and Community College n.d.). Delaware State University offers online courses, and Wilmington University offers online degree programs that reduce on-location class meetings by as much as 50 percent compared to traditional courses (Delaware State University n.d.) (Wilmington University n.d.).

Business Applications

Broadband has many applications in the business world and is rapidly becoming a necessary component for business success. Broadband helps accomplish many business-oriented tasks. From an economic-development perspective, broadband can be used to attract and keep large enterprises that need to access and transfer large amounts of data in a fast and reliable fashion. Broadband helps mobile professionals keep in touch with the office through the use of laptops and smart phones. Finally, many retailers use broadband to stay in touch with customers who may not live close enough to physically visit the store. All of these applications can serve to make companies money by reducing costs and finding new sources of income.

Agricultural community use of the Internet has grown rapidly. Farmers use Internet applications for tracking commodity prices, accessing agricultural information services, and transmitting data to vendors and purchasers. General information, such as weather forecasts, market analysis, and interactive advice from experts, can especially benefit farmers if they make use of free or lower-priced information.

Business applications related to telecommuting and the tourism sector are detailed in the remainder of this section.

Telecommuting

The number of people who work at home and communicate with the office by phone, fax, and computer has been increasing over the past few decades. An estimated one-third of the 150 million working Americans are reported to telecommute at least several times a month (Koerner 2008). Telecommuting affords the opportunity to move the workplace to workers' residences, rather than requiring daily commutes. Full, remote access to the office is made possible by high-speed, large-bandwidth broadband connections.

There are many potential benefits of telecommuting. Telecommuting can generally increase employee productivity by reducing interruptions at work. It can save money by reducing the need for office space, thus cutting down on facility costs. Telecommuting provides more opportunities for rural business owners to increase their labor pools and improves job

opportunities for rural workers by providing access to distant, previously inaccessible labor markets. It can be seen as a means to mitigate "rural brain drain"—the outmigration of young, college-educated workers from rural areas—which poses a serious threat to the social and economic vitality of rural America. Recent studies suggest that some educated workers are attracted to, or stay in, more remote locations when they can access the urban labor market through the Internet. (Whitacre and Mills 2003)

The Virginia Economic Bridge, a nonprofit economic-development corporation, has partnered with several companies to develop a telecommuting model. Local workers are trained for jobs in Northern Virginia, which they then perform from remote locations in Southwest Virginia. This approach serves as an example of how broadband-enabled telecommuting can connect rural residents to job opportunities in urban and suburban areas (Virginia Economic Bridge, Inc. 2009).

Tourism

Broadband Internet access is of growing importance to the tourism industry. Forrester Research, Inc., found that, in 2006, 56 percent of leisure travelers and more than 76 percent of business travelers bring their laptops with them when they travel (Forrester Research, Inc. 2009). This proportion is likely to grow as travelers place increased value on their laptops and other mobile devices. With the growing demand for access to broadband Internet in hotels and tourist destinations, several hotel groups, such as Marriott International, Fairmont Hotels and Resorts, and the InterContinental Hotel Group, have rolled out high-speed wireless Internet in all of their locations.

U.S. destinations use video clips, live webcam feeds, and downloadable video tours for promotional purposes. Tourism marketers increasingly offer downloadable tools for planning and generating detailed travel itineraries.

Ocean City, Md., a popular tourist destination, installed a mixed Wi-Fi and pre-WiMAX network to integrate multiple telephone systems into a single network. The network currently offers free Internet access in selected locations via Wi-Fi hotspots, providing value to tourists, visitors, and business travelers who now have access to free Wi-Fi via their mobile devices (Town of Ocean City, Md. 2008).

Government Applications

Broadband affords many opportunities for governments to save time, money, and energy while carrying out daily operations. Many departments, including public safety and public works, can make use of broadband. Potential government applications of broadband are examined in this section.

Public Safety

High-speed Internet can serve several public safety roles. With a broadband connection, large data files can be transferred, allowing for rapid distribution of safety-relevant information, such as photographs, building plans, and fingerprints. Video information and reports can make mobile

units and first responders more effective. Wireless surveillance technology extends the visual reach of police, firefighters, lifeguards, and park rangers. Mobile access to mapping can improve response times for public safety personnel.

Recognizing these potential applications, the FCC decided to authorize a nationwide wireless broadband network for first responders. The FCC auctioned spectrum in the 700 MHz band in January 2008 that was formerly used by television broadcast stations. A portion of this spectrum will be reserved for first responders.

The city of McAllen, Tex., has cameras connected to a wireless network (Vos, McAllen, Texas installs wireless video surveillance network 2008). Ubiquitous video surveillance is installed in parking lots, supermarkets and banks. Ponca City, Okla., has a broadband network that connects police units to an online database and allows them to file reports from the field (Vos, Ponca City, Oklahoma blends municipal wireless with energy management 2008). The city also plans to install wireless video cameras in police vehicles, enabling real-time monitoring of traffic stops.

Wireless Communication

Broadband technology can be very useful to municipal employees of all types. It benefits public-works employees by providing access to meters without needing to leave the office. Various aspects of public works, including sewer, electricity, and water, can use broadband to transmit detailed amounts of information on town assets, such as blueprints and schematics and maintenance records. Another benefit of utilizing broadband for public works is the ability of customers to monitor their utility usage at any time.

Rock Hill, S.C., recently installed 60,000 wireless meters for sewer, electricity, and water that report readings every 15 minutes (Vos, South Carolina city uses muni wireless for energy management, public safety, free WiFi 2008). The utility trucks have small antennas on the roofs that allow them to connect with the network while being mobile. Rock Hill is able to utilize high-speed wireless Internet to save on costs and encourage conservation. Many other cities are following suit, including Corpus Christi, Tex., and Ponca City, Okla. (MuniWireless, LLC 2009).

Chapter 3. The State of Broadband

This chapter reviews the status of broadband infrastructure deployment and use in rural areas of the United States, in general, and Sussex County, in particular. The first section broadly examines the status of rural broadband while considering historical obstacles to the provision of infrastructure in rural areas. Several national sources are relied upon to paint a picture of broadband infrastructure deployment and use in rural America. This chapter's second section focuses on the state of broadband in Sussex County. Existing providers of broadband service in Sussex County are profiled in terms of the geographic and performance characteristics of their offerings. With no comprehensive map of Sussex County broadband infrastructure available, characteristics including population demographics, housing density, and Sussex-specific knowledge of broadband infrastructure and applications are used to better understand the state of broadband infrastructure and use in the county.

Detailed assessments of broadband coverage are a key component of the rural broadband picture that is missing in the majority of rural America. Broadband-provider unwillingness to release information about their network coverage areas and subscriber locations, coupled with inadequate survey information on the use of broadband at small geographic scales, makes it difficult to definitively identify those areas that are unserved and underserved by broadband. Recognizing the lack of data on broadband infrastructure and service, the American Recovery and Reinvestment Act of 2009 devotes significant funding to the task of mapping out the location and characteristics of broadband networks across the United States. This chapter attempts to depict the status of broadband in rural areas and in Sussex County, without the benefit of detailed mapping that will likely be completed in the coming years.

3-1. Broadband Deployment and Use in Rural Areas

For the purposes of most of the data in this report, rural areas are defined as those regions located outside of metropolitan statistical areas (MSAs), such as Sussex County. For discussion purposes as it relates to broadband, rural areas might be more generally understood as geographical settings comprising small towns and agricultural landscapes—a definition that would encompass all of Delaware's land area outside the urban influence of Wilmington and Philadelphia. This section reviews the general obstacles to rural broadband provision, and presents evidence on the extent of broadband deployment and use in rural settings.

Obstacles to Broadband Deployment in Rural Areas

Infrastructure--rail, roads, and telephone lines--was first provided in urban areas and later expanded to rural areas. The provision of broadband has followed a similar pattern. The primary obstacles to rural broadband deployment are the remoteness of these areas and the lower population densities that typically characterize rural regions. The remoteness of rural areas can make it relatively expensive for providers to install broadband networks, compared to the installation expense in more centrally located urban areas. The relatively low population densities in rural areas can make it difficult for providers to recoup the expenses for installing what are often, at least initially, more expensive rural networks. These factors make it difficult

for private providers to develop the business case for rolling out broadband infrastructure to rural areas and can lead to selective market entry into these regions.

The typical demographic and economic characteristics of rural residents also contribute to slower deployment and use of broadband infrastructure in rural settings. The Pew Internet & American Life Project consistently finds that broadband adoption rates are especially high among the following groups of Americans: those between the ages of 18 and 49, those with annual household incomes exceeding $75,000, and college graduates (Horrigan 2009). On average, rural Americans are older, less wealthy, and have lower levels of education attainment than Americans living in urban and suburban areas. These factors might contribute to decreased demand for broadband in rural areas and subsequently translate to less willingness on the part of providers to make service available in these areas.

Evidence of Rural Broadband Deployment and Use

No comprehensive, nationwide map of broadband availability exists. This makes it necessary to use a variety of data sources to depict the status of broadband deployment and use in rural areas. Data from the Federal Communications Commission (FCC), Pew Internet & American Life Project, and the 2007 Census of Agriculture are presented in this regard.

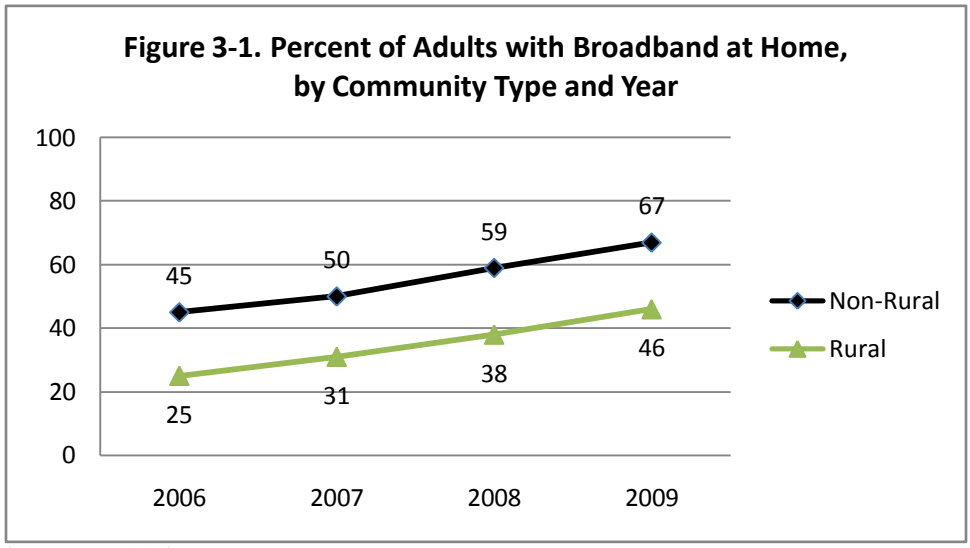
FCC Data

For several years, the FCC has collected data on the provision of high-speed Internet infrastructure and service in the United States. Numerous issues with the FCC's data-collection methods have made these data less than ideal for accurately assessing the status of broadband deployment. One issue is that data are often withheld to maintain firm confidentiality. This practice is particularly troublesome for small states like Delaware, since the withholding of one provider's data might represent the entirety of a particular broadband technology in a state. Another issue with FCC data is the practice of reporting a zip code as served by a broadband provider if at least one household subscribes to service. This method of tracking service does not count the actual number of subscribers in a geographic area and can gloss over locales smaller than zip codes that lack broadband infrastructure.

Beginning in 2009, the FCC will collect data in a manner that tracks the number of broadband subscribers by technology and Census Tract geography (Federal Communications Commission 2008). This report relies upon data collected using the old procedures. The FCC reported that, as of December 2007, zip codes with more persons-per-square-mile were slightly more likely than less densely populated areas to have residential broadband subscribers. While the difference is not large, this finding does support the general assumption that broadband service is more prevalent in areas of higher population density. Delaware ranked fifth out of 50 states in terms of the percentage of its zip codes that had more than five providers of high-speed service as of December 31, 2007 (93.1%)—a rough proxy for the extent of broadband coverage in a region (Federal Communications Commission, January 2009). However, Delaware ranked only 26th in terms of the percent of households using broadband in 2007 (50.4%) (National Telecommunications and Information Administration 2008).

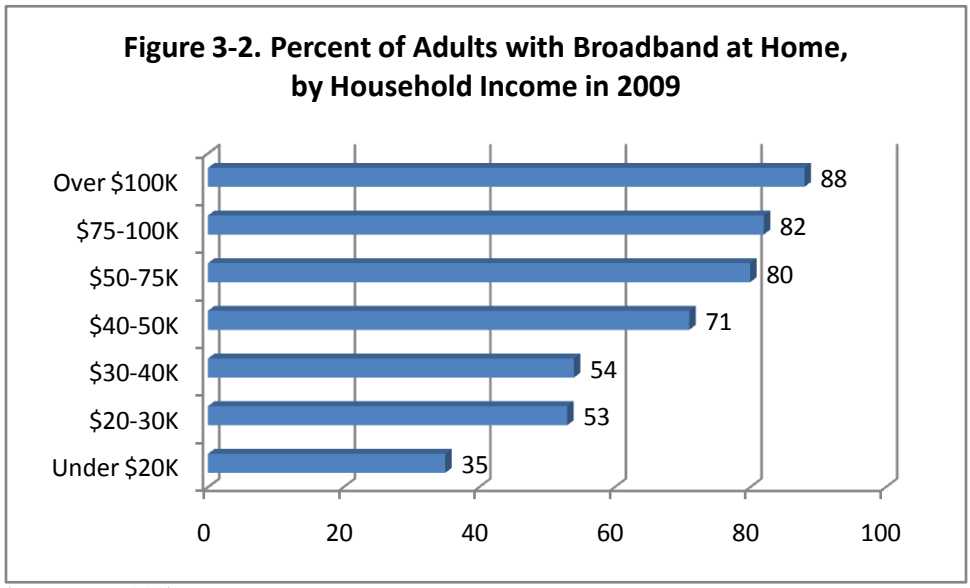
Pew Internet & American Life Project Data

The Pew Internet & American Life Project annually sponsors and conducts a survey that measures various aspects of home broadband adoption in the United States. This survey reported that in 2009 the proportion of adults with broadband in the home was 46 percent in rural areas and 67 percent in non-rural areas—one of the most convincing pieces of evidence speaking to the lag in deploying broadband in rural areas. Figure 3-1 tracks the growth in home broadband adoption from 2006 through 2009. DSL and cable technologies account for the majority (77%) of broadband connections in rural areas, although fixed wireless or satellite options comprise a significant portion of connections (19%) (Horrigan 2009).

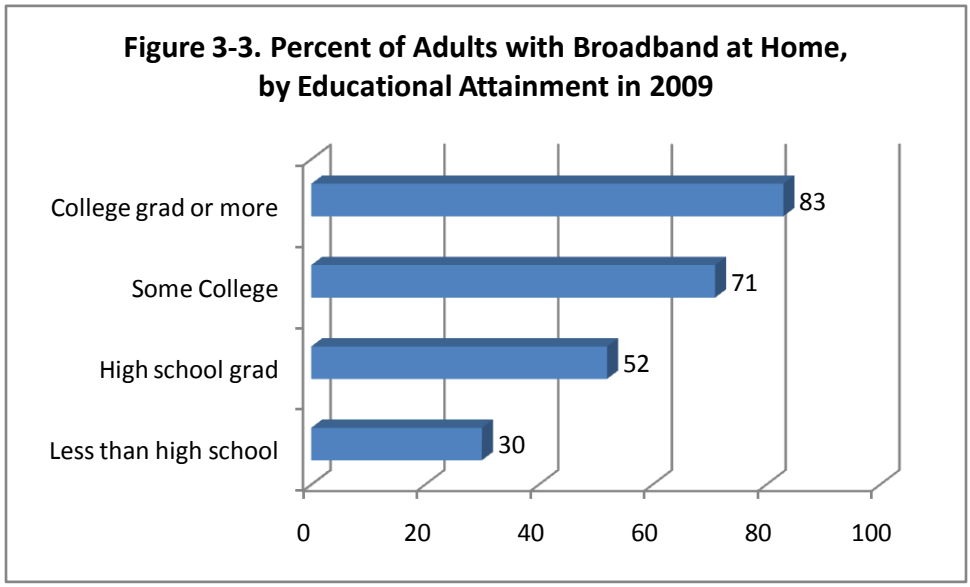


(Horrigan 2009)

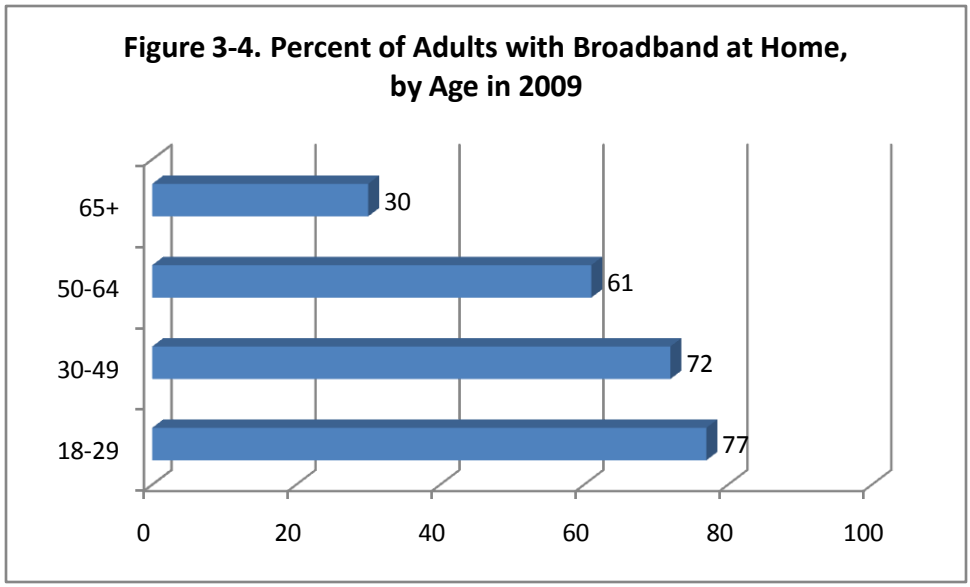
Figures 3-2, 3-3, and 3-4 depict the relationships between broadband adoption rates and household incomes, educational attainment, and age, respectively. Population characteristics typical to rural areas tend to reinforce the lower rates of broadband adoption in these regions.



(Horrigan 2009)



(Horrigan 2009)



(Horrigan 2009)

2007 Census of Agriculture Data

Every five years, the U.S. Department of Agriculture's National Agricultural Statistics Service takes a "complete count of U.S. farms and ranches and the people who operate them," and examines characteristics such as "land use and ownership, operator characteristics, production practices, [and] income and expenditures" (U.S. Department of Agriculture 2008). One area the census covers is the use of high-speed Internet at farms. Table 3-1 ranks the 50 states based on the percent of their farms reporting high-speed Internet access in 2007. Delaware ranked 42nd with 28 percent of farms reporting high-speed Internet access, compared to a median value of 36.2 percent for all states and a high value of 52.5 percent for the state of Connecticut.

Table 3-1. Percent of Farms with High-Speed Internet Access in 2007

Rank	State	Percent of Farms with High-Speed Internet Access
1	Connecticut	52.5
2	Massachusetts	49.9
3	Rhode Island	49.7
4	New Jersey	48.7
5	Colorado	47.9
6	Alaska	47.4
7	New Hampshire	46.6
8	California	43.5
9	Nevada	43.2
10	Oregon	43.1
11	Washington	42.7
12	Wyoming	42.6
13	North Dakota	42.1
14	Hawaii	42.0
15	Nebraska	41.9
16	South Dakota	41.2
17	Utah	41.0
18	Idaho	39.9
19	Iowa	39.0
20	Maine	38.0
21	Montana	37.5
22	Kansas	37.3
23	Minnesota	37.1
24	Florida	36.7
25	New York	36.2
26	Vermont	36.1
27	Georgia	36.0
28	Illinois	35.1
29	North Carolina	34.5
30	Maryland	33.8
31	Ohio	31.4
32	Texas	29.7
33	Arkansas	29.6
34	New Mexico	29.5
35	Wisconsin	29.2
36	Louisiana	29.2
37	Kentucky	29.1
38	Oklahoma	29.1
39	Pennsylvania	28.9
40	South Carolina	28.3
41	Indiana	28.1
42	**Delaware**	**28.0**
43	Alabama	27.7
44	Tennessee	27.1
45	Arizona	26.9
46	Michigan	26.6
47	Virginia	25.5
48	Missouri	23.8
49	West Virginia	21.3
50	Mississippi	20.5
Median Value = 36.2		

(United States Department of Agriculture, National Agricultural Statistics Service 2009)

3-2. Broadband in Sussex County

The problems of mapping broadband availability and characteristics can be even more pronounced as geographies at the sub-state levels are examined. As is the case nationally, no comprehensive map of broadband coverage exists for Sussex County. This section describes the state of broadband in Sussex County by profiling the providers of broadband services and reviewing several data sources indicative of the presence of broadband demand, use, and infrastructure.

Broadband Providers in Sussex County

Comcast

Comcast is franchised to provide cable services in a land area comprising a majority of the county. The franchise area generally encompasses Fenwick Island, the area from Dewey Beach west to the Maryland-Delaware line, and from Greenwood south to Delmar (Data Mapping, Inc. 2008). It is not clear if Comcast provides cable and associated broadband services in this entire area, so it is likely that there are gaps in service in the more rural areas of the county, requiring households to rely on other means for television and Internet service. Comcast provides service packages offering Internet speeds similar to those described in the "Cable" section of Chapter 2.

Mediacom

Mediacom's cable franchise area in Sussex County general encompasses the regions surrounding Angola by the Bay, Long Neck, Oak Orchard, Millsboro, Dagsboro, Selbyville, Bethany Beach, and South Bethany. Again, it is not clear if cable and broadband services are available without exception throughout Mediacom's franchise area, so gaps in service are likely to exist. Mediacom provides service packages offering Internet speeds similar to those described in the "Cable" section of Chapter 2.

Verizon

Verizon provides both DSL and fiber-optic (FiOS™) broadband services in areas of Sussex County. Verizon's DSL network is centered on Sussex County's municipalities. It is likely that, given the distance limitations of DSL technologies, this broadband option becomes less available as the distance from incorporated and densely populated areas increases. As of October 2008, Verizon offered its FiOS™ package of Internet and video services in the Angola area and to the Heritage Shores development in Bridgeville. Delaware's public schools, including those in Sussex County, are provided with high-speed Internet service by Verizon's switched ethernet network. (Allan, William R., President, Verizon Delaware LLC 2008) Verizon's household offerings are similar to those described in the "DSL" and "Fiber Optic" sections of Chapter 2.

Cellular Service Providers

Verizon Wireless, AT&T, T-Mobile, and Sprint/Nextel provide cellular broadband options in Sussex County. Services provided are similar to those listed in the "Cellular" section of Chapter 2. In general, mobile broadband services tend to more available in those areas of the county with

relatively high population densities, such as near the beach towns. However, there are a variety of mobile broadband options that blanket most of the county's area.

Supplementary Evidence of Broadband Deployment and Use in Sussex

Population Data

Table 3-2 lists income, educational attainment, and age data from the 2007 American Community Survey for Sussex County and the United States. While the county's median household income is on par with the national figure, educational attainment is significantly lower than the national average and the median age exceeds the national figure by nearly five years. These demographic factors might serve to dampen the demand for broadband services and, thus, slow the provision of broadband infrastructure across Sussex County.

Table 3-2. Population Characteristics for Sussex County and the United States in 2007

Geography	Median Household Income	% of Population Age 25-64 with Bachelor's Degree or Higher	Median Age
United States	$50,740	29	36.7
Sussex County, Delaware	$50,976	19	41.8

(U.S. Census Bureau 2009)

2007 Census of Agriculture Data

The 2007 Census of Agriculture provides information on the number of farms in each U.S. county that access high-speed Internet. Of the 3,077 counties with farms counted by this survey, Sussex County ranks #2,099 with 27.5 percent of farms accessing high-speed Internet. This percentage is lower than the median figure for all counties, 33 percent, significantly lower than the 38.6 percent of farms in New Castle County with high-speed access, and slightly higher than the 24.4 percent of farms in Kent County with access. (United States Department of Agriculture, National Agricultural Statistics Service 2009)

Mapping of Wi-Fi Hot Spots

A 2008 inventory of public-access Wi-Fi sites in Sussex was completed in connection with this report. It revealed at least 60 Wi-Fi hotspots throughout the county. The majority of sites seem to be clustered around the beach towns and in towns along U.S. Routes 13 and 113. The presence of these sites demonstrates that these areas have access to wired broadband sources and is evidence of commercial interest in providing wireless Internet access as a business, educational, and recreational amenity.

Summary of Broadband in Sussex County

Broadband coverage in Sussex County is relatively complete. However, there seem to be unserved and underserved areas throughout the county. One unserved area is likely to be located in a region of the county with no existing cable franchise. It is located approximately eight miles due south of Georgetown and runs south to the Maryland border in a band ranging from approximately one to eight miles wide. Unserved areas also likely exist in low-density areas relatively distant from incorporated places, where cable and DSL services may not be available. Much of Sussex County could be considered underserved due to the relative lack of emerging

broadband services, such as fiber optic. Areas outside of the beach towns also tend to be underexposed to wireless sources of high-speed Internet. Existing age and educational attainment characteristics of Sussex County's population would tend to suggest that many residents will not be predisposed to become early adopters of broadband services. These characteristics speak to the need to actively demonstrate the applicability of broadband technologies to household, business, and government purposes relevant to Sussex County.

Chapter 4. Broadband Policy Options for Sussex County

Sussex County's businesses, communities, and governments should enter into a dialogue aimed at crafting a regional broadband policy. Like nearly all public policy topics, a variety of public- and private-sector approaches has been used to address broadband. These range from market-based approaches that rely entirely upon the private sector for broadband provision to initiatives that actively enlist the public sector to install and operate broadband infrastructure and services. Some approaches focus exclusively on installing and upgrading broadband infrastructure, while others address a broader range of issues, such as the need to increase community use of the Internet.

This concluding chapter describes four general approaches that communities and regions have used to address broadband policy. These alternatives are not mutually exclusive and are presented to stimulate discussion about what steps might make sense for Sussex County. The ideal choice for Sussex may be one that exactly copies an ongoing initiative, or it may be a hybrid approach that blends elements of multiple approaches. For each of the four approaches—Status Quo, Aggregate Demand, Form Broadband Cooperatives, and Create Local Networks—a description is provided along with case-study examples and a discussion of the potential form of a given approach for Sussex. Finally, this chapter offers guidance regarding recommended first steps to enhance the state of broadband in Sussex County.

4-1. Status Quo

Doing nothing has been the hallmark of broadband policy across the United States. Most communities have not developed a strategy for the provision of regional broadband. Instead, localities have largely relied on private telecommunication companies to build, supply, and upgrade broadband infrastructure and services. While public service commissions often exert some influence over the provision of broadband, companies have tended to provide services on their own timetable—based largely on the presence of perceived local market demand.

Case Study Example

Delaware's public policy experience with broadband serves as an illustrative example of this approach. Some strategic plans, such as the Comprehensive Economic Development Strategy for the State of Delaware (CEDS), have recognized the growing importance of broadband technology to the state. However, there has been little active and sustained involvement in broadband policy on the part of Delaware's state and local governments beyond their traditional involvement in franchising decisions.

The most common result of this policy, in Delaware and in many other regions, has been disparate access to broadband infrastructure and service. For example, access to broadband services is not as widespread in Kent and Sussex counties as it is across New Castle County. While most households in Kent and Sussex are able to access a broadband connection, there are larger swaths of rural areas in the two southern counties without access to such connections. FCC data also points to less choice among residential and commercial broadband providers in Kent

and Sussex counties. According to June 2007 FCC data, the average number of companies with high-speed (i.e., broadband) subscribers by zip code was 8.6 in New Castle County, 6.6 in Kent County, and 6.1 in Sussex County (Federal Communications Commission 2008). While these data do not report the total number of subscribers by county, it definitively states that there are fewer broadband providers to choose from in Kent and Sussex counties. Emerging broadband technologies, such as fiber optic, have also been provided at a slower rate in Kent and Sussex counties, when compared to New Castle County.

The "Status Quo" Approach in Sussex County

As its name suggests, this approach only requires that the current state of broadband policy be maintained in Sussex. The pillar of this policy approach is to rely entirely upon private-sector companies to provide broadband infrastructure and service. The principle advantage of this approach is that it requires no direct expenditures on the part of state and local governments and business groups. There is also no time spent in engaging the public or government decision-makers in a discussion of the county's broadband policy. The prime disadvantage of this approach is that residents and businesses have no direct say in how and when broadband is provided in their communities. While there is no guarantee of this result, it is likely that locations with low population densities will be the last to enjoy the installation of upgraded broadband infrastructure and service.

4-2. Demand Aggregation

Like the status quo approach, the demand aggregation alternative relies primarily upon private-market provision of broadband. However, this approach effectively gives the market a nudge by working to actively demonstrate and pool regional demand for broadband offerings. While each approach tends to be unique, demand-aggregation initiatives usually involve four distinct steps.

First, the state of regional broadband infrastructure, services, and usage is assessed. The location and technical capabilities of infrastructure and service is inventoried and mapped to provide a baseline measurement of broadband availability. Through surveys or similar means, usage of broadband services by residents, businesses, and governments is assessed.

Second, the regional community is educated about potential applications of broadband technology. Education focuses on applications that make broadband useful to the general population, in addition to specific applications that might be applicable to particular private- or public-sector interests. The goal of this initiative is to foster demand for new infrastructure in addition to encouraging the community to increase their use of existing broadband resources.

Third, regional broadband "killer apps" are identified. Just as word-processing and spreadsheet software help make the personal computer a "must own" for the masses, certain applications make broadband service either particularly attractive or a downright necessity for certain users. The purpose of this step is to develop a regional constituency for broadband that is built around specific needs.

This approach's final step is to demonstrate demand for enhanced broadband services to private providers. The demand should be specific, with clear focus placed on who demands the service, what capabilities are needed to provide the service, and for what purposes enhanced broadband will be used.

Case Study Examples

Demand-aggregation approaches aim to increase the demand for regional broadband offerings by focusing attention on existing service deficiencies, educating businesses and residents about broadband's usefulness, and encouraging increased community usage of broadband. Two demand-aggregation case studies are briefly reviewed in this section. ConnectKentucky serves as an example of specific demand-aggregation strategies focused on a statewide basis. A general discussion of community technology centers is also included as a case study in this section.

Formed through a partnership among governments, universities, and technology businesses, ConnectKentucky focuses on "[accelerating] the growth of technology in support of community and economic development, improved healthcare, and more effective government" (ConnectKentucky 2008). The initiative's activities address: "(1) raising public awareness of broadband services, (2) creating market-driven strategies to increase demand—particularly in rural areas, and (3) initiating policy to reduce regulatory barriers to broadband deployment." (U.S. Government Accountability Office 2006) Efforts to raise awareness have focused on mapping broadband-availability and -adoption rates across Kentucky. This mapping has allowed for broadband-deployment efforts to be prioritized. Specific target groups in Kentucky have also been educated about how broadband can be applied to meet their needs.

ConnectKentucky's market-driven strategies follow the demand-aggregation approach—working with groups such as healthcare providers, schools, and the agricultural community, to build demand for specific broadband services and eventually deploy infrastructure catered to these needs. An ancillary advantage of these sector-specific approaches is that once the infrastructure is installed, it can generally be used by other groups of consumers who may not have had broadband available to them before.

One of ConnectKentucky's long-term, market-driven strategies, "No Child Left Offline," puts "Internet-ready computers [in the hands of] disadvantaged individuals and populations across the state." Partners including Microsoft, Lexmark, Kentucky's Office of Technology, the Appalachian Regional Commission, and American Electric Power have delivered approximately 2,000 computers through this initiative. The desire is to help disadvantaged populations acquire the skills necessary to compete in the digital age and generally increase the region's conversance with broadband technologies (ConnectKentucky 2008).

ConnectKentucky has also worked to reduce institutional and technical barriers to wider broadband deployment. The organization has performed assessments of wireless Internet capabilities, helped providers decide among broadband-deployment options, and assisted local governments in preparing requests for proposals (RFPs) to build broadband networks (ConnectKentucky 2008). Established in 2002, ConnectKentucky touts impressive statewide

results, including a doubling of broadband subscriptions, increased broadband coverage from 60 percent to 95 percent, and a 24 percent growth rate in home-computer ownership (ConnectKentucky 2008).

Community Technology Centers (CTCs) comprise a "wide range of public and private organizations and institutions, such as libraries, youth organizations, multi-service agencies, [and] stand-alone computing centers…that offer an array of technology-based services and programs to [disadvantaged] populations," and the public in general (Wendt 2008). For many, these centers serve as their first encounter with broadband technologies, and they are often the only access option for those who live in areas without widespread broadband infrastructure or lack the means to afford broadband service. Access can expand the availability of tools such as job-search databases and applications, online banking and bill payment, and access to online government services.

CTCs are a demand-aggregation approach that works to establish a regional culture of use. This culture is built by providing Internet access to a previously underserved population and offering training programs to enhance the digital literacy of the community. Essentially, the use of broadband Internet, and computers in general, becomes the norm as more and more residents are exposed to useful applications through CTCs and other means. It is hoped that use of broadband applications will translate to an increased recognition of community demand for such services and, ultimately, more widespread provision of broadband infrastructure and services. CTCs have developed through grassroots initiatives and, in some cases, with federal support.

The Demand-Aggregation Approach in Sussex County

A demand-aggregation approach for promoting enhanced broadband in Sussex County would likely have positives and negatives associated with it. On the positive side of the equation, broadband services created or enhanced through this approach could be highly usable by Sussex constituencies, since they would be vetted by a process aimed at identifying specific market demands. Also, the demand-aggregation approach requires very little public outlay of resources if the private sector makes the ultimate capital investments in broadband services and infrastructure. Finally, short of the installation of new infrastructure, this process could increase use of broadband services by making residents aware of currently available infrastructure and applications.

On a less positive note, time can be an issue with demand-aggregation approaches. Since this approach relies on a process, there may be some delay in the provision of new broadband service. However, nothing prevents a locality from adopting the general demand-aggregation approach by simply pushing the process, and particularly needed infrastructure investments, forward in an expedited fashion. Finally, more a requirement than a negative aspect of the approach is the need for a broad-base of high-level support in order to push demand aggregation toward implementation.

A possible demand aggregation approach in Sussex County could proceed according to the following four steps:

1. **Generate Initial High-Level Support**—Initiatives aimed at enticing private-sector investment benefit from the evident support of influential officials and significant community institutions, such as elected officials, business groups, governments, large employers, and community foundations. In Sussex County, a demand-aggregation approach will likely have the most chance for success if it has the backing of individuals and groups including town, county, and statewide elected officials, chambers of commerce, municipal and county governments, large employers, and local foundations. Assistance might include financial backing for needed studies and investments, participation on working groups aimed at expanding broadband coverage, or speaking in support of the initiative at public events.

2. **Seek Technical Assistance**—Baseline information about the availability and characteristics of broadband infrastructure and service is necessary so that initial investments can be prioritized and progress can be measured. County and local officials are not likely to have the time and resources needed to carry out an assessment of regional broadband coverage on their own. Whatever entity assists with this endeavor will need several capabilities, including 1) the ability to effectively coordinate with state agencies and private service providers, 2) familiarity with data analysis and survey techniques, and 3) the ability to display the results of any assessment in an easy-to-understand and geographically referenced format. Any assessment would likely proceed through a combination of information from state and private provider sources and survey results used to assess the current characteristics of broadband availability and use in Sussex.

3. **Engage a Community of Stakeholders**—A demand-aggregation approach requires the identification of specific community needs so that, ideally, providers can respond with particular broadband solutions. Identifying these needs will likely require a facilitated process. This process would be aimed at uncovering Sussex County's "killer apps" for broadband—those applications that would make the most impact in terms of volume of users, economic development or educational potential, quality-of-life benefits, gains in the efficiency and effectiveness of public-service provision, or a combination of these and other factors. A facilitated process could involve a two-tiered approach to engage stakeholders for this purpose. The first tier of engagement might be short and intensive with a focus on identifying initial broadband applications that would make the most immediate and significant impacts on the community. The second tier of engagement could be a more prolonged process that reaches out to specific sets of potential users and works to identify and publicize a variety of potentially beneficial broadband applications.

4. **Develop a Business Plan for Broadband in Sussex County**—A business plan for enhanced broadband in Sussex County would address four key items. First, it would detail Sussex County's specific broadband needs in terms of geographic focus areas and initially desirable applications. Next, the business plan would specify the governance of an enhanced broadband network, addressing items including initial startup and ongoing funding needs and the process for making network management decisions. Third, the

education and training components necessary to increase community adoption of broadband would be detailed. Finally, the plan would address, in a format similar to an RFP, the infrastructure and service enhancements and education and training components desired to implement a broadband plan for Sussex.

4-3. Form Broadband Cooperatives

Just as cooperatives were used to provide many rural areas with electric and telephone service, a growing number of regions are forming cooperatives to provide broadband infrastructure. These cooperatives are, at their core, partnerships among a variety of public and/or private entities for the purpose of constructing and maintaining high-capacity broadband infrastructure. Members of the cooperative pool their resources to install broadband infrastructure that typically allows for high-speed connections to fiber-optic networks.

Cooperatives do not typically provide retail services to residents and businesses. Instead, agreements are reached with existing and new providers to offer broadband service to homes and businesses using the cooperative's infrastructure. The cooperative's membership manages the ongoing installation, maintenance, and upgrading of broadband infrastructure.

Case Studies

Cooperatives have typically been employed by rural regions in an effort to install high-capacity broadband infrastructure prior to the willingness or ability of private providers to do so. Two illustrative examples of broadband cooperatives are the Maryland Broadband Cooperative (MDBC) and the Utah Telecommunications Open Infrastructure Agency (UTOPIA).

MDBC is a "member-owned and operated…fiber-optic network designed to deliver an advanced, world-class broadband network across the rural communities [of] Eastern, Southern, and Western Maryland." (Maryland Broadband Cooperative 2008) Public- and private-sector cooperative members participate in governing the construction, maintenance, and operation of the network. The cooperative, as a whole, is focused on the installation and maintenance of the backbone broadband network. Individual members provide "last mile" broadband services directly to businesses and households.

Founded in 2006, MDBC's major accomplishments include work to install a northbound fiber-optic route from NASA's Wallops Island Flight Facility in Virginia, installing fiber to cross the Chesapeake Bay and Harry Nice bridges in Southern Maryland, and generally expanding fiber coverage in the group's target areas. In addition to financing from the cooperative's membership, considerable funds from state and federal sources have supported MDBC activities. Funding and policy support has come from sources including Maryland's congressional delegation, the U.S. Department of Commerce's Economic Development Administration (EDA), and the Maryland Department of Business and Economic Development (Maryland Broadband Cooperative 2008). A similar initiative, the Mid-Atlantic Broadband Cooperative (MBC), was formed in southern Virginia to provide high-speed broadband infrastructure to rural communities in that region (Mid-Atlantic Broadband Cooperative 2009). Like the Maryland Broadband Cooperative, it has

benefited from widespread government support—in this case the Virginia Tobacco Commission, EDA, and the Governor of Virginia.

UTOPIA is an open-access fiber-optic network located in the region surrounding Salt Lake City, Utah. Sixteen regional towns partnered to issue $85 million in revenue bonds to finance the planning and construction of the network (Tri-County Council for Western Maryland 2004). Infrastructure is currently available along a stretch running approximately 50 miles south of Salt Lake City. UTOPIA's intended service region stretches for roughly 300 miles along Interstate 15 from Tremonton south to Cedar City—an area comprising over 250,000 households and approximately 35,000 businesses (Utah Telecommunications Open Infrastructure Agency 2009). Prohibited by Utah law from retailing broadband services, the municipal partners in UTOPIA "rent bandwidth to service providers that deal directly with the end users" (Kingsley 2008). Perhaps due at least in part to the large footprint of UTOPIA's existing and planned service region and the inability to retail its own services, the partnership has experienced financial difficulties and has been unable to build out as quickly as hoped. Despite these setbacks, providers in six Utah towns currently offer residents and businesses access to UTOPIA's high-capacity broadband infrastructure (ibid).

The "Form Broadband Cooperatives" Approach in Sussex County

A cooperative approach for promoting broadband in Sussex County could have several potential advantages and disadvantages. The cooperative model has a long track record as an option for providing utilities in rural areas, making this approach potentially attractive for broadband provision. This approach often results in regions "overbuilding" broadband capacity, essentially allowing rural areas to benefit from faster and higher-capacity broadband infrastructure before the private market would otherwise respond with service and infrastructure. The cooperative model could require a significant outlay of funds in order to build a broadband network and would certainly have to win out over competing priorities in order for public and private funding to be devoted to broadband. Beyond funding, the ongoing management of a broadband network could be of some concern to potential cooperative members.

A possible cooperative approach in Sussex County could proceed according to the following four steps:

1. **Generate Initial High-Level Support**—As is the case with the demand-aggregation approach, a cooperative model in Sussex would benefit from the support of influential officials and significant community institutions, such as elected officials, business groups, governments, large employers, and community foundations. Again, support might include financial backing for needed studies and investments, participation on working groups aimed at expanding broadband coverage, or promoting the initiative at public events.

2. **Convene Stakeholders**—Key stakeholders, such as governments, hospitals, business groups, and the higher-education community, would need to be engaged in the process of developing a Sussex broadband cooperative. Stakeholders should be involved based on

the potential for their organizations to benefit from enhanced broadband in Sussex and their ability to contribute time and resources to the effort. Initial stakeholder activities should focus on identifying a mission and goals for the cooperative effort that specify how the larger community, and specific subsets of Sussex County, will benefit from enhanced broadband. This effort will lay the groundwork for future cooperative activities.

3. **Identify Technical Needs and Target Areas**—After the cooperative's goals have been established, work should focus on identifying the specific areas to target for cooperative activity and the technical specifications necessary for any infrastructure enhancements. Areas should be identified based on the adequacy of existing broadband services and the relative potential for users in particular regions to benefit from broadband access. Technical needs should be identified based on the applications targeted for users in particular areas, with preference given to those technologies that have the most significant upside in terms of speed and data capacity.

4. **Develop Management and Investment Plans for a Broadband Cooperative**—The final step in establishing a broadband cooperative would be to detail management and investment plans for the organization. The management plan would address how the cooperative would be governed, how decisions about broadband infrastructure and service provision would be made, and appropriate dues structures for various classes of membership in the cooperative. An investment plan would prioritize initial and long-term investments for improved broadband infrastructure in Sussex County. These two plans are the keys to the initial formation and continued existence of any potential broadband cooperative.

4-4. Create Local Networks

The creation of local networks represents another broadband provision option. These networks have been created using a variety of public and private funding arrangements. While installed networks vary widely in terms of scale and scope, they generally share a few common characteristics. First, these networks generally offer Internet connections via some form of wireless broadband. Next, the tendency is for these networks to provide free service in selected, high-traffic areas, with service to the home and other locations often available on a subscription basis. Finally, local networks are often created with specific applications in mind. For example, a local government may use a wireless network to enable enhanced communications for its mobile employees.

Local networks have been associated with some of the splashier stories in the arena of broadband provision. For example, the Wireless Philadelphia initiative promised to provide wireless service to the entire city of Philadelphia through a partnership with EarthLink, Inc. The departure of EarthLink from this arrangement was widely publicized and apparently spelled the doom of Wireless Philadelphia. However, ownership has been transferred to Network Acquisition Co. LLC, and, thanks in part to numerous grants, a renewed focus has been brought to providing "digital-inclusion" packages. These packages provide laptops, wireless Internet access, training,

and technical support to disadvantaged populations across Philadelphia (Key, Wireless Philadelphia reboots to bring Wi-Fi to the masses 2009),

In an international example, Tallinn, Estonia's capital, has been at the epicenter of that country's impressive deployment of broadband technology over the past 15 years. Significant state support spurred the installation of a backbone broadband network connecting Tallinn with other Estonian municipalities. This backbone now supports a WiMAX network that covers 90 percent of the country (Intelligent Community Forum 2009).

Case Studies

In September 2007, the *Christian Science Monitor* reported on the status of municipal Wi-Fi projects. The article suggested that, despite notable big-city Wi-Fi projects being labeled as failures, many small communities have rolled out and maintained successful wireless networks. Five principles for successful initiatives were identified:

1. Provide residents with another option for broadband Internet service.
2. Enable public-safety applications through the wireless network.
3. Concentrate attention on the business community and market Wi-Fi service as an amenity for their customers.
4. Cater to the needs of mobile users of the Internet, such as those with laptops and smart phones.
5. Enhance municipal operations with the network and sign on municipalities and other large institutions as anchor tenants.
   (Gaylord 2007)

Ocean City, Maryland is one example of a community that has installed a local network. The town's wireless network integrates multiple telephone systems into a single network and accomplishes several goals. First, free wireless Internet access is provided via WiFi-hotspots at two locations in town—Somerset in the downtown area and Northside Park. Next, the network supports public-safety applications such as video surveillance on local buses during the summer tourist period. Finally, municipal workers are able to tap into the network for a variety of purposes. For example, public-works crews are now able to access data-intensive GIS maps of infrastructure while in the field (Town of Ocean City, Md. 2008).

North Ridgeville, Ohio (population 27,558 in 2007) is in the process of installing a more single-purpose municipal Wi-Fi network. At a cost of $2.8 million, 11,500 new, Wi-Fi-enabled, water-meter modules are the target of this initiative. The network will allow for all meter reading to take place from a computer in town hall. While water rates are slated to increase in order to support the purchase of the new modules, cost savings are anticipated to come through the ability of the network to quickly target costly water leaks for residential and commercial customers and through the eventual phasing out of meter-reader positions (Fogarty 2009).

With 11,000 subscribers already using the service, the "largest municipal Wi-Fi area in the country" is close to completion in the Minneapolis, Minnesota (Anderson 2009). The City signed a ten-year contract with USI Wireless in 2006 to own, build, and manage the wireless network

that will eventually provide service within the 59-sq.-mi. city (City of Minneapolis, Minnesota 2008). In addition to providing a broadband subscription option for businesses and residents, the network offers community benefits including free limited-time service in certain public areas, free wireless access for certain community and government applications, and the provision of free access to designated community technology centers (City of Minneapolis, Minnesota 2009).

The "Create Local Networks" Approach in Sussex County

The local-networks approach offers the potential benefit of creating specialized broadband networks that provide for specific local needs and applications. This approach might be more manageable than a countywide initiative, requiring less coordination and reducing the scale of needed technical studies. However, a local-networks approach would likely need to be more conservatively managed than broader initiatives in order to insulate the sponsors of the network (e.g., a town government) from financial difficulties. This might lead to local networks being narrowly conceived in terms of the uses of the network and the technology chosen, while broader initiatives might enable investment in more cutting-edge, multi-purpose technologies, since their investments would be protected by access to a wider range of potential funders and users.

A possible local networks approach in Sussex County could proceed according to the following three steps:

1. **Identify Network Users and Applications**—The users of a local network should be identified, along with their potential applications of broadband. Users should be classified according to the volume of their potential activities (e.g., needed bandwidth or number of users) and their ability to pay. This information will help in identifying the "anchor tenants" for broadband that can make local networks sustainable and generally help create a plan for financing the ongoing operations of the network. Potential user groups might include municipal governments, business owners in specific locations, and households in general.

2. **Identify Technical Needs**—With potential users and their applications identified, the next step is to translate this information into technical specifications for a network. Attention in this step should not only be paid to only already identified needs but to making the network flexible enough to accommodate as-yet-unidentified users and applications.

3. **Develop a Business Plan**—A business plan for a local network takes into account potential user groups and applications and identified technical needs to arrive at a plan for building, financing, and maintaining a localized broadband network. Components of the business plan would specify the technical specifications of infrastructure to be installed, initial and ongoing sources of funding, and guidelines for accessing the network, such as subscribership arrangements.

4-5. Guidance for First Steps in Sussex

The American Recovery and Reinvestment Act of 2009 brought unprecedented attention to the topic of rural broadband. While the extent of funding available for projects in Delaware is unclear, funding opportunities related to rural broadband have never been more abundant. Containing large swaths of rural areas that are likely to be unserved or underserved by broadband, Sussex County is a prime candidate to benefit from future broadband projects. This report summarized numerous general and specific approaches for expanding and enhancing regional broadband offerings. The ideal approach for Sussex County is likely to be one that has yet to be employed—an approach recognizing the unique characteristics of Sussex's households, businesses, and governments while considering the economic-development challenges that now face and will face the county.

The following guidance is offered in an effort to inform the process of developing a plan for enhanced and expanded broadband in Sussex County:

1. **Start With Community Needs, Not Solutions**—Many information-technology projects have failed because attention quickly becomes focused on the implementation of a particular solution, rather than the necessity of addressing specific operational concerns. A broadband project that initially focuses too much attention on a particular technological solution runs the risk of shortchanging potential user groups in Sussex County. The demand-aggregation approach offers guidance in this regard, since it advises that a regional broadband strategy be based around the identification of those broadband applications that can bring the most value to a region's potential users. A broadband plan built around community needs can go a long way toward ensuring an implementation that brings positive, long-lasting impacts to a region.

2. **A Broad-Base of Support is Critical to Success**—A Sussex County broadband initiative is not likely to succeed if major government, business, and community institutions are not involved in the crafting and maintenance of an action plan. A broad base of support can help identify the desirable characteristics of an enhanced broadband network and harness the resources necessary to implement an initiative. Initial activity should focus on convening a group of key stakeholders in the Sussex community to secure commitment for enhancing and expanding broadband in the County.

3. **Focus on Existing Residents and Businesses**—While enhancements to broadband offerings in Sussex County might make the region more attractive to new businesses, the recruitment of new firms should not be the primary focus of a Sussex broadband initiative. Instead, particular attention should be devoted to educating existing businesses and residents about the many applications of broadband in order to encourage increased use and positive outcomes, such as more profitable businesses and residents with access to increased educational opportunities.

Appendix A. Bibliography

Allan, William R., President, Verizon Delaware LLC. *Email Correspondence to Troy Mix.* October 14, 2008.

Anderson, James. "Citywide Wi-Fi service months away." *The Minnesota Daily*, February 2, 2009.

Belson, Ken. "With a Dish, Broadband Goes Rural." *New York Times*, November 14, 2006.

City of Minneapolis, Minnesota. "How Wireless Minneapolis will offer community benefits." *City of Minneapolis.* March 24, 2009. www.ci.minneapolis.mn.us/wirelessminneapolis/commbenefits_wireless.asp (accessed April 2009).

—. "Wireless Minneapolis." *City of Minneapolis.* March 18, 2008. www.ci.minneapolis.mn.us/wirelessminneapolis (accessed April 2009).

ConnectKentucky. "Future Broadband Deployments Close Few Remaining Gaps." *Connected: ConnectKentucky Quarterly*, Spring 2008: 3.

—. "No Child Left Offline Delivers Computers, Promises Hope." *Connected: ConnectKentucky Quarterly*, Winter 2008: 3.

ConnectKentucky. "Progress Report 2008." 2008.

—. "What We Do." *ConnectKentucky.* 2008. www.connectkentucky.org/what_we_do (accessed March 2009).

Crandall, Robert, William Lehr, and Robert Litan. "The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data." *Issues in Economic Policy: The Brookings Institution*, no. 6 (July 2007).

Data Mapping, Inc. "Maryland, Delaware, and District of Columbia: Cable Television and Franchise Areas." Crescent Twp., PA, June 2008.

Delaware State University. *Delaware State University.* www.desu.edu (accessed May 7, 2009).

Delaware Technical and Community College. *What is E-Learning?* www.dtcc.edu/elearning/What_is.html (accessed May 7, 2009).

Federal Communications Commission. *Broadband.* February 12, 2009. www.fcc.gov/broadband (accessed March 2009).

—. "Form 477 Orders." *Federal Communications Commission.* June 12, 2008. hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-148A1.pdf (accessed June 2009).

—. "High-Speed Services for Internet Access: Status as of December 31, 2007." *Federal Communications Commission.* January 2009. hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-287962A1.pdf (accessed April 2009).

—. "Zip Codes by Number of High-Speed Service Providers As of 6/30/07." *Federal Communications Commission.* April 2008. www.fcc.gov/wcb/iatd/comp.html (accessed April 2009).

Fogarty, Steve. "Ridgeville to revamp water meters." *The Chronicle Telegram,* February 6, 2009.

Ford, George S, and Thomas M Koutsky. *Broadband and Economic Development: A Municipal Case Study from Florida.* Birmingham, Alabama: Applied Economic Studies, 2005.

Forrester Research, Inc. *Forrester Research.* April 2009. www.forrester.com (accessed April 2009).

Gaylord, Chris. "Municipal Wi-Fi Thrives - on a small scale." *Christian Science Monitor,* September 13, 2007.

Gillett, Sharon E, William H Lehr, Carlos Osorio, and Marvin Sirbu. *Measuring the Economic Impact of Broadband Deployment.* National Technical Assistance, Training, Research, and Evaluation Project #99-07-13829, U.S. Department of Commerce, Economic Development Administration, 2006.

Horrigan, John B. "Home Broadband Adoption 2009." *Pew Internet & American Life Project.* June 2009. www.pewinternet.org/~/media//Files/Reports/2009/Home-Broadband-Adoption-2009.pdf (accessed June 2009).

Intelligent Community Forum. *Intelligent Community Forum.* April 2009. www.intelligentcommunity.org (accessed April 2009).

Kelley, Doris J. "A Study of the Economic and Community Benefits of Cedar Falls, Iowa's Municipal Telecommunications Network." Whitepaper, 2004.

Key, Peter. "Wireless Philadelphia reboots to bring Wi-Fi to the masses." *Philadelphia Business Journal,* January 2, 2009.

Kingsley, Lawrence. "The Rebirth of UTOPIA." *Broadband Properties,* October 2008: 54-57.

Koerner, Brendan I. "Home Sweet Office: Telecommute Good for Business, Employees, and Planet." *Wired Magazine,* September 22, 2008.

Lane, Bill. "Tech Topic 11: WiMAX Applications for Public Safety." *Federal Communications Commission: Public Safety and Homeland Security Bureau.* www.fcc.gov/pshs/techtopics/techtopics11.html (accessed May 2009).

LaRose, Robert, Jennifer L Gregg, Sharon Strover, Joseph Straubhaar, and Serena Carpenter. "Closing the rural broadband gap: Promoting adoption of the Internet in rural America." *Telecommunications Policy* 31, no. 6-7 (July 2007): 359-373.

Maryland Broadband Cooperative. *About MDBC.* 2008. www.mdbc.us/about-mdbc.asp (accessed April 2009).

McDougall, Paul. "IBM Plans Broadband Over Power Lines For Rural America." *InformationWeek*, November 12, 2008.

Mid-Atlantic Broadband Cooperative. *Mid-Atlantic Broadband Cooperative.* 2009. www.mbc-va.com (accessed April 2009).

MuniWireless, LLC. *MuniWireless.* April 2009. www.muniwireless.com (accessed April 2009).

National Telecommunications and Information Administration. *Networked Nation: Broadband in America 2007.* U.S. Department of Commerce, 2008.

Reardon, Marguerite. "Sprint's WiMax efforts doomed to failure?" *CNET News*, October 2, 2008.

State of Delaware. *Delaware Center for Educational Technology.* May 2008. www.dcet.k12.de.us (accessed 2009 April).

Town of Ocean City, Md. *Free Wi-Fi Fact Sheet.* November 6, 2008. www.town.ocean-city.md.us/wifi.html (accessed April 2009).

Tri-County Council for Western Maryland. "Western Maryland Broadband Deployment Strategy." Final Report, 2nd Edition, 2004.

U.S. Census Bureau. *2007 American Community Survey.* April 27, 2009. www.census.gov/acs/www/Products/index.html (accessed June 2009).

U.S. Department of Agriculture. *The Census of Agriculture: Frequently Asked Questions.* December 3, 2008. www.agcensus.usda.gov/Help/FAQs/General_FAQs/index1.asp (accessed June 2009).

U.S. Government Accountability Office. "Broadband Deployment Is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas." Report to Congressional Committees, GAO-06-426, 2006, 25.

United States Department of Agriculture, National Agricultural Statistics Service. "2007 Census of Agriculture." *United States Department of Agriculture.* February 4, 2009. www.agcensus.usda.gov (accessed June 2009).

University of Delaware. *About distance learning at the University of Delaware.* www.pcs.udel.edu/udonline/about.html (accessed May 7, 2009).

University of Kansas Medical Center. *Telemedicine & Telehealth.* 2009. www2.kumc.edu/telemedicine (accessed April 2009).

University of Kentucky College of Medicine. *Kentucky TeleCare.* August 8, 2008. www.mc.uky.edu/kytelecare (accessed April 2009).

USI Wireless. *Promotional Pricing Information.* 2009. www.usiwireless.com/service/pricing.htm (accessed May 2009).

Utah Telecommunications Open Infrastructure Agency. "Service Area." *UTOPIA.* 2009. www.utopianet.org/service-area.

Virginia Economic Bridge, Inc. *Virginia Economic Bridge.* 2009. www.virginiaeconomicbridge.org (accessed April 2009).

Vos, Esme. "McAllen, Texas installs wireless video surveillance network." *MuniWireless.* September 4, 2008. www.muniwireless.com/2008/09/04/mcallen-texas-installs-wireless-video-surveillance-network (accessed April 2009).

—. "Ponca City, Oklahoma blends municipal wireless with energy management." *MuniWireless.* December 9, 2008. www.muniwireless.com/2008/12/09/ponca-city-oklahoma-muni-wireless (accessed April 2009).

—. "South Carolina city uses muni wireless for energy management, public safety, free WiFi." *MuniWireless.* December 11, 2008. www.muniwireless.com/2008/12/11/rock-hill-muni-wireless-improves-energy-management (accessed April 2009).

Wendt, Matthias. *Is There a Way to Bridge the Digital Divide?* Analytical paper submitted in partial fulfillment of the requirements for the degree of Master of Urban Affairs & Public Policy, Newark, Del.: University of Delaware, School of Urban Affairs and Public Policy, 2008.

Whitacre, Brian E, and Bradford F Mills. "Bridging the Metropolitan-Nonmetropolitan Digital Divide in Home Internet Use." *Choices,* Quarter 2 2003.

Wilmington University. *Wilmington University.* www.wilmu.edu (accessed May 7, 2009).

Institute for Public Administration
College of Education & Public Policy
University of Delaware
180 Graham Hall
Newark, DE 19716-7380

phone: ***302-831-8971*** *e-mail:* ***ipa@udel.edu*** *fax:* ***302-831-3488***

www.ipa.udel.edu

The University of Delaware's Institute for Public Administration (IPA) addresses the policy, planning, and management needs of its partners through the integration of applied research, professional development, and the education of tomorrow's leaders.