# Spectrum Management: Strategic Planning and Policies for Wireless Innovation

## Spectrum policies for wireless Innovation
## Spectrum and infrastructure sharing

**Place: Algeria**

**Date: 1-5 Dec. 2019**

Presenter : Eng. Tamer Sayed

# Module Objectives

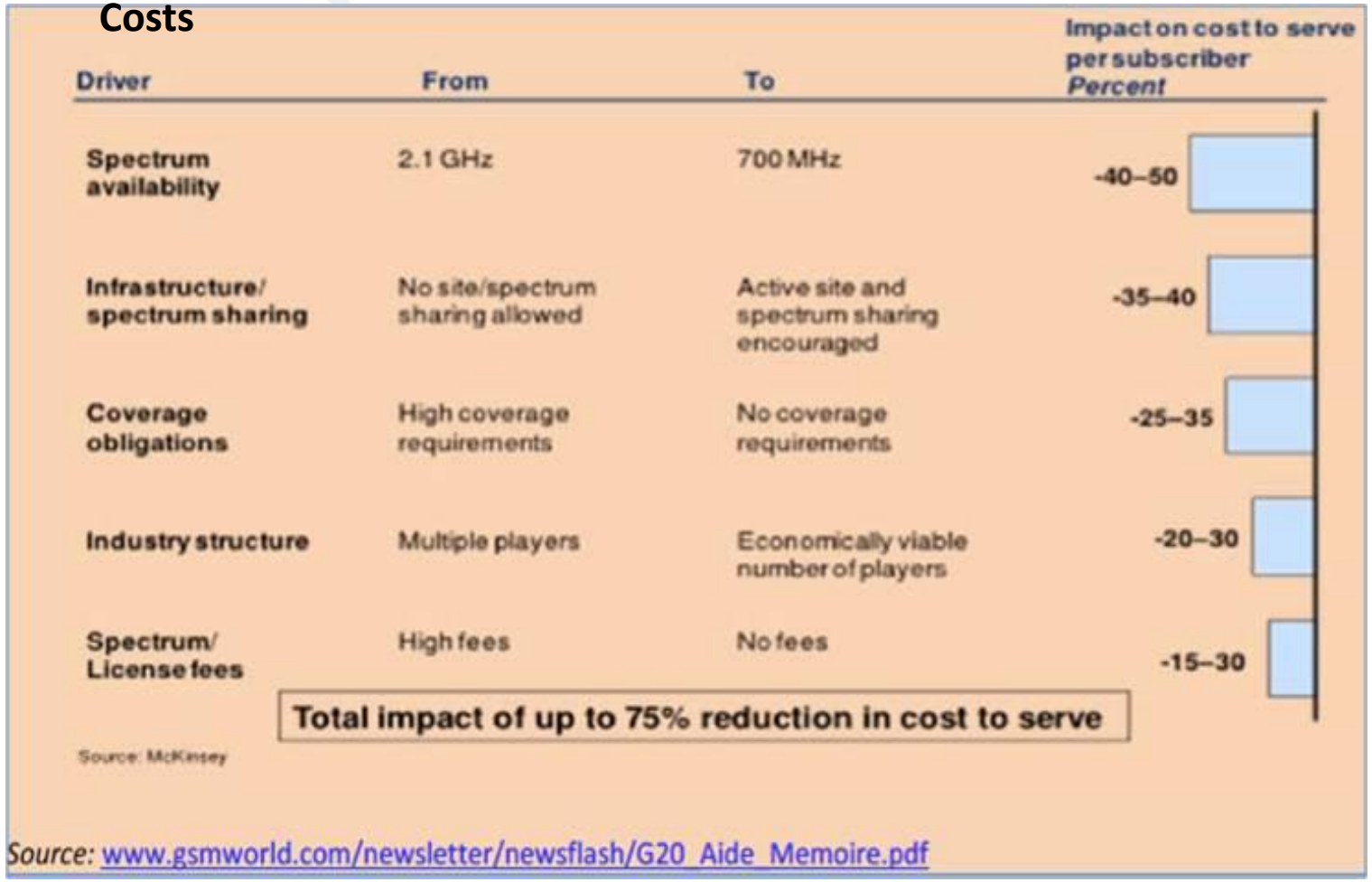
- The aim of this session is to introduce spectrum policy initiatives focussing on spectrum and infrastructure sharing and to provide examples

# Module Topics

- Spectrum Sharing
- Infrastructure Sharing
- MVNO’s

# Spectrum Policy Focus – Sharing can reduce costs

**Impact of Spectrum Management on Mobile Broadband Network Costs**



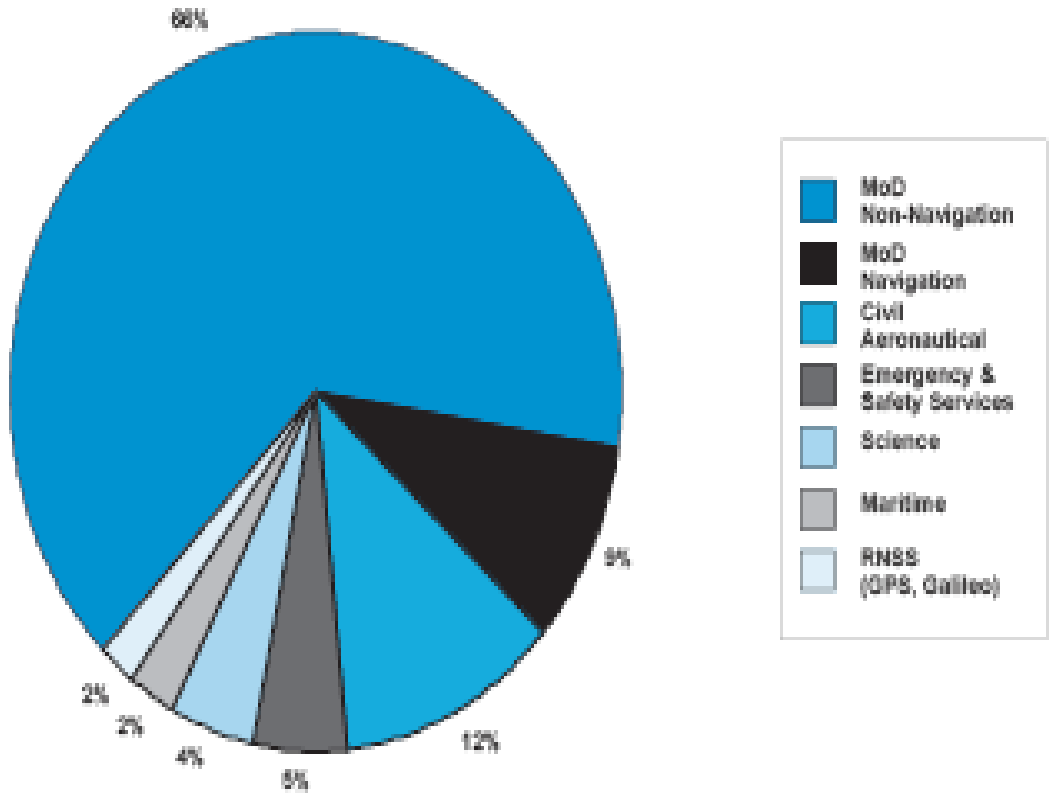

Source: www.gsmworld.com/newsletter/newsflash/G20_Aide_Memoire.pdf

# Spectrum Sharing

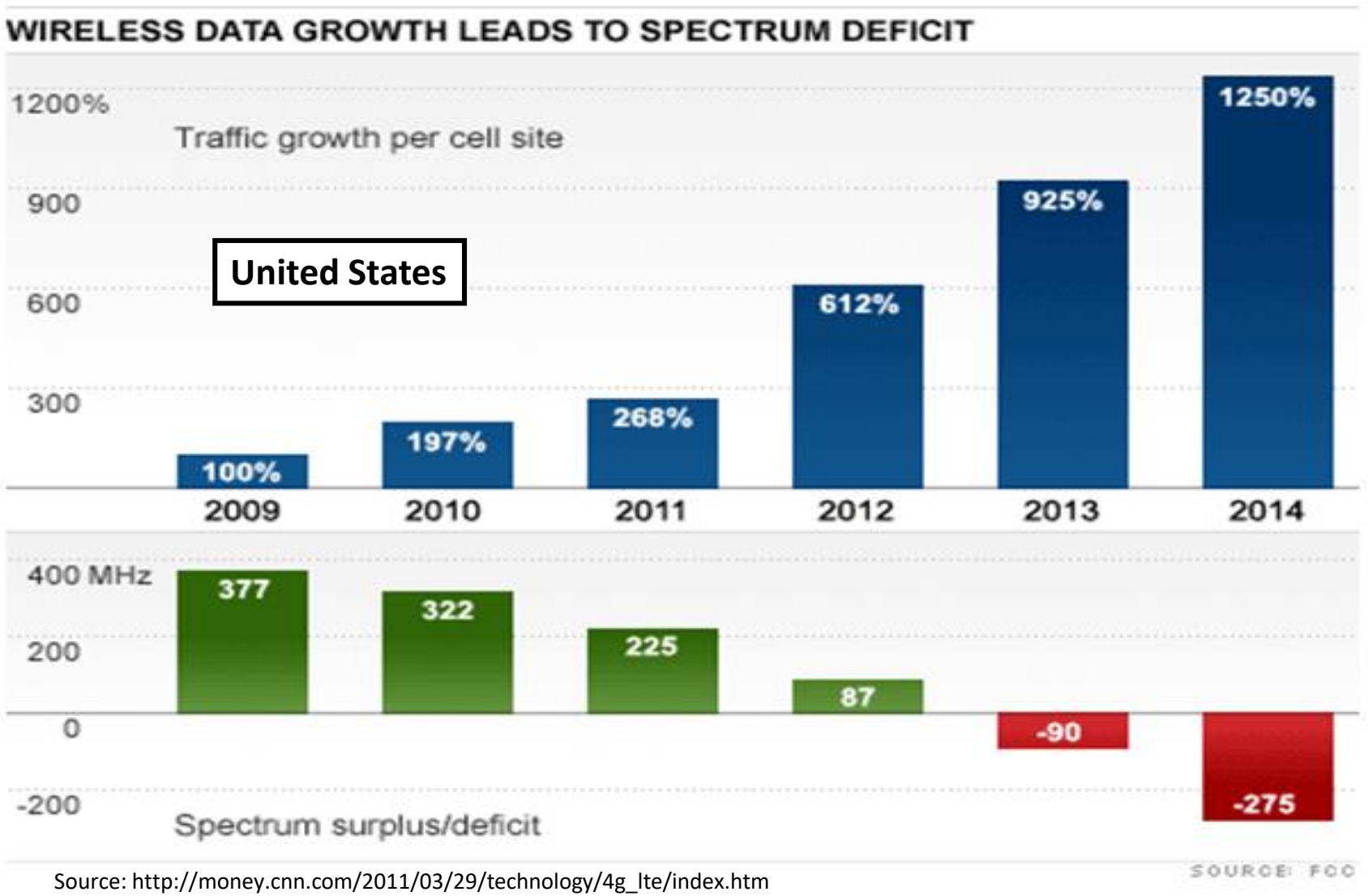
- Typically involves one or more user sharing the same band or piece of spectrum for different applications (services) or using different technologies;
- When is spectrum sharing truly required; and, when does it make the most sense? When:
  - sufficient demand exists for spectrum;
  - congestion exists;
  - the technical means exist to permit different users to coincide;
  - and other means for adjusting spectrum use and assignment have become burdensome and costly undermining the goals of economic and technical efficiency.

# Spectrum Scarcity

- Significant blocks of spectrum are allocated for government use often for military and other ministry communications systems. Government holdings of spectrum approximate 50% of the spectrum below 15GHz.
- Independent Audit of Spectrum Holdings (the Cave Audit)

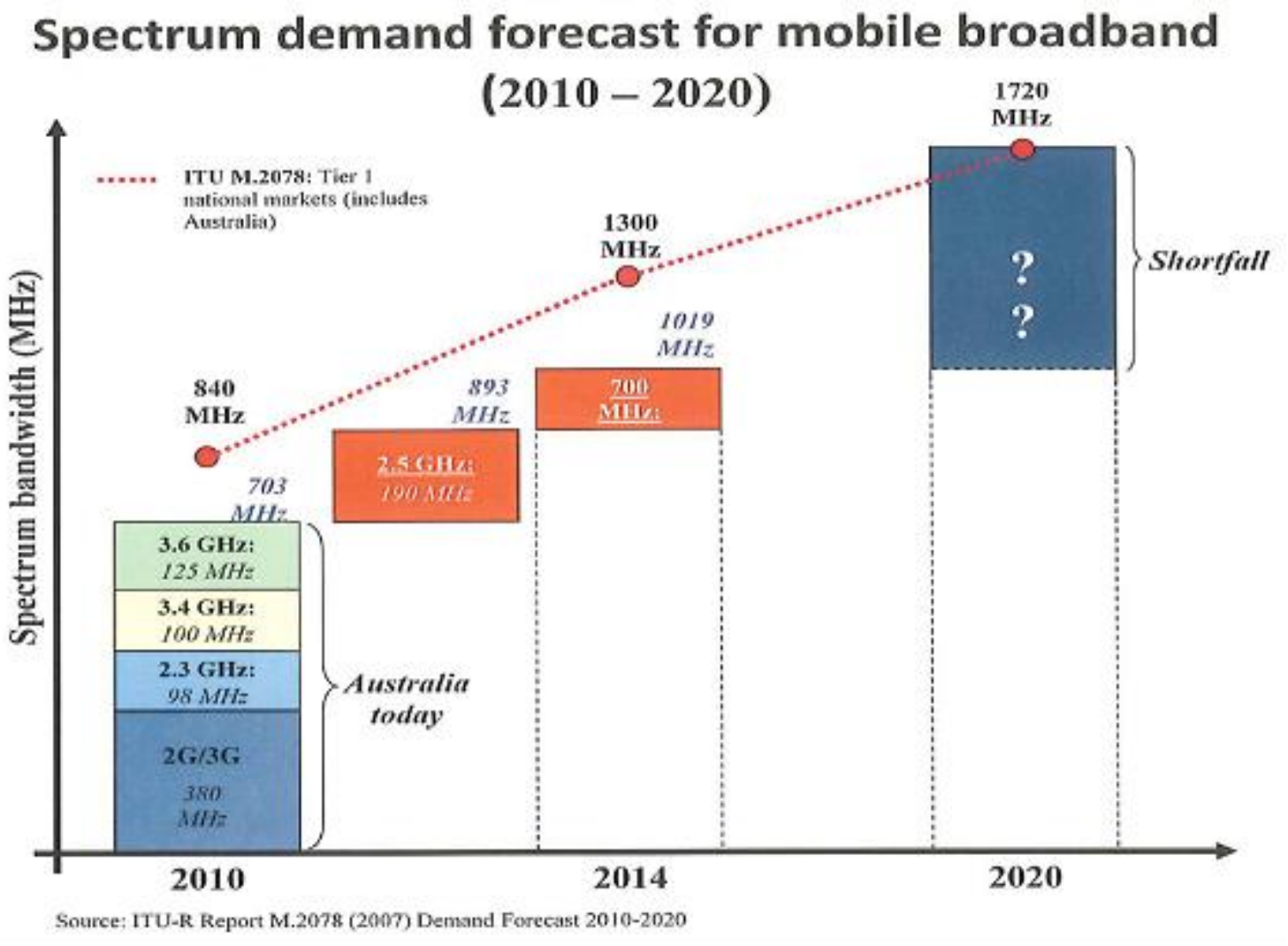


# 4G-LTE will not Solve 3G Spectrum Problems




Source: http://money.cnn.com/2011/03/29/technology/4g_lte/index.htm

# Forecast Spectrum Deficit in Australia



# Options and Tools

- Administrative Policy and Authorization reform:
  - liberalization of management rights;
  - Flexibility on usage and technology;
  - Spectrum transfer – leasing, subleasing;
  - Spectrum Pricing;
- Market-based methods such as trading;
- Technically enabled sharing – Ultra-wideband, spread spectrum techniques, smart antennas;
- Emerging technologies – Software defined and Cognitive Radio (agile radios), Dynamic Spectrum Access.

# Striking a balance

| | Opportunities | Challenges |
|---|---|---|
| **Command and Control** | Centrally managed and planned<br>Low risk of interference | Slow<br>Requires managers to make technology choices<br>Suboptimal efficiency |
| **Market Mechanisms** | Promotes efficient usage.<br>Gets spectrum to the users who value it most | Possibility of hoarding<br>Windfall gains<br>Fragmentation |
| **Flexible Use** | Potentially efficient use of spectrum<br>Prevents artificial scarcity and high values of spectrum | Perceived increased risk of interference<br>Relatively untested |
| **Sharing** | More efficient use of spectrum that is already allocated | Requires some management<br>Potential for interference<br>Fragmentation |
| **Commons** | Promotes innovation<br>Lower cost of regulation | Potential interference<br>'Tragedy' of commons<br>Untested (except for short range applications) |

Source: COMREG: Commission for Communication Regulation, 2007

# Interference Management

- Interference cannot be eliminated entirely. There is an ongoing debate on which models or models support sharing under administrative, market-based or spectrum commons.
  - Test and trial licenses (ComReg)
  - Spectrum Sharing Innovative Test Bed (FCC/NTIA initiative)

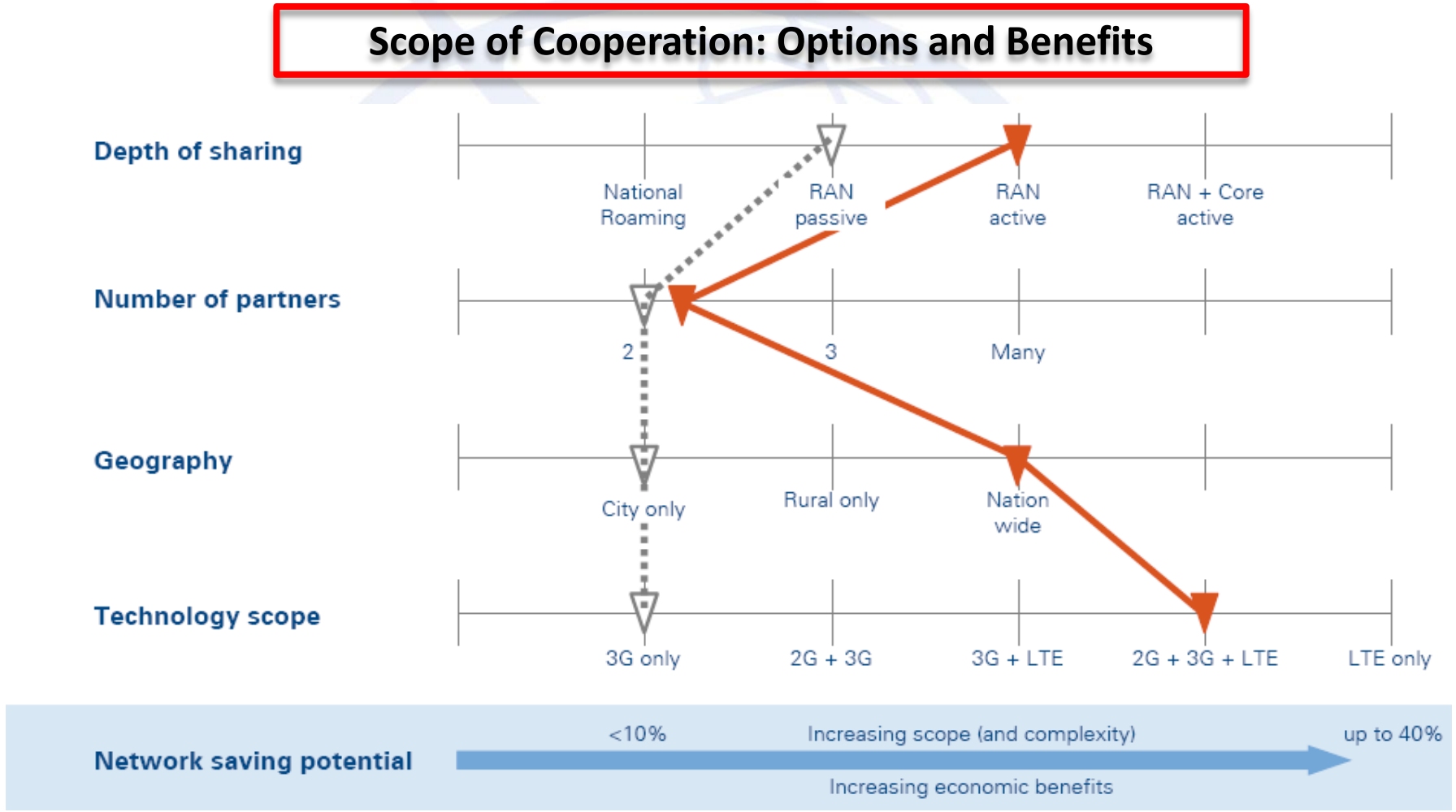
# Rationale for sharing

- **Demand for higher bandwidth:** costly fibre links between sites needed to support high density cell site
- **Growing subscriber base:** more cell sites to service exponential growth in wireless traffic
- **Emerging technology:** High investment requirements for advanced technologies occuring more rapidly.
- **Increased site rental costs:** Real-estate costs and increased site rentals costs as many operators rollout service in urban or semi urban areas.
- **Need for denser coverage due to spectrum constraints:** Spectrum allocation criteria provide operators only 10 MHz spectrum for up to 2 million subscribers. Operators require denser tower locations to ensure minimum quality standards.
- **Increased Regulatory and Planning costs:** Longer approval processes and high permit fees to install new cell site.s
- **Tower Restrictions: U**rban planning ministries and municipal governments now place restrictions on new tower construction (based on health and environmental concerns)

# Reasons to be careful

- Infrastructure sharing it is crucial to not going too far:
  - Loss of competition between players in areas such as coverage and innovation,
  - Reduce competition in the wholesale market,
  - Increased risks for collusion,
  - Loss of differentiation.

# Different types of cooperation models can be used by mobile networks



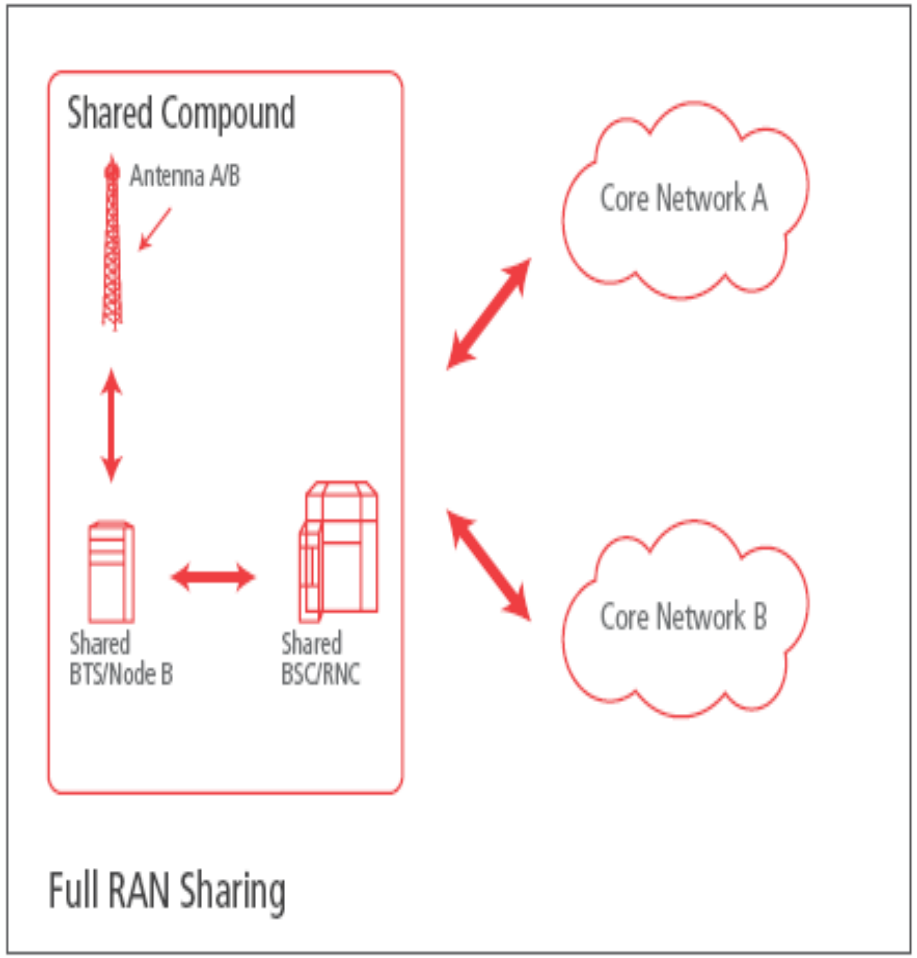

*Source: ADL 2010*

# Radio Access Network Sharing

- Operators share all access elements to point of connection with core network.

Advantages:

- Reduced Operating Expenditures (savings up to 20%[1])
- Reduced site acquisition cost
- Reduced Capital Expenditures (site build, BTS, and backhaul)
- Reduced environmental/visual impact
- Ideal for low density rural areas where low traffic does not justify multiple investments by operators in infrastructure




[1] – GSM Association, Infrastruture Sharing, Page 18

# Different mobile infrastructure sharing options are being used

Increasing depth of network sharing from left to right →

| Site sharing | Mast sharing | RAN sharing | RAN + Core network sharing | Regional or national roaming |
|---|---|---|---|---|
| • Operators A and B share the same physical compound but install separate masts, antennas, and BTS/Node B.<br>• The operators may decide to share support equipment, including shelters, power supply and air conditioning. | • A step up from site sharing, operators A and B share the same mast (or other structure such as a rooftop). Each operator installs their own antenna onto the shared mast.<br>• As for site sharing, the operators may also share support equipment. | • Operators A and B share all access network equipment, including the mast, antenna, BTS/Node B, BSC/RNC and possibly also share backhaul to a point of connection with the core networks.<br>• Despite sharing the same hardware, each operator keeps separate 'logical' control over the RAN by using its own software.<br>• Each operator also uses its own assigned spectrum. | • Beyond RAN sharing, operators A and B could also share some or all parts of the core network.<br>• To date the focus of interest for network sharing has concentrated on the access network. | • Agreements allowing users of operator A to roam onto the network of operator B if operator A's network is not present in a particular location.<br>• 2G/2G, 3G/2G or 3G/3G roaming. |

# International examples of mobile infrastructure sharing

| Country | Date | Operators | Details |
|---|---|---|---|
| Sweden | March 2001 | Tele2 and Telia | The two operators agreed to set up a joint venture company and deploy a nationwide 3G network. As of 2005, they had one of the largest shared 3G networks in the global telecom industry. |
| Sweden | May 2001 | Hi3G and Europolitan | The joint venture was tasked to deploy a 3G network covering the 70 percent of population outside major cities. Orange later joined the joint venture. |
| Germany and the United Kingdom | June 2001 | BT and Deutsche Telekom | The two operators agreed to share parts of their 3G networks. The main outcome was a roaming deal in the UK between BT Cellnet and One2One in small cities and rural areas. |
| Spain | October 2003 | Telefónica and Yoigo | The two operators agreed on an infrastructure-sharing deal for both urban and rural areas. |
| Australia | August 2004 | Hutchison 3G Australia and Telstra | The two operators agreed on network sharing and committed to joint ownership and operation of H3GA's existing 3G radio access network. |
| Spain | November 2006 | France Telecom (Orange) and Vodafone | The agreement focused on rural areas with fewer than 25,000 inhabitants. The agreement is expected to reduce costs by as much as 40 percent. |
| India | February 2007 | Hutchison Essar and Bharti Airtel | Vodafone (Hutch Essar) and Bharti entered into an MOU covering a comprehensive range of infrastructure-sharing options in India. A regulatory proposal to further share infrastructure throughout India followed in April 2007. |
| United Kingdom | February 2007 | Orange and Vodafone | The two operators announced plans to share their radio access network across the United Kingdom. |
| International | February 2007 | T-Mobile | T-Mobile indicated intent to focus on network sharing as a growth strategy but excluded the United Kingdom from its plans. |
| Spain | July 2007 | Telefónica and Yoigo | Five-year renewal of the 2003 contract. |

Source: Booz Allen Hamilton based on press releases

# Network Sharing - MVNOs

- Initial and early on experience with MVNO’s (2G and 3G) was very mixed. Many ended in failure. Recent activity with MVNO’s using LTE/Smartphones has re-ignited broad interest.
- MVNOs' are commercial dynamic and have unique skills in exploring new customers segments with beneficial purchasing opportunities for consumers. These include the following initiatives:
  - unlimited SMS packages and the first ranges of packages without commitment
  - all-unlimited packages available to the general public
  - packages for frontier-dwellers and regular travellers
  - metered packages
  - tailor-made packages

# Network Sharing – MVNO's

- ARCEP's view on the state of competition in wholesale and retail mobile markets in France in particular by examining wholesale prices in relation to the retail prices that network operators charge,  and provide market players and the regulator with recommendations on measures that could be taken to allow MVNOs to improve competition in the mobile telephony retail market.
- ARCEP since tremendous developments in the mobile retail market for consumers and in the wholesale market for access and call origination on mobile telephone networks:
  - the emergence of "éco" SIM only solutions in 2010, then of contract-free plans in 2011
  - the launch of low-cost, subsidiary brand offers by incumbent carriers in 2010;
  - the ubiquity of high-volume calling, SMS and data plans and the development of quadruple play solutions;
  - the commercial launch of Free Mobile in January 2012, which was particularly significant for the simplicity of its plans, their pricing and the fact that subscriptions are never bundled with the handset.

# Thank you