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ITU News
MAGAZINE

Sharing networks, driving growth

06/2017

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Sharing networks, driving growth

Houlin Zhao, ITU Secretary-General

"More and more companies are sharing the networks in order to lower costs, maintain profit margins and focus on innovative services to meet shifting customer demands."

In an era of great change for the information and communication technology (ICT) industry, sharing network infrastructure and services has steadily become more important than ever.

More and more companies are sharing the networks in order to lower costs, maintain profit margins and focus on innovative services to meet shifting customer demands. This dynamic requires unprecedented collaboration. Incumbent mobile network operators are increasingly working with mobile virtual network operators and enablers (MVNO/Es), tower companies, Internet companies – and a growing range of different industry and public-sector players.

The increase in telecoms infrastructure sharing has allowed for a more efficient roll-out of next-generation networks. The sharing of towers and other passive equipment also translates into the sharing of expertise and best practices.

As you will read in this edition of ITU News Magazine, the rise of tower companies ("towercos") – which now own more than two-thirds of the world's 4.3 million investible towers and rooftop sites – has demonstrated how specialized expertise can turn passive infrastructure from a depreciating asset to a potential source of long-term, recurring revenue. Reflecting the changing landscape of infrastructure sharing, and the need for all players to work together, two of the biggest tower companies, American Tower and China Tower, joined ITU in 2017.

You will also hear from several regulators who provide important insights into how infrastructure sharing has worked in their countries to boost competition and improve economies of scale in order to accelerate the development of our digital economy.

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Cover photo: Shutterstock

ISSN 1020–4148
itunews.itu.int
Six issues per year

Copyright: © ITU 2016

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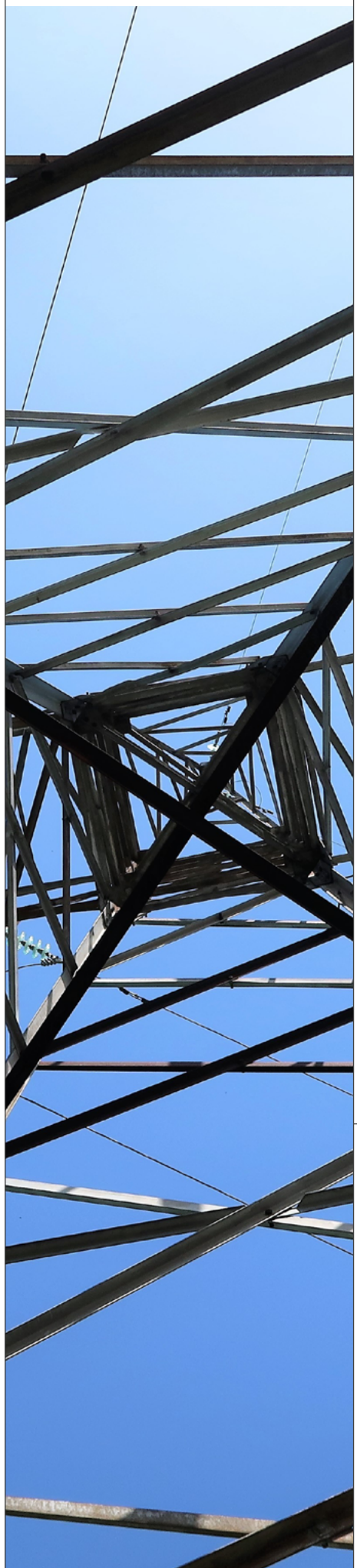


Telecommunications infrastructure sharing in brief

2 main types

Passive sharing
The sharing of non-electronic infrastructure such as sites, towers, poles, ducts, trays, shelters, equipment rooms, power, HVAC, security, etc.

Active sharing
The sharing of active (i.e., electronic) infrastructure in the access or core network, such as spectrum, switches, and antennae.

5 dimensions

Technology
For example: 2G, 3G, 4G, 5G, WiFi, xDSL, DOCSIS, etc.

Geography
The geographical dimension concerns where in the country the sharing will occur.

Architecture
The architectural dimension defines the (passive and active) assets and related activities that are shared.

Partners
Potential partners in a sharing deal include any entities such as mobile and fixed-network operators, etc.

Sourcing
Sourcing possibilities for sharing infrastructure, include unilateral, bilateral, or joint venture.

Several key benefits

- Reduction in capital expenditure (CapEx) and operating expenditure (OpEx).
- New/enhanced services.
- Faster geographic rollout.
- Improved service quality.
- Lower prices.
- Increased tax revenues for governments.

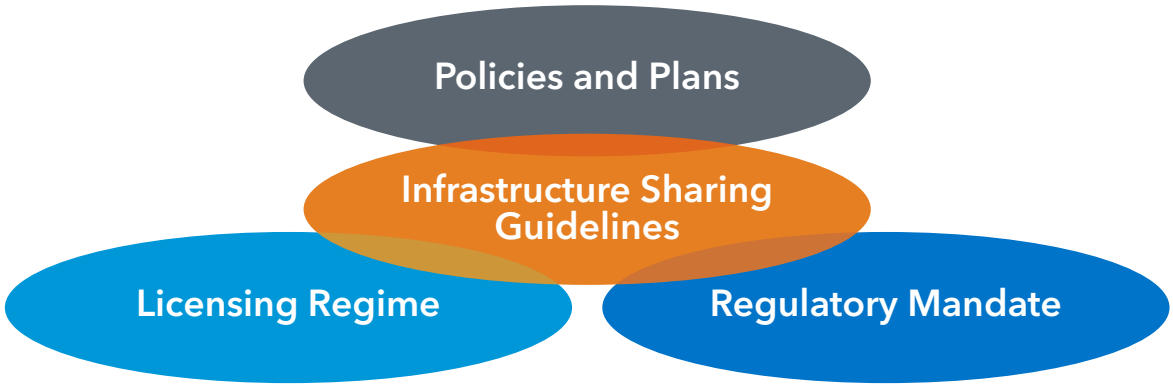
And some potential risks

For sharing parties
- Partner conflict.
- Technical incompatibilities.
- Breakdown in end-to-end customer experience management.

For regulatory authority/competition authorities
- Delays.
- High prices.
- Disputes.

Source: **SADC ICT and Broadcasting Infrastructure Sharing Guidelines**

Your guidelines for ICT and broadcasting infrastructure sharing within Southern African Development Community (SADC) countries



Allowing for regional harmonization in:

- Achieving an enabling policy and regulatory framework conducive to infrastructure sharing.
- Identifying existing platforms (transmission and contribution networks) suitable for infrastructure sharing in SADC countries.
- Enabling competition in access networks and providing positive environmental impacts.
- Providing positive incentives to roll out to underserved areas.
- Improving quality of service, especially in the rural areas.
- Ensuring positive impact on the wholesale and retail information and communication technology (ICT) and broadcasting services prices.

Download your guidelines » here.

The ITU's World Telecommunication Development Conference (WTDC) Africa Regional Initiative 2 aims to strengthen and harmonize policy and regulatory frameworks for the integration of African telecommunication/ICT markets.

As part of this initiative, the Communications Regulators' Association of Southern Africa (CRASA), in collaboration with ITU, initiated a project to establish these guidelines.

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A call for infrastructure sharing in Africa

Funke Opeke

CEO, **MainOne**

Seven submarine cable systems and an estimated combined capacity of 40+Tbps completed in sub-Saharan Africa since 2009, have transformed the availability of bandwidth in Africa's coastal regions. Most African countries now have some form of fiber connectivity to one or more submarine cable landing stations. Meanwhile, competition has crashed the wholesale price-per-megabit-per-second by over 80%. These are important gains.

Still, it remains astounding that Africa still has such low bandwidth penetration levels. With 29% Internet penetration, Africa has the lowest Internet rate in the world, compared to other continents: Western Europe (84%), Middle East (60%) and North America (88%).

> ***"Network sharing appears increasingly inevitable if African operators are going to survive."***
>
> Funke Opeke

Also, major cities continue to receive the majority of telecoms investments while developing areas are neglected because they do not constitute a promising market.

To address these issues, it's becoming clearer that information and communication technology (ICT) players will have to come together more to share network infrastructure and services. Indeed, with continued erosion of profit margins, as well as average revenue per user shrinking year on year, and encroaching freemium services, network sharing appears increasingly inevitable if African operators are going to survive.

Working together works

Industry sources cite that Africa's telecommunication companies (telcos) can potentially yield overall cost savings between 15% and 30% and reduce capital expenditure up to 60% by combining resources and reducing individual infrastructure needs. This would reduce the pay-back period of investments and also ensure faster deployment of new technologies.

Collaboration on network infrastructure and services is a proven global model. As such, incumbents in Africa will perhaps have to consider opening up their networks to generate new revenue even if that means they will get a "smaller piece of the pie."

This is an opening step that many African countries will need to go through, because in the most advanced markets, we're seeing infrastructure sharing as well as a range of non-traditional players working with larger operators to provide greater services that improve lives well beyond mere connectivity.

Take cashless banking for example: it's amazing to watch the significant shift from cash to cashless banking. What has happened could not have been achieved without a high degree of collaboration and considerable push from banking regulators. Perhaps this is a model African telecom regulators can use as a model.

Infrastructure sharing in Nigeria

Fortunately, Africa holds the answers to most of its problems and already has in place many of the building blocks required to put the puzzle together.

The continent is already host to numerous terrestrial fiber operators including mobile Network Operators (MNOs), Internet Service Providers (ISPs) and broadband wholesalers, who have invested considerably in network infrastructure. According to International Telecommunications Union (ITU), such investments in Nigeria alone total USD 68 billions as at July, 2016.

However, these investments belie the infrastructural deficit in Nigeria. Most of the existing terrestrial fiber is centered in Lagos, Abuja and a few other cities and the major highways interconnecting them. This makes development uneven.

Furthermore, there is limited infrastructure-sharing across the market, manifesting in multiple fiber transport networks operated by different companies serving the same high-traffic areas. Many Nigerians, particularly those in remote areas, must rely instead on other technologies, such as satellite and microwave for access to mobile base stations, and these services come at a high price.

While a few operators are truly open access, there are concerns that others playing in the wholesale and retail segments of African markets are using their leverage to squeeze the margins of smaller players, who are also their customers, via predatory pricing, refusal to supply wholesale capacity on certain routes, refusal to offer high capacity wavelengths or dark fiber access, or provide access to duct services. A 2013 Determination of Dominance study by the Nigerian regulator, Nigerian Communications Commission (NCC) corroborated this when it mentioned two of the country's biggest players as dominant players in transmission services with joint control of 62% of the nation's terrestrial transmission infrastructure.

Thus the capacity to build the networks that are required already reside on the Continent, but improved access will require a re-direction of where and how new networks are built going forward.

A look at Africa's Towercos

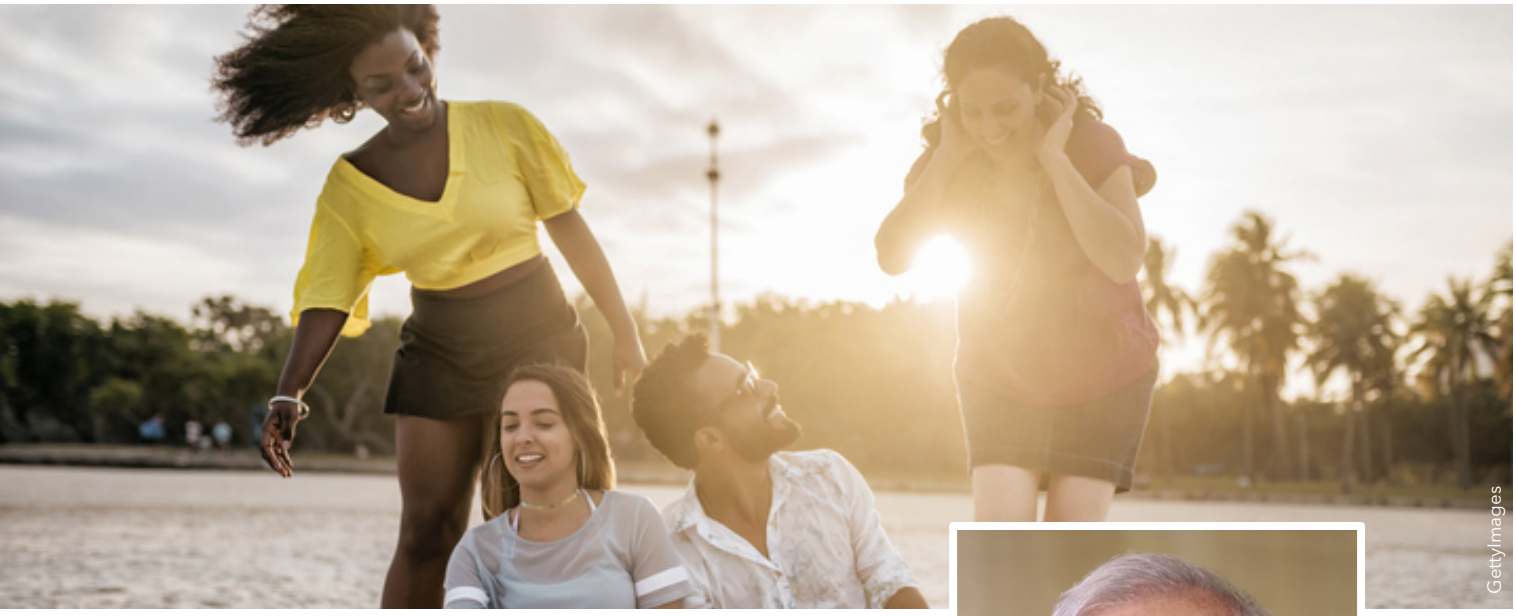
In advanced markets, regulators have tried to address the obstacles caused by "bottlenecks" that arise when infrastructure is controlled by one or more dominant operator through structural separation. In the United Kingdom, for example, BT OpenReach ensures other operators can compete with the incumbent BT for the delivery of services.

In Africa, however, structural separation has only manifested in the sales of towers by mobile network operators (MNOs) to tower companies. Since 2010, sub-Saharan Africa has seen MNOs divest almost 40 000 towers to independent towercos in a total of 28 transactions. Over the last few years, IHS, for example has acquired the majority of the towers belonging to MTN, Airtel and 9Mobile in Nigeria, among others.

MainOne's role as infraco for Lagos

The Towerco example has validated a model for Fiber Infracos delivering shared fiber connectivity services adopted by the Nigerian Communications Commission. MainOne is one of the leaders in infrastructure investment in Nigeria with submarine cables capable of delivering up to 19.2 terabytes per second and is the fiber infrastructure company (infraco) licensee for the Lagos region. However, lack of effective national, regional and last-mile distribution infrastructure has constituted a barrier to lower costs and broader Internet adoption in the eight countries it currently serves.

The company has been a major proponent of a broadband policy and an open access national backbone network in Nigeria and is poised to fill critical infrastructure gaps and enable broadband services in the largest mega city in sub-Saharan Africa.



Telecom infrastructure sharing regulation policies in Brazil

Juarez Quadros

President, **ANATEL**, Brazil

> ***"RAN sharing has been increasingly used due to its evident benefits for the development of the sector."***
>
> Juarez Quadros

The issue of infrastructure sharing in telecommunications is extremely important for regulation. Since the resources used to provide the service are finite, whether in passive or active infrastructure, infrastructure sharing is a key element in promoting competition among market players, with a reasonable investment value and a fair price to be charged to the consumer.

In Brazil, a country of continental proportions, it is necessary to make infrastructure competition viable. Considering all public policies to promote the expansion of telecommunications in the country, it would be impracticable not to take this into account when developing such policies.

Infrastructure-sharing policies that stand out

Among public policies that have favoured the sharing of infrastructure and networks in Brazil, the following stand out:

- The Decrees of the General Plan of the Universalisation Goals (PGMU) of the public switched telephone network promoted access to the fixed telephone service and, later, the broadband service, in a universal and equal manner to the majority of the country's population. Because of this, it was necessary to use the electricity poles to provide the service.
- The bidding documents of the radio frequency for personal mobile service obliged players interested in radio frequencies to buy the radio frequencies not only in the areas in which they could generate economic interest, but all over Brazil, including service obligations for all Brazilian municipalities. This made it necessary to share the mobile base stations for the provision of the service.

The Brazilian Federal Government, represented primarily by the National Telecommunications Agency – Anatel – has historically been creating regulatory mechanisms to promote infrastructure sharing. This regulatory premise was born with the General Telecommunications Law, and has evolved over the years through specific regulations for each aspect of infrastructure sharing.

The sharing of the finite resources means to provide the telecommunication service while reducing the cost of investing in networks, increasing the value of the business, optimizing the allocation and use of infrastructures when duplication is impossible, and guaranteeing compliance with regulatory obligations. Finally, it should result in an improvement of the conditions of the service provided to the users.

As can be observed in Brazil, some infrastructure sharing is in full operation. This includes radio base station sharing, radio access network (RAN) sharing, national roaming, mobile virtual network operators (MVNOs), and the sharing of electricity distribution poles.

The sharing of infrastructures that support telecommunications networks – after the publication of the Antenna Law (Law n° 13.116/2015), later regulated by the Revision of the old Resolution n° 274/2001 of Anatel that resulted in the Resolution No. 683/2017 – is mandatory in its excess capacity, except when the technical reason for the refusal is justified. Moreover, the established obligation foresees that aspects of urban, historical, cultural, tourist and landscape patrimony will be preserved. Here we sought a way of organizing municipalities without the unnecessary redundancy of infrastructure.

Increased use of RAN sharing – benefiting ICT sector development

Radio access network (RAN) sharing has been increasingly used due to its evident benefits for the development of the sector, as a way of optimizing the use of the scarcest resource the sector has: radiofrequencies. Radio spectrum sharing throughout the spectrum is one of Anatel's spectrum management goals.

Radio-spectrum sharing is regulated by the Radio Frequency Spectrum Use Regulation, and the Radio Frequency Use Conditions Regulations, in order to guarantee the efficient, rational and adequate use of the resource under the LGT (the Brazilian general telecommunications law), as long as there is technical feasibility, and it meets the public interest and economic order.

National roaming is an obligation foreseen in infrastructure-sharing bidding documents, and competition is guaranteed within municipalities when the incumbent does not have an economic financial advantage over new entry players. This gives the consumer the power to choose a different operator from the sole operator who is physically present at the location.

With the promulgation of a specific regulation, approved by Resolution n° 550/2010, it became possible to exploit the Personal Mobile Service (SMP) – by SMP providers (mobile virtual network operators (MVNOs)), through a virtual network. This allows the existence of a greater number of personal mobile service providers in the market, with innovative proposals of facilities, conditions and relationship with SMP users. By offering a larger set of SMP providers, competition is favoured within the sector, which can reduce the users' final costs.

Joint regulations for sharing electricity distribution poles

The sharing of electricity distribution poles by telecommunication service providers has always been a sensitive issue for the sector, since it is an essential infrastructure to support the construction of networks, besides being obviously essential to the energy sector, which uses them to distribute energy in municipalities. Thus, Anatel and the National Electric Energy Agency (ANEEL) issued three joint regulations, approved by Joint Resolutions No. 001/1999, No. 002/2001 and No. 004/2014, to address the main issues of inter-sectoral relations, technical or commercial aspects.

It should be pointed out that, since it is an essential infrastructure to support the construction of networks, the amount that electricity distributors charge from telecommunication service providers for the use of each attachment point on the distribution poles directly affects the amount to be charged to users of the telecommunication services using the infrastructure.

This specific point is a constant debate among the sectors. It is important that the price is fair, equitable, and that it does not harm those involved, nor the distributors, to receive a reasonable rent value, and for the providers not to pay an exorbitant amount for the use of the infrastructure.

Therefore, among the forms of infrastructure sharing observed in Brazil, all have their regulatory burden, either to compel some sharing, or to favour another. Nevetheless, the regulator aims to establish the necessary basis for infrastructure sharing to the benefit of all stakeholders.

More importantly, it is always advisable to foster competition in the sector, thus favouring the final consumer, either with an improvement in the quality of the service, or with a possible reduction in the prices charged by the sector.

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Balancing infrastructure sharing – The Danish experience

Morten Bæk

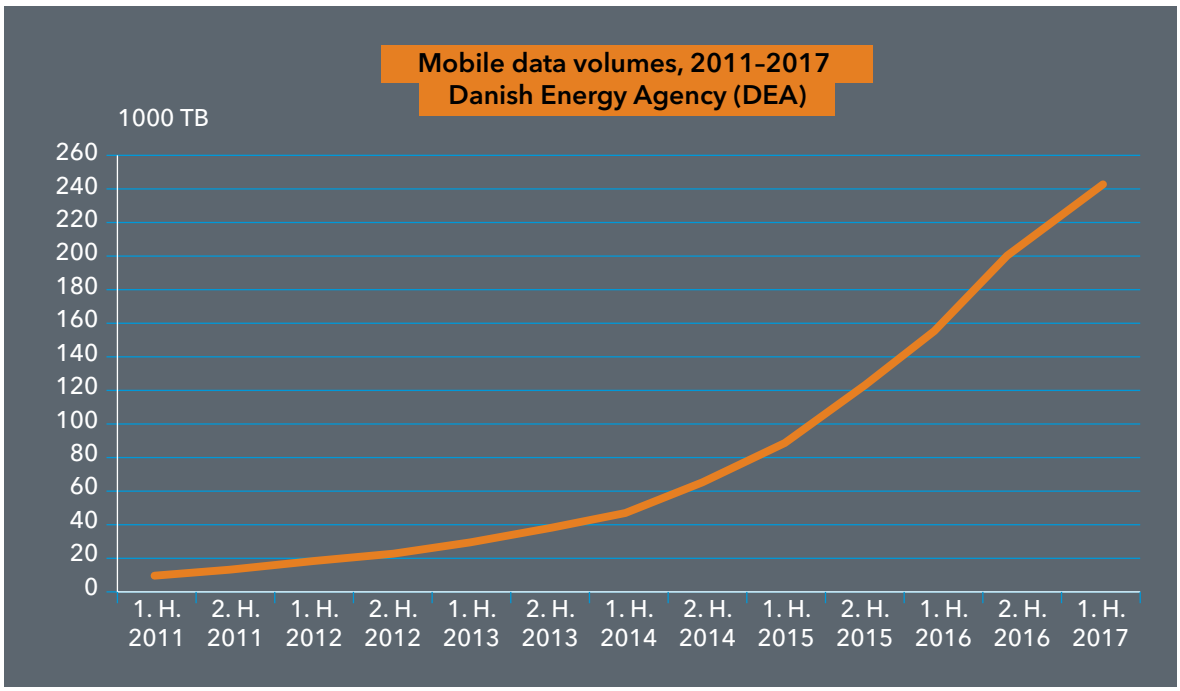
Director General, **Danish Energy Agency**

Denmark enacted the Danish act on the erection and shared use of telecom towers in 1999. The main goal of the act was to protect the environment against the visual and physical impact of masts and towers. When the public **database on antennas** was established in 2004, the focus was to provide the public with information about the location of mobile antennas, in view of rising public concerns over health risks from electromagnetic radiation.

> ***"So far the experience in Denmark has been increased coverage, prices have been reduced, and competition does not seem to have been affected in a negative way by infrastructure sharing."***
>
> Morten Bæk

Both turned out to be key elements in the shared use of infrastructure for mobile operators. They proved to be useful tools to gain quick access to existing sites as well as cost saving at a time when mobile networks expanded at a high pace, to become denser, and provide better coverage and more capacity. Especially with the introduction in 2010 of 4G on the Danish market where the demand for data began to grow with an annual increase of 60 % (see figure below). The first choice for the operators and for public authorities in Denmark have been to reuse existing infrastructure rather than duplicating infrastructure. The telecoms operators have for their part on a voluntary basis agreed on both guidelines and standard contracts for the sharing of costs and facilities. This has required a minimum of involvement from the authorities.

Over the years the local authorities responsible for granting construction permits have engaged in close dialogue with the operators in order to find the most suited locations for new masts and towers. The aim is on the one hand to address the need for better coverage, and on the other hand to minimize environmental impact. Strict Danish rules governing access to the rural open landscape and the preservation of the open coastal line are, however, still among the main challenges for the operators in providing full coverage. This is true even though the societal need for a nationwide digital infrastructure is well acknowledged. Since the entry into force of the act in 1999, it has only once been necessary for the public authority to enforce expropriation of property in order to ensure mobile coverage in an area.

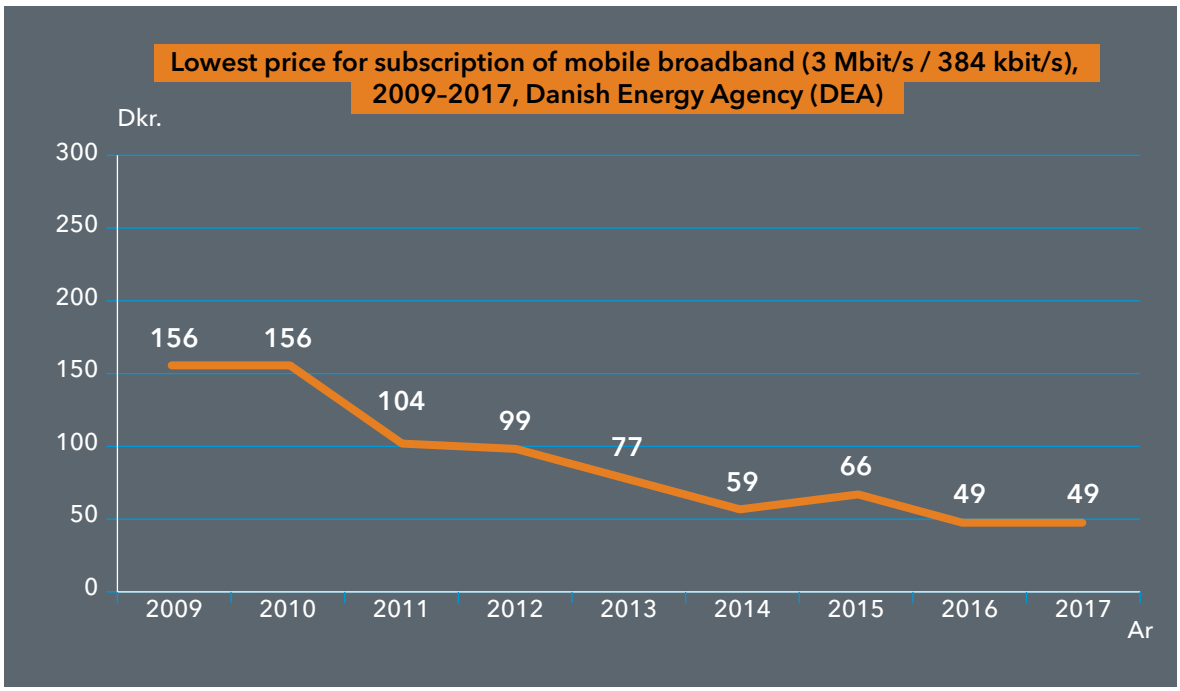


In 2012 the Danish Competition Authority granted permission for a network sharing agreement (Radio access network) between the Danish subsidiaries of Telia and Telenor. The conditions were among others that they should make redundant towers and sites available to other market players. This network sharing agreement between Telia and Telenor has led to substantial cost savings and a common network with a better coverage and capacity than the two previously independent networks.

At the core of both the European and the Danish regulation of the telecommunication sector is the aim to ensure competition both at the infrastructure and the service level. This includes a dilemma that can be phrased as a rhetoric question: what is the rationale behind having several parallel highways instead of one common, cost effective one?

Or why have several competing mobile networks instead of one common? The answer is simple. Without infrastructure competition there will be no efficient competition. Capacity, speed and coverage are competitive parameters that influence the choice of the consumers and give the operators a clear incentive to invest in their networks.

Efficient competition requires both choice between network operators and a surplus of infrastructure on the demand side. Infrastructure sharing reduces costs but might also reduce consumer choice. So far the experience in Denmark has been increased coverage, prices have been reduced, and competition does not seem to have been affected in a negative way by infrastructure sharing.



In the area of sharing underground infrastructure, the Danish experience is less clear. Co-digging and coordination of cable works is well accepted in the sector. The local authorities and operators are to a large extent eager to share the cost of deploying new cable infrastructure. When it comes to sharing existing infrastructure, like tubes and ducts, the incentives seem to be lacking. It appears that the operators prefer to have full control over their cables and are reluctant to lay cables in other operators' underground passive infrastructure such as ducts and tubes. This is a surprise from the regulators point of view. The general rule implies that 80% of the cost of deploying fibre optic cable is connected to the cost of digging in the urban areas and 50% in the rural areas.

In 2016 a legal obligation to provide access to existing passive infrastructure entered into force. So far the effects on the market players have been absent. No request for access has so far handed in complaints to the Danish Energy Agency. This indicates that the rules have had little, if any effect, so far.

Infrastructure sharing can reduce infrastructure costs to the benefit of both operators and customers. So far the Danish experience has been that both coverage has been increased, prices have continued to fall, and investments in new infrastructure have been unaffected. There is no indication that competition has been suffering. In order to continue efficient competition, infrastructure competition is the key.

A corner stone in the Danish regulatory approach is to ensure sufficient choice between network operators, and a surplus of capacity to choose from. With the expected future investments in 5G, and the massive deployment of antennas and small cells, the issues get new importance. This opens up the question of what is the acceptable degree of network and infrastructure sharing? The potential cost savings can on the one hand speed up deployment and give Denmark a competitive advantage. On the other hand, in the longer perspective, it may hamper the sustainable competition between network operators.

India's experience in passive network infrastructure sharing

R.S. Sharma

Chairman, Telecom Regulatory Authority of India (**TRAI**), India

ITU News asked Chairman R.S. Sharma about telecoms infrastructure sharing in India.

What made India leap ahead in 2007 to become one of the first to allow passive network infrastructure sharing?

R.S. Sharma In 1994, the tele-density in India was a meagre 0.89. In order to boost the growth of telecommunication services in the country, huge investments were required in the telecom sector.

> ***"Our experience in India suggests that passive infrastructure sharing enables speedy growth and rollout of telecommunication services, especially in developing countries."***
>
> R.S. Sharma

Equally critical were efficiency issues. With the premise that opening up the sector attracts investments, fuels efficiency, and in turn results in tele-density growth, the Indian telecom sector was opened up to competition in 1994. The results were fantastic.

After a tepid beginning, the telecommunication services sector, in the new millennium, entered into a virtuous cycle of growth on the shoulders of many initiatives taken by the Department of Telecommunications (DoT) and the Telecom Regulatory Authority of India (TRAI).

Recognizing the fact that the building of telecom infrastructure is highly capital intensive, DoT permitted licensed telecom service providers to share passive infrastructure with other licensed telecom service providers. In the year 2000, DoT introduced a new class of service provider called the Infrastructure Provider Category-I (in short, IP-I), who could provide passive infrastructure such as dark fibre, right of way, duct space, towers, etc. to licensed telecom service providers. However, the willingness of licensed telecom service providers to share towers was initially low because they had apprehensions that the sharing of towers would result in huge churn, as the other licensed telecom service providers would have almost the same coverage area and quality of service (QoS). In this background, the Government of India in the year 2006 sought TRAI's recommendations on ways to ensure the effective sharing of telecom towers by the mobile service providers. After a comprehensive consultation process, TRAI made its recommendations to the Government in the year 2007.

The following are salient features of such recommendations:

- To encourage passive infrastructure sharing among licensed telecom service providers on a mutual agreement basis.
- To bring in transparency, reasonability and a well-defined time frame to facilitate infrastructure sharing.
- To lay down well-defined mechanisms to facilitate infrastructure sharing in critical areas (where possibility to erect towers is limited).
- To facilitate active infrastructure sharing by modifying restrictive clauses in the existing licence.
- To develop a mechanism to provide financial support for the creation of infrastructure in rural and far-flung areas.
- To encourage the use of non-conventional energy sources in areas where electric power supply is erratic.

In the afore-mentioned recommendations, TRAI specifically noted that "*...mandating passive infrastructure sharing at this stage is not required.*" After receiving the TRAI's Recommendations, DoT, in the year 2008, formulated guidelines for the sharing of active infrastructure, a simplification of frequency allocation procedures, and an enhancement in scope of the Universal Service Obligation (USO) subsidy support scheme. After these guidelines came into force, the sharing of telecom towers was keenly adopted by telecom service providers.

Many incumbent telecom service providers hived off their tower segments into separate telecom infrastructure companies. In one case, a consortium of telecom service providers came together to form a joint venture in infrastructure sharing.

What have been the benefits to the population in terms of higher connectivity and lower prices?

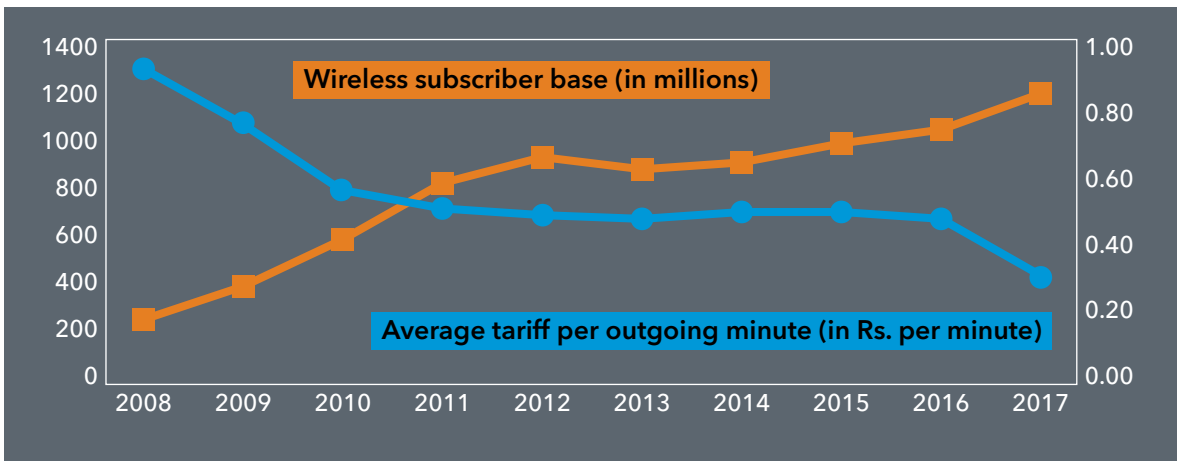
R.S. Sharma The policy and regulatory impetus on passive network infrastructure sharing has made perceptible improvement in the pace of roll-out and delivery of telecommunication services in both urban as well as rural areas. It is estimated that the cost for space and energy is reduced by about 20% for both telecom service providers when a telecom service provider shares a tower with another telecom service provider. The telecom service providers appear to have passed on the benefits of cost reduction to the consumers as can be seen from the trend of decline in consumer tariffs. The falling tariffs have made telecommunication services more affordable in India. Today, telecom services are ubiquitous and are enjoyed not only in the bustlling streets of a metropolis but also in the hinterland villages of the country. From a mobile tele-density of 22.78 in March, 2008, the mobile tele-density leapfrogged to 91.08 in March, 2017. The average mobile tariffs for outgoing voice calls declined from 0.92 per minute in March, 2008 to 0.31 per minute in March, 2017 (At present 1 USD = 64.84).

The chart below depicts the growth in the telecommunication subscriber base and the decline of telecom tariffs from 2008 to 2017.

Though there are numerous factors which led to the explosive growth of the telecommunication services sector in the country, passive infrastructure sharing played an important role in this growth.

Do you have any lessons learned from the past ten years of infrastructure sharing in India?

R.S. Sharma Our experience in India suggests that passive infrastructure sharing enables speedy growth and rollout of telecommunication services, especially in developing countries. It also brings down the capital cost and operating cost of networks. Governments and regulators need to be proactive in devising enabling frameworks for passive infrastructure sharing to boost the growth of the telecom sector.



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Supporting infrastructure sharing in Kuwait

Eng. Salim Muthib Al-Ozainah

Chairman and CEO, Communication and Information Technology Regulatory Authority (**CITRA**), Kuwait

ITU News asked Chairman and CEO, Eng. Salim Muthib Al-Ozainah, about telecoms infrastructure sharing in Kuwait.

"Telecom infrastructure is a crucial part of a digital economy."

Eng. Salim Muthib Al-Ozainah

What is the Kuwait telecoms regulatory authority's approach to infrastructure sharing?

Eng. Salim Muthib Al-Ozainah Telecom infrastructure is a crucial part of a digital economy. A robust telecom infrastructure can no longer be restricted to voice and data communications. It has become a vital part of the service delivery chains for a growing number of industries. Over-the-top services offered over telecom infrastructure are exceeding in value and are becoming an indispensable part of the user experience.

The challenge for operators and regulators is to strike a delicate balance between promoting digital services, and ensuring that operator investments made in developing telecom infrastructure is both profitable and sustainable.

The Kuwait Communication and Information Technology Regulatory Authority (CITRA) views infrastructure as a utility, and the Internet as a platform for the growth of a digital economy. Infrastructure sharing, in CITRA's view, is one of the cornerstones for achieving this balance, and is taking a position that supports the sharing of infrastructure, for both fixed and mobile communication networks. CITRA's mandate by law, includes allowing access to telecommunications facilities or services of another licensed operator.

CITRA's approach is to support infrastructure sharing by enabling conditions conducive to voluntary, market-based sharing, through the introduction of positive incentives, such as reduced license fees for mobile site licenses, and encouraging mobile infrastructure sharing by licensing companies that are specialized in mobile infrastructure sharing as a standalone business.

The sharing of mobile telecom Infrastructure is constantly evolving, motivated by financial and other incentives. With growing competitive intensity, and lower prices, mobile operators are facing margin pressure, and need to systematically improve their cost position. Operators are adopting multiple strategies, with infrastructure sharing emerging as a mechanism to substantially and sustainably improve and reduce network costs.

On the fixed network, CITRA is addressing infrastructure sharing through interconnect regulations that prevent operators from exploiting their dominant market positions. Although mechanisms for sharing fixed network infrastructure are complex, CITRA believes that enabling market structures that allow the transparent and efficient sharing of passive network infrastructure will help build a robust and sustainable fixed network service market, where everyone will benefit.

What are some of the opportunities and challenges you see regarding infrastructure sharing?

Eng. Salim Muthib Al-Ozainah Recent industry trends show higher awareness and readiness towards network sharing, also among operators seeking cost optimization and technology refresh currently aiming at optimizing access transmission through sharing leased lines and microwave links.

Kuwait has a developed mobile services market that leads national penetration and coverage indicators. CITRA believes that there is room for the improvement of services and cost reduction. For example, proactively working with operators to plan service rollout in new areas helps to ensure that the underlying infrastructure required for backhauling traffic is either available, or facilitated, through appropriate right of way and other permissions.

As any telecom regulator, CITRA's main challenge is working with other State institutions to promote its broadband agenda. CITRA is working to develop a harmonized and holistic approach across all distinct government actors, to reflect infrastructure sharing as a component of a Kuwait's broadband policy.

CITRA is developing policies designed to facilitate cross-sector infrastructure sharing to ensure that telecommunications operators have access to existing and planned land corridors, established for other public or private purposes, to ensure a telecommunications operator will be unhindered in its ability to build a new network, extend an existing network, or commercialize excess capacity on an existing internal utility network.

Taking a holistic approach to telecom infrastructure will help offset development costs that are eventually passed on to end users. For example, it is much more efficient and economical to ensure that telecommunications operators have access to corridors established or planned for other purposes, such as plans for unitality connectivity, than to require them to assemble their own corridors.

In addition to the passive infrastructure owned by the Ministry of Communications (MoC), other ministries and State enterprises reportedly own facilities that have excess capacity in ducts, fiber, towers and poles, which are not currently shared with operators. CITRA is working with other government agencies to allow the operators to make use of these assets, that can bring new services to customers faster, and at lower costs and meanwhile, prevent further degradation to the environment.

Has infrastructure sharing resulted in wider coverage?

Eng. Salim Muthib Al-Ozainah Kuwait's experience in opening up the mobile communications market is rather unique because of its flat terrain and population concentration on a relatively small area.

Infrastructure sharing has not only resulted in wider coverage, but has also allowed new market entrants to reduce the time taken for network rollout and service launch. Among the three mobile operators working in Kuwait, shared mobile site infrastructure accounts for nearly 30% of operator sites deployed. On the fixed network side, 100% of the Internet service providers use shared last mile access infrastructure to deploy Internet services.

The fixed network infrastructure is currently owned and operated by the State-owned Ministry of Communications. We are working towards a horizontal unbundling of State-owned assets, with an urgent focus on the passive network, to be owned and operated by an operator neutral independent entity.

Has infrastructure sharing led to lower prices?

Eng. Salim Muthib Al-Ozainah Kuwait's telecom service prices are among the lowest in the Arab States region. We believe strongly that this is in part due to the infrastructure sharing mechanisms that are both regulated and market driven. Mobile and Internet service prices in Kuwait are also lower when compared across the region. This is due, in part to the sharing of infrastructure owned by the Ministry of Communications, which enables lower build costs for operators or telecom services.

Are there any types of infrastructure sharing that the regulator will not allow? If so, why?

Eng. Salim Muthib Al-Ozainah CITRA will always encourage infrastructure sharing agreements that benefit the end users of telecom services, either by reduction in pricing or by improvement in service quality and efficiency. CITRA will not allow any type of infrastructure sharing agreement that either directly or indirectly affects competition and access to affordable telecom services.

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Infrastructure sharing and network competition in Spain – Regulating for network competition

José María Marín Quemada

President, Spain's National Authority for Markets and Competition (**CNMC**)

> ***"Three major agreements stand out, involving co-investment and infrastructure-sharing commitments and the participation of four operators in total."***
>
> José María Marín Quemada

In as innovative a sector as telecommunications, competition between the networks of different operators is the driver of effective investment and brings the user innovative, better-quality services, at competitive prices. We at Spain's National Authority for Markets and Competition (CNMC: *Comisión Nacional de los Mercados y la Competencia*) – responsible for multisectoral regulation, including the telecommunication sector, and for competition law enforcement – are staunch advocates of this approach.

The regulation we apply – which in some cases imposes infrastructure sharing – eliminates bottlenecks and provides operators with the rungs required to climb the investment ladder. Thus while deploying their networks, they are also able to compete in services.

Since 2009, Telefónica (the operator with significant market power) has been under the obligation to give third parties access to its ducts and conduits (the **MARCO** offer). Likewise, we regulate symmetrically, obliging all operators to provide access to vertical infrastructure within buildings where duplication would be senseless. In this way, operators have access to the civil works for the purpose of installing next-generation networks, which can account for three quarters of deployment costs.

The regulations regarding wholesale broadband markets were updated in early 2016, with the adoption of an innovative approach. The operator with significant market power is subject to obligations regarding the old copper-wire networks and new fibre networks, with differentiated treatment for the latter depending on the competitive environment.

This means that for fibre, greater obligations are imposed on Telefónica in areas where there is no effective competition in regard either to services or networks; a regional service is established for access to Telefónica's fibre network (regional **NEBA** (*Nuevo servicio Ethernet de Banda Ancha – new broadband Ethernet service*)). In areas with competition in services but limited network competition, virtual unbundled local access is also enabled (local NEBA offer).

Lastly, in 66 municipalities (35 % of the Spanish population) in which at least three operators are competing on next-generation networks, obligations relate solely to access to copper wire and civil works, with no obligation regarding the fibre network.

In mobile telephony, the investment obligations associated with licences for the use of spectrum boosted the development of four operators with their own networks offering services on the national market. As from 2006, access obligations were also imposed on virtual mobile operators, and were withdrawn in 2017 once market-dynamization objectives had been achieved.

Broad deployment of next-generation networks

The results of this model are extremely positive, especially in regard to next-generation network coverage, both mobile and fixed.

In 2016, 94% of Spanish homes could, as a minimum, access an operator's mobile network using 4G technology. Of even greater relevance is the indicator based on average mobile operator coverage, which stands at around 86% of homes and reflects considerable freedom of choice for users. Both figures are close to European Union (EU) averages.

Fixed and mobile next-generation network coverage in 2016

Coverage rates (% of homes)	Spain	EU
Next-generation access (NGA) coverage	81%	76%
Fibre-to-the-property (FTTP) coverage	63%	24%
4G (LTE) coverage. Homes covered by at least one operator	94%	96%
4G (LTE) coverage. Operators average	86%	84%

Sources: Broadband Coverage in Europe. Study carried out for the European Commission by IHS Markit and Point Topic and Europe's Digital Progress Report (EDPR) 2017, European Commission Staff Working Document, SWD(2017) 160 final.

On fixed networks, next-generation access (NGA) coverage for homes in Spain stands at 81%, which is above the European average (76%). Most significantly, 63% of homes already have access to fibre optic networks, fundamentally fibre-to-the-home (FTTH), offering greater services, as compared with 24% with access to fibre-to-the-property (FTTP) networks at EU level, sometimes with lower quality features. The four main operators present on the Spanish market are deploying FTTH networks, the trend being towards strong growth. This means a solid wager is being placed on the development of the digital society.

Tackling the challenges of deployment through sharing and co-investment

The regulatory model generates competitive pressure that promotes the deployment of next-generation networks.

Since 2012, in order to accelerate such deployment and reduce its costs, Spanish telecom operators have at their own initiative concluded infrastructure-sharing and co-investment agreements, fundamentally for fibre optic networks. Three major agreements stand out, involving co-investment and infrastructure-sharing commitments and the participation of four operators in total. Each of the three agreements would cover, respectively, 3 million, 6 million and 3 million building units.

Implementation of the agreements – along with other agreements concluded under market conditions for the provision of wholesale access services, including in areas designated as competitive – will bring the percentage of Spanish homes with NGA coverage to over 95 % in 2020.

Benefits and risks, a case-by-case analysis

The benefits of infrastructure-sharing agreements are clear, particularly when, as in Spain, they are accompanied by investment commitments. The cost reductions and risk reductions associated with innovative investments make it possible – when the regulatory and competitive environment is right – for users to access better-quality services at more competitive prices, sooner.

But risks are also possible, deriving from the exchange of information between competitors sharing infrastructure, from reduced differentiation between their networks and from decreased competitive pressure, combined with reduced idle capacity on the networks. There is an increased risk of collusion, and possibly less freedom of choice for consumers.

There is more likely to be a net benefit when the agreements relate to passive infrastructures (such as the ducts or placements) and are focused on rural areas. It is nevertheless the CNMC's understanding that the operators are responsible for analysing the effects of their agreements on competition and wellbeing, taking into account the competitive and regulatory environment.

CNMC had the opportunity, as the competition authority, to take a decision on a complex set of agreements between the first and fourth mobile telecommunication operators (S/0490/13). Those agreements, dating back to 2013, included elements relating to infrastructure sharing.

Without questioning the fact that some of those elements may generate efficiencies and foster competition, the CNMC ruled that other elements – such as limitations on the resale of certain wholesale services or certain provisions on roaming on 4G networks, which presupposed the sharing of active components of the networks and affected urban areas – constituted disproportionate restrictions on competition.

To reach these conclusions, it was necessary to carry out an in-depth analysis of all the agreements, the competitive context, operators' different positions, and the regulatory framework. It all illustrates how difficult it is to determine in advance which agreements may ultimately not be admissible.

Fortunately, as the regulatory authority responsible for telecommunications and for competition law enforcement, the CNMC is well placed to carry out these analyses.

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Independent towercos inaugurate an era of infrastructure sharing

Kieron Osmotherly

Founder and CEO, **TowerXchange**

> *“Towercos now own 68.7% of the world’s investible towers and rooftops.”*
>
> Kieron Osmotherly

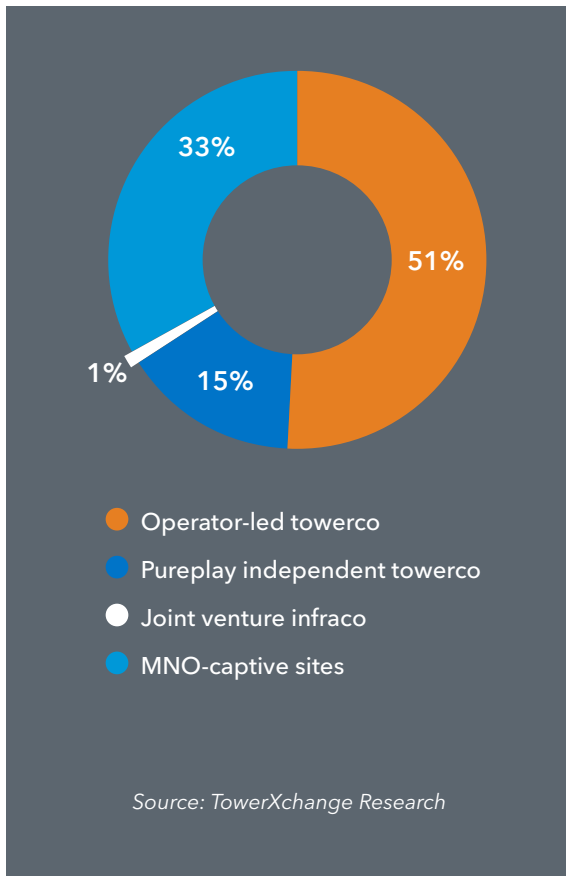
In a little over 20 years, a new breed of independent telecom tower companies (towercos) have created a new USD 300 billion infrastructure asset class – the tower industry – which according to TowerXchange, now owns 68.7% of the world’s 4.3 million investible towers and rooftop sites.

Today, a tower on a mobile network operator's (MNO's) balance sheet is a depreciating asset built to serve the needs of a single owner – the same tower on a towerco's balance sheet is a potential source of long-term, recurring revenue from multiple credit worthy tenants. Investors recognize towercos' proven long-term cash flows, and the separation of infrastructure assets from retail and technology risk, hence a valuation arbitrage wherein MNOs typically trade at 4-7x, while towercos typically trade at 10-25x.

While there is great diversity in towerco business models, they can be categorized into two groups. The first are pureplay independent towercos, exemplified by American Tower, Crown Castle, SBA Communications, Protelindo and Cellnex, which can all trace their origins back to the phenomenon where privately-owned tower builders started retaining and acquiring assets in the U.S. in the mid 1990s.

The second category are operator-led towercos, towercos in which 51% or more of the equity is retained by parent MNOs, exemplified by China Tower Corporation, Indus Towers, Bharti Infratel, edotco and INWIT. A third variant on the business model, which overlaps with both the pureplay independent and operator-led categories, are the power-as-a-service towercos, which provide a full service inclusive both tower and power, exemplified by IHS Towers, Helios Towers and Eaton Towers.

While less than a third of the world's towers remain on MNO balance sheets, shown in blue in the Figure below, only 15% of the world's towers are owned by pureplay independent towercos. 51% of the world's towers are owned by towercos that are themselves majority owned by MNOs, although that statistic is somewhat distorted by the sheer scale of China Tower Corporation and Indus Towers.



Asia

Just over 2 million of Asia's 3 million towers are owned or operated by towercos.

The Chinese market has transitioned to a co-build, co-share model, led by China Tower Corporation (CTC), which remains 94% owned by China's three MNOs, with an initial public offering (IPO) expected in the first half of 2018. In the two years since its creation in July 2015, the infrastructure sharing facilitated by CTC has reduced China's new cell site requirement by a staggering 568 000 sites, saving 27 700 acres of land, and CNY ¥100.3 billion (USD 15.2 billion).

With an ecosystem of over 700 registered local suppliers to CTC, and with the Ministry of Industry and Information Technology (MIIT) and the State-owned Assets Supervision and Administration Commission of the State Council (SASAC), both heavily involved in the transition to independent infrastructure ownership, the technical and regulatory environment is extremely supportive in China, particularly since document No. 92 legitimised the status of a fragmented ecosystem of over 200 privately owned, pureplay independent towercos that also serve the Chinese tower market.

The rest of North and Eastern Asia remains untapped by the tower industry – in countries like Japan, towers are still considered strategic assets and a source of competitive differentiation. Oceania also remains relatively unpenetrated, with only Axicom (formerly Crown Castle Australia), and a handful of smaller private tower builders active.

The "disarmament of MNOs passive infrastructure" continues in India, where towercos own more than two thirds of the country's 461 550 towers.

Consolidation of the carrier landscape to four or five all-India players will lower the glass ceiling on towerco tenancy ratios, however, it will also concentrate spectrum in the hands of carriers less burdened by debt and better able to deploy capex, resulting in more sustainable long-term growth for India's towercos, even if they have to absorb a slowdown in near-term growth.

Consolidation at the carrier level has accelerated consolidation among India's towercos, such that TowerXchange forecast two or three giant Indian towercos emerging; American Tower, plus a combined, increasingly privately owned Indus Towers/Bharti Infratel combine, with perhaps room for one other.

Two big questions remain in Indian towers: what will become of India's towers that remain on carrier balance sheets? While the Reliance Communications towers will be acquired by Reliance Jio, the future of an estimated 75 000 BSNL and MTNL towers, remains uncertain. And with Vodafone and Idea making no secret of their desire to monetize both their captive towers, already lined up by American Tower, and their stake in Indus Towers, TowerXchange wonder whether the Indian tower market is on the brink of evolving from an operator-led bias to a more pureplay independent towerco model. And if that were the case, will the current contractual norms survive, where lease rates are relatively low, amendment revenue is almost non-existent, and discounts are offered when towers are shared?

While the tower industry remains covetous of aligning the Indian business model more closely with the pureplay independent towercos of the U.S., TowerXchange believes that downward pressure on ARPU and lease rates suggests any transition in contractual norms may take many years.

While there remain operational challenges particularly in rural India, towercos like Bharti Infratel and Indus Towers have leveraged battery and renewable hybridization and free cooling to enable over 80 000 towers to run zero-diesel. India is one of the most welcoming countries in the world for towercos in terms of ease of doing business, with light touch registration of towercos as IP-1s, IP-1s afforded infrastructure status since 2012, expedited rights of way since 2016, and regulators actively promoting electromagnetic field (EMF) awareness, resulting in a tower count compound annual growth rate (CAGR) of 3% forecast for the next three years, and average tenancy ratios approaching 2.5.

Regulatory environments are more varied across the rest of Southern and Southeast Asia, with mature regimes in Malaysia and Myanmar, and new licensing regimes emerging in countries like Bangladesh.

This region has seen towerco penetration rapidly rise to 34%, driven most recently by the acquisitiveness of Asia's two multi-country towercos, edotco, which recently spent over USD 1 billion to acquire 13 700 towers in Pakistan, and OCK Group, which recently entered Myanmar and Vietnam.

This region is also home to Asia's most mature benchmark tower market; Indonesia, where over 50 towercos own two thirds of the country's 93 549 towers.

Africa and the Middle East

Five years ago, towercos owned less than 5% of the towers in sub-Saharan Africa. Today, led by Africa's 'Big Four' towercos (IHS Towers, American Tower, Helios Towers and Eaton Towers), that figure has risen to over 36%. With many untouched African tower markets remaining uninvestible due to regulatory and taxation regimes, the majority of Africa's most investible towers have now been acquired – MTN and Airtel have divested towers in the majority of their larger markets, while Orange, Etisalat and Vodafone/Vodacom have partnered more selectively with towercos.

The next milestone for the African tower industry is likely to be the IPOs of three of the big four towercos, with IHS Towers expected to list in New York, Helios Towers and Eaton Towers in London, seeking a collective valuation of around USD 14 billion.

Africa's 'Big Four' towercos have successfully evolved into full service powercos, assuming responsibility for and improving uptime at sites both on and off-grid, driving operational excellence, and reducing pilferage and opex.

While towercos currently own less than 1% of the towers in the Middle East and North Africa (MENA), this figure could rise to almost 10% in the next year. Q417 saw the first sale and leaseback of scale take place in the region; IHS Towers and Towershare announced the acquisition of 1600 towers from Zain Kuwait.

Expect this to be the first of several MENA tower transactions, where joint venture infracos may also emerge, with MCI, RighTel and Fanasia pioneering this form of infrastructure sharing in Iran.

Europe

Until recent adoption in MENA, the business model of the joint venture infraco (infrastructure company) had hitherto been unique to Europe, exemplified by CTIL and MBNL in the UK, as well as 3GIS, SUNAB, Net4Mobility, Yhteis Verkko and TT Networks in Scandinavia. Joint venture infracos own or operate 10% of Europe's towers, but since 2012 Europe has seen significant growth in both the pureplay independent towerco sector (driven by Cellnex and American Tower) and the operator led towerco sectors (with the carve outs of INWIT, Telxius); pureplay independent towercos now own 12% of Europe's towers, operator-led towercos own 17%.

While balance sheet re-engineering remains a driver in Europe, so does network efficiency – in particular the decommissioning of parallel infrastructure.

The Americas

USA and Canada remain the heartland of the global tower industry; the business models and contract structure utilized by American Tower, Crown Castle and SBA Communications continue to represent the 'gold standard' in terms of investibility and capital value creation, while the operational environment is less challenging than emerging markets, and the regulatory environment is considered extremely favourable.

While historically value in the U.S. market has been driven by robust contractual terms with healthy lease rates and escalators, and significant 'amendment revenue' (the overlay of nextgen technology equipment), healthy domestic lease up prospects have driven valuations to an unprecedented high.

With the majority of U.S. and Canadian towers now on towerco balance sheets, leading U.S. towercos have increasingly looked south of the border to extend their growth narratives.

When their latest acquisition closes in Paraguay, American Tower will have almost as many towers in Central America/Latin America CALA (36 486) as they do in the USA (40 426). SBA Communications has built a stronghold in Central America, utilizing U.S. style contract structures in largely USD economies. SBA recently supplemented their 7335 site Brazilian portfolio, acquiring Highline do Brazil and their 1200 sites.

This theme of towerco-on-towerco consolidation will be a constant in 2018, with Phoenix Tower International and Digital Bridge joining American Tower and SBA Communications in seeking to rollup the dozens of smaller private pureplay independent towercos in Latin America.

With the vast majority of towercos in Central and Latin America operated on a 'steel and grass' basis only (power remains the responsibility of the carrier), the region benefits from relatively low operational complexity, and the regulatory environment is developing positively, with new accelerated permitting initiatives bearing fruit in countries like Guatemala, Mexico and Brazil.

With an estimated 73% of North American and 51% of Central and Latin American towers now on towerco balance sheets, the 'heartland' of the tower industry is almost sold out, driving international growth of this proven innovation.

I'll conclude by mentioning some of the positive impacts, and pitfalls to be avoided, as we continue into an era of professional infrastructure sharing in which towercos own the majority of the world's towers.

Towercos' laser-beam focus on passive infrastructure creates value in several ways:

- Increasing tenancy ratios – driving tower cash flow and reducing skyline clutter.
- Making more efficient use of land, for example by decommissioning parallel infrastructure.
- Improving operational and energy efficiency.
- Standardization of site design and acceleration of rollouts.

Ultimately, the separation of infrastructure assets from retail telecommunication releases capital and creates capital value, enabling MNOs to focus on selling minutes and megabytes. It would be naïve to assume that this industry transformation comes at no cost and without risk: MNOs would be well advised to absorb the cautionary tales of peers who leveraged towerco partnerships to sell their passive infrastructure for many times its replacement cost, in the process saddling the MNO's local operating companies with an increased total cost of network ownership that may become difficult to sustain in the long term. Partnering with towercos can relieve debt, but the old cliché holds true: don't take out a mortgage you cannot afford!

About

Kieron Osmotherly is the CEO of **TowerXchange** (part of Euromoney Institutional Investor PLC). TowerXchange is a community of 35 000 tower industry leaders, which publishes the renowned TowerXchange Journal, and which organizes annual Meetups for the top 250+ decision-makers in the African, Latin American, Asian and European tower markets.

Top towercos 2017

Rank	Towerco	Tower count Q417	Countries	Listed/private
1	China Tower Corporation	1 900 000	China	IPO H118
2	American Tower	149 720	Argentina, Brazil, Chile, Colombia, Costa Rica, Germany, Ghana, India, Mexico, Nigeria, Peru, South Africa, Uganda, USA, France	Listed
3	Indus Towers	122 920	India	Private
4	Crown Castle	40 127	USA	Listed
5	Bharti Infratel	39 211	India	Listed
6	Deutsche Funkturm	34 700	Germany	Private
7	edotco	31 600	Bangladesh, Cambodia, Malaysia, Myanmar, Pakistan, Sri Lanka	Private
8	GTL Infrastructure	28 000	India	Listed
9	SBA Communications	26 764	Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Nicaragua, Panama, Peru, USA	Listed
10	Cellnex	24 664	France, Italy, Netherlands, Spain, UK, Switzerland	Listed
11	IHS Towers	23 382	Cameroon, Ivory Coast, Nigeria, Rwanda, Zambia	IPO H118
12	Telxius	16 245	Brazil, Chile, Germany, Peru, Spain, Argentina	Private
13	Telesites	15 111	Costa Rica, Mexico	Listed
14	Guodong	15 000	China	Listed
15	Protelindo	14 614	Indonesia	Listed
16	First Tower Coompany	14 000	Russia	Private
17	Tower Bersama	13 175	Indonesia	Listed
18	Mitratel	13 113	Indonesia	Private
19	NetWorkS!	13 000	Poland	Private
20	DIF	12 183	Thailand	Listed

Source: TowerXchange

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Networks and connectivity – Sharing in order to improve citizens' lives

Tobias Martínez

CEO, **Cellnex Telecom**

> *"The key word in the 'geo-economics' of the digital economy is 'sharing', not 'ownership'."*
>
> Tobias Martínez

We have made the concept of digital transformation an integral part of our mindset. Around the world, companies are largely digital in that our decision-making is determined by the volume of data and information which we access in real time, at all locations, through mobile systems.

In this digital ecosystem based on the transmission of billions of zeros and ones, the networks that make this possible are just as important as the information conveyed. I am referring to the connectivity and integration of fixed and mobile networks that make it possible to convey bits of information from one point to another, through whatever medium: cable, optical fibre, terrestrial wireless networks, satellites, or perhaps all of these at some point, as networks become increasingly integrated and hybridized to form heterogeneous networks ("HetNets") for reliable communications.

With this in mind, we need to create conditions conducive to the emergence of an innovative and competitive ecosystem at the service of people. As the foundation of this ecosystem, there is a manifest need for appropriate and resilient infrastructure capable of handling the data flows of today and tomorrow.

Some figures illustrate the trend. Some 25 years ago, before the advent of mobile connectivity, buildings were connected to the fledgling Internet via fixed telephone networks. By 2017, permanent access to the network wherever we happen to be had already become a basic necessity: there are now more mobile voice and data contracts than there are people in the world, and more smartphones than basic voice-only devices.

But objects – in the "Internet of Things" or via machine-to-machine communications – also interact among themselves. Nowadays we have all manner of sensors that improve society and enhance personal mobility. For example, they can improve the efficiency of industrial processes ("Industry 4.0") in the preventive maintenance of aircraft engines, or enhance welfare by carrying out remote monitoring of patients. Such sensors are all based on permanent and resilient connectivity, and it is estimated that there will 50 billion of them by 2020. The data they generate will facilitate decision-making based on "big data" applications.

And we are still only in the initial stages of development of an ecosystem which, with the advent of 5G (IMT 2020), will undergo unprecedented development: more, better, faster and more secure connectivity, with the capacity to handle volumes of data that have never been seen before. The data associated with every connected person alone will grow four- or five-fold by 2020.

More data in a network that is broader, denser, expanded… and shared

The inexorable growth in data traffic – in the case of mobile communications, by an estimated 600% in the next five years – presents us with a challenge: how do we make the major investments that are needed to ensure secure and reliable transmission based on short technology cycles? This point is highlighted in a recent study by the consultancy firm EY. ("**Digital transformation 2020 and beyond: A global telecommunications study**" 2017)

As the study suggests, "Operators will need to consider new ways of generating capex efficiency as they strive to meet growing demand for high-speed and low-latency data services."

There are a number of specific question which we must be able to address.

How will we ensure that the enormous number of simultaneous access operations will allow the speeds and latencies that are needed without compromising security, for example, in autonomous vehicles? Are we going to densify networks according to the principle of ownership and deployment of networks by every voice and data access provider? Or will we opt for sharing a network that is necessarily broader, better prepared, and denser, comprising "small cells" or small antennas deployed and administered by infrastructure operators which make that capacity available to the network access providers?

The need to harness models of network and infrastructure sharing was also raised by the Chairman of GSMA, Sunil Bahrti Mittal, at the Mobile World Congress 17 in Barcelona. In his view, the current model, based on proprietary networks deployed by each operator, cannot be sustained, and companies that are purely network and infrastructure operators ("Netcos") should have a more important role – that is, companies which, independently of network access providers, apply a model of value creation that maximizes the use of existing networks and capacities to facilitate resource sharing and thus help their clients (the network access providers) to be more competitive.

The key word in the "geo-economics" of the digital economy is "sharing", not "ownership". For example, in the future – and to some extent even now – a car will no longer be just a car but rather, a software platform that will make real-time decisions based on dynamic information gathered from the vehicle itself and its interaction with other external systems (other vehicles, GPS, and so on). For this to happen, it will be necessary to establish and "share" the networks and infrastructure needed to accelerate the introduction of new mobile broadband services and applications. If we really wish to boost competition among service providers (unleashing innovation) and reduce the "time to market" new products and services, entry costs must be cut to a minimum. Sharing also reduces CAPEX allocation to redundant (overlay) networks by service providers (such as mobile network operators), which releases available resources for the development of innovative broadband-based content, services, applications, and so on, which in turn stimulates digital transformation.

An adequate response will be possible only if all the players – public administrations, network access providers and infrastructure administrators – act in a coordinated way. The densification of networks in response to the growth in data traffic, and the need to ensure virtually universal coverage, will determine the criteria we apply in planning and deploying equipment and infrastructure, and it is reasonable to apply criteria that focus on efficiency and rationalization.

In an economy in which broadband connectivity will need to be taken for granted (like access to mains water, electricity and gas), as well as being a factor for "social inclusion" and overcoming the digital divide, competitiveness requires more rapid deployment of new value-added services and applications. It is essential to lower entry barriers by providing incentives for the development of services and content that will boost competition, differentiation and innovation, which in turn will enhance citizens' well-being.

Five trends in shared mobile infrastructure

By Jennifer D. Bosavage

The number of mobile network infrastructure sharing deals nearly tripled between 2010 and 2015, and has continued to rise since then. Indeed, infrastructure sharing is here to stay, but a number of trends will shape the market for years to come.

Mobile infrastructure sharing can help providers lower costs. It can also help boost competition and provide consumers with better options and better prices as the demand for mobile services increases.

In a typical tower company ("Towerco") deal, for example, a third party buys a tower from an operator, and then leases it back to the original operator, as well as to others, including newer small entrants (for whom rolling out a new network would be too costly) and more established players.

Here are five trends in shared mobile infrastructure that are impacting customers as well as providers today – and in the very near future.

Trend 1: Expansion into rural or underdeveloped areas

Despite government policies to encourage rural connectivity, rural areas are still often underserved by mobile providers due to small population numbers and lower revenue potential. But when network providers sell off their towers, the cost-benefit ratio becomes more attractive.

The operators leasing the tower can enjoy either reduced or no capital expenditure (capex) costs associated with building the structures, tower-capacity expansion and general maintenance. This helps operators to improve their profit margins, and to invest in new technologies and improve network quality of service for the benefit of subscribers.

Mobile market expansion is global in nature, and the growth of mobile infrastructure is seen as critical for emerging economies to gain traction. Stéphane Téral, executive director of research and analysis, mobile infrastructure and carrier economics for research firm IHS Markit is confident that real growth will be seen in developing nations.

"Nigeria is the most successful network sharing country [in Africa]. Africa, India and Latin America are three geographies where network sharing has been working well," said Téral. "Although India pioneered network outsourcing back in 2005 and since has moved fast to network sharing and managed services, it's EMEA (Europe, Middle East and Africa) that is leading this area now with network sharing deals all across Eastern Europe and Africa."

Trend 2: Emerging countries lead by example

Improved cost efficiency has meant that, in some instances, less-developed countries have embraced tower sharing before their industrialized counterparts. Countries that have made use of tower sharing out of financial necessity are now paving the way for others who are finding cost savings an attractive benefit.

"The tower business is moving from emerging to developed countries. This is already happening in Italy – and given the revenue crunch across Western Europe – it's just a matter of time before we see more and more service providers selling their towers to a tower company specialist," said Téral.

Trend 3: Reduction of emissions

Certain locations have imposed restrictions on building in high-density areas. That's partly the result of a desire to reduce emissions and also a reaction to complaints that towers and their power generators are noisy polluters that are unattractive additions to the environment. Tower sharing inevitably results in a reduction in the number of towers required to service the needs of network providers, while at the same time minimizing the overall carbon footprint of the telecom's infrastructure. This applies especially to emerging markets where towers are often powered by diesel generators due to unreliable electrical grids.

For example, commenting on Towershare's recent partnership with Telenor Pakistan, Irfan Wahab Khan, CEO of Telenor Pakistan, noted the **importance of being environmentally friendly**: "We believe shared mobile infrastructure is a smart way to accelerate the spread of telecom and digital services that will reap benefits by conserving resources and staying friendly to the environment."

About

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Trend 4: SDN market will benefit

The telecommunication service provider segment is expected to be the **fastest-growing end user for the software-defined networking (SDN) and network function virtualization (NFV) market**. That market is predicted to explode from USD 3.68 billion in 2017 to USD 54.41 billion by 2022.

SDN has been proposed as a key component in the design of future 5G wireless networks – providing the communication between applications and services in the cloud. The network can be managed based on real-time needs and status dynamically. SDN makes it easier for tower owners to introduce and deploy new applications and services than it is using hardware-dependent standards.

Trend 5: NFV will also be a winner

SDN is not a prerequisite for NFV, but the two sets of technology together augment each other's capabilities. The technology replaces dedicated network appliances, including routers and firewalls, with software running on servers. The software is dynamically implemented on the network, transforming it without requiring the installation of new equipment.

According to Téral, NFV will provide the next wave of operational efficiencies in network sharing. "By moving more and more network functions from hardware to software by using off-the-shelf IT components and platforms, the cost of network nodes goes down and new services can be turned up and down at a power of a click," he said. "Overall, with the concept of network slicing, it will become easier to share networks among several service providers."

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