Socio-economic impact of allocating 700 MHz band to mobile in Asia Pacific

Indonesia

THE BOSTON CONSULTING GROUP

Executive summary

The impending switchover from analogue to digital broadcasting across the Asia Pacific presents a unique opportunity to impact the future development of countries in the region

Allocation of the 698-806 MHz band[1] to mobile broadband is expected to increase adoption, especially among rural users

- Significantly lower capex and network costs should accelerate rollout and reduce cost to end users

This will generate incremental economic benefit (relative to alternate uses, e.g., broadcasting)

- Positive GDP impact (via increased productivity)
- Incremental job and new business creation
- Increased tax revenues

Increased adoption will also bring significant social benefits, helping address rural-urban inequality

- Accessible education
- Improved healthcare
- Financial inclusion

To fully realise these benefits, two conditions need to hold

- *Sufficient bandwidth:* The 698-806 MHz band must be allocated to mobile broadband in each country
- *Technical harmonization:* The 2x45 MHz bandplan adopted by APT must be implemented across the region, to benefit from economies of scale in equipment and handsets

1. Referred to as 700 MHz band

Agenda

Introduction and methodology

Adoption

Economic benefits

Social benefits

Implications for governments and regulators

Switchover to digital broadcasting presents opportunity to reallocate key block of spectrum to alternative use

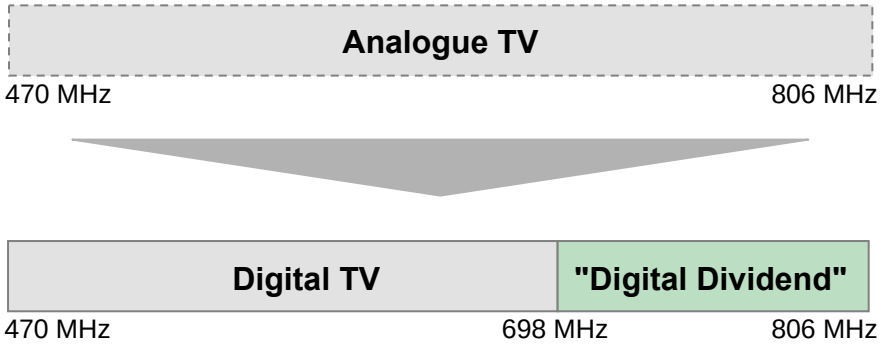
With digitalization, a large portion of the lower UHF band can be freed up...

Today, half of the lower Ultra High Frequency band is used for analogue broadcasting

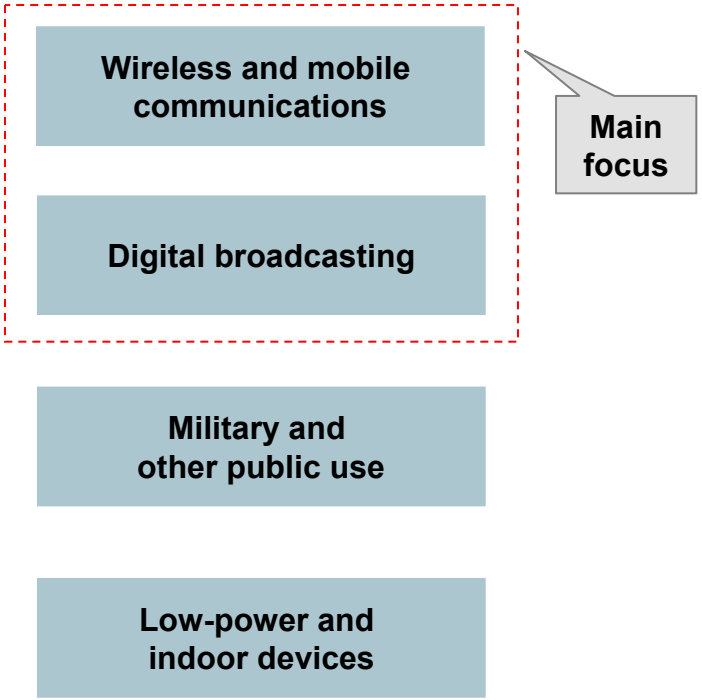
- For most of Asia Pacific, the 470-806 MHz[1] band is used to broadcast analogue television

With digital switch-over, all current channels can be transmitted in a much narrower band

- Studies show that 25% or less of the current spectrum can be sufficient[2] to carry current channels digitally

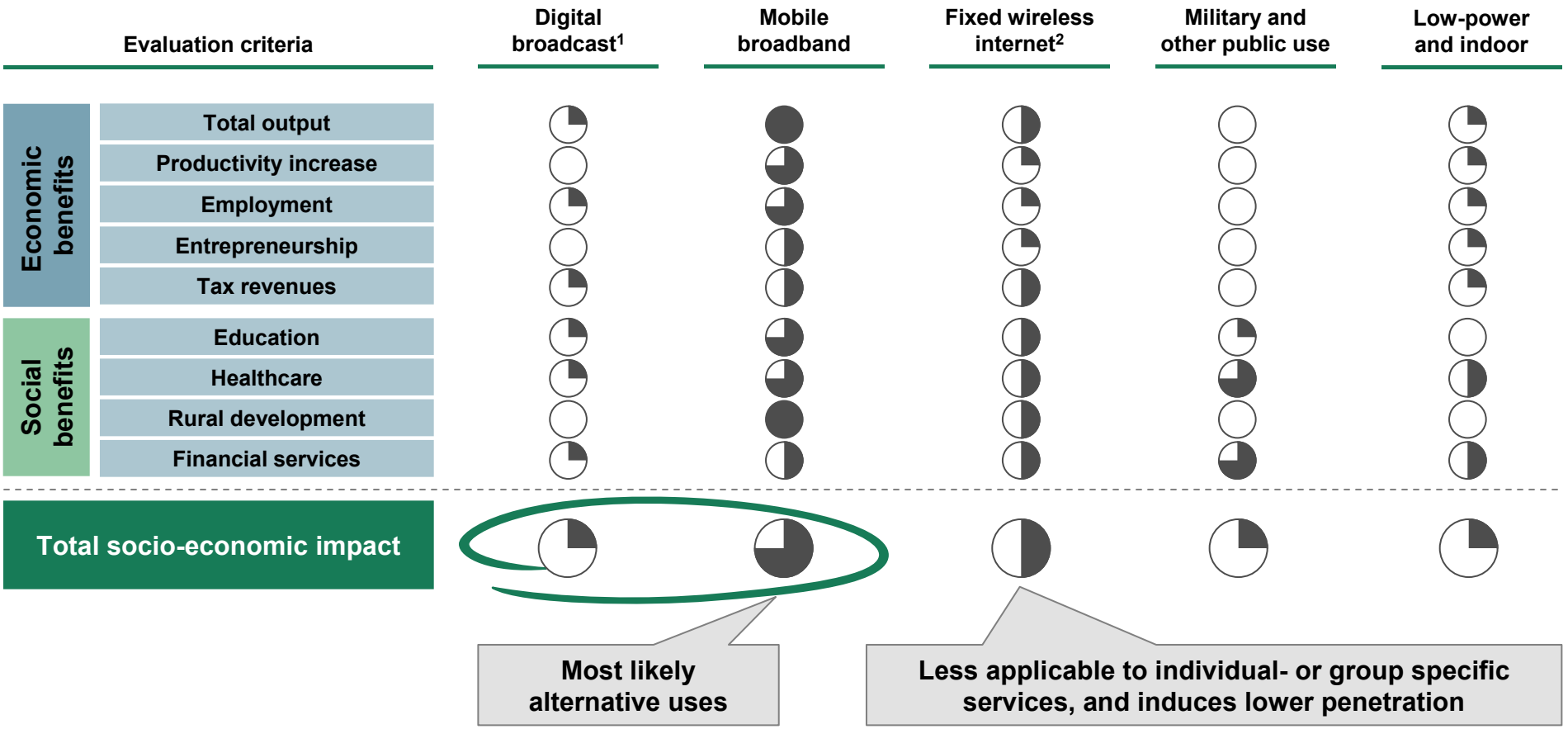


...presenting a "Digital Dividend" of alternative uses in the 698-806 MHz band[3], e.g.:



1. With some variations between countries, some go up to 880 MHz. India does not currently use the 700 MHz band for broadcasting 2. Ofcom's Digital Dividend Review concludes all of UK's 368 MHz of analogue broadcasting could be carried in 40 MHz 3. Referred to as 700 MHz band
Source: Association for International Broadcasting; GSMA

Mobile broadband likely to deliver superior socio-economic impact compared to broadcasting and other uses...



○ No incremental benefit compared to baseline ● High incremental benefit compared to baseline

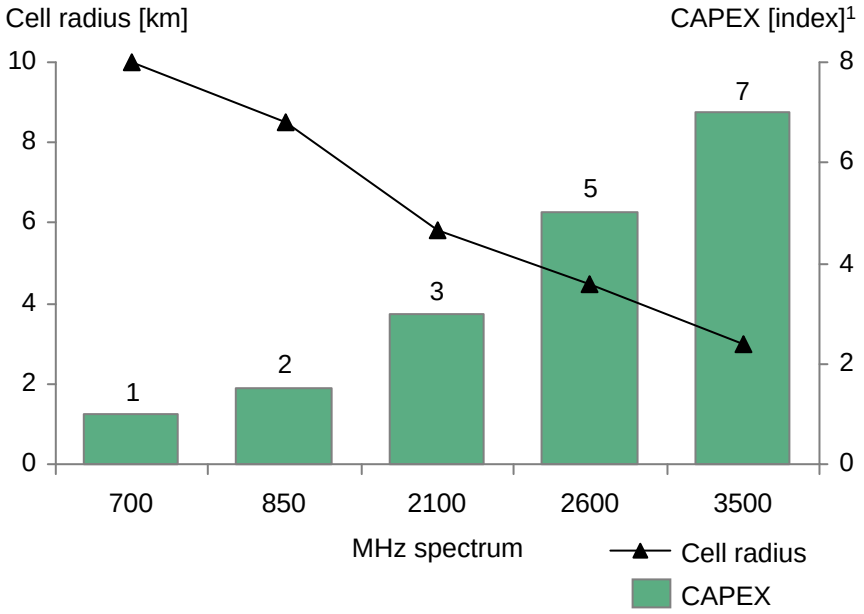
1. Extending number of channels beyond today's analogue which will be switched over 2. E.g. WiFi, WiMAX 3. Including emergency services, disaster warning and recovery
Source: Expert interviews; BCG analysis

... as Digital Dividend spectrum has unique characteristics making it ideal for roll-out of mobile broadband in rural areas

The 700 MHz band provides an optimal combination of range and data capacity

Significantly lower build-out cost can provide access to rural and difficult-to-reach areas

- At 700 MHz the signal covers a reception radius of 10 km, compared to ~6km for 2,100 MHz
- Implies up to 70% lower infrastructure investments needed versus 2,100 MHz



This will enable significant benefits if allocated to mobile broadband

Greater coverage and lower service costs would greatly improve customer accessibility

- Rural areas with previously limited coverage
- Low-income households who could not afford internet
- Entrepreneurs and small companies

Substantial economic impact from increased productivity and new business activity

- Increase productivity for businesses and agriculture
- Spur entrepreneurship and employment
- Benefit from infrastructure investment & taxes

Significant social benefits, especially in rural and less developed areas

- Enhance healthcare and education
- Facilitate rural development
- Provide access to information and entertainment

1. E.g. using the 2100 MHz band will require 3 times as many base stations
Source: SCF Associates; GSMA; Expert interviews; BCG analysis

700 MHz band can also help overcome common barriers to Internet adoption ...

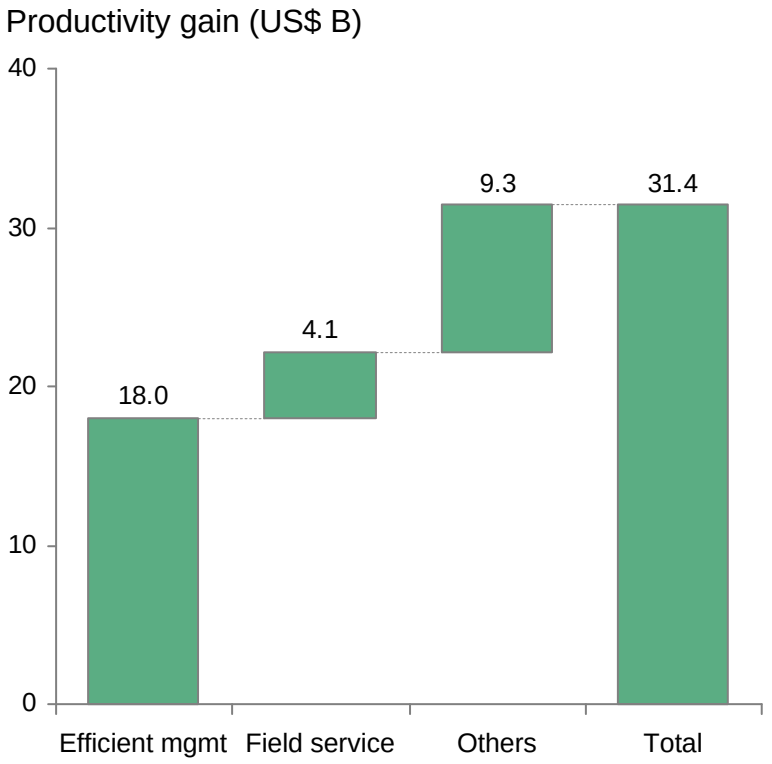
Infrastructure availability	**More rapid roll-out, with significantly larger rural footprint** • 700 MHz band has propagation characteristics highly suitable for rural and less densely populated areas	✓
Affordability	**Cost of service will be reduced, improving affordability for the poor** • Halving CAPEX requirements to establish network coverage can lower cost of service by approximately 5-10%, benefiting low income groups	✓
Perceived value of relevant content	**Availability of local content and services will be improved short-term** • Infrastructure investments and uptake likely to boost local content and service development ecosystem	✓
Literacy/ IT literacy	**Usage capabilities and trust in services will to be built up over time** • General and technical education made available to the individual likely to improve general literacy and IT skills over time	✓ Long-term

... and can complement fixed BB to boost business adoption and increase the productivity benefit

Complementary benefits of wireless broadband ...

Efficient management & documentation	• Accessing email on-the-go can save 30 minutes / day • Data synchronization reduces demand for paper documentation
Field service automation	• Real-time location information and least-distance routing allows field service workers to save time and fuel
Sales force automation	• Real-time access to inventory reduces risks of unfulfilled orders • Real-time updating of customer records improves customer relationship management
Others	• Virtual network office reduces need for staff at headquarters • Replacement of landlines with VOIP also saves cost

... helped U.S. realize productivity gain of US$ 31B in '05[1]

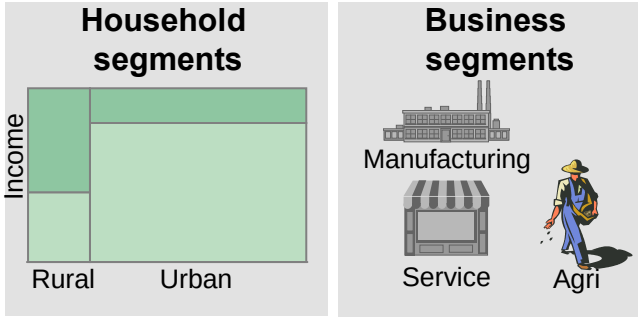


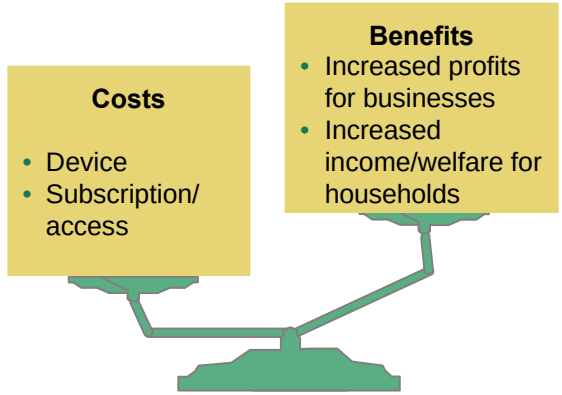
1. Based on 25% wireless BB penetration among enterprise users of telecom services

Source: The Increasingly Important Impact of Wireless Broadband Technology and Services on the U.S. Economy - Roger Entner 2008; BCG analysis

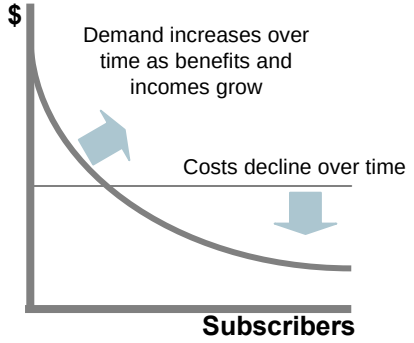
Study builds on rigorous cost-benefit analysis to estimate incremental adoption uplift from mobile broadband

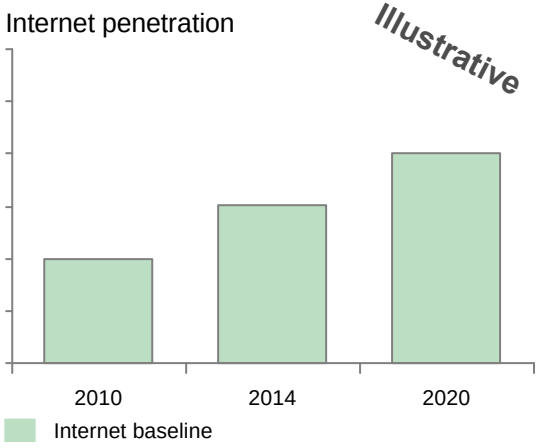
Cost-benefit analysis of businesses and households





Baseline estimate for Internet penetration

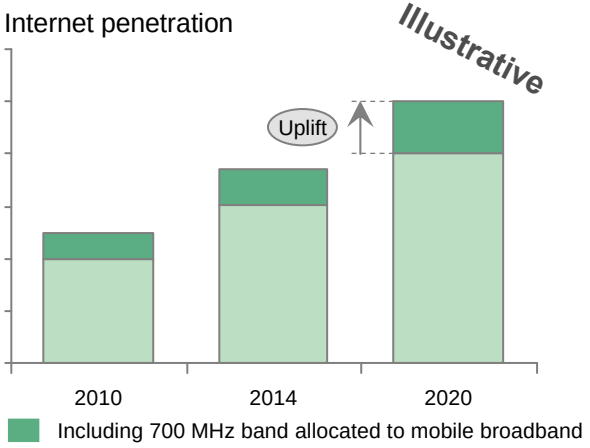




Incremental effect of mobile broadband in 700 MHz band

Mobile broadband in 700 MHz band will increase benefits and reduce costs

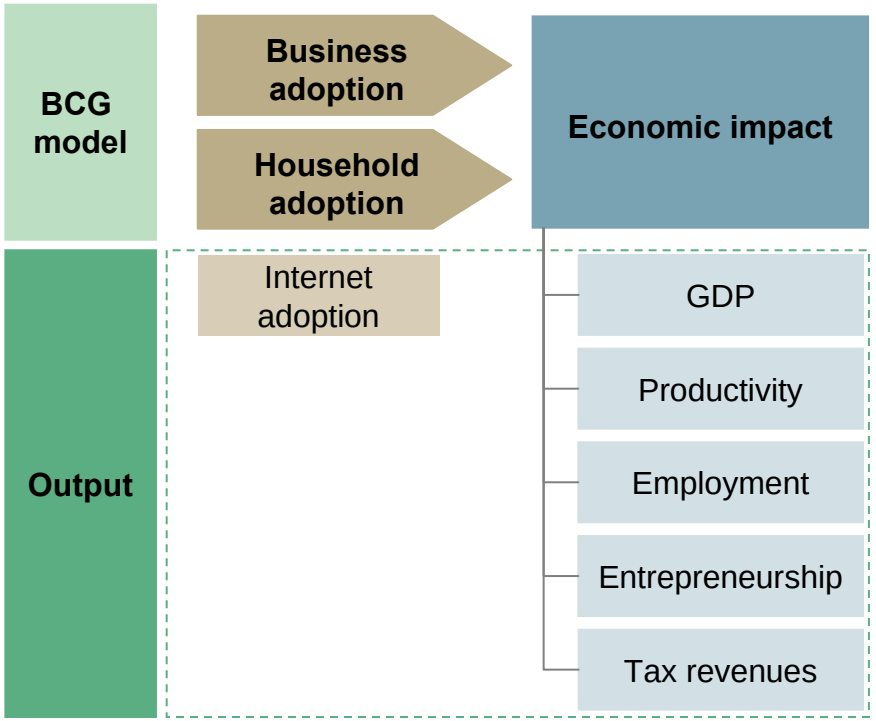
- Greater coverage and lower service costs will improve accessibility
- Economic benefits from increased productivity and rate of adoption
- Significant social and economic benefits in rural areas



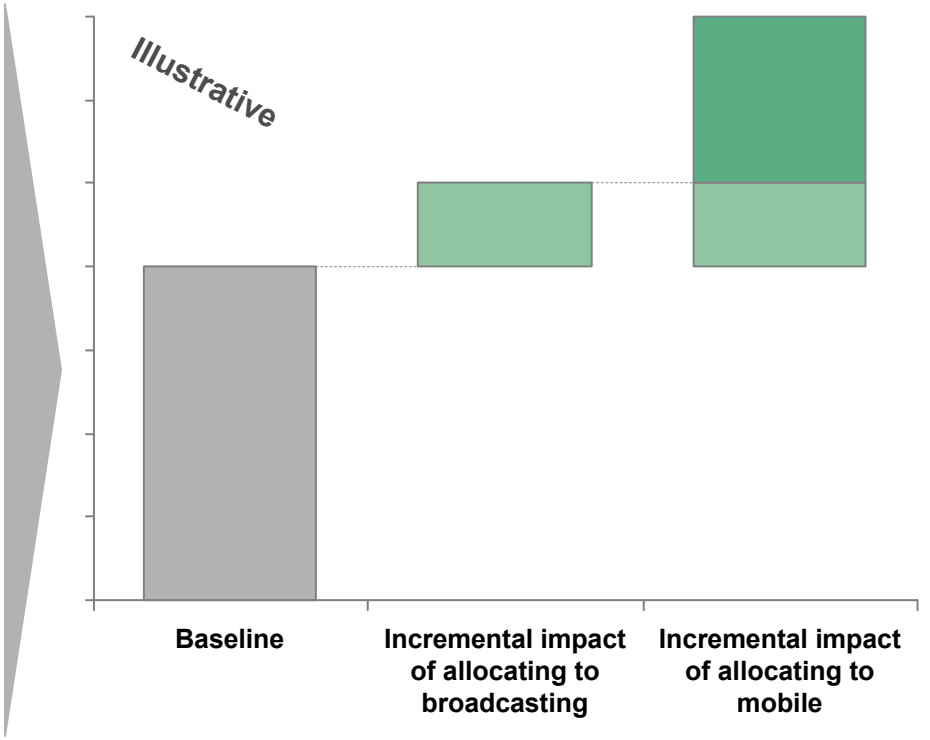
Note: Figures are illustrative

Adoption is translated into five economic factors...

Five economic factors are modeled...



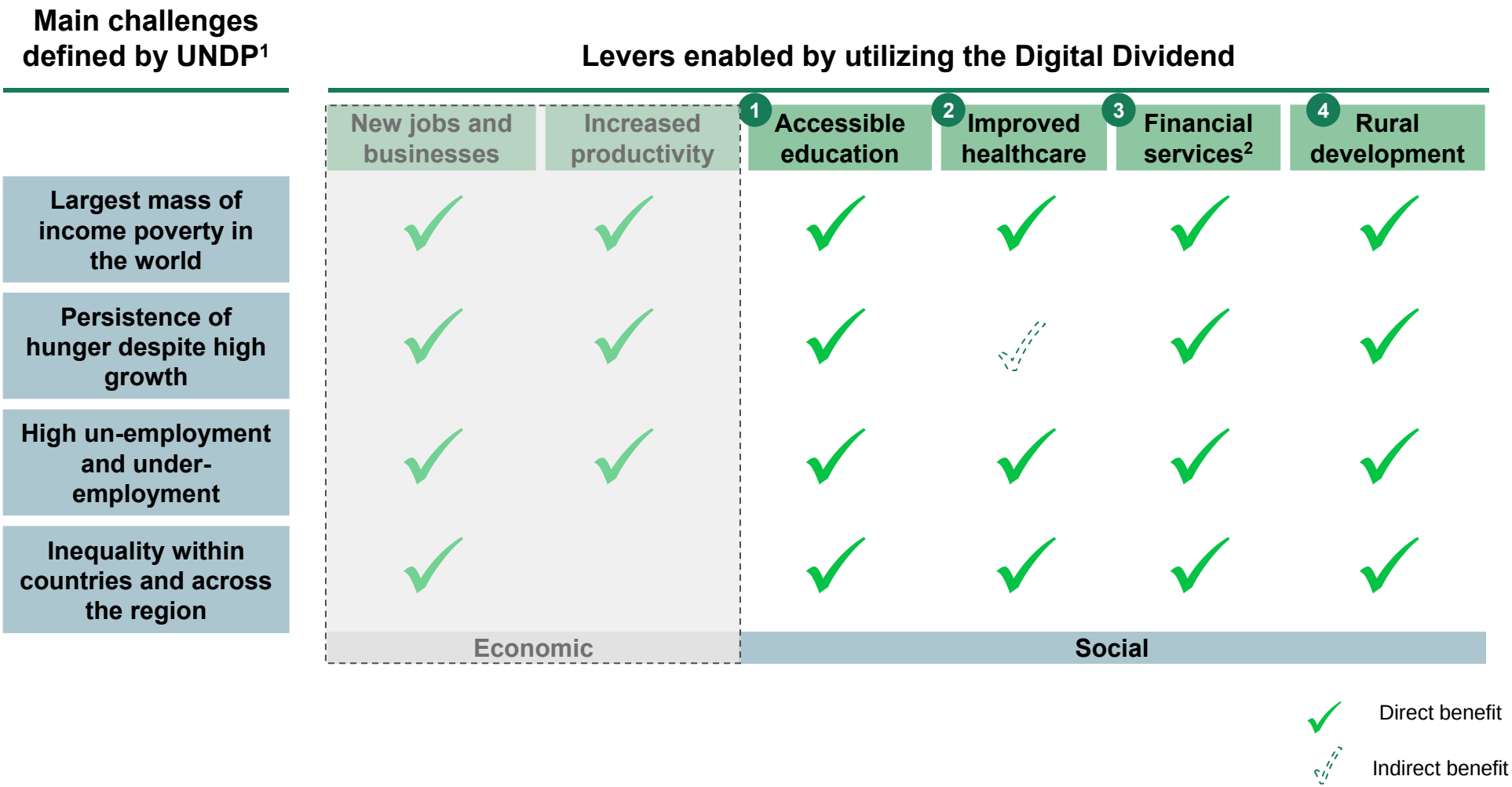
... to assess incremental value of allocating 700 MHz band to mobile



Costs related to digital switchover assumed to be sunk costs, and are not factored in the estimates

Note: Graphs are illustrative

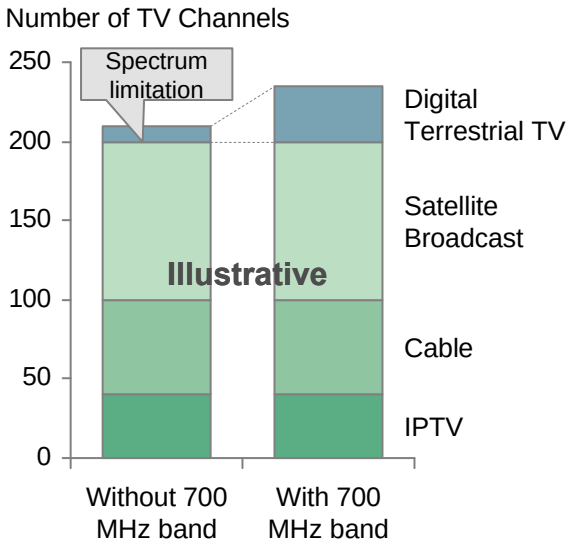
...and four social impact levers to help address the most important challenges across Asia Pacific[1]

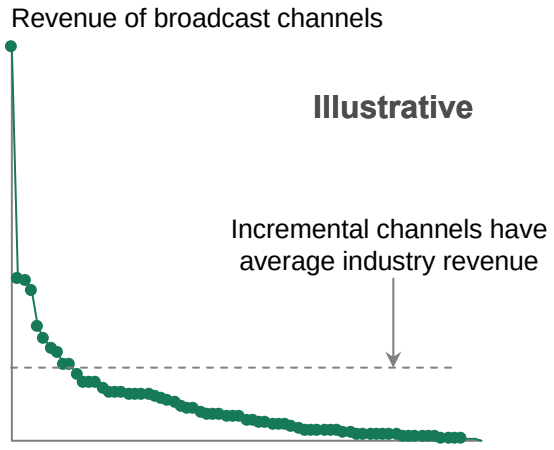


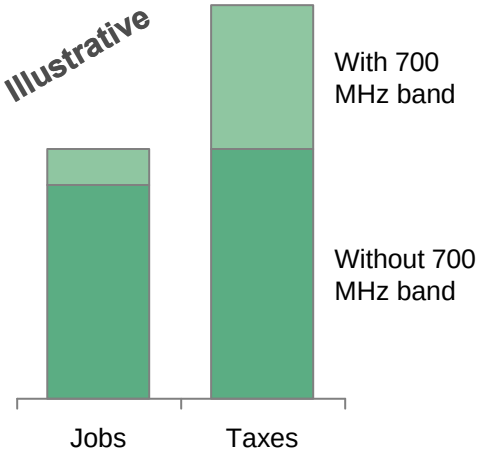
1. As defined by United Nations Development Programme (2009) 2. Including e.g micro-finance, micro-insurance and infrastructure for targeted financial aid from government and NGOs
Source: UNDP

Broadcast impact calculated with best-case assumptions, to ensure conservative estimates of mobile benefit

700 MHz band allows more TV channels... → **Generating revenue across supply chain...** → **As well as broadcast jobs and taxes**







Generous assumptions on additional channels

- 25-35 additional channels are technically possible in most countries
- Possibility that channels may not be commercially viable deliberately excluded

Optimistic revenue assumptions: overall industry effect may be lower

- Additional channels will cannibalize existing offerings
- Marginal channels likely to be niche

Few spinoff effects to general economy

- Existing public service channels already provide wide range of educational content
- Special interest groups well served by cable/satellite

Analysis of four representative study countries extrapolated to estimate impact for entire Asia Pacific

Countries clustered based on HDI[1], urbanization and mobile penetration...

Current human development level

- Increased mobile access, particularly in rural areas, has potential to improve education, healthcare, rural employment, etc.
- Current UN Human Development Index (UN HDI) score used as metric of development

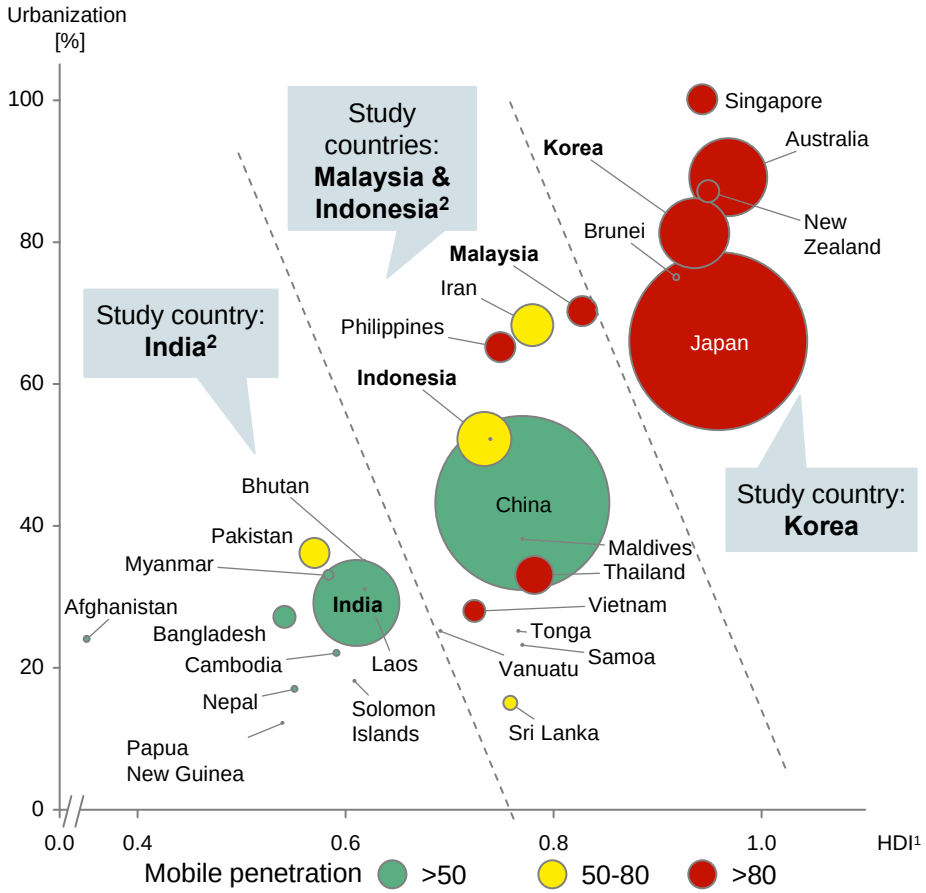
Rural-urban split

- High proportion of rural, low-density population increases incremental value of 700 MHz band

Mobile penetration

- High mobile penetration decreases incremental value of 700 MHz band

... and representative countries modeled to aggregate socio-economic impact



1. Human development Index 2. Two countries chosen to reflect diversity of cluster 2. Two regions modeled to reflect country diversity
Note: Size of bubble denotes GDP at constant prices (2009) , Kiribati, Marshall Islands, Micronesia, Tuvalu and North Korea omitted as HDI is not reported
Source: IMF; UNDP; CIA World Factbook; ITU; BCG Analysis

Agenda

Introduction and methodology

Adoption

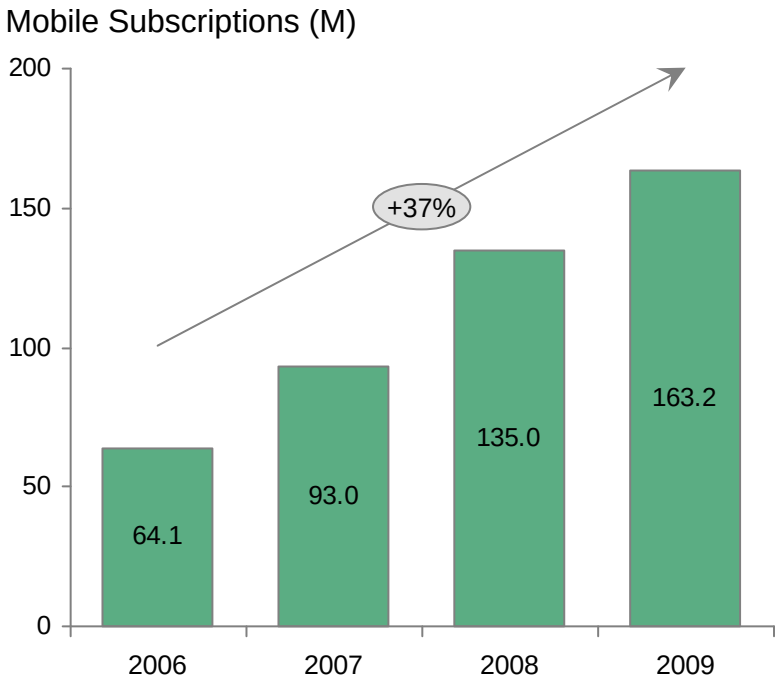
Economic benefits

Social benefits

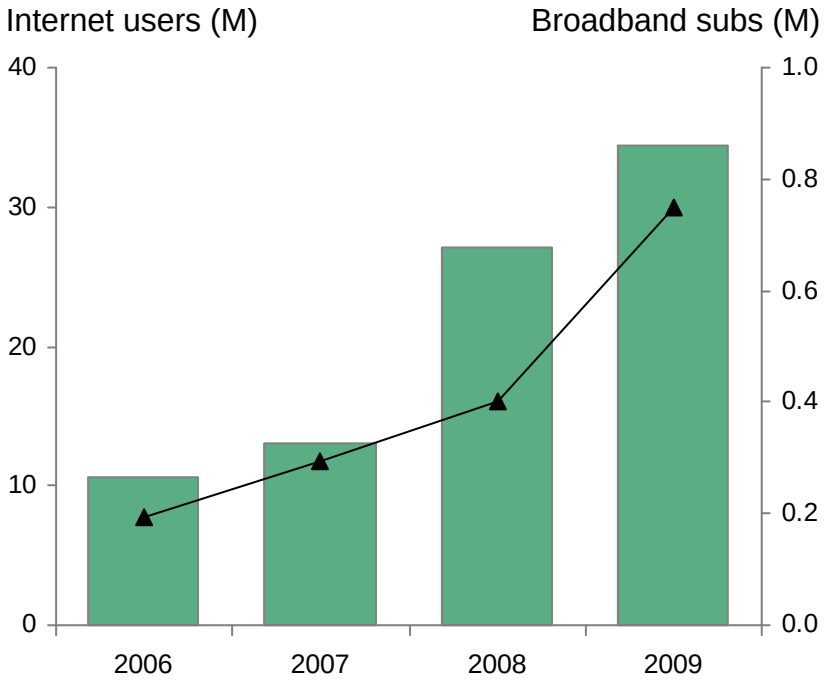
Implications for governments and regulators

Indonesia Today: Growing internet and mobile phone usage, but broadband is lagging

High mobile penetration at ~70%



High number of Internet users, but few broadband connections



HDI	Urbanization	Population
0.72	52%	230M

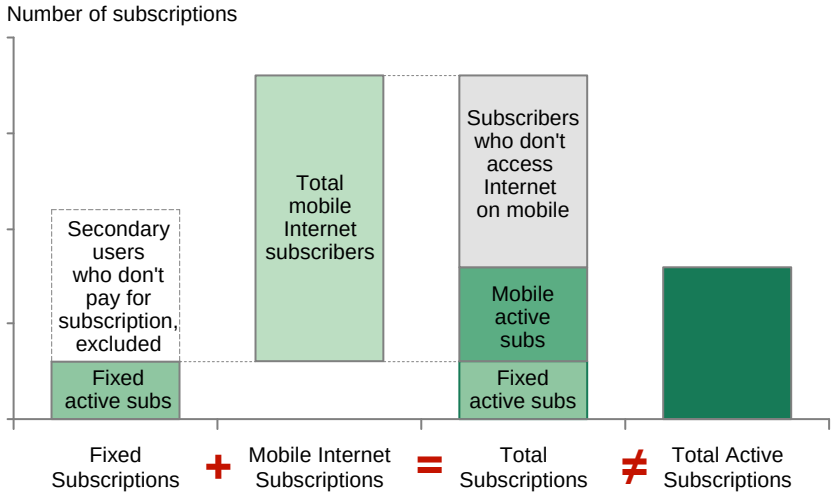
Source: EIU, UNDP

Baseline Internet penetration calculated as Active Subscriptions, to better predict economic impact

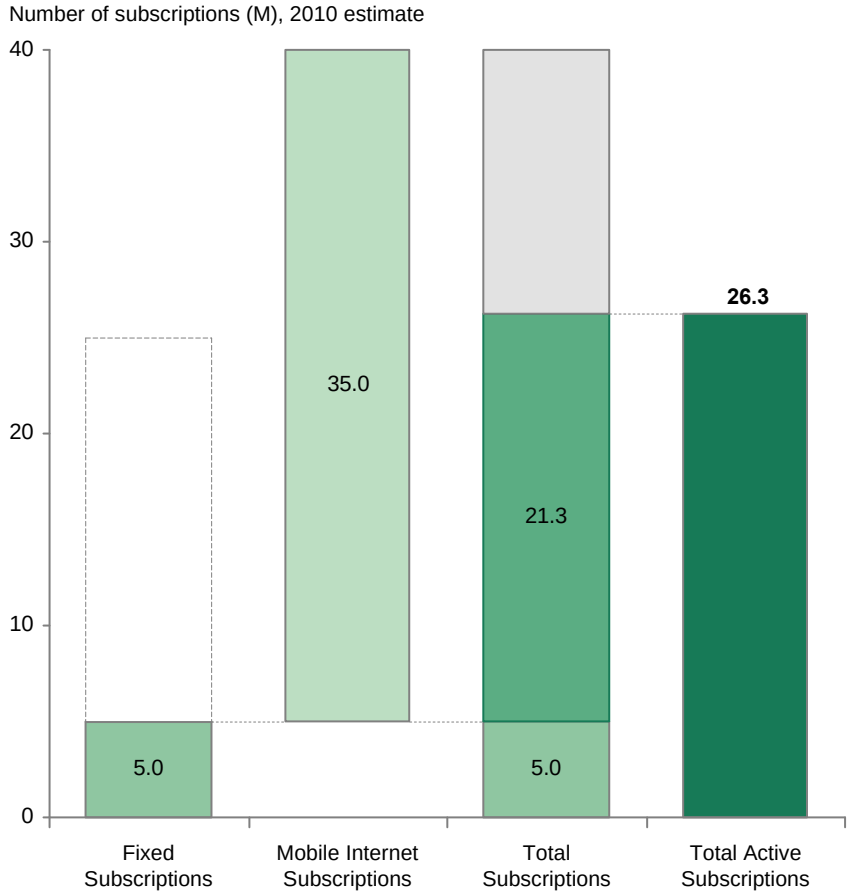
Internet statistics differ according to subscription vs usage

For fixed line internet, generally Users > Subscriptions
- Many people use internet at cafes, or share in household
- Each subscription often shared with secondary users

- **For mobile internet, generally Users < Subscriptions**
- "Subscriptions" counts people with Internet-enabled phones[1] in areas with 2.5G or better coverage
- A subscription could potentially go unused due to unwillingness to pay incremental data charges or lack of awareness of the Internet

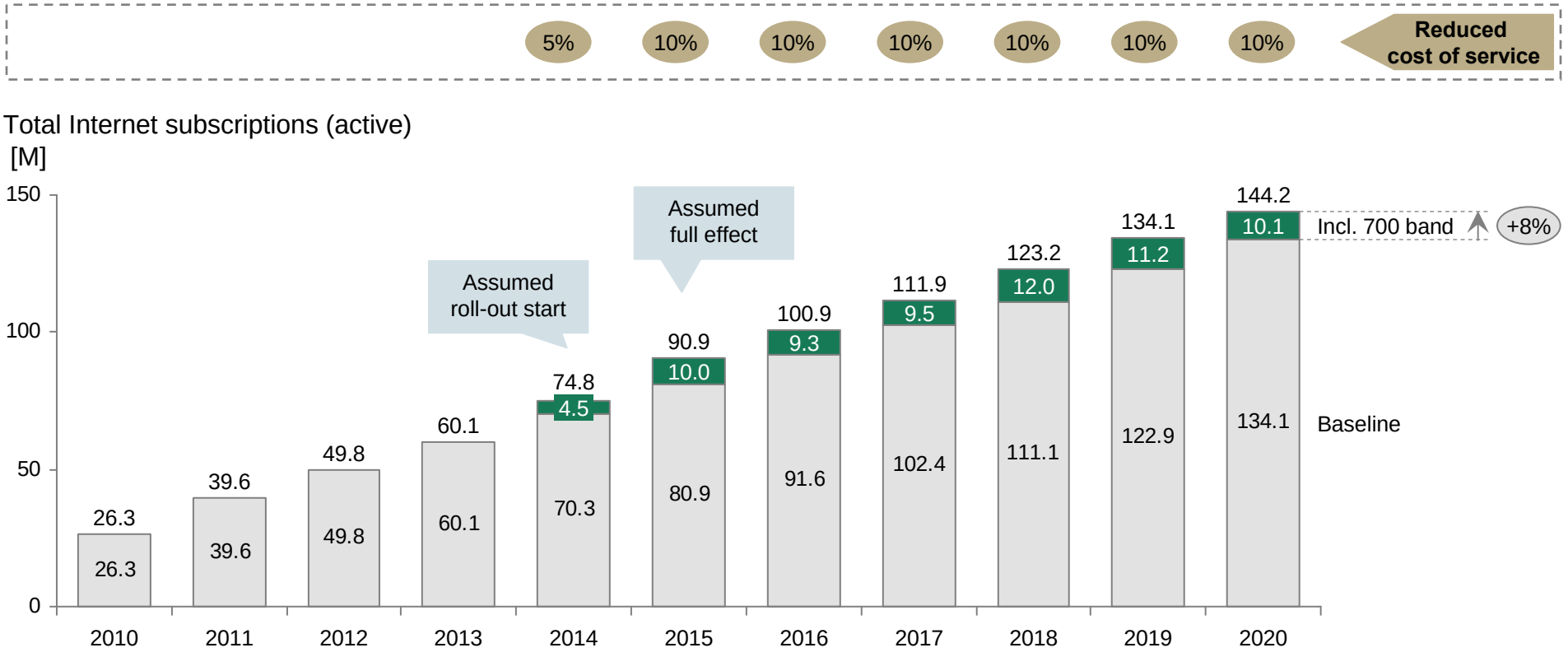


2010 baseline aligned with national and industry statistics



1. Includes dongles and other wireless data devices Note: subscription numbers not explicitly quoted are estimates for illustrative purposes
Source: Industry numbers; BCG analysis

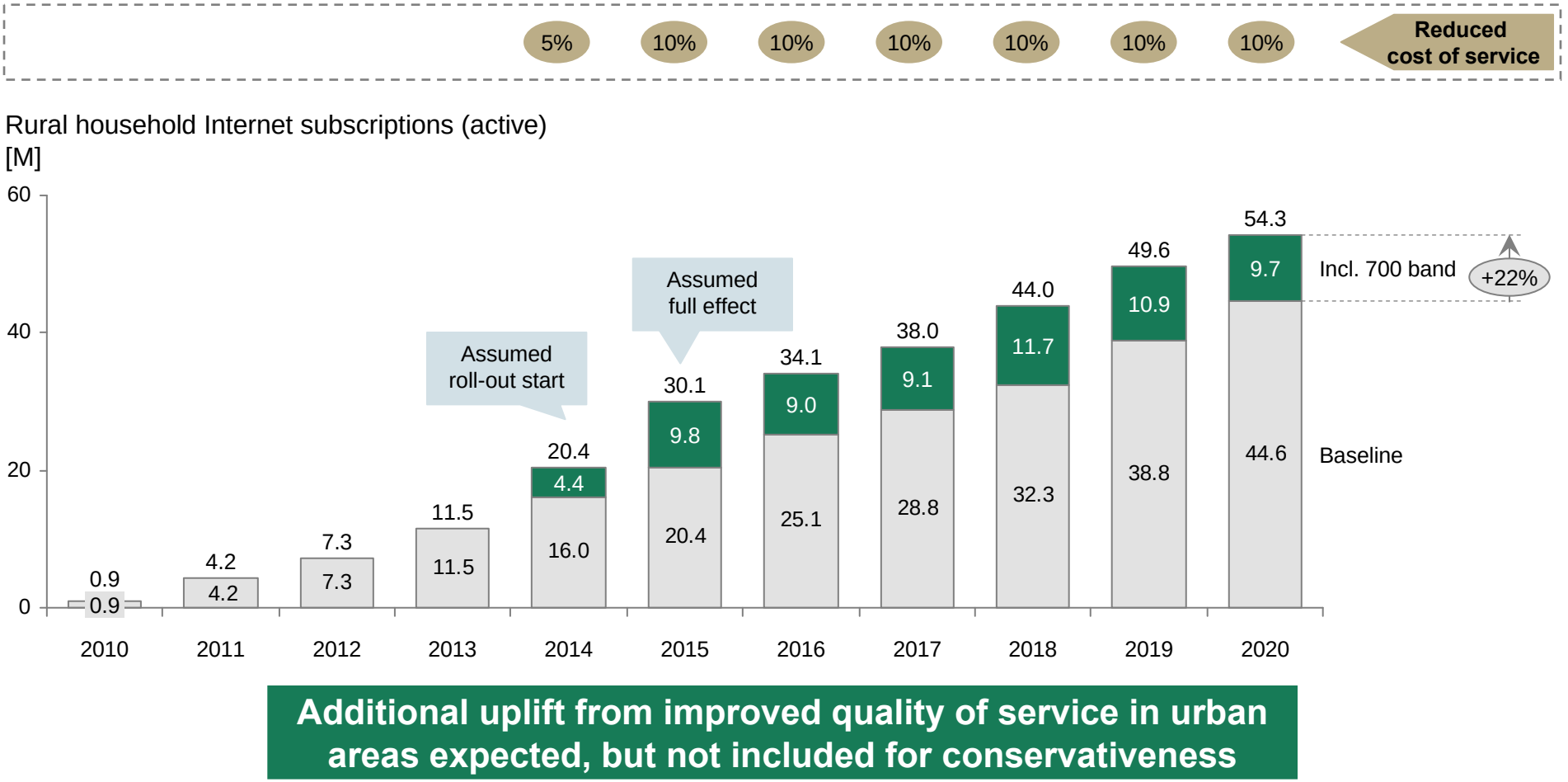
Overall Internet subscriptions expected to increase 8%, representing an additional ~4 subscribers per 100 population



Digital switch-over assumed in 2014 for comparability, impact of delaying estimated in Regulatory Implications

Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

Increase driven by rural households, the main beneficiaries of 700 MHz band



Additional uplift from improved quality of service in urban areas expected, but not included for conservativeness

Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

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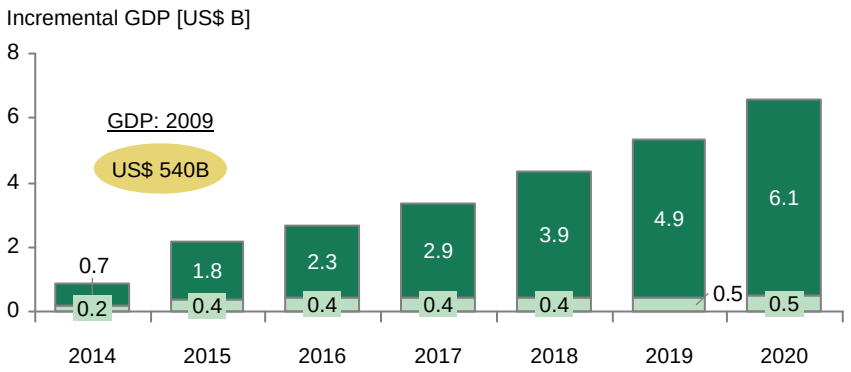
Economic benefits

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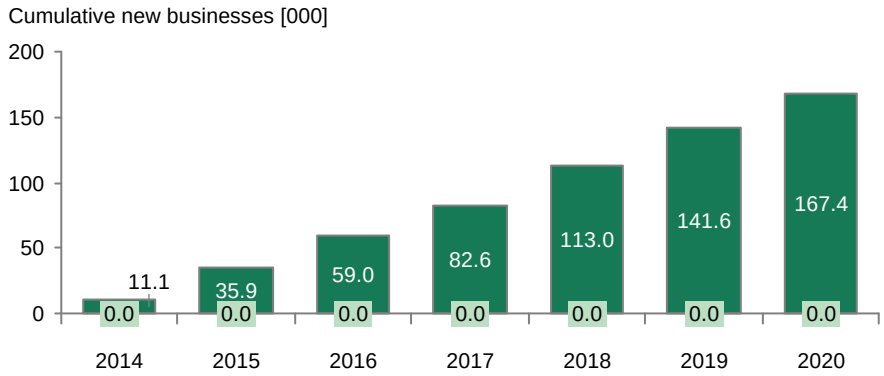
Implications for governments and regulators

Allocation of 698-806 MHz band to mobile will have significant incremental economic benefits over broadcasting

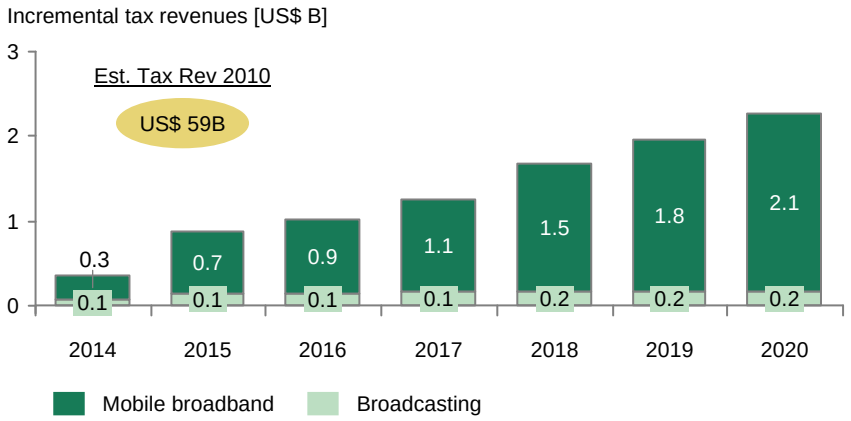
GDP to increase US$22.6B 2014-2020 (US $15.9B[2] NPV)



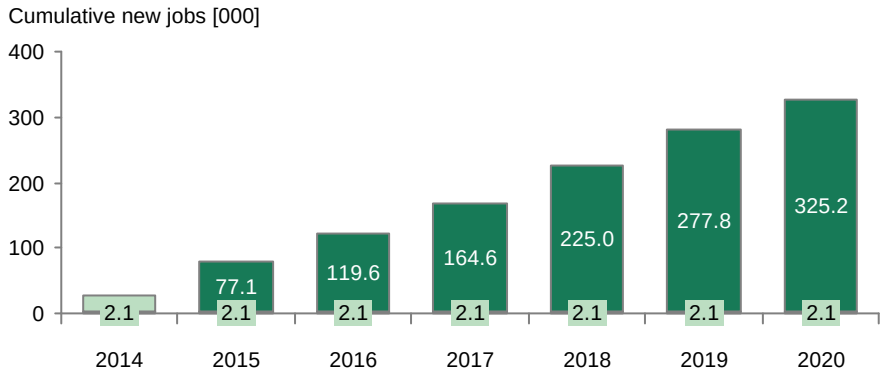
167K new businesses by 2020



Government revenues up US$ 8.4B (US $5.9B[2] NPV)



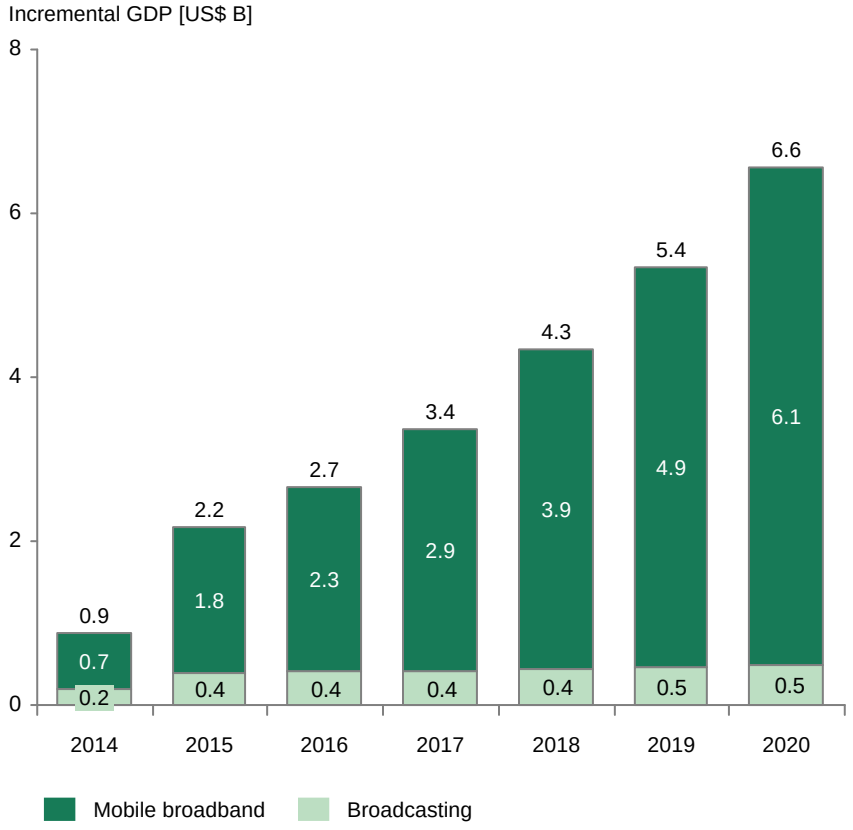
325K new jobs created by 2020



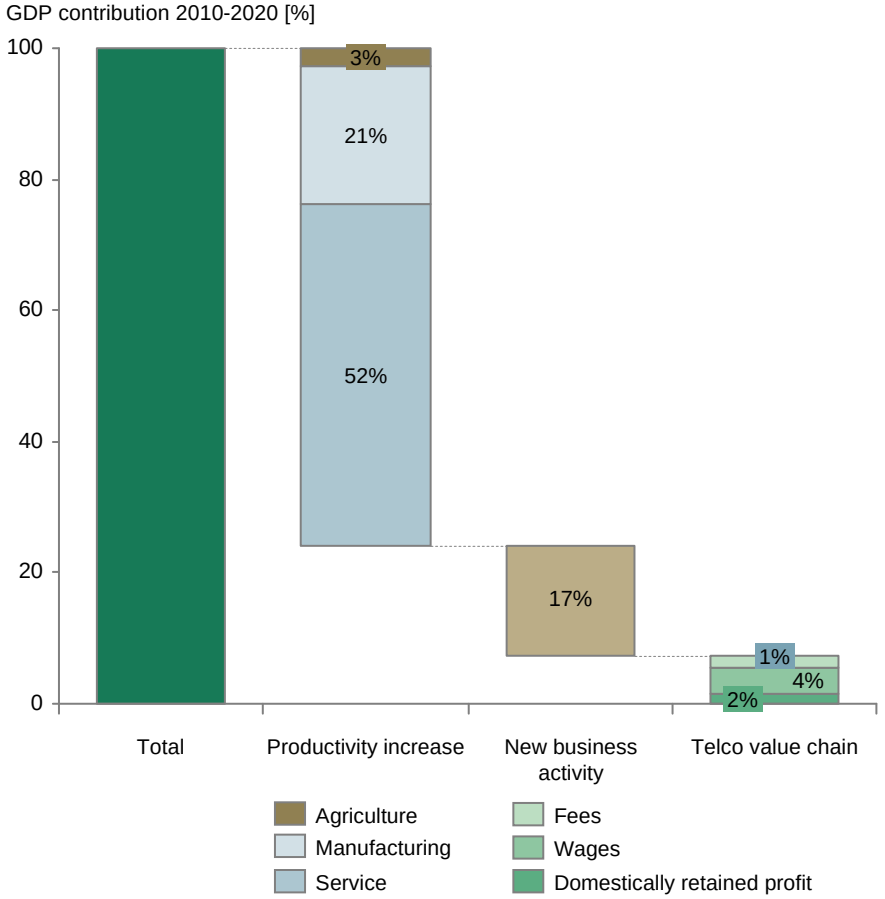
1. Referred to as 700 MHz band 2. Net present value based on 1-year GSec rate of 4%
Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

Total GDP will increase ~US$ 22.6B for the period 2014-2020

US$22.6B in GDP for 2014-2020 (US$15.9B[1] NPV)



... largely driven by increase in business productivity



1. Net present value 2010-2020 based on 1-year GSec rate of 4%
Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

~0.2% and 0.4% additional uplift in manufacturing and service firms' productivity due to greater rural adoption

Internet enhances productivity in a range of business operations

Suppliers

- Integrated supply chain reduces lead time & stock levels, as well as optimize logistic and cash management

Customers

- Online services can improve customer satisfaction, reduce costs
- E-commerce and online marketing increase selling opportunities

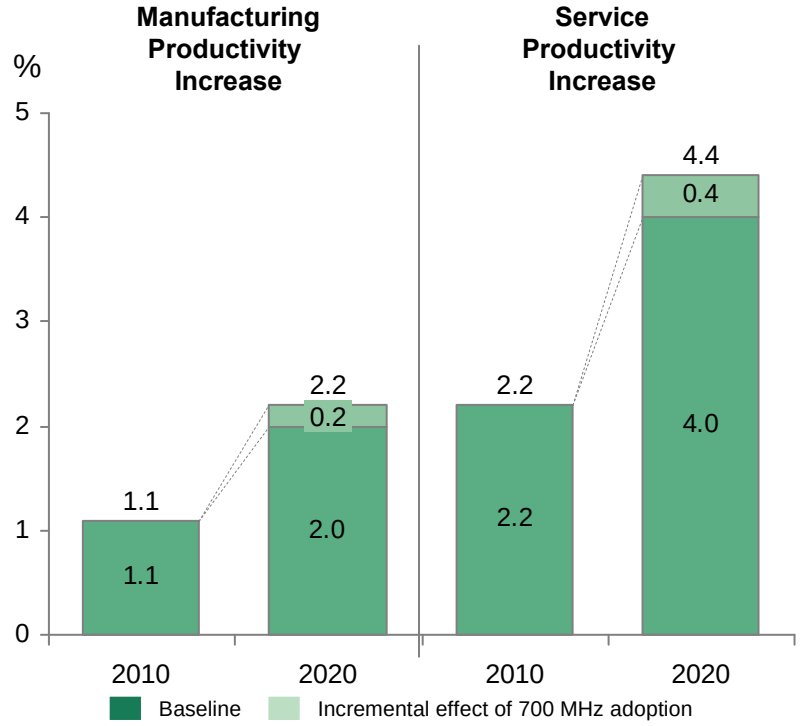
Internal process

- Intranet & email aids knowledge sharing within organization
- Streamline process saves time & allows employees to focus on core activities

3rd party transaction

- Electronic transaction with 3rd party such as banks and government saves travel time and improve efficiency for companies

The 700 MHz band's potential to increase rural adoption will spur additional gains



No productivity increase expected from allocating Digital Dividend spectrum to broadcasting

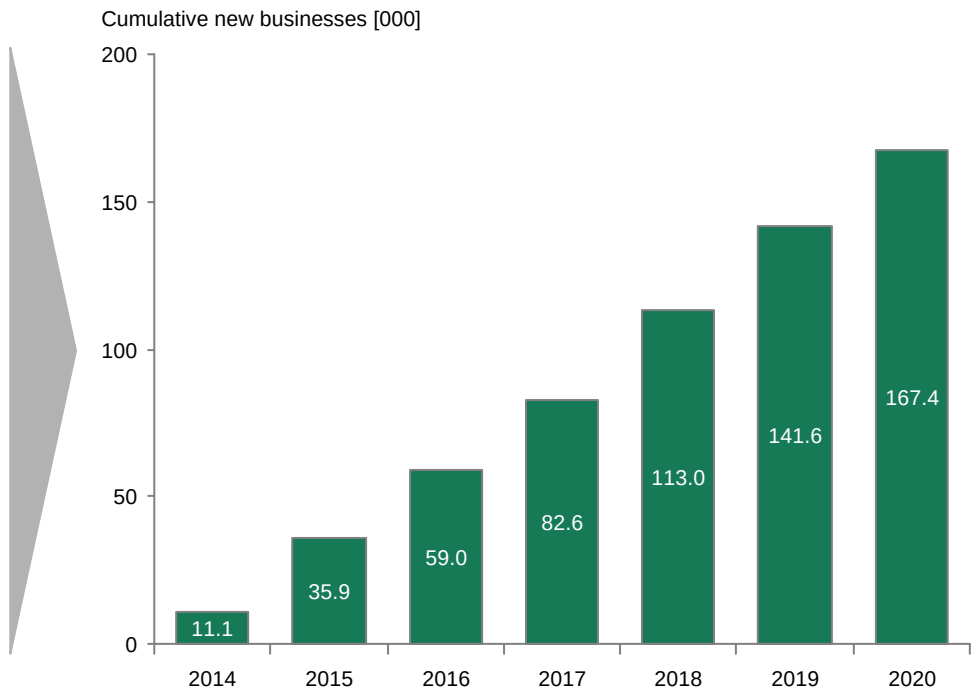
Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

Allocation of 700 MHz band to mobile could result in 167K new business activities[1] by 2020...

Increased Internet penetration creates opportunities in new spaces ...

Website design	ICT training	e-commerce for existing businesses
ICT maintenance	e-job services	Online specialty stores
Education application	Agricultural trading	Programming
Online outsourcing	Entertainment content	Hardware / software reseller

… contributing to the generation of new businesses activities



1. New business activities includes establishment of new independent businesses as well as new departments/units/business areas within existing firms
Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

...and create ~325K additional jobs relative to broadcasting

New business activity will drive job creation

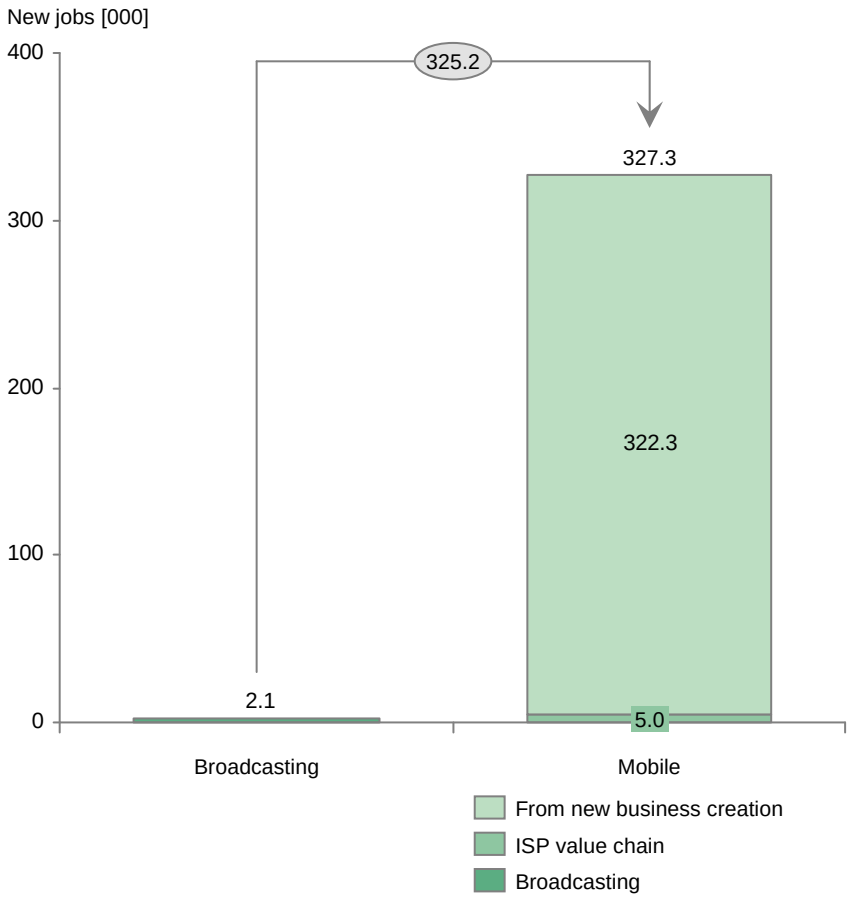
New businesses created as a result of 700 MHz band will create more opportunities for employment

- Diverse range of opportunities, from high-skilled technical roles to basic service functions, e.g., distribution of goods
- Significant portion should be created in rural areas, as 700 MHz band enables new business models

Although increased productivity in additional firms should spur further job creation, this is excluded from the analysis

- In line with general approach of making conservative assumptions where possible

325K more jobs created by 2020 compared to broadcasting



Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

In total, allocating 700 MHz band to mobile could contribute additional US$ 8.4B[1] to government revenues 2014-2020

Productivity benefits of mobile drive increased tax revenues for government

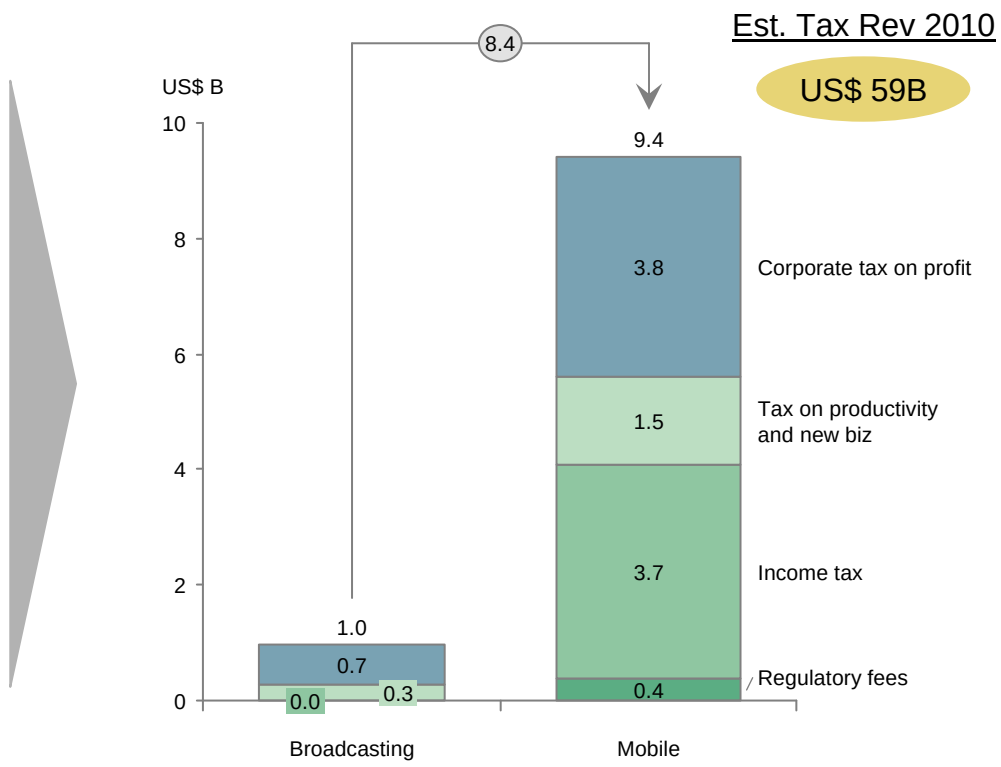
700 MHz band will increase productivity, and hence output, which will in turn increase government revenues

- Increased adoption by rural industries
- Greater adoption of mobile broadband to supplement fixed broadband

Incremental taxes from mobile broadband estimated to be 9.4B over 6 years

- Accrual from mobile broadband expected to be ~US$ 8.4B[1] more than from broadcast
- Incremental broadcasting taxes likely to be lower than the estimated US$1.0B, as some of the profits for the new channels will come at the expense of existing channels

Net benefit over broadcasting expected to be ~US$ 8.4B[1] for 2014-2020 period



1. US$ 5.9B net present value 2010-2020 based on 1-year GSec rate of 4%

Source: Badan Pusat Statistik; Directorat Jenderal Pajak; Gartner; Ovum; AMI Partners; BCG analysis

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700 MHz band based mobile broadband can significantly improve social benefits from Internet access

While general Internet access already brings advantages to a community...

- **Access to information**
- **Basic IT literacy**
- **News and current events**
- **Access to remote markets**



... 700 MHz band based mobile broadband will bring greater benefit

Lower cost will increase connections in homes, especially in low income and rural communities

- Enables Internet access for disadvantaged groups (e.g., women and elderly)
- Opens the possibility of home-based micro-entrepreneurship via Internet

Higher potential speed paves the way for high bandwidth applications

- Rich content and visualization engines

700 MHz band for mobile has the potential to create a step change in how people use, and benefit from, the Internet

Source: One Laptop per Child

Mobile broadband can help address Indonesia's most pressing challenges to "Development for All"[1]

National Priorities defined by Medium-Term Development Plan:

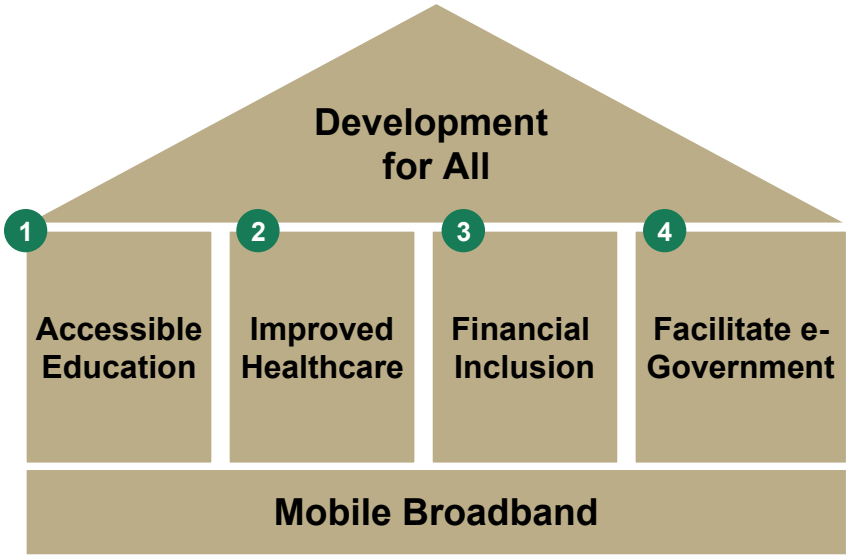
Reform the Bureaucracy and Governance
- Enhance performance and increase quality of service
- Increase efficiency of sub-district and villages

Increase access to education
- "Increasing access to education that is of sound quality, that is affordable, relevant, and efficient"
- Reduce price of material and provide Internet access

Improve healthcare
- Health development and prevention of illnesses
- Reach all Millennium Development Goals by 2015

Reducing poverty and improve inclusion of all
- Improve mechanism for distribution of micro-finance
- Spur micro-entrepreneurship

Levers enabled by utilizing the Digital Dividend



Digital Dividend spectrum can be an important lever to reduce inequality between Java and remote parts

1. Prime Minister's address to House of Representatives 19 August 2009
Source: UNDP; Report on the Achievement of Milllennium Developmet Goals 2007

Mobile broadband can help address key issues in education

Most benefit to rural regions, which lag behind urban areas in enrollment, literacy rates

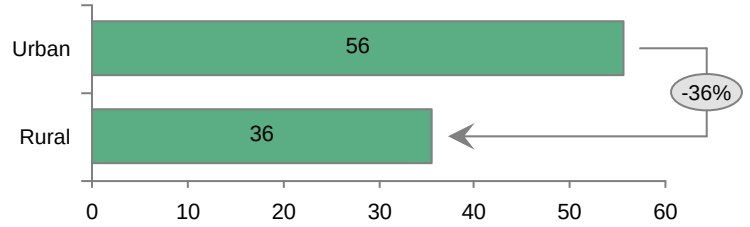
Key challenges in rural education

Rural schools face significant resource constraints

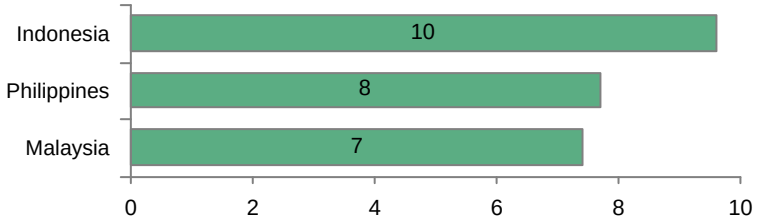
- Lack of qualified teachers, especially in rural areas
- Lower access classroom resources (e.g., textbooks, equipment, etc.)

Low secondary school enrollment across country

- Significant lag in secondary school enrollment between rural and urban areas ratio
- Structural barriers to school enrollment as youth often seek income opportunities rather than stay in school
- Secondary school net enrollment ratio, 2007



High illiteracy rates compared to regional neighbors
(% of illiterate population, 2007):

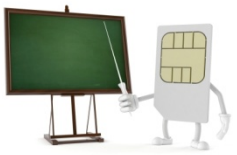


700 band for mobile enhance education



Improve literacy through mobile-learning

- Remove barriers to classroom learning
- Support broader learning initiatives
- E.g. Yoza.Mobi cellphone stories



Encourage out-of-classroom learning

- Encourage opportunistic learning and engagement with materials outside of classroom



Access to high quality class-room materials (e.g., online textbooks)

- Cost-effective way to equip classroom with materials
- Materials can be easily updated to include the latest information and customized for different age groups/setting

Source: Indonesian Education Ministry; UNDP Human Development Report 2007; One Laptop per Child; Yoza.Mobi

Mobile broadband can improve quality and access to educational opportunities for rural areas

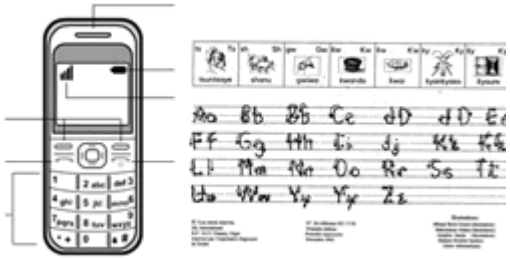
Encourage literacy

Mobile literacy programs can remove barriers to school enrollment with learning available anywhere

- e.g., CITRUS Seed Project designed special mobile literacy programs and installed them on cellphones of 1750 rural villager in Niger

Mobile broadband can also be used to support broader literacy initiatives

- e.g., m4lit published a short novel via mobile aimed at encouraging youth leisure reading; readers invited to interact with story and post comments, etc.



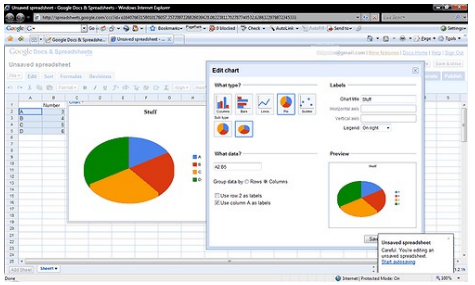
Online tools enforce classroom experience

Mobile broadband allows access to high-quality classroom equipment

- Rural users with basic devices can access online education tools
- Cloud-based programs such as GoogleDocs removes need to buy programs, (e.g., word processing tools, dictionaries, thesaurus, calculators, etc.)

Mobile broadband provides cost-effective textbook replacement

- Online textbooks can be updated and tailored to specific groups
- Cost-effective and convenient- e.g., prevents need to carry textbooks back and forth



Enhance opportunistic learning

Educational applications encourage opportunistic learning outside classroom

- Engages students with materials;
- Opportunistic/spontaneous learning

E.g., MILLEE project installed interactive language games onto smartphones

- Results show that rural children in India and China voluntarily used cellphones to access educational content

E.g., BBC Janala, an multimedia educational initiative in Bangladesh

- 3000 English quizzes available over mobile phone and Internet
- 12k registrants, who wanted to interact with other learners



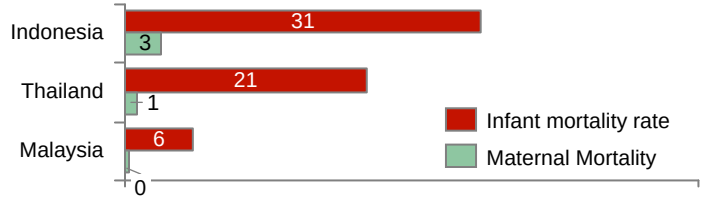
Source: MILEE Project; Carnegie Mellon University; MIT M4Lit; CITRUS seed Program; Google

Mobile broadband can improve healthcare outcomes and delivery in Indonesia

Key issues in Healthcare

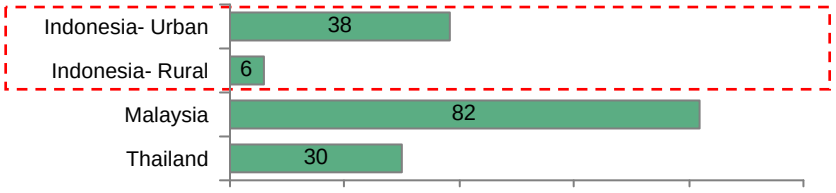
Maternal mortality rate among highest in region

- Deaths prevalent in rural areas where 1 in 6 have home births without skilled health workers
- Infant/Maternal mortality rates/100K live-births, 2008:



Fewer doctors serving rural regions, leading to uneven healthcare quality

- Doctors/100,000 population, 2006:



Tuberculosis and HIV/AIDS infection accelerating sharply across country

- Limited awareness of disease prevention tactics
- Spread of infectious diseases still a risk

Broadband can enable health outcomes



Enhance rural healthcare delivery

- Ensure availability of critical health care services (e.g., diagnostics) in remote and resource-poor regions



Provide tools for health education and awareness

- Allows access to critical information on health to rural poor
- Facilitates continuing education for healthcare professionals



Improve tracking of health indicators and disease

- Improve collection and analysis of in-country health information
- Allows for better tracking and warning of diseases and epidemics
- Facilitates policy-making and investment through data policies

Source: EIU, UNDP, Bappenas, UNICEF

Mobile broadband can facilitate service delivery and enhance education and healthcare tracking

Enhance healthcare provision to rural areas

Increase access to specialist support and remote diagnosis by augmenting "medical assistant program"

- "Medical assistants" go to field to meet patients and run samples, dispense medication, etc.
- Diagnosis offered by doctors in urban hospitals via e.g. camera-enabled smartphones or webcams
- Increasing reach and reducing cost of treatment

E.g., ClickDiagnostics' mobile telemedicine

- Patient data and images transmitted via mobile broadband to remote doctors who perform consultations
- Facilitates e.g. tele-dermatology and radiology, as well as prevention, treatment and follow-up of TB, HIV/AIDS and maternal health





Increase access to critical health education

Facilitates training of rural healthcare workers

- Educate community healthcare workers, doctors and nurses on advances in treatment
- Medical assistants and healthcare workers being empowered with remote diagnostics will over time learn what advice to give for a range of typical symptoms

Ensure availability of critical disease information in underserved areas

- Critical information made available to rural areas
- Especially important on "taboos" like contraception, maternal health and HIV/AIDS
- e.g., UNAIDS tapping into social networking sites (e.g., Facebook, Youtube) to spread outreach information on HIV/AIDS



Source: BCG Research; Press search; Journal of Health Informatics in Developing Countries; UNAIDS; ClickDiagnostics; Digital Opportunity

Mobile broadband can help combat poverty by improving livelihoods and increasing financial inclusion

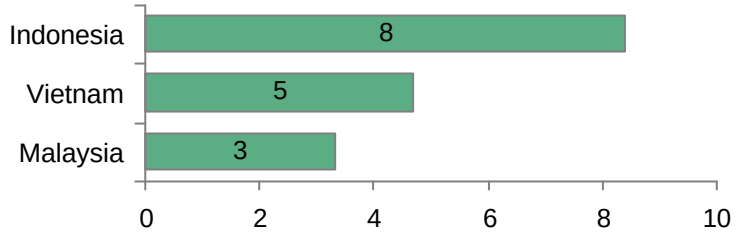
Indonesia with high poverty rates and unemployment

Extremely high poverty rate in rural areas

- >15% of rural population living below the poverty line (20.6M people in 2009)
- Large income gap between urban and rural households

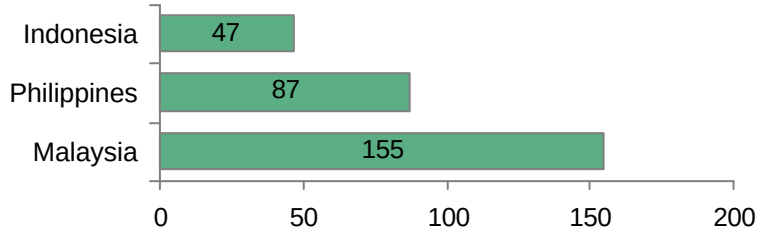
High unemployment rates throughout country,

- Unemployment rate, 2008 (%)



Lower levels of financial service access

- ~ 40 million low-income Indonesian's still lack access to basic financial services; many have cellphones but no bank accounts
- Estimated deposits/GDP, 2009:



Mobile broadband to encourage financial inclusion



Enables household entrepreneurship opportunities

- Access to global and regional markets increases employment opportunities



Improves access to basic financial services

- Mobile-banking brings banking to underserved rural markets
- Mobile-payment systems offer a safe alternative to cash

Source: EIU, Central Statistic Agency, Press Search

Mobile broadband can improve economic and employment opportunities for Indonesia

Enables home-based entrepreneurship

Mobile broadband opens regional and global markets to home-based entrepreneurs

- Increases livelihood potential and opportunities
- Opportunity to sell goods and services to global marketplace

Potential to participate in global labour/service outsourcing

- Leverage mobile broadband to bring jobs to rural areas
  - Data imaging and formatting
  - Application processing
  - Etc.
- Example is Source for Change, which created employment opportunities for women in rural India



Improves rural access to basic financial services

Mobile-banking provides service to those with no access to branches

- Convenient, safe and costless way of saving money
- Transaction costs much lower than traditional branch network

Mobile broadband allows for safe, convenient payment methods

- e.g., Nokia Money allows individuals without bank accounts access to more sophisticated financial services via the mobile Internet than could be delivered through SMS



Source: BCG Research; BCG Case experience; Science Daily; Meaningful Broadband; Nokia Money ; Source for Change

Broadband-enabled services could greatly increase bureaucratic efficiency at national and sub-district level

Indonesia has significant scope to implement e-Government services

Reduce costs with traditional paper-based filing
- Large staff required to store/manage documents
- High transportation and postal expenses of documents if stored at different locations
- High cost of paper, printers, cartridges, etc

Improve quality and availability of services
- Free up resources to provide high-quality service
- Reduce red tape and processing times
- Improve national competitiveness

Canada's eGovernment services one of best worldwide, generating high user satisfaction

Created in 2005 to improve the delivery of government programs and services to Canadians
- Faster, easier and more convenient access

Serves over 32 million Canadians from all walks of life, and across the country
- Including rural, remote, and northern locations

Offers single-window access to a wide range of Government of Canada programs and services for citizens

In 2007-2008 alone, following services provided (list not exhaustive)
- Processed 1.4M requests for Social Insurance Numbers
- Received and reviewed 270K passport applications
- Posted more than 1M job ads
- Hosted 26.6M visits to the Service Canada Web site
- Reached 250K Canadians in remote communities
- Investigated over 770K cases of possible fraud

CAD ~300M of efficiency savings annually and 84% user satisfaction ratings

Agenda

Introduction and methodology

Adoption

Economic benefits

Social benefits

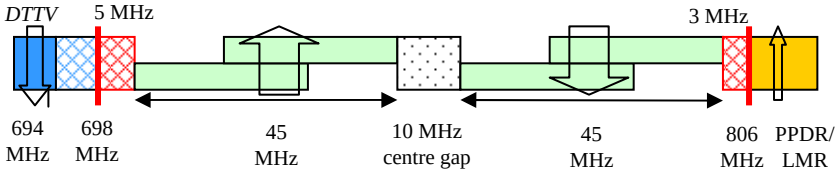
Implications for governments and regulators

Allocation of sufficient and harmonized spectrum has been assumed in the analysis of socio-economic benefits

Sufficient bandwidth needs to be allocated to mobile

2 x 45 MHz needed to provide sufficient bandwidth for effective rollout

- APT harmonized UHF bandplan for IMT within the 698-806 MHz band
- Lower guard-band between 698-703 MHz and an upper guard-band between 803-806 MHz



Adequate bandwidth will facilitate competition between operators, enhancing efficiency and consumer choice and price benefits

Harmonization of spectrum across region necessary to reap full benefits

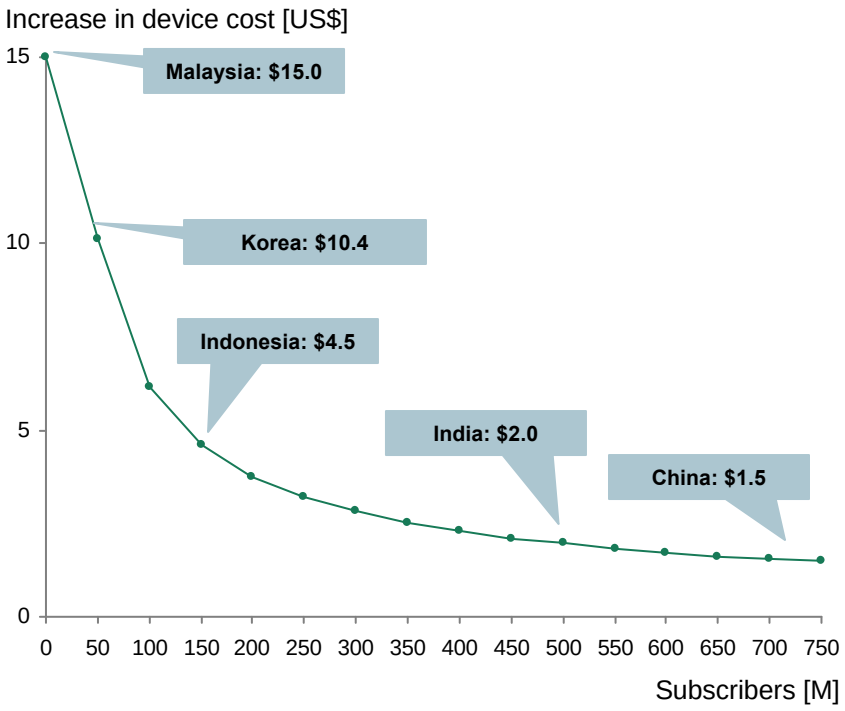
Non-harmonization will drive up cost of hand-sets and make them unaffordable to lower-income consumers

- Lack of frequency harmonization can drive up terminal costs, as providers will not be able to enjoy economies of scale
- Small un-harmonized markets risk being marginalized by equipment manufacturers
- Harmonization will reduce cross-border interference and facilitate improved usage quality

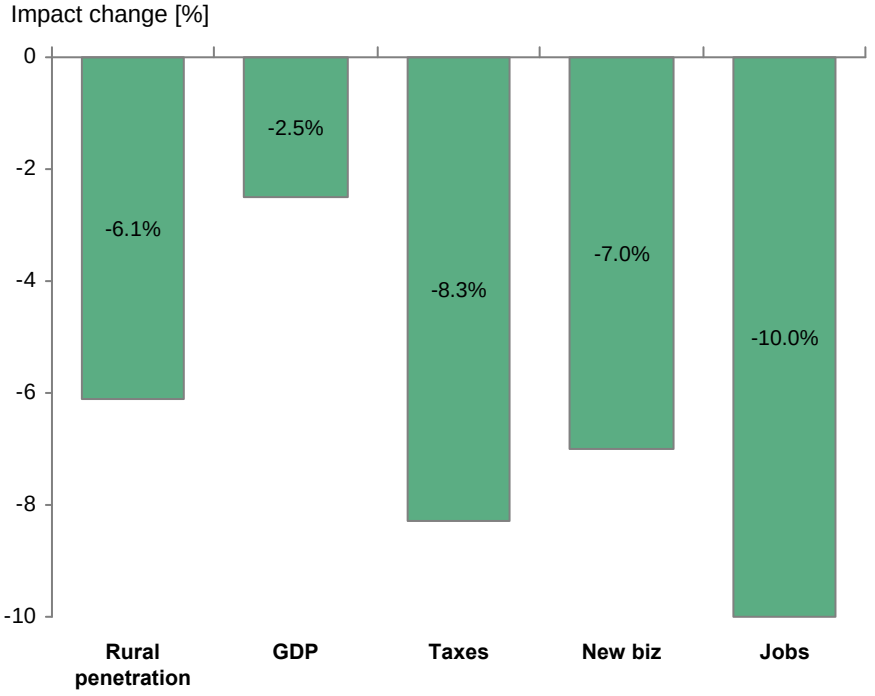
Source: 9th Meeting of the APT Wireless Forum (AWF-9); GSMA

Failure to harmonize spectrum would greatly reduce benefits

Non-harmonized spectrum could increase cost of handset US$4.50...



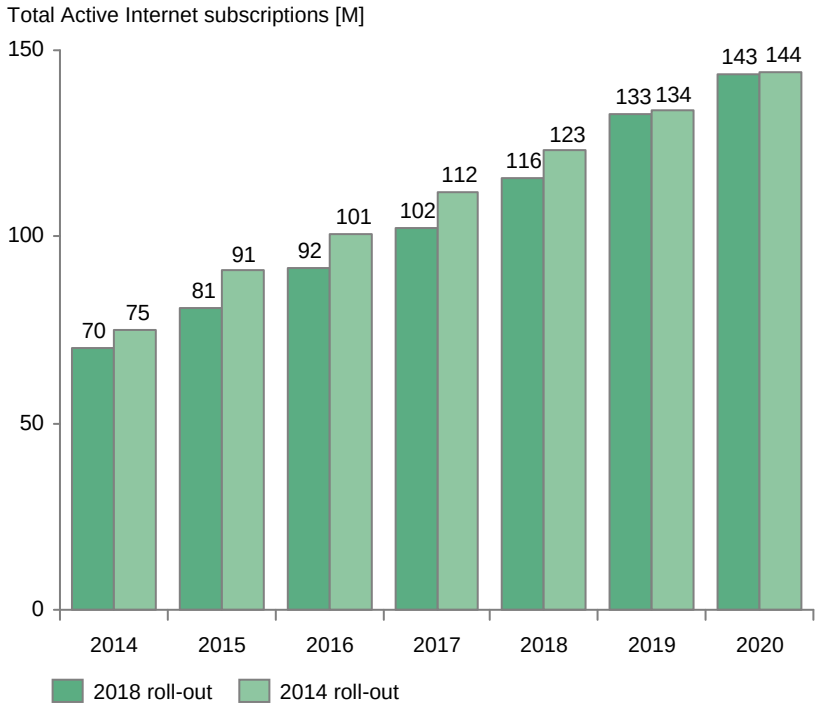
... reducing governmental revenues 8% and new job creation 10%



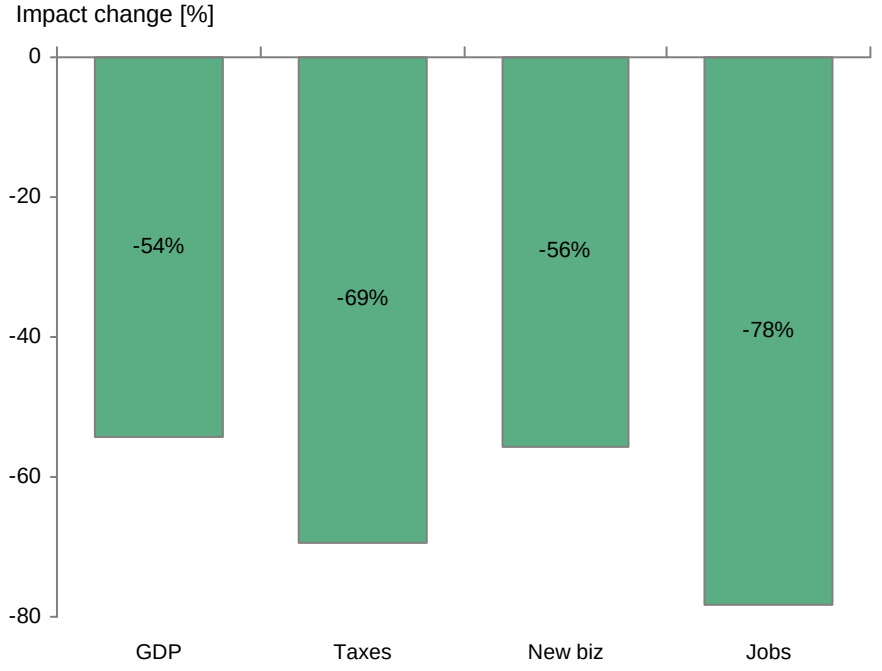
1. Based on interpolation of analysis results by RTT, which assumes a market like China with 80M handsets sold per year will increase prices US$ 1.5, up to US$ 15 for markets with 8M handsets
Source: RTT; GSMA

Postponing digital switch-over until 2018 would also result in loss of benefits in the near term

Postponing roll out of mobile broadband from 2014 to 2018 could...



... reduce governmental revenues 69% and new job creation 78%[1]



1. GDP and taxes 2010-2020 NPV, new business and job creation 2014-2020 cumulative
Source: BCG analysis

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