BENEFITS OF C-BAND REALLOCATION TO MOBILE IN APAC

THE CASE STUDY

Joe Guan, Spectrum Policy Regulatory Affairs Advisor, GSMA

1 NOVEMBER 2013

AGENDA

GSMA overview

Keeping up with demand

Why C-band?

Report Summary

GSMA OVERVIEW

GSMA BY THE NUMBERS

MEMBERSHIP

800
mobile operators in over 220 countries

230 associate members

MOBILE REACH

billion
mobile connections

3.2 billion
individual subscribers

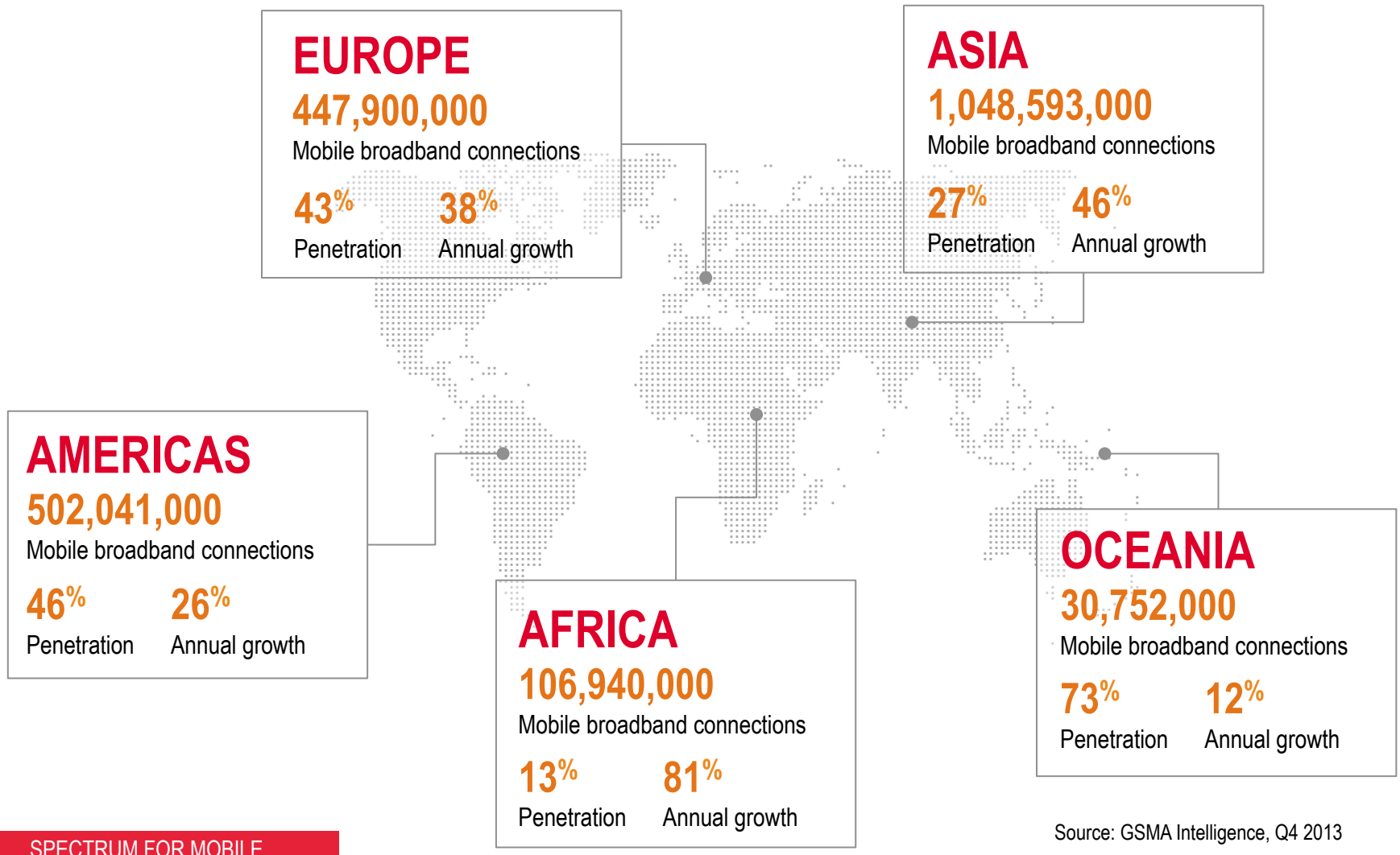
PRESENCE

Offices in
9 countries
serving every region

Staff based in
26 countries
representing
36 nationalities

KEEPING UP WITH DEMAND

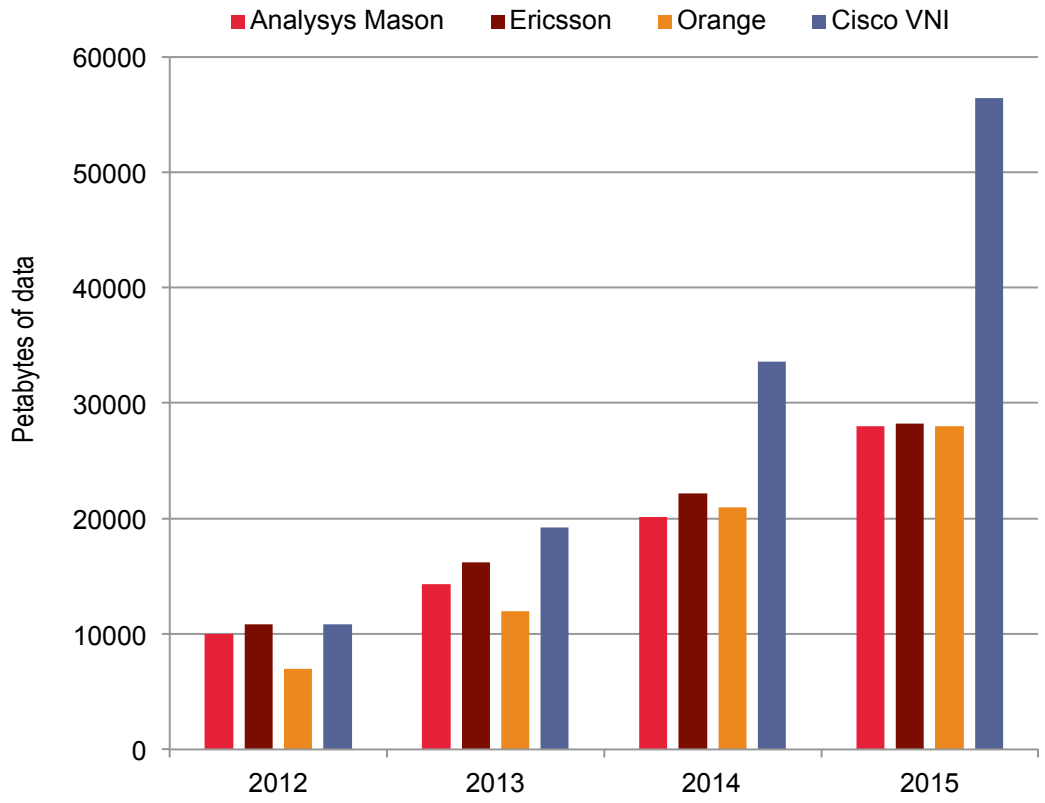
THE RISE OF MOBILE BROADBAND



Source: GSMA Intelligence, Q4 2013

MOBILE DATA KEEPS CLIMBING

GLOBAL DATA TRAFFIC FORECASTS FROM MULTIPLE SOURCES



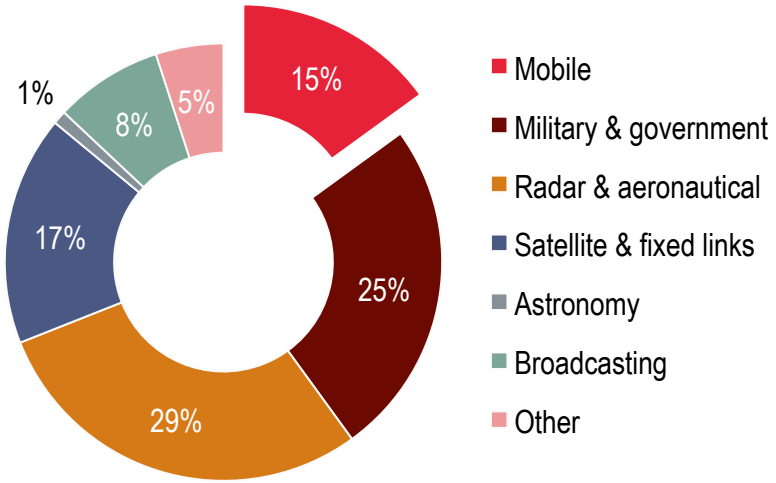
Mobile data traffic doubled in one year between Q3 2011 and Q3 2012
(Ericsson)

Sources
Analysys Mason, Global Mobile Network Traffic, June 2011
Ericsson Mobility Report, November 2012
Orange Global Forecast 2010-2020
Cisco VNI Mobile Forecast 2013

A CROWDED FIELD

EUROPE

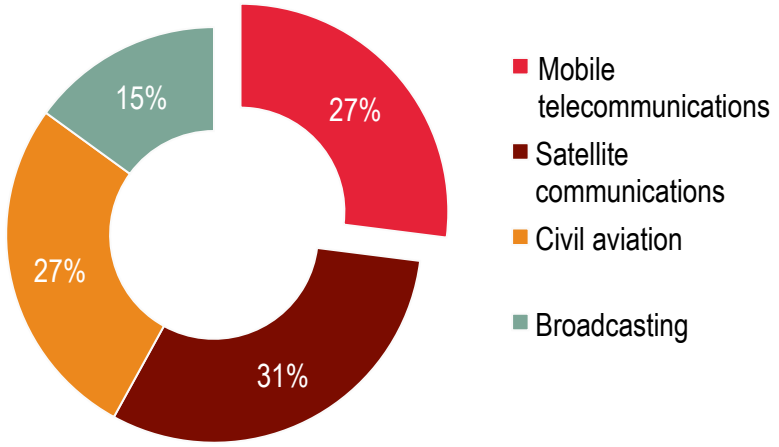
Relative share of radio spectrum in Europe between 400MHz and 5GHz, 2010



Source: GSMA analysis from ITU spectrum tables, 2010

CHINA

Relative share of spectrum in China between 500MHz and 5GHz, 2012



Source: China Academy of Telecommunication Research of MIIT (CATR), 2013

SPECTRUM ESTIMATES FROM WP5D

WP5D Global Estimates: 1340-1960 MHz In 2020

Individual countries estimates:

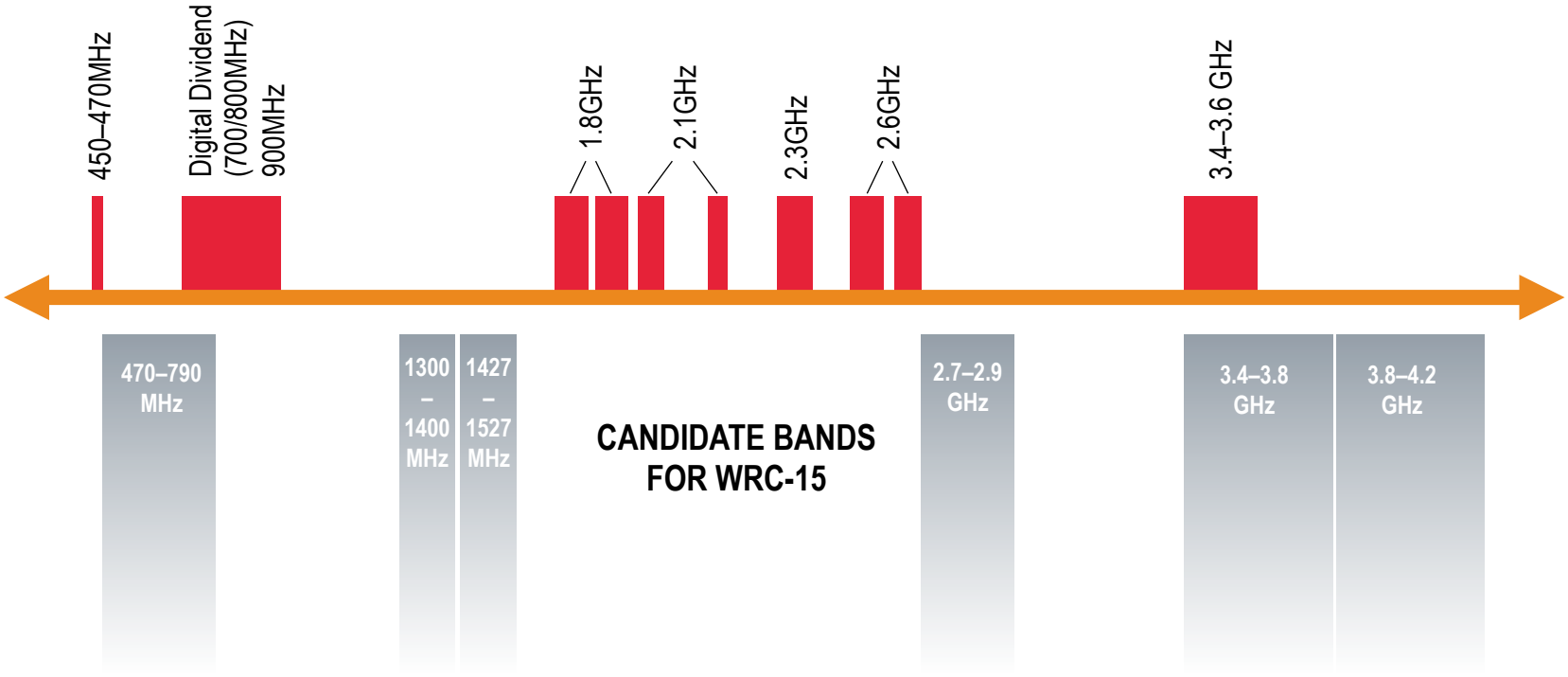
Doc. 5D/	63	66	118	256	242	170	417
Source	US	Australia	Russia	China	GSMA	India	UK
Estimation year	Until 2014	Until 2020	2020	2015, 2020	2020	2017, 2020	2020
Spectrum requirements	Additional requirement of 275 MHz by 2014	Total requirement of 1 081 MHz (Additional requirement of 300 MHz by 2020)	Total requirement of 1 065 MHz (Additional requirement of 385 MHz by 2020)	Total requirement of 570-690 MHz (by 2015) Total requirement of 1 490-1 810 MHz (by 2020)	Total requirement of 1 600-1 800 MHz for some countries	Additional requirement of 300 MHz by 2017 Additional requirement of another 200 MHz by 2020	Total requirement of 775-1 080 MHz for the low demand setting Total requirement of 2 230-2 770 MHz for the high demand setting

AWG input documents:

- Japan (AWG-14/INP-35): 1825 MHz by 2020
- Korea (AWG-14/INP-63): 1340-1960 MHz by 2020

NEW BANDS FOR MOBILE

RADIO SPECTRUM: IDENTIFIED MOBILE BANDS



WHY C-BAND?

WHY C-BAND?

For mobile communications:

- More spectrum is needed to meet consumer demands
- Possibility for large portion of contiguous spectrum
- High capacity and very high bit rate for densely populated urban areas
- 3400 to 3600 MHz was identified for IMT by footnote in a number of countries, but there was no global identification
- Endorsed by some APAC countries, EU CEPT (3.4-3.8 GHz) and others.

Existing C-band satellite services are moving to higher bands (Ku 12-18 GHz and Ka 26-40 GHz) :

- Higher bandwidth / throughput
- More cost effective

WHAT ABOUT RAIN FADE?

Rain Fade is highly dependant of availability requirement of each service. Need to consider required availability for each service.

Asia – Indonesia/Jakarta

Availability	C-band att.	Ku-band att.	Ka-band att.
99.9%	0.6 dB	10.2 dB	53 dB
99.7%	0.3 dB	5.8 dB	33 dB
99.5%	0.2 dB	4.0 dB	23 dB
97%		0.9 dB	5.8 dB

Newtec

- When looking at 99.5% instead of 99.9%, the rain fade is sensibly less, and for Ku band it's only a few dB.

Source: Newtec Webinar June 2013, Beyond Consumer and Ka-Band: The Future of Traditional VSAT (www.slideshare.net/newtec_satcom/the-future-of-traditional-vsat)

WHAT ABOUT RAIN FADE? (CONT.)

The rain fade for Ku-/Ka- bands can be overcome with today's modern satellite technology, such as Spot Beams, Adaptive Coding and Modulations and Uplink Power Control, for non-critical FSS.

- Over the last decade, a number of satellites with Ku-band only transponders have footprints in South East Asia.
- Satellite operators start offering critical services (eg. Disaster Relief) targeting tropical area, and using Ka-band only.

ADJACENT BAND INTERFERENCE

- No cross-border interference reported using pfd limit defined in WRC-07 for 3400-3600 MHz band (Radio Regulations 5.430A, 5.432A).

- In-country interference down to national planning guidelines.

- *"The minimum required separation distances, when using the long-term interference criterion derived in the studies up to date, separation distances are up to tens of kilometres (with no guard band) and decreasing as the guard band increases."* (ITU-R M. 2109, WRC-07)

ADJACENT BAND INTERFERENCE (CONT.)

- ITU-R JTG 4-5-6-7 is doing further sharing studies on adjacent band (China, Intel, GSMA studies and others).
- For example, Intel: about 1 km separation under certain assumptions, China around 100 m for indoor use.
- C-band for IMT is likely to be used in dense urban area, and FSS could continue to be used in remote areas if countries wish to accommodate both services.

REPORT SUMMARY

SCOPE OF FRONTIER'S STUDY

Overview

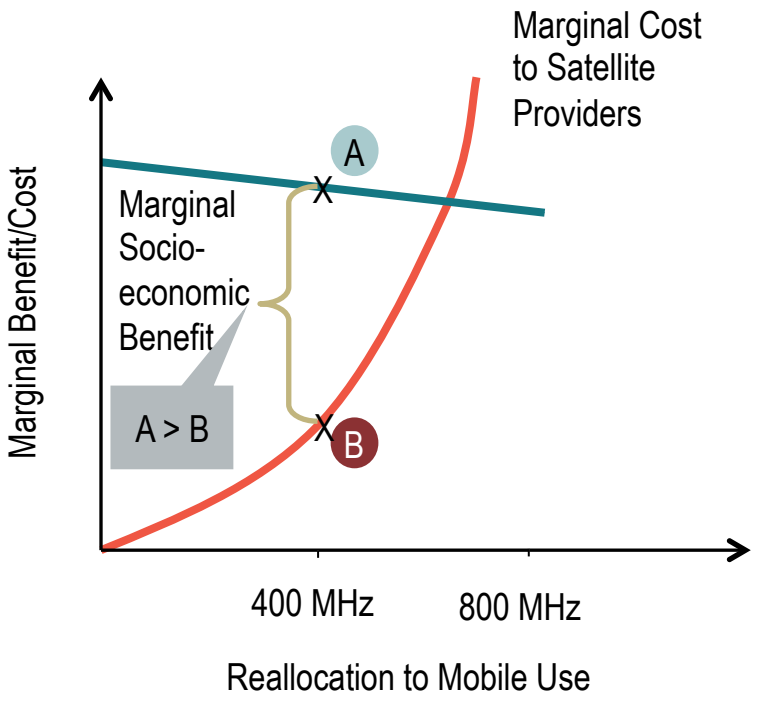
- Frontier has been commissioned by the GSMA to study the socio-economic effects of making part of the C-band spectrum (3.4MHz to 4.2MHz) available to mobile broadband services in the Asia Pacific region
- The C-band spectrum is currently mainly being used by satellite operators, for television and radio distribution and VSAT-based services

28 APAC countries covered

frontier economics

STUDY FRAMEWORK

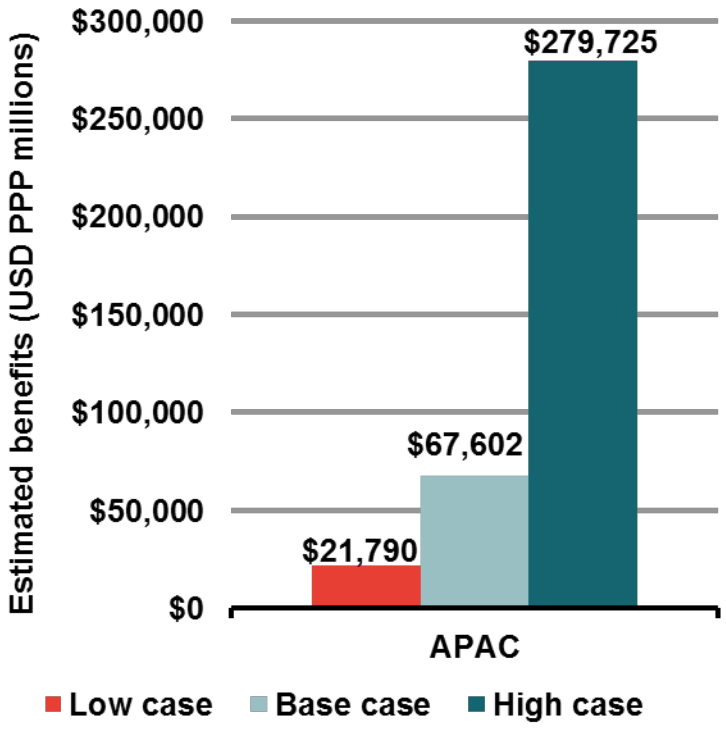
Net benefit of reallocation of C-band

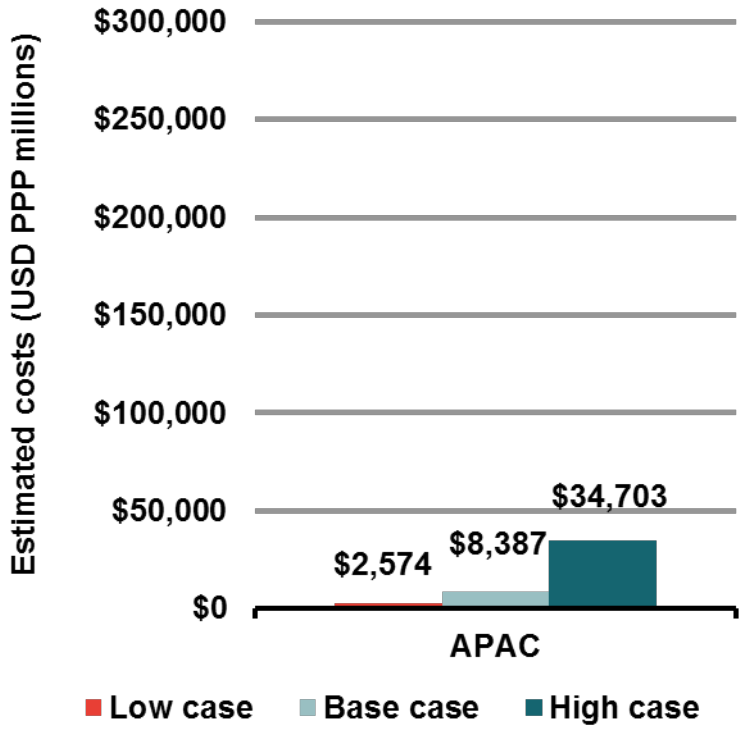


- The marginal benefit from allocating C-band spectrum to mobile operators will be higher than marginal cost to satellite providers
- Part of the band could be allocated for mobile use. Study initially considers reallocating 400MHz of C-band spectrum to IMT by 2025.
- Case studies for Australia and Indonesia

BENEFITS/COST OF C-BAND REALLOCATION

REALLOCATION 400MHz OF C-BAND TO IMT





BENEFITS OF C-BAND REALLOCATION IN APAC

IN OUR “BASE CASE” SCENARIO
THE BENEFITS EXCEED COSTS BY APPROXIMATELY

BENEFITS OF C-BAND REALLOCATION IN APAC

IN OUR "BASE CASE" SCENARIO
INCREASE IN GOVERNMENT INCOME AND NEW JOBS

US$52B

100k+

GSMA RESOURCES

Digital Dividend Toolkit

www.gsma.com/digitaldividendtoolkit

An online resource offering the latest policies, perspectives and best practices for securing and implementing Digital Dividend spectrum for mobile broadband.

Digital Switchover Guide

www.gsma.com/spectrum/digital-switchover

An interactive tool that describes how to manage the conversion to digital television and release Digital Dividend spectrum for mobile.

Mobile Policy Handbook

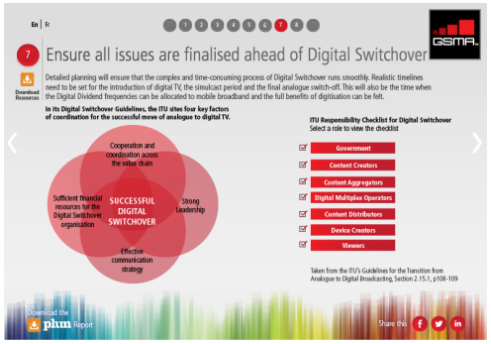
www.gsma.com/publicpolicy/handbook

A portal to GSMA positions on mobile policy issues, including spectrum management and licensing.

GSMA Spectrum Resources

www.gsma.com/spectrum/resources

Our library of research, reports, case studies and collateral.



THANK YOU

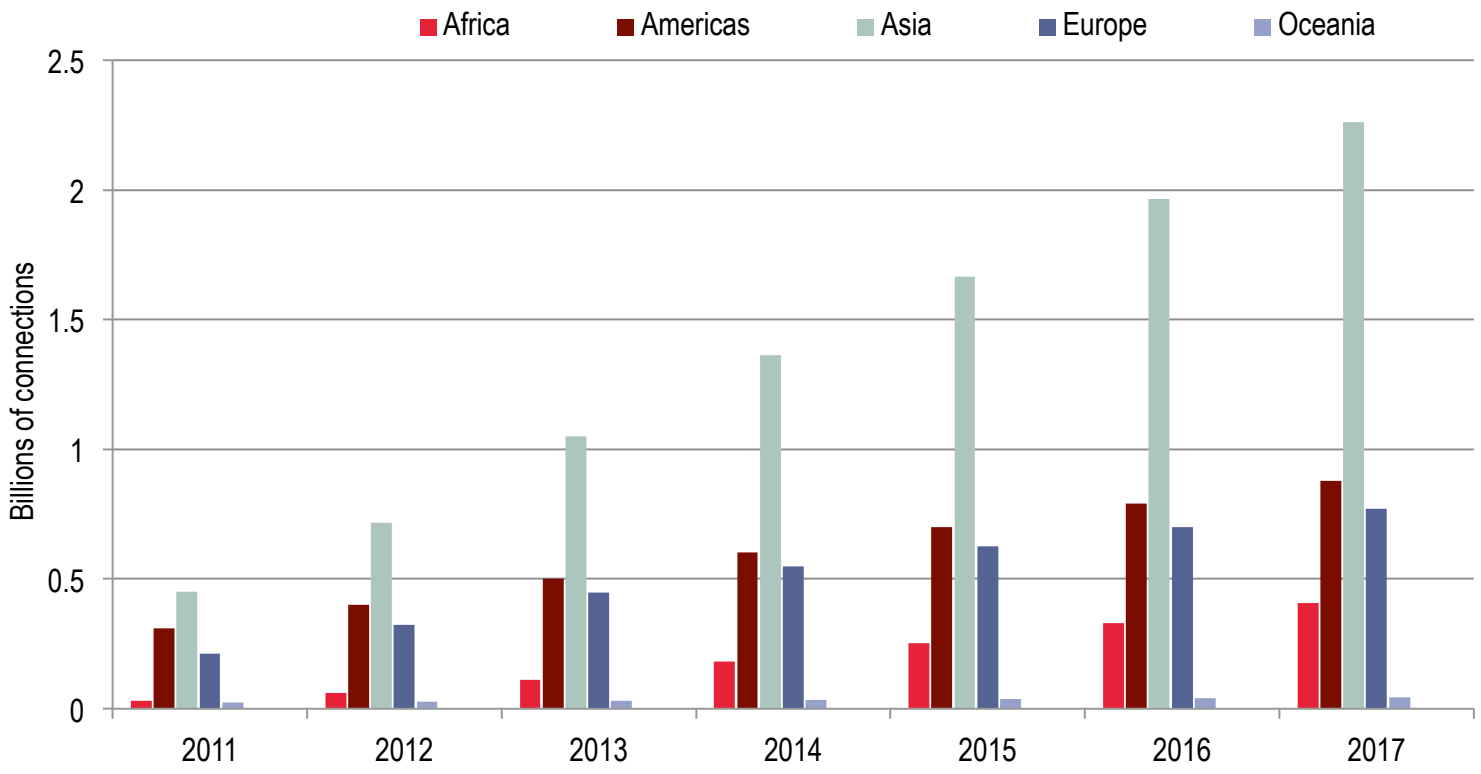
ANNEX:
SUPPORTING SLIDES

SMARTPHONES GROWTH

Region	Smartphone Shipments (In Million)								CAGR (In Percent, 2011- 2016)
	2009	2010	2011	2012F	2013F	2014F	2015F	2016F	
Western Europe	36.6	72.4	97.5	126.8	134.4	142.2	149.6	153.7	9.5
Eastern Europe	7.8	15.4	24.0	33.7	35.4	40.6	50.4	76.8	26.2
Asia Pacific	61.5	93.9	184.5	250.9	302.0	356.5	409.1	463.1	20.2
North America	53.3	75.9	113.2	140.2	150.1	160.3	167.6	175.0	9.1
Latin America	7.2	17.4	30.3	52.4	63.9	72.2	82.2	87.5	23.6
Middle East	5.0	12.0	18.4	26.1	31.0	37.7	45.1	53.9	23.9
Africa	3.5	8.6	16.6	25.1	35.1	48.3	64.0	84.6	38.6
Total	**174.9**	**295.6**	**484.5**	**655.2**	**751.9**	**857.8**	**968.1**	**1,094.6**	**17.7**

Source: Portio Research Ltd.

MOBILE BROADBAND CONNECTIONS



Source: GSMA Intelligence, Q4 2013

IMT CAN BRIDGE THE DIGITAL DIVIDE

Especially in developing countries

Table 4.1: Mind the Gap, Access across the World, 2011*

Region	Internet Users per 100 inhabitants	Mobile Broadband (Active) Subscriptions per 100 inhabitants	Fixed Broadband Subscriptions per 100 inhabitants	Mobile Cellular Subscriptions per 100 inhabitants
Africa	12.8	3.8	0.2	53
Arab States	29.1	13.3	2.2	96.7
Asia- Pacific	27.2	10.7	6.2	73.9
CIS	47.6	14.9	9.6	143
Europe	74.4	54.1	25.8	119.5
The Americas	56.3	30.5	15.5	103.3

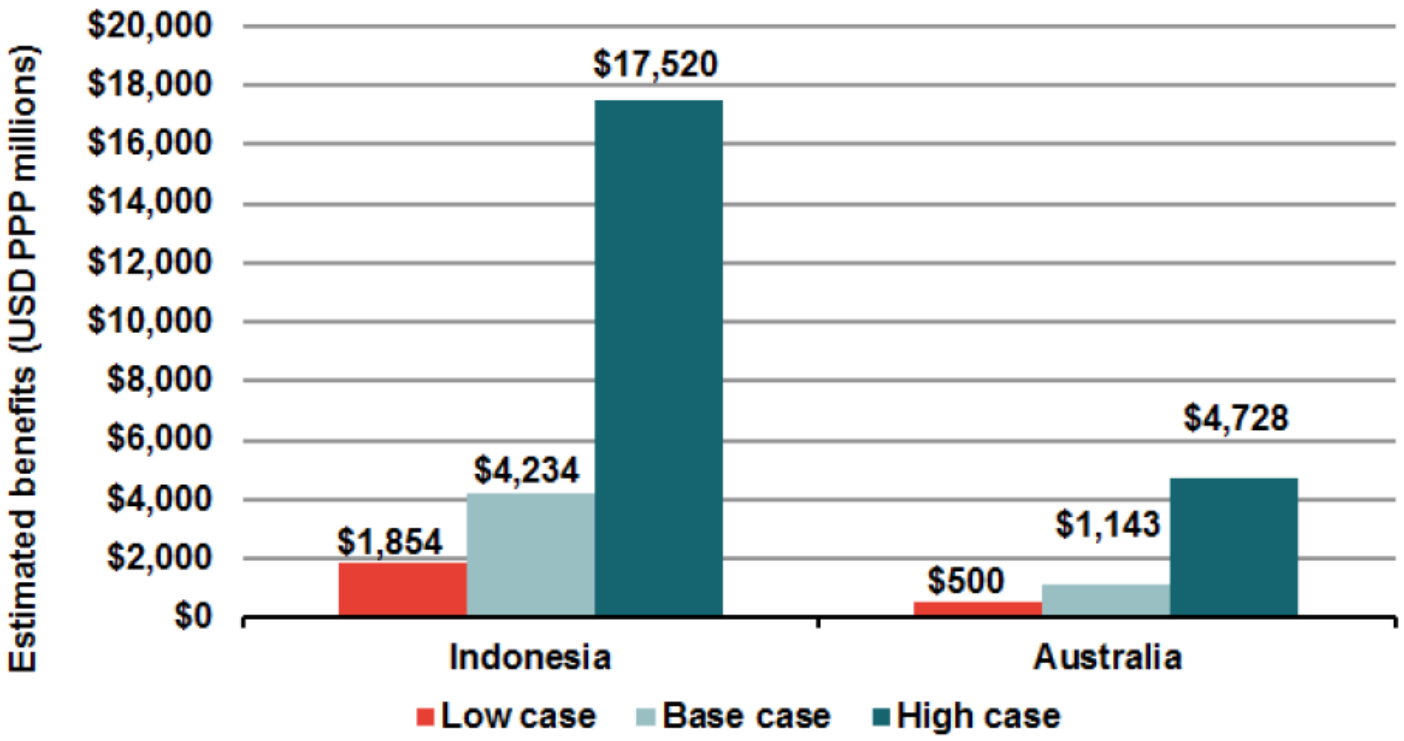
**Estimate*

Source: ITU Key Global Telecom Indicators for the World Telecommunication Service Sector

www.itu.int/ict

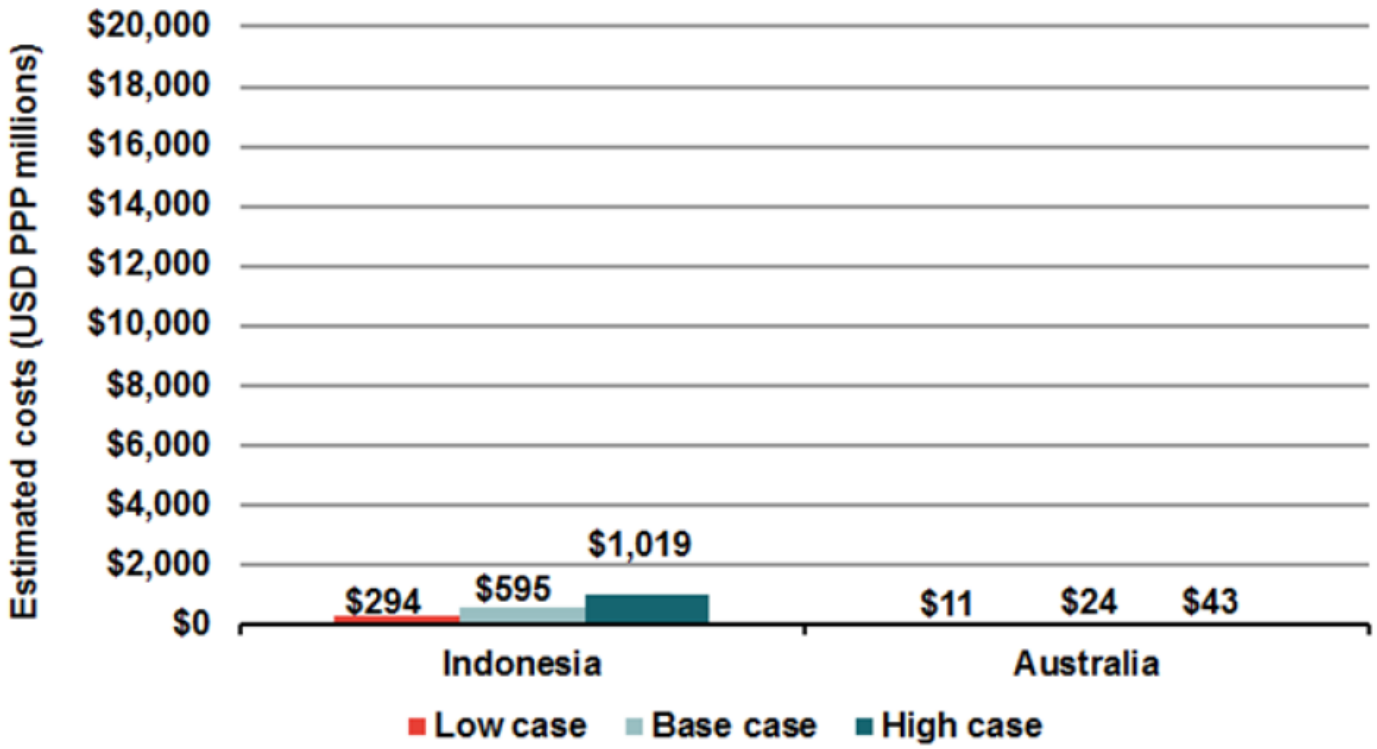
- Recent ITU report: trends in telecommunication reform 2012

BENEFITS OF C-BAND REALLOCATION CASE STUDY



Source: Frontier Economics

COSTS OF C-BAND REALLOCATION CASE STUDY



Source: Frontier Economics