

STRATEGIES FOR PRUDENT BROADBAND POLICY



by Caroline Welton and the Honorable Zach Whiting

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**Texas Public Policy
Foundation**

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Strategies for Prudent Broadband Policy

Caroline Welton and the Honorable Zach Whiting

Executive Summary

As access to the internet for a variety of resources for education, work, communication, and government becomes more important, there is a growing pressure for all people to have access to high-speed internet. To try to achieve more access, the state and federal governments have appropriated substantial funding for broadband projects. Federal and state appropriations will make more than \$600 million available to expand broadband access. Ultimately, this money comes from taxpayers, and lawmakers ought to determine whether and how much funding is necessary, reject any excessive federal funds, and consider how best to use taxpayer money to achieve concrete and measurable goals. Maintaining consistent standards and goals—and carefully targeting areas of need in ways that accomplish these goals—is important to avoid wasteful spending and duplication that does not ultimately solve the problem of a lack of access to necessary speeds of internet in some parts of Texas.

It is generally more costly to build out infrastructure in expansive rural areas of the state, so lawmakers should be judicious in determining where there is a true need and addressing only the actual demand. Furthermore, communities who do not currently subscribe to broadband are mostly lower-income or lower educated and have not been reached by prior programs. Lawmakers should similarly consider whether this indicates a lack of desire for broadband services, as research suggests. If it does not, and those without subscription also have a true need, they should better be reached by education and community-based programs that provide the services they need without wasting money on monthly subsidies that do not make significant progress toward subscription goals.

This paper will investigate broadband policy to determine broadband need and suggest policies that will serve Texas into the future, facilitating greater prosperity for Texans.

The Question

What Is Broadband?

Broadband, or high-speed internet, is currently defined by the Federal Communications Commission (FCC) as 25 megabits per second (Mbps) download and 3 Mbps upload, abbreviated as 25/3 Mbps ([Cooper, 2018](#)). This definition has been increased from the 2010 standard of 4/1 Mbps and the 1996 standard of 200/200 Kilobits per second (0.2 Mbps). FCC Chairwoman Jessica Rosenworcel has proposed raising the definition to 100/20 Mbps due to increased internet usage ([Velazco, 2022](#)). This type of goalpost moving is disruptive and unnecessary to meet the needs of Texans, because it creates the illusion of ever-increasing need, and makes previous and current projects irrelevant before they are even finished.

Key Points

- More than \$600 million in federal broadband subsidies are headed for Texas.
- In the past, such subsidies and programs have not been prudently administered in many states.
- About 6% of Texans, mostly in rural counties, do not have access to broadband internet.
- The Legislature should look toward cost-effective solutions such as community centers, middle-mile infrastructure, and revolving loan funds.
- Emphasizing private sector incentives rather than public incentives will help programs stay effective and goal oriented.

Figure 1*Average Cost Per User for Different Broadband Technologies in Urban Areas in Texas*

	DSL	Cable	Fixed Wireless	Fiber
Average Download Bandwidth (Mbps)	37	328	30	583
Average Upload Bandwidth (Mbps)	4.9	20	9.6	390.54
Average Total Monthly End User Charge	\$64.19	\$72.60	\$86.29	\$73.35

Note. Data from *Urban Rate Survey Data & Resources*, by Federal Communications Commission, 2022b (<https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources>).

The FCC’s analysis notes that most seemingly essential functions—accessing websites, email, streaming audio, video calls, VoIP calls, and social media—can be performed with less than 2 Mbps download speed (FCC, n.d.-b). The narrative that ever-higher broadband speeds are necessary for essential functions of life, work, and school assumes an economic increase with broadband speed increase, which is not supported by data. Ford (2018) used a before and after analysis of areas in which broadband had been expanded and found that models that purport to show increased benefits associated with higher broadband speeds—by using counties with predominant access to low speeds as a before and counties with mostly access to high speeds as an after case—fail to account for significant differences in these counties apart from broadband speed, most notably whether they are rural or urban. Building out broadband in rural areas with lower population density and different geographic concerns has different hurdles and results than building broadband in an urban area—and this significance means that even if high speed internet is delivered to rural areas there is no certainty that the results would have the same effect as the “after” example of urban areas. Instead of pushing rural areas to adopt speeds that are naturally adopted in urban areas, focus should be on establishing the basic speed which is actually necessary for activity such as work, school, or communication.

While focusing on the speed which is actually necessary, it is also important to note that there are numerous modalities of delivering this speed—each of which has advantages and disadvantages—some of which will work better in certain geographic areas than others. These delivery modes include digital subscriber line (DSL), cable, fiber, fixed wireless, 4G, 5G, and satellite connections—so long as these can meet the 25/3 standard. The only type of internet connection that is unable to meet broadband speeds is dial-up (Christiansen, 2022). Given these various delivery

modes, policymakers should be cautious not to advantage or disadvantage any one mode, but rather to allow freedom for providers to use the connection delivery vehicle that provides the best service at the lowest price for the area in which it is built.

An interesting broadband delivery mode is the Starlink satellite technology. These satellites are particularly marketed to rural areas because they provide higher speeds without needing to build out expensive fiber or cable infrastructure to remote spaces. This is different from traditional satellites because the Starlink satellites fly closer to Earth and can communicate higher speeds of broadband (Spadafora, 2022).

This technology was rolled out first in Canada and northern parts of the U.S. where it was marketed as “better than nothing” for rural areas. Benefits of this mode of delivery include higher download (50 to 150 Mbps) and upload (15 to 20 Mbps), low latency or delay, and unlimited bandwidth (Wideman, 2022). Drawbacks include connection drops due to coverage gaps, decreasing speeds due to over-subscription (Kan, 2022), weather-based performance variation in the same manner as traditional satellite, and less consistency than cable or fiber (Wideman, 2022). There is also a higher cost than other means of broadband delivery: a onetime \$599 hardware cost plus \$110 a month (Starlink, n.d.-a). Such speeds and performance are likely sufficient to meet identified “essential” functions.

Before reflexively adopting technologies such as Starlink—which may very well be a “better than nothing” option for some areas—policymakers should consider the specific dynamics of Texas. Physical geography is one such consideration. For internet to properly communicate via satellite, the dish must have a clear view to the sky (Starlink, n.d.-b). Of the six Texas counties with the lowest access

to broadband (less than 50% access across the county to 25/3 speeds), three of these (Marion, Shelby, and Newton) are in the East Texas piney woods ([Connected Nation, 2022b](#)), not particularly amenable to satellite technology due to trees obscuring the view to the sky ([Texas Parks & Wildlife, n.d.](#)). For this reason, East Texas counties expanding broadband have generally opted for hard line options, to prevent satellite connectivity issues due to their specific geography ([KLTV Digital Media Staff, 2022](#)). This is an example of why policy makers should not favor one type of broadband delivery universally, but rather, allow the market and regional considerations determine the best path.

Why Is Broadband Important?

In the last decade, public officials have argued that broadband access is a technology to “connect every part of America to the digital age” ([White House, 2011, para. 52](#)) which has become “not simply an amenity...[but] essential” ([Perdue, 2017, p. 2](#)). Much of the recent concern for expanding broadband has been driven by the COVID-19 pandemic, during which 53% of Americans said the internet was essential to their daily life ([Vogels et al., 2020](#)). These opinions have motivated much of the recent appropriations for broadband. However, massive government spending and use of taxpayer resources without a clear understanding of the need and efficacy can lead to potential waste, fraud, abuse, and duplication.

There is ample evidence that broadband contributes positively to economic outcomes ([Bertschek et al., 2016](#)). It has a positive effect on overall GDP ([Gruber et al., 2014](#)) as well as GDP per household ([Thompson & Garbacz, 2007](#)). Koutroumpis (2009) and Czernich et al. (2011) both find evidence for a critical mass at 10% or 30% respectively for broadband adoption and access from multiple providers, before which point benefits are not significantly realized. Ensuring this point is met evenly in all areas could serve as a clear goal. As Bai (2016) and Ford (2018) indicate, there are not increasing benefits with increasing speed, so it would be wiser and more effective to set a goal of ensuring even access to the 25/3 speed. The threshold should be even access to activities at which economically productive tasks can be done, rather than using public resources to promote ever-higher speeds to enable people to, for example, enjoy more entertainment or convenience.

Who Lacks Broadband?

There are two ways in which a household could lack broadband, with different causes and solutions. First, one could live in a geographic area that is not covered by any

networks providing broadband, which would be considered lack of *access*, likely caused by a shortage of infrastructure to carry internet in that area. The second is a lack of *subscription* to a broadband network, often caused by inability to pay, lack of digital literacy to use the product, or simply no desire for the product.

The areas most likely to have a lack of access are rural ([Vogels, 2021](#)). According to Connected Nation (2022c) data, 98.15% of Texas’ geographic area is covered by at least one network providing 25/3 Mbps broadband, and 181 of Texas’ 254 counties have access to 25/3 Mbps broadband in over 90% or more of the county.

Many government broadband programs and subsidies have focused on closing the “digital divide,” which usually refers to the disparity in broadband access between various groups, most notably between rural and urban areas ([Vogels, 2021](#)). This emphasis largely began after the FCC changed its broadband definition from 4/1 to 25/3 Mbps in 2015 to provide an avenue for increased quality and coverage ([FCC, 2015](#)).

Both broadband access, as above, and subscription, covered below, affect the digital divide, although for different reasons. The numbers of Texans without access (about 6%) are different from the numbers without subscription (about 15%), so it is important to distinguish the two and understand the underlying causes. This is a higher rate of access or coverage than the rate of actual subscription. The 2020 Census numbers show that 85.1% of Texan households have a broadband subscription, and 14.7% of Texan households have no internet subscription, not even dial-up or other modes that do not meet the broadband speed definition ([U.S. Census Bureau, 2020](#)).

According to a 2021 nationwide Pew poll ([Perrin & Atske, 2021](#)), the biggest reasons for not having an internet subscription—not necessarily a subscription of broadband quality—are, in order of significance age (25% of those 65+ did not have an internet subscription), income and/or education (14% of both those with an annual income less than \$30,000 and those without a high school diploma did not have an internet subscription), and community type (10% of those in rural areas did not have an internet subscription). A Census Bureau report suggests that the cost of internet and lack of technology skills (often associated with senior citizens and people with lower education levels) remain the primary reasons for internet non-subscription ([Martin, 2019](#)). For this reason, broadband initiatives often support physical infrastructure

Several recent federal appropriations bills will send more than \$600 million to Texas for broadband infrastructure. One is the American Rescue Plan Act of 2021, part of which is the Coronavirus Capital Projects Fund.

for rural communities and subsidies for low-income families ([Texas Comptroller, 2022](#)). However, digital literacy programs have the potential to increase knowledge, skills, and access for each group.

Several researchers ([Kolko, 2012](#); [Mack & Faggian, 2013](#); [Whitacre et al., 2014](#)) find it is predominantly knowledge workers and companies in information- and communications-related sectors who significantly benefit from broadband, and that added jobs or increasing average pay in rural areas as a result of broadband expansion tend to be due to technological jobs coming into the area rather than the broadband improving already existing jobs. This suggests that when analyzing the rural areas which have lower access or subscription to broadband, solutions which assume that adoption of this technology will provide substantial economic benefit to the area may be hasty.

Previous Governmental Responses Money Allocated to Broadband

Several recent federal appropriations bills will send more than \$600 million to Texas for broadband infrastructure. One is the American Rescue Plan Act of 2021, part of which is the Coronavirus Capital Projects Fund ([Public Law No: 117-2, 2021](#)). Guidelines require emphasis on expanding broadband in rural areas and providing subsidies to low-income citizens ([U.S. Department of the Treasury, 2021](#)). Commentators argue there will be increased coverage for rural areas ([Feely, 2022](#)) and sizable numbers of people will be reached by this funding ([Ballard, 2022](#)).

Furthermore, approximately \$500.5 million in federal funds will come from the American Rescue Plan Act of 2021 ([Texas Comptroller, 2022](#)), out of the nearly \$16 billion allocated to the state for discretionary spending from the

act overall ([K CBD Staff, 2021](#)). At the state level, \$5 million from the state's general revenue has been allocated to run the Broadband Development Office and implement appropriate legislation ([Texas Comptroller, n.d.-a](#)).

The Infrastructure Investment and Jobs Act (IIJA) includes several provisions for funding broadband projects in the amount of at least \$100 million through the Broadband Equity, Access, and Deployment Program ([Texas Comptroller, n.d.-a](#); [White House, 2021](#)). These include programs to build physical infrastructure as well as improve coverage and affordability ([Bailey, 2021](#)). The “Internet for All” initiative within the IIJA particularly emphasizes coverage and subscription issues, addressing these largely through individual subsidies ([NTIA, 2022](#)).

It is important that Texas legislators push back as much as possible on efforts by the federal government to put unnecessary or burdensome guidelines on the use of funding, to give the state—and not local governments or municipal providers—the greatest degree of freedom to work with providers to determine needs.

Past Strategies

The government has employed several strategies to increase both broadband access and subscription, including grants to internet service providers to expand their coverage in high-need areas, subsidies to individuals to encourage higher subscription rates, and funding for physical infrastructure such as poles and cables.

The FCC's Emergency Broadband Benefit (EBB) fund is an example of subsidies made available to individuals to encourage higher subscription rates. The EBB was established by the Consolidated Appropriations Act of 2020, which appropriated the \$3.2 billion fund to give subsidies to low-income families who may have struggled to afford internet during the COVID-19 pandemic. It was to last until funds were expended or for six months after the end of the pandemic ([FCC, 2022a](#)). The program expired at the end of 2021 and was replaced by the Affordable Connectivity Program, which was created as part of IIJA ([FCC, n.d.-a](#)). This program offers smaller discounts (\$30/month as opposed to the \$50/month discount from the EBB) to the same populations ([Cooper, 2021](#)). This type of program is intended to increase subscription rates in lower-income areas). While the fund reached 7 million enrolling households by November 2021, this is only about 20% of the 30 million households estimated to have been eligible ([Cooper & Shevik, 2021](#)). In the five states with best eligible-to-enrolled ratio, the penetration rate was from

29% to 33% eligible households enrolled; and in the five worst states the rate was from 3% to 7% eligible households reached. Cooper and Shevik claim it was not marketed well enough to be effective. Alternatively, it may indicate that such programs are not effective or needed and these households may not desire or need a broadband subscription.

Other programs give grants to providers that offer broadband and voice service in areas said to be high need to promote greater access. These programs often focus on building physical infrastructure or expanding existing networks. The Connect America Fund, launched in 2011, is an example (FCC, 2017). This program was created to provide high-quality broadband coverage across the country in the fashion of roads or telephone lines. The second phase of this program focuses on reaching new areas through funding grants to large providers or “price cap carriers” to extend their services to unreached areas (FCC, 2019).

As discussed earlier, the largest disparity in broadband coverage is in rural areas and has often been addressed by programs issuing subsidies to providers to improve access. The FCC’s Rural Broadband Experiments, for example, provided grants to bidders who built out broadband in underserved areas (FCC, 2016b). In Texas, only a few providers use the majority of available grants, such as the Big Bend Telecom which covers most of far South and West Texas, due to the low number of providers interested in the perceived low benefit for their business of the grant programs (FCC, 2016a).

Results of Past Programs

Early in the development of broadband policy, support emerged for local governments to run their own municipal broadband networks (Tapia et al., 2006; Tapia et al., 2009). This solution purports to provide local governments more autonomy in allocating funds, and therefore may be a preferred solution for many cities today (Shields, 2022). Some research has focused on reducing state barriers to such networks, since conflicts often arise as regards access to state-owned land on the highways or telephone poles (Strover & Dickey, 2021; Stricker, 2013). Municipally run networks often fail, however (Ijazi, 2017). Municipal networks rarely bring in enough revenue to cover costs, are often funded by debt such as bonds, do not increase subscription rates, and are not competitive enough to work against larger, established providers (Oh, 2019; Andrews, 2022).

However, such a problem is not unique to municipal providers. Private enterprises such as Google Fiber have not

seen high enough subscription rates to justify the substantial upfront cost (Levin & Downes, 2018). This could be due to trying to increase the supply side of the market—broadband coverage or access—due to a perception that anything less than 100% adoption is not enough, yet the demand or subscription needs are not actually enough to justify this investment.

Furthermore, grant programs often focus on building broadband delivery infrastructure to cover areas which have little to no existing infrastructure and have created access to broadband (NTIA, 2020). While this has increased some subscription rates, subscription rate increases due to these programs have been less significant in rural areas, although programs claim to have increased subscription more so in suburban areas. Previous grant programs have focused on rural areas for this reason, contending that because the cost per customer is higher in rural areas, government support is necessary because there is not as strong an incentive for companies to build out in these areas unassisted (NTIA, n.d.-a). Although these programs claim to have increased access and subscription, concerns remain that they have not seen significant enough results given the amount of funds put into the programs (Cooper & Tanberk, 2020; American Broadband Initiative, 2019). Oh (2021) suggests using reverse auctions instead of grant review as a way to increase the productivity of grant dollars and make these programs more effective. A reverse auction process is where vendors try to present the lowest price to the buyer—in this case the government—for the product offered. In contrast, a regular auction is where the vendor sells an item to the highest bidding buyer. The former incentivizes thrift in providing the broadband product.

Future Responses

As Texas enters another phase of broadband expansion and development with new federal monies, legislators should bear in mind past experiences, programs, and their results to avoid similar pitfalls. As noted in the previous section, past monies have often been expended with vague goals or without achieving identified goals set out by specific programs. As is often the case, failure of government programs only further drives demands for more government money and programs to solve the problem. Broadband advocates acknowledge these limitations: “If this is the only tranche of federal dollars we get, if the federal government says this is it, this is the last time we’re spending money, we’re still going to have broadband challenges in Texas,” said Jennifer Harris, the state program director for Connected Nation Texas (Donaldson, 2022, para. 35). If policymakers continue to primarily support programs that do not address

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the root of the problem and pursue a goal of 100% access and subscription, calls for more government programs and spending will remain. Rather, lawmakers should establish clear goals and metrics for broadband policy and spending and establish whether there is a true problem.

Connected Nation’s comments to NTIA provide an idea of how broadband goals could improve, although specific goals and metrics are still needed. Some of their suggestions include encouraging broadband market competition by developing “middle mile” infrastructure, which can then be brought to the “last mile” to rural houses and businesses; prioritizing cost reduction in network service through network interconnection; and promoting program transparency and accountability ([Connected Nation, 2022a](#)).

Municipal networks continue to be promoted as a potential solution. However, as noted above, government-run networks have a shaky history ([Taxpayers Protection Alliance, 2020](#); [Dalrymple, 2021](#)). Reasons include opposition to entrenched larger providers and the sunk costs of low subscriptions often associated with these networks ([Andrews, 2022](#)). Municipal networks are not in the best interest of taxpayers or consumers. Of 20 networks with enough data for analysis, Yoo and Pfenninger (2017) found only two to be on track to pay off their debt within the usable lifetime of the network. The best solution is for the government to not be involved in running broadband networks. Rather, the government should step aside and allow market competition and innovation ([Dalrymple, 2021](#)). Accordingly, Texas legislators should resist calls for municipal broadband funding or expansion.

Furthermore, having government entities involved in the broadband process as both regulator and competitor does not effectively achieve broadband goals and brings conflict-of-interest concerns, such as when preference is given to government-owned networks regardless of their quality ([Collier, 2021](#); [Dalrymple, 2021](#)). These programs may also

lead to overbuilding or duplication in targeting the same areas multiple times without achieving the stated goals of subscription or access ([Tracy & DeBarros, 2022](#)). Programs such as grants or loans to providers for each high-need person subscribed will have at least some effect in reducing this issue ([Rosston & Wallsten, 2020](#)). Future successful programs should not only avoid sunk costs or government conflicts of interest but also directly address the root causes of non-subscription—rather than hand out individual subsidies in perpetuity. The latter is a sure way to waste this money quickly.

One positive example is an El Paso program housed under the NTIA’s archived Broadband Technology Opportunities Program. The program addressed the fact that broadband non-subscription is most prevalent among rural citizens with lower education levels and/or incomes, even in areas where there may already be broadband access ([Perrin & Atske, 2021](#)). To address this issue, El Paso built community centers with public computers and provided courses on digital skills. This type of community-based program is distinguished from municipal programs in that it is not trying to provide additional infrastructure or network to distribute broadband itself. Rather it addressed a problem of subscription and provided a way to utilize benefits from internet which El Paso citizens may not have desired or had the ability to gain independently or with traditional subscription incentives such as individual subsidies. This program resulted in considerable success:

As of June 2013, more than 163,000 El Paso citizens participated in classes on topics including Microsoft Office basics, e-government, resume writing and job searches, financial literacy, citizenship, and social media. In addition, approximately 48,000 users per week on average visited the centers during the last quarter to use the computer stations. ([NTIA, 2013, “BTOP In Action”](#))

Since the total grant award for this project was \$8,395,752, the cost per user comes to around \$50 over the three years the project was monitored ([NTIA, 2013](#)). This is similar to the amount spent per month on many individual subsidies—but is a farther reaching, more successful, and more cost-effective approach by reaching individuals often not aware of or attracted to subscription by individual subsidies.

The Foundation has also proposed a broadband revolving loan fund ([Whiting & Dunmoyer, 2022](#)). With more

than \$600 million in funding available, a well-managed revolving loan fund can provide decades of funding for broadband infrastructure projects rather than just one-time funding now. A revolving loan fund could provide low-cost, low-interest loans for planning, acquisition, rights-of-way, construction, expansion, and maintenance of broadband infrastructure. Using a revolving loan fund saves taxpayer money by requiring loans to be repaid from savings realized from efficiency in projects. This incentivizes prudent spending and setting achievable goals. Texas has used revolving loan funds well in several programs, a good example of which is the one began in 1988 for the LoanSTAR energy program. This program has funded over 325 loans totaling more than \$546 million as of 2021. They estimate the savings to taxpayers from this program to be over \$711 million. ([Texas Comptroller, n.d.-b](#))

Whether the disbursement of funds is through grants, loans, or another mechanism, it is critical that there are appropriate requirements for recipients, including their experience and track record in providing broadband services or completing broadband infrastructure projects. Furthermore, a model driven by partial or full matching funds by recipients ensures the recipient has skin in the game to complete the project and meet metrics for success. While we argue that municipal investment is not desirable, if the Legislature does indeed provide funding to municipal projects or providers, this funding should come with the same requirements, goals, and metrics for success. Government providers should not receive waivers, watered-down standards, or unfair competitive advantages compared to private providers.

Policy Solutions

Better Tech for Tomorrow at the Texas Public Policy Foundation encourages policymakers to consider these solutions to broadband policy and spending:

- Maintain decentralization, transparency, accountability, and prudence in broadband funding ([Whiting & Dunmoyer, 2022](#)).
 - ▶ No one person, agency, or entity should be in control of the entire broadband fund.
 - ▶ Spending of the money should be transparent for the public and industry to see, ensuring greater accountability.
- ▶ Funding should target areas most in need—predominantly in rural areas—in a way which will be cost-effective and goal oriented.
- ▶ Desired outcomes should be clearly outlined to allow auditing of the funds during and after project completion.
- Target funding toward entities, programs, and projects that
 - ▶ have a good track record of success in providing services or building out infrastructure,
 - ▶ will use it effectively, and
 - ▶ have clear goals and metrics for success.
- Consider the proper mode of delivery based on cost-effectiveness, actual need, and considerations such as geographical limitations.
- While fiber is often the best, fastest, and most secure, it may not be the most cost-effective or even necessary to provide adequate service. Accordingly, it is crucial to remain open to other means of internet access, including DSL, cable, fixed wireless, 4G, 5G, and satellite connections.
- Implement community centers and digital literacy programs to provide skills and improve subscription rates rather than providing individual subsidies.
- Implement a revolving loan fund to provide long-term funding for broadband expansion rather than spending one-time dollars right now.

With these guidelines, Texas can use the broadband funds allocated in a prudent and effective manner that will serve its citizens for years to come. ★

References

- American Broadband Initiative. (2019). *Milestones report*. https://www.ntia.doc.gov/files/ntia/publications/american_broadband_initiative_milestones_report.pdf
- Andrews, C. (2022, June 6). *Why voters in a small Maine town may pull plug on broadband*. Government Technology. <https://www.govtech.com/network/why-voters-in-a-small-maine-town-may-pull-plug-on-broadband>
- Bai, Yang. (2016). *The faster, the better? The impact of internet speed on employment*. TPRC 44: The 44th Research Conference on Communication, Information and Internet Policy 2016. <http://dx.doi.org/10.2139/ssrn.2772691>
- Bailey, J. (2021). *Broadband provisions in the Infrastructure Investment and Jobs Act: A primer*. American Enterprise Institute. <https://www.aei.org/research-products/report/broadband-provisions-in-the-infrastructure-investment-and-jobs-act-a-primer/>
- Ballard, M. (2022, June 8). *Federal funding to bring 88k Louisianans high-speed internet*. Government Technology. <https://www.govtech.com/network/federal-funding-to-bring-88k-louisianans-high-speed-internet>
- Bertschek, I., Briglauer, W., Hüschelrath, K., Kauf, B., & Niebel, T. (2016). The economic impacts of broadband internet: A survey. *Review of Network Economics*, 14(4), 201–227. <https://doi.org/10.1515/rne-2016-0032>
- Christiansen, P. (2022, May 11). What is broadband? HighSpeedInternet.com. <https://www.highspeedinternet.com/resources/what-is-broadband>
- Collier, D. (2021, December 9). Broadband infrastructure dollars must be used wisely. *The Waste Watcher* blog, Citizens Against Government Waste. <https://www.cagw.org/thewastewatcher/broadband-infrastructure-dollars-must-be-used-wisely>
- Connected Nation. (2022a, February 9). How NTIA can best leverage its infrastructure bill programs to close the digital divide. *Connected Nation* blog. <https://connectednation.org/blog/2022/02/09/how-ntia-can-best-leverage-its-infrastructure-bill-programs-to-close-the-digital-divide/>
- Connected Nation. (2022b, January 31). *Texas household broadband availability by county: 25 mbps download/3 mbps upload*. https://connectednation.org/texas/wp-content/uploads/sites/19/2022/01/TX_Broadband_AvailabilitybyCounty_25x3Mbps_2022_01_31.pdf
- Connected Nation. (2022c, January 31). *The broadband landscape in the state of Texas*. Retrieved August 1, 2022, from <https://connectednation.org/texas/planning/>
- Cooper, T. (2018, February 10). *The FCC definition of broadband: Definition and history*. Broadband Now. Retrieved June 27, 2022, from <https://broadbandnow.com/report/fcc-broadband-definition/>
- Cooper, T. (2021, December 6). *Understanding the affordable connectivity program*. Broadband Now. Retrieved June 27, 2022, from <https://broadbandnow.com/report/affordable-connectivity-program/>
- Cooper, T., & Shevik, J. (2021, December 6). *Emergency broadband benefit recap: 7.1 million households enrolled, adoption varies significantly by state*. Broadband Now. <https://broadbandnow.com/internet/emergency-broadband-benefit-report>
- Cooper, T. & Tanberk, J. (2020). *Broadband report 2020*. Broadband Now. <https://broadbandnow.com/research/q1-broadband-report-2020>

- Czernich, N., Falck, O., Kretschmer, T., & Woessmann, L. (2011). Broadband infrastructure and economic growth. *The Economic Journal*, 121(552), 505–532. <https://doi.org/10.1111/j.1468-0297.2011.02420.x>
- Dalrymple, J. (2021, October 15). *Broadband: Biden's plan would not close the digital divide*. Heritage Foundation. <https://www.heritage.org/technology/report/broadband-bidens-plan-would-not-close-the-digital-divide>
- Donaldson, E. (2022, May 30). Texas expanding broadband, but focus on sustainability key. *Dallas Morning News*. <https://www.dallasnews.com/news/education/2022/05/30/texas-expanding-broadband-but-focus-on-sustainability-key/>
- Federal Communications Commission. (n.d.-a). *Affordable connectivity program*. Retrieved August 1, 2022, from <https://www.fcc.gov/acp>
- Federal Communications Commission. (n.d.-b). *Broadband speed guide*. Retrieved August 1, 2022. <https://www.fcc.gov/consumers/guides/broadband-speed-guide>
- Federal Communications Commission. (2015, February 4). *2015 broadband progress report*. <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2015-broadband-progress-report>
- Federal Communications Commission. (2016a, September 12). *Rural broadband experiment support authorized for winning bids submitted by Big Bend Telecom, LTD. and Northeast Rural Services, Inc.* <https://www.fcc.gov/document/rbe-big-bend-nrs-authorization-pn>
- Federal Communications Commission. (2016b, December 14). *Rural broadband experiments*. Retrieved June 27, 2022, from <https://www.fcc.gov/general/rural-broadband-experiments>
- Federal Communications Commission. (2017, February 2). *Connect America fund (CAF)*. Retrieved August 24, 2022, from <https://www.fcc.gov/general/connect-america-fund-caf>
- Federal Communications Commission. (2019, December 30). *Connect America fund phase II FAQs*. Retrieved August 24, 2022, from <https://www.fcc.gov/consumers/guides/connect-america-fund-phase-ii-faqs>
- Federal Communications Commission. (2022a, May 9) *Emergency broadband benefit*. Retrieved August 1, 2022, from <https://www.fcc.gov/broadbandbenefit>
- Federal Communications Commission. (2022b, August 15). *Urban rate survey data & resources*. Retrieved November 9, 2022, from <https://www.fcc.gov/economics-analytics/industry-analysis-division/urban-rate-survey-data-resources>
- Feely, P. (2022, June 8). *New Hampshire to receive \$50m for rural internet funding*. Government Technology. <https://www.govtech.com/network/new-hampshire-to-receive-50m-for-rural-internet-funding>
- Ford, G. S. (2018). Is faster better? Quantifying the relationship between broadband speed and economic growth. *Telecommunications Policy*, 42(9), 766–777. <https://phoenix-center.org/PolicyBulletin/PCPB44Final.pdf>
- Gruber, H., Hätönen, J., & Koutroumpis, P. (2014). Broadband access in the EU: An assessment of future economic benefits. *Telecommunications Policy*, 38(11), 1046–1058. <https://doi.org/10.1016/j.telpol.2014.06.007>
- H.R.1319, American Rescue Plan Act of 2021. 117th Congress. (2021). <https://www.congress.gov/bill/117th-congress/house-bill/1319/text>

- Iljazi, M. (2017, February 7). *Taxpayers Protection Alliance Foundation releases municipal broadband failure map*. Taxpayers Protection Alliance. <https://www.protectingtaxpayers.org/state-issues/taxpayers-protection-alliance-foundation-releases-municipal-broadband-failure-map/>
- Kan, M. (2022, July 15). *Starlink's massive growth results in congestion, slow speeds for some users*. PCMag. <https://www.pcmag.com/news/starlinks-massive-growth-results-in-congestion-slow-speeds-for-some-users>
- KCBD Staff. (2021, November 8). *Gov. Abbott signs Senate Bill 8, allocating nearly \$16 billion of federal American Rescue Plan funds*. KLTv. <https://www.kltv.com/2021/11/08/gov-abbott-signs-senate-bill-8-allocating-nearly-16-billion-federal-american-rescue-plan-funds/>
- KLTv Digital Media Staff. (2022, August 15). *Gregg County commissioners select contractor for broadband internet project*. KLTv. Retrieved August 29, 2022, from <https://www.kltv.com/2022/08/15/gregg-county-commissioners-select-contractor-broadband-internet-project/>
- Kolko, J. (2012). Broadband and local growth. *Journal of Urban Economics*, 71(1), 100–113. <https://doi.org/10.1016/j.jue.2011.07.004>
- Koutroumpis, P. (2009). The economic impact of broadband on growth: A simultaneous approach. *Telecommunications Policy*, 33(9), 471–485. <https://doi.org/10.1016/j.telpol.2009.07.004>
- Levin, B., & Downes, L. (2018, September 7). Why Google Fiber is high-speed internet's most successful failure. *Harvard Business Review*. <https://hbr.org/2018/09/why-google-fiber-is-high-speed-internets-most-successful-failure>
- Mack, E., & Faggian, A. (2013). Productivity and broadband: The human factor. *International Regional Science Review*, 36(3), 392–423. <https://doi.org/10.1177/0160017612471191>
- Martin, M. (2019). *Deconstructing the digital divide: identifying the supply and demand factors that drive internet subscription rates*. Education and Social Stratification Branch, U.S. Census Bureau. <https://www.census.gov/content/dam/Census/library/working-papers/2019/demo/sehsd-wp2019-15.pdf>
- National Telecommunications & Information Administration. (n.d.-a). *BTOP / SBI archived grant program*. Retrieved August 1, 2022, from <https://www2.ntia.doc.gov/Texas>
- National Telecommunications & Information Administration. (2013). *BTOP/SBI archived grant program: The virtual village: El Paso's pathway to success*. Retrieved August 1, 2022, from <https://www2.ntia.doc.gov/grantee/city-of-el-paso>
- National Telecommunications & Information Administration. (2020). *Broadband technology opportunities program 46th annual report to congress*. https://www.ntia.doc.gov/files/ntia/publications/ntia_btop_46th_quarterly_congressional_report.pdf
- National Telecommunications and Information Administration. (2022). *FACT SHEET: Biden-Harris administration's "internet for all" initiative: Bringing affordable, reliable high-speed internet to everyone in America*. <https://ntia.gov/other-publication/2022/fact-sheet-biden-harris-administration-s-internet-all-initiative-bringing>
- Oh, S. (2019). *What are the economic effects of municipal broadband?* TPRC47: The 47th Research Conference on Communication, Information, and Internet Policy 2019. <https://dx.doi.org/10.2139/ssrn.3426247>

- Oh, S. (2021). *Using reverse auctions to stretch broadband subsidy dollars: Lessons from the Recovery Act of 2009*. Technology Policy Institute. <https://techpolicyinstitute.org/wp-content/uploads/2021/03/Oh-Reverse-Auctions-Lessons-from-BTOP-Jan-2021.pdf>
- Perdue, S. (2017). *Report to the president of the United States from the task force on agriculture and rural prosperity*. United States Department of Agriculture. <https://www.usda.gov/sites/default/files/documents/rural-prosperity-report.pdf>
- Perrin, A., & Atske, S. (2021, April 2). *7% of Americans don't use the internet. Who are they?* Pew Research Center. <https://www.pewresearch.org/fact-tank/2021/04/02/7-of-americans-dont-use-the-internet-who-are-they/>
- Rosston, G. L., & Wallsten, S. J. (2020). *Increasing low-income broadband adoption through private incentives*. Technology Policy Institute & Stanford Institute for Economic Policy Research. <https://techpolicyinstitute.org/wp-content/uploads/2020/07/RosstonWallstenIE.pdf>
- Shields, T. (2022, June 7). *Baltimore looks to expand internet access by building its own network*. Bloomberg. <https://www.bloomberg.com/news/articles/2022-06-07/baltimore-eyes-federal-funds-for-municipal-broadband>
- Spadafora, A. (2022, August 12). *Starlink internet coverage, cost, speeds and the latest news – What you need to know*. Tom's Guide. <https://www.tomsguide.com/news/starlink-internet-coverage-speed-cost-satellites-ipo-and-latest-news>
- Starlink. (n.d.-a). *Order Starlink*. Retrieved August 29, 2022, from <https://www.starlink.com/>
- Starlink. (n.d.-b). *Recommended topics*. Retrieved August 26, 2022, from <https://support.starlink.com/?topic=4badc520-cf8e-b3aa-dd49-b731686d5bf1>
- Stricker, J. (2013). Casting a wider net: How and why state laws restricting municipal broadband networks must be modified. *George Washington Law Review*, 81, 589. <http://www.gwlr.org/wp-content/uploads/2013/03/Stricker1.pdf>
- Strover, S., Riedl, M., & Dickey, S. (2021). Scoping new policy frameworks for local and community broadband networks. *Telecommunications Policy*, 45(10), 102171. <https://doi.org/10.1016/j.telpol.2021.102171>
- Tapia, A., Maitland, C., & Stone, M. (2006). Making IT work for municipalities: Building municipal wireless networks. *Government Information Quarterly*, 23(3–4), 359–380. <https://doi.org/10.1016/j.giq.2006.08.004>
- Tapia, A. H., Powell, A., & Ortiz, J. A. (2009). Reforming policy to promote local broadband networks. *Journal of Communication Inquiry*, 33(4), 354–375. <https://doi.org/10.1177/0196859909340799>
- Taxpayers Protection Alliance. (2020). *GON with the wind: The failed promise of government owned networks across America*. <http://munibroadbandfailures.org/wp-content/uploads/2020/05/Broadband-Report-May-2020.pdf>
- Texas Comptroller. (n.d.-a). *Broadband development office: Funding resources*. Retrieved August 1, 2022, from <https://comptroller.texas.gov/programs/broadband/funding/>
- Texas Comptroller. (n.d.-b). *LoanSTAR revolving loan program*. Retrieved November 4, 2022, from <https://comptroller.texas.gov/programs/seco/funding/loanstar/>
- Texas Comptroller. (2022). *Texas broadband plan*. <https://comptroller.texas.gov/programs/broadband/plan.php>

- Texas Parks and Wildlife. (n.d.). *Wildscapes: Plant guidance by ecoregion: East Texas Pineywoods*. Retrieved August 29, 2022, from https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/wildscapes/ecoregions/ecoregion_1.phtml
- Thompson, H. G., & Garbacz, C. (2007). Mobile, fixed-line and Internet service effects on global productive efficiency. *Information Economics and Policy*, 19(2), 189–214. <https://doi.org/10.1016/j.infoecopol.2007.03.002>
- Tracy, R., & DeBarros, A. (2022, June 15). Why rural Americans keep waiting for fast internet, despite billions spent. *Wall Street Journal*. <https://www.wsj.com/articles/rural-broadband-internet-fcc-11655300008>
- U.S. Census Bureau. (2020). *Presence of a computer and type of internet subscription in household*. <https://data.census.gov/cedsci/table?q=broadband%20internet%20access&tid=ACSDT5Y2020.B28002>
- U.S. Department of the Treasury. (2021). *Guidance for the coronavirus capital projects fund for states, territories, and freely associated states*. <https://home.treasury.gov/system/files/136/Capital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf>
- Velazco, C. (2022, July 19). FCC calls 25 Mbps ‘broadband’ speed. The push is on to up it to 100. *Washington Post*. <https://www.washingtonpost.com/technology/2022/07/19/fcc-broadband-new-definition-100mbps/>
- Vogels, E. (2021, August 19). *Some digital divides persist between rural, urban, and suburban America*. Pew Research Center. <https://www.pewresearch.org/fact-tank/2021/08/19/some-digital-divides-persist-between-rural-urban-and-suburban-america/>
- Vogels, E., Perrin, A., Rainie, L., & Anderson, M. (2020, April 30). *53% of Americans say the internet has been essential during the COVID-19 outbreak*. Pew Research Center. <https://www.pewresearch.org/internet/2020/04/30/53-of-americans-say-the-internet-has-been-essential-during-the-covid-19-outbreak/>
- Whitacre, B., Gallardo, R., & Strover, S. (2014). Broadband’s contribution to economic growth in rural areas: Moving towards a causal relationship. *Telecommunications Policy*, 38(11), 1011–1023. <https://doi.org/10.1016/j.telpol.2014.05.005>
- White House. (2011). *President Barack Obama’s State of the Union address*. <https://obamawhitehouse.archives.gov/photos-and-video/video/2011/01/26/2011-state-union-address-enhanced-version#transcript>
- White House. (2021). *White House releases updated state fact sheets highlighting the impact of the Infrastructure Investment and Jobs Act nationwide*. <https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/04/white-house-releases-state-fact-sheets-highlighting-the-impact-of-the-infrastructure-investment-and-jobs-act-nationwide/>
- Whiting, Z., & Dunmoyer, D. (2022, June 29). *Testimony to the Texas Senate Business & Commerce Committee: Broadband and telecommunications*. Texas Public Policy Foundation. <https://www.texaspolicy.com/testimony-to-the-texas-senate-business-commerce-committee-broadband-and-telecommunications/>
- Wideman, Alex. (2022, July 21). *Starlink in Canada – Review of Cost, Speeds, & Coverage*. Cansumer. <https://cansumer.ca/starlink-canada/>
- Yoo, C., & Pfenninger, T. (2017). *Municipal fiber in the United States: An empirical assessment of financial performance*. Penn Law Center for Technology, Innovation, and Competition. <https://www.law.upenn.edu/live/files/6611-report-municipal-fiber-in-the-united-states-an>

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