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**APT REPORT ON**

**TELECOM ACTIVE INFRASTRUCTURE SHARING**

**Edition: October 2023**

**The 24th Meeting of South Asian Telecommunication Regulators’ Council (SATRC-24)**

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[1 Background 2](#_Toc145426760)

[2 Introduction and Details of the Concept 2](#_Toc145426761)

[2.1 Types of Infrastructure Sharing 3](#_Toc145426762)

[2.2 Drawing Boundaries - Active and Passive Infrastructure Sharing 3](#_Toc145426763)

[2.3 Need for Telecom Infrastructure Sharing 6](#_Toc145426764)

[2.4 Benefits of Telecom Infrastructure Sharing 7](#_Toc145426765)

[2.5 Challenges and Limitations of Telecom Infrastructure Sharing 8](#_Toc145426766)

[2.6 Telecom Infrastructure Sharing Business Models 8](#_Toc145426767)

[a. Co-operation Approach 9](#_Toc145426768)

[b. Asset Light Joint Venture (JV) Approach 9](#_Toc145426769)

[c. Asset Heavy Joint Venture (JV) Approach 9](#_Toc145426770)

[3 Global Trends 10](#_Toc145426773)

[3.1 Global Outlook on Infrastructure Sharing 10](#_Toc145426774)

[3.2 Active Infrastructure Sharing Regulatory Regimes in SATRC Countries 11](#_Toc145426775)

[b) Afghanistan 11](#_Toc145426777)

[b) Bangladesh 12](#_Toc145426778)

[c) Bhutan 13](#_Toc145426779)

[d) India 13](#_Toc145426780)

[e) Iran 14](#_Toc145426781)

[f) Maldives 14](#_Toc145426782)

[g) Nepal 15](#_Toc145426783)

[h) Pakistan 15](#_Toc145426784)

[i) Sri Lanka 16](#_Toc145426785)

[4 Recommended Effective Strategies for Regulating Telecom Infrastructure Sharing 16](#_Toc145426786)

[5 Acronyms 20](#_Toc145426787)

[6 References 21](#_Toc145426788)

[7 Annex A: Country Wise Consultation Feedback 22](#_Toc145426789)

[8 Annex-B: Case Study- Pakistan’s Existing Telecom Infrastructure Sharing Regime 33](#_Toc145426790)

[8.1 Telecom Policy 2015 33](#_Toc145426791)

[8.2 Infrastructure Sharing Among Licensees 33](#_Toc145426792)

[8.3 Telecom Infrastructure Sharing Policy Framework & Consultation with Stakeholders 34](#_Toc145426793)

[9 Annex-C: Infrastructure Sharing in European Union 37](#_Toc145426794)

[a. United Kingdom 38](#_Toc145426795)

# Background

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| **Work Item** | **Telecom Active Infrastructure Sharing** |
| Responsible Working Group | Working Group on Policy, Regulation and Services, SATRC |
| Background and Purpose | The objective of this work item is to produce an analytical report for the regulators and telecom industry as a whole within the SATRC countries to adopt effective strategies and policies for Telecom Active Infrastructure Sharing. |
| Consultation | A questionnaire was circulated to all the 9 SATRC Countries. Based on the inputs received, the recommendations to regulate the Telecom Active Infrastructure Sharing, have been proposed. The consultation feedback is attached as Annex-A. |

# Introduction and Details of the Concept

Telecom infrastructure sharing is a broad range term that generally refers to sharing of telecom network components and associated non-electronic and physical infrastructure. Telecom network can broadly be divided into two major areas:

* **‘Inside Plant (ISP)’,** thatcomprise of network components such as Core Network (CN), Charging / Billing Systems, Intelligent Network (IN), Application Servers for VAS, Content Delivery Network (CDN), Data Centers (DC), Transport Network Management components, etc. (such as ADM, DWDM).
* **‘Outside Plant (OSP)’,** that mainly comprises of Access Network that involves cable as well as Radio Access Network (RAN) and associated civil infrastructure involved to support deployment of Access Network such as towers, masts, cable ducts / utility corridors, space for collocation of different types of telecom related equipment, etc.

Infrastructure sharing concept promotes resource optimization by better utilization of assets, avoiding duplication of network infrastructure, saves time & costs and accelerate service rollouts.

Telecom network deployment involves heavy CAPEX and OPEX liabilities for operators and is considered as a major deterrent for network expansions. Furthermore, delays in rolling out new network infrastructure, which are attributed to procuring Right of Ways (RoW), pose great challenges to licensed operators in terms of time relevance to market for telecom and ICT services.

Infrastructure sharing enables operators to focus on the competition in the service layer regardless of the extent of the sharing. Operators can share whole or strategically unimportant parts of its network to share infrastructure costs while providing acceptable performance. Furthermore, these savings can facilitate mobile operators’ migration to next-generation technologies.

## **Types of Infrastructure Sharing**

Infrastructure sharing can be categorized into two (2) broad categories i.e. a) Active Infrastructure Sharing and (b) Passive Infrastructure Sharing.

1. **Active Infrastructure Sharing**

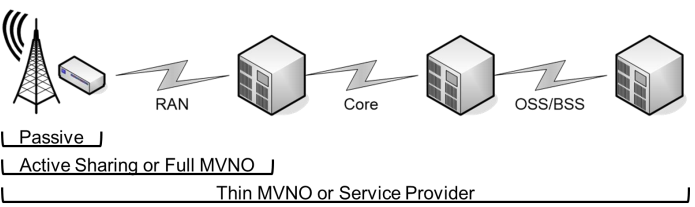
Active infrastructure sharing involves sharing the electronic network components – energized network elements – embodied in mobile and fixed networks, core and access nodes, Operational Support System (OSS), Business Support System (BSS) and elements involved in management of transport network including fiber and radio networks.

1. **Passive Infrastructure Sharing**

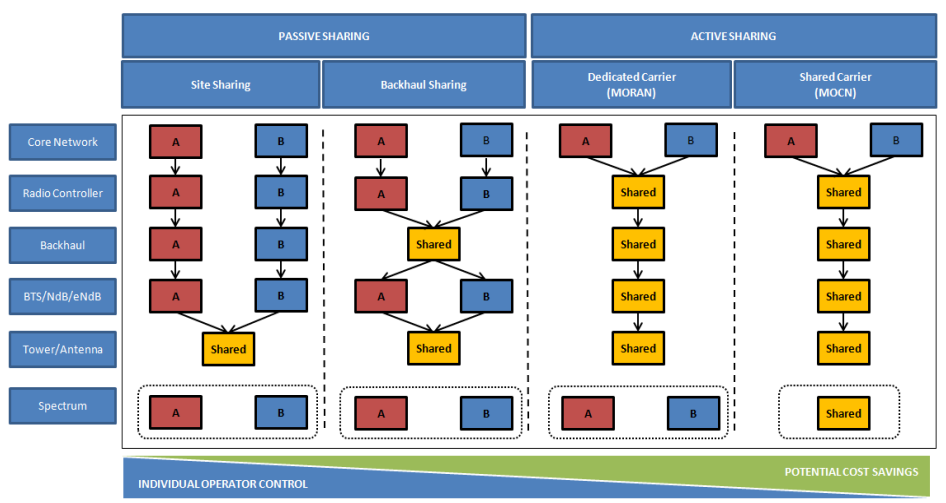
Passive infrastructure sharing means sharing of infrastructure such as physical sites, civil infrastructure, buildings, premises, tower / masts, power supply (including towers, poles, masts, ducts, trays, shelters, equipment rooms, power system (including battery backup), Gen Set, any alternate energy means, HVAC, security, Distributed Antenna System (DAS), etc. Passive sharing also includes antenna line components including the antennas, feeders, amplifiers, combiners, etc.

## **Drawing Boundaries - Active and Passive Infrastructure Sharing**

Due to complex nature and models involved in infrastructure sharing, active sharing includes passive infrastructure components, therefore, boundaries between the two types are often blurred. Figures in the following section provide a high level of understanding to draw boundaries between active and passive elements for mobile as well as fixed networks infrastructure.

1. **Mobile Network Infrastructure Sharing**

**Figure 1: Mobile Network Infrastructure Sharing**



**Figure 2: Mobile Network Infrastructure Sharing**

Source: Adopted from Nokia Siemens Networks NSN



**Figure 3: Mobile Network Infrastructure Sharing**

Source: GSMA “Infrastructure Sharing: An Overview”, 2019

1. **Multi-Operator Radio Access Network (MORAN)**

This is a type of active sharing in which Radio Access Network (RAN) nodes are also shared between operators i.e. BTS, Node-B, eNode-B and controllers (BSC, RNC). The Radio Access Network, which can comprise of 2G, **3G** and / or 4G technology, is shared physically, however, each operator has its individual logical network. Each operator still has maximum independent control over its logical RAN, thus, ensuring quality and performing necessary optimization activities. The RAN nodes, namely BTS, Node-B, eNode-B, BSC & RNC are physically same but logically split between operators as per their traffic demands. The commercial arrangement and hardware/software dimensioning is based on the distribution of node capacity use. The independent logical RANs are connected to non-shared core networks. Since, spectrum is not shared; each operator uses the frequency in assigned frequency bands and broadcast their own Public Land Mobile Network (PLMN) identifiers, which means the end customers’ experience is not affected.

1. **MOCN (Multi-Operator Core Network)**

MOCN is a major step up from MORAN and is essentially a MORAN plus the sharing or pooling of spectrum. Operator A can share its spectrum or assigned frequency along with Radio Access Network (BTS, Node-B, BSC, RNC) with Operator B or vice versa. Furthermore, if both operators have dedicated spectrums, they can pool the frequency bands / carriers in an optimized way and share them. With both MORAN and MOCN, the core networks are kept separate and individual operator owned. In terms of resource utilization, MOCN is the most efficient solution. For example, by pooling their spectrum bands, trunking gain is realized.

1. **MVNO (Mobile Virtual Network Operator)**

MVNO is also be perceived as a type of infrastructure sharing where MVNO leases almost all of the necessary network infrastructure. MVNO is an operator licensed to use the Radio Access Network (RAN) and spectrum of another operator, the MVNO does not hold a spectrum license and may or may not own a core network.

1. **National Roaming**

National Roaming is also perceived as a type of infrastructure sharing, where users from one Cellular Mobile Operator (CMO) are able to access the network of a second CMO within the same country, usually limited to a geographical area.

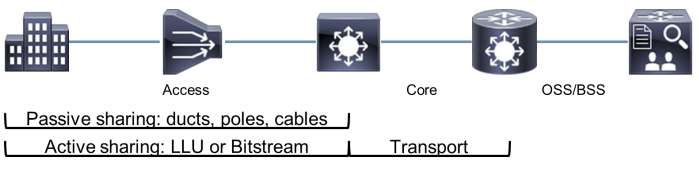
1. **Transmission sharing**

Sharing of the back-haul or backbone transmission, front-haul transport including equipment such as microwave, fiber optic cable, network terminating/edge equipment, routers, etc. Transmission sharing can be materialized in Radio Access Network (RAN) between BTS and BSC (2G network), Node-B and RNC (3G network) and eNode-B and core network (4G system). This approach is also sometimes considered part of passive network sharing. For access networks in metropolitan cities, the “last mile” backhaul links are usually aggregated at transmission rings (for example there may be 8-10 fiber optic based rings in a city) and carried to core network sites. If capacity is available in these rings, these may be shared with other operators.

1. **Gateway Core Network( GWCN ) sharing**

Gateway Core Network (GWCN) sharing also employs sharing of some core network functionalities i.e. MSC / VLR, SGSN (2G, 3G) and MME (4G). However, functionalities which are more instrumental in-service differentiation and confidential information, pertaining to operators’ business, is not put up for sharing. Therefore, North-bound nodes like subscriber databases (HLR), authentication (AuC), Business Support Systems (BSS) like billing, charging, CRM are retained by each operator in independent cores.

1. **Fixed Network Infrastructure Sharing**

**Figure 4: Fixed Network Infrastructure Sharing**

1. **Passive sharing**

Sharing of passive infrastructure such as sites, towers, poles, ducts, trays, shelters, equipment rooms, power, HVAC, security, etc. In fixed network sharing the “local loop” cabling (copper, coax, fiber optic or HFC) is treated as part of the passive infrastructure.

1. **LLU (Local Loop Unbundling)**

Use of a fixed access network operator’s physical connection between a local exchange and the customer’s premises to deliver services by another operator; partial unbundling is where the network operator retains the voice services and the second operator takes over the data services.

1. **Bit stream access**

Provision by one fixed access network operator to another of xDSL service between the customer’s premises and a handover point.

1. **OAN (Open-Access Network)**

OAN operator allows multiple telecommunication service providers to deliver services over its network; the OAN operator does not compete with the service providers.

## **Need for Telecom Infrastructure Sharing**

There are several dimensions driving the need for Telecom Infrastructure Sharing amongst the telecom operators in Pakistan. These dimensions, covering major aspects, are briefly discussed as below:

1. **Competition:** Services offered by telecom operators are in constant price war trying to beat competition by offering high value generous bundles at very low prices. Pakistan is a low ARPU market, with ARPU hovering in the range of PKR 200-220 per month.
2. **Geography:** Coverage holes exist for operators due to high deployment costs and long ROI in remote / rural areas. There is a great need to maximize network coverage in rural areas. Capacity shortfall is persistent in dense population areas due to high traffic and high speed broadband services in urban areas. Due to spectrum limitations, fill-in sites are needed with associated CapEx and site acquisition challenges.
3. **Technology:** Operators are investing heavily to build 4G networks and make their coverage close to ubiquitous 2G coverage. This effort requires large upfront CapEx which can be reduced through a shared 4G network rollout. The same shall be applicable for newer (e.g. 5G & beyond) technologies.
4. **Operational:** Joint network deployment increases rollout capacity and results in shorter Time to Market (TTM) for new services & coverage. Site acquisitions are becoming increasingly difficult to acquire new suitable sites in urban areas, cantonments, strategic locations like airports, commercial buildings (malls, residential complexes), etc. Division of shared network operationally results in reduction of OpEx and faster rollout due to split / sharing of responsibilities as compared to stand alone network operations.
5. **Financial:** Capital savings realized by sharing of responsibilities (CapEx & OpEx) can be used for strategic spectrum acquisitions & network expansions.
6. **Health:** Limiting the Electro Magnetic Radiation (EMR) impact by reducing number of mobile BTS sites as a result of active sharing arrangement.
7. **Operator Logic:** Trade-off full service differentiation against lower cost. The extent of trade-off depends on operator strategy.

## **Benefits of Telecom Infrastructure Sharing**

The network sharing model acts as a jump-start for new services with larger coverage foot print and early TTM. The user uptake of new services is accelerated resulting in increased revenues & profit. Sharing operator enjoys flexibility in new rollout as well as capacity expansion on existing shared network by joint planning, sharing of initial CapEx and subsequent cost of operations (OpEx).

1. The operator benefits can be summarized as follows:

* **Financial Benefits:** Reduced OpEx from lower operations cost (rental, electricity & fuel bill, maintenance and backhaul). Reduced CapEx from lower deployment costs (civil works, network equipment). Potentially less assets on books of operator.
* **Operational Benefits:** Increase in capacity and coverage to enable operator for data traffic growth. Coverage in rural areas where there is no business case or has long time of Return On Investment (ROI). Access to licenses / spectrum, if licenses are few. Reduced carbon footprint (lesser CO2 emissions) – shared equipment consuming less power.

1. According to BEREC’s report on infrastructure sharing (2018), which highlighted figures provided by some European Regulators, sharing arrangements which are currently in place in various individual European markets, indicates some significant cost-savings given as below:

* Passive infra sharing 16% to 35% on CapEx and OpEx
* Active infra sharing (excl. spectrum) 33% to 35% CapEx, 25% to 33% OpEx
* Active infra sharing (incl. spectrum): 33% to 45% CapEx, 30% to 33% OpEx

The shared networks approach is beneficial to all the stakeholders, not only for operators, but also for telecom regulator, infrastructure vendors, suppliers, and end customers.

1. From regulatory perspective, benefit comes in terms of better survival & growth of mobile network operators, heightened competition among operators to focus on service differentiation and enhancing customer experience, since part of underlying network is common. Operators need to compete on basis of new and innovative products and services which can catch attention of customers.
2. The environmental sector benefit comes in the form of reduced emissions (lesser carbon footprint) due to consolidation of sites as well as the aesthetic beauty of cities is improved.
3. Finally, the customers benefit comes in the form of rapid uptake of technology (4G, LTE Advanced, and 5G etc.) and provisioning of new & innovative services. Larger coverage footprint means more options available to end consumers as compared to an individual operator’s limited capability.

## **Challenges and Limitations of Telecom Infrastructure Sharing**

Cellular network sharing has got attention of majority of mobile network operators worldwide and many of them have already embraced passive infrastructure sharing for many decades now. To reap additional benefits of network sharing, operators need to step-up the network sharing arrangements like active sharing, joint venture to handle operations, etc. The initial discussions on network sharing are easy and promising but are very difficult and complex to setup and may fall short of anticipated benefits. The key to success is careful and meticulous planning based on extensive deliberations. Some key limitations, risks and challenges for network sharing are summarized below:

* **Risks:** Strategic lock-in, future merger / divestment becomes complex, high termination costs and asymmetric benefits
* **Limitations:** Loss of control & independence, competitive disadvantage, growth limitation and high assets write-off.
* **Challenges:** Deal and integration complexity, complex governance, staff resistance, regulatory scrutiny and stringent approval processes

## **Telecom Infrastructure Sharing Business Models**

The business objectives of licensees in a shared network consider the existing network footprint, market share and position of TSP in the competitive landscape, their wanted position in medium to long term (3-5 years) and its growth strategy. For example, does the operator want to be aggressive in increasing subscriber base or is it focused on improving the subscriber experience & quality of its services? It needs to quantify the extent of competitive loss due to network sharing with other operator and will depend on the type of sharing model as well as the geographic dimension of network implementation.

Does the operator want to weaken its market position by opening network sharing or would it opt for unilateral service by excluding these geographies from network sharing? If the market is mature and saturated with high cellular tele density, both operators would be more focused on service differentiation and customer experience. They can outsource the planning, rollout, operations to a 3rd party (Managed Services Model) and focus on revenue growth via new products & increased Average Revenue per User (ARPU).

The business driversare different for each operator due to a variety of diverse factors and parameters, for example, time of start of service, targeted market segment, brand strength, market share, network modernization level, geographic coverage and so on. Closely aligned with business drivers are the **objectives of sharing** for each operator which usually are CapEx savings, OpEx reduction, coverage extension, launch & rapid deployment of new services, shorter TTM, etc.

There can be many models depending upon how the two sharing operators treat settlements, human resources & assets and how far the regulatory framework allows. The operators may take a phased approach, for example, starting with the simplest model and moving to complex model offering better governance and more savings with time. There are three main approaches of infrastructure sharing governance discussed as below, which are being adopted and practiced across the globe with some variations:

### **Co-operation Approach**

This is the simplest model in which for the mutually developed Joint/Single Grid - Radio Access Network (JG-RAN or SG-RAN), each operator has its own set up to plan, build and operate the network. Asset ownership remains with respective operator. The parties will negotiate and enter into a co-operation agreement to set out the commercial and legal principles which will govern rollout and sharing of the network.

### **Asset Light Joint Venture (JV) Approach**

Operators’ setup an organization (a separate legal entity) to plan, build and operate but assets ownership remains with each operator nationwide (independent of assigned areas of operations to each operator). The passive assets belong to access network and can be further categorized into (a) tangible assets i.e. towers / masts on sites, civil works (shelter, equipment pads), Diesel Generator (DG) set and (b) intangible assets i.e. site lease, commercial electricity connection. The active assets are provided by each operator in its area of operations and cost sharing models are implemented.

A core team of staff will be transferred (or seconded) to the JV and will form a JV team, responsible for managing the network and for planning, design, deployment (rollout), operations and maintenance of the shared infrastructure nationwide for the agreed scope of sharing. By establishing Asset Light JV the parties agree to facilitate joint procurement decisions for their RAN infrastructure, in order to optimize the suppliers and network costs.

### **Asset Heavy Joint Venture (JV)** **Approach**

This type of JV usually is the next phase of Asset Light JV in which rights of ownership of all shared assets are transferred to the Asset Heavy JV (e.g. a Telecom Infrastructure Provider (TIP) Licensee) and the JV provides services back to the parent companies. It is more complex, integrated, and difficult to reverse and requires comprehensive regulatory approvals. Asset Heavy JV works like a NetCo.

A Tower Co (e.g. a Telecom Tower Provider - TTP Licensee) is an independent licensed company which owns passive assets in a region / country and leases out tower, site space and DC power (with battery backup) to multiple operators. A NetCo extends this concept to active equipment and leases out coverage & capacity. The NetCo can buy the existing active and passive assets of operators (for example consolidated 2G, 3G network) and / or build additional technological layers (new 4G rollout), expand capacity / coverage. NetCo is responsible for consolidation, transformation, and modernization of existing networks with committed time plans and consolidation savings. A NetCo may or may not hold spectrum assets. For example, Malaysia DNB model (holds 5G spectrum & mobile infrastructure) but can only provide coverage & capacity to licensed mobile service providers.

**Note:** In all above models, the Telecom Services Provider (TSP) license obligations (Rollout, QoS, etc.) do not change hands. The TSP (Cellular Mobile Operators, Long Distance International Operators, Local Loop Operators, Integrated licensees) may enter into commercial agreement with, for example, Telecom Infrastructure Providers (TIPs) or Telecom Tower Providers (TTPs) to ensure compliance to its license obligations.

Where the TIPs are the entities licensed by the regulator, for the provision of the telecommunication-based infrastructure to the service providers. Where the TTP are the Tower providers to the TSPs.



# Global Trends



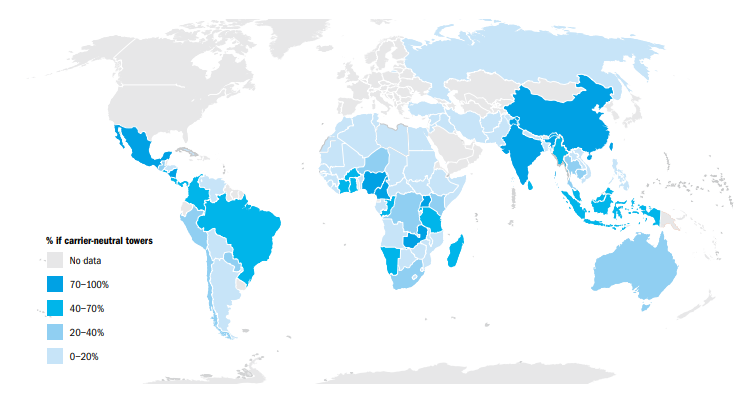
## **Global Outlook on Infrastructure Sharing**

The scope of sharing opportunities ranges from network elements like ducts, poles, tower, and masts, to dark fiber (unused fiber-optic cable) and frequency spectrum. Telecom operators are employing various forms of infrastructure sharing, with different implications in terms of risk sharing, access, ownership, and funding. The most common of these is the sale and leaseback structure. Under this structure, mobile operators sell towers to an independent tower company (Tower Co). The towers are then leased back to the operator as well as other operators. The tower co is then responsible for the operation and maintenance of the tower. The Tower Co model is mature globally and is gaining further traction across a range of emerging economies. Africa, South America, Myanmar and Indonesia are leading the way in the current environment, as operators and governments align their interests in utilizing and encouraging such models.

As per International Finance Corporation: IFC report “Accelerating Digital Connectivity Through Infrastructure Sharing”, sharing in digital infrastructure remains limited and several emerging markets are lagging (Figure 3). At the global scale, an estimated 70 percent of countries reported mandated infrastructure sharing, and just 44 percent in the Asia-Pacific region, the lowest among regions worldwide.

Sharing of mobile network elements, including towers and spectrum, is rising but at a slow pace. The report further said that during 2010-2017, only 10 active network sharing agreements were announced across the Middle East and Africa region. Countries including Algeria, Ethiopia, Senegal, Morocco, Zimbabwe, Bolivia, Philippines, the Lao People’s Democratic Republic and Nepal have virtually no independent tower company.

Fixed broadband network sharing, whereby incumbent operators provide access to their last-mile network to competitors, is virtually absent in most emerging markets. Beyond broadband infrastructure, data centers can also be shared. Most large companies with sensitive customer databanks, healthcare firms, telecoms companies, and government agencies, for example—can share building, connectivity, and power by housing their IT infrastructure with an independent data center operator. Likewise, medium and small businesses can take advantage of cloud-based services to store and process their digital data on remote IT infrastructure without incurring the costs of installing and maintaining their own data centers. Data centers require high-quality connectivity and can also benefit from shared broadband infrastructure.

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**Figure 3: Tower sharing through independent companies in selected markets**

Source: IFC report “Accelerating Digital Connectivity Through Infrastructure Sharing”, 2020

The detailed case study of European Union’s Infrastructure Sharing is given in Annex-C.

## **Active Infrastructure Sharing Regulatory Regimes in SATRC Countries**

A round of consultation was carried out where the telecom regulators of the SATRC countries were consulted with a set of questionnaires.

In the light of the responses to the question, it has been observed that in most of the SATRC countries, the active infrastructure is in infancy stage of adoption. And the infrastructure sharing, is not mandated by regulations, rather the companies are sharing their infrastructure on market/ business needs. Furthermore, most of the countries have licensing model of mobile service provider license and separate infrastructure provider license.

Following is the glimpse of the country wise status of SATRC countries with respect to active Infrastructure sharing. The detailed response of the countries is shared as Annex-A.

### 

### **Afghanistan**

The telecom infrastructure sharing is allowed in Afghanistan. The operators are sharing only Multiple Operator Radio Access Network (MORAN), In Building System (IBS), Optical/ Wired Transmission Links, and Multiplexer (MUX) Synchronous Digital Hierarchy (SDH) and Dense Wavelength Division Multiplexer (DWDM).

The sharing is not mandatory by regulation, companies are sharing their telecom active infrastructure as per their business needs. According to the procedure, ATRA usually do not encourage them to share their active infrastructure, especially in urban areas. As per the current status/statistics, the MORAN type of sharing is applied to almost 200 telecom sites.

There are few telecommunication infrastructure companies (different from the existing licensed service providers), who provide their technical services to MNOs under the name of TTSP (Telecom Technical Service Provider). These TTSP license holders are providing MORAN services to MNOs on revenue sharing basis. ATRA put Strick rules on MNOs to share their passive equipment such as Towers, DGs, access roads, buildings and etc.

### **Bangladesh**

The telecommunication infrastructure sharing is allowed in Bangladesh. In these Infrastructure Sharing Guideline, the provision of Active Sharing is not addressed in general. However, BTRC has been permitting active sharing in special cases (important governmental premises) on case-to-case basis. A technical committee was formed for preparing Active Sharing guideline and a draft has been prepared. Hopefully, with the emergence of newly introduced 5G services, Active Sharing Guideline will be approved and issued soon. The active sharing i.e.. MORAN, MOCN, and Spectrum Sharing shall be allowed through the framework being drafted on Active infra sharing.

Sharing is not mandatory by regulation rather operators can adopt sharing as per their business needs. Currently, for passive infrastructure, there are separate licensing categories who are responsible for any new deployment of fibre network or tower. For existing facilities, operators are not bound to share infrastructure but are suggested to do so. If they want to share, they must have to do it through the 3rd party infrastructure licensee. As per the current status/statistics, for mobile cellular services, there are total of 39,155 towers in Bangladesh. Amongst these 16,804 (6628 shared already) number of towers are shared through the 3rd party infrastructure licensee and 4,107 (22180 owned) by mobile operators themselves (owned by MNOs). For fiber optic, there are total 1,90,000 km of optic fiber laid throughout Bangladesh. Amongst it, most of the fiber routes are shared through the third party licensee.

There are two types of infrastructure service providers (different from the existing licensed service providers). The NATIONWIDE TELECOMMUNICATION TRANSMISSION NETWORK (NTTN) Licensee who shall build and operate the NTTN network nationwide. The other are “TOWER SHARING LICENSEES’ who shall develop, build, acquire, own, rent, lease, operate and maintain the Towers anywhere through the Nation. The sharing is actually mandated for newly developed sites through the above-mentioned 3rd party infrastructure licensing categories. The MNOs can only build new tower or facility when the infrastructure providers are unable to do so. But for existing sites, the operators have the independence of either receiving or allowing share in their facility.

There is no policy yet on sharing of utility service providers’ network. But there are instances where the service providers, through the coordination of BTRC, have collaborated with certain utility service providers to use their facility to build telecom network.

Provision for allowing and encouraging public utility facilities of telecom services have been recently proposed to be included in the revised MNO licensing guideline.

In the proposed active sharing guideline, BTRC will be responsible body for dispute resolution. The dispute resolution mechanism shall follow the SLA between the sharing parties and the draft of the master SLA shall be vetted by BTRC.

### **Bhutan**

The telecommunication active infrastructure sharing is allowed in Bhutan. However, this has not been initiated ever since, because no proposals were received from the TSPs, and as such, no detailed framework on active infrastructure sharing has been developed. General provisions such as cost of sharing, procedure for sharing, refusal of access, reservation of capacity, obligations have been mentioned in the infrastructure sharing rules.

The infrastructure sharing is not mandatory by regulation, it is done as per the needs of the operators. Current status/statistics of infrastructure sharing is approximately 20% of the ICT infrastructure is shared among the service providers.

There are no telecommunication infrastructure companies (different from the existing licensed service providers, that enters an active infrastructure sharing agreement with licensed service providers, and also, currently, there is no model contract between donor and seeker of the telecommunication active infrastructure. While the government encourages sharing of utility infrastructure to reduce cost and other obligations, however there is no clear policy in place. The BICMA has infrastructure sharing rules and regulations to facilitate utility service providers from sharing an infrastructure such as power line poles being used by the telecom and ISP providers. If there arise any disputes, it is being dealt with as per the provisions of the relevant Act and by-laws including the infrastructure sharing rules and regulations enforced by the BICMA.

### **India**

Sharing of active infrastructure (limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system) amongst service providers based on the mutual agreements entered amongst them is permitted. Further, sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, Access Point etc. is also allowed. Further sharing of backhaul is also permitted.

In addition, spectrum sharing is allowed between only two mobile service providers where both the licensees are having spectrum in the same band and utilizing the spectrum in the same band, subject to the condition that there will be at least two independent networks provided in the same band.

The Indian companies are eligible to apply for Infrastructure Providers Category-I (IP-I). No license is issued for IP-I. The applicant company is required to be registered with Department of Telecom. only. IP-I can establish and maintain the assets such as Dark Fibres, Right of Way, Duct Space and Tower for the purpose to grant on lease/rent/sale basis to the licensees of Telecom Services licensed under Section 4 of Indian Telegraph Act, 1885 on mutually agreed terms and conditions.

As such there is no restriction on the model of sharing among the access service providers. As regards spectrum sharing, it is allowed between only two mobile service providers where both the licensees are having spectrum in the same band can pool their spectrum holding and utilize the spectrum in the same band.

The sharing arrangement is based on the mutual agreements entered amongst the service providers.

Sharing is permitted and there is no mandatory sharing by regulation. The sharing arrangement is based on the mutual agreements entered amongst the service providers.

Some utility companies have been empowered by their respective Regulatory Authorities such as Central Electricity Regulatory Commission to enable infrastructure sharing with other services providers. The disputes between the service providers have been left to the commercial and market conditions for amicable resolution.

### **Iran**

Telecommunication active infrastructure sharing is permitted by regulation of Communications Regulatory Authority (CRA) in I.R of Iran. Any sharing of facilities such as access layer equipment and facilities, whether active or inactive in the license holder's networks, such as power supply, site, tower, antenna, BTS/NodeB/eNB/gNB, RAN, BSC, RNC and frequency spectrum between the license holders must be done after concluding a contract under the framework set by CRA. Also, Implementation the contract is not allowed before the approval of the CRA.

The sharing of facilities must not result in non-compliance with license obligations, unfavorable network performance, reducing the QoS (quality of service) below the limits set in the license agreements and CRA’s regulations.

The sharing of facilities is done voluntary based on regulation of Communications Regulatory Authority (CRA) in I.R of Iran and operators can adopt sharing as per their business needs. In order to encourage the operators for infrastructure sharing, wholesale revenue is exempt from revenue sharing and also, the tariff of infrastructure sharing is competitive. According to the CRC regulation, municipalities and power company should share their facilities by telecom operators with approved RoW tariff.

### **Maldives**

In Maldives, telecommunication active infrastructure sharing is allowed under the Telecom Act, but not practiced. As of now only passive infrastructure is being shared. Active Infrastructure sharing shall be encouraged by CAM, with due consideration to availability and redundancy of communications.

The sharing is not mandatory here by regulation, the operators adopt sharing as per their business needs. Almost all new towers being established in the outer islands are shared passively. And No active infrastructure sharing yet. Also there is no policy w.r.t sharing of utility service provider’s network for provision of telecommunication services.

There is a telecom infrastructure company (different from the existing licensed service providers). just very recently licensed. It is licensed to provide telecom infrastructure only on Hulhumale’ which is a separately reclaimed newly populated island close to capital. There is No active infrastructure sharing agreement as yet.

### **Nepal**

In Nepal, active infrastructure sharing between the operators is not allowed under T*elecommunication Infrastructure Regulations, 2017*. For these regulations, the active infrastructures are defined as electronic infrastructures and their facilities such as BTS, NodeB, eNodeB, Radio Spectrum, Antenna, Feeder Cable, Radio Access Network (RAN), Microwave Radio Equipment, Billing Platform, Switching System, Router, Base Station Controller BSC), Radio Network Controller (RNC) etc. However, some active infrastructures e.g. Fiber Port, OLT Port, Fiber Core, Point to Point Microwave Connectivity, Lambda Lease and Wireless Subscriber Module Port are not only allowed but are mandatory for sharing among the operator,

But on the recommendation of NTA based on the basis of cost of infrastructure, revenue to government or benefits to consumers, Ministry of Communication and Information Technology (MOCIT) may allow the active sharing by prescribing necessary service, terms and conditions and operating procedure for it.

There are NO telecommunication infrastructure companies (different from the existing licensed service providers), the licensed operator may share the infrastructure among themselves. The operators are encouraged to adopt infrastructure by introducing Telecommunication Infrastructure Regulation, 2017 and Telecom Infrastructure Sharing and its Tariff Fixing Bylaw, 2021. There is no policy w.r.t sharing of utility service provider’s network for provision of telecommunication services. If any event of dispute arises between the operators regarding telecom infrastructure sharing, anyone may file the application to the NTA. Then, NTA formulates the dispute resolution committee to resolve the dispute. Based on the recommendation of this dispute resolution committee, NTA will resolve the dispute.

### **Pakistan**

Infrastructure sharing is not mandatory, however Cellular Mobile Operators are encouraged through license conditions to adopt sharing as per their business needs, for facilitation of the CAPEX and expansion of services. Currently, Cellular Mobile Operators (CMOs) have implemented Infrastructure sharing across the country on commercial terms. Furthermore, it is also proposed in recent framework that the sharing parties, shall maintain Telecom Infrastructure Sharing Database / Atlas. The database shall include available capacities of Active and Passive Telecom infrastructure elements (including VSATs and Satellite Hubs), physical space, site geographical locations etc. Active sharing is currently not being implemented.

There are multiple Telecom Infrastructure Providers (TIP) and Telecom Tower Provider (TTP) i.e. telecommunication infrastructure companies (different from the existing licensed cellular service providers) in Pakistan. No one has entered into active infrastructure sharing agreement with licensed service providers as of now.

Dispute Resolution Mechanism is part of proposed Telecom Infrastructure sharing framework. In it is proposed that the resolution of a Dispute referred to the PTA is to be conducted in accordance with the applicable provisions of the ‘Dispute Resolution Regulations, 2022’, ‘Telecom Infrastructure sharing framework’ and is subject to any other binding resolution imposed on the Parties by PTA.

### **Sri Lanka**

As of now telecommunication active infrastructure sharing is not permitted in Sri Lanka but work has been initiated to prepare a framework for infrastructure sharing which includes active infrastructure sharing. There are no regulations with regard to infrastructure sharing at present but there is a guideline on Antenna Structures. This guideline encourages Operators to share the antenna structures. Based on these there are huge number of towers being shared between operators.

In the light of the feedback received from the countries, the following are the recommendations to be considered while drafting the framework to regulate the Infrastructure-Sharing in a country.

# Recommended Effective Strategies for Regulating Telecom Infrastructure Sharing

5.1 For regulating the infrastructure in a country, the Framework may focus on to provide a regulatory mechanism for licensed operators to share Infrastructure that include Active as well as Passive Telecom Infrastructure facilities,

1. Where, **Active Infrastructure** means any electrical, electro-magnetic, electronic, optical or optio-electronic system for the emission, conveyance, switching or reception of any intelligence through “Telecommunication System” that may comprise of active components – energized network elements performing intelligent processing – embodied in mobile and fixed networks, core and access nodes, operational support system (OSS), business support system (BSS) and elements involved in management of transport network including fiber and radio access network elements, etc.
2. And **Passive Infrastructure** means infrastructure such as tower/pole/mast, space & civil infrastructure, power system (including Battery backup), Gen set, DAS (including combiners, couplers, splitters, attenuators, co-axial cables, fiber optic, connectors, jumpers, etc.), equipment grounding/earthing, HVAC, security, etc. If the framework includes the cable ducts/utility corridors owned by non-licensed telecom operators or other utility infrastructure owners, then definition may be enhanced accordingly.

**5.2 The following are proposed strategies for regulating telecom infrastructure sharing: -**

1. The regulatory framework/ guidelines for regulating the industry is recommended to be applicable to all Telecommunication Services Providers (TSP) and Telecom Infrastructure Providers (TIP) including the Telecom Tower Providers (TTP) (where applicable).
2. All TSP, TIP and TTP licensees which own (host) a telecom infrastructure, may share their active as well as passive infrastructure with other TSP, TIP and TTP licensees, in accordance with respective license conditions and scope, with prior intimation to the regulator.
   1. Such intimation may comprise of high-level details including but not limited to financial/commercial information, infrastructure sharing details and dispute resolution mechanism. This information will be helpful for the regulator, if the dispute occurs and/or also for any other regulatory assessment.
3. The framework/ guideline is recommended to include MORAN – Multiple Operator Radio Access Network sharing, using the available market transport technologies/solutions for backhaul purpose.
4. It is observed that there is a high demand of seamless and quality network connectivity inside large public places / commercial complexes / residential buildings etc. In such premises, all cellular operators may not have a business case to separately deploy and maintain their own In-building System (IBS). And if a Telecom Infrastructure available in the building, is owned by any Telecom Service Provider (TSP) or Telecom Infrastructure Provider (TIP), the cellular operators may enter into a sharing agreement with TSP / TIP on mutually agreed commercial basis.
5. Taking into account the scope of the telecom infrastructure provider (TIP) License, the TIP Licensee (where applicable) may also be allowed to:
   1. Provide end to end Bandwidth or Transmission-as-a-facility to Telecom Operators licensed by the respective regulator, using fiber network or other backhaul technologies such as Microwave, VSAT, etc. as per the scope of TIP License.
   2. Telecommunication Infrastructure / “Radio Communication Links” Facilities – end to end links (e.g. Radio Access Network (RAN) including BTS, Node-B, eNode-B, BSC, RNC, Microwave transport, Fiber Optic transport, RMS, etc.) to authorized Telecom Service Provider (TSP), and other Telecom Infrastructure Providers (TIPs) (applicable under their license conditions), in such a manner that active elements/components of TIP licensees shall be energized/activated only for conveyance of telecom services/or conveyance of intelligence byTelecom Operators licensed by Authority.
   3. The Infrastructure Licensee (TIP) as well as Telecom Tower Licensee (TTPs) may be authorized for Distributed Antenna System (DAS) for IBS, whose components may include Indoor Antennas, Jumpers, Cabling (Co-axial / Fiber), Connectors, Taps / Splitters, Multiplexer, Combiners, Couplers, Attenuators, grounding / earthing and associated power equipment (if any
6. For the license rollout obligations and other conditions, following is recommended to be taken into consideration:
   1. In a situation where Telecom Infrastructure Facility is provided by an Infrastructure Licensee (TIP), to TSP, the TSP licensees would be responsible to ensure compliance to license obligations pertaining to service provisioning to end user. For example, QoS requirements, roll out and environmental obligations, etc.
   2. If the infrastructure sharing arrangement is between TSPs licensees, both TSP licensees (parties) should ensure compliance to respective licensed obligations pertaining to service provisioning to end users, QoS requirements, roll out and environmental obligations and compliance to all applicable laws.
7. The licensees, may maintain Telecom Infrastructure Sharing Database / for availability of the information about available capacities of Active and Passive Telecom infrastructure elements (including VSATs and Satellite Hubs), physical space, site geographical locations, etc.

**5.3 Dispute Resolution**

Following question was asked to the SATRC countries on Dispute Resolution Mechanism, i.e.

**Question: What measures and safeguards have been kept for dispute resolution? In the case of rollout obligations and quality of service what could be the mechanism to resolve challenges and issues coming up due to active infrastructure sharing?**

The responses were as follows:

1. **Afghanistan Telecom Regulatory Authority (ATRA):**

The dispute resolution mechanism, covers not only active sharing-related issues but also cover all telecom related issue. For raising an issue for the first time ATRA’s board is responsible for the resolution and if the parties are not agreed, the issues are submitted to an independent commission by the name of Financial Dispute Resolution Commission (FDRC).

1. **Bhutan InfoComm and Media Authority (BICMA):**

In the event if there arises any disputes, it is being dealt with as per the provisions of the relevant Act and by-laws including the infrastructure sharing rules and regulations enforced by the Authority.

1. **Bangladesh Telecommunication Regulatory Commission (BTRC):**

In the proposed active sharing guideline, BTRC will be responsible for as the body for dispute resolution. The dispute resolution mechanism shall follow the SLA between the sharing parties and the draft of the master SLA shall be vetted by BTRC.

1. **Communications Regulatory Authority (CRA) of Islamic Republic of Iran:**

Not relevant currently as no active infrastructure sharing yet.

1. **Regulatory Authority (CRA) in I.R of Iran.**

According to the regulation and approved policies, regulator resolve challenges and dispute between telecom operators.

1. **Nepal Telecommunications Authority (NTA):**

If any dispute arises between the operators regarding telecom infrastructure sharing among the operator, anyone may file the application to the NTA. Then, NTA formulates the dispute resolution committee to resolve the dispute. Based on the recommendation of this dispute resolution committee, NTA will resolve the dispute.

1. **Pakistan Telecommunication Authority (PTA):**

Dispute Resolution Mechanism is part of proposed Telecom Infrastructure sharing framework. The resolution of a Dispute referred to the Authority shall be conducted in accordance with the applicable provisions of the ‘Dispute Resolution Regulations, 2022’, ‘Telecom Infrastructure sharing framework’ and be subject to any final binding resolution imposed on the Parties by the Authority.

1. **Telecom Regulatory Authority of India (TRAI):**

The disputes between the service providers have been left to the commercial and market conditions for amicable resolution.

1. **Telecommunications Regulatory Commission of Sri Lanka (TRCSL):**

N/A

**5.3.1 Recommendations on Effectively Taking Care of Dispute(s)/ Dispute Resolution Mechanism.**

Taking into consideration the responses from the SATRC countries, following is suggested with respect to the settlement of disputes amongst licensees:

1. The Parties may be advised to carry out this Infrastructure Agreement in the spirit of mutual co-operation, arrangement and good faith and may seek to resolve amicably on any disputes arising between them.
2. For that either Party (the “Disputing Party”) may be free to invoke the dispute procedure by serving written notice of the dispute (“Dispute”) to the Nominated Representative of the other Party (the “Disputed Party”). The notice should contain all relevant details including the nature and the extent of the Dispute.
3. If fail to reach to any resolution, then parties should consult with the appropriate senior management / steering committee / governance committee, i.e. “Coordination Committee” (with an equal number of appropriate representatives from either Part.)
   1. Meanwhile, each Party should be bound to fulfil its obligations under the Agreement during the pendency of a dispute or any procedures. For that matter, a Party should not disrupt Infrastructure sharing arrangements being provided to the other Party, or take any other actions, that might materially and adversely affect that Party’s Infrastructure Sharing arrangements, unless it has intimated to the respective regulatory authority.
4. If the Coordination Committee is unable to resolve the Dispute in the given timeframe, either Party may refer the Dispute to the regulator with prior notice of intention to the other Party.
5. In the event of a reference to the regulator, both Parties should compile a detailed dispute report, which may include origin, nature, extent, issues and any proposals for resolution and make their respective reports available to the regulator and also each other.
6. The regulator may invite sharing parties for hearing, request further information from Parties and issue determination/decision on the case.
7. If the licensee and the regulator fail to amicably resolve such difference or dispute, either party may make an application to the Court of law or a Tribunal established by the Federal Government (if any) for the settlement of the matter.

# Acronyms

|  |  |
| --- | --- |
| AIP | Administrative Incentive Pricing |
| BSS | Business Support System |
| BTS | Base Transceiver Station |
| CAPEX / CaPex | Capital expenditures |
| CMOs | Cellular Mobiles Operators |
| DAS | Distributed Antenna System |
| DC | Data Center |
| DG Set | Diesel Generator Set |
| FAB | Frequency Allocation Board |
| FPA | Facility Provisioning Agreement |
| GSM | Global System for Mobile communication (2G) |
| GWCN | Gateway Core Network |
| IBS | In-building System |
| ISP | In Side Plant |
| KPIs | Key Performance Indicators |
| LDI | Long Distance and International |
| LL | Local Loop |
| LLU | Local Loop Unbundling |
| LTE | Long Term Evolution (4G) |
| MBB | Mobile Broadband |
| MNO | Mobile Network Operator |
| MOCN | Multi-Operator Core Network |
| MORAN | Multi-Operator Radio Access Network |
| MoU | Memorandum of Understanding |
| MS | Mobile Station / Managed Services |
| MSC | Mobile Switching Station |
| MVNO | Mobile Virtual Network Operator |
| MW | Microwave |
| OAN | Open Access Network |
| QoS | Quality of Service |
| RAN | Radio Access Network |
| RF | Radio Frequency (Hz) |
| ROW | Right of Way |
| TIP | Telecom Infrastructure Provider |
| TSP | Telecom Service Provider |
| WLL | Wireless Local Loop |
| WMS | Web Monitoring System |
| xDSL | x Digital Subscriber Line |

# References

1. ICT and Broadcasting Infrastructure Sharing Guidelines, International Telecommunications Union (ITU), 21 Feb 2016.
2. BEREC Report on Infrastructure Sharing, BoR (18) 116, 14 June, 2018
3. Infrastructure Sharing: An Overview by GSMA, 18 June, 2019
4. Accelerating Digital Connectivity Through Infrastructure Sharing, Davide Strusani and Georges V. Houngbonon, February 2020.
5. Policy paper, Review of the Access to Infrastructure Regulations - call for evidence, Published 12 June 2020

Annex-A

# Annex A: Country Wise Consultation Feedback

**Question No.1: Is there telecommunication active infrastructure sharing allowed in your country? If yes, please provide the details of the existing regulatory provision/ framework of telecommunication active infrastructure sharing in your country? If not what is the plan of active sharing in future?**

1. **ATRA Afghanistan:** Yes, it is allowed. We have a procedure for Infrastructure Sharing and Collocation Regulatory. In this Procedure, we sharing only Multiple Operator Radio Access Network (MORAN), In Building System (IBS), Optical/ Wired Transmission Links, and Multiplexer (MUX) Synchronous Digital Hierachy (SDH) and Dense Wave length Division Multiplexer (DWDM).
2. **BRTC Bangladesh:** In current Infrastructure Sharing Guideline, the provision of Active Sharing is not addressed in general. However, BTRC has been permitting active sharing in special cases (important governmental premises) on case to case basis. A technical committee was formed for preparing Active Sharing guideline and a draft has been prepared. Hopefully, with the emergence of newly introduced 5G services, Active Sharing Guideline will be approved and issued soon.
3. **BICMA Bhutan:** Yes, telecommunication active infrastructure sharing is allowed in Bhutan. However, this has not been initiated since no proposals were received from the TSPs, and as such, no detailed framework on active infrastructure sharing has been developed. General provisions such as cost of sharing, procedure for sharing, refusal of access, reservation of capacity, obligations have been mentioned in the infrastructure sharing rules.
4. **TRAI, India:** Sharing of active infrastructure (limited to antenna, feeder cable, Node B, Radio Access Network (RAN) and transmission system) amongst service providers based on the mutual agreements entered amongst them is permitted. Further, sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, Access Point etc. is also allowed. Further sharing of backhaul is also permitted.

In addition, spectrum sharing is allowed between only two mobile service providers where both the licensees are having spectrum in the same band and utilizing the spectrum in the same band, subject to the condition that there will be at least two independent networks provided in the same band.

1. The Licensee is allowed to share its own active and passive infrastructure for providing other services authorized to it under any other telecom license issued by Licensor.
2. An authorized Gateway hub operated by the satellite provider itself is permitted to be shared with the satellite bandwidth seeker.
3. **CRA, Iran:** Yes, telecommunication active infrastructure sharing is permitted by regulation of Communications Regulatory Authority (CRA) in I.R of Iran.

Any sharing of facilities such as access layer equipment and facilities, whether active or inactive in the license holder's networks, such as power supply, site, tower, antenna, BTS/NodeB/eNB/gNB, RAN, BSC, RNC and frequency spectrum between the license holders must be done after concluding a contract under the framework set by CRA (Communications Regulatory Authority). Also, Implementation the contract is not allowed before the approval of the CRA.

The sharing of facilities must not result in non-compliance with license obligations, unfavorable network performance, reducing the QoS (quality of service) below the limits set in the license agreements and CRA’s regulations.

1. **CAM, Maldives:**

* Allowed under the Telecom Act, but not practiced. As of now only passive infrastructure is present.
* Active Infrastructure sharing shall be encouraged by CAM, with due consideration to availability and redundancy of communications.

1. **NTA, Nepal:** As per the Sub Rule 1 of Rule 17 of the Telecommunications Infrastructure Regulation, 2017, active infrastructure sharing between the operators is not allowed. For this regulation Active Infrastructures are defined as the electronic infrastructures and their facilities such as BTS, NodeB, eNodeB, Radio Spectrum, Antenna, Feeder Cable, Radio Access Network (RAN), Microwave Radio Equipment, Billing Platform, Switching System, Router, Base Station Controller BSC), Radio Network Controller (RNC) etc. But on the recommendation of NTA based on the basis of cost of infrastructure, revenue to government or benefits to consumers, Ministry of Communication and Information Technology (MOCIT) may allow the active sharing by prescribing necessary service, terms and conditions and operating procedure for it. However, some active infrastructures e.g. Fiber Port, OLT Port, Fiber Core, Point to Point Microwave Connectivity, Lambda Lease and Wireless Subscriber Module Port are allowed for sharing among the operator.
2. **PTA, Pakistan:** Initially active sharing was not proposed in the consultation paper on telecom infrastructure sharing guidelines published on PTA website. However, PTA has conducted another round of consultation with the Industry and will also include Active Sharing in the proposed “Infrastructure sharing framework”. The Framework is being shared with the Federal Government (MOIT & T) for policy level approval in 2022.
3. **TRCSL, Sri Lanka:** No. Drafted the work plan in 2021. Planning to execute in 2023-2025.

**Question No.2: What model and network components of active sharing are allowed e.g. MORAN, MOCN, and Spectrum Sharing etc?**

1. **ATRA Afghanistan:** As per the relevant procedure currently only MORAN type of sharing is allowed for more details please check answer no 1.
2. **BRTC Bangladesh:** So far, for the case to case basis permissions, BTRC has been allowing active sharing IBS & DAS. But the draft guideline which has been prepared by the relevant committee, covers all aspects of active sharing including.. But as described above, this is still in draft phase and yet to be approved and issued officially.
3. **BICMA Bhutan:** As above.
4. **TRAI, India:** As such there is no restriction on the model of sharing among the access service providers. As regards spectrum sharing, it is allowed between only two mobile service providers where both the licensees are having spectrum in the same band can pool their spectrum holding and utilize the spectrum in the same band. The sharing arrangement is based on the mutual agreements entered amongst the service providers.
5. **CRA, Iran:** Both MORAN (Multiple Operator Radio Access Network) and MOCN (Multiple Operator Core Network) sharing models, including spectrum sharing, are allowed by regulation of Communications Regulatory Authority (CRA) in I.R of Iran.
6. **CAM, Maldives:** Not applicable
7. **NTA, Nepal:** Some active infrastructures e.g. Fiber Port, OLT Port, Fiber Core, Point to Point Microwave Connectivity, Lambda Lease and Wireless Subscriber Module Port are allowed for sharing among the operator.
8. **PTA, Pakistan:** Active Infrastructure includes any electrical, electro-magnetic, electronic, optical or optio-electronic system for the emission, conveyance, switching or reception of any intelligence through “Telecommunication System” that may comprise of active components – energized network elements doing intelligent processing – embodied in mobile and fixed networks, core and access nodes, operational support system (OSS), business support system (BSS) and elements involved in management of transport network including fiber and radio access network elements etc.

MORAN, which is sharing of active infrastructure in a RAN such as the BTS/BSC, Node B/RNC, eNode-B, etc. is allowed.

Spectrum Sharing is currently not allowed. However, Spectrum Sharing framework is submitted to the Federal Government (MOIT & T) for formal approval. Moreover, Sharing of Backhaul spectrum will also be part of Spectrum Sharing Framework.

Telecom Tower Provider (TTP) licensee are proposed in the framework to be authorized for Distributed Antenna System (DAS) for IBS. whose components include Indoor Antennas, Jumpers, Cabling (Co-axial / Fiber), Connectors, Taps / Splitters, Multiplexer, Combiners, Couplers, Attenuators, grounding / earthing and associated power equipment (if any) by elaborating its License scope.

1. **TRCSL, Sri Lanka:** Will be MORAN & MOCN

**Question No.3: Is sharing mandatory by regulation or operators can adopt sharing as per their business needs?**

1. **ATRA Afghanistan:** Companies sharing their telecom active infrastructure as per their business needs. According to our procedure, we are not encourage them to share their active infrastructure, especially in urban areas.
2. **BRTC Bangladesh**: Active sharing is not mandatory nor is proposed to be mandatory. Currently, for passive infrastructure, there are separate licensing categories who are responsible for any new deployment of fibre network or tower. For existing facilities, operators are not bound to share infrastructure but are suggested to do so. If they want to share, they must have to do it through the 3rd party infrastructure licensee.
3. **BICMA Bhutan:** It is as per the needs of the operators.
4. **TRAI, India:** Sharing is permitted and there is no mandatory sharing by regulation. The sharing arrangement is based on the mutual agreements entered amongst the service providers.
5. **CRA, Iran:** The sharing of facilities is done voluntary based on regulation of Communications Regulatory Authority (CRA) in I.R of Iran and operators can adopt sharing as per their business needs.
6. **CAM, Maldives: Not mandatory by regulation.**
7. **NTA, Nepal:** Infrastructures as mentioned above in response to Q2 are mandatory for sharing.
8. **PTA, Pakistan:** Infrastructure sharing is not mandatory, however Cellular Mobile Operators are encouraged through license conditions to adopt sharing as per their business needs, for facilitation of the CAPEX and expansion of services.
9. **TRCSL, Sri Lanka:** Sharing is not mandatory.

**Question No.4: Current status/statistics of infrastructure sharing in your respective country.**

1. **ATRA Afghanistan:** The MORAN type of sharing applied to almost 200 telecom sites.
2. **BRTC Bangladesh:** For mobile cellular services, there are total of 39,155 tower in Bangladesh. Amongst these 16,804 (6628 shared already) number of towers are shared through the 3rd party infrastructure licensee and 4,107 (22180 owned) by mobile operators themselves (owned by MNOs). For fiber optic, there are total 1,90,000 km of optic fiber laid throughout Bangladesh. Amongst it, most of the fiber routes are shared through the third party licensee.
3. **BICMA Bhutan:** Approximately 20% of the ICT infrastructure is shared among the service providers.
4. **TRAI, India:**
5. The sharing of infrastructure, owned, established and operated by the Licensee under the scope of Access Service Authorization under Unified License, is permitted as below:
6. Sharing of “passive” infrastructure viz., building, tower, dark fiber, duct space, Right of Way etc. with other Licensees.
7. Provision of point-to-point bandwidth from their own infrastructure within their Service Area to other licensed telecom service providers for their own use. However, the Licensee hiring the bandwidth shall not resell such bandwidth.
8. **CRA, Iran:** There are some regulation for passive infrastructure sharing such as dark fibre, pole, duct,
9. **CAM, Maldives:** All new towers being established in the outer islands are shared. But operators have their own on the capital.
10. **NTA, Nepal:** Not available.
11. **PTA, Pakistan:** Currently, Cellular Mobile Operators (CMOs) have implemented Infrastructure sharing across the country on commercial terms. Furthermore, it is also proposed in recent framework that the sharing parties, shall maintain Telecom Infrastructure Sharing Database / Atlas. The database shall include available capacities of Active and Passive Telecom infrastructure elements (including VSATs and Satellite Hubs), physical space, site geographical locations etc.
12. **TRCSL, Sri Lanka:** N/A

**Question No.5: Are there any telecommunication infrastructure companies (different from the existing licensed service providers) in your country? If yes, what is their license scope, and has anyone entered into an active infrastructure sharing agreement with licensed service providers?**

1. **ATRA Afghanistan:** Yes, different license holders are available in the country who provide their technical services to MNOs under the name of TTSP (Telecom Technical Service Provider).
2. **BRTC Bangladesh:** BTRC has two types of such infrastructure service providers apart from the existing service providers.

* Nationwide Telecommunication Transmission Network
* Tower Sharing License
  1. **Nationwide Telecommunication Transmission Network**

**Scope**:

* 1. The Licensee(s) shall develop, build, operate and maintain its NTTN system anywhere in the entire country under these Licensing Guidelines.
  2. The license(s) will Lease out / Rent out the Licensees’ NTTN resources to the ANS Operators, Licensed Telecommunication Operators and to other authorised users for a specified Lease Term / Rental Term not exceeding NTTN’s license duration.
  3. The licensee(s) shall obtain permission from the Commission before making any lease agreement. The Licensee(s) will entitle the Lessee for sharing or sub-leasing of any of its leased systems or any apparatus or facility to others without any discrimination. The Licensee(s) shall file all concluded lease agreements with the Commission.
  4. The Licensee(s) shall keep provisions in the lease agreement so that:
  + the lessee has an obligation to connect the NTTN to the systems of any other operator licensed by the Commission and the lessee will ensure compatibility.
  + the lessee complies with the requirements and approval of tariff by the Commission.

1. **TOWER SHARING LICENSE:**

**Scope**:

1. The licensee(s) shall develop, build, acquire, own, rent, lease, operate and maintain the
2. Towers anywhere through the Nation under these Licensing Guidelines.
3. The license(s) will Lease out / Rent out the Licensees' Towers and/or its infrastructure including its associate services to the Licensed Telecommunication Operators and other authorized users for a specified Lease Term / Rental Term not exceeding the Tower Sharing License duration.
4. The licensee and the operators shall come across with a Service Level Agreement (SLA) for Tower Sharing. The licensee shall submit the draft SLA to the Commission for necessary vetting.
5. The licensee(s) shall obtain permission from the Commission before building any tower in boarder areas as directed by the Commission from time to time. The Licensee(s) will be entitled to lease or share or sub-lease any of its systems or any apparatus or facility to others without any discrimination. The Licensee(s) shall file all concluded lease agreements with the Commission.
6. The Licensee(s) shall have an obligation to connect the Tower to the systems of any other Licensed Telecommunication Operators by the Commission and ensure compatibility.
7. The Licensee(s) shall comply with all the requirements and approval of tariff by the Commission.
8. The Commission may issue separate directives regarding sharing of electronic/ active elements of towers.
9. **BICMA Bhutan:** No.
10. **TRAI, India:** Answer No.5: The infrastructure space was opened to private sector with effect from 13.08.2000. Indian companies registered under Companies Act 1956/2013 are eligible to apply for Infrastructure Providers Category-I (IP-I). No license is issued for IP-I. The applicant company is required to be registered with Department of Telecom. only.  IP-I can establish and maintain the assets such as Dark Fibres, Right of Way, Duct Space and Tower for the purpose to grant on lease/rent/sale basis to the licensees of Telecom Services licensed under Section 4 of Indian Telegraph Act, 1885 on mutually agreed terms and conditions. In no case the company shall work and operate or provide telegraph service including end to end bandwidth as defined in Indian Telegraph Act, 1885 either to any service provider or any other customer.  As on 30.6.2022, 1310 companies have been registered by DoT to provide infrastructure services.
11. **CRA, Iran:** Answer No.5: Yes, there is a governmental company that manage national infrastructure.
12. **CAM, Maldives:**

One (1) telecom infrastructure company just very recently licensed. Licensed to provide telecom infrastructure only on Hulhumale’ which is a separately reclaimed newly populated island close to capital. No active infrastructure sharing agreement as yet.

1. **NTA, Nepal:** Not yet. However, the licensed operator may share the infrastructure as mentioned in response to Q2.
2. **PTA, Pakistan:** Yes there are multiple Telecom Infrastructure Providers (TIP) and Telecom Tower Provider (TTP) i.e. telecommunication infrastructure companies (different from the existing licensed cellular service providers) in Pakistan. Below are the scope for TIP and TTP. No one has entered into active infrastructure sharing agreement with licensed service providers as of now.
3. **TRCSL, Sri Lanka:** Answer No.5: No

**Question No.6: Please provide the coordination/ facilitation mechanism for commercial partnership and/or model contract between donor and seeker of the telecommunication active infrastructure. Please share information related to ‘Price Benchmarking’ if any.**

1. **ATRA Afghanistan:** In this field there is no proper price benchmarking mechanism, but TTSP license holders are providing MORAN services to MNOs on revenue sharing.
2. **BRTC Bangladesh:** The Active sharing is yet to be approved and implemented.
3. **BICMA Bhutan:** Currently, we do not have the model contract between donor and seeker of the telecommunication active infrastructure.
4. **TRAI, India:** The sharing arrangement is based on the mutual agreements entered amongst the service providers.
5. **CRA, Iran:**  Wholesale revenue is exempt from revenue sharing.The tariff of infrastructure sharing is competitive.
6. **CAM, Maldives:** No active infrastructure sharing yet.
7. **NTA, Nepal:** As per the Telecom Infrastructure Sharing and its Tariff Fixing Bylaw, 2021, NTA has identified the sharable infrastructure and their minimum tariff on the basis of RTDF funded and operator’s own network as mentioned below. The operators may enter to an agreement for infrastructure sharing. If there is any dispute arise, the operator may request NTA to resolve it.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S. No.** | **Sharable Telecomm Infrastructure** | **Maximum Fee Per Month** | | | |
| **For RTDF Funded Network** | | **For Operator’s own Network** | |
| **Optical Fiber Network** | | | | | |
|  | Fiber Port Charge per port | | Rs. 220 | | Rs. 315 |
|  | OLT Port B/W per Mbps (1-100Mbps) | | Rs. 0.56 | | Rs. 0.80 |
|  | Dark Fiber lease ADSS per Km per Core | | Rs. 630 | | Rs. 900 |
|  | Dark Fiber lease UG per Km per Core | | Rs. 840 | | Rs. 1200 |
|  | Dark Fiber lease Figure-8 per Km per Core | | Rs. 420 | | Rs. 600 |
|  | Point to Point Data per Mbps/Km ( upto 100Mbps) | | Rs.0.84 | | Rs. 1.20 |
|  | Point to Point Data per Mbps/Km (100Mbps -500 Mbps) | | Rs. 0.70 | | Rs. 1 |
|  | Point to Point Data per Mbps/Km (500 MBps- 1 Gbps) | | Rs 0.56 | | Rs. 0.80 |
|  | Point to Point Data per Mbps/Km (1 Gbps -5 Gbps) | | Rs. 115.50 | | Rs. 165 |
|  | Point to Point Data per Mbps/Km (5 Gbps -10 Gbps) | | Rs. 115.50 | | Rs. 165 |
|  | Point to Point Data per Mbps/Km (Above 10Gbps) | | Rs. 101.50 | | Rs. 145 |
|  | Lambda lease up to 10 Gbps (per Km) | | Rs. 101.50 | | Rs. 145 |
| **Wireless Network** | | | | | |
|  | Wireless SM Charge per port | | Rs. 220.5 | | Rs. 315 |
|  | AP B/W per Mbps (1-5Mbps) | | Rs. 9.10 | | Rs. 13 |
|  | Point to Point Data per Mbps/Km (1-10Mbps) | | Rs. 9.10 | | Rs. 13 |
|  | Point to Point Data per Mbps/Km (10-50Mbps) | | Rs. 7.70 | | Rs. 11 |
| **Tower/ Shelter/Building/ Land** | | | | | |
|  | Tower (GBT) (Per Antenna) | | Rs. 15,820 | | Rs. 22,600 |
|  | Rent/Shelter/Building (Per Sq. Ft.) | | Rs. 70 | | Rs. 100 |

1. **PTA, Pakistan:** No Active sharing is currently implemented.
2. **TRCSL, Sri Lanka:** N/A

**Question No.7: What measures have been taken to encourage operators to adopt infrastructure sharing e.g. monetary benefit, facilitation in site approvals, facilitation in RoW etc.?**

1. **ATRA Afghanistan:** According to ATRA’s Telecom Active infrastructure Sharing we are not encouraging any Telecom company but allow it and as per the Collocation procedure, we put Strick roles in order MNOs to share their passive equipment such as Towers, DGs, access roads, buildings and etc.
2. **BRTC Bangladesh:** The sharing is actually mandated for newly developed sites through the above mentioned 3rd party infrastructure licensing categories. The MNOs can only build new tower or facility when the infrastructure providers are unable to do so. But for existing sites, the operators have the independence of either receiving or allowing share in their facility.
3. **BICMA Bhutan:** The only measure adopted is the enforcement of the infrastructure rules and regulations. While doing so, the Authority has been facilitating in approving the sites if needed and also been regulating on the price for infrastructure sharing with the service providers.
4. **TRAI, India:** Infrastructure sharing has been left to the Telecom Service providers and IP-Is as per their commercial arrangements.
5. **CRA, Iran:** Wholesale revenue is exempt from revenue sharing. The tariff of infrastructure sharing is competitive. According the CRC regulation, municipalities and power company should share their facilities by telecom operators with approved RoW tariff.
6. **CAM, Maldives:** Generally, encourage nut no specific measures.
7. **NTA, Nepal:** The operators are encouraged to adopt infrastructure by introducing Telecommunication Infrastructure Regulation, 2017 and Telecom Infrastructure Sharing and its Tariff Fixing Bylaw, 2021. The measures have been taken to encourage operators to adopt infrastructure sharing are facilitation in site approvals, facilitation in Row, Fixing of Infrastructure Sharing Tariff etc.
8. **PTA, Pakistan:** Facilitation in site approvals will be given to encourage operators to adopt Infrastructure sharing, moreover Scope has been increased for TIP/TTP in proposed framework.
9. **TRCSL, Sri Lanka:** N/A

**Question No.8: Is there any policy in your country w.r.t sharing of a utility service provider’s network for the provision of telecommunication services? If yes, what are the merits and demerits of allowing a network of utility service providers?**

1. **ATRA Afghanistan:** Yes, in order to facilitate the telecom service provider, ATRA adopted open access policy, for implementing the international dig once policy a separate policy is almost adopted for OFC-related issues.
2. **BRTC Bangladesh:** No, there is no such policy yet. But there are instances where the service providers, through the coordination of BTRC, have collaborated with certain utility service providers to use their facility to build telecom network.

Provision for allowing and encouraging public utility facilities of telecom services have been recently proposed to be included in the revised MNO licensing guideline.

1. **BICMA Bhutan:** While the government encourages sharing of infrastructure to reduce cost and other obligations, there is no clear policy in place. However, the Authority has infrastructure sharing rules and regulations to facilitate utility service providers from sharing an infrastructure such as power line poles being used by the telecom and ISP providers.
2. **TRAI, India:** Yes, some utility companies have been empowered by their respective Regulatory Authorities such as Central Electricity Regulatory Commission to enable infrastructure sharing with other services providers.  The infrastructure sharing has certain advantages as it helps in bringing down costs and enables speedier network expansion.
3. **CRA, Iran:** Yes

Metris as follows: increase the speed of telecom network deployment and services coverage area, Optimize OPEX and improve CAPEX efficiencies of Telecom Operator.as follows: discriminatory behaviours, create monopoly

1. **CAM, Maldives:** No.
2. **NTA, Nepal:** Not yet.
3. **PTA, Pakistan:** Yes, Telecommunication Policy 2015 in section 7.4.1 states that “The use of electricity networks and water, gas & other pipelines to provide rights of way, and in some cases infrastructure for telecommunications, will be promoted by ensuring the legality of such use and the preparation of guidelines for their use & pricing. Economic pricing for the use of such infrastructure as a right of way for telecommunications infrastructure will be applied. Federal Government (MoIT) will consult with owners of utility infrastructure over specific proposals for an economic pricing methodology and issue a policy directive for the calculation of the cost of rights of way. “The formulation of the framework is under process.

**Question No.9: What measures and safeguards have been kept for dispute resolution? In the case of rollout obligations and quality of service what could be the mechanism to resolve challenges and issues coming up due to active infrastructure sharing?**

1. **ATRA Afghanistan:** For the dispute resolution to cover not only active sharing-related issues but to cover all telecom related issue, for raising an issue for the first time ATRA’s board is responsible for the resolution and if the parties are not agree the issues are submitting to a independent commission by the name of Financial Dispute Resolution Commission (FDRC).
2. **BRTC Bangladesh:** In the proposed active sharing guideline, BTRC will be responsible for as the body for dispute resolution. The dispute resolution mechanism shall follow the SLA between the sharing parties and the draft of the master SLA shall be vetted by BTRC.
3. **BICMA Bhutan:** In the event if there arises any disputes, it is being dealt with as per the provisions of the relevant Act and by-laws including the infrastructure sharing rules and regulations enforced by the Authority.
4. **TRAI, India:** The disputes between the service providers have been left to the commercial and market conditions for amicable resolution
5. **CRA, Iran:** According the regulation and approved policies, regulatory resolve challenges and dispute between telecom operators.
6. **CAM, Maldives:** Not relevant currently as no active infrastructure sharing yet.
7. **NTA, Nepal:** Network components of active sharing (e.g. MORAN, MOCN, Spectrum Sharing etc.) are allowed in Nepal till date. But, some active infrastructures e.g. Fiber Port, OLT Port, Fiber Core, Point to Point Microwave Connectivity, Lambda Lease and Wireless Subscriber Module Port are allowed for sharing among the operator. If any dispute arises between the operators regarding telecom infrastructure sharing among the operator, anyone may file the application to the NTA. Then, NTA formulates the dispute resolution committee to resolve the dispute. Based on the recommendation of this dispute resolution committee, NTA will resolve the dispute.
8. **PTA, Pakistan:** Dispute Resolution Mechanism is part of proposed Telecom Infrastructure sharing framework. The resolution of a Dispute referred to the Authority shall be conducted in accordance with the applicable provisions of the ‘Dispute Resolution Regulations, 2022’, ‘Telecom Infrastructure sharing framework’ and be subject to any final binding resolution imposed on the Parties by the Authority.
9. **TRCSL, Sri Lanka:** N/A

Annex B

# Annex-B: Case Study- Pakistan’s Existing Telecom Infrastructure Sharing Regime

In Pakistan, “Mobile Cellular Policy 2004” encouraged passive infrastructure sharing and the license conditions were supportive of passive sharing. Passive Sharing is in practice, since 2010 after issuance of Standard Operating Procedure (SOP) by PTA and all Cellular Operators signed a MOU with PTA in 2010. The purpose of signing MOU was to increase the Tenancy Ratio to 1.5 by 2013. PTA would facilitate processing of Infrastructure Sharing cases to the extent possible within its jurisdiction. Each operator jointly with other industry players would put in efforts to make commercial arrangements and strive to take up its own and overall industry’s tenancy ratio to a level of 1.5 within next 3 years provided that the arrangement is feasible for the operator(s). It was made part of the licenses issued to Mobile operators after that.

Tenancy ratio means number of operators sharing one tower. If a tower is used by more than one operator it would improve Tenancy Radio hence decreasing the number of towers installed across the country. If the Ratio increases to 1.5, it would mean that 50 out of every 100 towers are being shared by operators.

## **Telecom Policy 2015**

**Section 7.5** of the telecom policy 2015 mandated PTA to develop the necessary regulatory framework/guidelines to encourage, facilitate and standardize infrastructure sharing in based on the principles of neutrality, non-discrimination and equal access*.*

## **Infrastructure Sharing Among Licensees**

1. **Telecom Service Provider Licenses**

All the licenses in Pakistan including the Cellular licenses, the Long Distance International (LDI), the Local Loop (LL) license, the Telecom Infrastructure Licenses and the Telecom Tower provider licenses can share and lease out their infrastructure under their respective license Conditions, through mutual commercial agreements.

1. **Telecom Infrastructure Providers**

In Pakistan, Telecom Infrastructure Provider & Telecom Tower Provider licensing regime was introduced in 2006 with objectives to implement cost savings in the telecoms industry and to mitigate the delays incurred in procuring rights of way for new infrastructure and reducing environmental impact. However, due to relatively less growth of this sector, the Infrastructure sharing in Pakistan could not reach to its full potential. Furthermore, in the absence of any Framework / Guidelines for sharing infrastructure, there was a need for clarification and elaboration of respective scopes of Telecom Infrastructure Provider & Telecom Tower Provider licensees and their sharing of telecom infrastructure boundaries. This further supported the need for development of the such framework, which systematically provides a comprehensive guideline for the growth of telecom sector.

## **Telecom Infrastructure Sharing Policy Framework & Consultation with Stakeholders**

A consultation paper comprising of draft of regulatory framework for Telecom Infrastructure Sharing was floated for consultation with stakeholders in October 2020. After receiving feedback, suggestions were analyzed and incorporated accordingly.

1. **Feedback on Consultation and Industry Mindset**

A collective summary of responses is given below:

1. All stakeholders agreed on infrastructure sharing in principle, as it limits duplication and gears up investment in telecom infrastructure in underserved areas, product innovation, and improved customer service. Infrastructure sharing has great impact on competition. Market becomes more attractive to new players for decreased entrance barriers. Such players can enrich the competition while investing effectively. By alleviating pressure of network deployment, sharing allows operators to turn their attention to improved innovation, better customer service and eventually better commercial offerings and healthier competition.
2. All stakeholders were of the view that shared infrastructure can improve service affordability through numerous channels, including cost savings, balance sheet optimization, and competition. Infrastructure sharing spreads the cost of network expansion across multiple market participants and can generate significant capital expenditure (CAPEX) savings for connectivity service providers (telecom network operators), digital infrastructure providers (tower companies and wholesale fixed broadband companies), and IT infrastructure users in the wider economy (businesses in the case of data centers).
3. One of the stakeholders was of the view that “All licensees MUST be obligated to first review existing infrastructure for sharing purpose on mutually agreed commercial terms. Any deviation from existing infrastructure be approved from REGULATOR with plausible reasons.”
4. One of the stakeholders was of the view that “All Licensees (TIP/TTP) be directed to optimally utilize existing civil infrastructure (Power Grids, Roads/Railways setups and street furniture). REGULATOR must finalize ROW formalities with major stake holders of Power like NEPRA, Transport Like NHA and Ministry of communications etc.”
5. Some stakeholders suggested that framework should include a number of key infrastructure sharing principles including (i) the basis of infrastructure sharing should be non-discriminatory and on commercial terms and (ii) minimum intervention and proportionality.
6. Some stakeholders suggested that “TSPs/TTP/TIP should be mandated to share the in-building infrastructure (IBS, OFC and other cables, ducts etc.) with other TSPs, in large public places like Airports, hotels, multiplexes, etc., commercial complexes and residential complexes.”
7. Stakeholders supported streamlining of processes across the sector to make it easier to share infrastructure; e.g., via process simplification and digitization.
8. Some of the stakeholders pointed out issues regarding ‘Right of Way’ (RoW). Acquisition of ROW remains a major challenge for TSPs. It was suggested by stakeholders that there should not be any preferential treatment given to any licensee for the RoW, to exclude the possibility of monopoly, in any given geographic area.
9. One of the stakeholders stated “All infrastructure sharing agreements must be on a voluntary basis and entirely up to the concerned parties to decide. An independent, business friendly and market driven approach must be adopted for infrastructure sharing agreements in which all TSPs and TIPs/TTPs will be free to enter into agreements on mutually agreed commercial terms and without any external interventions. For the sake of seamless and quality network connectivity, infrastructure sharing must not be enforced or obligated in any way on any of the TSPs and TIPs/TTPs.”
10. Some of the stakeholders argued that it is not possible to share infrastructure details publicly i.e. such information should not be shared publicly or should not be made available on Authority’s website, pertaining to the availability of active/passive infrastructure elements, physical space etc. as this information is highly dynamic, changes quite often and such information if shared publicly may loose the competitive advantage. Information pertaining to the shared sites along with geographical locations and sharing party details can be provided to the Authority, after the sharing agreements between the parties.
11. Some stakeholders argued that there is no need for Authority to establish unnecessary controls of review and approvals related to business case analysis, risk analysis and mitigation plans.
12. All stakeholders suggested that if both sharing parties (licensees) reach a fair mutual agreement then either party will intimate the agreement which is made between the parties to PTA. Authority agreed with this stance, in principle, of sharing the agreements i.e. prior intimation to PTA for new agreement is mandatory, however, sharing agreements already in field must also be intimated by licensees and shared with PTA after formal issuance of this framework.
13. One major stakeholder stated that “It is encouraging to see that PTA intends to include active sharing in this framework. However, active sharing should not be limited to MORAN only but should also include MOCN. MOCN requires the same investment as MORAN but offers improved efficiency and a better return on investment by opening up possibilities of spectrum sharing and trading in specific areas. Also, MORAN without Microwave/backhaul sharing has limited range of utility for operators. Therefore, the guidelines should clearly include spectrum sharing/trading and MORAN/MOCN modalities”. The Authority is of the view that backhaul spectrum sharing shall be subject to implementation of Administrative Incentive Pricing (AIP) and shall be covered under separate Framework.
14. One of the stakeholders suggested that Telecom Infrastructure Provider Licenses (TIP) be allowed to own and operate bandwidth services for Telecom Service Providers (TSP). The key to ensuring a truly differentiated 4G and 5G services lies with the ability of the MNOs to have access to fiberized telecom sites. The Authority is of the view that TIP licensee can lease, rent out or sell its Telecom Infrastructure Facilities/Telecommunication system that include lit fiber and bandwidth to TSP licensee(s). As this approach will create synergy between TIP and TSP licensees in providing access to cost-effective shared infrastructures. The stakeholder further advocated that the provision of bandwidth services by TIP should not just be limited to fiber system and suggested PTA to adopt a more pragmatic and technology-agnostic approach by recognizing that TIP can also provide bandwidth services or Transmission-as-a-Service to its TSP customers using other technologies such as microwave and VSAT. The Authority is of the view that in case of Microwave TIP would need to be assigned backhaul frequencies. For any spectrum assignments from microwave or for backhaul purposes shall be subject to introduction and implementation of a pricing mechanism such as AIP Regime. TIP can lease out/sell VSAT telecom infrastructure facility to LL or LDI licensees subject to respective license geographical areas and applicable license conditions.
15. One stakeholder suggested that “Telecom Tower Provider and Telecom Infrastructure Provider License to be able to own and operate In-Building System (IBS) and small cells. By allowing TTP and TIP licensee to own, install, operate, lease and sell the capacity of IBS to Telecom Service Provider (TSP) at non-discriminatory terms and conditions is consistent with international best practices. The Authority agreed and elaborated the definition of Distributed Antenna System (DAS) / IBS, whose components include Antennas, Cabling(Co-axial, Fiber), Taps, Splitters, Multiplexer, Coupler, Attenuators, Combiners and associated power equipment (if any).
16. Dispute Resolution in sharing agreements was one of the main issues pointed out by most of the stakeholders. The Authority has considered this important aspect and has provided a mechanism to deal with Dispute Reporting & Resolution in the framework.

Annex C

# Annex-C: Infrastructure Sharing in European Union

Sharing is a feature in many European mobile markets and is often but not always concluded on a voluntary basis (i.e. “commercially driven”), and not as a result of regulatory intervention. In some of the countries where mobile infrastructure sharing is already a factor in the market or under active consideration, National Rental Affordability Scheme (NRAS) have adopted guidelines trying to achieve a reasonable balance between incentivizing investment and ensuring a fair and competitive market development through infrastructure-based competition.

There are also differences in terms of providing guidelines or rules with respect to infrastructure sharing with some countries providing detailed guidelines and some providing none at all.

There is some degree of passive infrastructure sharing, but the ways in which infrastructure sharing is managed or assessed differs from country to country. Differences arise from how information about infrastructure sharing agreements is treated and shared between the parties and the authorities and how disputes are dealt with. There are also differences in the approaches regarding the inclusion of rules in spectrum awards that may foster, mandate or prohibit network sharing.

In Denmark, an active sharing agreement on Radio Access Network (RAN) is seen to work fine, although the parties involved are in fierce competition. In France, also RAN sharing is efficient and resulted in better 2G / 3G coverage, as it was a prerequisite for authorization, as defined in the NRA sharing guidelines. Furthermore, Norway describes infrastructure sharing as a prerequisite for newcomers to enter the mobile retail market.

In Sweden, there were three Mobile Network Operators (MNOs) during the 1990s when GSM services were launched: Telia, Comvik and Europolitan. The last two later became Tele2 and Telenor respectively through mergers and acquisitions. Swedish government awarded four 3G licenses in year 2000. Tele2 and Europolitan (acquired by Telenor in 2006) had existing 2G operations and Orange and Three (Hi3G) were new entrants in the market. The regulatory conditions mandated coverage of 99.98% population by end 2003. The license terms and conditions also permitted 3G license holders to share up to 70% of RAN infrastructure to meet the coverage obligations.

Telia, which had 50% 2G market share, was not successful in winning a 3G license (Telia later merged with Finland based Sonera in 2002 and formed TeliaSonera). Tele2 and TeliaSonera decided to build a shared 3G network based on 3G license acquired by Tele2. They formed a Joint Venture (JV) named Svenska UMTS Nät AB “SUNAB” in 2001 which was responsible for planning and deployment of the joint 3G network.

Tele2 and Telenor already had a 3G network sharing arrangement with Telia and Three respectively, they announced plans to build a shared 4G network in April 2009 and established a JV “Net4Mobility” for LTE network deployment. One of the reasons was that though Telia had a partnership with Tele2, Telia had plans to build its standalone 4G network and went on to launch world’s first 4G commercial network in 2010.

Despite the level of sharing among operators, the network sharing agreements are limited to joint planning, deployment, operations and procurement. Each operator competes for customers and mobile company front end functions like marketing, customer service, customer relationship management and billing are not shared and are thus controlled by each mobile network operator. Further, individual operators traffic data, network statistics and customer information are also not shared. All the network agreements have exit clauses to end the sharing arrangements, however, such terminations are difficult to execute and can be very costly for the partner operators. The SUNAB network sharing model worked well for participating operators Tele2 and Telia

Despite concerns that such extensive network sharing agreements might affect operators’ ability to compete, however, evidence suggests on the contrary that there is healthy competition in the mobile market with subscribers getting the benefit in the shape of economic broadband and full coverage. Overall, network sharing acted as a catalyst to establish dense networks in Sweden enabling early uptake of Mobile Broadband (MBB) services due to improved coverage and wide population reach. It also reduced operators CapEx and OpEx costs resulting in improved profitability and more investment into networks by shareholders of companies.

With a view to the 5G rollout, it is expected that a much larger amount of sites will be needed. As the amount of sites increases, also the number of sharing agreements is expected to increase or at least the complexity of such agreements to become higher.

Operators are obliged to publish information on passive infrastructure sharing opportunities in advance, in a public forum, in nine countries (Belgium, Bulgaria, Croatia, Greece, Italy, Latvia, Liechtenstein, Montenegro and Serbia). In Norway, the obligation applies only to the SMP operator. The obligations can take the form of online publication, notifying the NRA / Ministry or publication via a third-party platform.

### **United Kingdom**

For operators in UK which opt for network sharing, they typically share the sharing agreements terms and conditions with the Ofcom. Passive network sharing (site sharing) has been present in the United Kingdom since the early mobile networks in 1980s. Operators were reluctant to share sites where they had exclusive coverage to maintain the competitive advantage. However, in some areas where market was mature (low growth), operators shared sites on reciprocal basis.

In 2001, telecom sector regulator OfTel (Now OfCom) issued policy for 3G network sharing. However, some limitations were as follows:

* As per the Wireless Telegraphy (WT) Act, the sharing agreements cannot have transfer of frequency assets and spectrum between parties
* Infrastructure sharing encouragement by government should not be at the expense of anti-competitive practices

In Dec 2007, Hutchison (brand name “Three”) and T-Mobile announced plan for 3G WCDMA network sharing which was the first network sharing deal in United Kingdom. Both operators’ main drivers were to extend coverage, increase capacity & reduce expenditures with the active network sharing arrangement as both did not have fixed line network. A joint management company (50:50) was formed, Mobile Broadband Network Ltd “MBNL” setting a target to cover up to 90% of population with a single grid of BTS sites. The sharing arrangement **did not include spectrum pooling** and consisted of passive infrastructure and active sharing based on MORAN (base stations, transmission and RNC). The governance model was Asset Light JV. Some salient highlights of this sharing arrangement results are given below:

* Pre-consolidation total sites were 18,800 (Q1 -2010)
* Post-consolidation shared sites were 12,400 (Q4-2010)
* 5,500 sites were de-commissioned
* Coverage expansion in rural areas
* Improved indoor coverage in urban areas
* Savings of up to 30% (CapEx & OpEx) with active RAN sharing
* Additional OpEx savings of 15-20% via Managed Services (outsourcing of operations and maintenance)

In 2010, T-Mobile and Orange merged their networks and formed EE (Everything Everywhere) which became the largest mobile network operator in UK. As a result of merger, MBNL also took over assets of Orange and used its RAN infrastructure to further consolidate and improve the joint/ shared 3G network. The current network sharing agreement is between Three (3UK) and EE and presently covers the following under MBNL agreement:

* **Passive network sharing:** Three and EE share the passive infrastructure and existing sites at national level.
* The initial agreement was limited to 3G sites only, however, 4G was launched by both operators in 2013 and passive sharing was extended to 4G sites as well.
* **Active network sharing:** MORAN based solution (excluding spectrum sharing) on national level (3G only)
* Three and EE are not sharing active 4G RAN and co-operation is limited to passive infrastructure sharing.
* Backhaul transmission sharing for both 3G and 4G technologies.
* Core networks are separate for both Three and EE.
* Joint deployment for new sites and expansions. The cost for deployment and network operations is shared proportionally.
* Each operator carries out the deployments in its own region.

In 2012, an agreement was signed between Telefonica (O2) and Vodafone for network sharing resulting in establishment of a Joint Venture (JV) company known as Cornerstone Telecommunications Infrastructure Limited “CTIL”. CTIL takes care of the infrastructure and existing sites of both operators at national level covering following areas:

* Owns and manages all cell sites belonging to both operators.
* Active RAN sharing model based on MORAN for all three technologies (2G, 3G and 4G) and **excludes spectrum sharing.**
* Cornerstone agreement stipulates that UK is divided into two geographic regions (East and West) excluding London city. East region is managed by O2 and West by Vodafone. Both operators own active equipment and are responsible for operations and maintenance in respective region. In East region, O2 is host operator and Vodafone is guest and vice versa in West region. For London, North and South geographic division is carried out.
* Since each operator is responsible geographically for half of UK area, so the cost for deployment and network operations is divided in proportion to the area managed by each operator.
* If any operator required a unilateral coverage, the requesting operator needed to provide the investment to other operator if the desired coverage fell into the other operator’s managed area.
* Transmission (backhaul) is also shared. Traffic from a cluster of sites is aggregated and backhauled to core sites on joint transmission network.