Regulatory Analysis For Non-Public Networks (NPNs)

IN THE 1800 MHZ AND THE 3.6-4.2 GHZ BANDS IN KENYA

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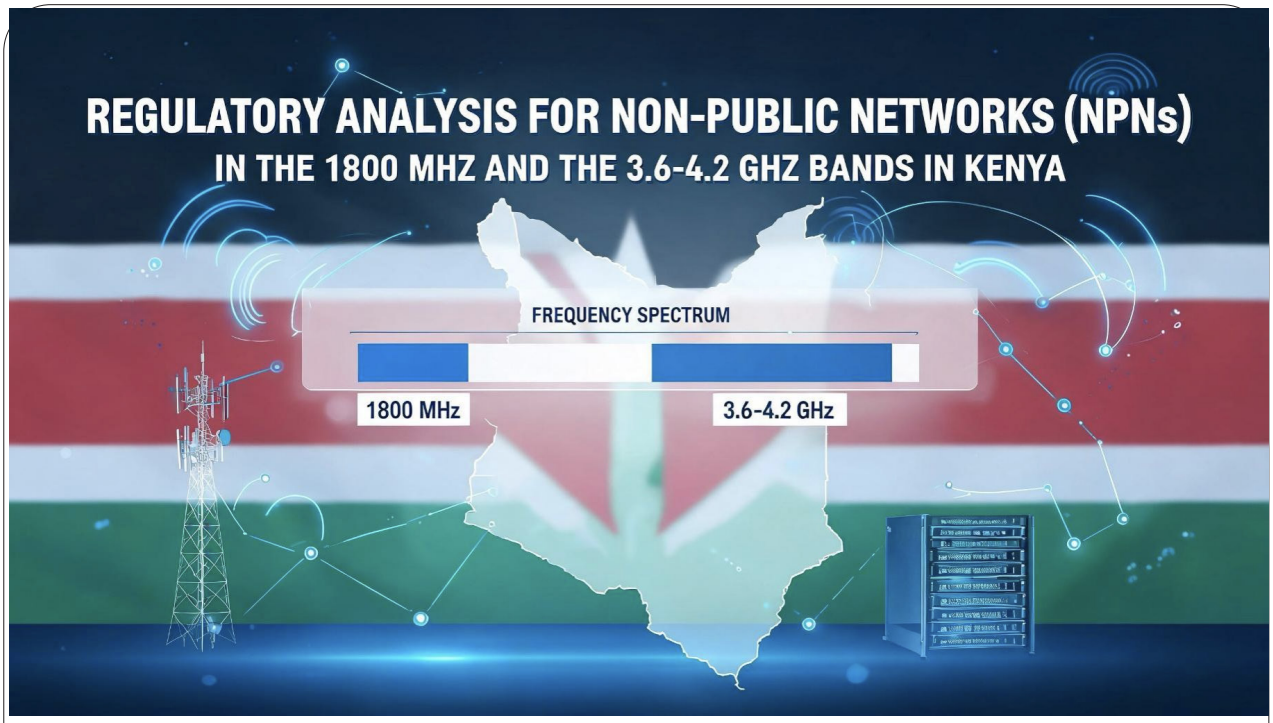

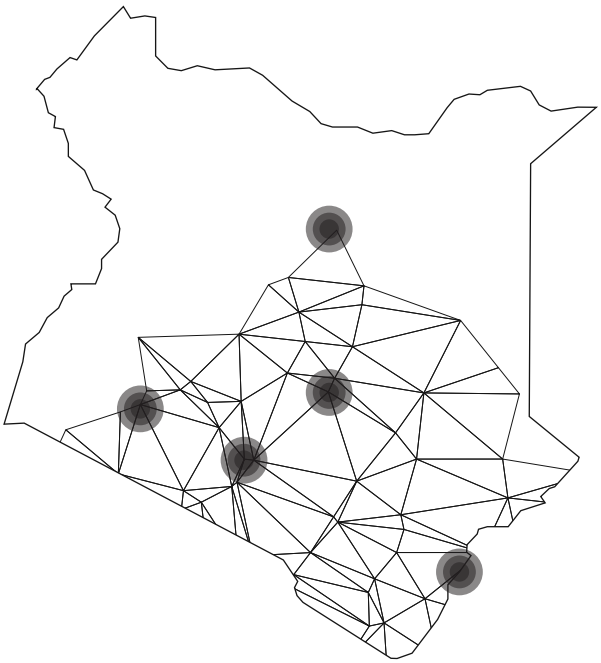

FREQUENCY SPECTRUM

1800 MHz **3.6-4.2 GHz**

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Executive Summary

The rapid advancement of digital transformation in Kenya has significantly increased the demand for secure, reliable, and high-quality broadband connectivity, particularly for industrial automation, emerging Industry 4.0 applications, and community-centered connectivity initiatives. Non-Public Networks (NPNs)—encompassing Private LTE and Private 5G networks—have emerged as pivotal enablers for enterprise digitalisation, research, innovation, and the extension of digital services in specialised and underserved environments.

Despite progress by Mobile Network Operators (MNOs) in expanding broadband coverage, connectivity gaps remain, especially in rural and industrial sectors where public mobile networks cannot always meet specific operational, security, or performance requirements. The growing adoption of digital technologies across sectors such as agriculture, healthcare, education, manufacturing, and logistics further accentuates the need for tailored wireless solutions.

This Regulatory Analysis Report evaluates international best practices and regulatory frameworks for NPNs, with a focus on the 1800 MHz and 3.6–4.2 GHz bands. Developed alongside technical assessments, benchmarking and GIS-based studies in Kajiado County, the report identifies potential regulatory options for authorising NPNs in Kenya, cognizant of the priority requirement of protecting the incumbent users.

The findings from the analysis determine that various regulatory regimes have adopted different spectrum management models—ranging from exclusive and local licensing to dynamic spectrum access—to enable private wireless networks. Examples such as the United Kingdom's Shared Access Licence framework, Germany's local licensing for private 5G, the United States' Citizens Broadband Radio Service (CBRS), and hybrid approaches in Brazil, showcase flexible regulatory mechanisms that balance efficient spectrum use with incumbent protection. Japan and South Korea exemplify models where dedicated spectrum is allocated for enterprise and local 5G networks under localised licensing.

Based on these experiences and the context derived from the technical and GIS assessment work, three policy options for enabling NPNs in Kenya emerge: 1. Band-Specific Shared Local Access (SLA) Framework: Allows opportunistic secondary access to underutilised spectrum in the 1800 MHz (for private LTE) and 3.6–4.2 GHz (for private 5G) bands, subject to technical safeguards for incumbent protection; 2. Band-Specific Local Licensing: issues geographically limited exclusive licenses, providing certainty but less flexibility where spectrum availability is variable; 3. Band-Specific Spectrum Leasing: Enables spectrum leasing from MNOs to eligible organisations, though access depends on commercial agreements.

Our comprehensive analysis identifies the Shared Local Access (SLA) Framework as the preferred regulatory approach for enabling Non-Public Networks (NPNs) in Kenya. This model is well-suited to Kenya's spectrum landscape and supports the country's digital transformation ambitions. Under the SLA Framework, the Communications Authority of Kenya (CA) will authorise eligible organisations to access underutilised spectrum within clearly defined geographic areas. Access will be governed by robust technical and operational conditions, ensuring the continued protection of incumbent users. Central to this approach is the establishment of an SLA Repository for effective spectrum management, alongside the deployment of an NPN Finder tool to streamline coordination, facilitate deployment, and enhance transparency

Introduction

The increasing demand for broadband connectivity, industrial automation, digital public services, and emerging Industry 4.0 applications is creating new requirements for access to radio frequency spectrum worldwide.

Non-Public Networks (NPNs) have emerged as important enablers of enterprise digitalization, industrial automation, research and innovation, and community-centered connectivity initiatives. These networks provide organizations with secure, reliable, and dedicated wireless connectivity tailored to specific operational requirements. Consequently, regulators across the world are increasingly developing regulatory frameworks that enable enterprises, educational institutions, utilities, research organizations, and local communities to access spectrum resources for localized wireless deployments, while safeguarding incumbent users.

Significant progress has been made in expanding broadband coverage through Mobile Network Operators (MNOs). However, connectivity gaps remain in rural and underserved areas where commercial investment is often constrained by low population density and limited returns on investment. At the same time, the growing adoption of digital technologies within sectors such as agriculture, healthcare, education, manufacturing, mining, logistics, and public administration is creating increasing demand for secure and reliable wireless connectivity solutions.

This Regulatory Analysis Report examines international regulatory frameworks governing Non-Public Networks (NPNs), with particular emphasis on opportunistic spectrum access and spectrum-sharing mechanisms within the 1800 MHz band and the 3.6–4.2 GHz band. The analysis is informed by desk research, international regulatory benchmarking, and supporting technical and Geographic Information System (GIS) assessments undertaken in Kajiado County between January and May 2026.

The study evaluates developments across the three International Telecommunication Union (ITU) regions and examines how regulators have implemented spectrum sharing, local licensing, spectrum leasing, and dynamic spectrum access frameworks. Attention is given to the utilization of the 1800 MHz and 3.6–4.2 GHz bands, which present opportunities for supporting Non-Public Networks while maintaining protection of incumbent users.

The primary objective of this report is to identify spectrum-sharing approaches and regulatory models that are suitable for Kenya's spectrum management environment and capable of supporting sustainable deployment of Non-Public Networks. The findings are intended to inform the development of a regulatory framework that promotes efficient spectrum utilization, expands broadband connectivity, supports innovation, and contributes to the achievement of Kenya's national digital transformation objectives.

2

Policy Context for NPNs in Kenya

2.1 National Digital Transformation Agenda

Kenya is implementing an ambitious digital transformation agenda aimed at expanding broadband connectivity, promoting digital inclusion and improving access to digital public services. Through initiatives such as the Digital Economy Blueprint, the National Digital Master Plan 2022–2032 and the National Digital Superhighway Programme, the Government has prioritized digital infrastructure development and the adoption of digital technologies across all sectors of the economy.

The expansion of digital government and other digital services is increasing demand for reliable, secure and high-quality broadband connectivity. Although Mobile Network Operators (MNOs) have significantly expanded broadband coverage, connectivity gaps remain in rural, remote and specialized operational environments where public networks may not adequately meet specific coverage, capacity, security or performance requirements.

These developments highlight the need for complementary connectivity solutions to support specialized and localized connectivity requirements. An enabling regulatory framework for Non-Public Networks (NPNs) would promote more efficient spectrum utilization, support innovation and investment, and complement existing public mobile networks in advancing Kenya's digital transformation objectives.

2.2 Current Spectrum Environment

The Communications Authority of Kenya (CA) is responsible for the allocation, licensing, monitoring and enforcement of the radio frequency spectrum. In carrying out this mandate, the Authority seeks to promote efficient spectrum utilization, protect authorized spectrum users and support the deployment of innovative wireless technologies.

The 1800 MHz band is currently assigned primarily to Mobile Network Operators (MNOs) for the provision of nationwide public mobile services. While the band is extensively utilized in many areas, technical assessments undertaken as part of this study identified geographically underutilized spectrum that presents opportunities for opportunistic secondary access, subject to appropriate regulatory and technical safeguards to protect authorized incumbent users

The 3.6–4.2 GHz band is allocated to Fixed Satellite Services (FSS) on a primary basis and mobile services on a secondary basis. The study found that portions of this band have relatively low utilization in some geographic areas, creating opportunities for localized spectrum sharing and private 5G deployments under appropriate coexistence conditions.

These findings demonstrate that both bands have the potential to support Non-Public Networks through a band-specific spectrum access framework based on opportunistic secondary access, with the 1800 MHz band supporting private LTE deployments and the 3.6–4.2 GHz band supporting private 5G deployments, while ensuring continued protection of authorized incumbent users.

2.3

The Need for Non-Public Networks

Non-Public Networks (NPNs) herein also referred to as Private LTE and Private 5G Networks are designed to provide dedicated wireless connectivity tailored to meet the operational and service requirements of enterprises, public institutions and local communities. They complement public mobile networks by providing dedicated connectivity where public networks may not adequately meet specific coverage, capacity, security or performance requirements.

NPNs support a wide range of sectors, including manufacturing, mining, utilities, agriculture, healthcare, education, research, logistics, public administration and community-centered connectivity initiatives.

The 3rd Generation Partnership Project (3GPP) defines two deployment models for Non-Public Networks: Standalone Non-Public Networks (SNPNs) and Public Network Integrated Non-Public Networks (PNI-NPNs).

Standalone Non-Public Networks (SNPNs)

According to 3GPP, a Standalone Non-Public Network (SNPN) is a non-public network that operates independently of a Public Land Mobile Network (PLMN). It comprises its own Radio Access Network (RAN), backhaul and core network, and is managed independently to provide connectivity for a defined organisation or user group. SNPNs are well suited to organizations requiring dedicated infrastructure, enhanced security and greater operational control.

Public Network Integrated Non-Public Networks (PNI-NPNs)

The 3GPP specifications define a Public Network Integrated Non-Public Network (PNI-NPN) as a non-public network that integrates with a Public Land Mobile Network (PLMN) and uses the infrastructure and spectrum resources of a Mobile Network Operator (MNO). Connectivity is typically provided through mechanisms such as network slicing while remaining under the management of the public network. PNI-NPNs are suitable where an enterprise or institution can meet its connectivity requirements using existing public mobile infrastructure, without deploying a standalone network.

2.4

Policy Objectives for Spectrum Sharing

The introduction of spectrum-sharing mechanisms for Non-Public Networks (NPNs) seeks to achieve the following policy objectives:

- Improve the efficient utilisation of the 1800 MHz and 3.6–4.2 GHz bands.
- Enable opportunistic secondary access of the bands while protecting authorized incumbent users.
- Expand broadband connectivity in underserved and specialized operational environments.
- Support the deployment of private LTE and private 5G networks.
- Promote digital transformation, innovation and investment in local connectivity solutions.
- Contribute to Kenya's national broadband and digital transformation objectives.

Achieving these objectives requires a spectrum licensing and sharing framework that balances efficient spectrum utilization with the protection of incumbent users.

3 Spectrum Licensing, Sharing Approaches and Models

3.1 Introduction

Spectrum management defines how radio frequency spectrum is allocated, assigned and managed to support wireless communications. Traditionally, spectrum has been assigned through exclusive licensing arrangements that grant operators sole rights to use specific frequency bands within defined geographic areas. While this approach provides certainty and protects users from harmful interference, it can also result in inefficient spectrum utilization where assigned spectrum is underused.

Increasing demand for wireless connectivity and advances in spectrum management has led regulators to adopt more flexible licensing and spectrum sharing models. These approaches improve spectrum utilization by enabling additional users to access spectrum under defined technical and regulatory conditions, while ensuring the protection of authorized incumbent users.

This chapter reviews the principal spectrum licensing and sharing models adopted internationally, highlighting their key characteristics and their relevance to the deployment of Non-Public Networks (NPNs).

3.2 Spectrum Access and Licensing Models

3.2.1 Exclusive Licensing

Exclusive Licensing is a spectrum licensing model in which a regulator grants a licensee exclusive rights to use a specified frequency band within a defined service area, typically nationwide or over a large geographic region for a specified period, subject to regulatory conditions. The license holder is protected from harmful interference by other users operating in the same frequency band, provided it complies with the applicable license conditions. In return, the licensee is required to meet regulatory obligations, which may include spectrum fees, technical operating conditions, coverage requirements and quality-of-service obligations.

3.2.2 License-Exempt Access

License-Exempt Access allows users to operate wireless systems without obtaining an individual spectrum license, provided they comply with technical requirements established by the regulator. This approach is commonly applied to frequency bands such as 2.4 GHz and 5 GHz, which support technologies including Wi-Fi and Bluetooth.

Although license-exempt access encourages innovation, low-cost deployment and widespread use, users do not receive protection from interference or guarantees of service quality. Consequently, it has limited applicability for most private LTE and private 5G deployments, which typically require licensed or coordinated spectrum access.

3.2.3 Local Licensing

Local Licensing is a spectrum licensing model in which a regulator assigns spectrum rights directly to an organisation for use within a clearly defined geographic area, such as a factory, university campus, hospital, school, mine, industrial facility or local community. Unlike nationwide licensing, Local Licensing authorizes spectrum use only within the specified location, subject to defined technical and operational conditions and appropriate coexistence with incumbent users.

Local licenses typically provide exclusive or near-exclusive spectrum access within the authorized area, offering predictable network performance and protection from harmful interference. This makes the model well suited to private LTE and private 5G deployments that require dedicated spectrum resources. Germany's local licensing framework for the 3.7–3.8 GHz band is one of the best-known examples of this approach.

While Local Licensing provides a high degree of certainty and reliability, it may involve greater administrative requirements and can lead to inefficient spectrum utilization where assigned frequencies are not fully used.

3.2.4 Light Licensing

Light Licensing is a spectrum licensing model that provides access to spectrum through a simplified licensing process. It combines an individual license with predefined technical operating conditions, offering greater regulatory certainty than license-exempt access, while imposing fewer administrative requirements than traditional exclusive licensing. Depending on the regulatory framework, access may be subject to technical conditions such as power limits, geographic restrictions and frequency coordination.

Light Licensing is well suited to localized wireless deployments where exclusive nationwide spectrum rights are unnecessary but some level of regulatory oversight is required. It has been adopted in several jurisdictions to support fixed wireless systems, point-to-point links and private wireless networks, providing a balance between efficient spectrum utilization and protection of authorized users.

3.3 Spectrum Sharing Models

3.3.1 Licensed Shared Access (LSA) / Authorized Shared Access (ASA)

Licensed Shared Access (LSA), also referred to as Authorized Shared Access (ASA), is a spectrum sharing model that enables additional licensed users to access spectrum already assigned to incumbent users under predefined sharing conditions. Access is granted through individual licenses and coordinated to ensure that incumbent users retain protection while improving the utilization of underused spectrum.

LSA establishes a predictable regulatory framework by defining the conditions under which spectrum may be shared, including geographic limitations, technical operating conditions, coordination procedures and interference management requirements.

3.3.2 Shared Local Access (SLA)

Shared Local Access (SLA) is a spectrum sharing model that enables enterprises, institutions and communities to access underutilized spectrum within defined geographic areas while protecting authorized incumbent users. Rather than granting exclusive spectrum rights, the regulator authorizes localized shared access under predefined technical and operational conditions.

These conditions typically include geographic boundaries, power limits, coordination requirements, and protection zones. By enabling localized spectrum sharing, SLA improves spectrum utilization while supporting enterprise, industrial and community-centered connectivity deployments based on private LTE and private 5G.

3.3.3 Multi-Tier Spectrum Sharing

Multi-tier spectrum sharing is a dynamic spectrum access framework in which multiple categories of users share the same frequency band according to predefined priority levels. The best-known implementation is the Citizens Broadband Radio Service (CBRS) framework in the United States.

The CBRS framework comprises three tiers of users: Incumbent Access, Priority Access License (PAL) and General Authorized Access (GAA). Spectrum access is coordinated by a Spectrum Access System (SAS), which dynamically assigns spectrum, protects higher-priority users, prevents harmful interference and maximizes spectrum utilization. This model demonstrates how database-assisted spectrum management can enable efficient and dynamic spectrum sharing while safeguarding incumbent operations.

3.3.4 Spectrum Leasing

Spectrum Leasing is a regulatory mechanism that allows a spectrum licensee to permit another authorized user to access all or part of its licensed spectrum under agreed commercial and regulatory conditions. The primary licensee retains overall responsibility for complying with license obligations, while the secondary user operates in accordance with the leasing arrangement. Spectrum leasing enables more efficient utilization of underused spectrum and has been adopted in several jurisdictions to support private LTE, private 5G and enterprise networks where direct local licensing is unavailable.

Comparative Assessment of Spectrum Access Models

No single spectrum access or spectrum-sharing model is suitable for all deployment scenarios. The choice of model depends on the regulatory objectives, spectrum utilization, the need to protect authorized incumbent users, and the operational requirements of the intended deployment. Internationally, there is a growing shift towards more flexible and shared spectrum access frameworks that promote efficient spectrum utilization while supporting innovation and the deployment of new wireless services. The table below compares the different spectrum access models;

Comparison of Spectrum Access & Sharing Models

Spectrum Model	Rights	Geographic Scope	Typical Applications
Licensed Access	Exclusive license	National or regional	Public mobile networks, broadcasting, critical communications
Licence-Exempt Access	No individual Licence	Open access	Wi-Fi, Bluetooth, short-range devices
Local Licensing	Exclusive or near-exclusive local license	Localized	Industrial sites, campuses, mines, utilities
Light Licensing	Simplified individual license	Localized	Fixed wireless, private wireless networks, point-to-point links
Licensed Shared Access (LSA) / Authorised Shared Access (ASA)	Licensed shared access	National or local	Shared access between incumbents and authorised licensees
Shared Local Access (SLA)	Localized shared access	Localized	Private LTE, private 5G, enterprises, institutions and community networks
Multi-Tier Spectrum Sharing (CBRS)	Dynamic shared access	Local or regional	Private LTE/5G, enterprise networks, fixed wireless access

4

International Regulatory Benchmarking Across ITU Regions

This chapter reviews regulatory approaches adopted for Non-Public Networks (NPNs) across the three International Telecommunication Union (ITU) Regions, with particular emphasis on the 1800 MHz and 3.6–4.2 GHz bands. The review examines how different countries have implemented spectrum licensing and sharing mechanisms to support private LTE and private 5G deployments while ensuring the protection of incumbent users.

The benchmarking focuses on the regulatory approach adopted in each jurisdiction, the spectrum bands made available for NPNs, the applicable licensing or spectrum-sharing model, and the key lessons relevant to Kenya's spectrum management environment. Particular attention is given to approaches that facilitate localized and opportunistic spectrum access, as these align with the objectives of this study.

4.1 ITU Region 1

4.11 United Kingdom

The United Kingdom (UK) operates one of the most advanced spectrum-sharing frameworks globally through the Shared Access License regime administered by Ofcom under the Wireless Telegraphy Act introduced in 2019 for private networks. The framework enables opportunistic use of both the 1800 MHz and 3.6–4.2 GHz bands through localized licensing, and technical coordination mechanisms, allowing enterprises, industries, and community networks to deploy private wireless networks while protecting incumbent users.

The Shared Access Licence is the core regulatory mechanism that enables spectrum sharing in the UK for NPNs[1]. It allows enterprises, industries, and local service providers to access spectrum without purchasing nationwide spectrum licenses. Under this framework, spectrum is assigned on a first-come, first-served basis, per geographic location and subject to coordination with existing users. This means users can access the spectrum opportunistically where it is available.

This is subject to technical coordination, power limits, and interference protection of existing licensees, with licenses granted for defined locations rather than nationwide exclusivity. Ofcom performs the coordination. The licensing model is not a dynamic, three-tier, database-driven system like the U.S. CBRS, but rather an administrative, local licensing model in which spectrum is shared geographically through coordination and defined coverage boundaries. In the UK, therefore, private LTE and 5G networks are regulated through the Shared Access framework[2].

[1] https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-1-10-weeks/consultation-supporting-increased-use-of-shared-spectrum/associated-documents/shared-access-licence-guidance-document.pdf?v=416487

[2] https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-1-10-weeks/129951--enabling-opportunities-for-innovation/associated-documents/local-ac

Two types of licenses are offered under the shared access license framework.

- The low-power license authorizes users to deploy multiple base stations within a 50-metre radius, along with associated fixed, nomadic, or mobile terminals.
- The medium-power license, on the other hand, authorizes a single base station with higher transmit power.

Comprehensive guidance, including license fees, terms, and the application process, is provided in the Shared Access guidance document[3]. Issued licenses are published in Ofcom's spectrum information portal. Furthermore, an online mapping tool for spectrum availability in the 3.8-4.2 GHz band, launched in November 2024, is available to assist applicants.

4.111 1800MHz band

Within the wider 1800 MHz mobile band, Ofcom has designated a portion of spectrum (1781.7–1785 MHz paired with 1876.7–1880 MHz) for localized shared access. This spectrum is not assigned to nationwide Mobile Network Operators (MNOs), making it available for local wireless deployments under the Shared Access Licence. The available bandwidth of approximately 2 × 3.3 MHz supports private LTE networks, rural broadband services and enterprise or campus connectivity. The band is widely supported by LTE equipment, making it well suited to private LTE deployments where localized spectrum access is required.

4.112 3.6- 4.2GHz band

Prior to the introduction of the Shared Access Licence, the 3.8–4.2 GHz band was already used by Fixed Satellite Services (FSS), fixed links and fixed wireless access services. To accommodate new users while protecting these incumbent services, Ofcom adopted a coordination-based approach that enables localized access to the band under defined technical and operational conditions.

To reduce the risk of harmful interference with adjacent services, Ofcom does not generally issue Shared Access Licenses in the 3800–3805 MHz and 4195–4200 MHz portions of the band. These guard bands help protect public mobile networks operating below 3.8 GHz and radio altimeters operating above 4.2 GHz. The remaining spectrum is available for private 5G deployments, subject to technical coordination and coexistence requirements.

The UK approach demonstrates how coordinated local spectrum access can improve spectrum utilization while safeguarding incumbent users, providing a practical model for supporting Non-Public Networks.

[3] https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-1-10-weeks/consultation-supporting-increased-use-of-shared-spectrum/associated-documents/shared-access-licence-guidance-document.pdf?v=416487

4.12 Germany

Germany regulates Non-Public Networks (NPNs) through the Bundesnetzagentur (BNetzA) under the European Electronic Communications Code (EECC). The regulatory framework supports the deployment of private LTE and private 5G networks through a combination of local licensing and commercial arrangements with Mobile Network Operators (MNOs), while promoting efficient spectrum utilization and protecting incumbent users.

Germany's 1800 MHz Band

Germany does not allocate the 1800 MHz band directly for Non-Public Networks. The band is assigned primarily to Mobile Network Operators (MNOs), with private LTE deployments typically enabled through spectrum leasing arrangements or operator-managed campus networks. Consequently, access to the 1800 MHz band is commercially enabled rather than through local or opportunistic spectrum sharing.

Germany's 3.7–3.8 GHz Band

Germany has allocated 100 MHz (3700–3800 MHz) specifically for local private 5G networks. Spectrum is assigned through a local licensing framework, with licenses issued for defined geographic areas such as factories, ports, campuses, utilities and research facilities. Licence fees are determined by the assigned bandwidth, the geographic area covered and the license duration.

Germany's local licensing approach provides enterprises with dedicated spectrum for private 5G deployments while ensuring efficient spectrum management and protection of incumbent users.

4.2 ITU Region 2

4.21 United States

In the United States, private LTE and 5G networks are regulated by the Federal Communications Commission (FCC) under the Communications Act. The regulatory framework supports private LTE and private 5G deployments through a combination of spectrum leasing in licensed mobile bands and dynamic spectrum sharing under the Citizens Broadband Radio Service (CBRS) framework. This hybrid approach promotes efficient spectrum utilization while protecting incumbent users.

United States' 1800MHz band

Unlike many countries, the United States does not designate a specific 1800 MHz band for Non-Public Networks. Spectrum within the equivalent frequency range forms part of the Advanced Wireless Services (AWS) bands and is assigned primarily to Mobile Network Operators (MNOs) for commercial mobile services.

Private LTE and private 5G deployments are enabled through the FCC's spectrum leasing framework, which allows licensed operators to lease spectrum rights to third parties under the Commission's secondary market policies. As a result, access to this spectrum is commercially enabled through leasing arrangements rather than through dedicated local licensing or opportunistic spectrum sharing.

United States' 3.6-4.2 GHz

The 3.6–4.2 GHz range in the United States has historically been used for Fixed Satellite Services (FSS). Recent regulatory reforms have repurposed portions of the band for 5G mobile services, with 3.7–3.98 GHz assigned to Mobile Network Operators (MNOs) through C-band spectrum auctions, while the 3.98–4.2 GHz portion continues to support FSS operations.

Although operating in the adjacent 3.55–3.7 GHz band, the Citizens Broadband Radio Service (CBRS) has become an internationally recognized benchmark for dynamic spectrum sharing. CBRS supports private LTE and private 5G deployments through a three-tier spectrum sharing model comprising Incumbent Access, Priority Access Licence (PAL) and General Authorized Access (GAA) users, with spectrum access coordinated by a Spectrum Access System (SAS)[4].

All access is coordinated dynamically by a Spectrum Access System (SAS) to prevent interference and protect higher tiers, enabling enterprises to deploy private networks either under PAL licences or GAA authorization without exclusive nationwide spectrum. At the same time, additional private network deployments may also occur in traditional licensed bands via direct spectrum ownership or leasing from mobile operators, as well as in unlicensed bands (e.g., Wi-Fi spectrum), making the U.S. framework a hybrid system with CBRS

[4]https://www.fcc.gov/wireless/bureau-divisions/mobility-division/35-ghz-band/35-ghz-band-overview

representing the primary structured shared-access model for enterprise 5G. The SAS allocates spectrum dynamically, prevents interference, protects incumbent users and authorises device operation. Private network operators must connect their base stations to the SAS, which determines available channels in real time.

To protect incumbents and ensure coexistence, the FCC uses Dynamic frequency assignment, power limitations, geographic protection zones and real-time monitoring via SAS. These mechanisms enable opportunistic access without harmful interference.

4.22 Brazil

In Brazil, private LTE and 5G networks are regulated by the Agência Nacional de Telecomunicações (Anatel) under the General Telecommunications Law and related spectrum regulations. Brazil regulates private networks mainly under the Restricted Interest Telecommunications Service (Serviço Limitado Privado – SLP) framework. Brazil demonstrates a hybrid model combining Local enterprise spectrum licensing, Secondary spectrum access and operator-mediated spectrum sharing in the two bands of interest. This approach enables industrial private networks while protecting nationwide mobile spectrum licenses.

Brazil's 1800MHz band

The 1800 MHz band (1710–1785 MHz / 1805–1880 MHz) in Brazil is assigned primarily to Mobile Network Operators (MNOs) for the provision of public mobile services. Although the band is not dedicated to Non-Public Networks (NPNs), enterprises may deploy private LTE or private 5G networks through commercial spectrum leasing or sharing arrangements with MNOs, as well as operator-managed private network solutions.

This approach enables enterprises to utilize existing licensed spectrum for local private network deployments while maintaining the rights and responsibilities of the primary spectrum licensee and ensuring the protection of incumbent users.

Brazil's 3.6-4.2 GHz band

Brazil has made the 3.7–3.8 GHz band available to support private 5G deployments for enterprise and industrial applications. Eligible organizations may obtain authorization from Anatel to deploy private networks under the Restricted Interest Telecommunications Service (SLP) framework for their own internal communications.

Authorizations are granted for specific geographic locations and are subject to spectrum availability, technical coordination and the protection of incumbent users. Unlike the United Kingdom, Brazil does not operate a formal Shared Local Access (SLA) framework. Instead, private networks are enabled through site-specific spectrum authorizations under Anatel's regulatory framework, supporting industrial automation, utilities, logistics, mining and other enterprise connectivity applications.

4.3 ITU Region 3

Japan

Japan regulates Non-Public Networks (NPNs) through the Ministry of Internal Affairs and Communications (MIC) under the Radio Act and related regulations. In 2019, Japan introduced the Local 5G framework to enable enterprises, municipalities and other organizations to deploy self-operated private 5G networks. Unlike many countries that rely on spectrum sharing in existing mobile bands, Japan has adopted a dedicated spectrum and local licensing approach for private 5G.

Japan primarily supports NPNs through Local Licensing using dedicated spectrum rather than spectrum sharing in commercial mobile bands. Eligible organizations may obtain local licences to deploy private 5G networks within defined geographic areas such as factories, ports, campuses, hospitals, farms and smart city developments. The principal spectrum bands available for Local 5G include:

- **4.6–4.9 GHz f**or local private 5G deployments.
- **28.2–29.1 GHz** for high-capacity private 5G applications.

The 1800 MHz and 3.7–4.1 GHz bands remain assigned primarily to Mobile Network Operators (MNOs) for nationwide public mobile services and are not available for independent Local 5G deployments.

Japan's approach demonstrates a dedicated spectrum with local licensing model, providing enterprises with predictable spectrum access while avoiding coexistence challenges associated with spectrum sharing.

South Korea

South Korea regulates Non-Public Networks (NPNs) through the Ministry of Science and ICT (MSIT). The country has established one of Asia's most structured regulatory frameworks for private 5G by making dedicated spectrum available under a local licensing regime.

South Korea’s Spectrum Access and Sharing Mechanism

South Korea enables NPN deployments through local licensing using dedicated spectrum assigned specifically for private 5G. Eligible enterprises may obtain licences to deploy private networks within defined geographic areas such as manufacturing plants, ports, logistics hubs, research facilities and university campuses. The principal spectrum bands include:

- **4.72–4.82 GHz**
- **28.9–29.5 GHz**

The 1800 MHz and 3.7–4.2 GHz bands remain assigned primarily to Mobile Network Operators (MNOs) for public mobile services and are not used for independent private network licensing.

South Korea's framework therefore adopts a dedicated spectrum and local licensing approach rather than spectrum sharing in existing commercial mobile bands, supporting secure and predictable private 5G deployments for enterprise and industrial applications.

Comparative Analysis of International Regulatory Approaches

The international benchmarking demonstrates that there is no single regulatory model for enabling Non-Public Networks (NPNs). Instead, countries have adopted different spectrum access and licensing approaches based on national policy priorities, spectrum availability, existing spectrum assignments and the maturity of their telecommunications markets. Despite these differences, the regulatory frameworks share a common objective of facilitating private LTE and private 5G deployments while ensuring efficient spectrum utilization and protecting authorised incumbent users.

The review identifies diverse regulatory approaches.;

- The United Kingdom has adopted a Shared Access Licence framework that enables geographically coordinated access to underutilized spectrum.
- Germany has implemented local licensing, assigning spectrum directly to enterprises for use within defined geographic areas.
- The United States has adopted a hybrid approach, combining dynamic spectrum sharing through the Citizens Broadband Radio Service (CBRS), spectrum leasing and traditional licensed access.
- Brazil similarly applies a hybrid framework, enabling private networks through the Restricted Interest Telecommunications Service (SLP), site-specific authorisations and commercial arrangements with Mobile Network Operators (MNOs).

In contrast, Japan and South Korea have adopted a dedicated spectrum approach, assigning specific frequency bands for private 5G deployments under local licensing frameworks rather than introducing spectrum sharing within existing commercial mobile bands.

Although the regulatory mechanisms differ, several common principles emerge. All countries maintain protection of authorised incumbent users through appropriate technical and regulatory safeguards. Localized licensing or geographically defined authorizations are widely used to match spectrum access to actual deployment requirements, while technology-neutral licensing enables the deployment of both private LTE and private 5G networks. Increasingly, regulators are moving towards more flexible spectrum management approaches that improve spectrum utilization without compromising interference protection or service quality.

The benchmarking also reveals distinct regional approaches. Countries in ITU Region 1 generally favor shared spectrum access and local licensing to improve utilization of existing spectrum resources. ITU Region 2 adopts hybrid models that combine spectrum sharing, commercial leasing and dynamic spectrum management. In

contrast, the countries reviewed in ITU Region 3 primarily support Non-Public Networks through dedicated spectrum allocated specifically for private 5G, rather than by introducing spectrum sharing within existing commercial mobile bands.

In conclusion, the international experience demonstrates that there is no universally applicable regulatory model for Non-Public Networks. Instead, regulators have adopted approaches that reflect their national spectrum environments and policy objectives. For Kenya, the experiences of the United Kingdom, Germany, the United States and Brazil provide particularly relevant lessons for enabling opportunistic and localized access to the 1800 MHz and 3.6–4.2 GHz bands, while the approaches adopted by Japan and South Korea illustrate an alternative model based on dedicated spectrum for enterprise connectivity.

5

Policy Options for Enabling Non-Public Networks in Kenya

The spectrum occupancy assessment undertaken in this study identified geographically underutilized spectrum within the 1800 MHz and 3.6–4.2 GHz bands that could support the deployment of Non-Public Networks (NPNs). The policy challenge is therefore not whether spectrum should be made available for NPNs, but how access can be authorised while ensuring the continued protection of authorised incumbent users.

International benchmarking demonstrates that regulators have adopted different approaches to facilitate private LTE and private 5G deployments, reflecting their national spectrum environments, regulatory objectives and market conditions. Drawing on these experiences and the findings of this study, four policy options were identified for consideration in Kenya.

Option 1: Band-Specific Shared Local Access Framework (Preferred Option)

Under this option, the Communications Authority of Kenya would establish a band-specific Shared Local Access (SLA) framework to enable opportunistic secondary access to underutilized spectrum in the 1800 MHz and 3.6–4.2 GHz bands. Access would be authorised only where spectrum is demonstrably available and would be subject to predefined technical and operational conditions designed to protect authorised incumbent users.

Within the proposed framework, the 1800 MHz band would support private LTE deployments, while the 3.6–4.2 GHz band would support private 5G deployments. Spectrum access would be geographically defined, time-limited where necessary, and coordinated to ensure that incumbent users retain priority access at all times, without interference.

This option offers the greatest flexibility for improving spectrum utilization while enabling secure enterprise connectivity. It is particularly well suited to Kenya because the study found that spectrum availability within both bands is opportunistic rather than permanently available, making secondary access more appropriate than permanent spectrum assignments.

Option 2: Band-Specific Local Licensing

Under this option, the Communications Authority would issue geographically defined licences directly to eligible organizations for the deployment of private LTE and private 5G networks within the 1800 MHz and 3.6–4.2 GHz bands. Licensees would receive exclusive or near-exclusive rights to use the assigned spectrum within the authorised area, subject to license conditions and technical coordination requirements.

This approach provides greater certainty for network operators and supports predictable network performance. However, because it relies on dedicated spectrum assignments, it is less suited to environments where spectrum availability is geographically variable and primarily opportunistic.

Option 3: Band-Specific Spectrum Leasing

This option would allow incumbent spectrum licensees, particularly Mobile Network Operators (MNOs), to lease portions of their licensed spectrum to eligible organizations for private LTE and private 5G deployments. The incumbent licensee would retain the primary spectrum rights, while enterprises would operate under commercial leasing agreements approved by the Communications Authority.

Spectrum leasing provides a commercially established mechanism for enterprise connectivity and avoids the need for additional spectrum assignments. However, access depends on commercial negotiations between licensees and prospective users and may not provide consistent access to underutilized spectrum, particularly in underserved or rural areas.

Option 4: Maintain the Existing Spectrum Assignment Framework

Under this option, the existing spectrum assignment framework would remain unchanged, with the 1800 MHz and 3.6–4.2 GHz bands continuing to be assigned exclusively to existing licensees. Organizations requiring private wireless connectivity would continue to obtain services through commercial arrangements with Mobile Network Operators.

Although this approach maintains the current regulatory framework and provides strong protection for incumbent users, it does not address the underutilization of spectrum identified in this study and offers limited opportunities for organizations to deploy independent private LTE or private 5G networks.

Table 3 a comparative assessment of the policy options against the objectives of improving spectrum utilization, protecting authorised incumbent users, supporting private LTE and private 5G deployments, promoting innovation and facilitating implementation within Kenya's spectrum management framework.

The Table 1 compares the different spectrum access models;

Criteria	*Option 1: Shared Access*	*Option 2: Local Licensing*	*Option 3: Spectrum Leasing*	*Option 4: Status Quo*
Regulatory Approach	*Opportunistic shared access via CA*	*Direct local spectrum assignment*	*Commercial leasing via MNOs*	*Maintain existing exclusive licenses*
1800 MHz Band	*Private LTE (Shared)*	*Private LTE (Dedicated)*	*Private LTE (Leased)*	*MNO Services Only*
3.6–4.2 GHz Band	*Private 5G (Shared)*	*Private 5G (Dedicated)*	*Private 5G (Leased)*	*Incumbent Services Only*
Spectrum Efficiency	*High*	*Moderate*	*Moderate*	*Low*
Incumbent Protection	*High (Technical Coordination)*	*High (License Conditions)*	*High (MNO Obligations)*	*Very High*
Implementation Ease	*Moderate*	*Low (High Complexity)*	*Moderate*	*High (No Change)*
Enterprise & Rural Support	*High*	*Moderate to High*	*Low to Moderate*	*Low*

Preferred Regulatory Framework for Kenya

Following the evaluation of the policy options presented in the previous section, this study recommends the adoption of Option 1: Band-Specific Shared Local Access (SLA) Framework as the preferred regulatory approach for enabling Non-Public Networks (NPNs) in Kenya.

The recommendation is informed by the findings of the spectrum occupancy assessment, which identified geographically underutilized spectrum within the 1800 MHz and 3.6–4.2 GHz bands. Although these bands are assigned to authorised incumbent users, spectrum utilization varies across geographic locations, creating opportunities for opportunistic secondary access where spectrum is not in use. A band-specific Shared Local Access framework therefore provides an appropriate mechanism for improving spectrum utilization while ensuring that incumbent users retain priority access and are protected from harmful interference.

Under the proposed framework, the Communications Authority of Kenya would authorize eligible organizations to access underutilized spectrum on a secondary basis within defined geographic areas, subject to clearly defined technical and operational conditions. Access would only be authorised where spectrum is demonstrably available and would remain subject to the priority rights of authorised incumbent users. Secondary users would therefore be required to comply with the applicable technical, operational and interference management conditions established by the Communications Authority.

The framework should be supported by a regulator-managed Shared Local Access (SLA) Repository, which would maintain information on incumbent spectrum assignments, spectrum availability, local access authorizations and the applicable technical and operational conditions.

To facilitate spectrum authorization and planning, the framework should also incorporate an NPN Finder, a GIS-enabled spectrum management tool that enables the regulator and prospective applicants to identify locations where opportunistic secondary access may be permitted.

Recognizing the different characteristics of the two study bands, the framework should adopt band-specific access and coexistence requirements. The 1800 MHz band should support private LTE deployments through opportunistic secondary access to geographically underutilized spectrum, while the 3.6–4.2 GHz band should support private 5G deployments through coordinated access to available spectrum for high-capacity, localized wireless networks. The detailed technical requirements, coexistence criteria and interference protection measures applicable to each band are presented in the companion technical report.

To support different deployment scenarios, the framework should adopt two categories of local access authorization based on the principles of Ofcom's Shared Access Licence model:

- **Low-Power Licence** intended for highly localized deployments such as schools, hospitals, campuses, industrial facilities and other enterprise environments.
- **Medium-Power Licence** intended for wider-area deployments, including industrial sites, utilities and rural or community-centered connectivity initiatives,

subject to additional coordination and interference management requirements.

The Communications Authority should determine the applicable technical parameters, including power limits, coverage areas, coordination distances and other operating conditions, taking into account the characteristics of each band and Kenya's spectrum environment. This is provided in the companion technical report of this study, defining the technical conditions for opportunistic access.

The proposed band-specific Shared Local Access framework provides a practical, scalable and future-ready regulatory approach for enabling private LTE in the 1800 MHz band and private 5G in the 3.6–4.2 GHz band through opportunistic secondary access. By combining spectrum coordination, differentiated local access authorizations, the SLA Repository, the NPN Finder, and appropriate monitoring and enforcement mechanisms, the framework promotes more efficient spectrum utilization while safeguarding the rights of authorised incumbent users and supporting Kenya's digital transformation objectives.

Figure 1 shows the proposed regulatory approach. Key components of the regulatory approach are shown in the diagram. The following is explanation entities or components and the roles of the various components:

a. Communications Authority of Kenya, CA: In the proposed regulatory framework, CA will provide data to the SLA repository.
b. MNOs and Satellite Service Providers: They will provide data about spectrum usage across the country. There should be exclusion or protection zones around MNO base stations and satellite earth stations to ensure that there is no harmful interference.
c. SLA Repository: SLA repository is a centralized database that stores and manages information about spectrum availability and spectrum usage rights in bands where spectrum sharing is permitted. The main roles include the following:
    - Spectrum Information Storage: Maintains records of incumbent users (primary license holders), SLA licensees (secondary users), frequency assignments, geographical coverage areas, and operating conditions.
    - Spectrum Availability Management: Tracks when and where spectrum is available for sharing and identifies areas or times when incumbent users require protection.
    - Interference Protection: Provides information needed to ensure that SLA users do not cause harmful interference to incumbent users. It will define exclusion zones, power limits, and operational constraints, usually available through technical analysis on the proposed area.
    - Coordination and Control – Acts as the information source for the SLA system, communicating spectrum availability and restrictions to the NPN finder, which then manages the radio networks of NPN licensees.

d. NPN Finder: NPN Finder is generally a mechanism, database, or discovery function that helps users, devices, operators, and regulators identify and locate authorized NPNs operating within a specific area or spectrum band. The main roles of the NPN finder include the following:

- Spectrum Coordination: Assists regulators and operators in identifying which NPNs are using frequency assignments, helping to avoid harmful interference between the NPNS and public mobile networks.
- Parameters and Authorization: NPN finder will communicate with the SLA repository to find out the allowable parameters for NPN deployment such as power limits and coverage radius.
- Regulatory Compliance: Maintains records of licensed or authorized NPN deployments, allowing regulators to verify that a network is operating within its assigned spectrum, geographical area, and technical condition
- NPN Base Station: NPN base station will query the NPN finder to check if will be possible to deploy a NPN in a certain location and the allowable parameters.

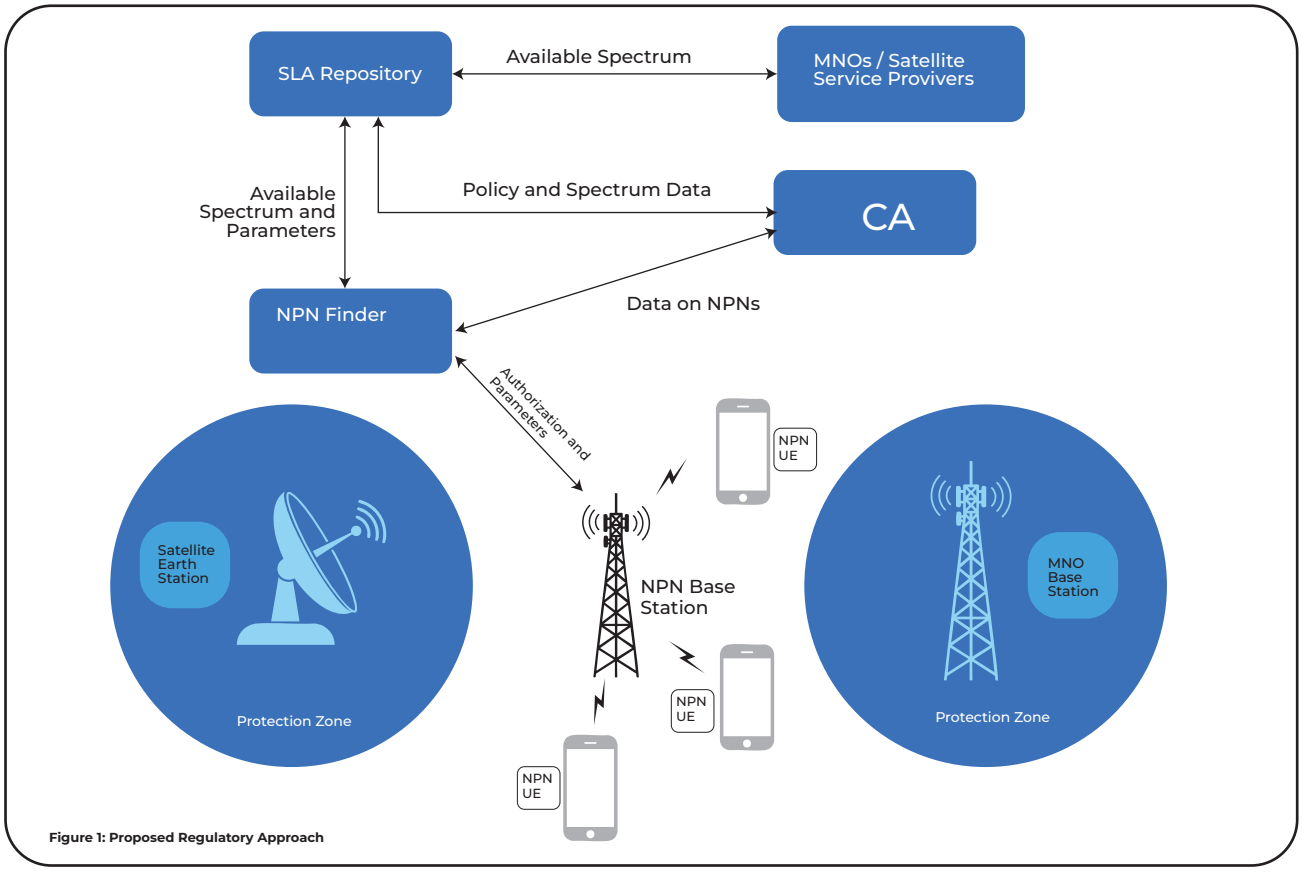

Figure 1: Proposed Regulatory Approach

Alternative Regulatory Implementation Approach

As an alternative to the recommended band-specific Shared Local Access (SLA) framework, the Communications Authority of Kenya could adopt a phased implementation approach that builds on existing spectrum management mechanisms. Under this approach, Shared Local Access (SLA) would be introduced for the 3.6–4.2 GHz band, while access to the 1800 MHz band would be facilitated through the existing regulatory provisions for spectrum leasing, spectrum trading and transfer of spectrum usage rights, subject to approval by the Communications Authority.

This approach recognizes the different regulatory and operational characteristics of the two bands. The 3.6–4.2 GHz band is well suited to localized private 5G deployments through regulator-managed opportunistic secondary access, whereas access to the 1800 MHz band could initially be enabled through commercial agreements between incumbent licensees and eligible NPN operators under the existing spectrum transfer framework.

To support this approach, the proposed Shared Local Access (SLA) Repository could be expanded to maintain information on spectrum availability, incumbent spectrum rights, local access authorizations, and approved spectrum leasing, trading or transfer agreements. The repository could therefore serve as a single coordination platform for both Shared Local Access authorizations and spectrum transfer arrangements.

Appropriate technical coordination, coexistence requirements and regulatory safeguards would be required to protect authorised incumbent users, ensure transparent spectrum access and support efficient spectrum utilization. Measures to promote fair, reasonable and non-discriminatory commercial access should also be considered to minimize barriers to entry for smaller enterprises, institutions and community-centred connectivity initiatives.

While this phased implementation approach provides a practical pathway that leverages existing regulatory mechanisms, access to the 1800 MHz band would remain dependent on commercial agreements with incumbent licensees. Consequently, it may not provide the same level of flexibility, accessibility or spectrum utilisation as the recommended band-specific Shared Local Access (SLA) framework, under which opportunistic secondary access would be available in both the 1800 MHz and 3.6–4.2 GHz bands.

Spatial Considerations for Spectrum Authorization

The implementation of the proposed band-specific Shared Local Access framework should be supported by spatial analysis to identify geographically underutilized spectrum, protect authorised incumbent users and facilitate evidence-based spectrum authorization. GIS tools can support spectrum planning by identifying suitable deployment areas, establishing coordination and protection zones, and assessing infrastructure availability. A detailed spatial implementation example is presented in the companion GIS Analysis Report for Kajiado County.

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CONCLUSION

This study examined the regulatory framework required to enable Non-Public Networks (NPNs) to access underutilized spectrum in the 1800 MHz and 3.6–4.2 GHz bands through opportunistic secondary access while ensuring the continued protection of authorised incumbent users. The study combined international regulatory benchmarking, analysis of Kenya's spectrum management framework and spectrum occupancy assessment to evaluate policy options for enabling private LTE and private 5G networks (Non-Public Networks-NPNs).

The findings indicate that, although the 1800 MHz and 3.6–4.2 GHz bands are assigned to incumbent users, spectrum utilization varies geographically, creating opportunities for opportunistic secondary access. International experience demonstrates that flexible spectrum management approaches can improve spectrum utilization while safeguarding incumbent users, providing useful lessons for Kenya.

Based on the evidence presented, this study recommends a band-specific Shared Local Access (SLA) framework, informed by the principles of Licensed Shared Access (LSA), provides the most appropriate regulatory approach for enabling Non-Public Networks in Kenya. The proposed framework supports opportunistic secondary access through geographically coordinated spectrum authorizations, band-specific technical conditions and appropriate regulatory oversight, while preserving the rights of authorised incumbent users.

The adoption of the proposed framework would promote more efficient spectrum utilization, support the deployment of private LTE and private 5G networks, and contribute to Kenya's digital transformation by enabling secure, reliable and purpose-built wireless connectivity across key sectors of the economy. Together with the companion GIS Analysis and Technical Reports, this study provides a practical foundation for implementing a sustainable spectrum-sharing framework for Non-Public Networks in Kenya.