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# Unleashing Community Networks: Innovative Licensing Approaches

Internet Society

# Table of contents

# Introduction

The Internet Society (ISOC) aims to make the Internet available for everyone, everywhere.[1] ISOC works with industry, government, academia, and other organizations worldwide to support innovation and growth of the open Internet. For over 25 years, ISOC has helped to connect individuals in virtually every country to the Internet. Part of our mission includes highlighting key policy issues related to connectivity. This "Policy Brief" is part of a series of briefs related to our Community Network campaign — one of our four Strategic Campaign Objectives for 2018,[2] and it complements our "Policy Brief: Spectrum Approaches for Community Networks."[3]

After more than 25 years of Internet development, there still remains a profound connectivity "gap" in many parts of the world, particularly in developing nations, leaving over half the global population without Internet access[4]—3.58 billion people currently have Internet access.[5] This connectivity "gap" exists in urban, rural, and remote unserved and underserved areas of many countries, particularly developing and least-developed countries.[6]

The consequences of being unconnected are well documented.[7] Internet access enables socio-economic development, and those without access are left behind, facing tremendous competitive and economic disadvantage. Better connectivity and the exchange of information strengthens democratic processes, spurs economic growth, and enables sharing of culture and ideas in ways previously unimaginable. Accordingly, the United Nations seeks, as part of its Sustainable Development Goals (SDGs), to "significantly increase access to information and communications technology" and "strive to provide universal and affordable access to the Internet in least developed countries by 2020."[8]

As we note above, this paper aims to build on our "Spectrum Paper," and to focus specifically on innovative licensing options for community networks. Networks that have developed due to work by stakeholders around the globe and innovative policy-makers and regulators taking action to support complementary ways to connect the underserved. Community networks are working with policymakers and regulators who, in turn, are enabling communities to connect via community-built networks—networks developed by local communities, with local communities, for local communities. Through common sense regulatory and policy change and dialogue with community network advocates, government can unleash the potential of community networks and allow unserved and underserved areas to realize the transformative benefits of having access to affordable connectivity.

# Key Considerations

## What is a Community Network?

Community networks refer to telecommunications infrastructure deployed and operated by a local group to meet their own communication needs.[9] They are the result of people working together, combining their resources, organizing their efforts, and connecting themselves to close connectivity and cultural gaps.[10]

Unlike the traditional, "top-down" commercial approach, community networks originate from the ground up. Deployment starts from the end user or the "last mile." Some community networks are self-contained within a community, and others aim or build out to connect with an Internet gateway via backhaul networks. Community networks are fundamentally different from traditional communications networks as they are bottom-up. They are complementary to commercial networks, filling gaps and providing local access where commercial networks generally do not find it economically viable to operate.

Several hundred community networks exist in unserved and underserved areas worldwide.[11] They may be built and managed by individuals, local nongovernmental organizations, private sector entities, and/or government bodies, and they usually operate on a cost-recovery basis. Community networks are often small in scope and typically serve communities of under 3,000 residents. However, some networks can serve multiple neighbouring communities.[12]

## Why are Community Networks Important?

Economic and social benefits can be brought to communities worldwide to reduce the "digital divide."[13] Access to connectivity is a key factor driving opportunity and success in today's global economy. Benefits include access to electronic commerce and telehealth services, distance learning, social and political engagement, government services and public safety information, and much more. They also bring connectivity to those otherwise excluded because of geography, topography, size, or income level, and enable local development, lead to local business development, and encourage civic participation. Additionally, they help keep profits local—generally reinvesting any proceeds in the local community and its network. Community networks also empower people and encourage civic participation.[14] A by-product of this local connectivity is the strengthening of user-centric connectivity, empowering local communities. [15]

# Challenges and Guiding Principles

**Policymakers are urged to consider the benefits of community networks and reduce or eliminate barriers to community network development.** Doing so may help Governments achieve important universal connectivity goals. Community networks face a myriad of challenges: lack of affordable access to backbone infrastructure, barriers to entry (e.g., business and/or service licensing, regulatory fees and taxes, spectrum access), high deployment costs, and limited funding, including difficulty in obtaining universal service funding, among others.

This policy paper explores these challenges in detail below and offers guidance and real-world solutions for addressing these barriers. This paper first discusses barriers that hinder efforts to begin constructing networks at the outset. Next, this paper highlights the importance of spectrum availability and suggests innovative policy solutions to ensure access for community networks. Policymakers should look to these examples when considering how community networks can allow the unconnected to connect.

## Start-up Barriers Can End Community Network Ventures Before They Begin

Common start-up and organization costs can be detrimental to community network ventures. Unlike for-profit, commercial entities, community networks often lack the resources and wherewithal to navigate complex legal requirements and associated costs.

- **Registration, Licensing, Permitting, and Compliance.** Many countries require operators to register their business and subsequently apply for a license to provide service. Operators often must also obtain permits and other authorizations before constructing their network.

These often require operators to file applications (and pay application fees) with multiple agencies. The applications are often difficult for the layperson to complete. Furthermore, application requirements, though well-intentioned, may inadvertently disqualify community networks. For example, some jurisdictions require applicants to satisfy a minimum net worth requirement to demonstrate their ability to deploy the network. India, in some instances, has required applicants to demonstrate a net worth of at least Rs 100 crore ($15.4 million) to participate in spectrum auctions.[16] Others require collateral, which many community networks are not able to supply as they start-up. [more information can be found on the resources section Matthew Rantanen.]

Once completed, processing times can take months or even years—time these communities remain without service. Compliance requirements, including onerous reporting obligations, can further hinder community network initiatives. Complying with these requirements may detract from limited time and resources needed to get nascent community-built networks off the ground.

- **Taxes, Regulatory/Licensing, and Import Fees.** Countries often lack access to telecommunications equipment and end-user devices, especially equipment and devices built to withstand extreme heat and cold, tropical and dust storms, and other weather conditions. Equipment is therefore often imported from abroad. This can be expensive and subject to high duties, taxes, and customs fees.

Regulators frequently assess application fees, entry fees, and licensing fees to spectrum holders. These fees often prevent communities—many serving fewer than 3,000 end users—from obtaining spectrum. Fixed fees, as opposed to variable, income-based fees, can be particularly cost-prohibitive for community network operators.

- **Financing.** Deploying, maintaining, and operating a community network can be costly, especially for very poor and rural communities in developing nations. For some, it is a choice between investing in a community network or other necessities like food or healthcare. For others, obtaining much needed capital is difficult as they are just starting out or their communities are not able to put up land or assets, particularly in indigenous communities as noted above.

Community network operators need initial capital to procure equipment and other resources to develop the underlying infrastructure. These communities often lack access to an electric grid or other reliable power source and must therefore invest in developing a power infrastructure.[17] Power costs can account for more than 70 percent of capital expenses.[18] Backhaul costs—namely the costs of connecting the community network to the network core—are also high.[19]

In addition to private grant programs, some communities are keen to procure universal service program funds to help defray start-up and other maintenance costs. Yet, many countries do not offer any financial support in general, nor do their universal service programs accommodate community or local-access networks. For those countries that do accommodate them, universal service funds are often difficult to obtain or the funds seem to be frozen. In African countries Benin, Kenya, Rwanda, Togo, and Uganda, for example, an estimated $59 billion remains unused or has been diverted for other purposes.[20] In South Africa, an operator must be licensed in order to be eligible for Universal Service and Access Fund (USAF) funding.[21] India has only used 30 percent of fees collected for its universal service fund since establishing the fund in 2003.[22] Without more flexible universal service or other financial support, many community networks take longer to develop or never come to fruition.

## Governments Can Ease or Eliminate These Barriers through Common Sense Reforms

Opportunities abound for policymakers and thought leaders to alleviate many of these burdens, which are often costly, unnecessary, and contrary to the public interest. Community networks are only successful if connectivity is not only available, but also affordable. Governments should therefore consider the following reforms:

- **Easing Regulatory Requirements.** The existing regulatory landscape—developed for large, for-profit telecommunications companies—does not work well in the community network context. Governments should consider creating enabling regulations and polices to specifically address not-for-profit operators and small-scale operators.

Countries should streamline onerous regulatory requirements, such as annual reporting requirements and other unduly burdensome requirements designed to address market dominance by larger, commercial providers.

Governments should promote infrastructure sharing and access to rights of way policies that allow smaller networks to share infrastructure and build out infrastructure in a more cost-effective manner.

- **Tax and Fee Exemptions.** Governments should similarly consider exempting community networks from various tax, regulatory and licensing, and import fee requirements as they get started, and consider reduced fees as they develop and based on their operational model. Such fees are difficult for small, non-profit community network operators to afford and can delay or prevent their development. If an exemption is not possible, governments should consider a reduced fee as these networks are start-up or will never have the imbedded assets that many traditional operators have.

- **Enhanced Transparency.** Regulators can greatly assist community networks by providing clear guidance on the specific policies and regulatory requirements (and exemptions) for community networks. This information is often not easily accessible, especially for communities without Internet access, or not widely known.

- **Expanding Universal Service and Other Public Funding Opportunities.** Countries without a universal service program should consider creating one or create funds to support innovative connectivity projects. For example, even though underutilized, India's universal service program has helped provide more than 2.6 million broadband connections in rural and remote areas. In Malaysia, the universal service program has helped to raise the broadband penetration rate from 20% to over 53% in three years.[23]

In addition to universal service, governments should also consider identifying additional funding opportunities specifically for community networks. This could entail a separate grant program, support for public-private partnerships, or low-interest loan opportunities. For example, a new report from the Alliance for Affordable Internet (A4AI) and the Web Foundation, suggests ways for multi-lateral lending institutions to help bridge the inclusion "gap" and to look at ways to free-up additional resources.[24]

For example, the United States Community Connect Program provides grants to help fund community broadband deployment in rural areas where it is not yet economically viable for private sector providers to deliver service. Rural areas lacking access to broadband speeds of at least 4 Mbps downstream and 1 Mbps upstream are eligible to apply.[25]

As another example, the European Union (EU) has set aside €120 million to provide free wireless Internet connections by 2020 to up to 8,000 municipalities in the EU in areas with no Internet coverage.[26] Canada's "Connect to Innovate" program will invest $500 million to connect 300 rural and remote communities by 2021.[27]

## Access to Spectrum is Another Challenge for Community Networks

In addition to the general entry barriers identified above, communities often face difficulties identifying and accessing spectrum necessary to support their networks. Common barriers include spectrum scarcity, inefficient use of spectrum, and expense of spectrum access.

- **Spectrum Scarcity.** The scarcity—or perceived scarcity—of spectrum and high-demand can deter policymakers from allocating spectrum for community networks. Although spectrum is considered a finite resource, technologies have evolved that make previously unusable spectrum attractive to operators. Many experts would encourage policymakers to focus on efficiently managing this public resource, rather than on its limits.

- **Inefficient Use of Spectrum.** The traditional regulatory approach to spectrum licensing has been to authorize broad licenses on an exclusive basis. Exclusive-use, as opposed to shared-use, licenses vest one licensee with exclusive access to an assigned swath of spectrum. Many licenses cover broad geographic areas, even if the service provider lacks the economic incentive to deploy its network throughout the entire licensed area. This type of licensing can result in lack of coverage in some areas and decreased competition in others.[28]

- **Expense of Spectrum Access.** Spectrum access can come at a high cost, especially where regulators auction spectrum rights to the highest bidder or impose high license fees. These are forms of market gatekeeping. Because of the sizable investments commercial operators make, they frequently demand exclusive use of the spectrum. Although it can be tempting to view spectrum auctions as an opportunity to generate revenue, Governments should focus on putting spectrum to its highest and best use, and to consider setting aside spectrum for community and/or local access networks at a reduced cost. Doing so ensures long-term benefits for end users and serves the public interest.

## Innovative Licensing Models Can Help Community Networks Access Spectrum

Spectrum access is essential for the success of any community network. The types of networks and technologies employed vary. Some networks are Wi-Fi, Global System for Mobile Communications (GSM) 2G networks, or may be based on Television White Space (TVWS) technologies. They can connect to the Internet core using a variety of backhaul technologies, including wireless, satellite, or fibre.

> Community Networks require access to spectrum to operate. Ensuring adequate spectrum enables communities to reap the social and economic benefits of information and communications technologies.

Policymakers can facilitate community access to spectrum through innovative licensing solutions, such as social-purpose licensing, license exemptions, unlicensed or “license free” use, secondary use and dynamic spectrum sharing, and secondary market transactions. In each approach, regulators should pursue technology neutral policies to provide communities ample flexibility to develop networks tailored to serve their unique needs.

# Licensing Approaches

## Social Purpose Licensing

One example of innovative licensing is a "social purpose" license. This is a license granted in rural unserved or underserved areas to non-traditional network operators, such as community network operators. By setting aside spectrum for non-traditional operators, regulators can remove the competitive barriers to spectrum access and prioritize spectrum for social-use purposes. Although a relatively new form of spectrum management, social purpose licensing has proven to be tremendously successful in launching community networks.

Mexico is at the forefront of innovative, social purpose licensing. In 2015, the Mexican communications regulator, Instituto Federal de Telecomunicaciones (IFT), amended its frequency plan to set aside 2 x 5 megahertz of spectrum in the 800 MHz band for "social" use.[29] To qualify for a social-use license, applicants must demonstrate that the spectrum would be used to service communities of 2,500 people or less, or communities located in a designated indigenous region or priority zone.

IFT's bold reforms have already resulted in new community networks and concessions being granted. Non-profit organization Rhizomatica, for example, relies on social purpose licensing to develop community networks in indigenous regions around Oaxaca, Mexico—areas that have typically garnered little interest from incumbent operators.[30]

## Experimental Licensing

Experimental licenses are another way to provide communities direct access to spectrum. Experimental licenses authorize the licensee to test and develop new technologies and services, while protecting incumbent services against harmful interference. Before setting aside spectrum for social use, Mexico's IFT awarded experimental licenses to organizations like Rhizomatica for community networks.[31]

India has also issued experimental licenses for community network projects. In 2016, for example, the Indian government issued eight experimental licenses in the 470-582 MHz band to carry out experiments of Television White Space-type rules and regulations.[32] These licenses enabled the Dynamic Spectrum Alliance (DSA) to study whether spectrum below 1 GHz could be authorized on an unlicensed or lightly-licensed framework in India, as it is in Malawi, Ghana, Singapore, the Philippines, the United Kingdom, and elsewhere. Former DSA Executive Director Professor H Sama Nwana observed that "[t]he 470-582 MHz band will be key to bridging the digital divide in India, a country with more than 800 million people who are not connected to the Internet, 68% of which are living in rural areas."[33]

Experimental licenses are generally temporary. Many community networks find that experimental licenses help them establish their operations, but they also run the risk of the experimental license taking considerable time to be transformed into a more permanent license. Longer term licensing solutions would be optimal—like the social-purpose licenses issued by Mexico as noted above.

### Spectrum Auction Credits

Governments may also adopt reforms that reduce or eliminate barriers to communities seeking access to licensed spectrum. For countries that license spectrum via auction, policymakers should consider providing auction bidding credits for community networks with adequate safeguards to prevent abuse.

To encourage marketplace competition, for example, the United States routinely awards bidding credits to small businesses, rural telephone companies, and businesses owned by members of minority groups and women to participate in spectrum auctions.[34] In the 2017 600 MHz Broadcast Incentive Auction, for example, the U.S. Federal Communications Commission provided a 15% bidding credit to rural service providers. Over 50 rural carriers participated in the auction and, saving nearly $18 million in credits, secured low-band spectrum for rural networks.[35] Without these credits, these businesses would find it much harder—if not impossible—to compete for spectrum with commercial operators.

The agency also awarded bidding credits in the 600 MHz Broadcast Incentive Auction to telecommunications providers that will deploy facilities and provide service to tribal areas.[36] The credit amount, which is determined based on the number of square kilometres of tribal lands being served within the license area and the gross bid amount, was awarded in addition to any other credits the bidder may qualify for. This approach—intended to encourage carriers to provide access to affordable, quality service to those living in tribal areas—provides a useful model for awarding bidding credits to those seeking to deploy community networks.

## License Exemptions and Unlicensed Use Approaches

As an alternative to social purpose licensing, regulators can **exempt social purpose users** from licensing requirements or permit social purpose services in designated **unlicensed spectrum.**

### License Exemptions

Brazil has eliminated licensing requirements for providers with fewer than 5,000 users.[37] Eligible "Private Limited Service" providers must notify the government of their intent to provide service and comply with certain equipment authorization rules. However, they are not required to obtain a service license. In Nigeria, private use of Wi-Fi spectrum is exempt from licensing fees and requirements, but commercial use is not.[38] In South Africa, operations in the 5725-5875 MHz Industrial, Scientific and Medical Apparatus band are exempted for all uses.[39] These and similar approaches could work in other countries as well—freeing small community networks to operate on a largely unrestricted basis subject to reasonable protections for incumbent operators.

### Unlicensed Spectrum

Separate from license exemptions, which release specific operators or services from otherwise applicable licensing rules, **unlicensed spectrum** is spectrum available for use without a license or license exemption. Users may operate in this spectrum with minimal regulatory requirements and without the need to pay the high costs of obtaining a spectrum license, subject to power limits and other conditions intended to mitigate interference to other services. Unlicensed users generally lack exclusive use of the spectrum and may be subject to interference from other users of the spectrum.

Countries across the globe are continuing to examine appropriate use cases for license exemptions and unlicensed use. Spectrum in the 5-6 GHz range was allocated for unlicensed use during the 2003 International Telecommunication Union World Radio-Communication (ITU WRC)

Conference.[40] The United States, United Kingdom, and Canada, among others, have since taken steps to authorize these frequencies on an unlicensed basis.[41] Many African counties also offer 5 GHz spectrum on an unlicensed basis, including Namibia, Ethiopia, and Kenya.[42]

The European Commission has proposed that its member states identify spectrum in the 2.4 GHz and 5 GHz bands for unlicensed use, which resulted in an increase of Wi-Fi spectrum in most EU-member states.[43] The European Commission further recommended allocating the 433-434 MHz band for unlicensed use, as did Australia, Malaysia, New Zealand, and Singapore.[44] China has expanded unlicensed use to include the 5150-5250 GHz and 5250-5350 GHz bands.[45] Several countries are also using the 900 MHz band for unlicensed use, including Argentina, Brazil, Canada, Chile, Mexico, and the United States.[46]

In India, the Supreme Court held that spectrum could be allocated on a license-exempt or unlicensed basis as long as the policy is "backed by a social or welfare purpose," such as using connectivity to increase social and economic inclusion.[47] Organizations like the Digital Empowerment Foundation (DEF) have since established wireless community networks using unlicensed spectrum in the 2.4 GHz and 5.8 GHz bands in remote areas in the Indian states of Madhya Pradesh, Meghalaya, Assam, Rajasthan and Uttarakhand.[48] DEF's Wireless for Communities (W4C) program has helped to build over 100 wireless mesh networks in rural and remote communities across India, connecting more than 4,000 people.[49]

Wi-Fi access technologies in unlicensed spectrum bands have also helped to connect communities in other parts of the world. In South Africa, for example, non-profit initiatives Zenzeleni and Project Isizwe use Wi-Fi to deliver affordable broadband access in unserved and underserved areas.[50] The world's largest Community Network, Spain-based guifi.net, serves more than 50,000 users using predominately Wi-Fi service.[51]

Unlicensed spectrum can also be used to support non-Wi-Fi-based technologies. In 2013, the Netherlands allocated 5 megahertz of spectrum in the 1800 MHz band for unlicensed GSM operations using low-power, femtocell base stations. Within three years, over 3,000 organizations established their own private GSM networks, and the government freed up additional spectrum for such use.[52]

To provide maximum flexibility for community network operators, unlicensed spectrum opportunities must be technology neutral. Unlicensed spectrum is often synonymous with Wi-Fi spectrum, but some regulators are considering "how" and "whether" to allow unlicensed GSM, TVWS, and accompanying technologies and services. Policymakers should therefore pursue a technology neutral approach to unlicensed spectrum and think strategically about new and innovative technologies and services, including open-source equipment and systems.

## Secondary Use and Dynamic Spectrum Sharing Approaches

### Secondary Use

Advancements in spectrum sharing allow for more efficient use of spectrum and create greater opportunities for community access networks, which could operate on a secondary basis in already-licensed spectrum to connect unserved or underserved areas.

In 2002, the United States initiated a proceeding to permit unlicensed devices to operate in unused spectrum between television channels—known as television white spaces (TVWS)—on a

secondary basis.[53] In addition to providing separation needed to prevent interference between co-frequency or adjacent television channel operations, this ultra-high frequency spectrum can simultaneously support certain broadband operations. TVWS initiatives have started to appear around the world.

Microsoft has backed numerous TVWS initiatives, including Citizen Connect in Namibia[54] and Project Kgolagano,[55] which have successfully connected large portions of northern Namibia and Botswana respectively. Similarly, Google supported the Cape Town TVWS Trial in South Africa in 2013, which utilized a database that calculated channel availability to avoid harmful interference.[56]

In Malawi, the regulator partnered with a university to conduct a TVWS trial, connecting hospitals and schools in rural areas where there is limited or no broadband service available through commercial operators.[57] And in Mesetas, Colombia, TVWS technology has helped to connect five farms and two educational institutions.[58]

### Database-Driven, Dynamic Spectrum Sharing

Some countries are exploring increasingly innovative ways to share spectrum, known as "dynamic spectrum sharing." In the 3550-3650 MHz band, the United States has adopted a new Citizens Band Radio Service (CBRS), in which 150 megahertz of spectrum currently occupied by incumbent users—in this case the U.S. Department of Defense and commercial Fixed Satellite Service—is shared on a secondary and tertiary basis with priority access and general access users through a Spectrum Access System.[59] Using automated techniques, the Spectrum Access System will facilitate the coexistence of disparate systems that would otherwise require separate bands to avoid interference. The European Union is examining a similar proposal for licensed, shared access in the 2.3 GHz band.[60]

Modern technologies, such as orthogonal frequency-division multiple access, spread spectrum, frequency hopping, beam division multiple access, fixed-mobile convergence, ultra-wide band, and software-defined radio technologies further facilitate spectrum sharing. But, complex spectrum access systems are not necessary to leverage the benefits of dynamic spectrum sharing. Mobile handsets exist today that can identify spectrum activity and automatically select unused spectrum.[61]

Policy makers should allow and create incentives for spectrum sharing by supporting spectrum sharing research and testing of new devices and services. Regulators should also ensure that each spectrum user's rights and obligations are clearly defined, and that multiple uses of the spectrum are compatible.

# Secondary Markets

Policymakers, in addition to providing direct access to spectrum for community networks, should facilitate indirect access through secondary market transactions. Secondary market transactions increase the efficiency of spectrum usage, and by adopting policies that support secondary market transactions, governments can enable spectrum leases and other arrangements that place spectrum in the hands of communities.

Incumbent service providers often lack the economic incentive to build out their networks in rural communities and those located in mountainous and other geographically challenging regions. These communities are therefore often left unserved. Network operators, however, might be willing to share their licensed spectrum with community networks through a lease or other secondary market agreement. In Rwanda, for example, wholesale service provider Vanu Rwanda was assigned spectrum and works with companies like Airtel Rwanda and are committed to serving rural areas. For example, Vanu Rwanda intends to establish a total of 376 sites, reaching approximately one million unserved Rwandans.[62]

Flexible licensing policies can also allow for community-based networks to partner with incumbent operators to provide service for profit. Open Cellular, which is owned by Facebook, is partnering with existing operators to develop community cellular networks in Pakistan, Indonesia, Iraq, and The Philippines,[63] and is providing free equipment to some projects through a new grant programme. Experience has shown that many incumbent service providers, despite investing heavily in network deployment, find it challenging to build out last mile connections in certain rural and low-density communities. By working in partnership, community networks and service providers together can bridge the digital divide.

Regulators should consider developing incentives to encourage incumbent licensees to allow low-cost, secondary market access to community operators. Regulators could, for example, credit licensees for the deployment of the lessees. In other words, if the regulator imposes geographic or population coverage milestones on the incumbent licensee, it could credit the licensee for the community network coverage enabled by the sharing of spectrum.

# Conclusion

**Policymakers and regulators can help reach the next 1 billion unconnected through innovative changes and through community network initiatives, helping to close the digital divide.** To unleash the full potential community networks, policymakers should consider innovative ways to license Community Networks and provide meaningful access to spectrum. This includes:

- **Streamline or Eliminate Onerous Regulatory Requirements,** especially those that are not applicable to small, community-based networks.
- **Provide Tax, Customs, Regulatory, and Licensing Fee Exemptions.** These fees and duties are difficult for community network operators to afford and can delay or prevent their development.
- **Enhance Transparency.** Regulators should provide clear, public guidance on the specific policies and regulatory requirements (and exemptions) for community networks.
- **Expand Universal Service and Other Public Funding Opportunities** and publicize that Community Networks are eligible for funding. Work with micro-finance and International Funding Institutions (IFIs) to examine innovative funding options.
- Pursue Innovative Approaches to Providing Spectrum Access, such as:
    - **Direct Licensing of community networks,** including social purpose licensing, experimental licensing, and providing spectrum auction credits;
    - License Exemptions and Unlicensed Use;
    - Secondary Use and Dynamic Spectrum Sharing; and
    - Secondary Market Transactions.

# Additional Resources

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Matthew Rantanen on U.S. Native American communities and funding issues for some indigenous communities: some tribal residents may not borrow money from banks to build homes due to concerns about removing homes from tribal communities. Some tribes have focused on economic development projects and are looking at creative financing options, including working with banks on creative solutions or creating tribal banks. For example, the Viejas Band of Kumeyaay Indians have purchased and own the Borrego Springs National Bank. Money can be loaned to their tribal members and the repossession and recovery belongs to the tribe so it never leaves sovereign control. The Pala Band of Mission Indians partnered with Wells Fargo, with a branch of the bank in their tribal offices.

# Endnotes

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