



**Nepal Telecommunications Authority (NTA)**  
**Bluestar Office Complex, Tripurehwor**  
**Kathmandu, Nepal.**

**CONSULTATION PAPER**

**ON**

**INFRASTRUCTURE SHARING**

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## PREFACE

Infrastructure sharing is the norm even for companies that are engaged in direct and heated competition. In Nepal, it is common to find three similar masts belonging to three different operators. It is equally common to find different telecom operators digging up roads in cities and along highways, each laying infrastructure similar to that of the other companies. Whereas there is the argument of different operators using different suppliers in their value chains as a source of competitive advantage, if they shared infrastructure they could use the savings to enhance their service profit chains. This would allow them to maintain their good employees, add value to their services and therefore increase customer satisfaction and loyalty that would lead to growth in subscription base and profit.

Lack of an infrastructure-sharing culture in the country is a hindrance to the dispersion of services, and also contributes to the high prices that consumers have to pay to access telecom services. Across several hilly mountainous terrains, masts and towers of different telecom companies dot hill after hill, which proves very expensive for the operators to roll out services. Yet they each continue investing in duplicating each other's infrastructure.

But the need of the hour is to roll out telecom services at faster pace and at affordable price to ensure higher penetration of telecom services in rural areas. Providing telecom services in rural and far flung areas will require both additional resource and time to roll out the services. The goal of NTA is to make an environment conducive for easily affordable quality service and to make the slogan "**mobile at each hand and internet to each home**" a reality.

To date, around 1,500 BTSs are installed all over the country. Based on the data provided by the telecom operators, it has been estimated that nearly 900 BTSs will be added each year to cater the growing demand, where as approximately 10,000 BTSs are needed to provide mobile telecom services to the entire population of the country. Installing such a large number of mobile tower sites is a huge task. The service providers are exploring all possibilities of reducing cost and time to roll out of service in remote rural areas of the country. Creation of

infrastructure like erecting towers, backhaul connectivity with nearest network element account for about 60% of the total cost. Hence it is important to explore the possibilities of sharing existing as well as new infrastructure by service providers. In addition, the aesthetics of the landscape also demands infrastructure sharing.

Therefore, to overcome this situation, Nepal Telecommunications Authority (NTA) has come up with this Consultation Paper on infrastructure sharing with the objective of providing benefits for all.

The purpose of this Consultation Paper is to consult all stakeholders for the formulation of guidelines on infrastructure sharing. The stakeholders are requested to send their comments on the Paper within 15 days of posting on NTA website. This Paper does not convey in any sense a decision of the NTA in respect of the issues discussed. In case of any clarification/information, please contact Mr. Kabindra Shrestha, Deputy Director of NTA, Tel.: 4101030 or email at [kshrestha@nta.gov.np](mailto:kshrestha@nta.gov.np).

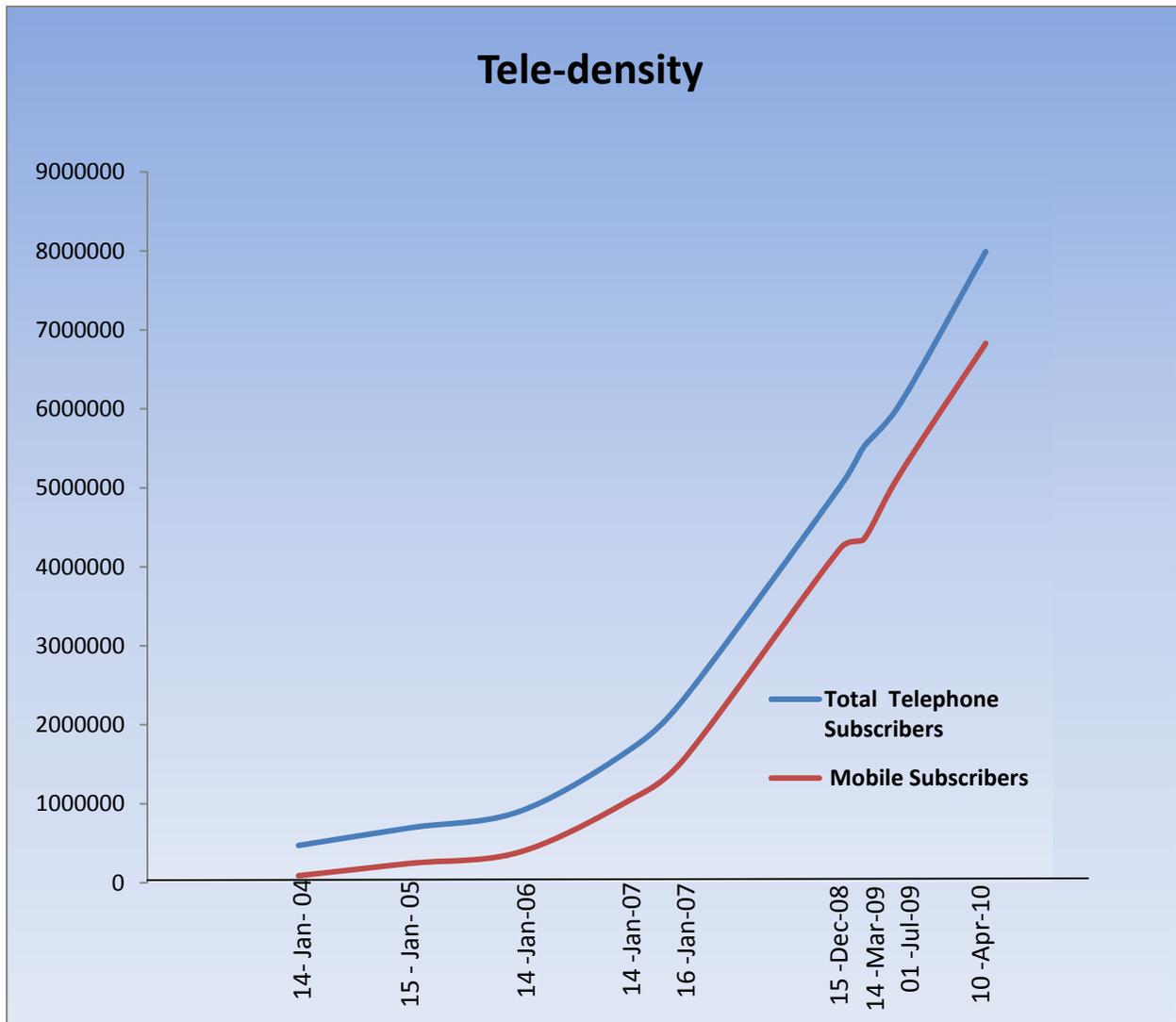
**Bhesh Raj Kanel**

**Chairman**

## CHAPTER 1

### INTRODUCTION

- 1.1 The Nepal Telecommunication Authority ("The Authority") is responsible for regulating the telecommunications sector in Nepal, through the Telecommunication Act, 1997.
- 1.2 The total number of telecom subscribers by April 2010 is nearly 80 Millions with mobile subscribers contributing nearly 70 Millions. The growth pattern of telephony services is depicted in the graph below:



- 1.3 In Nepal, it is common to find three similar masts belonging to three different operators. It is equally common to find different telecom operators digging up roads in cities and along highways, each laying infrastructure similar to that of the other companies.
- 1.4 Lack of an infrastructure-sharing culture in the country is a hindrance to the dispersion of services, and also contributes to the high prices that consumers have to pay to access telecom services.
- 1.5 Across several hilly mountainous terrains, masts and towers of different telecom companies dot hill after hill, which proves very expensive for the operators to roll out services. Yet they each continue investing in duplicating each other's infrastructure.
- 1.6 Infrastructure sharing among telecom service providers is becoming the requirement and process of business in the telecom industry where competitors are becoming partners in order to lower their increasing investments.
- 1.7 Nepal Telecommunication Authority has taken note of exponential growth of the mobile subscribers in the country. Mobile service providers will require large number of the towers to sustain this growth pattern, which will need huge expenditure and time to roll out services. It is likely to further deteriorate the skyline by erecting more towers. Passive infrastructure sharing will help to reduce mushroom growth of towers.
- 1.8 The capital cost for creating new infrastructures is estimated nearly 60% roll-out cost of a mobile service is towards setting up of passive infrastructure. Therefore passive infrastructure sharing amongst mobile service providers assumes crucial importance, as it allows more than one service providers to leverage and ride on common infrastructure.
- 1.9 For encouraging infrastructure sharing in the country, the Telecommunications Policy 2004 and licensing conditions need to be amended as per the suggestions received from different stakeholders to promote infrastructure sharing with nondiscriminatory basis to other service providers.
- 1.10 The ground is also ready for introduction of third-generation (3G) services in Nepal. Its high speed and data will facilitate delivery of a wide range of multimedia services including video telephony, television, etc. To maximize benefits, 3G services should be cost effective which also demands for the need of infrastructure sharing.

1.11 Therefore to successfully implement the infrastructure sharing in Nepal, "The Authority" is proposing to **mandate passive infrastructure sharing including backhaul in the initial stages in rural and far flung areas if possible in urban areas also, whereas active infrastructure sharing shall be initiated after the success of passive sharing and when the telecom industry becomes matured.**

## CHAPTER 2

### INRASTRUCTURE SHARING

- 2.1 Infrastructure sharing generally translated as having two or more operators coming together to share various parts of their network infrastructure for the purposes of their service provisioning.
- 2.2 The term Infrastructure Sharing refers to the sharing of mobile towers for provision of wireless service between service providers, sharing existing base station sites, air conditioning, power, backbone, radio links, and other resources to reduce infrastructure duplication and costs.
- 2.3 **Prospects of Infrastructure Sharing in Nepal**
  - 2.3.1 Today's economic climate calls for companies to run like well-oiled cost efficient machines; companies can benefit from even the smallest savings. Measures such as telecom infrastructure sharing will provide companies with a means to save on rollout costs and in the long run, the said savings can be used to counter shrinking investment. It is a solution that might prove practical, especially for companies looking to expand.
  - 2.3.2 Infrastructure sharing opens a number of possibilities for telecommunication companies; savings translate to more capital to reinvest on building new sites, save companies from slimming down the workforce, and stay competitive, among others. The customers benefit too, as the healthy competition promotes better quality of services and lower costs.
  - 2.3.3 The growth of the telecom industry brings its own pitfalls with it. Growing call traffic, limited bandwidth and a limited number of cell towers have all combined to lead in poor network coverage by most operators is a matter of fact. One way to solve to this problem would be to set up more towers. At present, around 1,500 BTSs cater to nearly 7 million wireless subscribers and estimated that

nearly 900 BTSs will be added each year to cater the growing telecom demand. The Authority has estimated approximately 10,000 BTSs are required to serve entire population, which brings up the related problem of identifying such a large number of sites.

- 2.3.4 For telecom operators, infrastructure i.e. towers and backhaul connectivity account for about 60 percent of the cost of doing business. However, given the recent rise in property, steel and cement prices, the capital cost of passive infrastructure is going up while that of the active infrastructure is coming down thanks to declining prices of electronic components. Thus, apart from the high costs that are incurred, it also results in delaying the roll out of services.
- 2.3.5 Telecom infrastructure requires huge investment outlays. Often, such investments turn out to be risky propositions given the rapid introduction of successive generations of new technology. Operators are occasionally faced with a situation where even before recovering their investments in existing infrastructure they embark on further investments in new generation networks. This phenomenon is common in the mobile sector, particularly in the context of 3G services, where the high cost of licensing and equipment have left operators vulnerable at the early stages of network deployment.
- 2.3.6 In response to this phenomenon, The Authority has put a greater emphasis on alternatives to the traditional high-cost infrastructure development model by considering such measures as infrastructure sharing, domestic roaming and Mobile Virtual Network Operator (MVNO) agreements in future as market matures. The Authority realizes that these measures can help reduce the financial burden on operators, accelerate the introduction of new services and facilitate the deployment of new networks while lowering barriers to market entry.

## CHAPTER 3

### FORMS OF INFRASTRUCTURE SHARING

- 3.1 A cell site consists of *electronic* and *non-electronic* infrastructure.
- Electronic infrastructure includes base tower station, microwave radio equipment, switches, antennas, transceivers for signal processing and transmission.
  - Non-electronic infrastructure includes tower, shelter, air-conditioning equipments, diesel electric generator, battery, electrical supply, technical premises, easements & pylons and even billing systems that account for nearly 60 percent of network rollout costs.
- 3.2 There are several different elements of infrastructure that can be shared. However, not all elements of the network infrastructure can or should be approached in the same manner. In order to develop frameworks for regulating the sharing of network infrastructure, it is helpful to conceptualize infrastructure as falling into two categories:
- Passive Infrastructure Sharing
  - Active infrastructure Sharing
- 3.2 The telecom market in its various stages may leverage different forms of Infrastructure Sharing. Passive Infrastructure (mainly site sharing: utilities, towers, shelter, etc.) and backhaul are relevant in the early stages of Infrastructure Sharing. These initiatives facilitate faster rollout and allow significantly reduce cost and time to the market.
- 3.3 In our context, other forms of sharing becomes equally relevant as a telecom market develops and matures, namely – network sharing, national roaming, spectrum sharing, Mobile Virtual Network Operator (MVNOs) – to prompt a new wave of growth in the Telecom Sector.

### 3.4 **Passive Infrastructure Sharing**

- 3.4.1 **Passive Infrastructure** sharing is nothing but sharing non-electronic infrastructure that includes civil engineering works at cell site. In cell sites, "passive" equipment includes the tower itself, electrical supply, air-conditioning equipment, and technical premises, among other things. The service providers while sharing sites may share all site related infrastructure which includes ownership rights or right to-use the site. Thus far, passive infrastructure sharing is the most commonly used option by telecom companies around the world. It accounts for the larger chunk of rollout costs.
- 3.4.2 In passive sharing, service providers including infrastructure provider acquire a common site to host the Base Transceiver Station (BTS) and share space, power backups, air conditionings in shelter, etc. Service providers put their own antennae and separate feeder cables. In this case, arrangement between service providers is easy and chances of dispute are minimal.
- 3.4.3 Though passive sharing is comparatively easy and simple than an active sharing, technical arrangements like height and load bearing capacity of tower, capacity of building structure and foundation in case of Roof Top Tower, azimuth angle of different service providers, tilt of the antenna, height of the antennae, space, need to be considered seriously.
- 3.4.4 Design of infrastructure should be in view the requirement of all service providers interested in sharing. This could bring changes in technical specifications of towers, which will have direct impact on selection of cell sites, foundation for erection of towers, etc.
- 3.4.5 In case of existing infrastructure, need to be very careful in analyzing whether the towers and other infrastructures including the space is designed to cater the combined load of antennae of different service providers.
- 3.4.6 Large number of antennae on a tower is likely to create problems like designing towers in busy areas will be complicated, as it will require special type of tower capable of bearing much higher load.

3.4.7 Unsatisfied operation and maintenance of site may badly affect coverage and quality of service, where as the insufficient power supply can totally paralyze service in that area.

3.4.8 The Authority proposes to mandate passive infrastructure sharing in the initial stages in rural and far flung areas if possible in also in urban areas.

### 3.5 **Active Infrastructure Sharing**

3.5.1 **Active** sharing is nothing but sharing electronic infrastructure. Active sharing involves the shared use of electronic infrastructure in a cell site, including the base tower station, switches, antennas, feeder cables, node B, transmission and signal processing transceivers, backhaul, and microwave radio equipment.

**Spectrum**-sharing concept is based on a lease model and is often termed 'spectrum trading'. With spectrum-sharing, an operator can lease a part of its spectrum to another operator on commercial terms, which enables both companies to provide service to the same customer. Though this mechanism, along with that of A Mobile Virtual Network Operator (MVNO), it promotes better service at competitive prices and benefits customers.

3.5.2 Though active infrastructure sharing reduces large sum of investment cost and time to roll-out networks, it is more complex as compared to passive infrastructure sharing. For example, provision of exit clause in case of dispute will be almost impossible as networks between service providers may not be easily separated, another reason being increased inter dependency between the service providers, which may limit the competition due to increased interdependence. Therefore, The Authority does not permit Active Infrastructure Sharing except backhaul until the telecom industry matures.

3.5.3 Apart from other active components, The Authority is planning to permit backhaul sharing in rural and far flung areas, where traffic from BTS to BSC is low and this will reduce cost and maintenance efforts. The Authority realizes that backhaul sharing will definitely play a key role in the expansion of telecom services in rural and far flung

areas of Nepal. In backhaul sharing, exit from sharing arrangements is easy for service providers.

## **CHAPTER 4**

### **BENEFITS FOR ALL**

- 4.1 With passive infrastructure sharing, operators are expected to save 40-60 percent on capex and opex when it comes to passive infrastructure management. The passive infrastructure sharing will allow service providers to focus on their own core sales/marketing areas. This will also free up management time at the carriers.
- 4.2 As service providers expand their networks into semi-urban and rural areas, there will be an increase in capex. This is due to higher costs of land development, security and insurance costs, power shortages and increased use of diesel generator backups, unclear land ownership and expensive backhaul connectivity costs. Hence passive infrastructure sharing will significantly lower the capex.
- 4.3 Passive infrastructure sharing will allow operators to defer their tower-related capex investments into opex lease rental payments over an extended period of time. Existing towers can also be sold and leased back, thereby creating new sources of cash, which can be invested in radio network expansion and distribution.
- 4.4 Service Providers outsourcing passive infrastructure sharing will cater to the multiple requirements of the growing Telecommunications Sector and would facilitate better Quality of Service (QoS), will benefit from a quicker network rollout, reduces Capex requirements for network rollouts, reduces Opex via infrastructure sharing, decreases time to market, develops a long term partnership who shares financial and technical responsibilities and increases public support via fewer unsightly towers on the landscape.
- 4.5 Infrastructure Sharing checks proliferation of towers by percolating the benefits of technological innovations, which are environment friendly and aesthetic in nature. Another critical benefit of Infrastructure Sharing is to ensure ubiquitous coverage by ensuring deployment of cell sites in Critical/High Security Areas.

- 4.6 Benefits to end-consumers; from reduced costs for operators and the resultant lower cost of services. Infrastructure sharing also leads to increased availability of telecom services across wider geographies, further promoting competition and better services.
- 4.7 Benefits to new operators; to launch services rapidly across the length and breadth of the country through ready-infrastructure, and at much lower costs due to the reduction in their capital and operational expenditure. Reduced capex also releases cash that can be used for strategic corporate purposes.
- 4.8 Bridging the digital divide by helping the government achieve its objectives of increasing telecom penetration in rural Nepal and making reality the slogan of "**mobile at each hand and internet to each home**" a reality. Unless shared, the rollout of telecom services in rural Nepal will be an unviable option for most service providers.
- 4.9 Benefits to the environment by reducing the infrastructure requirements, like telecom towers. Infrastructure sharing also offers other benefits such as shared energy and maintenance bills, thus helping the operators, while benefitting the environment with reduced carbon emissions.

## **CHAPTER 5**

### **REGULATORY ISSUES IN INFRASTRUCTURE SHARING**

- 5.1 The coverage in rural areas is much less as compared to urban coverage. In order to faster roll-out and to provide affordable tariffs to rural population, it is vital that cost of service in rural area is low. It is very urgent to recognize sharing of infrastructure as one of the effective tools for reducing Capex and Opex. Therefore, the Authority plans to make Passive Infrastructure Sharing mandatory including the sharing of backhaul.
- 5.2 The Authority plans to permit passive sharing for:
- Existing infrastructure
  - To be built new infrastructure
- 5.3 The Authority in consultation with the stakeholders will amend the Telecommunication Policy 2004 and licensing conditions if required to promote sharing of passive infrastructure and backhaul.
- 5.4 The Authority recognize that sharing should be encouraged not only within the boundaries of the telecommunication and Broadcasting industry, but together with the other infrastructure industries such as electricity, water and sewage etc. as well. In the context of technological development, joint infrastructure building with other market players and with other industries may be encouraged, providing for timed, organized opportunities for access to ducts and conduit (for example, for the joint laying of fiber) to distribute the cost of civil works among service providers and reduce the inconvenience for traffic in town and cities. This will also provide for a positive environmental (including aesthetic) impact, in particular by reducing the number of mobile masts and towers.
- 5.4 Telecom Infrastructure sharing will become important for speedy growth and rollout of telecom services especially in the developing countries like Nepal, where geographical terrain varies from terai to hills and to high mountains. Therefore, the Authority has identified three different models for building new infrastructure as well as for sharing of existing infrastructure:

- **Model 1:** One operator providing access to another
- **Model 2:** Jointly Building a Site for Sharing by the Service Providers
- **Model 3:** Third party as an Infrastructure Service Provider for sharing (Independent model)

5.4.1 The "Model 1" is basically for the sharing of existing infrastructure where as the "Model 2" and/or "Model 3" is identified for the infrastructures to be built in the future.

5.4.2 The Authority realizes some of the following reasons for service providers to prefer Model 3: Independent Model.

#### **Reason 1: Service Providers prefer an independent infrastructure provider**

Due to cut throat competition amongst various operators, mutual sharing and joint construction of towers might lead to conflict of interest amongst the operators. Indiscriminate sharing of tower might not fit into the individual network model of operators. Given the massive expansion of telecom in rural areas, mutual agreement on sharing of towers would still involve heavy Capex. With an Independent Third Party Infrastructure provider, the maintenance of sites, layout on allocation of towers for an operator etc. are taken care of by the provider in a neutral manner gaining equal confidence of all the operators sharing the site. This allows the operators to enhance its focus on improving their capabilities in customer service activities.

#### **Reason 2: BOOL business Method in Infrastructure sharing**

In a BOOL Business Model, the abbreviated form of Build- Own - Operate - Lease Model, the Telecom Infrastructure Service Provider acquires up the land for the site, builds up the Passive Infrastructure on the site, owns the site and then lease out the site to multiple Telecom Operators on a sharing basis in exchange of a fixed monthly Rental as pre-decided with the operator. In this Model, once the site is declared 'Ready for Installation' by the Infrastructure Provider, the operator just brings and plugs in its BTS and is operational from Day One. This helps the operators for a quick roll-out of site and

significant saving on the Capex expenditure. The Infrastructure Service Provider even carries out the operation and maintenance of the site and ensures the uptime to an agreed service Level and provides the security of the site.

### **Reason 3: Cost saving in Infrastructure sharing under BOOL Method**

The approximate cost for building up the passive Infrastructure of a Ground Based Tower (GBT) site is 5 to 7 million rupees and that of a Roof Top Tower is 3.2 million rupees. In addition there is the cost of land acquisition for the site which is either purchased or lease from the land owner on a fixed monthly rental. Then there is the cost of depreciation of the Infrastructure and O&M along with the security of the site. The Infrastructure Service Provider takes up the total burden of these various expenses. The Operator thus has significant savings on his Capex as well as Manpower. In lieu of the Infrastructure provisioning service the operator pays a monthly rental to the operator which is miniscule in compared to the huge Capex and Opex savings.

- 5.5 The Authority will provision different incentives/subsidies for the promotion of infrastructure sharing in the country, some of which could be reduction or exemption (for certain periods) in/of license fees/tax, financial support from Rural Telecommunication Development Fund, relaxation in terms of network rollout / additional spectrum, etc.
- 5.6 The Authority also encourages the service providers to use non-conventional source of energy for power backup especially in the rural and far flung areas.
- 5.7 Regulation of the commercial agreements for the sharing of the site is difficult as sharing possibilities varies from location to location and cities to cities, the cost of the site is dependent on the location, cost of setting up of infrastructure, type and extent of sharing, number of the service providers sharing the infrastructure etc. In this regard, sharing agreements have to be between service providers. It is important to note that sharing of infrastructure is between two service providers and it depends on number of factors like cost of setting up infrastructure, possibility of sharing of infrastructure, technological suitability etc.

- 5.8 Even if it is assumed that there will be savings in infrastructure sharing, the next concern of the Authority would be, whether savings out of infrastructure sharing will be passed on to subscribers. Likelihood of reduction in tariffs as a result of infrastructure sharing may be too little.
- 5.9 Such advantages are generally retained by service providers unless there is tough competition. The monitoring and regulating such costs becomes almost impossible since the sharing pattern will not be uniform and between service providers.
- 5.10 The increasing numbers of the towers are putting a stress on the aesthetics of the city. Similar case will soon appear in rural areas as well if timely action is not taken.
- 5.11 Many a time the suitability of the building and strength to support load for roof top towers are not properly checked and may result in damages and risk to human life. Infrastructure sharing definitely has potential environmental benefits of passive infrastructure sharing.

## CHAPTER 6

### INTERNATIONAL EXPERIENCE

#### 6.1 India

The Telecom Regulatory Authority of India (TRAI) has proposed the sharing of passive, active and back haul networks in the country for faster rollouts of networks in urban and rural areas, and at lower cost. TRAI has sought amendment in the license condition to allow active infrastructure sharing limited to antenna, feeder cable, node B, radio access network and transmission systems. However, the authority has not favoured sharing of spectrum at this stage.

Considering the importance of back haul sharing for mobile services in rural and far flung areas, licensing conditions should be amended to allow operators to share their back haul in a limited way on optical Fiber. No sharing of spectrum at access network side is permitted.

Passive infrastructure sharing means sharing of physical sites, buildings, shelters, towers, power supply and battery backup and is permitted under the licences.

TRAI took into consideration the prevailing international practices and has opted for co-operative efforts amongst telecom service providers with least regulatory intervention. The authority has made it clear that it does not prefer any mandated passive infrastructure sharing but has required that the entire process should be transparent and non-discriminatory. The licensees should be required to announce on their website the details of existing as well as future infrastructure installations available for sharing by the other service providers.

The mode of commercial agreement has been left to the telecom service providers but it has reserved the option of prescribing a standard commercial agreement format in future if the

process of infrastructure sharing does not become a pattern of planning in the schemes of telecom service providers. It seeks conclusion of commercial agreements in four weeks" time.

In a major recommendation, the TRAI has recognized the need for immediate identification of critical infrastructure sites. It has recommended a joint working group under the chairmanship of the district magistrate to take spot decisions. The representatives of the telecom service providers, municipal corporation/local bodies and a representative of military land control wing, where necessary, would be its members.

In order to provide level-playing field and rollout opportunities to all the licensees, the authority has expanded the scope of financial incentive for passive infrastructure sharing in rural and far-flung remote areas. Accordingly, it has recommended that all the licensees in any service areas should qualify for financial subvention schemes meant for rural areas though at reduced scale compared to the winner in the tender process of Universal Service Obligation Fund (USOF) administration. TRAI has also recognised the need to encourage use of non-conventional energy sources and has recommended to the Department of Telecommunications to finalise suitable schemes in consultation with the concerned ministry so as to resolve the critical power availability issue.

## **6.2 New Zealand**

With limited exceptions, mobile site sharing is mandatory upon request in New Zealand, although service seekers and service providers are free to set their own pricing arrangements for collocation. In 2007, an investigation conducted by the New Zealand Commerce Commission (the Commission) found that although collocation agreements for mobile site sharing had been in place for many years, collocation had occurred on less than 0.5% of available towers. The investigation further found that pricing for collocation services was not the impediment to mobile collocation. Instead, the Commission considered that collocation had not occurred more frequently because "incumbent operators had control over optimal collocation sites and incumbents had no or limited incentives to support collocation by competing networks."

(Commerce Commission, Schedule 3 Investigation into Amending the Co-Location Service on Cellular Mobile Transmission Sites, 14 December 2007).

In response to these findings, the Commission undertook a process to determine the Standard Terms for collocation on mobile cellular transmission sites. The Commission released its Determination on these Standard Terms (the "STD" or "Standard Terms Determination") in December, 2008. The Commission's STD was aimed at enabling the efficient provision of mobile collocation services and at providing service seekers and service providers with appropriate incentives to make efficient use of mobile network resources for the long-term benefit of end-users. The Commission identified three aspects of the STD in particular that it considered will contribute to more rapid collocation of mobile network transmission and reception equipment:

1. the standard type site solution process;
2. the ability for service seekers to make multi-site applications; and
3. the Service Level capacity limit for each service provider of ten applications per access seeker per five day working period.

The Commission also stated that it would also monitor the implementation of the STD closely, given the limited progress that has been made towards collocation. The Commission stated that it "will be carefully examining the Service Level performance reports, with particular attention on the number of collocation Applications received and final approvals issued by Service Providers, as well as Service Level defaults."

### **6.3 Sweden**

According to the present 3G licensing in Sweden, network infrastructure sharing is allowed as long as each service provider has 30% of the population covered with its own infrastructure and the remaining 70% can be shared. the radio infrastructure includes the antennas, transmission

equipments and other intelligent parts of the networks, while the passive infrastructure include mast, power supply, sites and various air conditioning equipments.

## **6.4 France**

ART (Autorité de Régulation des Télécommunications) also favoured sharing of 3G infrastructure between service providers, as long as they don't share frequencies. It added that it did not want the sharing agreement to prevent the development of effective competition in the 3G market, which must be beneficial for subscribers.

ART defined following five levels of sharing and their compliance with conditions for issuing 3G authorizations:

### **a) Level 1: Sharing of sites and passive elements**

This form of sharing consists of common use by multiple service providers of all or part of the passive elements of the infrastructure. This would include sites, civil engineering, technical premises and easements, pylons, electrical supply, air conditioning, etc.

This type of sharing is not only permitted, but encouraged.

This "level 1" sharing also includes the pooling of transmission elements that are not part of the UMTS architecture, such as connections between base station controllers (BSC) and network nodes (MSC and SGSN) or connections between base stations (node B) and base station controllers (BSC). Such pooling is possible if these elements are not directly from the UMTS network.

## **b) Level 2: Antenna sharing**

This level is defined as pooling of an antenna and all related connections (coupler, feeder cable), in addition to passive radio site elements. Since an antenna can be considered a passive element, antenna sharing can be included in the more general issue of passive infrastructure sharing mentioned above and therefore complies with the telecommunications act.

## **c) Level 3: Base station sharing (Node B)**

Base station sharing is possible as long as each service provider:

- maintains control over logical Node B so that it will be able to operate the frequencies assigned to the carrier, fully independent from the partner service provider.
- retains control over active base station equipment such as the TRXs that control reception/transmission over radio channels.

## **d) Level 4: Base station controller (RNC)**

RNC sharing is possible since it represents maintaining logical control over the RNC of each service provider independently.

## **e) Level 5: Sharing of backbone elements**

This consists of sharing switches (MSC) and routers (SGSN) on the service provider's fixed network. The frequency usage authorizations issued by the Authority are assigned intuitu personae and cannot be transferred. Accordingly, the Authority must exclude infrastructure sharing solutions that lead to a pooling of frequencies between service providers.

The sharing of backbone elements does not comply with the French regulatory framework if it leads to such pooling of frequencies. This is the case when backbone elements are shared along with the radio portion.

## **6.5 Singapore**

In general, a Licensee is not required to “share” the use of any infrastructure that it controls with its competitors. Instead, each Licensee is expected to build or lease the use of the infrastructure that it requires. However, where Infocomm Development Authority of Singapore (IDA) finds that specific infrastructure constitutes Critical Support Infrastructure, or where IDA concludes that it is in the public interest, IDA may mandate that a Licensee share the use of the infrastructure with other Licensees.

IDA uses the following standards to determine whether any infrastructure must be shared:

### **1. Critical Support Infrastructure (CSI):**

IDA will only deem the infrastructure to constitute CSI if it concludes that:

- a.* the infrastructure is required to provide telecommunication services;
- b.* an efficient new entrant would neither be able to replicate the infrastructure within the foreseeable future, nor obtain it from a third-party through a commercial transaction, at a cost that would allow market entry;
- c.* the Licensee that controls the infrastructure has sufficient current capacity to share with other Licensees;
- d.* the Licensee that controls the infrastructure has no legitimate justification for refusing to share the infrastructure with other Licensees; and
- e.* failure to share the infrastructure would unreasonably restrict competition in any telecommunication market in Singapore.

## **2. Public Interest:**

In certain cases, IDA may determine that the public interest requires that infrastructure to be shared. Therefore, even if such infrastructure does not constitute CSI, IDA may, in consultation with other government agencies where appropriate, require the sharing of such infrastructure.

## **3. Designation of Specific Infrastructure by IDA that must be shared:**

The following types of infrastructure must be shared:

- a. radio distribution systems for mobile coverage in train or road tunnels;
- b. in-building cabling (where the occupant elects to take service from another service provider); and
- c. lead-in ducts and associated manholes.

## **6.6 Norway**

The Norway's parliament, agreed up on Government's proposal for a framework for infrastructure sharing. For 3G infrastructure sharing, Norwegian Post and Telecommunications Authority (NPT), the Ministry of Transport and Communications has decided the following.

### **Within the minimum coverage requirements:**

The following components shall be shared within the area covered by the concessions' minimum coverage requirement:

- Antennas and masts: All sites, masts, antennas, cables, combiners, power supply, buildings etc.
- Node B: Node B may be shared physically, but operators must retain logical control over their own base station.

- RNC (Radio Network Controllers): RNCs may be shared physically, but operators must retain logical control over their networks and spectrum.
- Transmission: All transmission routes, i.e. optic Fiber, cables, P-P radio lines may be shared.
- Core networks: The MSC (Mobile Switching Center) not to be shared.
- Frequency sharing is not allowed.

## **6.7 USA**

Telecommunications in the USA is regulated by the Telecommunications Act 1996, which contains requirements for both collocation and infrastructure sharing. These requirements are imposed by section on Interconnection. There is a separate section on Infrastructure Sharing, but applies only where the service provider who is sharing another service provider's facilities uses them only for services that do not compete with the provider of the infrastructure.

Section on Interconnection includes requirements, which are as follows:

1. All carriers to provide access to poles, ducts, conduits and rights-of-way to competing carriers;
2. Incumbent local exchange carriers (LEC) to:
  - Negotiate in good faith.
  - Provide to any requesting carrier non-discriminatory access to network elements on an unbundled basis at any technically feasible point on terms that are non-discriminatory.
  - The access must be provided in a way that enables the requesting carrier to combine such elements to provide a service.

- Provide on reasonable and non-discriminatory terms for the physical collocation of equipment necessary for interconnection or unbundled access at the premises of the LEC, except that virtual collocation may be provided if collocation is not practicable for technical or space reasons.
- Rural telephone companies may gain exemption or modification from the requirements.

Regulations on 3G infrastructure sharing has not been issued by the US regulator in recent years, the regulator has been called upon to scrutinize any issues on a case-by-case basis several infrastructure sharing joint ventures between various mobile service providers. Based on this experience, the US approach generally has been not to intervene in infrastructure sharing issues, but the regulator has the authority to do so if issues of competitive harm are raised. The same general approach would be applicable to 3G infrastructure sharing should the issue arise. There is also a proposal by the FCC, which examines that, in rural areas infrastructure sharing must be promoted as a means of bringing competition.

## **6.8 Hong Kong**

Hong Kong encourages the telecommunications operators to negotiate for sharing of facilities on fair commercial and technical terms & condition. According to the Telecommunications Ordinance, the Telecommunications Authority may direct the licensees to share use of facilities where it is in the public interest to do so. In considering whether or not to issue a direction in the public interest to share a facility, the Telecommunications Authority will take into account relevant matters, including the following:

- whether the facility is a bottle neck facility;
- whether the facility can be reasonably duplicated or substituted;
- the existence of technical alternatives;
- whether the facility is critical to the supply of service by the licensees;
- whether the facility has available capacity having regard to the current and reasonable future needs of the licensee or person to whom the facility belongs;

- whether joint use of the facility encourages the effective and efficient use of telecommunications infrastructure;
- the costs, time, penalties and inconvenience to the licensees and the public of the alternatives to shared provision and use of the facility prior to issuing such direction, the Telecommunications Authority will provide the licensees reasonable opportunities to make representations. As far as the terms and conditions of the shared use (including the rental prices), the parties are required to reach an agreement within a reasonable time. If the parties cannot reach an agreement, the Telecommunications Authority may determine the terms and conditions for the shared use of the facility and provide for fair and reasonable compensation.

## **6.9 Pakistan**

The different networks in Pakistan can share most of the infrastructure: masts, antennae, power supplies, housing, transmission routes etc. can be shared .Node B and Radio Network Controllers can be shared except from the intelligent control of frequency resources.

This License authorizes the licensee to establish and maintain the following Telecom Infrastructure Facilities to lease and rent out or sell end to end links to Telecom Operators licensed by Authority on mutually agreed terms strictly keeping in the view of license conditions:

- Earth stations & Satellite Hub
- Optic fiber cables
- Radio communications links
- Submarine cable landing centre within fifteen miles of costal area of Pakistan
- subject to approval by the Authority & clearance of Ministry of Defense and Ministry of Interior;
- Towers, poles, ducts and pits used in conjunction with other infrastructure facilities; and
- Such other Telecommunication infrastructure as the Authority may, by Regulation, require.

## **6.10 Germany**

The regulator RegTP (Regulierungsbehörde für Post und Telecommunication), in Germany, stated that each 3G license holder should require its own network, each of which needed to ensure its 'competitive independence' during the lifetime of the license. This means that backbone facilities such as switching centers can not be shared by the service providers even though they could share network elements such as masts and antennas.

The regulator ruled that infrastructure sharing of wireless sites, masts, antennas, cables, combiners and cabinets was permissible – provided that full legal control of the networks and competitive independence remains intact. There is expectation that this will allow Universal Mobile Telecommunications System (UMTS) license holders (particularly new market entrants) to achieve meaningful economies in the build-out of their UMTS networks, particularly outside urban areas infrastructure sharing could also lead to an extension of 3G coverage.

## **6.11 Brazil**

In Brazil, National Telecommunications Agency (ANATEL) issued the rules on infrastructure sharing among various telecommunications service providers.

According to the rules conditions and standards for sharing of ducts, conduits, poles, towers and utility easements in the telecommunications sector, ANATEL has prescribed a methodology for actual calculation of infrastructure costs, instead of a price list.

The major points in the resolution are:

- a. Only infrastructure over-capacity may be shared with other telecommunications companies;
- b. Acts or omissions aimed at protracting an agreement between telecommunications companies will be treated as unfair competition under antitrust laws; and

- c. Telecommunications service providers applying for use of another service provider's infrastructure has to pay caps on the amount.

## **6.12 Jordan**

Telecommunications Regulatory Commission (TRC) of Jordan has issued the statement in regard to the implementation of Infrastructure Sharing and National Roaming for mobile telecommunications service providers. The TRC has concluded that, any issues related to capacity, availability or other situations that may arise on a case by case basis by the TRC, instead of publishing an exhaustive set of rules with respect to collocation and infrastructure sharing matters, an investigation is conducted by the TRC for the instances where the requesting service provider and the other service provider fail to reach agreement in these matters. Upon completion of its investigation, it will issue a decision regarding the terms, conditions and time frames under which infrastructure sharing or collocation (or both) if feasible.

## **6.13 Netherlands**

In a joint memorandum issued by the NMA (Netherlands Competition Authority), OPTA (Independent Post and Telecommunications Authority), and the V&W (Ministry of Transport, Public Networks and Water management) provided comprehensive clarification on collaboration the deployment of 3G networks in September 2001. According to this memorandum, 3G service providers can collaborate in the construction of 3G network components on the condition that competition between service providers continued to exist and that service providers compete against one another in providing 3G services. While they shared the opinion that collaboration in 3G network deployment could contribute to a more rapid 3G rollout, they clarified that collaboration must be limited to the joint construction and use of the 3G network infrastructures such as masts, aerials and network operation. On this basis, joint use of frequencies and core network is restricted.

#### **6.14 China**

In order to decrease superfluous telecom construction, the Ministry of Industry and Information Technology (MIIT) and the State-owned Assets Supervision and Administration Commission (SASAC) have resolved to promote joint construction and joint use of telecom infrastructure, and have issued a notice requiring all telecom infrastructure enterprises – the post-restructuring China Telecom, China Mobile, and China Unicom – to implement sharing and joint construction for all towers and pole lines, as well as sharing and joint construction for base station equipment and transmission lines meeting the requirements. In addition, exclusive lease agreements for third-party facilities had been forbidden, with a corresponding system for reviewing and punishing agreements that violate the new rules.

A national workgroup for the joint construction and sharing of telecom infrastructure facilities, headed by the MIIT and SASAC, and with participation from the telecom industry, has been established to oversee and mediate in the joint construction and use of national telecom infrastructure, and to make decisions on major projects.

#### **6.15 Switzerland**

According to the license, Swiss operators are obliged to use jointly the operations building and the antenna mast in so far as sufficient capacity exists and technical, legal and economic reasons do not prevent co-use of sites.

## **CHAPTER 7**

### **ISSUES FOR CONSULTATION**

- 7.1 Is there a need for Infrastructure Sharing in the country?
- 7.2 Do you agree with the Authority's plan to permit Passive Infrastructure and Backhaul Sharing?
- 7.3 Is there a need to mandate or promote passive infrastructure sharing through policy intervention?
- 7.4 Do you think The Authority's plan not to permit active infrastructure sharing except backhaul at the early stage of sharing is correct? Please suggest.
- 7.5 Do you feel the need of appropriate legislation and/or amendment of policy and licensing conditions for promoting passive infrastructure and backhaul sharing?
- 7.6 Do you find it necessary to define critical support infrastructure (CSI) for the purpose of passive infrastructure sharing? If yes, please explain the basis to identify CSI?
- 7.7 Do you agree with the proposed models for sharing of existing and to be built new infrastructures or it should be left to the market forces?
- 7.8 Will the infrastructure sharing bring in faster and better ICT service deployment within the country? Please explain.
- 7.9 Should The Authority invest on building infrastructure (tower, cell site) in public private partnership model with the infrastructure service provider(s) mobilizing Rural Telecommunications Development Fund?
- 7.10 Please suggest in step wise for future action to be taken to encourage MVNO in Nepal.
- 7.11 What forms of active infrastructure sharing should be promoted in step wise manner in future? Please suggest.
- 7.12 Do you feel infrastructure sharing would arise any competition concerns among the service providers? If yes, please suggest how to address such concerns to ensure that there will not be any adverse impact on consumers' benefits in terms of choice of service providers, access, availability of services, range, quality of services and pricing?

7.13 Please explain how the subscribers are benefitted by infrastructure sharing and how these can be monitored?

7.14 Please suggest steps to internalize infrastructure sharing among telecom service providers in both rural and urban?

7.15 What could be the innovative schemes to provide incentives for use of non-conventional sources of energy especially in rural and far flung areas?

7.16 Please suggest monitoring and enforcement mechanism be adopted by The Authority to ensure successful implementation of infrastructure sharing?

**“The Authority shall formulate the Guidelines after receiving the suggestions from all the stakeholders”.**

## ANNEX A

### Drivers for sharing passive infrastructure

|   |   |
|---|---|
| <b>Subscriber base</b>                                      | The exponential growth of the subscriber base leading to increasing wireless traffic.   |
| <b>Emerging technology</b>                                  | High investment requirements in technologies like EDGE, 3G and 4G.  |
| <b>Rising site rentals</b>                                  | Along with real-estate prices, site rentals have also seen a sharp increase. Site owners are aware of relatively large number of players desiring to rollout in urban or semi urban areas. Hence the demand for tower sites and rentals are expected to increase sharply. |
| <b>Need for denser coverage due to spectrum constraints</b> | According to the insufficient spectrum allocated to the operators in the country, operators need to have much denser tower locations to ensure minimum quality of service standards.  |
| <b>Regulatory and planning authorities</b>                  | Installation of cell sites has become a cumbersome process as there are a number of clearances required and involves labour-intensive work. Passive infrastructures sharing will speed up the process and trim time to market.  |
| <b>Restrictions</b>   | Both the Ministry of Physical Planning and Works and municipal corporations can place restrictions on new tower construction on the grounds that they pose a health hazard, congest the skyline and around the heritage sights.   |

## ANNEX B

### Practices in different countries about infrastructure sharing

| S. No. | Country     | Infrastructure Sharing Provisions   | Incentive | Mandatory | Active / Passive                     |
|--------|-------------|---|-----------|-----------|--------------------------------------|
| 1      | India       | Guidelines already in place   | Financial | No        | Passive                              |
| 2      | New Zealand | Mobile site sharing is mandatory.   | Yes       | Yes       | Passive                              |
| 3      | Sweden      | Allowed under the present 3G licensing regime as long as each service provider has 30% of the population covered with its own infrastructure, the 70% remaining being sharable.                           | No        | No        | Both                                 |
| 4      | France      | ART defined following five levels of sharing and their compliance with conditions for issuing 3G authorizations.  | No        | Yes       | Both except frequencies              |
| 5      | Singapore   | A Licensee is not required to "share" the use of any infrastructure. However, where IDA concludes that it is in the public interest, IDA may mandate that a Licensee share the use of the infrastructure. | No        | No        | Passive                              |
| 6      | Norway      | The different networks in Norway can share most of the infrastructure.  | No        | No        | Both except core network & frequency |
| 7      | USA         | Telecommunications Act 1996 has mentioned co-location and infrastructure sharing.   | No        | No        | Both                                 |
| 8      | Hong Kong   | The network operators are encouraged to share facilities on a fair commercial and technical terms & conditions in order to avoid uneconomic duplication on network resources.                             | No        | Yes       | Passive                              |

|           |             |  |     |     |                           |
|-----------|-------------|--|-----|-----|---------------------------|
| <b>9</b>  | Pakistan    | Guidelines already in place for 2.5G and consultation underway for 3G and for passive network sharing  | Yes | Yes | Both                      |
| <b>10</b> | Germany     | The regulator ruled that infrastructure sharing of wireless sites, masts, antennas, cables, combiners and cabinets was permissible but 3G license holder should require its own network, each of which needed to ensure its 'competitive independence' during the lifetime of the license. | No  | No  | Passive                   |
| <b>11</b> | Brazil      | ANATEL has set out rules for sharing   | No  | Yes | Only overcapacity passive |
| <b>12</b> | Jordan      | Telecommunications Regulatory Commission (TRC) analyze on case by case basis as it has said it is impractical to publish an exhaustive set of rules with respect to collocation and infrastructure sharing matters.  | No  | Yes | N/A                       |
| <b>13</b> | Netherlands | Joint memorandum between NMa, OPTA and V&W has been issued that provided comprehensive clarification on collaboration in the deployment of 3G networks in September 2001.  | No  | No  | Passive                   |
| <b>14</b> | China       | Resolved to promote joint construction and joint use of telecom infrastructure   | No  | Yes | Both                      |
| <b>15</b> | Switzerland | operators are obliged to use jointly the operations building and the antenna mast in so far as sufficient capacity exists  | No  | Yes | Passive                   |