FUTURE MOBILE SPECTRUM PLANNING

Creating a sustainable future for mobile broadband

Peng Zhao, Senior Policy Manager,

Government & Regulatory Affairs, GSMA

March 2015

AGENDA

Mobile broadband trends

Keeping up with data demand growth

Future mobile spectrum





© GSMA 2015

ABOUT THE GSMA

WE ARE THE GLOBAL INDUSTRY VOICE SHAPING THE FUTURE OF MOBILE

INDUSTRY FORUM

Enabling industry collaboration and consensus

POLICY ADVOCATE

Promoting policies that foster growth and investment

MARKET THINK TANK

Delivering insight and analysis from global industry data

BUSINESS CATALYST

Serving the global mobile ecosystem through events such as Mobile World Congress

© GSMA 2015

GSMA BY THE NUMBERS

MEMBERSHIP

800
mobile operators in over 220 countries

230 associate members

MOBILE REACH

6.6 billion
mobile connections

3.2 billion
individual subscribers

PRESENCE

Offices in
9 countries
serving every region

Staff based in
26 countries
representing
36 nationalities

© GSMA 2015

MOBILE BROADBAND TRENDS



A MOBILE BROADBAND REVOLUTION

Smartphones Installed Base

237m
2008

1,457m
2013

2,890m
2017

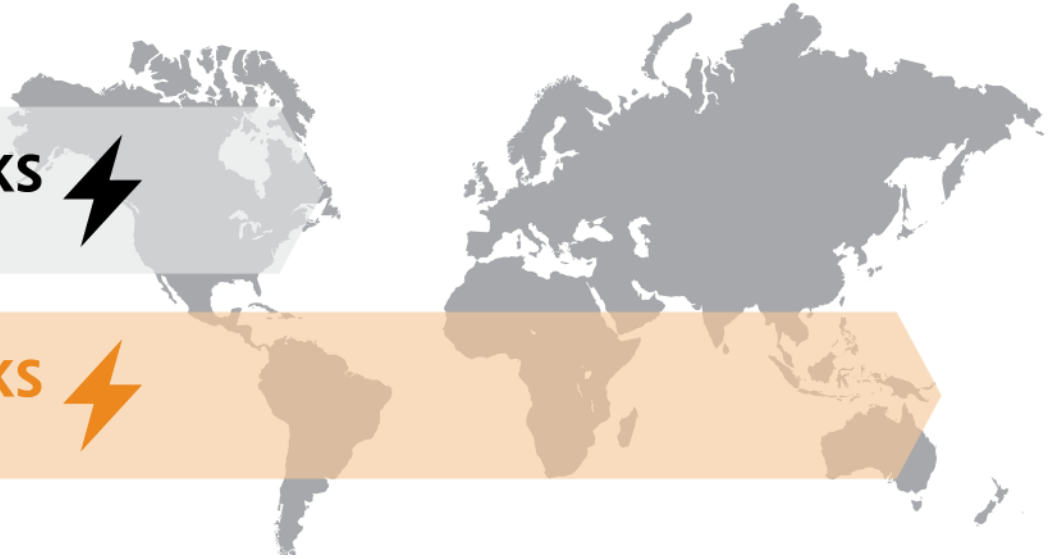
Global Connection Speed

2010 189kbps

2017 3898kbps

54% CAGR

LTE Networks



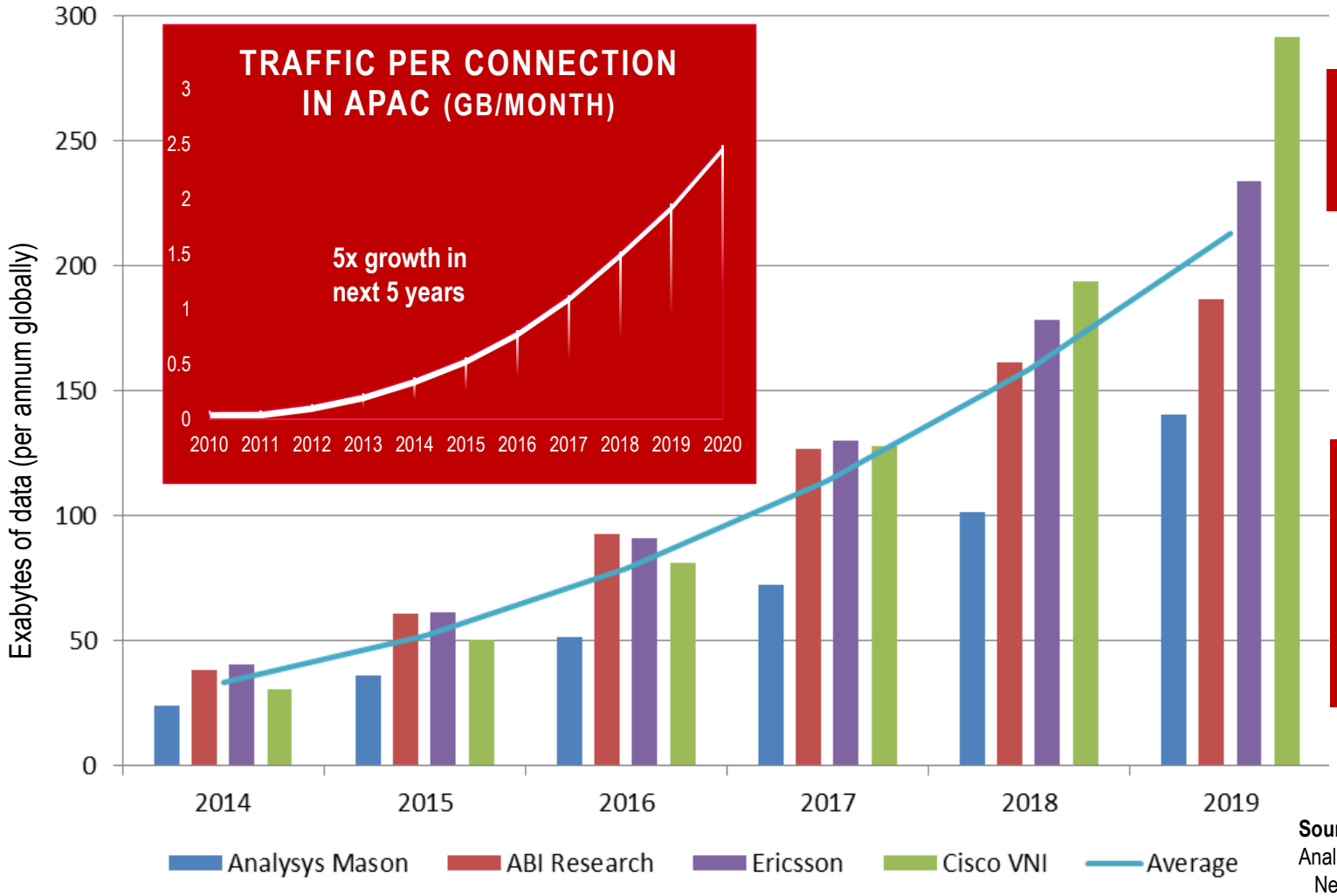
2013 256 Networks
In 97 Countries

2017 500 Networks
In 128 Countries

SOURCE: MOBILE ECONOMY, GSMA 2014

© GSMA 2015

GLOBAL DATA TRAFFIC FORECAST



TOTAL TRAFFIC IN 2019 ABOUT 100X HIGHER THAN 2010

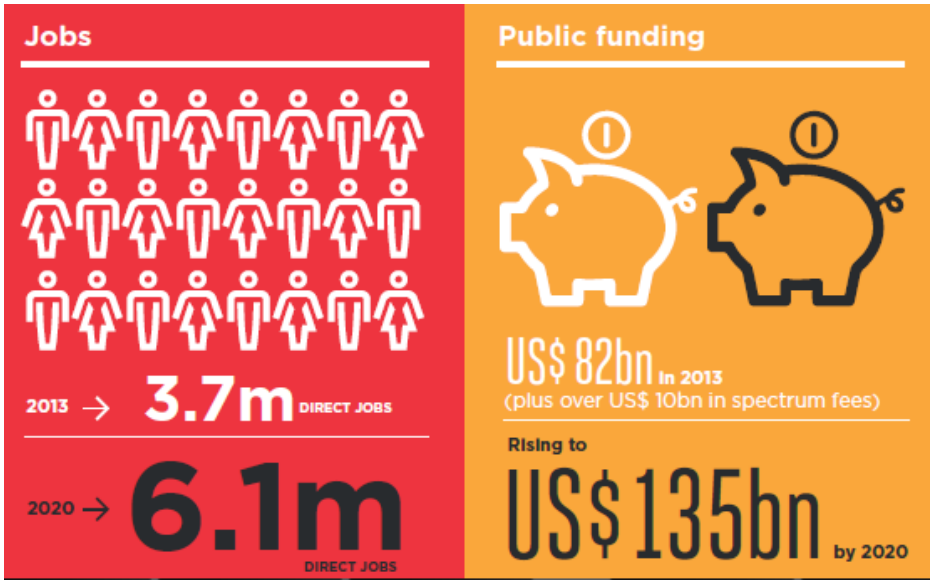
PREDICTIONS MAY BE UNDERSTATED
ANALYSYS MASON & ABI FORECASTS FOR 2019 JUST INCREASED 30%

Sources
Analysys Mason, Global Mobile Network Traffic, Oct 2014
ABI Research, Mobile Data Traffic & Usage, Oct 2014
Cisco VNI Mobile Forecast, Jan 2015
Ericsson Mobility Report, Feb 2015

© GSMA 2015

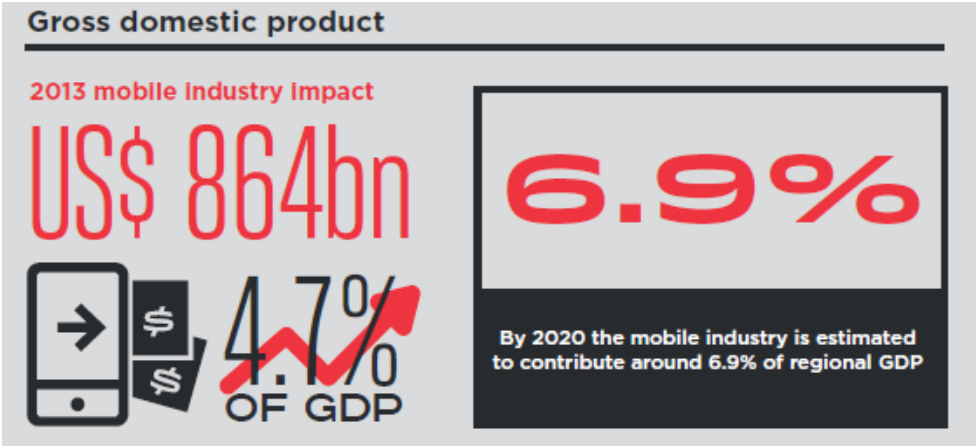
WHAT IS AT STAKE?

GROWING MOBILE ECONOMIC IMPACT IN APAC



APAC has very high data demand due to large, densely populated cities

Most telecom equipment and devices are made in Asia Pacific - so worst affected if any slowdown



© GSMA 2015

KEEPING UP WITH DATA DEMAND GROWTH



HOW CAN THIS DATA BE SUPPORTED?

THERE ARE 4 MAIN WAYS MOBILE NETWORKS CAN SUPPORT RISING DATA

- **Increasingly spectrum efficient technologies** (e.g. HSPA+, LTE, LTE-A etc)
  - Operators actively upgrade technologies but needs to follow standards evolution and device availability for the market.
- **Denser networks** (e.g. more cell sites inc. small cells)
  - This drives up CAPEX and OPEX for equipment, backhaul, leasing sites, power etc
- **Wi-Fi offload** (i.e. shifting data on to Wi-Fi networks as much as possible)
  - Many operators have Wi-Fi hotspots but there are backhaul and network management challenges
  - No QoS, WiFi is best effort.
- **Licensing more mobile spectrum**
  - The most cost-effective capacity enhancing method so keeps consumer prices down

© GSMA 2015

MORE DATA = MORE SPECTRUM

KNOW YOUR NATIONAL MOBILE SPECTRUM REQUIREMENTS FOR 2020?

- **The ITU predicts that on average a total of 1340–1960MHz will be required for mobile services worldwide by 2020.**
- **GSMA research shows a further 600-800MHz should be made available by 2020**
  - This accounts for the use of other capacity enhancing methods
- **This needs to be identified at WRC-15 to meet data demand in 2020-2025**
  - Can take around a decade to ready new mobile allocations for licensing then launch services
  - Existing identified mobile spectrum will be essential to support data rises for the next 5-10 years

WITHOUT ADDITIONAL SPECTRUM MOBILE NETWORKS WILL STRUGGLE TO MEET GROWING DATA DEMANDS RESULTING IN SLOWER SPEEDS, HIGHER PRICES AND THE SOCIOECONOMIC BENEFITS OF MOBILE WILL BE LIMITED

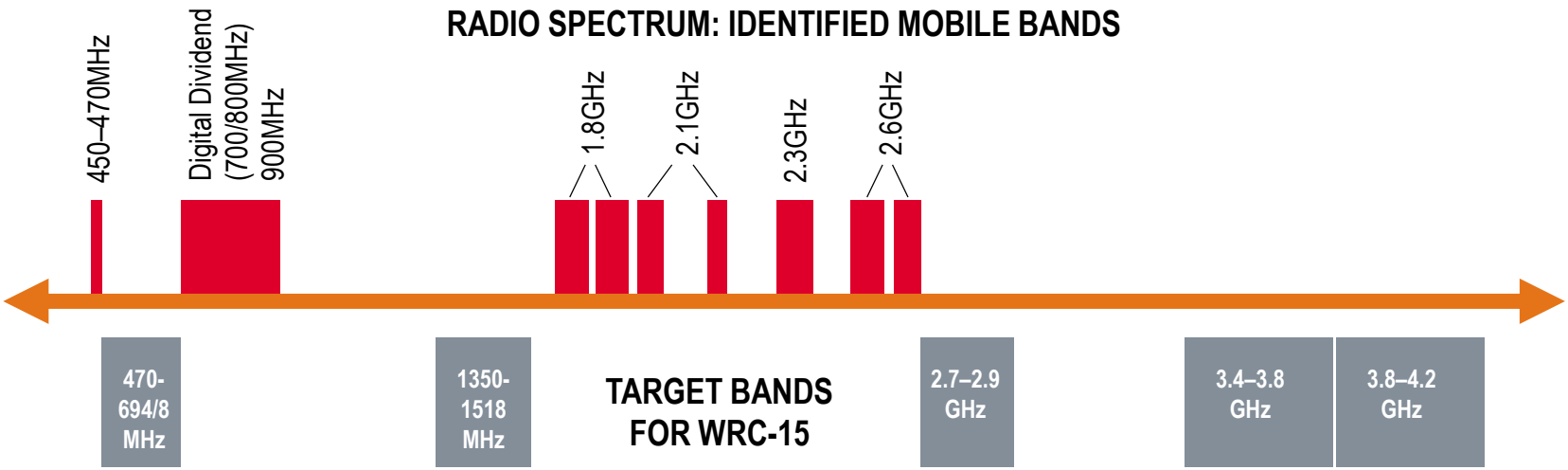
© GSMA 2015

FUTURE MOBILE SPECTRUM



NEW BANDS FOR MOBILE

- **GSMA had agreed widespread mobile operator support for 4 new mobile allocations**
  - Sub-700MHz UHF (470-694/8MHz)
  - L-Band (1350-1400 & 1427-1518MHz)
  - 2.7-2.9GHz
  - C-Band (3.4-4.2GHz)
- **These provide coverage & capacity**
- **These bands have the most potential to be harmonised globally to drive lower cost equipment/services**
  - Pursuing other bands risks creating a fragmented market



© GSMA 2015

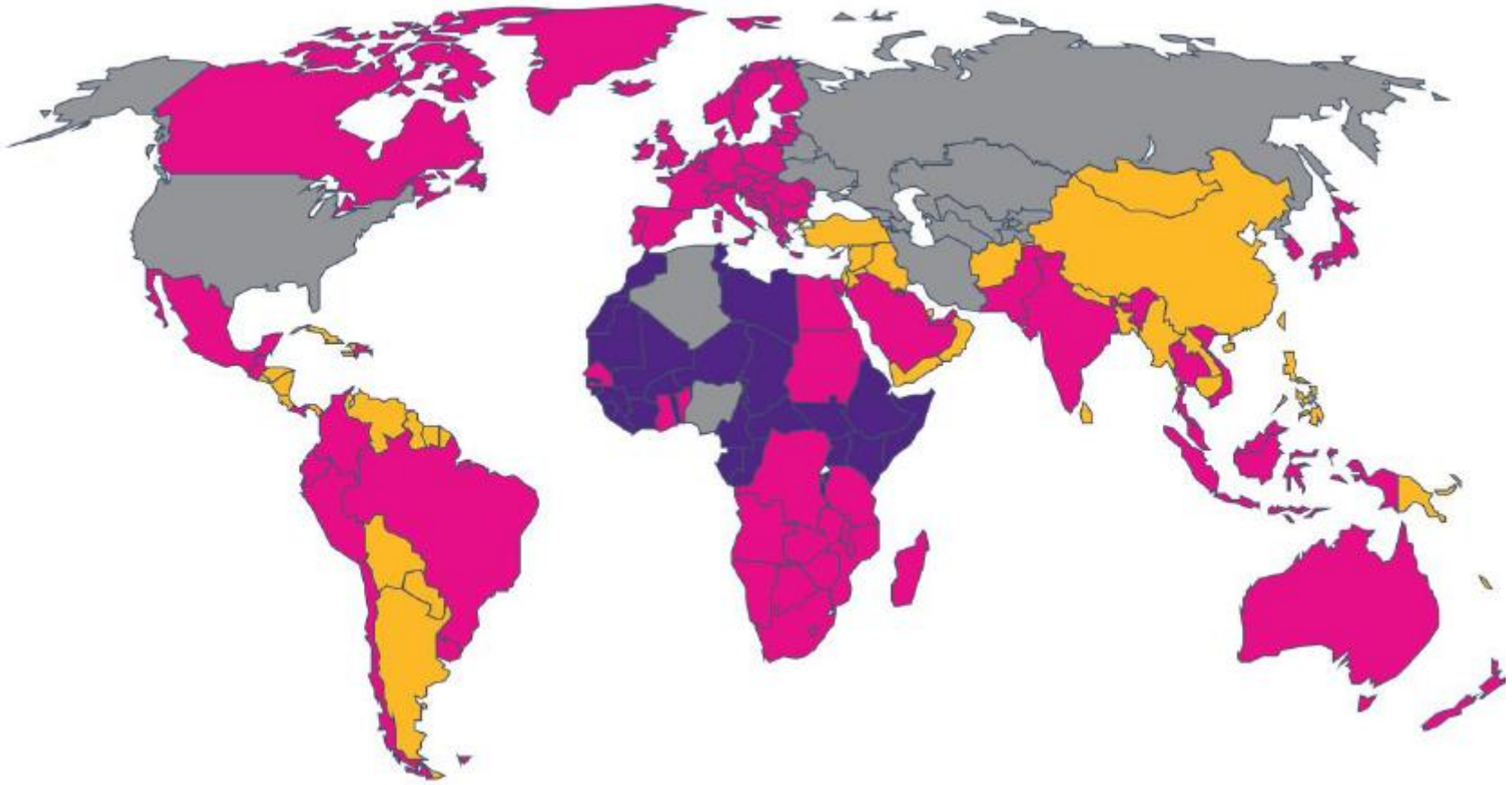
TARGET BANDS – 1 SLIDE SUMMARY

Target Band	Benefit for mobile	Existing Usage	How to accommodate mobile
Sub-700 MHz (470-694/8MHz)	- Extremely important for bringing high speed mobile broadband everywhere	- Mostly broadcast	- Broadcasters can use more spectrum-efficient tech - IPTV, satellite, cable & LTE broadcast will complement
L-band (1350-1400 & 1427-1518MHz)	- Good general purpose band for coverage and capacity	- Comms for aircraft control systems (ie. telemetry) - Military and civilian radar - Fixed links (e.g. for business) - Satellite phones - Earth observation satellites	- 1452-1492MHz portion largely unused globally - Radar & aeronautical mobile telemetry services could potentially use spectrum more efficiently
2.7-2.9GHz	- Excellent capacity band - Could use existing 2.6GHz base stations	- Air traffic control - Military radar	- Band is mostly under-used so could support mobile in a portion. Big exclusion zones not needed
C-band (3.4-4.2GHz)	- Excellent capacity band - Supports fastest services - Only suitable for urban areas or small cells	- Fixed Satellite Services (e.g. satellite TV and broadband)	- Satellite providers can use smaller portion –they use other bands in tropics w/ new tech Big exclusion zones not needed

For more info on those bands, please see our Public position paper

© GSMA 2015

COMMITMENT TO L-BAND (1427-1518 MHz)



© GSMA 2015

C-BAND (3.4-4.2 GHz)

EXCELLENT CAPACITY BAND – SUPPORTS BEST POSSIBLE MOBILE EXPERIENCE

CURRENT USAGE:

- Mostly used for the Fixed Satellite Service (FSS) worldwide
- Already used for mobile broadband in some parts of the world



HOW TO ACCOMMODATE MOBILE *IN A PORTION*:

- Sharing studies prove satellite & IMT can use the band under the right conditions
  - When a C-band *portion* is assigned for IMT in city centres, and *full* FSS use continues in rural areas, a separation distance **of 5 km** would typically be required*
  - Several markets already use the band for both, including an LTE service in the UK
- Portion could be freed in future as FSS is increasingly moving to higher bands (e.g. Ka & Ku) which provide better value, better quality services

IN ASIA PACIFIC THE USE OF MOBILE IN THE BAND WOULD DRIVE 100K NEW JOBS AND DRIVE US$53BILLION IN GOVERNMENT REVENUES**

EXISTING SUPPORT:

- Existing IMT footnote for 3.4-3.6 GHz in 91 region 1 countries and 10 region 3 countries since 2007
- Japan and Korea Support 3.4-4.2 GHz
- Common Region 1 mobile proposal for 3.4-3.8 GHz
- Strong agreement for 3.4-3.6/7 GHz in Region 2

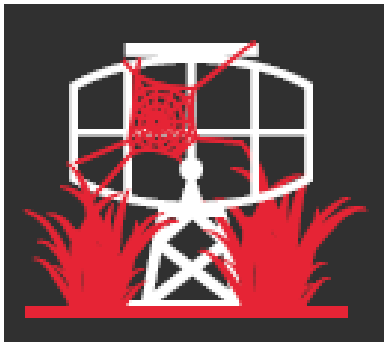
© GSMA 2015

*For more details on C-band co-existence, please see document APG15-3/INF-03 and APG15-4/INF-17

**See Frontier Economics' report: "Economic assessment of C-band re-allocation".

2.7-2.9GHz

GOOD CAPACITY BAND THAT ALSO MINIMISES NETWORK EXPANSION COSTS DUE TO POTENTIAL RE-USE OF 2.6GHz BASE STATIONS



CURRENT USAGE:

- Back-up air traffic control system & for military radar
  - Mostly used around some airports so unoccupied in other areas
  - Most of the radars are ageing so can waste valuable spectrum

HOW TO ACCOMMODATE MOBILE *IN A PORTION*:

- All existing radar requirements can be met in the band while still freeing a portion*
- Mobile could operate in areas where radar is not used or band could be segmented
  - Studies show large exclusions zones are not necessary around radar stations
  - Co-channel: separation distance for an IMT suburban microcell and a radar receiver is around 15km
  - Adjacent channel: no separation distance required with a guard band of 20 MHz

EXISTING SUPPORT:
Pakistan, Sweden, Finland, UK, Norway, Senegal, Guinea, Ghana, Sudan, and 15 SADC countries.

ESSENTIAL CAPACITY BAND FOR COUNTRIES OPPOSED TO C-BAND

© GSMA 2015

*For more details on segmentation of this band, please see document APG15-4/INF-17

PROGRESS ON MOBILE AGENDA ITEM IS VITAL

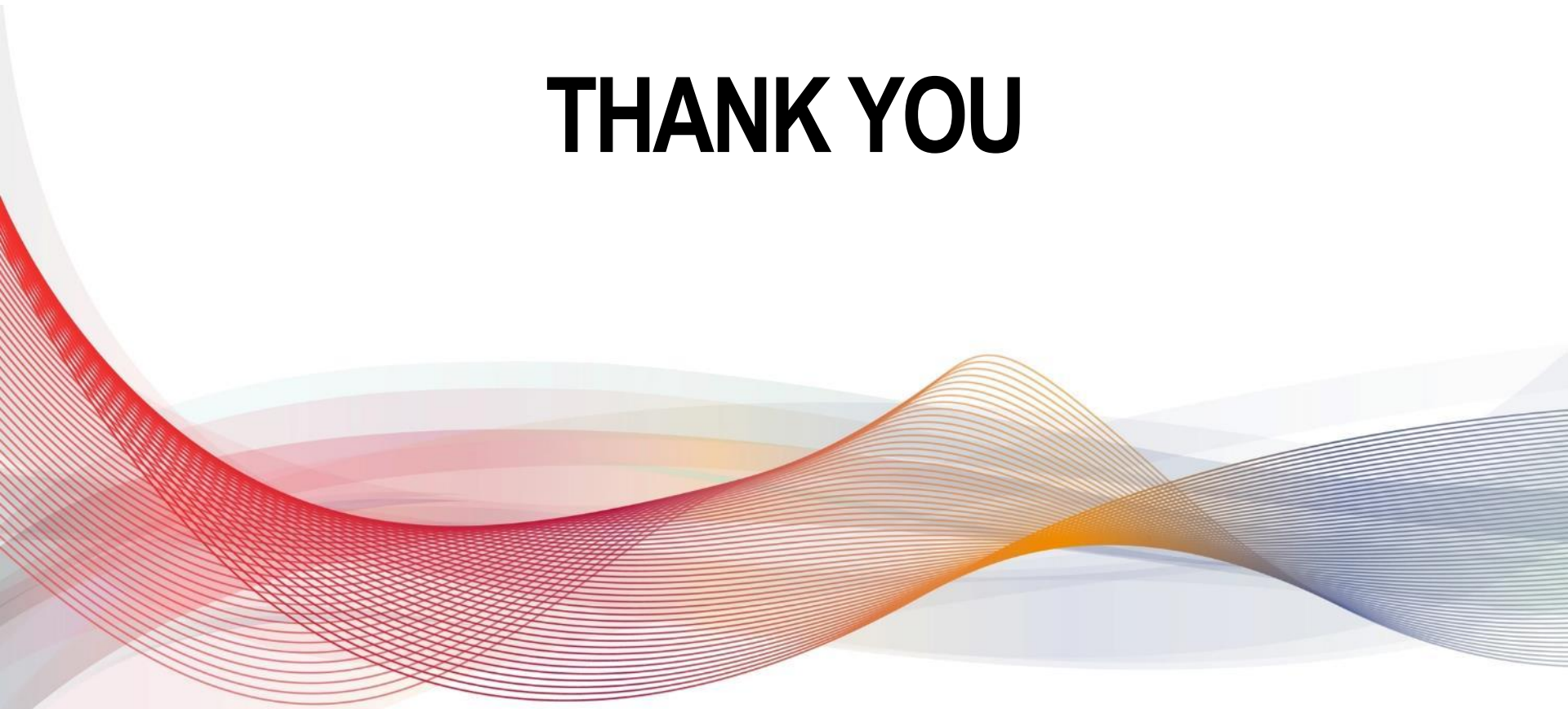
THE FUTURE OF MOBILE BROADBAND IS AT RISK WITHOUT MORE SPECTRUM

- **Mobile traffic is growing faster than expectations**
  - 2015-2020: 10x traffic growth is currently expected
- **Unless more harmonized spectrum is made available, administrations will struggle to react to rising data**
- **networks could slow, consumer prices may rise, socio economic benefits lost**
- **APAC has more to lose than other regions**
- **Capacity bands are critical for large, densely populated cities**
- **Flexibility is essential to allow countries to react to their evolving situations**
  - New bands will only be licensed to operators when governments see clear demand in their market
  - Advanced markets who use the bands first drive lower-cost devices for those using later



© GSMA 2015

THANK YOU





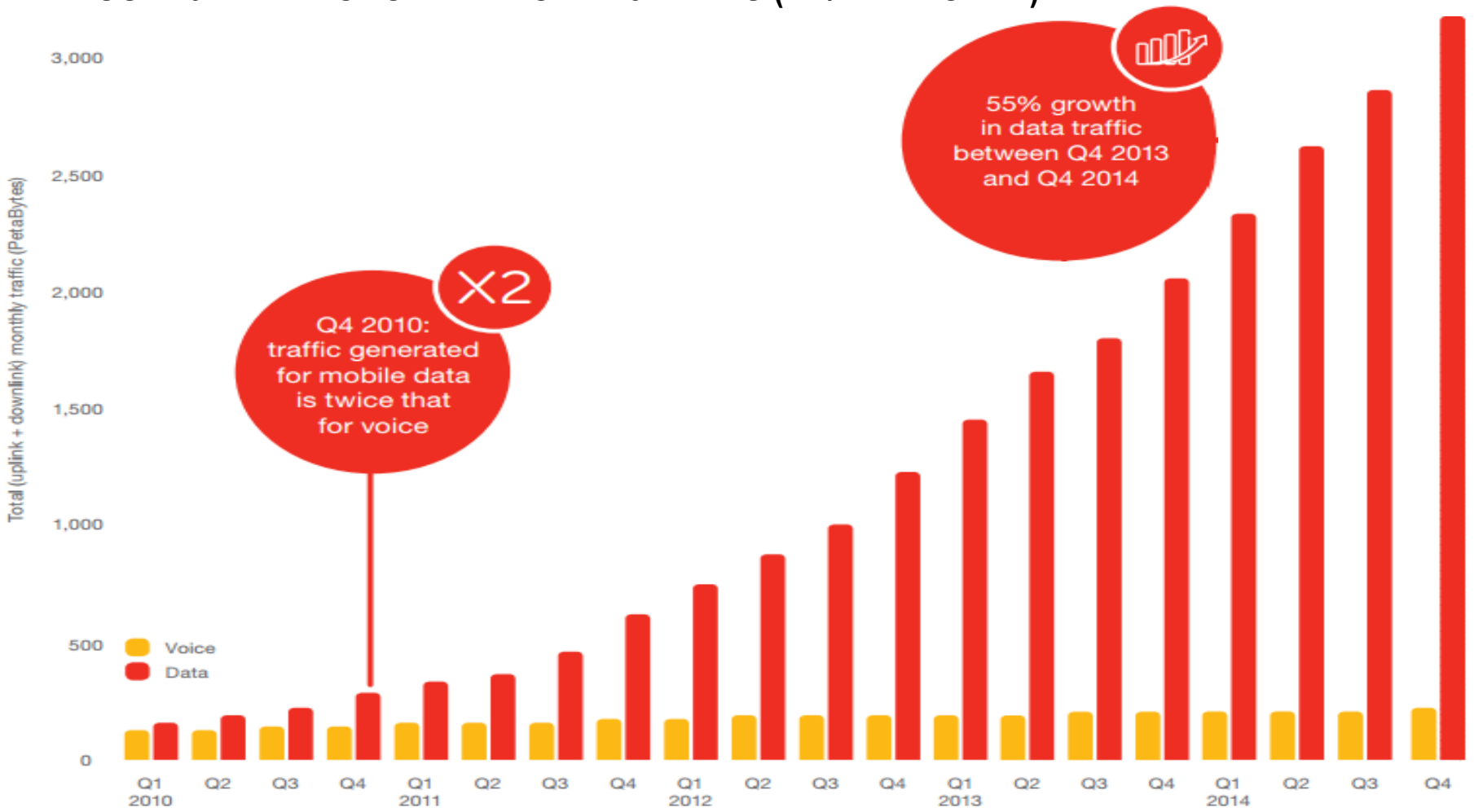
© GSMA 2015

ANNEX:
SUPPORTING SLIDES

© GSMA 2015

RECENT MOBILE DATA ROCKETING

ALMOST 20X DATA GROWTH IN ONLY 5 YEARS (PB/PER MONTH)



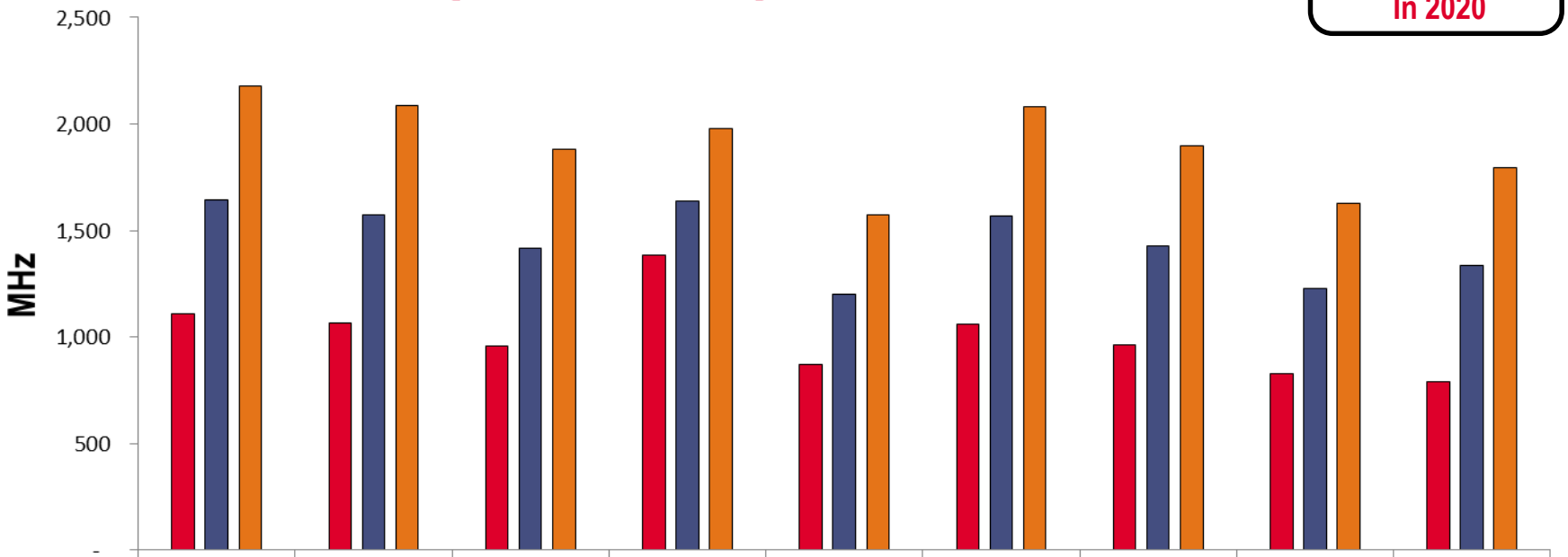
SOURCE: ERICSSON MOBILITY REPORT – FEB 2015

© GSMA 2015

INITIAL ESTIMATE FOR SOME APT COUNTRIES

WP5D Estimates: 1340-1960 MHz In 2020

IMT Spectrum requirement for 2020



	Bangladesh	Cambodia	Indonesia	Malaysia	New Zealand	Pakistan	Philippines	Sri Lanka	Vietnam
Low	1,109	1,063	955	1,384	869	1,060	964	829	791
Medium	1,644	1,574	1,418	1,640	1,198	1,570	1,430	1,227	1,334
High	2,180	2,088	1,882	1,980	1,572	2,082	1,897	1,626	1,794

9 APT countries – 3 usages scenarios each

Note that the spectrum requirement number is assuming an asymmetric disposition, that is 80% downlink and 20% uplink. If symmetric, this would imply an higher allocation. As an example, this would be 2 x (80% x 2180) MHz = 2 x 1744 MHz for the BGD higher scenario.

© GSMA 2015

WHAT IS THE JTG?

PROVIDES THE TECHNICAL AND REGULATORY EVIDENCE TO HELP GOVERNMENTS FORM DECISIONS AND PROPOSALS FOR WRC-15

- **Joint Task Group 4-5-6-7 focuses on new mobile broadband identifications**
  - Principally under agenda item 1.1 (agenda item 1.2 is only for Region 1 i.e. EMEA)
- **It agrees the mobile portion of the CPM text which will be finalised in March/April 2015 and then supplied to governments attending WRC-15**
- **This includes candidate bands which could support mobile services**
  - Sharing studies are referenced & summarized to show the conditions whereby mobile services and incumbent services could both use the candidate band
  - Potential options for regulators to choose a mobile allocation and/or IMT identifications, or no change, are provided including associated regulatory provisions
- **The draft CPM text was agreed at the final JTG meeting in Geneva in August**

WE NOW KNOW THE CANDIDATE BANDS FOR NEW MOBILE BROADBAND IDENTIFICATIONS THAT WILL BE INCLUDED IN THE DRAFT CPM TEXT FOR WRC-15

© GSMA 2015

LIST OF JTG CANDIDATE BANDS

WRC-15 CANDIDATE BANDS IN THE DRAFT CPM TEXT ARE:

Band	Frequency ranges	
UHF	**470 - 694/698 MHz**	
L-band	**1350 - 1400 MHz**	**1492 - 1518 MHz**
	1427 - 1452 MHz	1518 - 1525 MHz
	1452 - 1492 MHz	1695 - 1710 MHz
S-band	**2700 - 2900 MHz**	
C-band	3300 - 3400 MHz	4500 - 4800 MHz
	3400 - 3600 MHz	4800 - 4990 MHz
	3600 - 3700 MHz	5350 - 5470 MHz
	3700 - 3800 MHz	5725 - 5850 MHz
	3800 - 4200 MHz	5925 - 6425 MHz
	4400 - 4500 MHz	

© GSMA 2015

ALL THE GSMA'S TARGET BANDS ARE INCLUDED (IN BOLD)

SHARING STUDIES MUST BE REALISTIC

Sub-700MHz (470-694/8MHz) – Co-channel sharing between broadcast and IMT

Worst Case	Realistic
274-1000km exclusion zones	14km adequate in more realistic scenarios

L-band (1300-1400MHz) – Sharing between radars and IMT downlink (co-channel)

Worst Case	Realistic
Co-channel: A study indicates 560km separation/ coordination distance	Co-channel: Less than 5km coordination under others Adjacent: <0.5km w/ 10MHz guard band & –0 dB OOBE (or 1.6km w/ same OOOB)

2.7-2.9GHz – Sharing between radars and IMT

Worst Case	Realistic
Co-channel: Separation distance of 670km with IMT downlink	Adjacent channel: Uplink:<0.5km w/ 10MHz guard band & –10 dB OOBE (or 1.6km with same OOBE). Downlink: 1km w/ 30MHz guard band and -35 dB OOBE

C-band (3.4-4.2GHz) – Sharing between Fixed Satellite earth stations and IMT

Worst Case	Realistic
Co-channel: Separation of at least tens of kms	Adjacent channel: IMT small cells should be able to co-exist with ubiquitous satellite earth stations with <5MHz guard band

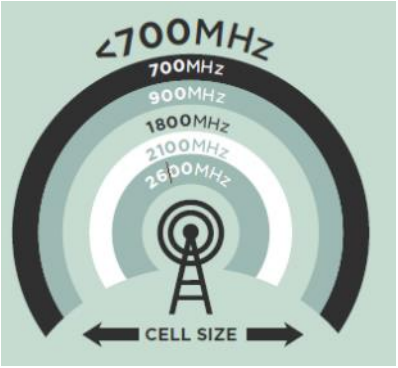
© GSMA 2015

SUB-700MHz (470-694/8MHz): KEY FOR COVERAGE

EXTREMELY IMPORTANT FOR SCALING AFFORDABLE MOBILE BROADBAND SERVICES EVERYWHERE INCLUDING IN RURAL AREAS & INSIDE BUILDINGS

CURRENT UHF USAGE (470-694/8MHz):

- Mostly supports terrestrial broadcast TV services (together with VHF)
- Use of terrestrial broadcast varies by country
  - In many countries it supports lots of channels and is heavily watched
  - In others it is heavily watched but supports few channels
  - In others it is little used (ie. cable, satellite & IPTV dominate)



HOW TO ACCOMMODATE MOBILE *IN A PORTION*:

- The evolution of terrestrial broadcast delivery means more can be done with less spectrum
  - More efficient broadcast tech & changing viewing habits mean broadcast can use less spectrum
- Less demand for large number of TV channels in future (in many countries) as IPTV use grows

VARIATION IN NATIONAL BROADCAST USE MEANS REGULATORS NEED FLEXIBILITY TO USE THE BAND AS THEY WISH ESPECIALLY GIVEN IMPACT ON MOBILE COVERAGE



© GSMA 2015

L-BAND (1350-1400MHz & 1427-1518MHz)

COULD PROVIDE A GOOD MIXTURE OF ADDITIONAL MOBILE COVERAGE AND CAPACITY – THAT COULD BE MADE AVAILABLE QUICKLY



CURRENT USAGE:

- Various: radar, aeronautical telemetry, fixed links & broadcast satellite
  - However, in most countries it is underutilised
  - Portion reserved for broadcast satellite service (1452-1492MHz) is unused in many countries

HOW TO ACCOMMODATE MOBILE *IN A PORTION*:

- The largely unused portion could quickly and easily be made available (ie.1452-1492MHz)
  - Europe already plans to use this portion for mobile so equipment will be coming
- ITU sharing studies show mobile services & existing users could operate in the band
  - They demonstrate interference can be avoided when the proper measures are taken

© GSMA 2015

OPTIONS FOR REGULATORS/POLICY MAKERS

THE OPTIONS OPEN TO APT REGULATORS REGARDING THE CANDIDATE BANDS ARE DETAILED IN THE CPM TEXT. THESE ARE:

1. **No Change** (in ITU terminology 'NOC') – i.e. opposition to new mobile provisions
2. **Allocation to the mobile service**
   - I. Either via allocation in the table in the ITU Radio Regulations (RRs)
   - II. Or via allocation through a footnote (referenced in the RRs)
3. **Identification for mobile broadband (in ITU terminology 'IMT') through a footnote**

E.G. ITU Radio Regulation table and accompanying footnote for a portion of the C-band - 3.4-3.5GHz - in Region 2 (ie. the Americas)

The mobile service has an existing secondary allocation as well as a primary allocation in several countries by footnote

3 400-3 500
FIXED
FIXED-SATELLITE (space-to-Earth)
Amateur
Mobile 5.431A
Radiolocation 5.433
5.282

5.431A *Different category of service:* in Argentina, Brazil, Chile, Costa Rica, Cuba, French overseas departments and communities in Region 2, Dominican Republic, El Salvador, Guatemala, Mexico, Paraguay, Suriname, Uruguay and Venezuela, the band **3 400-3 500 MHz is allocated to the mobile, except aeronautical mobile, service on a primary basis,** subject to agreement obtained under No. 9.21.

© GSMA 2015

WRC-15: FINAL OPPORTUNITIES TO INFLUENCE

- **One global ITU meeting remains before WRC-15: the Conference Prep Meeting**
- **The six ITU regional groups only have two more meetings each before WRC-15**
  - It is essential that common regional proposals in favour of our target bands are agreed

Conference Preparatory Meeting
23 March - 2 April 2015

WRC-15
2-27 Nov 2015

APAC | Africa | Arab States | Europe | Americas | CIS - Commonwealth of Independent States (ex-Soviet states)

UPCOMING REGIONAL MEETINGS

APAC: July
Africa: July
Arab States: October
Europe: June, September
Americas: February, August
CIS: October

© GSMA 2015