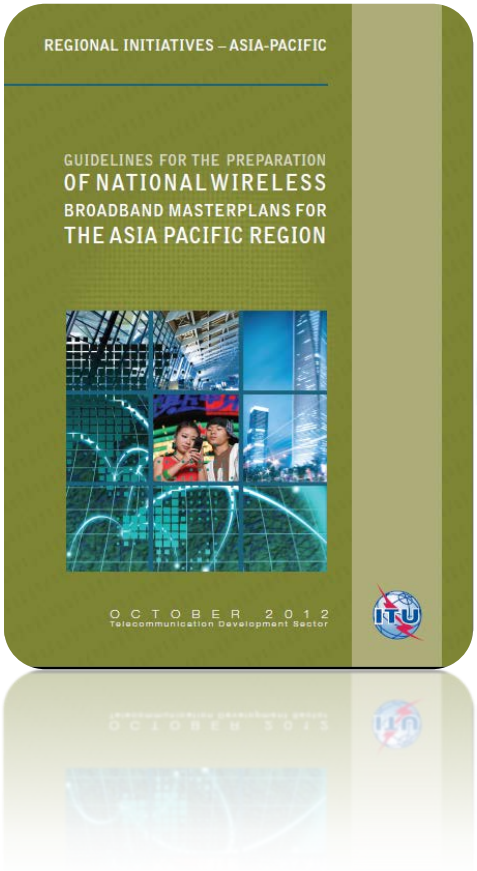
Where are we now: Wireless Broadband Ecosystem

ITU ASP COE TRAINING ON "WIRELESS BROADBAND ROADMAP DEVELOPMENT"

06-09 August 2016

Tehran, Islamic Republic of Iran



Summary of the key issues in the formulation of a wireless broadband masterplan

Regulatory	• Legislation • Promote Access • Infra sharing • Mandated rules • Spectrum allocation	• How effect are current laws and regulations in promoting broadband? • Are there effective infrastructure sharing arrangements in place? Is there costly duplication? • Does the government need to consider mandating MVNOs and/or spectrum caps to prevent spectrum hoarding? • What is the most appropriate way to allocate spectrum (i.e. auction, beauty contest, etc.) to facilitate it use for wireless broadband?
Market	• No of Operators • Degree of Competition • Penetration rate • Access Targets • Retail Tariffs	• How many mobile subscribers are there relative to fixed line subscribers? • What is the structure of the market? How many operators exist and what is their current market share? Is there adequate competition among network operators? What is the level of retail tariffs? • What is the current penetration rate? What are the target penetration and access rates for the country?
Spectrum	• Future requirements • Technology neutrality • Overall Wireless Spectrum • Digital Dividend	• What are the country's forecast spectrum requirements now and for the future? Will additional releases of spectrum (including 700 MHz, and 2.3/2.6 GHz) be required in the future? • What is the trend for wireless data traffic and what is the forecast demand? • Is the country committed to technology neutrality? Eg WCMDA @ 900 Mhz • Has the country migrated to digital television and can Digital Dividend in the 700 Mhz spectrum band be secured?
Technology	• Key technologies • LTE and key spectrum • Satellite • Domestic Backhaul • International	• What is the most effective technology mix (i.e. GSM, WCDMA, LTE, satellite)? Is the government targeting key spectrum band (i.e. 700 MHz) for the use of LTE technology? • What is the country's backhaul capacity? Is further investment in a fibre backbone required? Is wireless offloading suitable? • Which technology is best suited for international connectivity (i.e. submarine cable or satellite)? What are the geographical considerations?
Content	• Language • Local content • Government online • Training	• Is government support of local content industries required? • Are local languages supported (i.e. by Unicode or ASCII characters) for online content and information? How prevalent is local language content? • Does the government have a direct online presence? Is government leading the way in terms of online engagement with its citizens? • Are digital literacy and skills being promoted in schools and universities?

Source: Author

ICT Goals and Targets

- Sustainable Development Goals
- ITU 2020 Agenda

Goals for a Sustainable Future : The SDGs

Enhancing the Objectives

- ICTs are a key cross-cutting enablers for promoting and achieving each and every SDG.
- Has great potential to accelerate human progress
- Bridge the digital divide and to develop knowledge societies.

Acknowledging the Role of ICTs

SDG : 4(b) Education and scholarships

SDG : 5(b) Gender Empowerment

SDG : 9(b) Infrastructure for Universal and Affordable access to ICTs and the Internet in the Least Developed Countries

- Other (health, energy, agriculture, water, climate change…….)

Mainstreaming the 2030 Agenda

The new universal agenda requires that ITU :

-support governments, the UN system and sector partnership efforts effectively at the national, regional, and global levels to meet the sustainable development goals.

Better inter-sectoral coordination will also be required at ITU to strengthen its related work and enhance the important role of ICTs as crosscutting enablers for the SDGs.

ITU CONNECT 2020 VISION

GROWTH
Enable and foster access to and increased use of telecommunications/ICTs

55% households access to the Internet
60% individuals using the Internet
40% Telecoms/ICTs be 40% more affordable

INCLUSIVENESS
Bridge the digital divide and provide broadband for all

(i) 50% of households access to the Internet in the developing world; 15% in LDCs (ii) 50% of individuals using the Internet in developing world; 20% in LDCs (iii) 40% affordability gap be reduced by 40% between developed and developing countries (iv) 5% Broadband services should cost no more than 5% of average monthly income in the developing countries

SUSTAINABILITY
Manage challenges resulting from the telecommunication/ ICT development

40% improvement in cybersecurity readiness
50% reduction in volume of redundant e-waste
30% decrease GHG emissions per device generated by the telecom/ICT sector

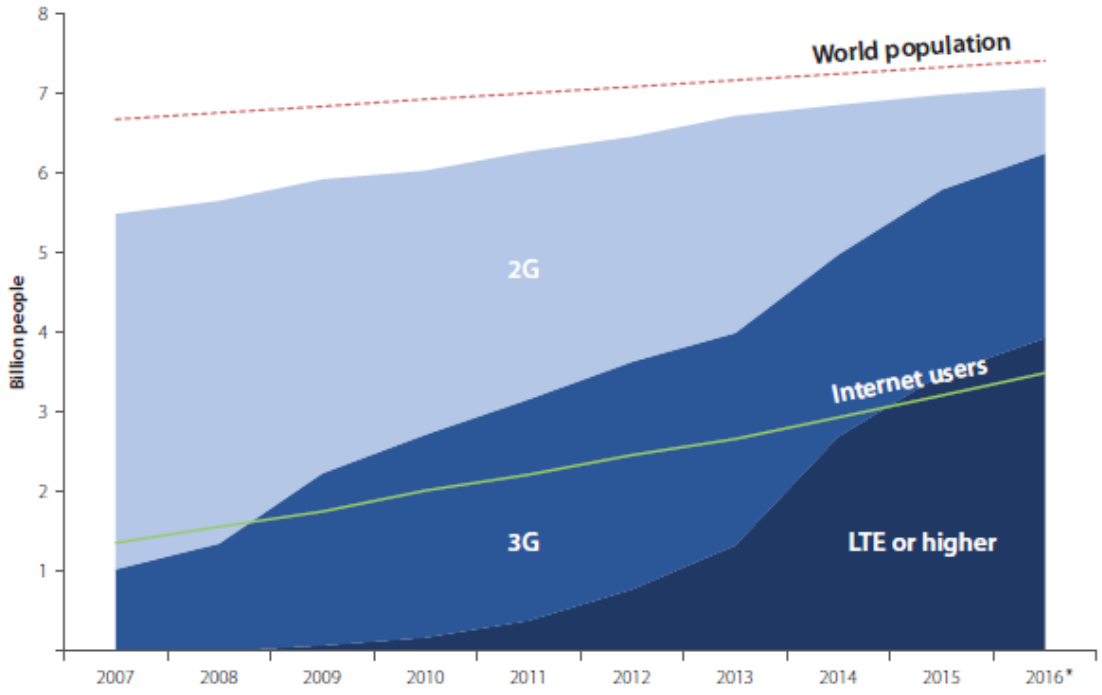
INNOVATION & PARTNERSHIP
Lead, improve and adapt to the changing telecommunication/ICT environment

Telecommunication/ICT environment conducive to innovation
Effective partnerships of stakeholders in telecommunication/ICT environment

- Resolution on Connect 2020 Agenda
- Approved by the ITU Plenipotentiary Conference (PP-14):
- Includes measurable targets – ICT indicators

Some ICT Trends…

Mobile network coverage and evolving technologies



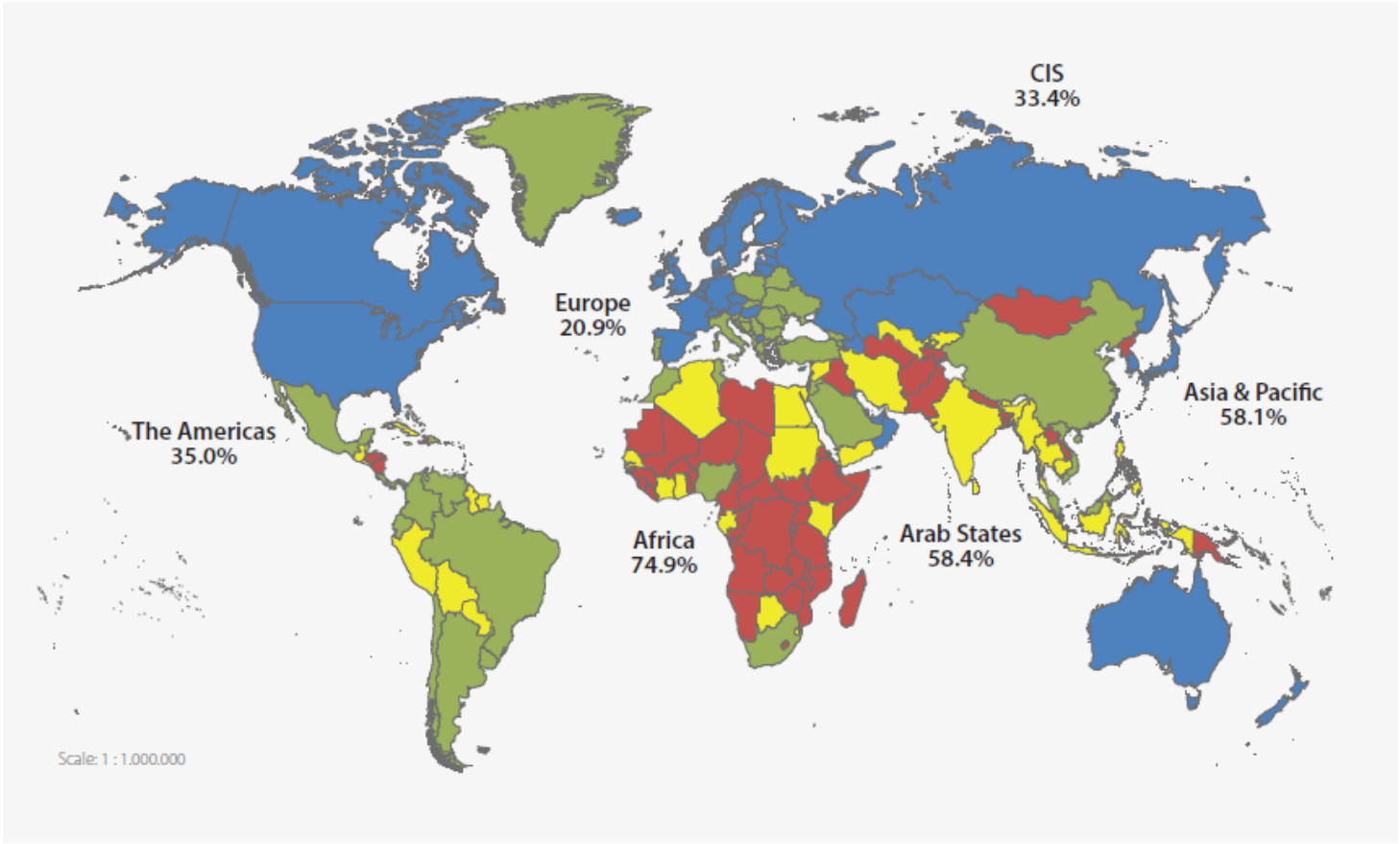
Seven billion people (95% of the global population) live in an area that is covered by a mobile-cellular network.

Mobile-broadband networks (3G or above) reach 84% of the global population but only 67% of the rural population.

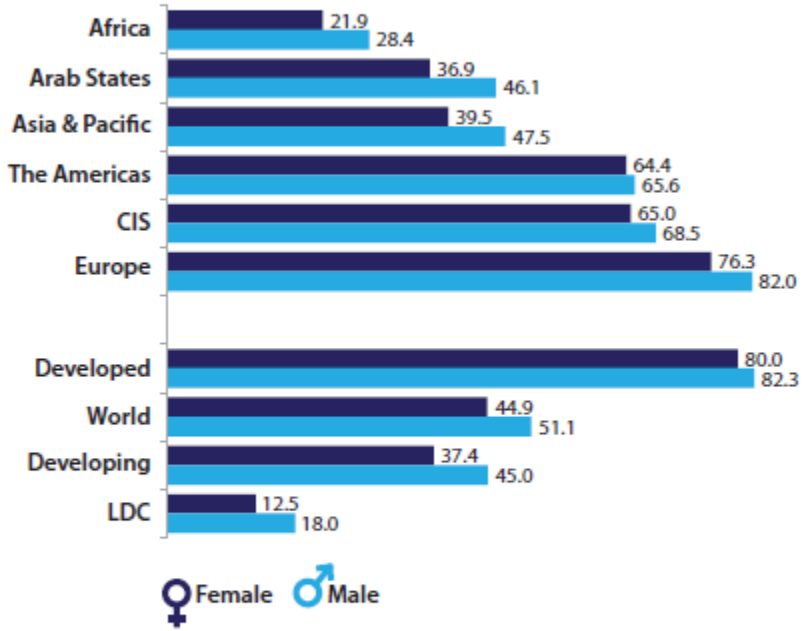
LTE networks have spread quickly over the last three years and reach almost 4 billion people today (53% of the global population), enhancing the quality of Internet use.

Source: ITU.
Note: * Estimates. Mobile network coverage refers to the population that is covered by a mobile network.

More than half the world's population is not using the Internet



Internet penetration rate for men and women, 2016*

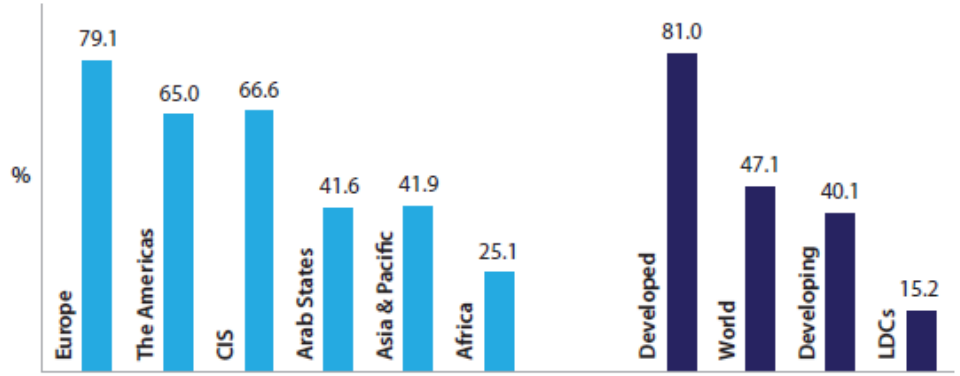


Internet penetration rates are higher for men than for women in all regions of the world.

Source: ITU. Note: * Estimates. Penetration rates in this chart refer to the number of of women/men that use the Internet, as a percentage of the respective total female/male population. CIS refers to: Commonwealth of Independent States.

THE DIGITAL DIVIDE IN 2016

Percentage of individuals using the Internet



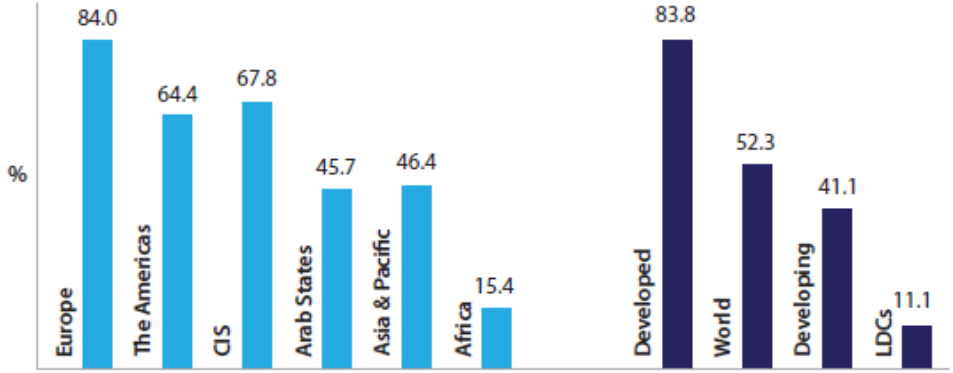
Close to one out of two people (47%) in the world are using the Internet but only one out of seven people in the LDCs.

Developed regions are home to one billion Internet users, compared to 2.5 billion users in the developing world.

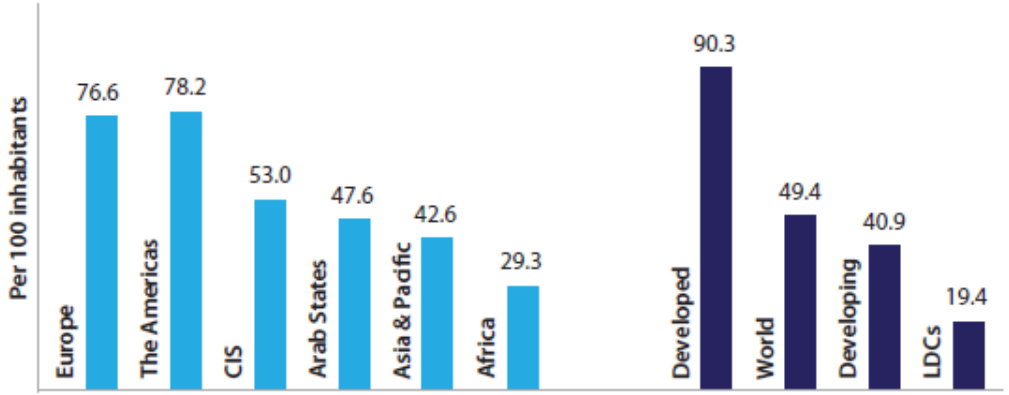
Percentage of households with Internet access

Almost two-thirds of households in the Americas are connected, compared with half of all households globally.

Almost 1 billion households in the world have Internet access, of which 230 million are in China, 60 million in India and 20 million in the world's 48 LDCs.



Mobile-broadband subscriptions



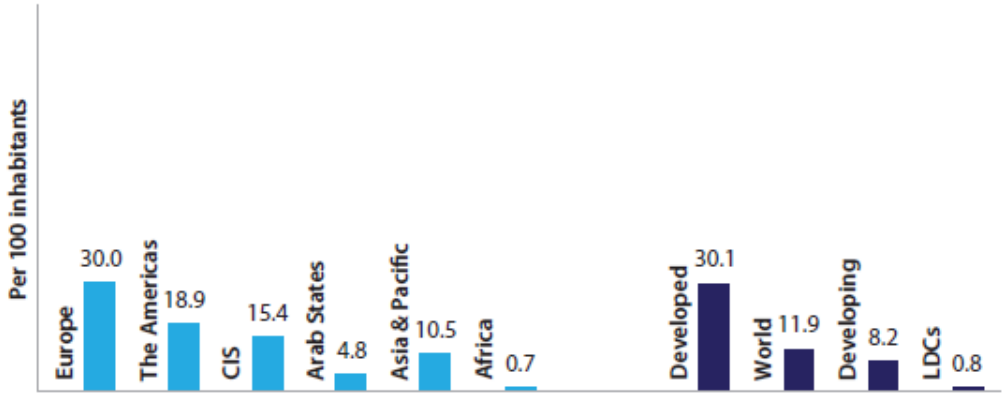
In developing countries, the number of mobile-broadband subscriptions continues to grow at double digit rates, reaching a penetration rate of close to 41%.

The total number of mobile-broadband subscriptions is expected to reach 3.6 billion by end 2016.

Fixed-broadband subscriptions

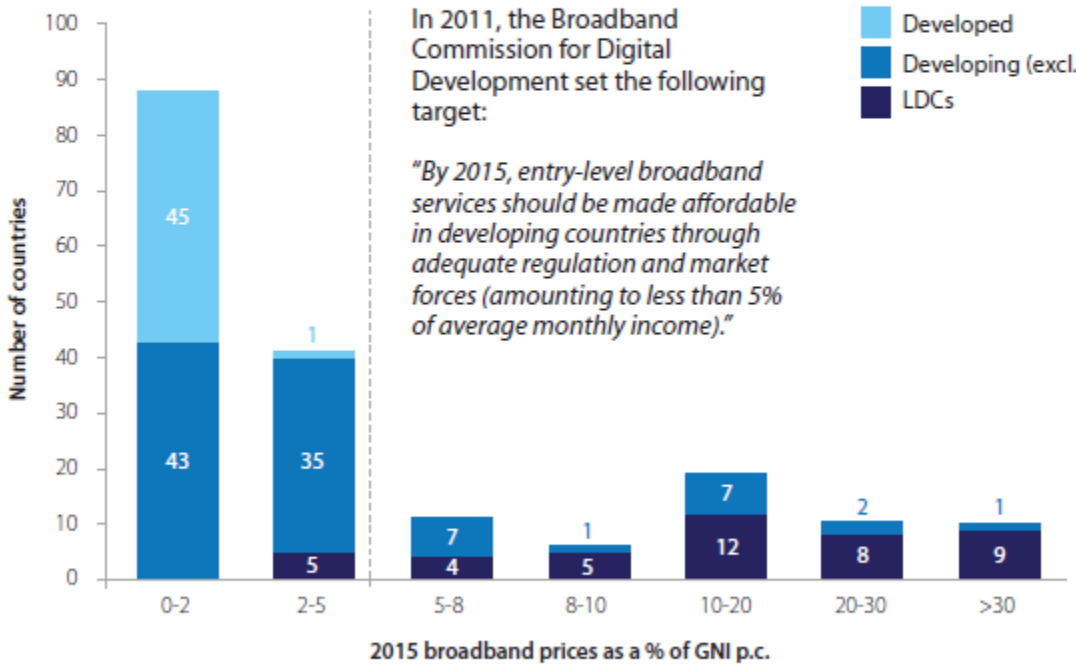
Fixed-broadband penetration remains at below 1% in Africa and the LDCs.

Strong growth in China is driving fixed broadband in Asia and the Pacific, where fixed-broadband penetration is expected to surpass 10% by end 2016.



ICT PRICES

By end 2015, 83 developing countries had achieved the Broadband Commission's affordability target



In 2011, the Broadband Commission for Digital Development set the following target:

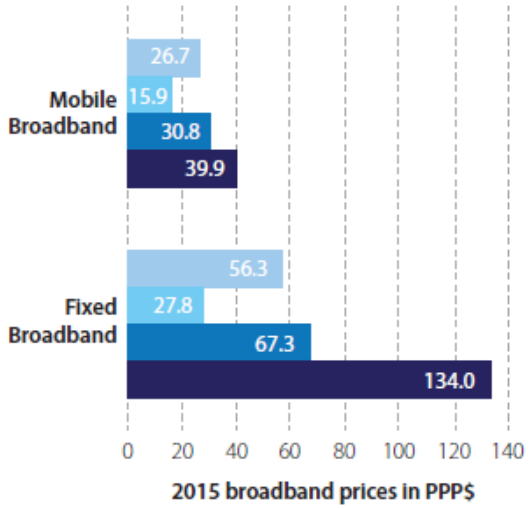
"By 2015, entry-level broadband services should be made affordable in developing countries through adequate regulation and market forces (amounting to less than 5% of average monthly income)."

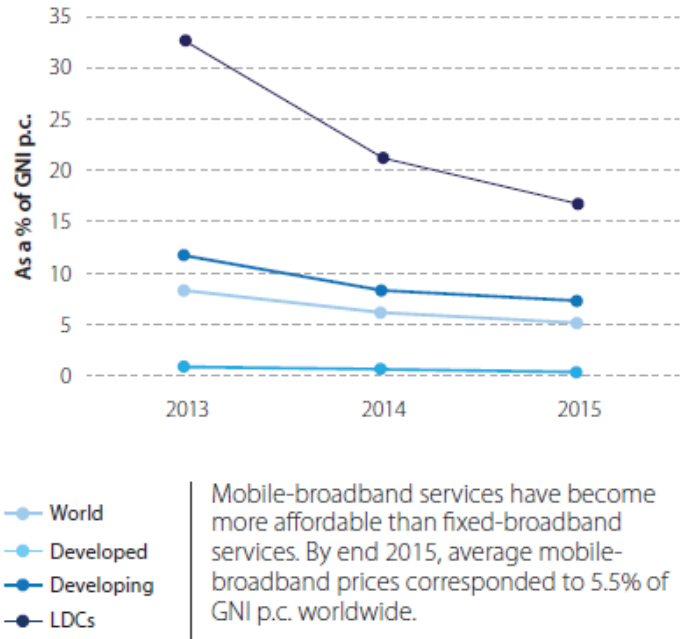
Developed
Developing (excl. LDCs)
LDCs

Five LDCs achieved the Broadband Commission target, but in the majority of the world's poorest countries broadband remains unaffordable.

Source: ITU. Note: Broadband prices refer to the most affordable service: either fixed or mobile broadband.

Fixed- and mobile-broadband prices, PPP$, 2015 (left) and price of 1GB computer-based mobile-broadband services as a percentage of GNI p.c. (right)





Source: ITU. Note: Based on simple averages including data for 159 economies (left) and 147 economies (right). Prices are based on 1GB cap.

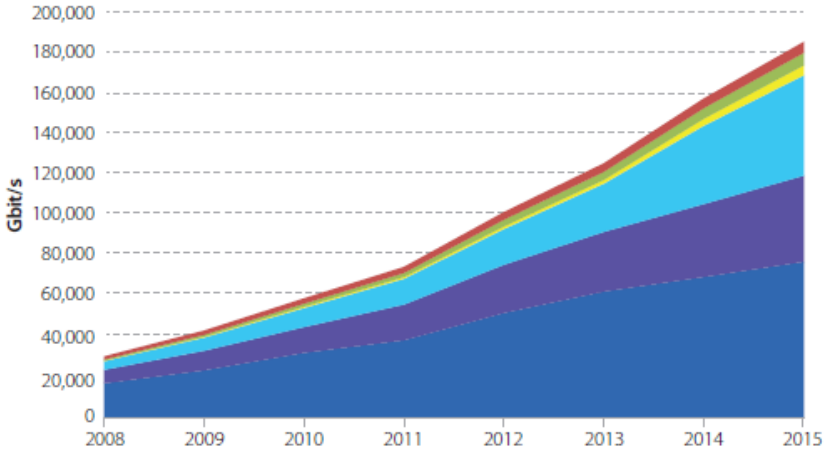
Mobile-broadband services have become more affordable than fixed-broadband services. By end 2015, average mobile-broadband prices corresponded to 5.5% of GNI p.c. worldwide.

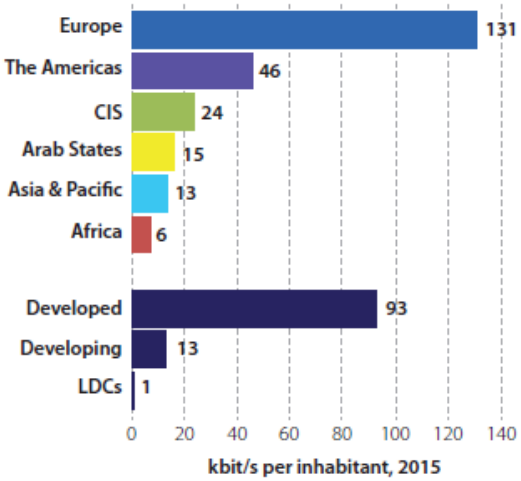
The average price of a basic fixed-broadband plan is more than twice as high as the average price of a comparable mobile-broadband plan.

In LDCs, fixed-broadband services are on average more than three times as expensive as mobile-broadband services.

M2M, IoT AND BANDWIDTH

Internet bandwidth remains unequally distributed across the world





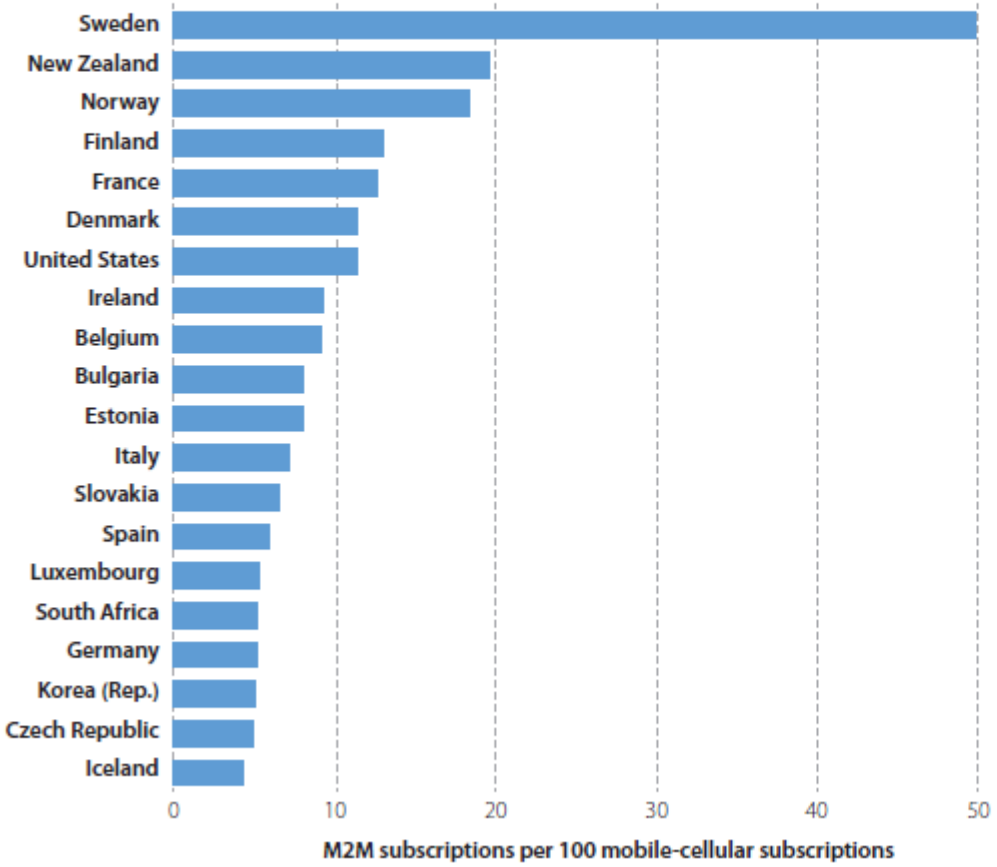
Source: ITU. CIS refers to: Commonwealth of Independent States.

By early 2016, total international Internet bandwidth had reached 185'000 Gbit/s, up from 30'000 in 2008.

Africa has the lowest international connectivity of all regions: there is twice as much bandwidth per inhabitant available in Asia and the Pacific, four times as much in the CIS region, eight times as much in the Americas and more than twenty times as much in Europe.

Lack of international connectivity is a major bottleneck in the Internet infrastructure of LDCs.

The Internet of Things (IoT) is in its early stages



Based on available data, there were 22 mobile-cellular subscriptions for each machine-to-machine (M2M) subscription worldwide at the beginning of 2015.

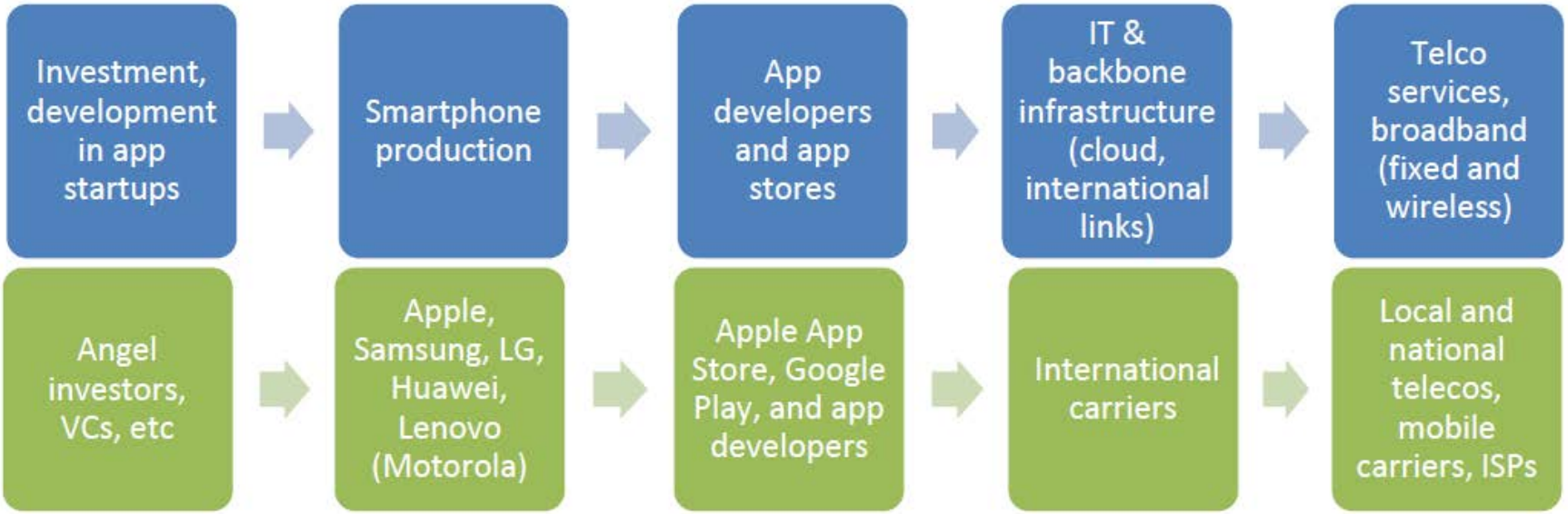
The countries with the highest M2M penetration rates are highly industrialized, advanced economies, including the Northern European countries of Sweden, Norway, Finland and Denmark.

Source: ITU. Note: Data refer to early 2015.

Some mobile business trends…

The App Economy (cont'd)

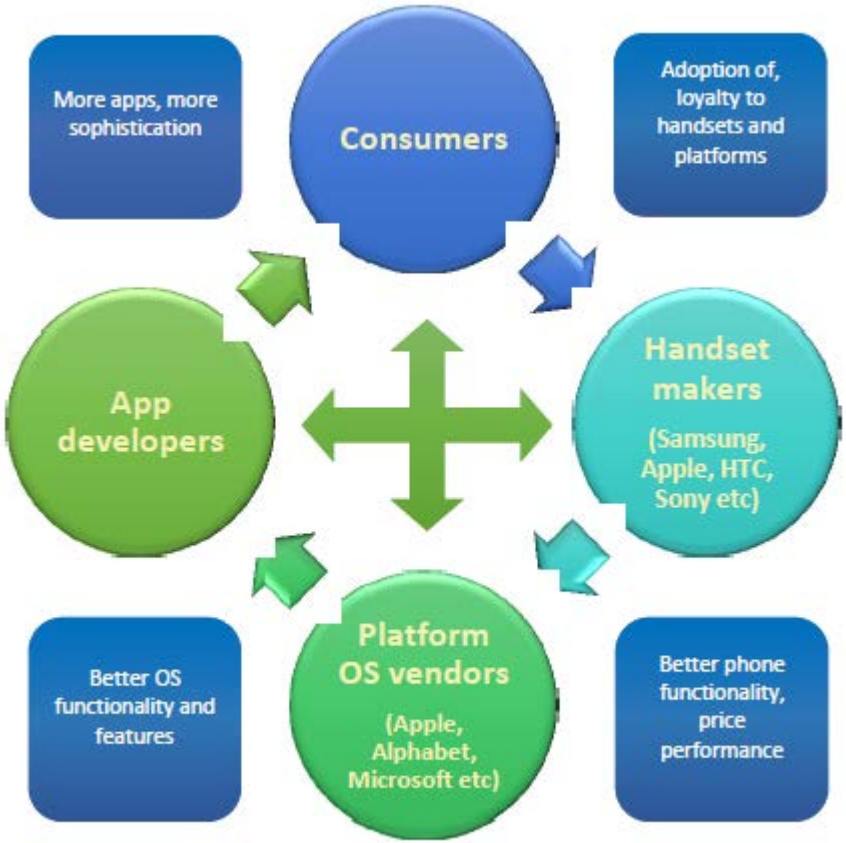
Figure 3: App economy value chain



Source: Systems Knowledge Concepts (www.skc.net.au)

•Source: ITU GSR discussion paper THE RACE FOR SCALE: MARKET POWER, REGULATION AND THE APP ECONOMY
Authors: Mr Simon Molloy of System Knowledge Concepts and Mr Scott W. Minehane of Windsor Place Consulting, with significant inputs from Mr Barry Burgan, Associate Dean of Bond Business School, Bond University, Gold Coast, Australia
The full paper can be downloaded http://www.itu.int/en/ITU-D/Conferences/GSR/Pages/GSR2016/Papers.aspx

Figure 4: The 'virtuous cycle' of the app economy ecosystem



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The App Economy

Source: www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/ (accessed 26/12/15)

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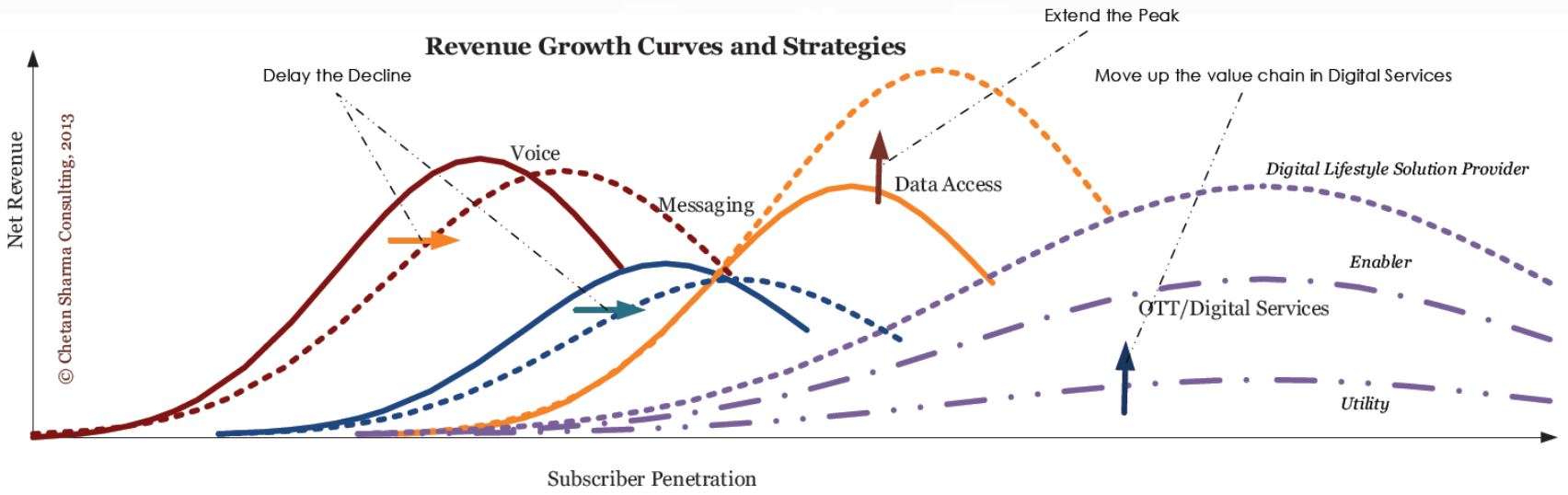
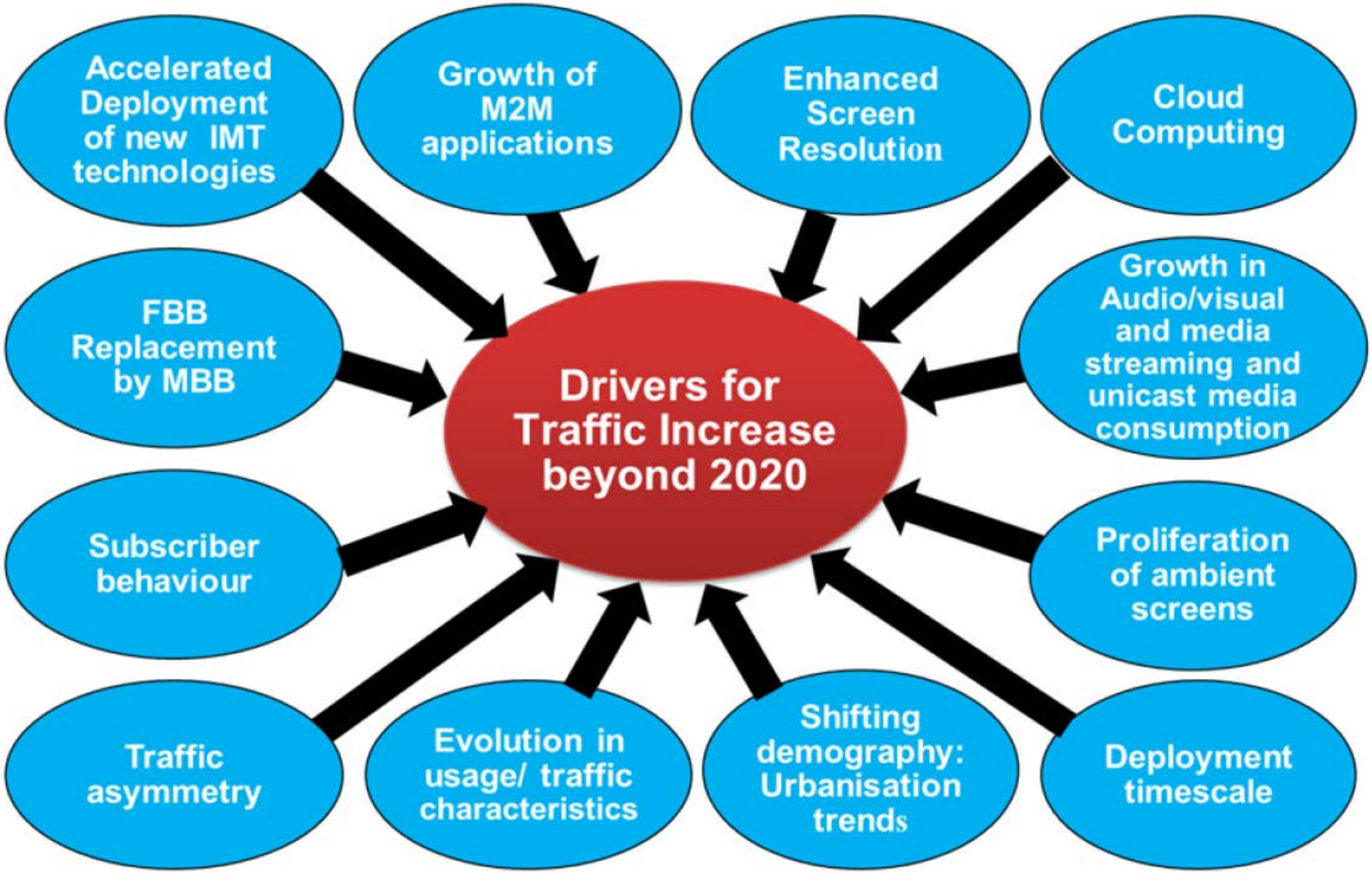
The 4th Wave

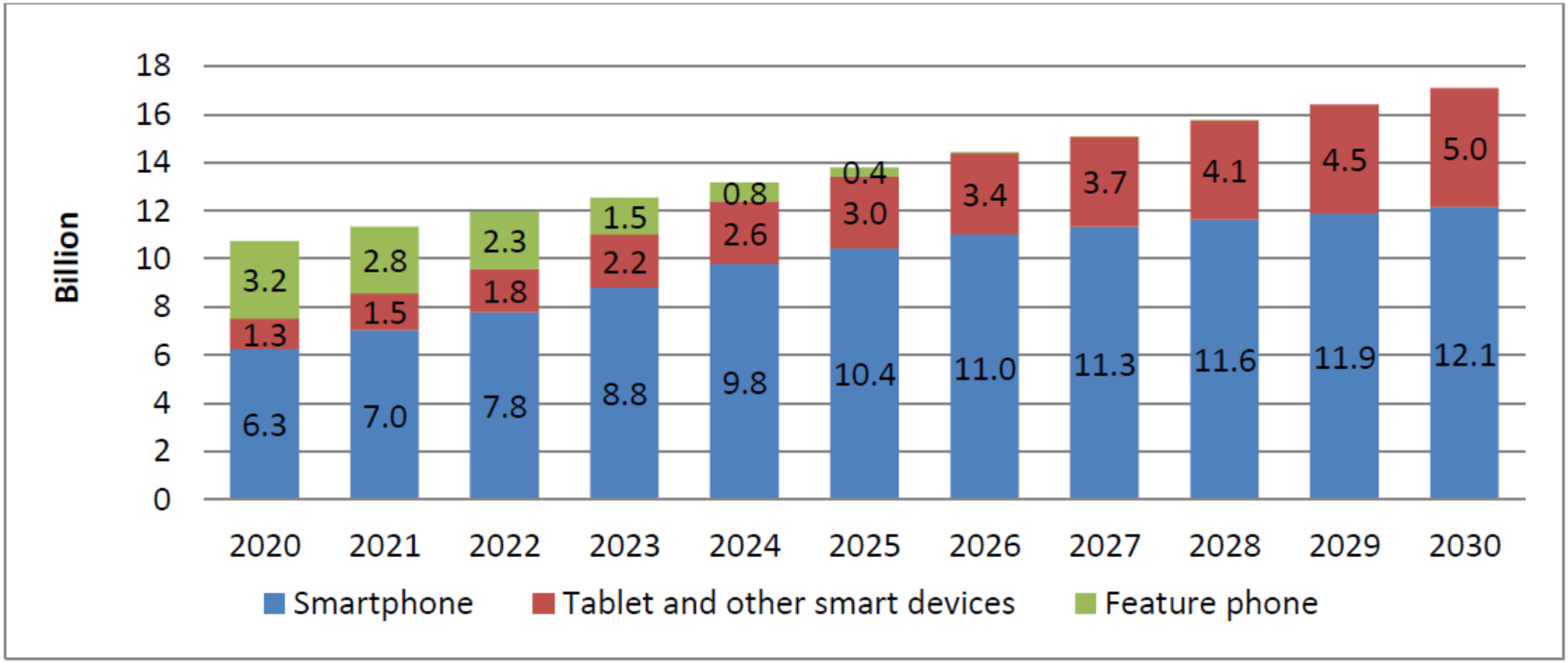


Mobile technology trends…



Source: ITU-R M.2370 (07/15)

Estimation (1) of mobile subscription



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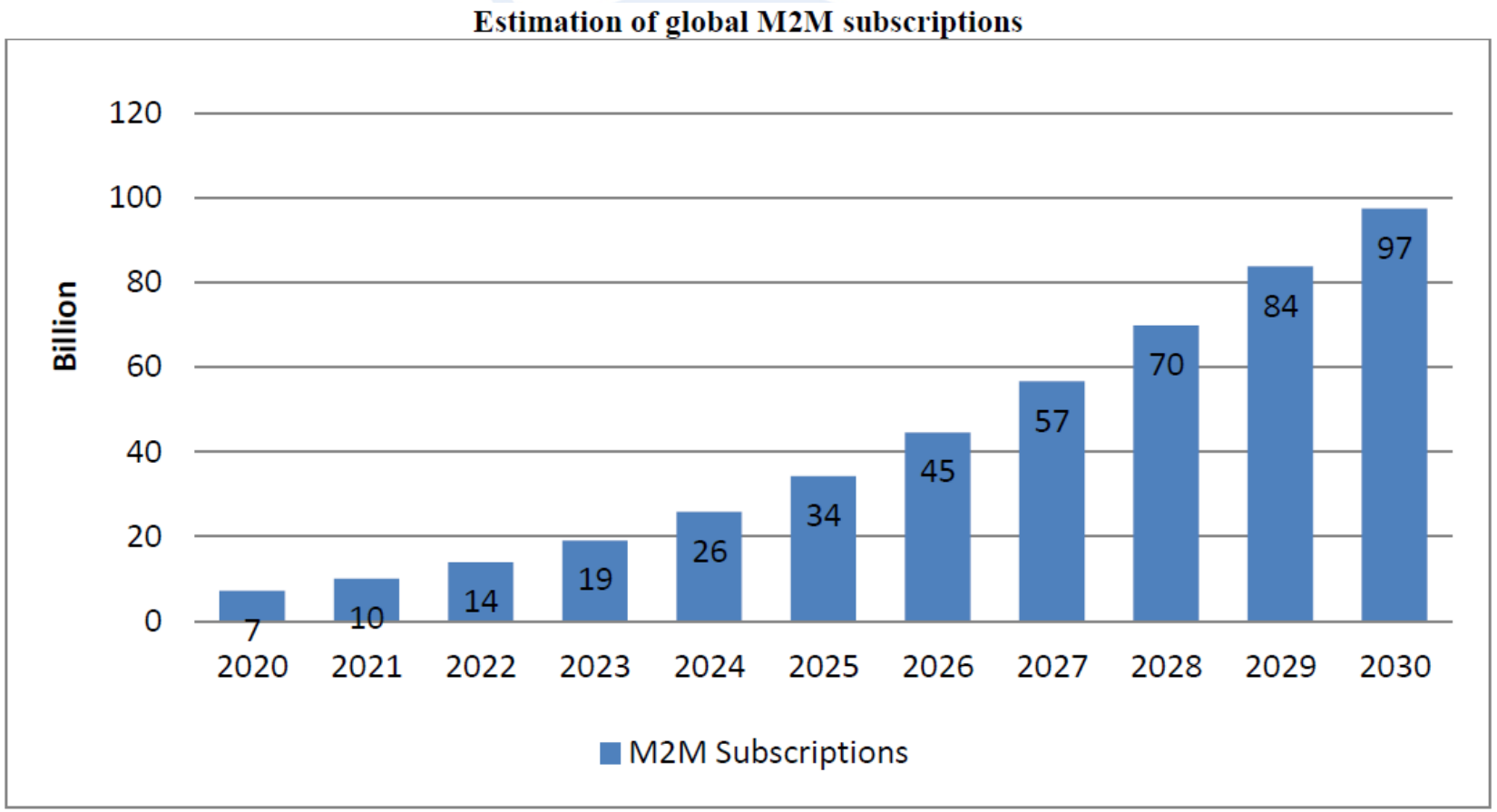
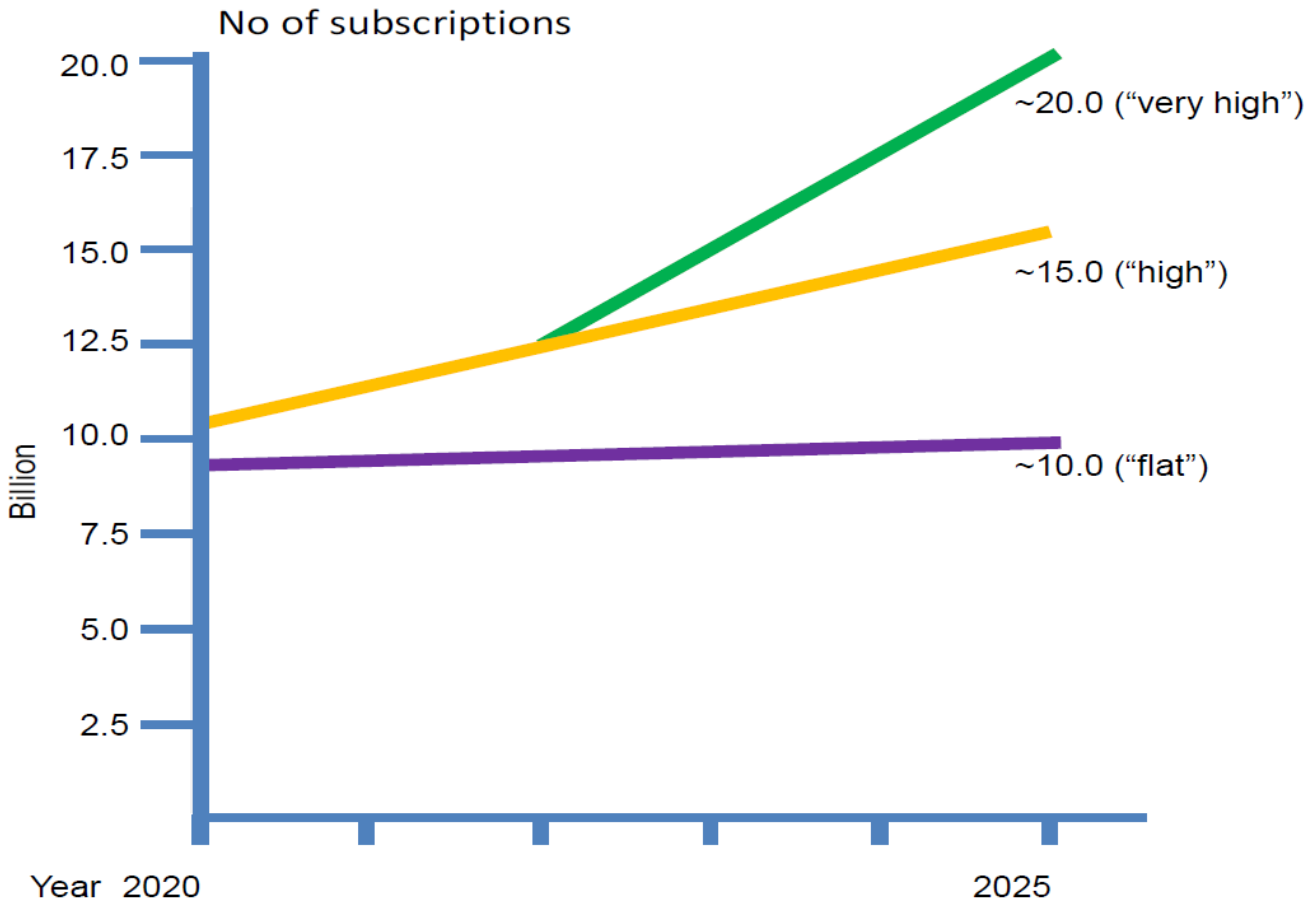


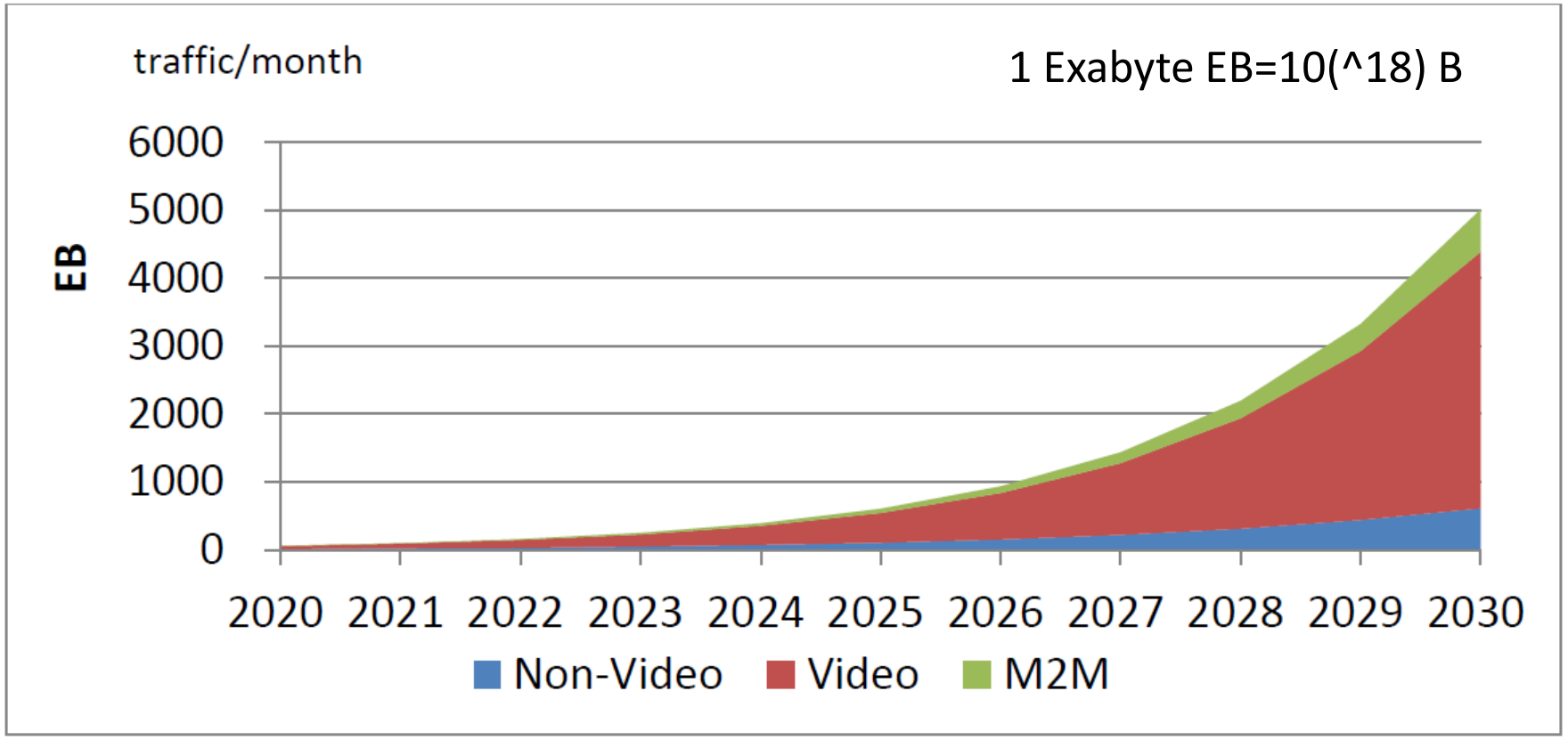
Source: ITU-R M.2370 (07/15)

Estimation (2) of mobile subscription



Source: ITU-R M.2370 (07/15)

Estimation of mobile traffic by different service types globally

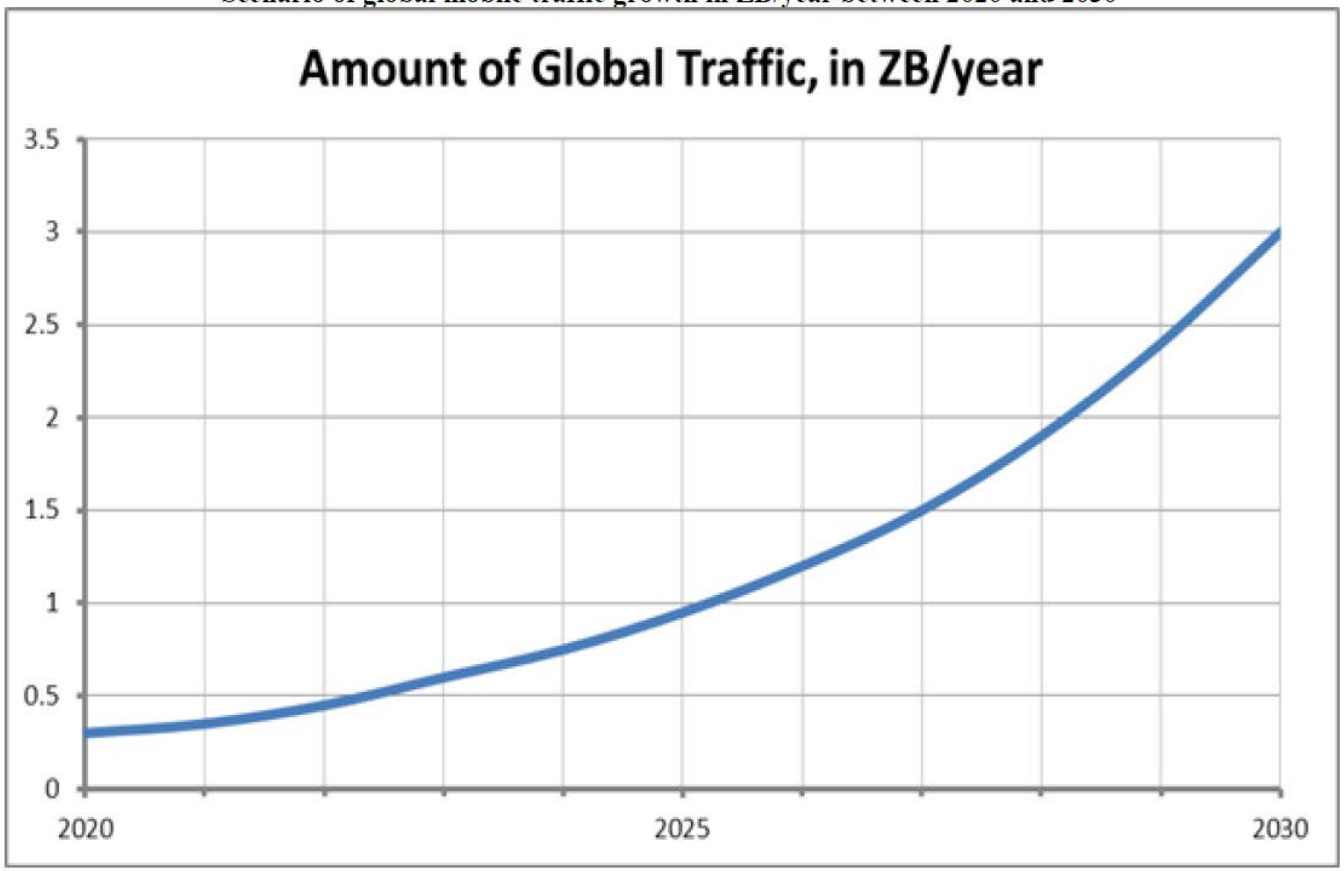


Source: ITU-R M.2370 (07/15)

Estimate 2

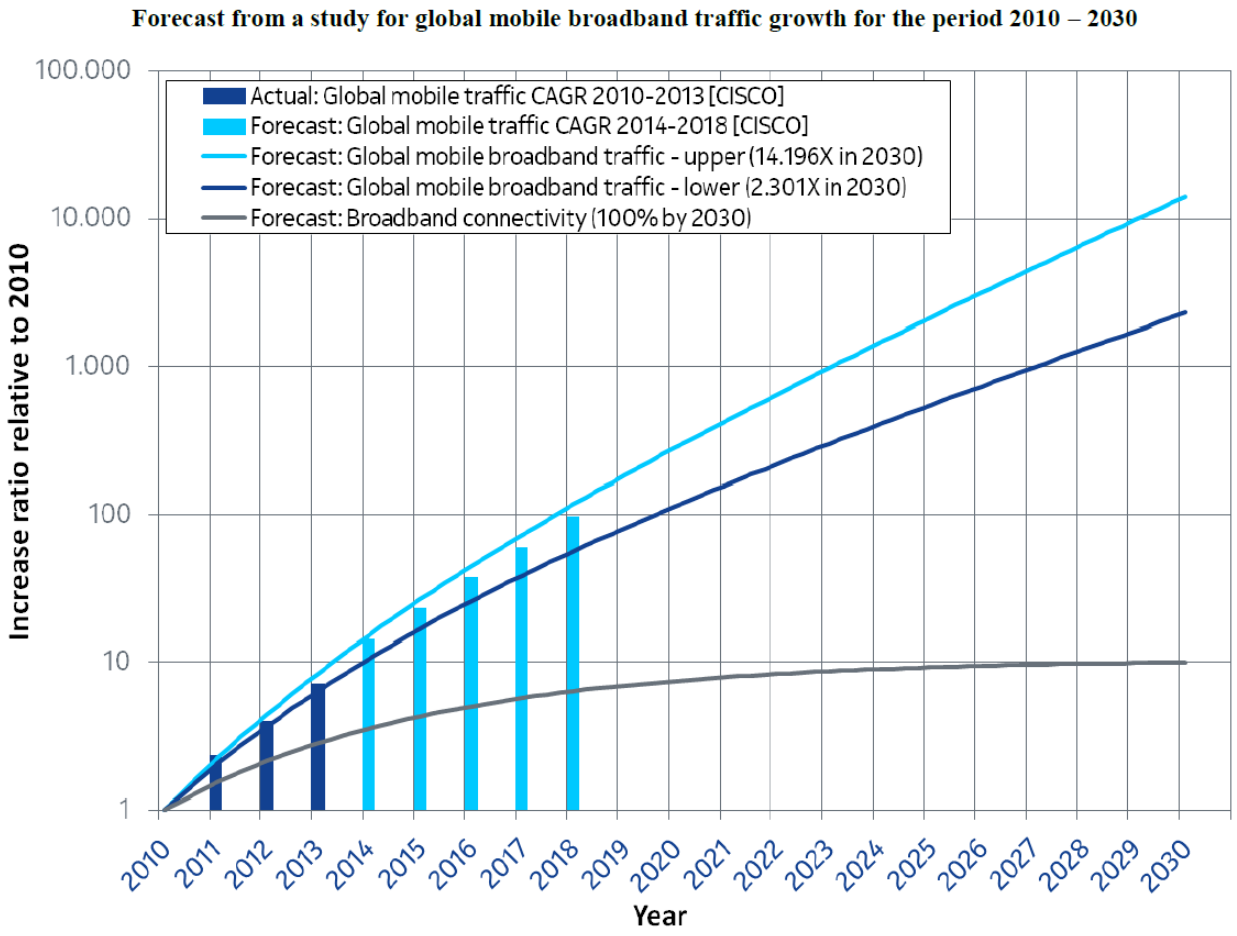
1 Zetabyte =10(^21) B

Scenario of global mobile traffic growth in ZB/year between 2020 and 2030



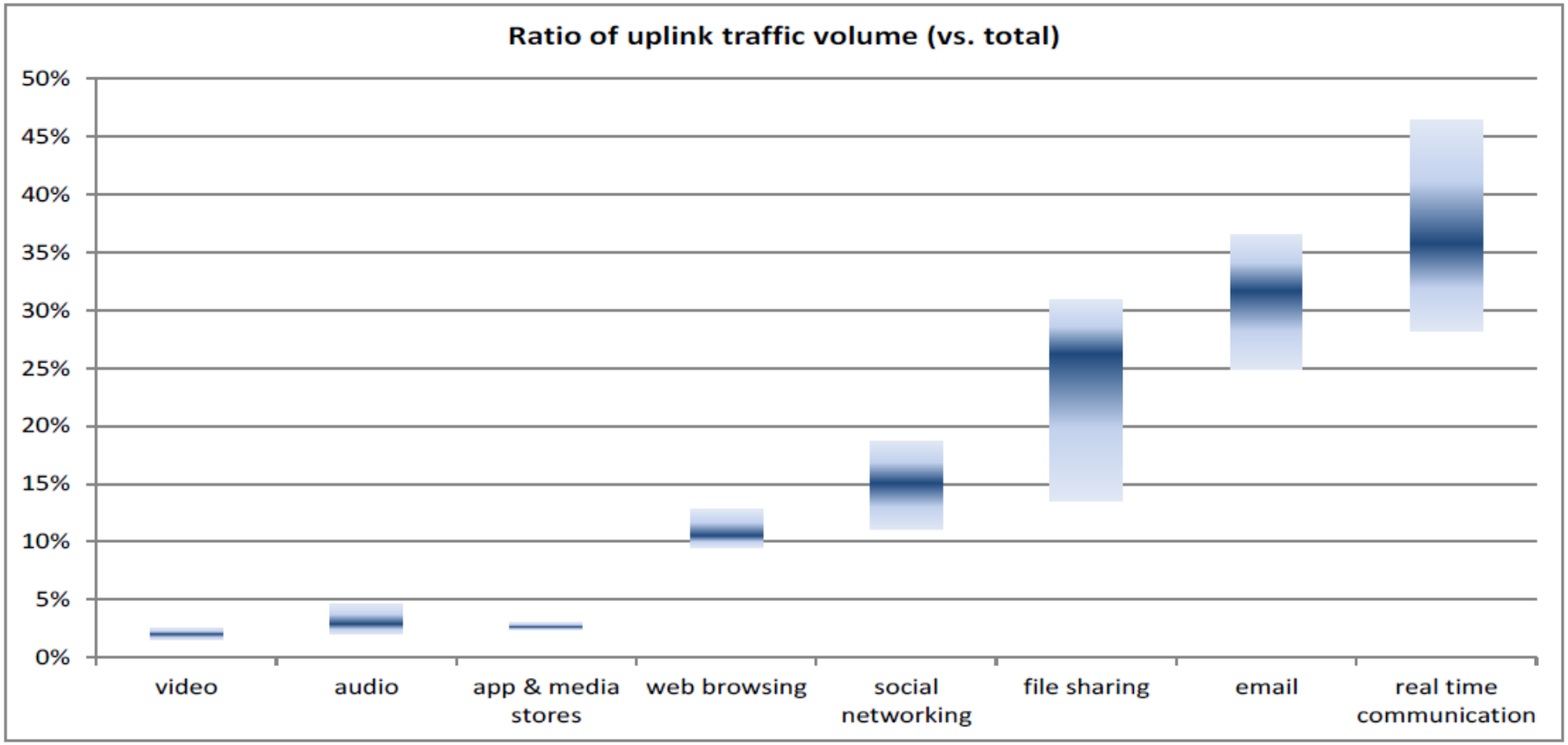
Source: ITU-R M.2370 (07/15)

Estimate 3



Source: ITU-R M.2370 (07/15)

Traffic assymetry



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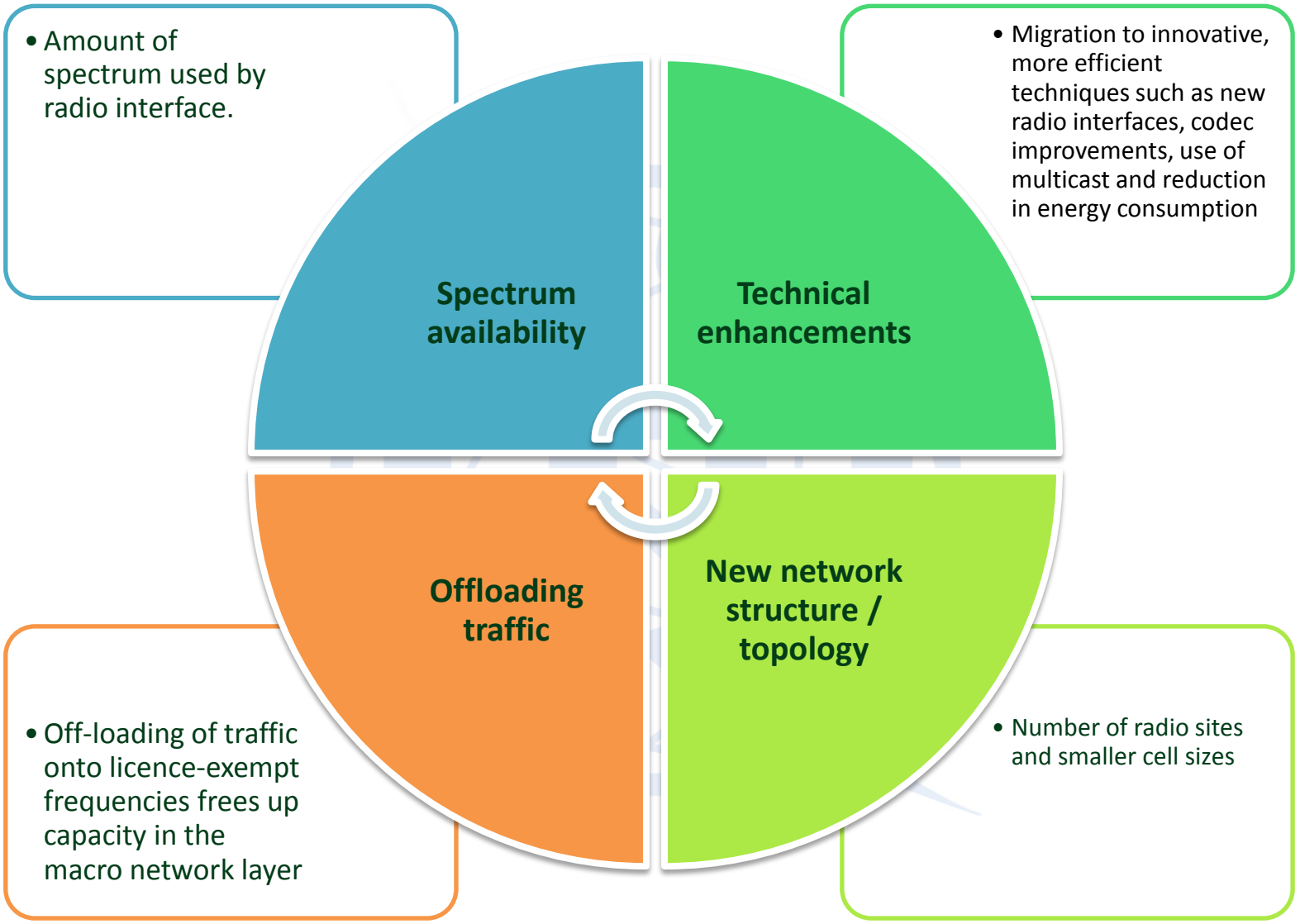


Source: ITU-R M.2370 (07/15)

Estimates of terrestrial spectrum requirement for IMT

RATG definitions

RATG 1: Pre-IMT, IMT-2000 and its enhancements	RATG 2: IMT-Advanced (new mobile access and new nomadic/ local area access)	RATG 3: Existing radio LANs and their enhancements	RATG 4: Digital mobile broadcasting systems and their enhancements

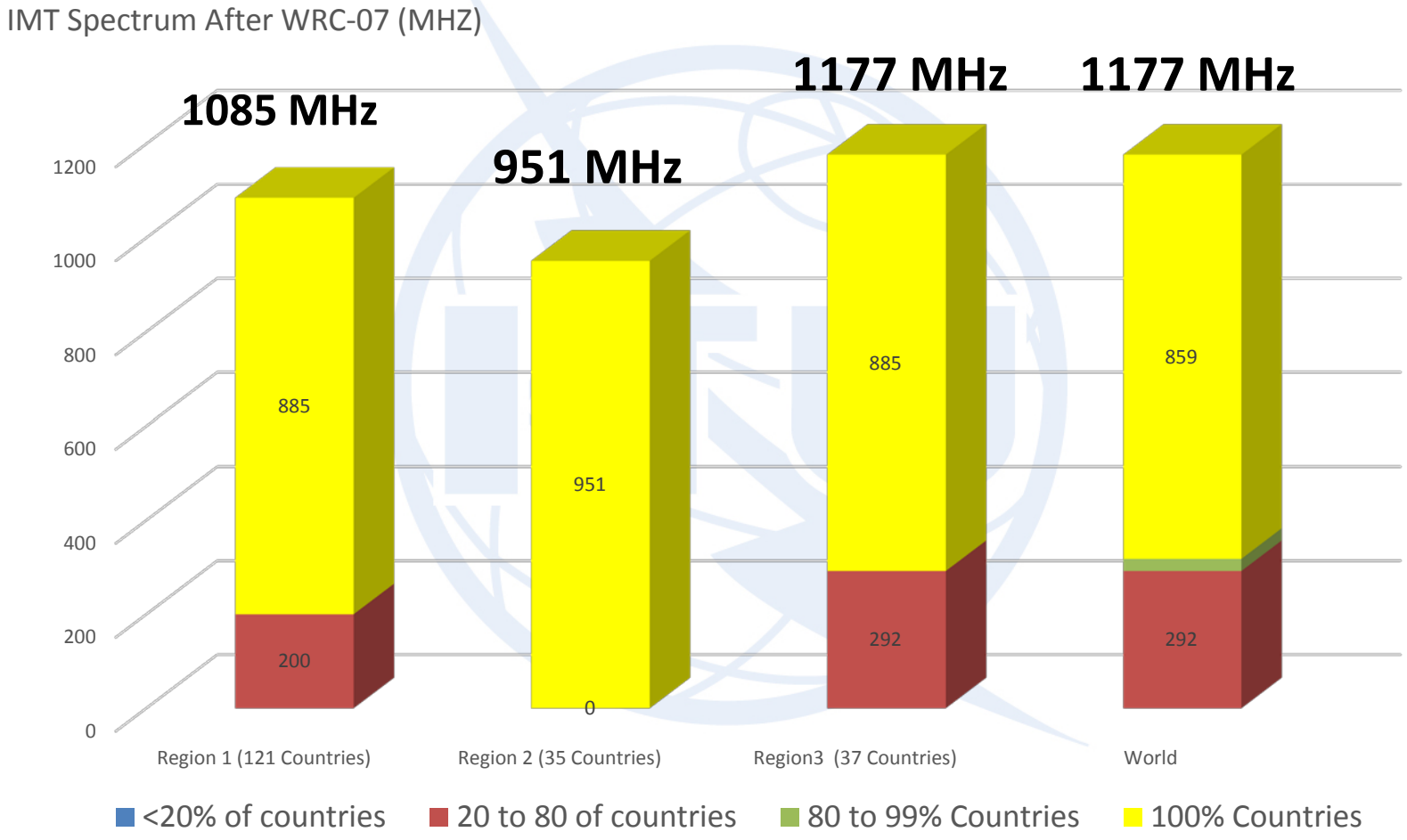
Total spectrum requirements for both RATG 1 and RATG 2 in the year 2020

	Total spectrum requirements for RATG 1	Total spectrum requirements for RATG 2	Total spectrum requirements RATGs 1 and 2
Lower user density settings	440 MHz	900 MHz	1 340 MHz
Higher user density settings	540 MHz	1 420 MHz	1 960 MHz

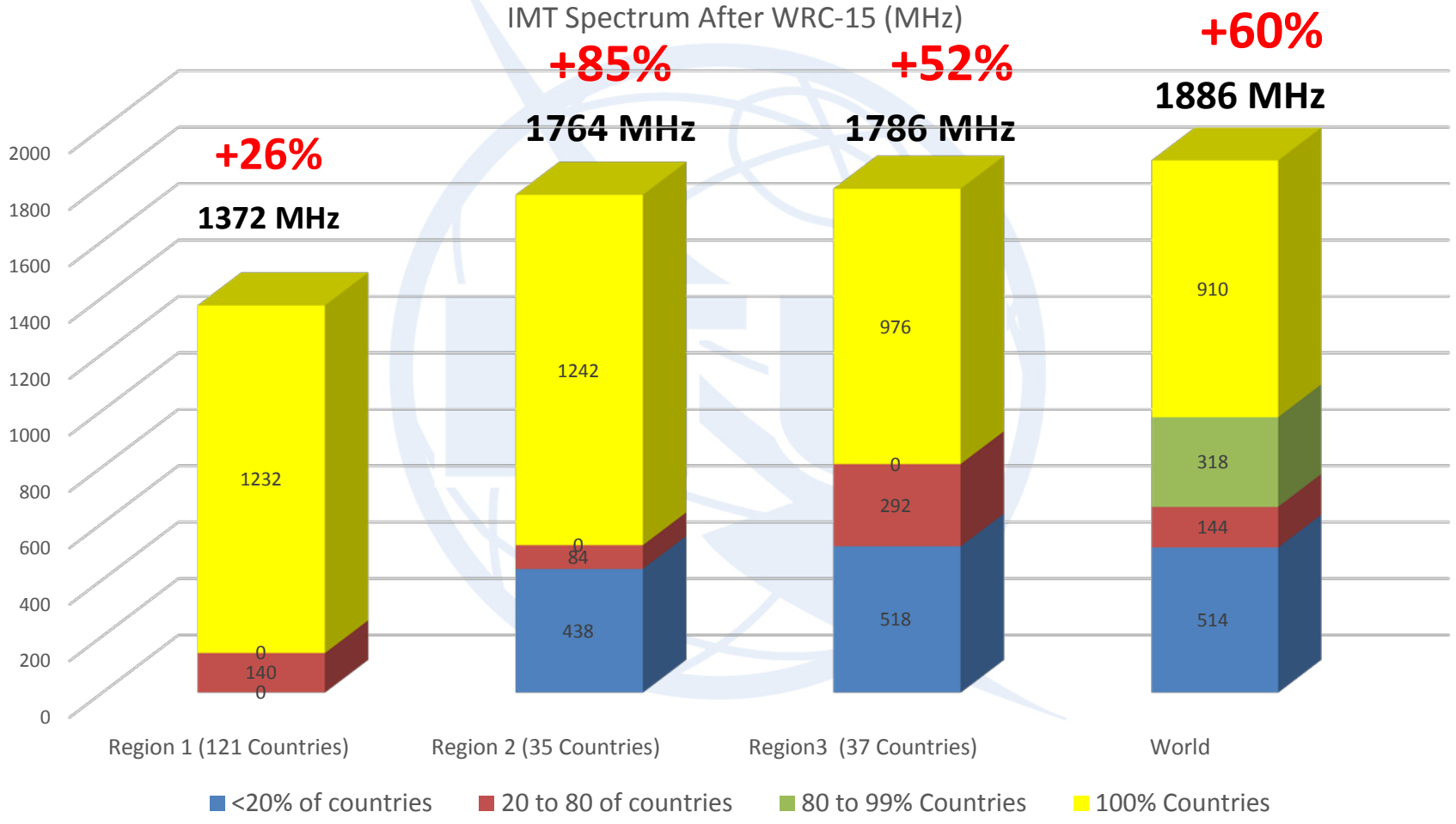
RATG 1 (i.e. pre-IMT, IMT-2000, and its enhancements) and
RATG 2 (i.e. IMT-Advanced) for the year 2020

Source: ITU-R M.2290 (12/2013)

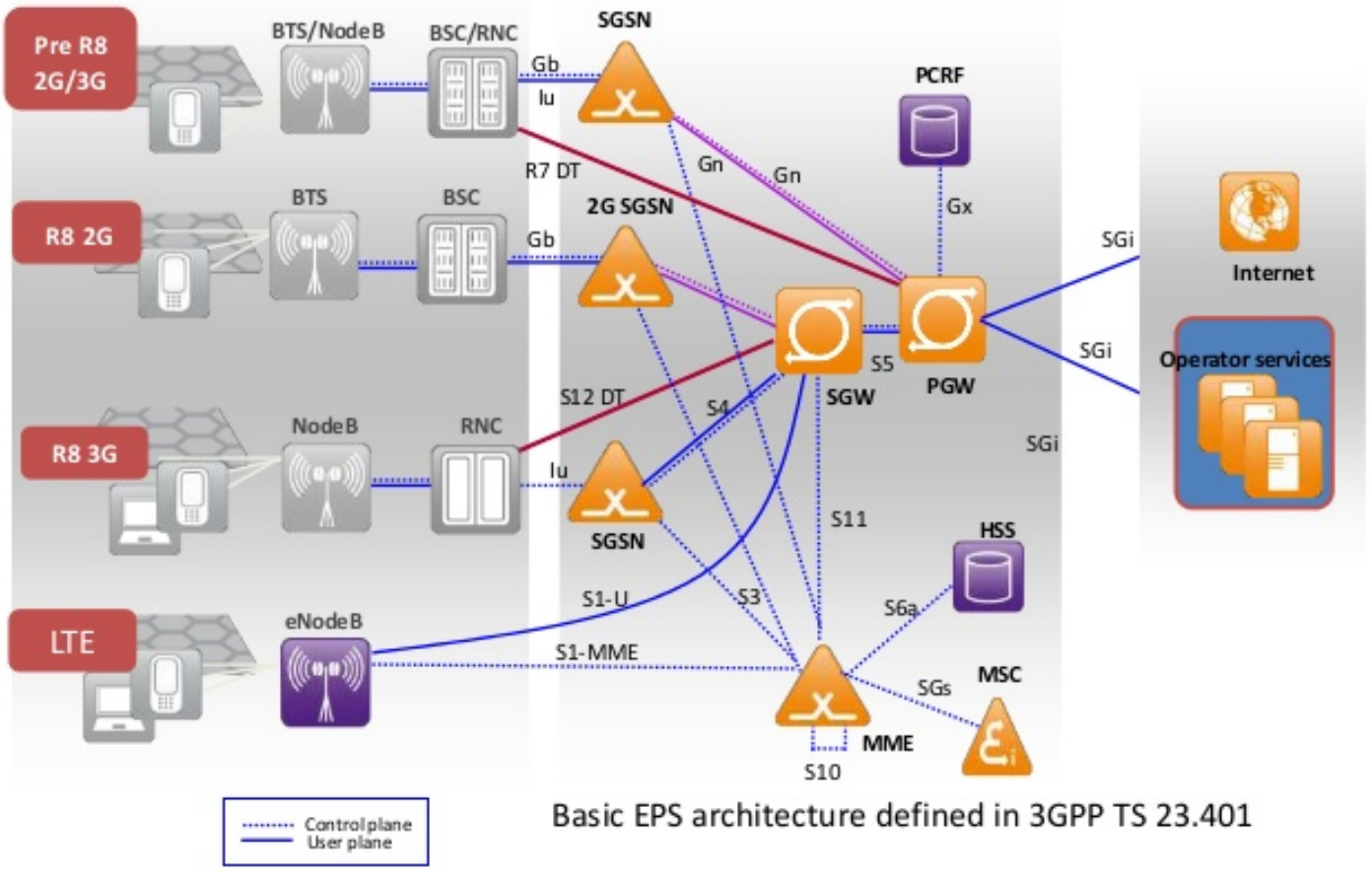
IMT Spectrum after WRC-07



IMT Bands after WRC-15



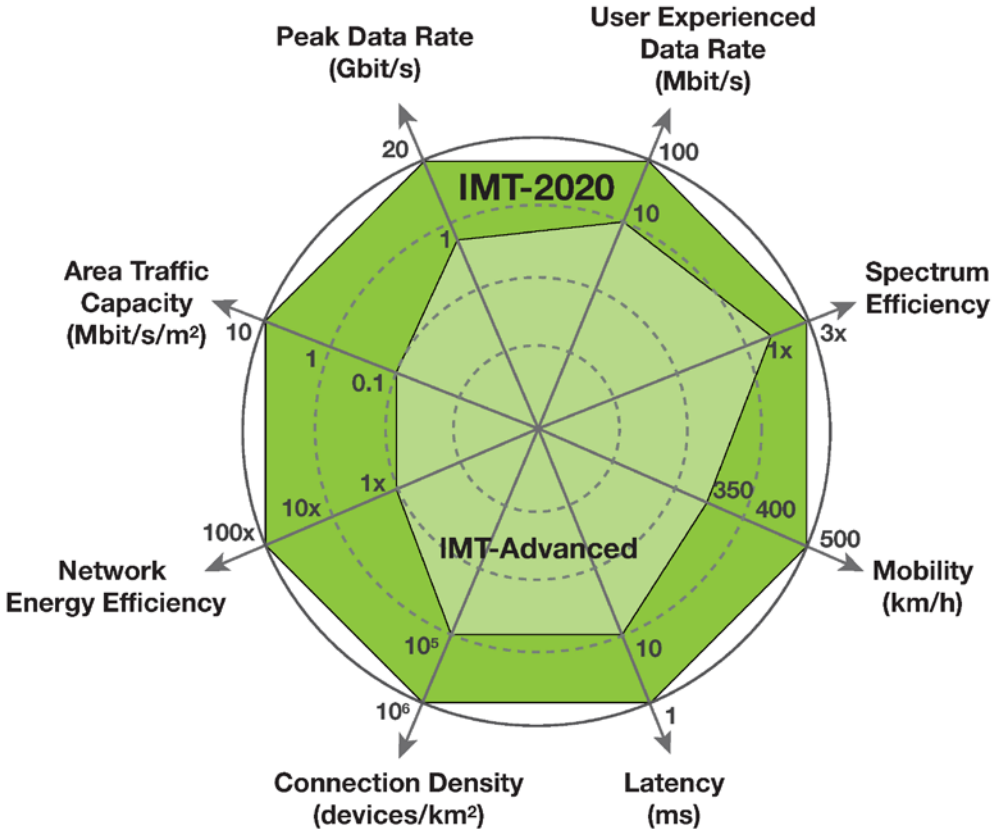
General LTE Architecture



Basic EPS architecture defined in 3GPP TS 23.401

Source: http://www.slideshare.net/yusufd/introduction-to-mobile-core-network-17667704

Future Mobile Generation:
Enhancement of key capabilities from IMT-Advanced to IMT-2020



Source: ITU-R Recommendation M.2083-0 (09/2015)

Converged ICT Networks

A multi-tier SSC (smart sustainable city) ICT architecture from communication view (physical perspective)

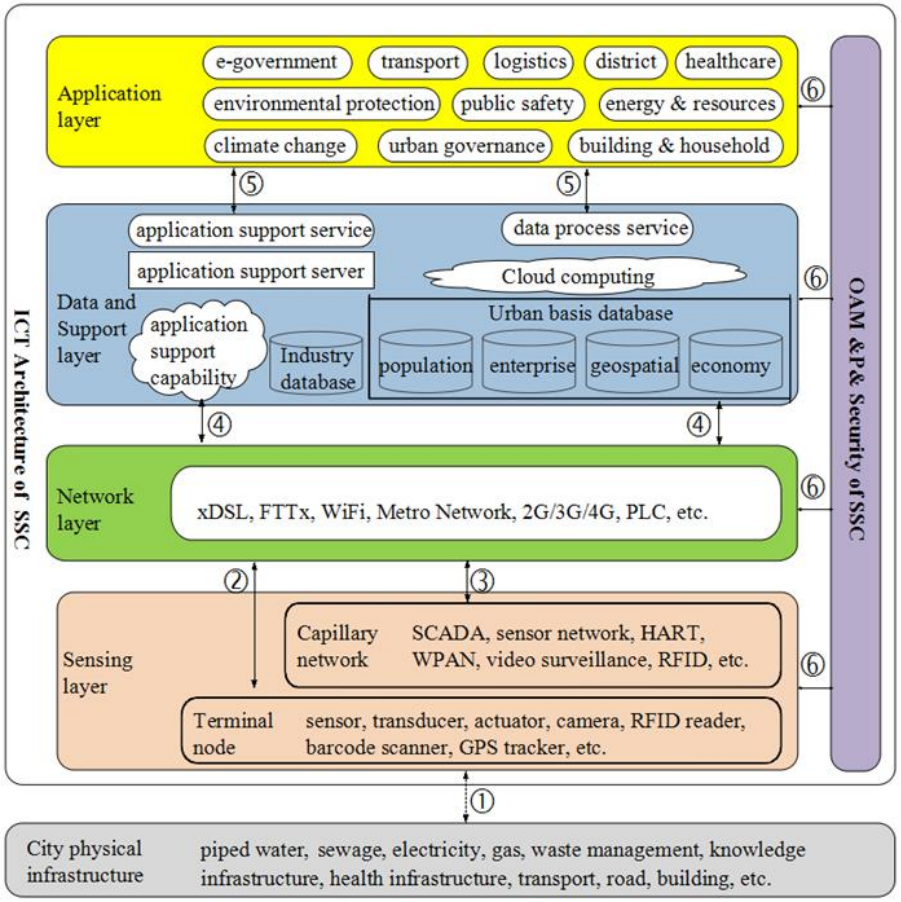
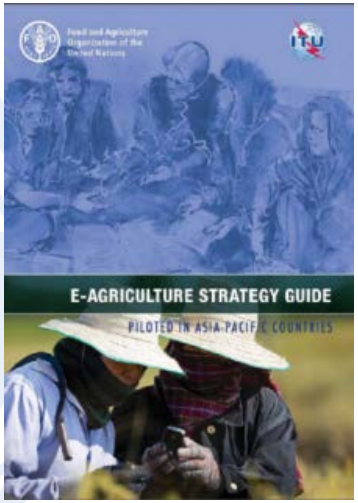


Figure source: ITU-T Focus Group on Smart Sustainable Cities: *Overview of smart sustainable cities infrastructure*

Telecom/ ICT Sector Issues (examples)

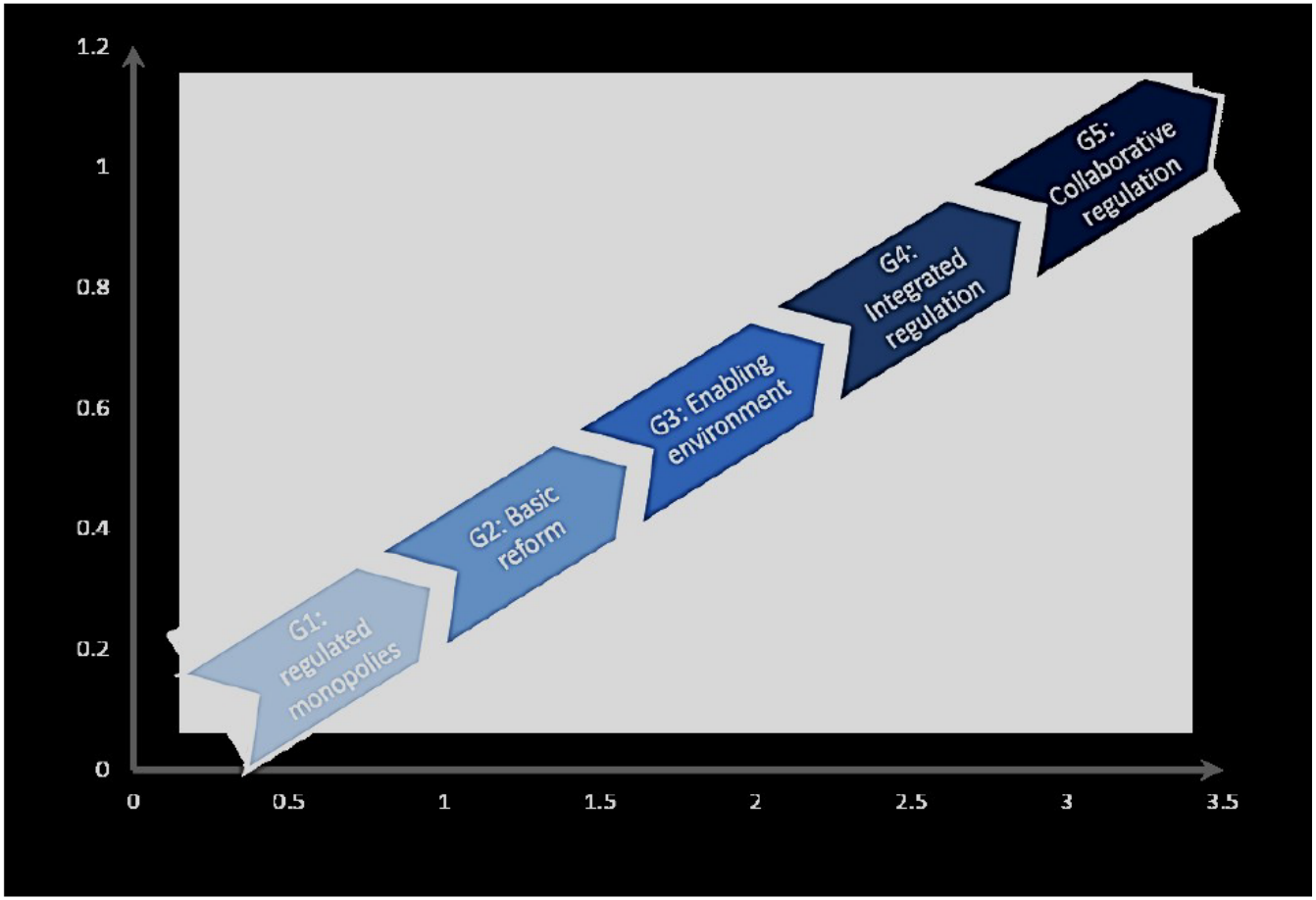
- Cross-Sector Collaboration
- Competition
- Investment
- Licensing
- Spectrum
- HetNets
- Broadband
- Cloud
- IoT / M2M
- Interoperability
- QoS/QoE
- Numbering & Addressing
- Big Data & Open Data
- Security
- Privacy
- Right of Way
- Infrastructure Sharing
- Green ICTs
- Data Centres
- e-Waste
- Emergency Telecommunications

Cross-Sector e-strategies: Examples of ITU experiences



Implementing e-strategies requires some common requirements e.g. Cloud, Security, Privacy, Sensors, Big Data Analysis, Interoperability, Open Data, Applications Development, Digital Literacy etc.

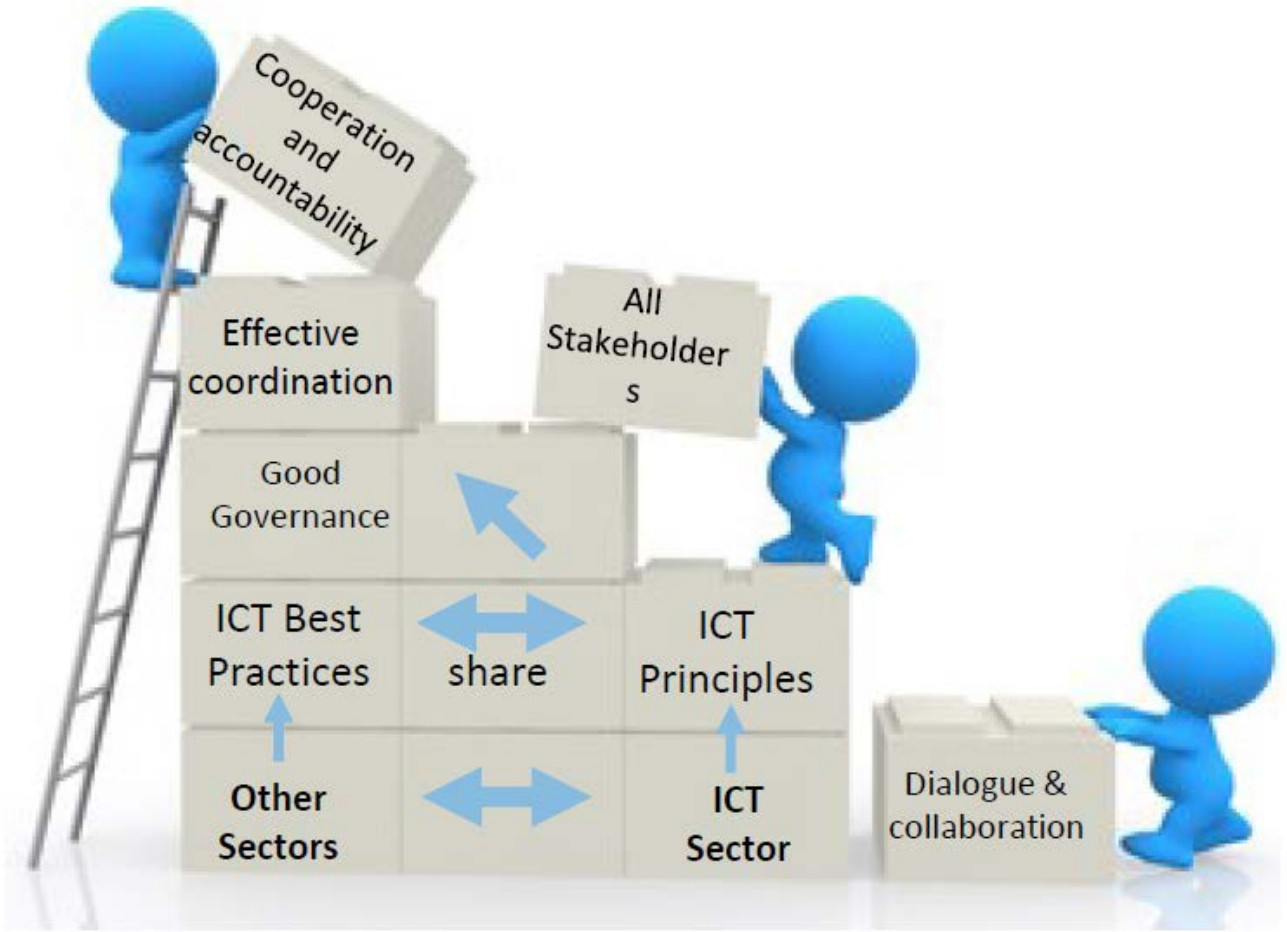
Evolution of ICT Regulation



Source: ITU

Draft GSR Discussion Paper: Building Blocks for Smart Societies in a Connected World: A Regulatory Perspective on Fifth Generation Collaborative Regulation, Sofie Maddens, ITU

Building Blocks for Collaborative Regulation



Source: ITU

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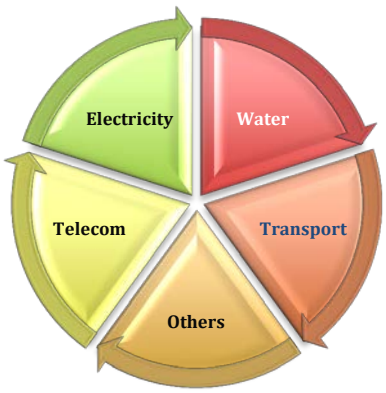
REGULATORY COLLABORATION
Examples



MULTI UTILITY REGULATOR

ITU : I Thank U