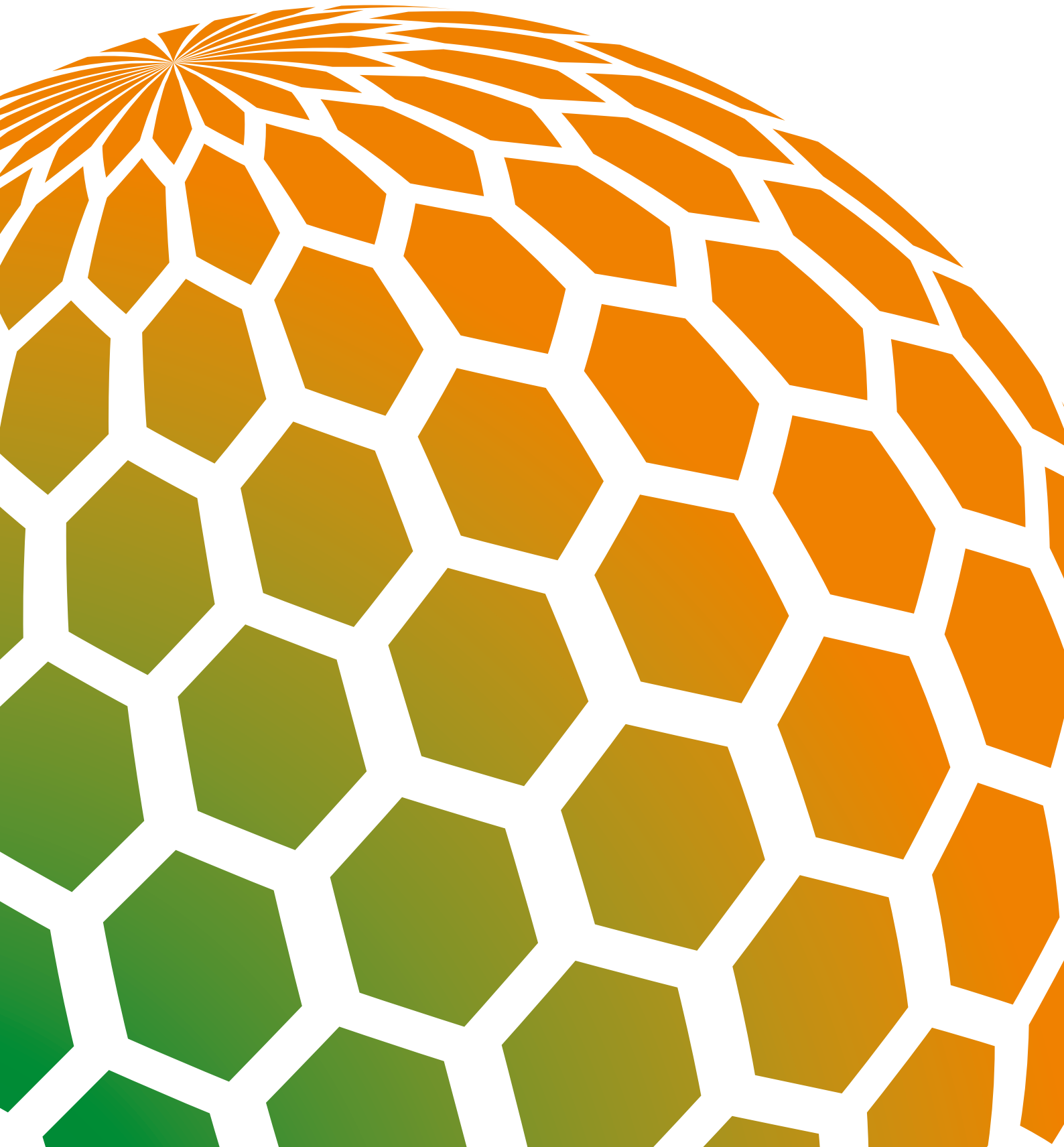




The Mobile Economy India 2013





The **GSMA** represents the interests of mobile operators worldwide. Spanning more than 220 countries, the **GSMA** unites nearly 800 of the world's mobile operators with more than 230 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers and Internet companies, as well as organisations in industry sectors such as financial services, healthcare, media, transport and utilities. The **GSMA** also produces industry-leading events such as the Mobile World Congress and Mobile Asia Expo.

For more information, please visit the **GSMA** corporate website at www.gsma.com

or **MOBILE WORLD LIVE**, the online portal for the mobile communications industry, at www.mobileworldlive.com

BCG

THE BOSTON CONSULTING GROUP

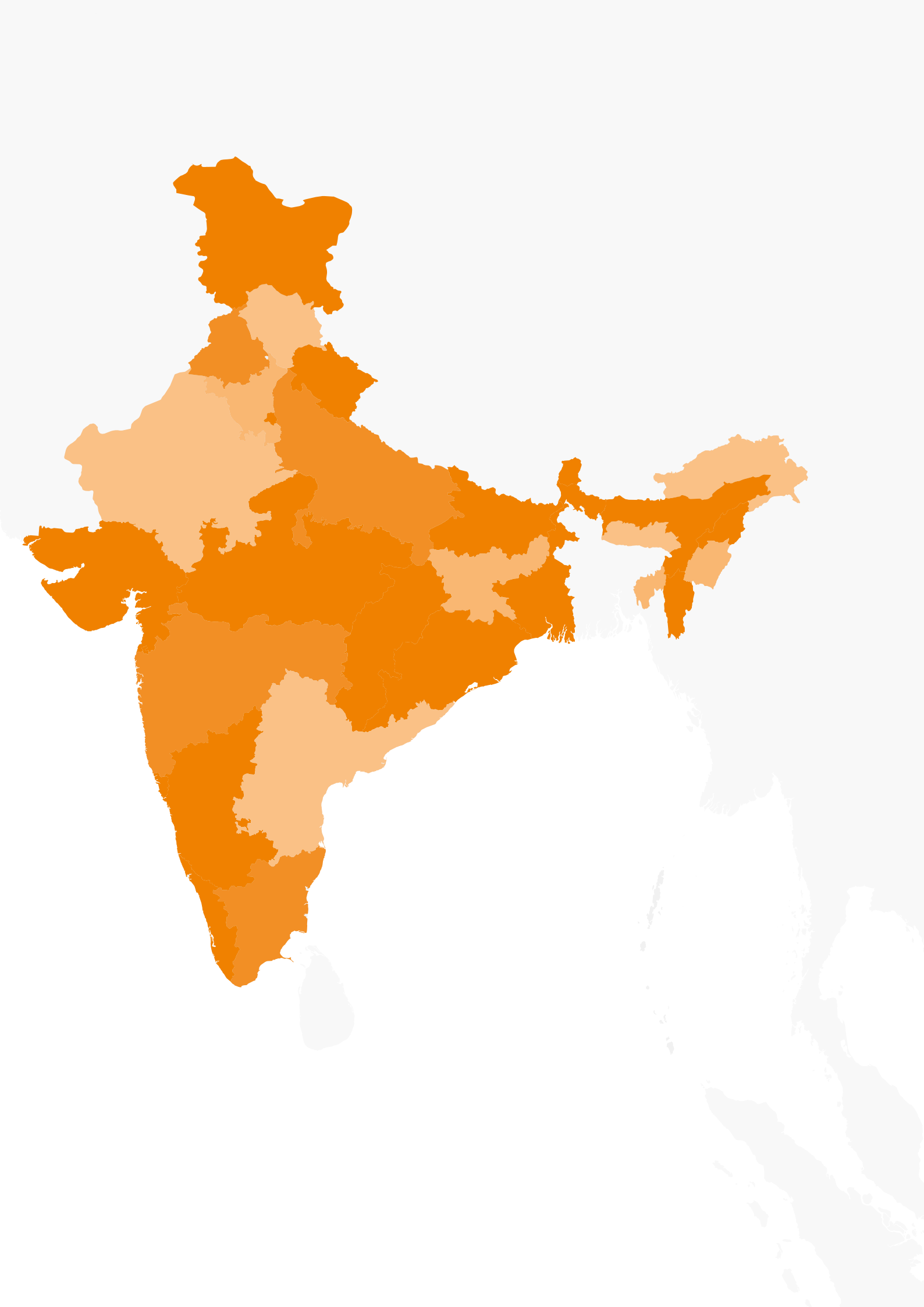
The Boston Consulting Group (BCG) is a global management consulting firm and the world's leading advisor on business strategy. We partner with clients from the private, public, and not-for-profit sectors in all regions to identify their highest-value opportunities, address their most critical challenges, and transform their enterprises. Our customized approach combines deep insight into the dynamics of companies and markets with close collaboration at all levels of the client organization. This ensures that our clients achieve sustainable competitive advantage, build more capable organizations, and secure lasting results. Founded in 1963, BCG is a private company with 78 offices in 43 countries.

These materials were prepared by BCG and may be used for informational purposes only. The opinions and conclusions expressed do not represent official GSMA viewpoints.

The report provides an overview of the situation in India as of October 2013, with numbers used from GSMA Intelligence. BCG has not independently verified all of the data and assumptions used in these analyses, although we have attempted, where possible, to test for plausibility. Changes in the underlying data or operating assumptions will clearly impact the analyses and conclusions. Further, BCG has made no undertaking to update these materials after the date hereof notwithstanding that such information may become outdated or inaccurate.

For more information, please visit the Boston Consulting Group website at www.bcg.com

Or contact
Kanchan Samtani Samtani.kanchan@bcg.com
Mukut Deepak Deepak.mukut@bcg.com



CONTENTS

1 EXECUTIVE SUMMARY	4
2 INTRODUCTION: MOBILE TRENDS IN INDIA	10
3 ECONOMIC IMPACT OF THE MOBILE ECOSYSTEM IN INDIA	16
4 SOCIAL IMPACT IN PRIORITY SECTORS	24
4.1 Healthcare	29
4.1.1 Access to healthcare	30
4.1.2 Communicable diseases	31
4.1.3 Maternal and child healthcare	31
4.1.4 Potential impact and requirements for support	32
4.2 Agriculture	35
4.2.1 Key challenges	36
4.2.2 Potential impact and requirements for support	38
4.3 Financial Services	41
4.3.1 Spreading financial access to the poor	42
4.3.2 Enhancement of citizens benefits by government initiatives	42
4.3.3 Mobile Financial Services in India today	43
4.3.4 Potential impact and requirements for support	44
4.4 Education	47
4.4.1 Access to education	48
4.4.2 Cost of education	49
4.4.3 Quality of education	49
4.4.4 Potential impact and requirements for support	50
5 REGULATORY FRAMEWORK FOR FUTURE GROWTH	53
5.1 Key enablers for future investment	54
5.1.1 Ability to invest	54
5.1.2 Willingness to invest	56
5.2 Policy Call to Action	58
5.2.1 Robust spectrum management	60
5.2.2 Moving away from the Universal Service Fund approach	73
5.2.3 Aligning Radio Frequency exposure limits to global norms	76

EXECUTIVE SUMMARY

India's position in the region



Second largest market by mobile connections and unique subscribers in the world



1/4 of all mobile connections in the APAC region

Sustainable Development in India: 2012 and 2020

GDP



+408%

Employment

2012: 28 LAKH



AN INCREASE TO
41 LAKH
BY 2020

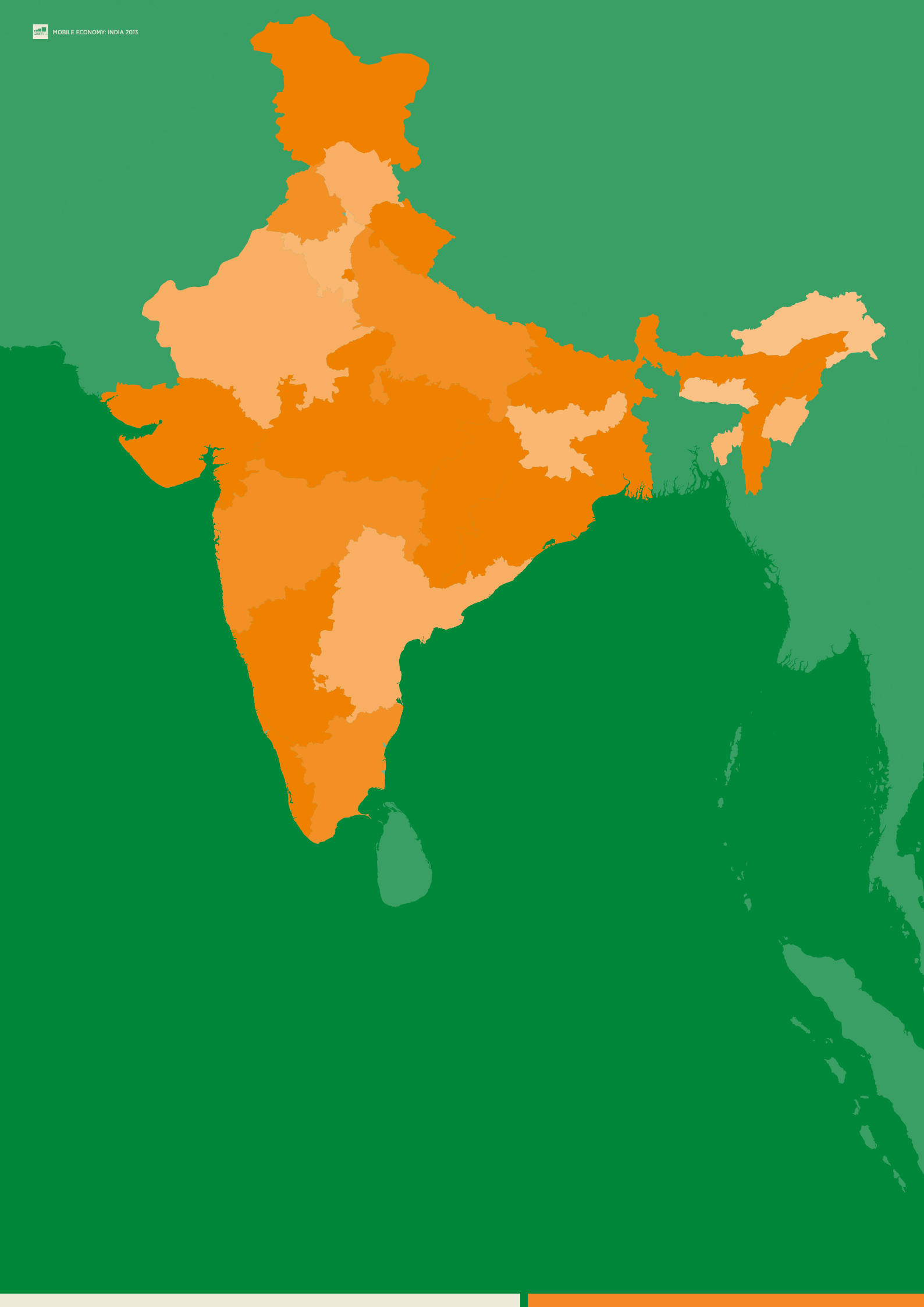
Public Funding



Infrastructure



+409%



1.

Executive Summary

India's citizens rely on mobile technology and mobile-enabled services to a degree that few would have predicted only a few years ago. With nearly 900 million mobile connections across the country, India represents a quarter of all mobile connections in Asia Pacific, and this figure is expected to rise to 1.16 billion by 2017.

While a large majority of the mobile services available in India are based on 2G technology, the country has seen the adoption of 3G accelerate in recent months. With improved spectrum pricing and management, growth of mobile broadband service is expected to continue, with 3G and 4G adoption projected to increase by 31% between 2013 and 2017.

The mobile sector makes an enormous economic contribution to the country, through direct employment; by enabling an ecosystem of mobile product and service providers; and through the productivity gains that mobile technology delivers across the whole of India's economy. Combined, these contributions amounted to 5.3% of GDP in 2012. In terms of employment, the mobile ecosystem contributes directly to 730,000 jobs and an additional 2 million jobs when points of sale and distributors are included.

By 2020, mobile could contribute almost Rs21.6 lakh crore (US \$400 billion) to India's GDP, creating 4.1 million additional jobs, and generating significant contribution through infrastructure investment (Rs48,300 crore/US \$9 billion) and public funding (Rs1.8 lakh crore/US \$34 billion).

Nevertheless, India still lags behind the world's major economies in mobile maturity and penetration. Network investment by mobile operators is held back by low tariffs due to the market conditions, an unusually high level of competition, and the financial burden caused by government policies that channel funds away from the sector, such as the high cost of access to spectrum. Indian operators are amongst countries that have the highest debt and lowest profitability ratios in the Asia Pacific region. This affects their ability to upgrade consumer services, meet demand in highly populated urban areas and expand networks to provide coverage to people living in rural areas.

Mobile can only bring about transformation in the Indian economy and society if the right visionary policy framework is put in place. With the upcoming elections the time is right to make this happen.

India is lacking a regulatory environment that allows the sector to surge ahead and deliver the full, transformative power of mobile to all. To do this, the government must design policies and regulations — working with the mobile industry — that maximise long-term private sector investment. In order to invest, the industry needs clarity on the direction and the overall economic and regulatory environment that will be put in place to support this path.

Only with a sustainable mobile industry will India be able to achieve the vision described in the country's National Telecommunications Plan — “to provide secure, reliable, affordable and high-quality converged telecommunication services anytime and anywhere for accelerated, inclusive socio-economic development.”

Increased penetration of mobile technology in India will bring with it many socio-economic benefits. In agriculture, mobile solutions improve yields and provide greater access to markets. Greater access to healthcare and reduced mortality are facilitated by mobile solutions, while mobile technology brings financial services to rural and underprivileged communities. Meanwhile, with mobile solutions, education for all is a goal that is increasingly within reach.

Government has an important role to play in all of these areas by removing barriers to the integration of mobile solutions in an increasingly connected world.

The vast potential of mobile to enhance development can only be realised if the mobile sector itself is allowed to prosper. To this end, three regulatory policy areas require particular attention:



SPECTRUM MANAGEMENT

The government is encouraged to allocate and release more harmonised spectrum for mobile according to international guidelines, and in larger blocks that prevent unnecessary market fragmentation. Currently, on average, around 60% of the spectrum that is of relevance and interest to mobile operators is yet to be allocated, while large blocks of spectrum, internationally identified for mobile, continue to be occupied by other sectors. An important factor in releasing mobile spectrum more effectively is to set reserve prices for spectrum auctions more conservatively, in alignment with international benchmarks and local market conditions. The recent proposals by TRAI to significantly reduce reserve prices are a step in the right direction. To increase the efficiency of spectrum use, the government is also urged to clear the way for market-driven sharing and trading of spectrum resources.



UNIVERSAL SERVICE OBLIGATION FUND (USOF) LEVY

With one of the world's highest universal service levies, at 5% of operating revenues, India's USOF has a poor performance record and a large accumulation of yet unspent funds and would benefit from a review. Taxing the sector so heavily for this purpose is highly unproductive and creates another financial burden on the industry. Instead, the government would be better served by fostering public-private partnerships for the implementation of projects and seeking alternative funding sources as part of a thorough review of the USOF policy.



BALANCED AND EVIDENCE-BASED RADIO FREQUENCY EXPOSURE REQUIREMENTS

The government has responded to public concern about the health risks of radiofrequency (RF) exposure by adopting regulation that goes beyond global norms. This increases network costs and can reduce the quality of service that consumers experience. Best practice for RF limits, based on International Commission on Non-Ionizing Radiation Protection (ICNIRP) and endorsed by the World Health Organization, should instead be followed. The Government also has a role to play in communicating the state of the science to citizens, to allay concerns about RF exposure.

By systematically pursuing public policy that increases certainty, acknowledges market realities, and removes regulatory barriers to investment and innovation, India's government stands to achieve so much in the coming years. But these outcomes can only be attained through openness and collaboration with industry, as all have the shared goals of maximising the benefits of mobile for all.

MOBILE TRENDS IN INDIA

₹ Contribution to GDP by the Indian mobile ecosystem

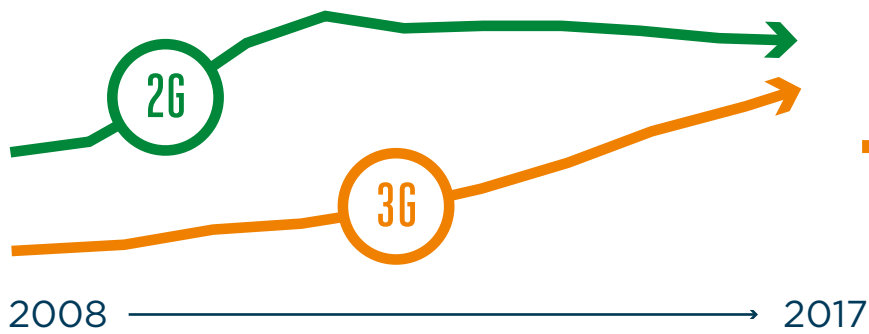
The overall mobile ecosystem, including suppliers of infrastructure and support services, handset manufacturers and content and app providers, contributed 1.3 percent to India's GDP in 2012.





2G/3G mobile connections in India

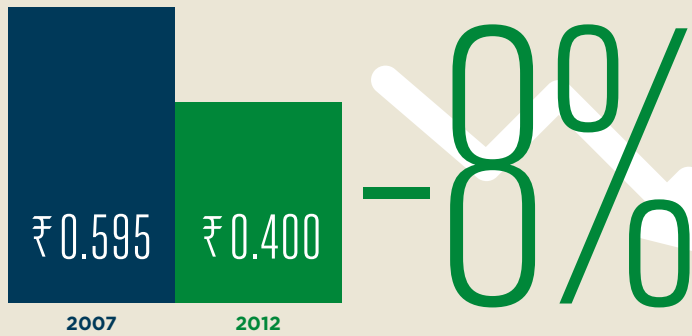
Voice traffic growth has slowed, and the use of data and value-added services are growing.



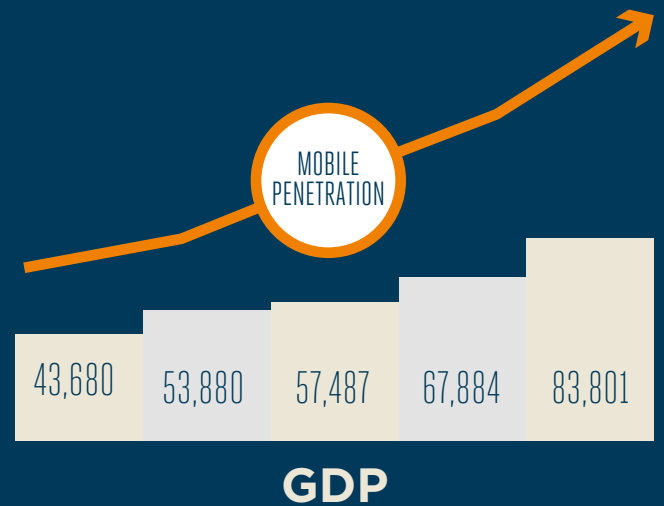
+31%

Price Per Minute

Effective price per minute declining sharply across India



Mobile penetration vs GDP



Voice growth declining

175%

110%

57%

30%

32%

19%

9%

ANNUAL GROWTH

2005 →

→ 2012

2.

Mobile Trends in India

From watching television to making banking transactions, mobile devices are at the very heart of life today, changing the way people communicate, learn and access information. In India, people use their phones to access entertainment, to check the day's cricket scores, to find the best route to work or to communicate globally through their Twitter accounts. They purchase goods online and use apps for anything from monitoring their weight to checking out local restaurants. In fact, the uses of mobile devices are virtually limitless.

With almost 900 million¹ mobile connections across the country, India represents a third of all connections in Asia Pacific, with the figure expected to rise to 1.16 billion by 2017.

So far, however, adoption of 3G technology in India has been hindered by the small amount of spectrum allocated to mobile services and the very high spectrum prices reached during the 2010 auction. The final prices concluded were high due to limited availability of spectrum, the auction design process and particularly the reserve prices. This prevented any operator from acquiring a national footprint and forced companies to borrow heavily to pay for 3G spectrum, limiting their ability to invest in further roll-

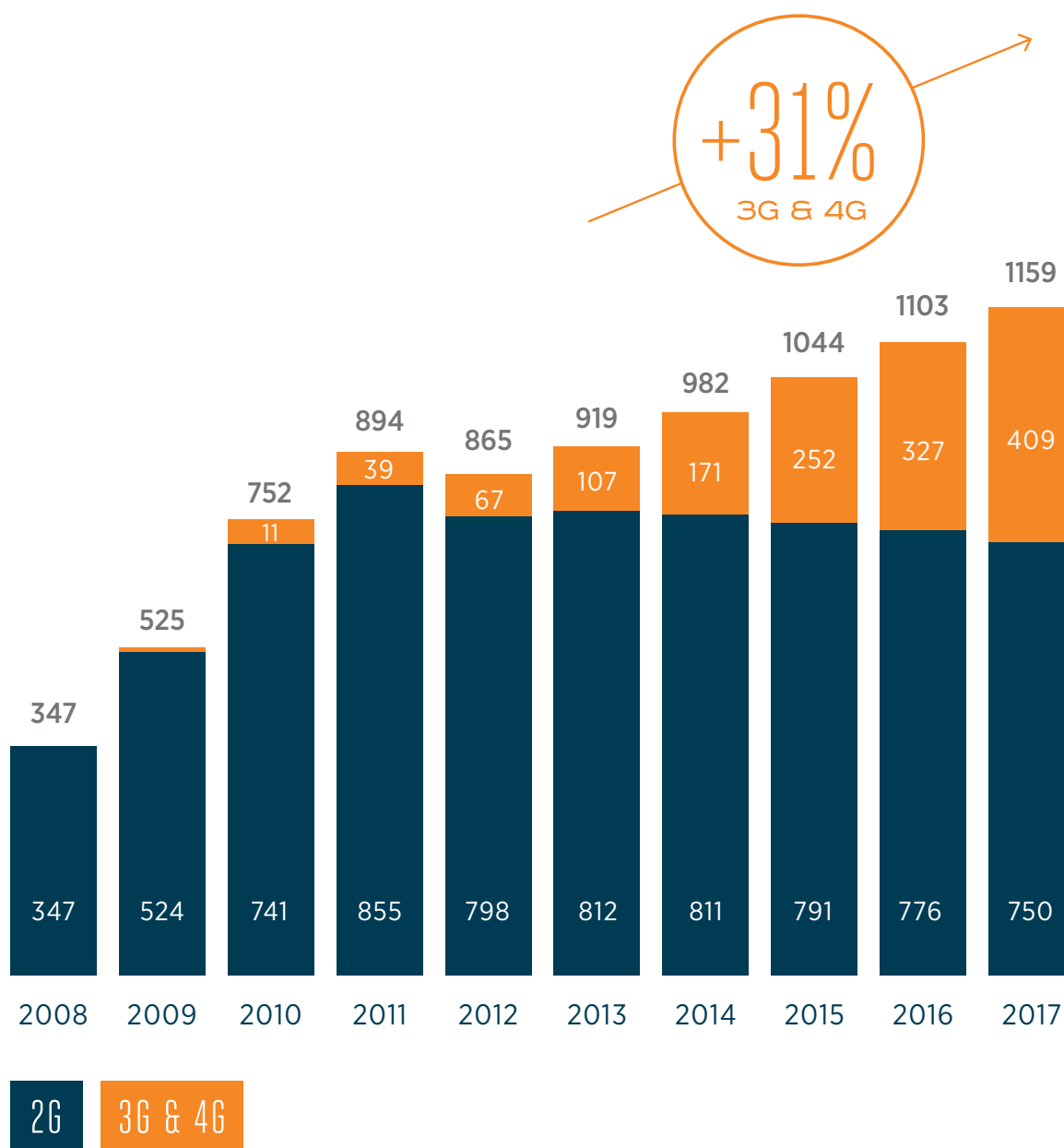
out of networks and services.

The move by operators to screen out inactive subscribers since 2012 has resulted in a temporary dip in the base. However, the subscriber base is expected to grow in the long term. In recent months, India has seen an increase in adoption of 3G and, with better spectrum pricing and management, mobile broadband growth could continue, with 3G and 4G adoption in India expected to increase 31 percent between 2013 and 2017.

1. Source: GSMA Intelligence

NO OF 2G/3G MOBILE CONNECTIONS IN INDIA

(millions)



Source: GSMA Intelligence

Figure 1

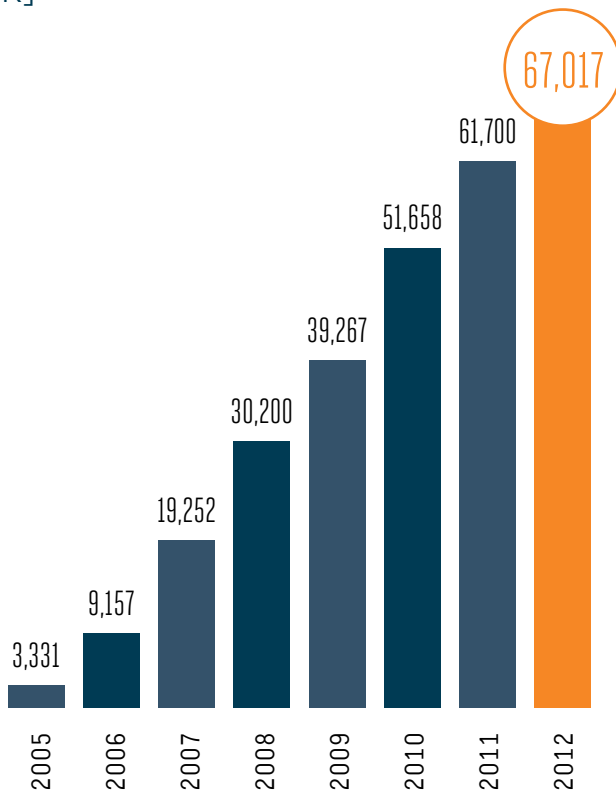
In India, two trends have emerged in recent years. Voice traffic growth has slowed, albeit from high levels. Meanwhile, the use of data and value-added services are growing.

GROWTH TREND IN VOICE TRAFFIC AND DATA AND VALUE ADDED SERVICES IN INDIA

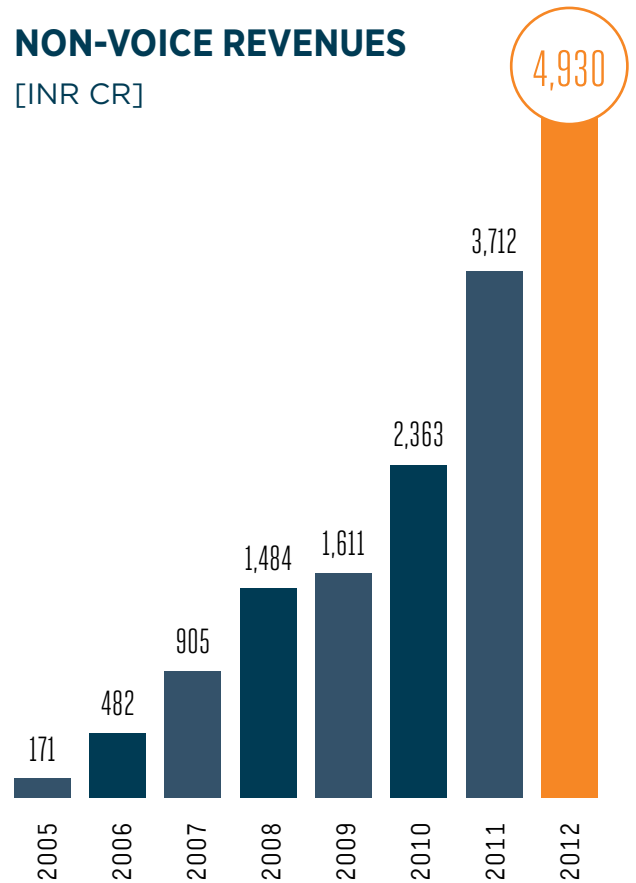
Voice traffic growth slowing down to around 9% p.a. in India ...

... while data and value added services is increasing significantly

MINUTES OF USE [CR]



NON-VOICE REVENUES [INR CR]



ANNUAL GROWTH

1. Q4 number from selected operators and countries to show trend
Source: GSMA Intelligence

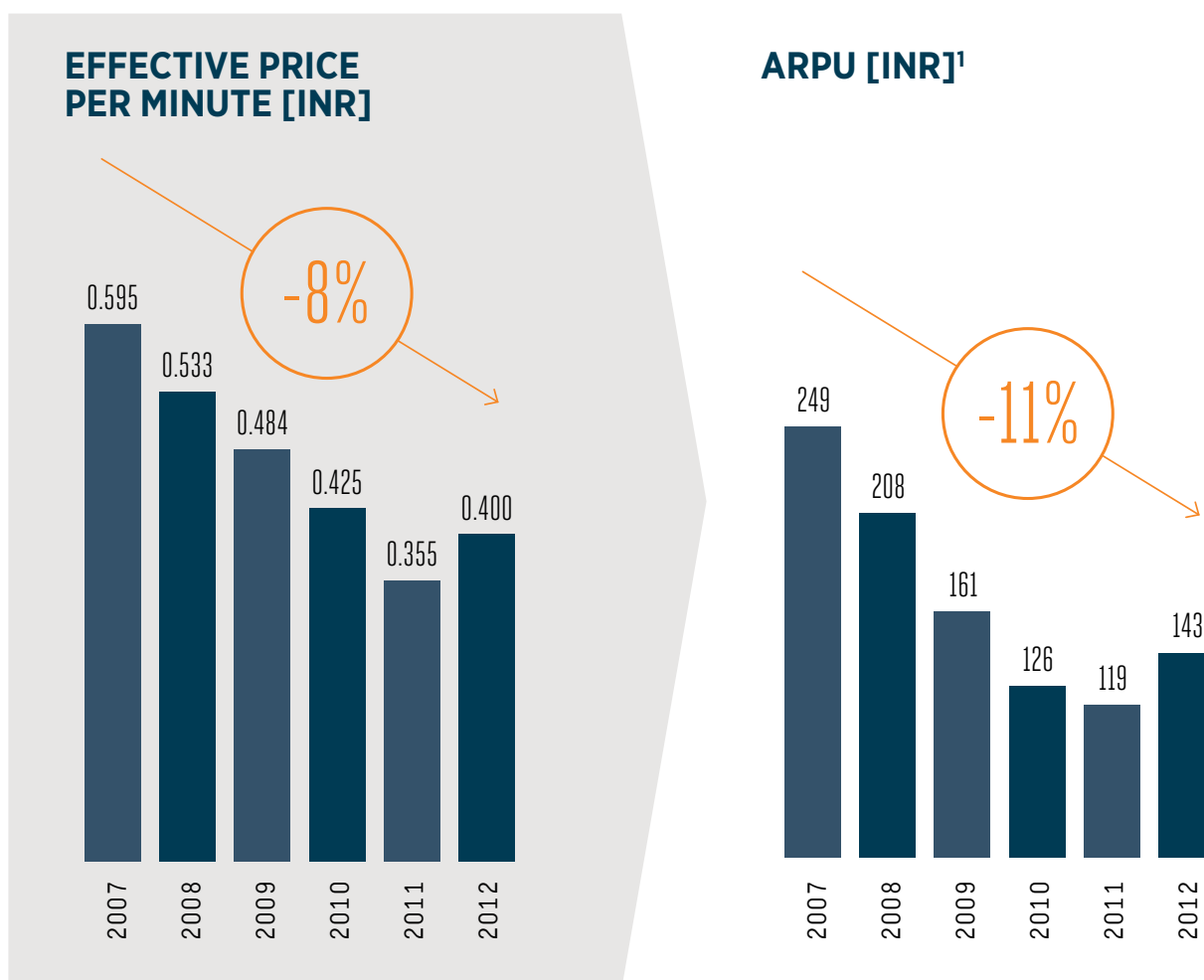
Figure 2

The rapid decline in price-per-minute cost of usage has helped boost subscriber numbers, but this has come at the expense of declining revenue per user.

DECLINING TREND IN EFFECTIVE PRICE PER MINUTE AND AVERAGE REVENUE PER USER

Effective price per minute declining sharply across India

... driving down Average Revenue Per User



1. ARPU by connection Q4 numbers
Source: GSMA Intelligence

Figure 3

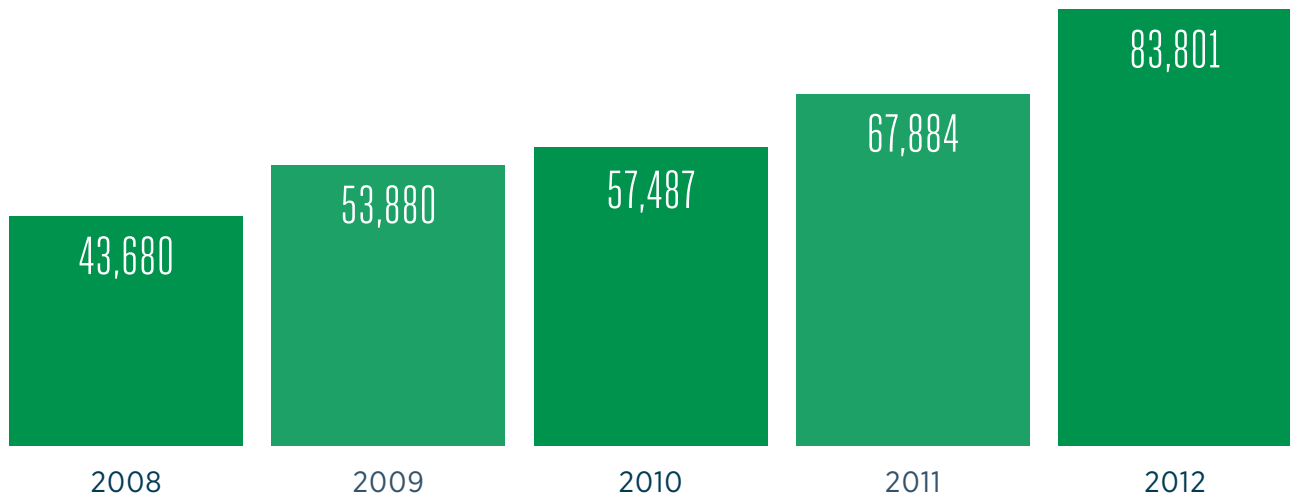
3.

Economic Impact of the Mobile Ecosystem in India

A strong correlation exists between mobile penetration and GDP growth, with mobile technology contributing to increased productivity, creation of new jobs and businesses and increased public funding through the generation of tax revenues. In 2012, Indian mobile operators made a significant economic contribution, accounting for 0.8 percent of GDP, with the total mobile ecosystem representing 1.3 percent of GDP that year.

CONTRIBUTION TO GDP BY INDIAN MOBILE OPERATORS

[INR cr]¹

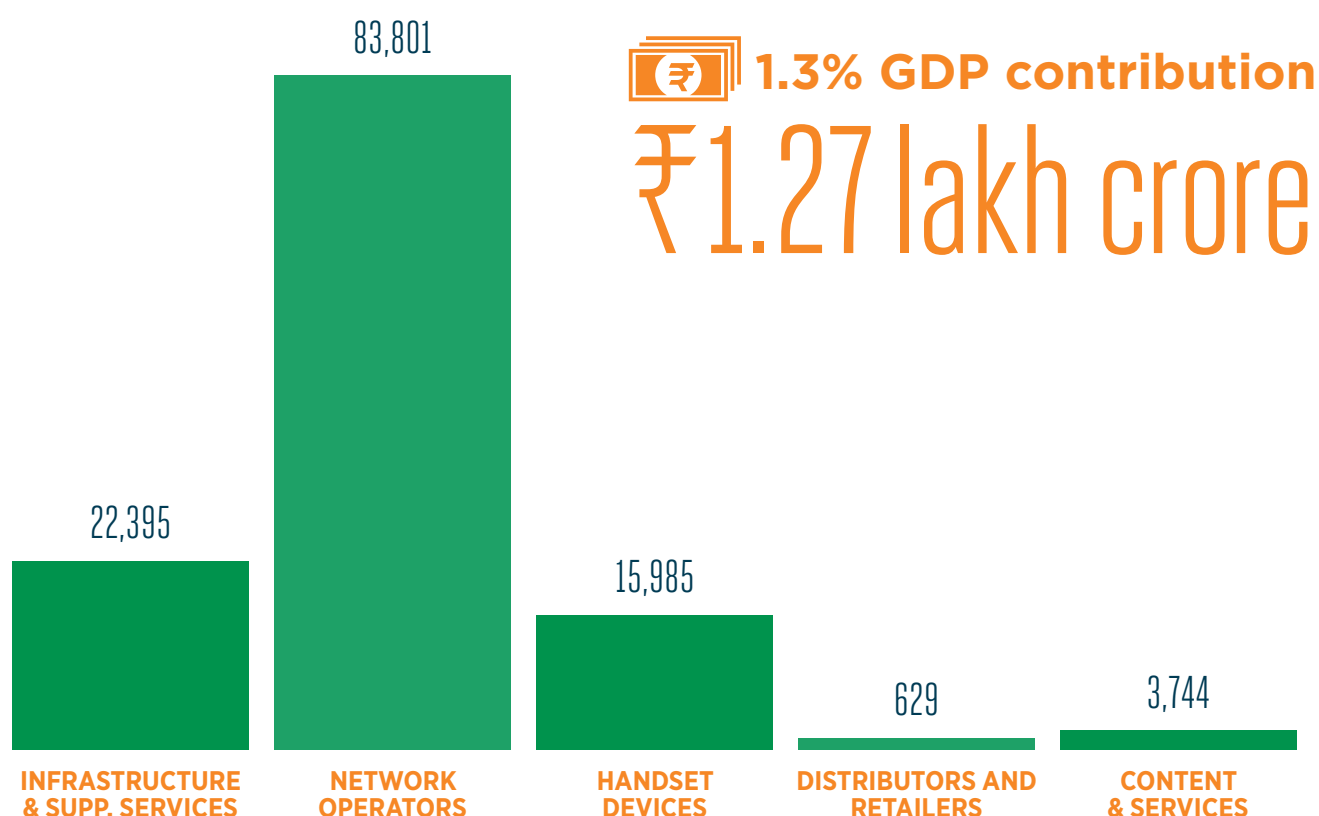


1. Mobile operator value add is approximated as Revenue - Cost of sales for selected operators. Average gross margin of 88% assumed for all years.
Source: GSMA Intelligence; BCG Analysis

Figure 4

The overall mobile ecosystem, including suppliers of infrastructure and support services, handset manufacturers and content and app providers, contributed 1.3 percent to India's GDP in 2012.

DIRECT CONTRIBUTION TO GDP BY THE INDIAN MOBILE ECOSYSTEM



1. Mobile operator value add is approximated as Revenue - Cost of sales for selected operators.
Source: GSMA Intelligence; BCG Analysis

Figure 5

In addition to the direct contribution from the mobile ecosystem, the improved productivity brought about by mobile technology contributed an additional 3.8 percent to India's GDP. The formal sector—defined as all firms with 10 or more employees—accounts for 2.8 percent of productivity-related GDP impact. High-mobility users, such as professionals and other skilled workers, experience the largest productivity gains from mobile phone use. The informal sector accounts for the remaining 1 percent gain in GDP.

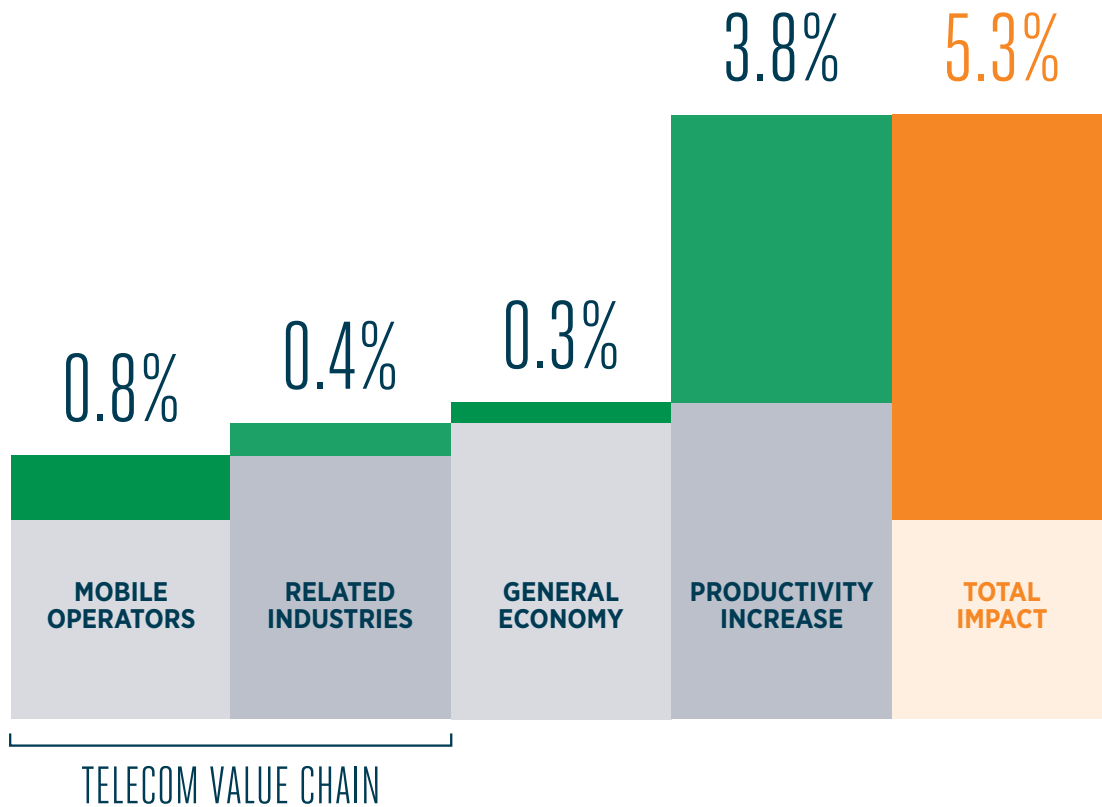
Mobile has been shown to improve productivity in both agriculture (which makes up 15 percent of Indian GDP) and fisheries (which make up 1.1 percent of GDP). The impact is particularly strong for smallholders, since mobile technology allows them to increase yields, reduce waste and sell their produce at higher prices.



Overall, the economic impact from mobile technology in India amounts to nearly Rs5.3 lakh crore (US \$100 billion)—or a significant contribution of 5 percent of GDP in 2012.

TOTAL ECONOMIC IMPACT OF THE MOBILE VALUE CHAIN

GDP contribution [INR lac cr]¹



1. Value add defined as gross profit 2. Assuming an additional affect as 20% of the mobile value chain, to account for how the general economy services the mobile ecosystem 3. Related industries include tower companies, handset OEMs, value added service providers etc. Source: GSMA Intelligence; EIU; GSMA; BCG analysis

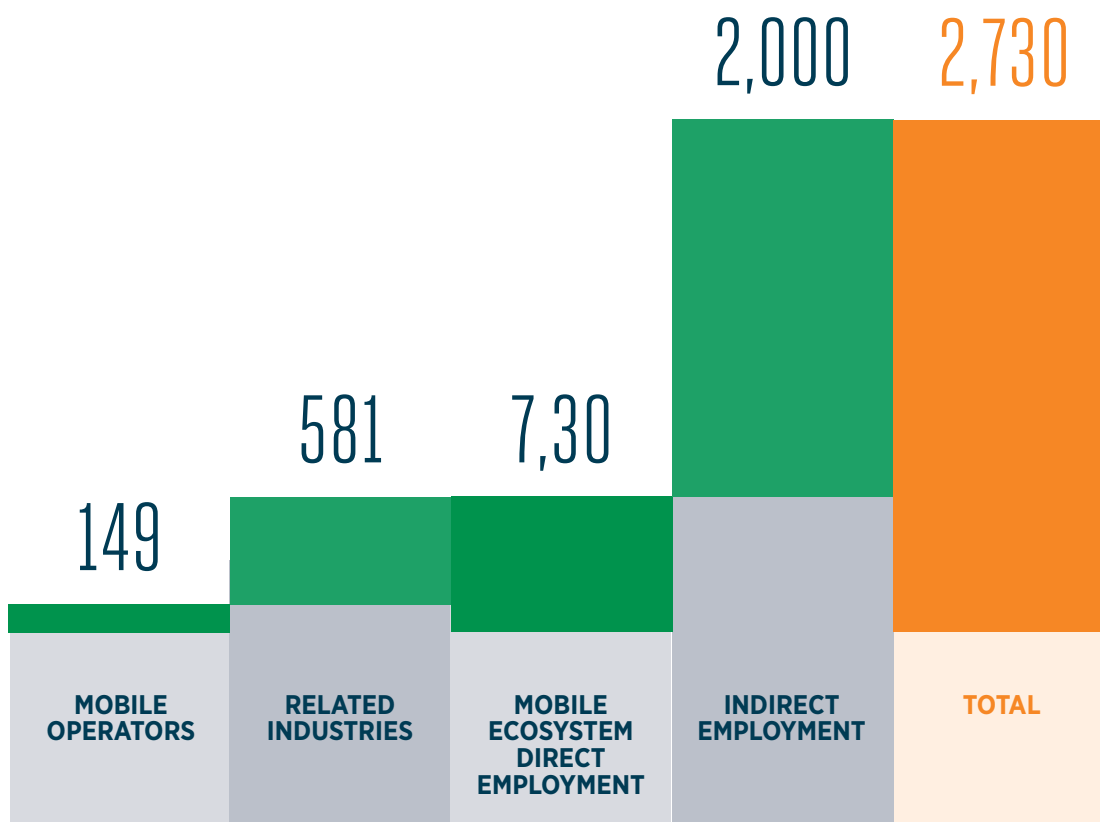
Figure 6



The mobile ecosystem contributes directly to 730,000 jobs in India and an additional 2 million jobs when points of sale and distributors are included.

JOBS CREATED BY THE MOBILE ECOSYSTEM

Jobs ['000s]



1. Assuming 2 to 2.5 Million points of sale with an average of 1 employee each
Source: GSMA Intelligence; EIU; GSMA; BCG analysis

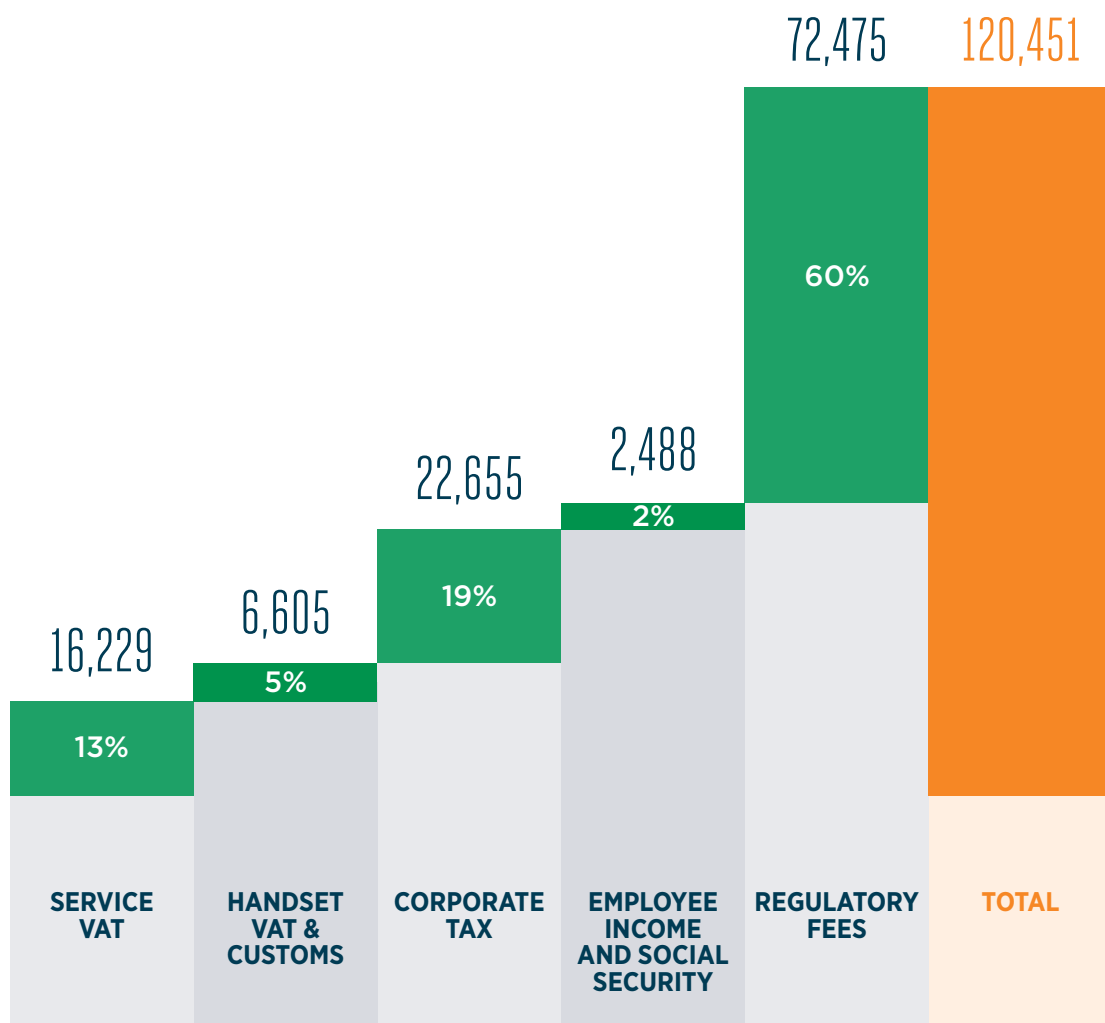
Figure 7



Regulatory fees account for a large portion (60%) of mobile contribution to public funding in India putting a substantial burden on operators.

CONTRIBUTION OF THE MOBILE ECOSYSTEM TO PUBLIC FUNDING

[2012 INR cr]

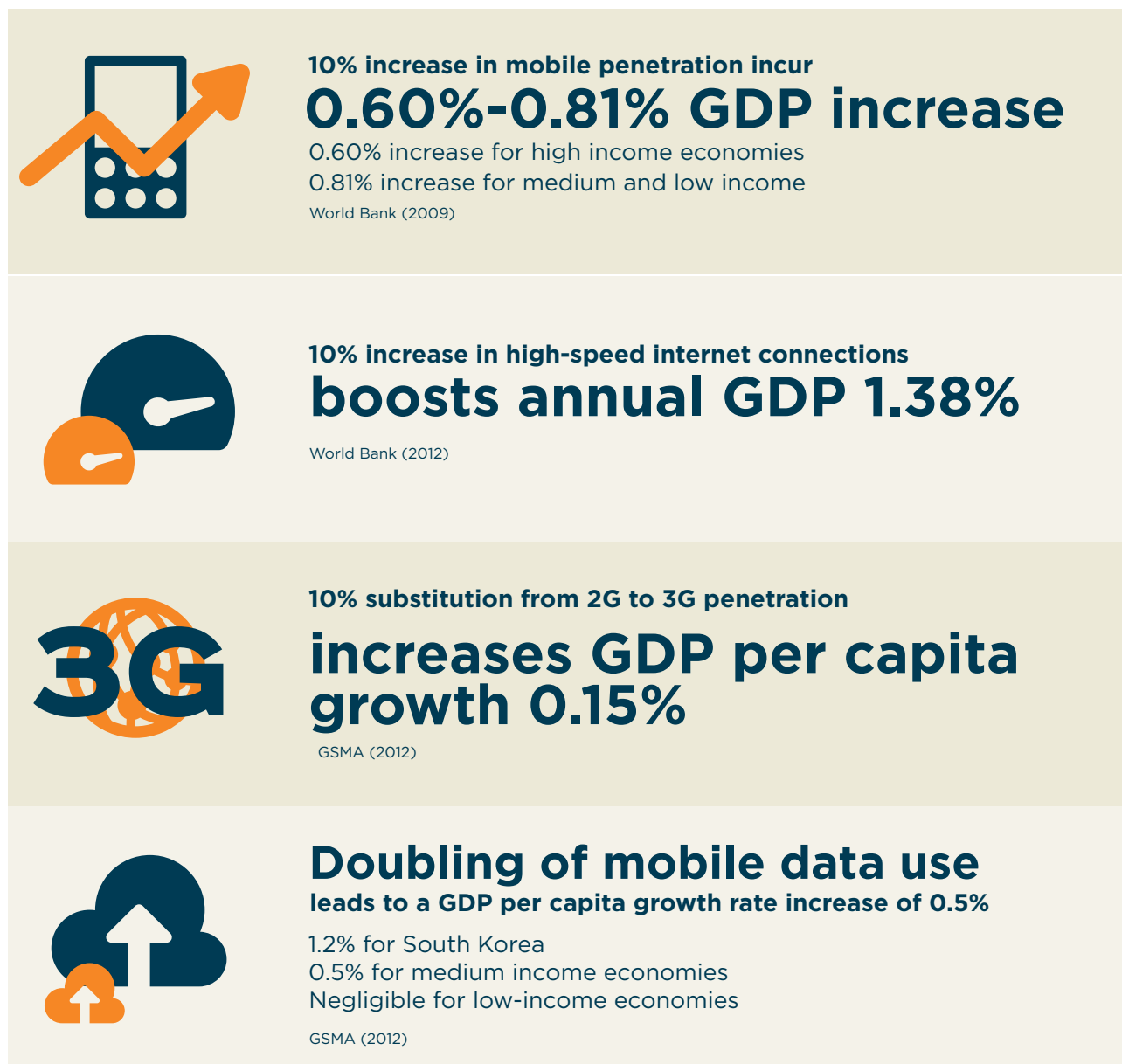


Note: 2012 estimates. Does not consider tax revenues on sale of equipment
 Regulatory fees includes license fees, spectrum fees and universal service funds
 Source: GSMA Intelligence; Annual Reports; Factiva; GSMA; BCG Analysis

Figure 8

The mobile ecosystem is expected to continue making a significant socio-economic impact. Several studies show a strong link between mobile penetration and GDP growth.

EXAMPLES OF STRONG CORRELATION BETWEEN INCREASED MOBILE PENETRATION AND GDP

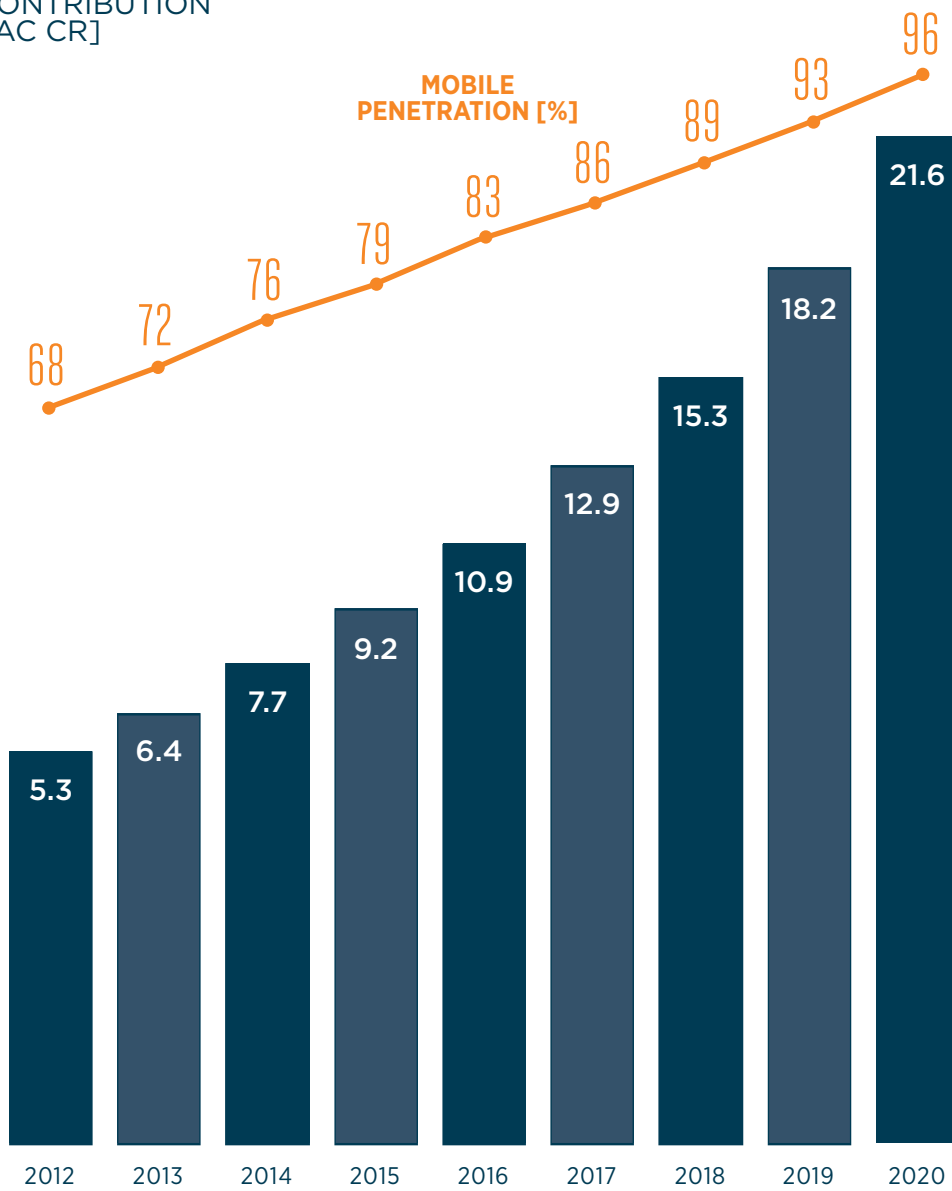


Source: World Bank; GSMA; EIU; Deloitte; Cisco; BCG analysis

Figure 9

CONTRIBUTION OF THE MOBILE ECOSYSTEM TO GDP IN INDIA

GDP CONTRIBUTION
[INR LAC CR]



1. GSMA Intelligence forecasts for number of connections until 2017, then linear growth based on Ovum estimates until 2020
Source: GSMA Intelligence; GSMA; Ovum; EIU; MOSPI; BCG analysis

Figure 10

While mobile technology has started to have a transformative socio-economic impact in India, much greater impact could be unleashed in the coming years. With the right policies and private sector investment, mobile technology could deliver significant advances in everything from healthcare delivery and agricultural productivity to access to education and financial inclusion.

India will benefit from a significant step up in GDP contribution from the mobile ecosystem as penetration grows across the country. By 2020, the mobile ecosystem could contribute almost Rs21.6 lakh crore (US \$400 billion) to India's GDP, creating 4.1 million additional jobs, and generating significant contribution through infrastructure investments (Rs48,300 crore/US \$9 billion) and public funding (Rs1.8 lakh crore/US \$34 billion).

Beyond economics, other benefits include a reduction in maternal mortality, a 50 percent increase in student proficiency and a 12 percent increase in financial inclusion.

To achieve these advances, significant investment will be needed to drive up wireless internet penetration and roll out mobile broadband technologies. With 4G penetration at approximately 400,000 subscribers in 2012, the operators will need greater support from the government in funding the capital investment required for 4G roll-out.

4.

Social Impact in Priority Sectors

The increased penetration of mobile technology in India will bring with it many socio-economic benefits. This report assesses the social impact of mobile technology and its power to address key global challenges across four key sectors—healthcare, agriculture, financial services and education.

In agriculture, mobile solutions create the potential for increased productivity and greater access to markets. Increasing access to healthcare and reduced mortality will also be facilitated by mobile solutions, while mobile technology brings financial services to unbanked rural and underprivileged communities. Meanwhile, with mobile solutions, “education for all” is a goal that is increasingly within reach.



**FINANCIAL
SERVICES**



HEALTHCARE



EDUCATION



AGRICULTURE

SOCIAL IMPACT IN INDIA

Healthcare



Coverage

mHealth offers the ability to extend coverage significantly by allowing healthcare workers to conduct consultations, diagnostics and treatment remotely.



A powerful tool

Raising awareness of healthcare, reducing mortality, extending healthcare to rural areas and to the low literacy audiences



Policy

Policy making must keep pace with technological and mHealth developments. Scale will allow savings in the overburdened health systems.

Agriculture



Supply Chain Inefficiencies

Track and trace facility in the supply chain. Raw material sourcing enhancement



Productivity Loss

mAgri supports info services on weather, remote irrigation systems.



Poor market & price discovery

mAgri gives access to current price information, access to commodity trading platforms for farmers



Financial services



Potential to serve 250million by 2020 with financial services.



In just one year(2011 to 2012) mobile financial transaction volumes doubled, with the value of those transactions tripling.



Policy missing that could boost mobile financial services



Align / reduce the financial requirements on mobile accounts to increase adoption, especially in rural areas



MNOs to negotiate commercial terms with banks directly



Raising the transaction limit on fully KYCed* m-money accounts. (*KnowYourCustomers)



Education



mEducation can address key affordability challenges apart from providing learning tools and help improve student proficiency.



To achieve full potential of mEducation, government support is critical through partnerships and promotions.



Potential to help 300,000 students to gain employment through grade improvement.



mHealth

and telemedicine offer the ability to extend coverage significantly by allowing healthcare workers to conduct consultations, diagnostics and treatment remotely.

Policy making must keep pace with technological and mHealth developments – scale will allow savings in the overburdened health systems.

4.1

Healthcare

India is struggling to meet its healthcare challenges. These include expanding access to healthcare, reducing child and infant mortality and improving healthcare quality, all within increasingly tight budgets. Since existing resources and methods will not suffice, the pressure is increasing to find affordable but high-quality solutions.

CHALLENGES IN HEALTHCARE IN INDIA

KEY CHALLENGES

mHEALTH APPLICATIONS

MATERNAL AND CHILD HEALTH

- Maternal health and mortality
- Infant/child malnutrition and mortality
- Contraceptives/family planning

"Reduce infant mortality rate to 28/1000 live births, maternal mortality to 1/1000 live births."

"To ensure a reduction in the growth rate of population."



Public and healthcare worker information/education

COMMUNICABLE DISEASES

Infectious diseases, e.g. tuberculosis, malaria, HIV/AIDS, measles, and polio

"Reduce the incidence of communicable diseases."



Public health surveillance
Patient monitoring/compliance

COVERAGE/ACCESS

Sufficient healthcare service from doctors, nurses

Universal access, by geography, SES, age

"Ensure availability of quality healthcare on equitable, accessible, affordable basis across regions and communities."



Healthcare worker education
Remote diagnostic/treatment support

Source: Indian Ministry of Health and Family Welfare

Figure 12

4.1.1



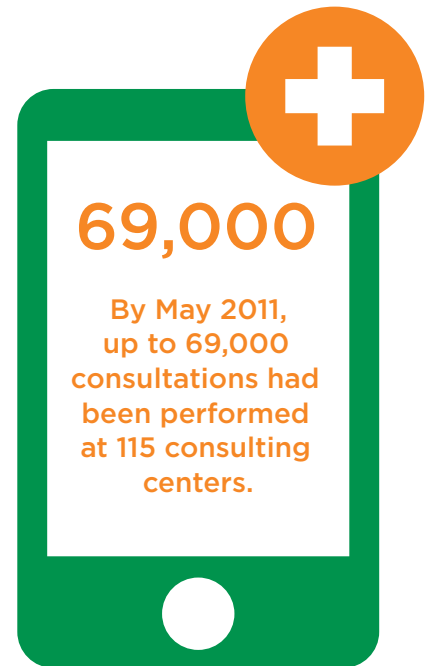
Access to healthcare

With just six doctors and 13 midwives for every 10,000 citizens in India, delivering healthcare to remote rural areas is extremely challenging. mHealth and telemedicine offer the ability to extend coverage significantly by allowing healthcare workers to conduct consultations, diagnostics and treatment remotely. For doctors, this saves travel time and improves their retention rates. Meanwhile, patients save time, cost and the physical burden of traveling long distances to obtain treatment.

To reduce this gap in health advice and services, Airtel's Mediphone service is using the mobile phone as a channel for the delivery of real-time treatment, remote disease monitoring and health awareness. The company is also exploring enhanced web-based telemedicine options. It has formed a strategic alliance with Healthfore Technologies, which is supported by Australia's Medibank Health Solutions, to offer a service through which accredited doctors and paramedics can deliver reliable, high-quality healthcare advice via the mobile phone anytime, anywhere.

In another example, the Apollo Telemedicine Networking Foundation (ATNF), a non-profit that is a part of the Apollo Hospitals Group, is using telemedicine to link rural areas to key hospitals in India. By May 2011, up to 69,000 consultations had been performed at its 115 consulting centers. With a full-scale roll-out, doctors could reach twice as many rural patients.²

For individuals seeking advice with puberty, menstruation, pregnancy and contraception, Tata DOCOMO has launched India's first sexual and reproductive health services application—SPARSH—in association with the Family Planning Association of India. The service disseminates information via Interactive Voice Response (IVR), SMS and Out Call technologies, giving users privacy and providing timely information (critical in life-threatening situations). Live counseling allows users to discuss personal issues with qualified counselors in 10 locations.



2. Source: AFNF; Ericsson; WHO; BCG analysis

4.1.2



Communicable diseases

In India, communicable diseases place a heavy burden on healthcare services, particularly tuberculosis (TB). With low drug compliance, about 300,000 people needed re-treatment in 2010 because of default and a resulting relapse in their condition. mHealth solutions could reduce the number of relapses and cure more people.

For example, through a program run by Operation ASHA, a non-governmental organization (NGO), patients can have their fingerprints scanned during administration of their medicine at mini TB centers, which means their drug adherence can be tracked and promoted through SMS reminders.

At the TB centers—set up in shops and homes—a GSM modem logs visits to the centers, collects compliance data via SMS and sends SMS reminders to supervisors on missed doses. Meanwhile, the government provides free medication, diagnostics and grants for each patient cured after two years of a center's operation.

The 40 centers in India, across Delhi, Mumbai and Jaipur, have approximately 2,700 patients enrolled, with the total cost of treatment per patient just US \$50. And the result has been remarkable—with about 50,000 supervised doses logged, the compliance rate for TB drug regimens is 98.5 percent, with a default rate of just 1.5 percent.

4.1.3



Maternal and child healthcare

Lack of information and poor access to maternal healthcare are among the main reasons for maternal and infant deaths in India. To reduce mortality rates, educating and informing the community workers who attend births and advise pregnant mothers is critical—and something to which mHealth is particularly well suited.

For example, the CommCare mobile app—powered by Dimagi, a US-based social enterprise—is being used by ASHA (the Accredited Social Health Activist program), which works with India's National Rural Health Mission to train social workers to educate mothers and facilitate safe pregnancies.

The app can also deliver registration forms and prioritized checklists, monitor danger signs and offer educational prompts. The materials are simple and visual, making them easily followed by audiences with

low literacy rates. This helps improve the effectiveness of monitoring and knowledge sharing. Studies have shown that CommCare engages more household decision-makers in the mother's pregnancy and the child's health while promoting mothers' understanding of critical topics.

Another ASHA project is Vodafone's e-Mamta mother and child tracking initiative, run in partnership with the Gujarat government. With SIM cards provided to health workers, mothers can access information and assistance at any time. Meanwhile, health-related data can be fed into a centralized system that sends timely health updates to the mobile phones of health workers and mothers. Reaching 20,000 villages in 26 districts, the system has led to a 4-point drop in infant mortality.

4.1.4

Potential impact and requirements for support

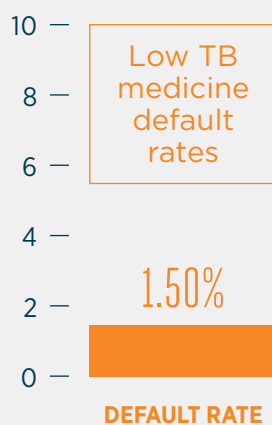
For countries like India that are working to improve the health of their citizens, mHealth can be a powerful tool. The areas in which mobile technology can play a role include reducing the mortality rate, extending access to healthcare facilities to rural areas, improving disease recovery by lowering default rates and increasing people's knowledge of health danger signs.

IMPACT OF mHEALTH

Low default rates for TB medicines

High compliance rates for successful administration of TB medicines enabled by mobile applications

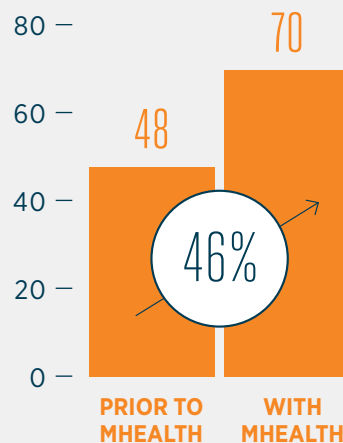
% DEFAULT RATE FOR TB MEDICINES WITH USE OF MHEALTH



Understand danger signs for maternal & child health better

Mobile app utilised to educate on and monitor maternal and child health everywhere

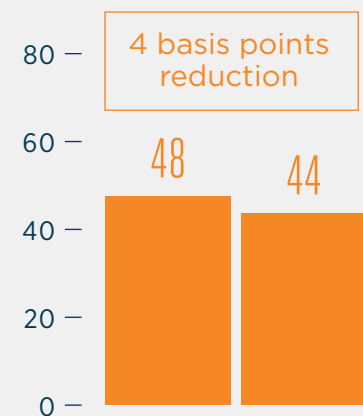
% OF CASES WITH KNOWLEDGE OF DANGER SIGNS



Reduction in infant mortality

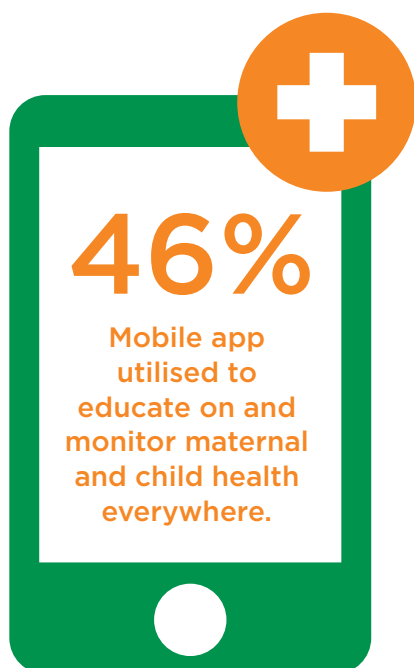
Mortality rate reduced with help of mother and child tracking initiative

INFANT MORTALITY RATE (BASIS POINTS)



Knowledge of at least 3 of 5 danger signs improved from 48% to 70% after four months of using CommCare
Source: FNF; Ericsson; WHO; CommCare Evidence Base; Vodafone, WHO, Halabot

Figure 13



While mHealth has the potential to transform the delivery of healthcare services, significant obstacles prevent the full-scale implementation of mHealth solutions in most countries.

In India, policy making is struggling to keep up with technological and mHealth developments, and overburdened health systems mean decision-makers face competing priorities. And while private sector investment is critical, companies have a difficult time keeping up with rapid technological developments, and have yet to demonstrate the potential value of mHealth to the bottom line. Despite many promising pilots, financially sustainable and scalable business models have yet to emerge.

Meanwhile, demand for mHealth solutions from health workers and the general public remains low, and health professionals and decision makers often lack the knowledge and technical expertise needed to assess mHealth's benefits and cost effectiveness.

Breaking down these barriers will require changes in regulatory regimes as well as the evolution of industry ecosystems. Government can play a role by using subsidies and tax incentives to stimulate investment. It can help scale up successful mHealth pilots and support infrastructure development through public-private partnerships. Meanwhile, regulators can commit to common technical standards and promote technical and data interoperability. Such moves will help operators to establish viable business models and co-ordinate key players in the mobile ecosystem.

mAgri

increases farmer income
through location and market
information

Core challenges include supply
chain inefficiencies, productivity
loss, poor market and price
discovery and access to credit,
savings and insurance facilities.

4.2

Agriculture

The agricultural sector faces key challenges across the supply chain, affecting not only farmers but also other players, such as input providers, co-operatives and commodities traders, food product manufacturers and processors, wholesalers, retailers and transport companies. Core challenges include supply chain inefficiencies, productivity loss, poor market and price discovery and access to credit, savings and insurance facilities. mAgriculture solutions can address many of these challenges.

MAGRICULTURE APPLICATIONS

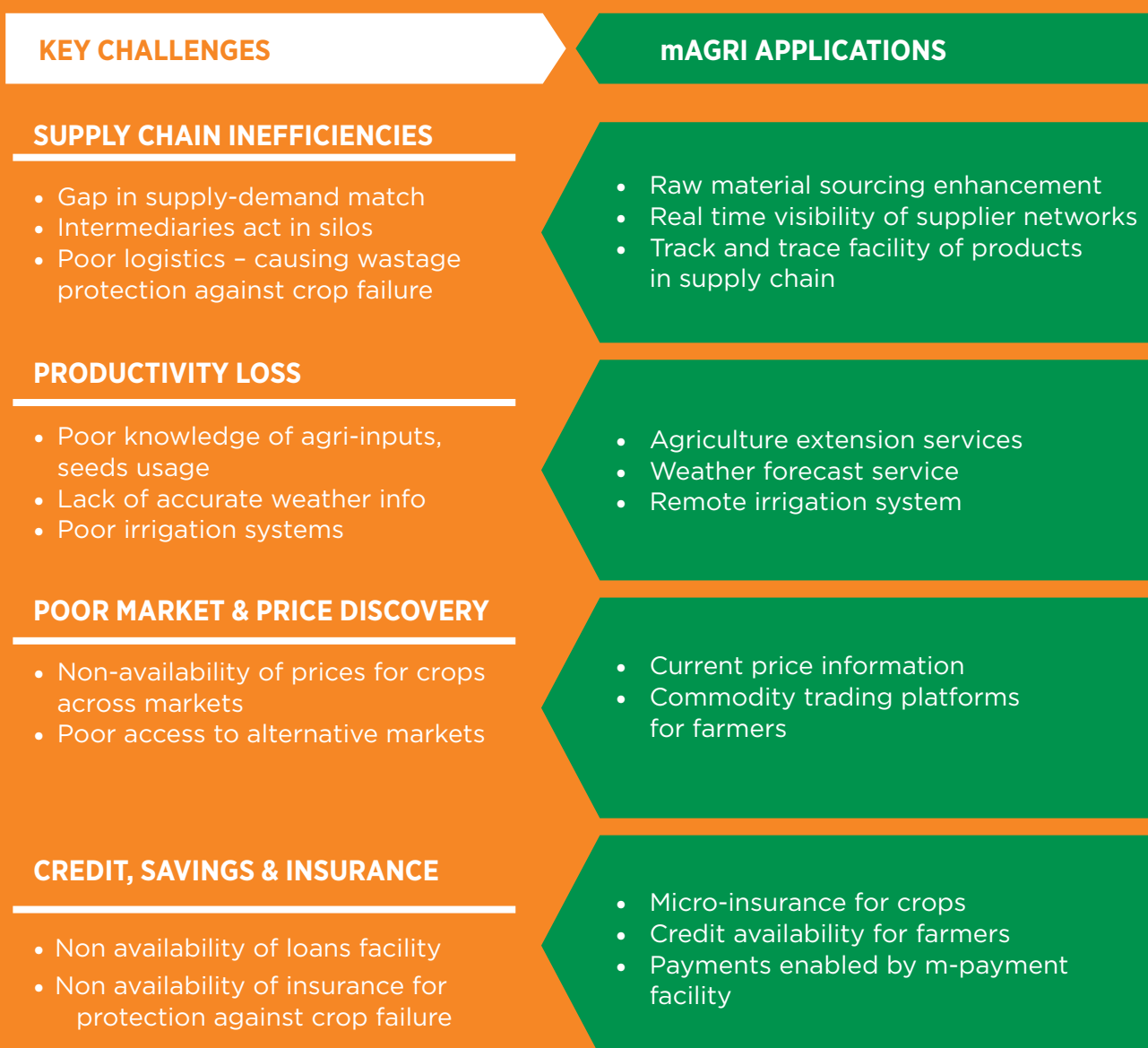


Figure 14

4.2.1



Key challenges

In India, mismatches between supply and demand, siloed agricultural intermediaries poor logistics systems, and lack of agricultural information lead to substantial agricultural wastage and prevent farmers from maximizing their returns.

In the state of Kerala, for example, lack of balance between supply and demand in the fishing industry causes price volatility and wastage. With many fishermen possessing mobile phones, access to real-time price information has increased the efficiency of coastal beach auctions by helping fishermen to make better decisions on where to sell their catch. This simple innovation has led to improved margins for the fishermen, a dramatic fall in waste (from 5-8 percent) and reduced price volatility. All these points have led to benefits for consumers by providing a more dependable source of food at stable prices.

To connect farmers with multinational buyers, Vodafone works with one of the world's largest confectionery company to establish direct communication with cocoa producers. The solution enables farmers to indicate the quantity and date of their produce through a voice portal. Moreover, using information collated from the portal, sourcing teams can plan collection routes more efficiently, which means both farmers and buyers benefit.

In remote rural areas, poor information on market prices for crops prevents farmers from maximizing their returns, increasing their incomes and reducing post-harvest waste. In India, services such as Reuters Market Light (RML) give farmers vital market

information via SMS. By providing timely and relevant market prices, RML (which has 1 million subscribers in 13 states) has enabled farmers to plan their harvests and strengthen their negotiating power in agricultural markets.

Another information distribution model is IFFCO Kisan Sanchar Limited (IKSL) a joint venture between the Indian Farmers Fertiliser Cooperative Ltd (IFFCO), India's largest farmers' co-operative, and Airtel, along with rural telephony experts Star Global Resources. IKSL distributes "Green SIM" cards to its members and other farmers, who receive five free recorded voice messages a day covering local and national agricultural topics. Through an Agri Helpline, they can also get answers from agricultural experts on all their farming questions. Today, the IKSL Green SIM service has 3 million users.

Meanwhile, the mobile-based Nokia Life Agriculture Service is connecting rural communities with agricultural markets, meaning they can avoid middlemen. The impact has been substantial. Between 2009 and 2011, the service—which has 18 mobile operators as partners—attracted 15 million subscribers across four countries. Incomes for subscribing farmers are estimated to have risen between 10 and 15 percent.



Farmers in emerging economies also struggle to meet the high standards of international buyers, many of which demand traceability. A project for pineapple farmers in Ghana offers a promising model for India, where supply chain waste in the fruit and vegetable industry is up to 18 percent. The project, an initiative of the United States Agency for International Development (USAID) uses a GPS-based product to track Ghanaian pineapples from farms and collection sites to the ports from which they are exported, ensuring compliance with GlobalGap certifications.

When it comes to productivity, obstacles include lack of knowledge about agricultural best practices and up-to-date weather information. This is something mobile technology can address. Technical guidance on farming methods and weather warnings can help farmers maximize yields and increase production. In the Philippines, for example, a mobile-based application—the Farmer’s Text Centre—is providing important technical guidance and weather warnings to rice farmers. As a result, farmers are increasingly opting to plant crops that have higher yields, and, as a result, are reporting production increases of up to 20 percent.

Also, without access to credit, savings and insurance products, farmers in emerging markets find it hard to generate a stable income. Lack of insurance, in particular, creates uncertainties for these smallholders and means they are badly hit when severe weather events such as droughts or floods occur.

As international examples demonstrate, mobile-payment based micro-insurance programs can help farmers safeguard their incomes from the vagaries of nature. Kilimo Salama—a micro-insurance program from Kenya—provides mPayment-linked crop insurance to farmers. Farmers purchase insurance via their mobile phones and, if weather stations show loss, all farmers are paid, regardless of actual field losses. The scheme covers 40 percent of the hinterland with 30 weather stations in operation. Replicating this model in India could provide substantial benefits to rural communities.

In India, crop insurance penetration is substantial but concentrated among large farmers. Using mobile technology, micro-insurance could reach millions of smallholders, reducing uncertainty and preventing floods or drought from destroying their businesses.

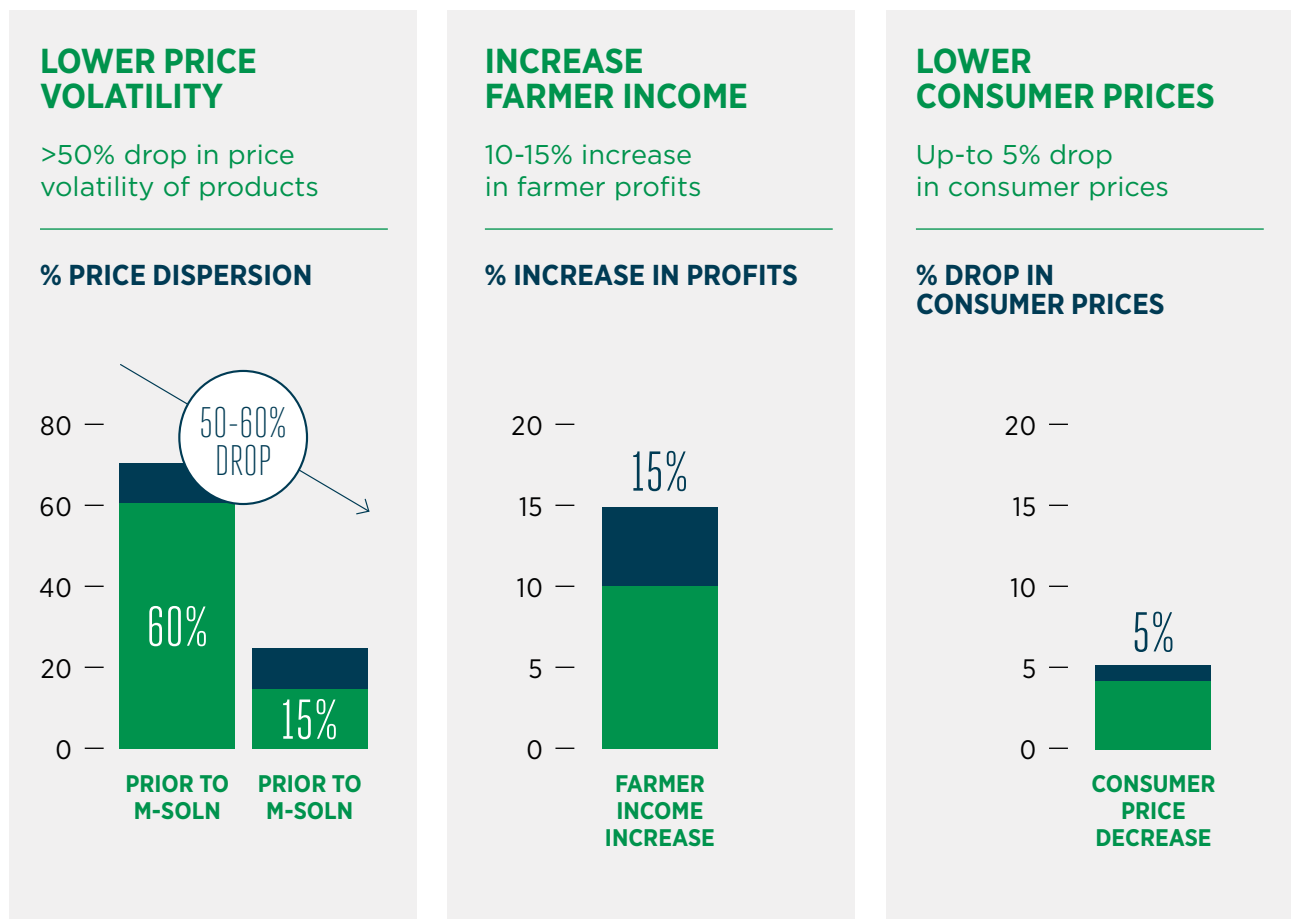
4.2.2



Potential impact and requirements for support

In rural communities, mAgriculture solutions have a huge potential impact. Mobile solutions empower farmers to improve efficiency in the agricultural value chain and can help lower price volatility, increase farmers' income and reduce consumer prices. However, to realize the full impact of these solutions, government support will be critical.

IMPACT POTENTIAL OF mAGRICULTURE APPLICATIONS

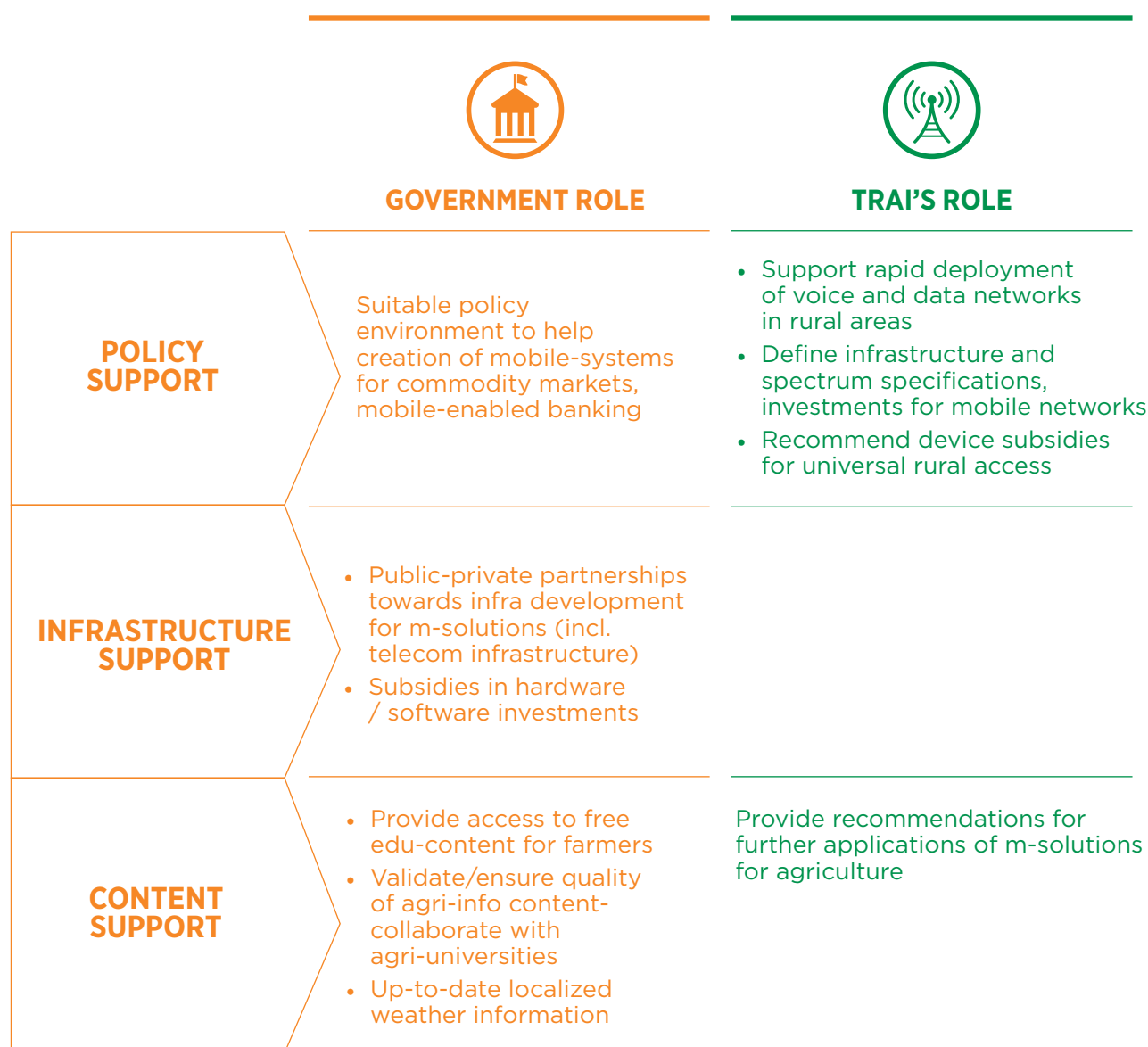


Source: (1) Overview of ICT in Agriculture – InfoDev World Bank Group (2) “Mobile Applications in Agriculture” (2011) – Syngenta Foundations; GSMA mAgri Nokia Case Study; BCG analysis

Figure 15

With appropriate policies, governments can help make mobile payment systems accessible to farmers, support infrastructure through partnerships and subsidies and create high quality content for farmers on agricultural techniques. The telecom regulator's role is equally important in creating a policy environment that supports the rapid deployment of mobile networks in rural and remote areas.

REQUIREMENTS FOR SUPPORT FROM GOVERNMENT AND THE TELECOM REGULATOR



1. KYC: Know Your Customer obligations 2. Telecom Regulatory Authority of India
 | Source: Press searches; Thailand rural broadband infrastructure policy project; BCG analysis

Figure 16

Mobile operators also have a critical role in developing an ecosystem that supports mAgriculture. Companies can develop mobile-based agricultural information services for farmers that include agronomy services, weather information and expert advice. These services increase access to commodity markets by providing information relating to prices as well as offering mechanisms connecting buyers and sellers.

With a vast consumer base, the telecom industry has the knowledge and experience to customize mobile voice and data packages for farmers. By tapping into their sales and retail networks, companies can also promote use of mobile technology in agricultural settings.



250M

Potential to serve 250 million by 2020 with financial services.

Align / reduce the financial requirements on mobile accounts to increase adoption, especially in rural areas.

4.3

₹ Financial Services

Creating access to safe, convenient and reliable financial services has a proven positive impact on economic development and could enhance the life of millions of Indians. However, as per the 2011 census, 41.3% of the Indian population - or 513 million people - live in households without access to formal financial services.

Many barriers exist to accessing formal financial services. These include lack of proximity to bank branches, administration costs, such as high service fees and minimum transaction amounts; the difficulties of understanding banking products; and lack of financial literacy. Meanwhile, the cost of extending the reach of formal financial services through the typical “brick and mortar” strategy is very high. Banks therefore have little incentive to provide services to individuals with low incomes, who they do not perceive as interesting from a commercial point of view because they make little contribution to bank revenue. Such customers typically need transactional services and hence not perceived as profitable. The poor are also seen as high-risk borrowers, and hence are not attractive targets for banks to cross-sell more sophisticated (and higher margin) products, such as loans.

Today many countries are embracing mobile-based solutions and innovations to fill this gap. Operators are contributing to achieve financial inclusion and foster economic development, by leveraging the existing

national mobile coverage and infrastructure and other assets of the mobile industry with operator-led or bank-partnered solutions³.

Mobile money⁴ schemes facilitate transactions including small cash transfers, the payment of bills, remittances from anywhere, and the transfer of funds from firms and public authorities to employees and people in the social welfare. Moreover, an increasingly wide range of services are being offered via mobile money, from micro-savings and micro-loans to micro-insurance packages. This is particularly relevant in countries whose populations are largely unbanked. In such countries, banking products are typically offered through the mobile money platform (e.g., M-Shwari in Kenya, and EasyPaisa's Khushaal Munafa in Pakistan).

With about 67 percent of retail spending in India carried out in cash⁵, mobile money services could potentially replace cash transactions and enable micro transactions to proliferate, enabling millions to store, send and spend money at low transaction costs.

3. Mobile Money: Enabling Policy Solutions, GSMA, 2013, p. 12.

4. Definition: Mobile money is monetary value that is: a) available to a user to conduct transactions through a mobile device; b) accepted as a means of payment by parties other than the issuer; c) issued on receipt of funds in an amount equal to the available monetary value; d) electronically recorded; e) mirrored by the value stored in an account(s) usually open in one (or more) bank(s); and f) redeemable for cash. Ibid., p. 5. value Mobile money includes different forms of mobile transfers and mobile payments.

5. Airtel India Sustainability Report, 2012

4.3.1



Spreading financial access to the poor

In emerging economies, 2.5 billion people lack a viable alternative to the cash economy, but 1.7 billion of them have mobile phones. Mobile represents an unparalleled opportunity to increase the reach of the formal financial sectors. 80 percent of India's villages lacking a bank within a two-kilometer radius (according to the World Bank), but the vast majority of the people living in those villages have a mobile phone. Mobile-based solutions could thus certainly increase access to financial services for a large part of the Indian population. Despite this potential, in India today, there are still only 20 million registered mobile financial services⁶ users (RBI, 2012), but only a small proportion of these use mobile

payments and transfer services on a regular basis.

Mobile micro-savings accounts create a vital and convenient buffer for the poor against the shocks of severe and unexpected costs, such as job loss, the death of a spouse or a family illness. For migrant workers, person-to-person payments over mobile networks also play a critical role, offering a secure, affordable alternative to expensive, unreliable remittance providers. Without a bank branch in most villages, for those sending monthly funds to relatives, the alternative is to use informal hawala couriers, who can charge 7.5 percent to remit money.

4.3.2



Government initiatives enhancing benefits for citizens

In many emerging markets, inefficient welfare disbursements place heavy financial and administrative burdens on governments. Mobile financial services provide a means of operating a secure, low-cost, time-efficient welfare disbursement system, facilitating e-Government and supporting disaster relief efforts.

For example, the cost of administering India's Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is substantial, and efficiency is hampered by frequent funding leakages, procedural delays and corruption. Disbursement challenges also limit adoption of programs such as Janani Suraksha Yojan, a maternity program giving rural women financial incentives to give birth in hospitals. With delays in

payments of up to a year, and payment only available as cash or checks, the women who need it most are often reluctant to sign up.

For such welfare payments, mobile financial services can provide an efficient and secure disbursement tool. Using mobile accounts, fraud risks are reduced and payments can be monitored at reduced cost, thereby reducing leakage.

6. Definition: Mobile financial services refer to a range of financial services that can be offered across the mobile phone. The two leading forms of mobile financial services are mobile money and mobile banking. For the definition of mobile money, see footnote n. #. Mobile banking refers to banking transactions that are undertaken by bank customers using mobile phones

4.3.3

₹ Mobile Financial Services in India today

Mobile financial services also provides a powerful tool in times of crisis, supporting disaster relief initiatives by directing help, funds and information to those in need, as international examples demonstrate⁷. Mobile Financial Services in India Today Indian regulation stipulates that operators can help deliver financial services by offering two types of mobile wallets. “Prepaid payment instrument” (PPI) accounts can be set up by operators themselves for each of their customers, and do not have individual customer bank accounts “backing” each mobile wallet. However, these wallets currently do not support the withdrawal of cash. They can only load cash or use certain external payments (such as utility bills). For customers to enjoy mobile wallets that have “cash-out” functionality, they need to submit to the full “Know Your Customer” (KYC) process of the operator’s partner bank. This requires presenting ID and paperwork for the bank application, as well as a waiting time until approval is granted. These “full KYC” wallets can only be opened, and fully utilised, at operator’s retailers who have been granted “Business Correspondent” (BC) status by the Reserve Bank of India.

A number of services have already been launched in India by the leading telecoms companies. Bharti Airtel and Axis bank are creating a state-of-the-art payments infrastructure by using its capabilities across the country and promoting an ecosystem of merchants and retailers who make transactions using their Airtel Money product. Through Airtel Money’s PPI service (the “Express Account”), users can make utility payments for electricity, water and cooking gas, send remittances for medical and education services, pay for citizen services and shop at local kirana (grocery) stores without carrying a card or cash or having to worry about losing them. Airtel “Super Account” users, who have applied and been granted bank accounts that

link to their Airtel accounts, can also withdraw cash from thousands of appointed Airtel BC agents.

Another example of mobile money in India is the Idea MyCash initiative, set up in association with Axis Bank. The service—available in several areas of UP East, Bihar, Delhi and Mumbai—enables unbanked people to open an account and access basic services such as cash deposits, withdrawals, remittances, utility payments, and mobile recharging services, using its mobile platform.

Additionally, Vodafone have launched M-Pesa, the world’s most successful mobile money service (pioneered in Kenya), in India. Other examples of live mobile money services include Airtel ICICI Bank Mobile Money and mRupee (launched by Tata).

In just one year (2011 to 2012), mobile financial services transaction volumes have doubled, with the value of those transactions tripling. Many of the users of these services were previously unbanked, with 81 percent using informal means of savings and 31 percent working as day laborers or factory workers and domestic workers (IMTFI, 2012). This is happening, in part, because mobile financial services are more affordable for low income people than services offered at a bank branch, with average costs for mobile financial transactions about 20 US cents, compared to US \$1.45 at branches⁸.



In just one year (2011 to 2012), mobile financial services transaction volumes have doubled, with the value of those transactions tripling.

7. In response to the floods in Pakistan, for example, EasyPaisa—a Pakistan-based branchless banking service—used its platform to solicit donations from people who lacked internet access and distribute donations to affected households (a model that also proved highly successful in the wake of the Haiti earthquake). Mobile money or coupons can be used to direct people to specific stores or relief centers.
8. Source: Effects of Mobile Banking on the Savings Practices of Low Income Users, IMTFI, 2012. By comparison to the average SBI branch’s all transaction cost of \$1.45, EKO’S average transaction cost is only \$0.21 (Malhotra 2010)

4.3.4

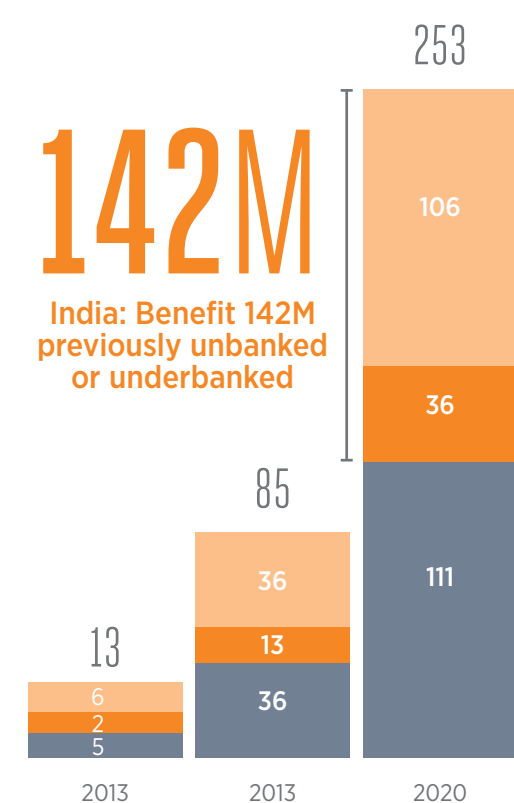


Potential impact and requirements for support

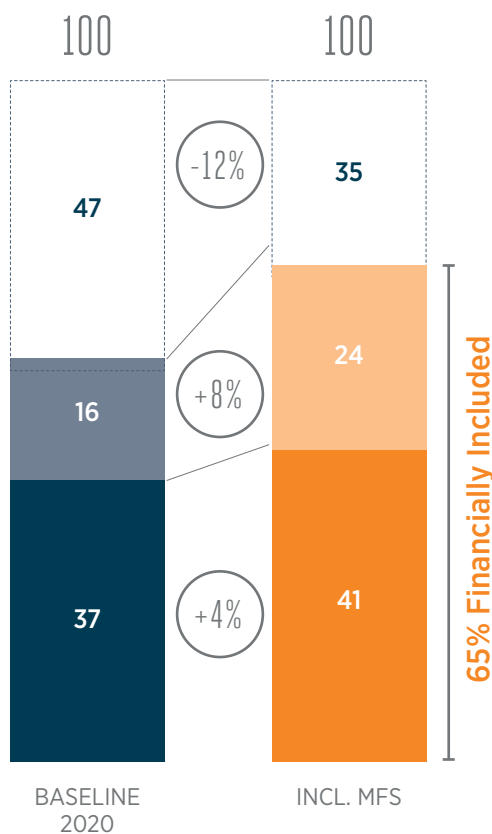
Services delivered via MFS have the potential to serve 250 million people by 2020, raising the adult financial inclusion⁹ rate to 65 percent. This assumes an increasingly enabling regulatory environment that supports the growth of the mobile financial services industry (see regulatory recommendations outlined later in this section). MFS growth is expected to follow an s-curve, expanding extremely rapidly once a critical mass of users have mobile wallets. This is the path to scale that has been observed in some international markets with a mobile phone penetration rate as high as India. The graph below shows how MFS could impact currently unbanked or underbanked customers over the next seven years.

IMPACT POTENTIAL OF MFS

MFS USERS [M]



% FINANCIAL INCLUSION (ADULTS)



1. Based on GSMA Intelligence forecasts with 1,203M users in 2014 and saturation around 100%
Source: Telenor; BuddeCom; OVUM; ITC; GSMA Intelligence; TRAI; BCG analysis

Figure 17

9. The adult financial inclusion rate includes people who are under banked (those with access to savings account / current account) and those who are fully banked (use all main services: savings, bill payments, credit cards)

However, taking advantage of the benefits of MFS will require a proportional regulatory framework and a responsible business approach from the providers.

The latter is a challenge that mobile network operators are ready to address, taking a proactive role in the identification of standards and procedures to:

- a) safeguard customer money held as electronically stored value,
- b) make the IT platforms sound and reliable,
- c) prevent and manage fraud,
- d) make reliable and trustworthy the third parties that participate in the distribution of the products and the cash-in and cash-out operations,
- e) provide customers with clear and effective disclosure of pricing, terms, and conditions,
- f) ensure clients have knowledge of and access to redress and complaint procedures,
- g) protect clients' sensitive data and personal information.

Regarding the first point, in his first remarks as Governor of the Reserve Bank of India (RBI), Dr. Rajan pointed out that “Everyone has a right to a safe investment vehicle, to the ability to transfer remittances to loved ones, to insurance, to obtain direct benefits from the government without costly intervening intermediaries, and to raise funding for viable investment opportunities.”

The regulator can play a critical role in achieving the vision laid out by Dr. Rajan, by establishing a regulatory environment that embraces innovation and the mobile opportunity allowing both banks and non-banks, such as operators, to establish the most effective MFS business models and ecosystems. There are some of the policy measures that can be adopted, like:

- Adding cash withdrawal functionality (of a low value) to PPI mobile accounts, to enable safe, secure remittances for millions of low income, unbanked customers who have PPI accounts
- Harmonizing the KYC requirements between the financial sector and telecom regulations to rationalize compliance costs and making sure that telecom regulation for SIM registration doesn't impact negatively customers' access to financial services.
- Raising the transaction limit on fully KYCed mobile money accounts opened by non-bank BCs¹⁰ to bring them on par with fully KYCed accounts opened by banks' BCs (currently the limits are 25,000 and 49,999 respectively).
- Removing the requirement that BCs need to be within a 30km radius of a bank branch, to allow further rural extension of financial services via operator networks and increase the availability of financial sector touch points for rural and low-income population.
- Giving permission to operators, to negotiate commercial terms with banks on mobile money escrow accounts. Current restrictions in this regard hamper the sustainability of the services and therefore have a negative impact on the cost of the services for the customers.

10. In consistent with the risk-based approach promoted by the Financial Action Task Force (FATF) in the 2012 Recommendations and the related guidance documents on financial inclusion and on new payments products and services.



300,000

mEducation has the potential to help 300,000 students to gain employment through grade improvement.

To achieve full potential of mEducation, government support is critical through partnerships and promotions.

4.4

 Education

In its efforts to increase the quality of education and broaden access to schooling and skills training, India faces three challenges:



Extending access to underprivileged communities,



Making education affordable for these communities and



Increasing the quality of the education delivered.

With traditional, labor-intensive methods of delivering education, it is hard to achieve economies of scale. However, new forms of education—delivered through mobile technology—deliver economies of scale, making education accessible for everybody. While remote learning is primarily focused on broadening the reach of education, interactive tools and community interaction can also improve the quality of education.

4.4.1



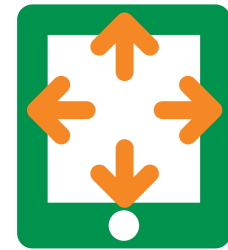
Access to education

For many developing countries, the biggest educational challenge is increasing low rates of access, especially among rural and less-privileged communities. With less than 60 percent of secondary school¹¹ teachers trained to teach, expanding access to education is extremely challenging. However, mobile solutions provide learning tools with which teachers can be empowered with new, engaging content, and children without access to schooling can either teach themselves or access tutor services that would otherwise be unaffordable.

To address India's high drop-out rate and poor student performance, particularly in reading and math, the Vodafone Foundation is working with Pratham Education Foundation to deploy the 'Learning with Vodafone' Solution. The solution combines software with mobile technology to empower teachers to improve the classroom experience. Rich graphical and multi-media content and interactive teaching methods help students improve their performance by exploring and learning via the internet in an interactive, engaging manner. The program—which includes a school management system that tracks attendance and grades—will be rolled out in 1,000 schools in India over the next three years.

When it comes to self-learning solutions, one channel has been tested in India. A "hole in the wall" initiative encourages children in rural areas to learn on their own. At kiosks with mobile internet-enabled computers, children can access everything from educational games and technical material to content on mathematics, geography and other subjects, allowing them to educate themselves. Children using the kiosks said they found them entertaining and helpful for their studies, while in a survey of local residents, 80 percent said they believed it improved academic performance and spread literacy.

What the computer kiosk model powerfully demonstrates is the ability for children to access learning independently, when schools or teachers are unavailable. And the promise of this kind of model is that it could easily be adapted to mobile devices.



11. Source: World Bank Education Statistics for low income countries (Percentage of trained teachers in secondary schools, 2010)

4.4.2



Cost of education

28%

On average, an Indian family would need to spend up to 28 percent of their annual income on public school fees.

For many poor communities, education is simply unaffordable. On an average, an Indian family would need to spend up to 28 percent of their annual income on public school fees, and up to 40 to 167 percent on international schools (if they were to afford one). mEducation solutions can address this key challenge by providing content via the mobile channel.

In India, Tata DOCOMO's Tutor on Mobile service provides a knowledge marketplace for affordable access to education. Subscribers can obtain access to learning content on a wide range of subjects, including school curricula, job interview preparation guides and hobbies. Content is sourced from about 75 providers, including other subscribers, and delivered via multiple channels, including WAP, SMS, IVRS and video.

In the first year, approximately 1.5 million pieces of mEducation content were accessed, with this early phase of the project attracting about 200,000 users. In the first year of operation, some 1 million are expected to benefit from the service.

4.4.3



Quality of education

When it comes to the quality of education, a lack of qualified teachers leads to low standards, particularly in secondary and higher education. This leaves a clear opportunity for mEducation to fill the gap.

In addition to increasing access to educational content, mEducation can also offer certification opportunities, helping improve employment prospects in places where college education leaves graduates with only low quality skills.

4.4.4



Potential impact and requirements for support

An educated population is the foundation of a healthy and prosperous society. Once, only wealthier nations could deliver high quality education to their citizens. With m-solutions, turning every young person into a well-educated student is an eminently achievable goal. Estimates suggest that mEducation solutions can improve the affordability of education by up to 65 percent¹², helping millions of households in countries like India.

Mobile-enabled solutions can also help improve student proficiency. Experiences with the Hole in the Wall initiatives indicate that for low proficiency students, improvements of up to 50-75 percent in performance could be achieved.

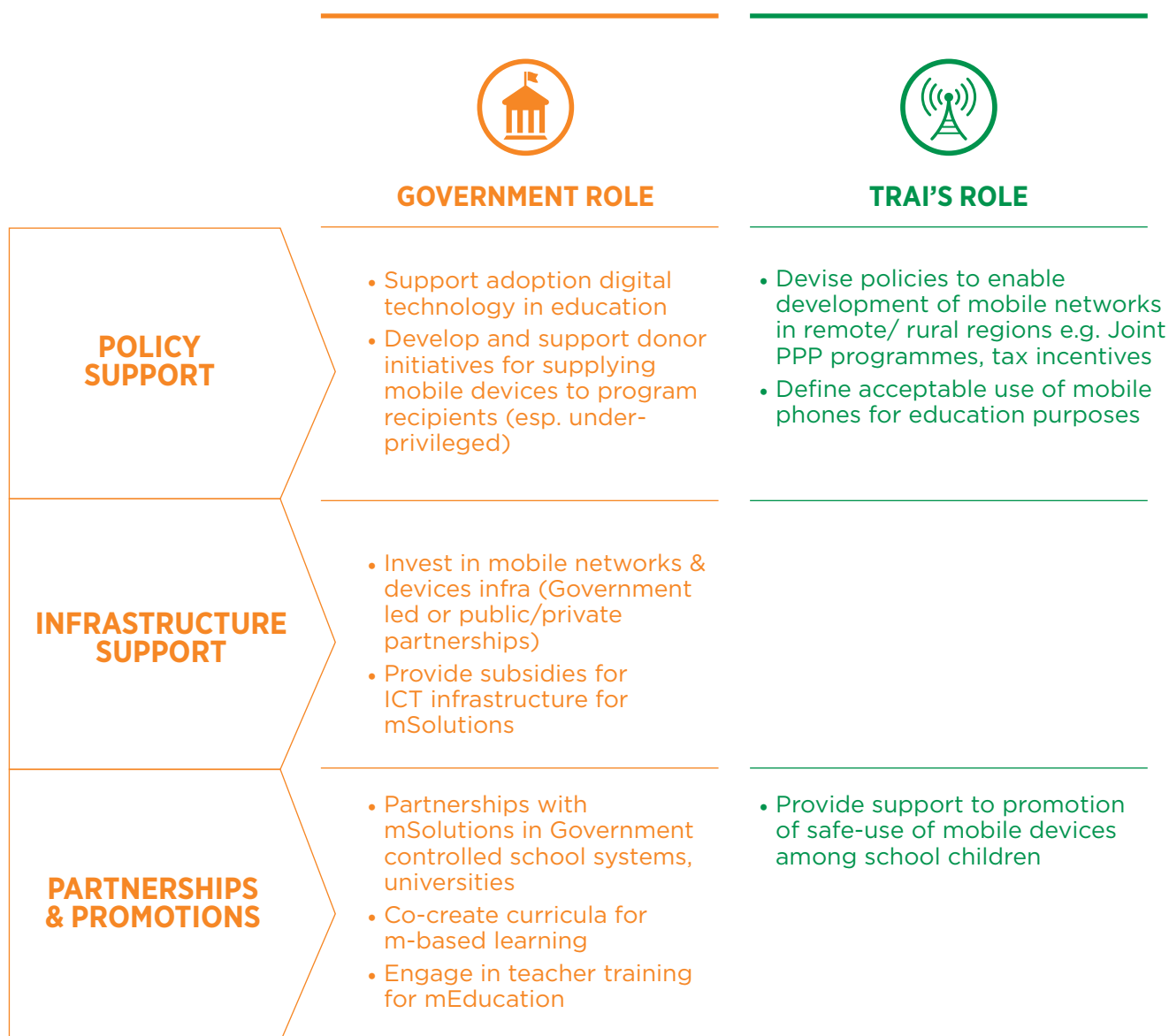
Mobile solutions can also increase employability. In India, for instance, up to 80 percent of graduates have been found to be unemployable in some sectors. In one study, nearly 30 percent of engineers were unable to solve basic mathematics problems¹³. A conservative 20 percentage point improvement in employability—as successful mLearning programs in India have shown to be possible—could help approximately 300,000 engineering graduates become suitable for employment.

By offering training remotely, mobile technology can also increase incomes among underprivileged groups. For example, Uninor¹⁴ has supported the Citizen Centre Project in Tamil Nadu to help marginalized women increase their livelihoods. Working with Hand in Hand, an international NGO, the program (which ran from June 2010 to June 2012) encouraged female entrepreneurship by providing them with computer training and opportunities to do business through communications services.

While mobile solutions can transform the delivery and quality of education, with further support, these technologies could achieve even more. Government support will be critical to ensure that new solutions in education achieve their full potential.

12. Based on Megastudy example | Source: Literature research, analyst Report, cram school for undergrads who plan to enter Medical (MEET) or Dental (DEET) graduate program
 13. Based on NASSCOM studies, FICCI and World Bank surveys
 14. Subsidiary of Telenor Group

REQUIREMENTS FOR SUPPORT FROM GOVERNMENT AND THE TELECOM REGULATOR



1. Source: Hindustan Times Press Report "Uttar Pradesh: Laptop sop turns a reality" (March, 2013) | 2. Source: <http://aakash.org.in/> | 3. National Telecom Policy (NTP), 2012 | 4. Source: GSMA | 5. AMTA Web Portal | 6. From TRAI - Recommendations of the Authority on DoT reference on TRAI recommendations on "National Broadband Plan" (May 2011) | 7. National Broadband Plan (NBN), Australia

Figure 18



National Telecom Policy 2012
(NTP 2012)

A vision to 'provide secure, reliable, affordable and high quality converged telecommunication services anytime, anywhere for an accelerated inclusive socio-economic development'



Regulatory Framework for Future Growth

Regulatory changes are critical to unleashing the full benefits of mobile technology, with legislation providing the clarity and incentives industry players need in order to make appropriate investment decisions.

India's Department of Telecommunications (DoT) has formulated the National Telecom Policy 2012 (NTP 2012) with a vision to "provide secure, reliable, affordable and high quality converged telecommunication services anytime, anywhere for an accelerated inclusive socio-economic development."

The NTP 2012 states that social and economic development in India is its primary goal, and it includes multiple stakeholders, from consumers to government and the overall economy. The goal for consumers is to extend affordable, high quality coverage, particularly in remote and rural areas, so that mobile can be an instrument of socio-economic empowerment. Meanwhile for the economy and mobile operators, the mission is to promote India as a global hub and R&D center for the ICT industry, attracting foreign investment and creating jobs in the clean tech sector and to reach out to the population who does not yet have access to mobile connection.

The goals are designed to serve as official guidelines indicating the overall direction of regulation. We have therefore drawn on the NTP 2012 mission statement to highlight what regulatory changes are needed to make these goals a reality.

Government cannot achieve these goals alone, however. It must work with the mobile industry by designing policies and regulations that maximize long-term private sector investment. Only with a sustainable mobile industry, will India be able to reach the full socio-economic benefits envisioned in the NTP. In order to invest, the industry needs clarity on the direction and the overall economic and regulatory environment that will be put in place to support this path.

5.1

Key enablers for future investment

We have identified two enablers that are critical to supporting the mobile industry in meeting the NTP 2012 objectives. These are:

- The industry's ability to invest: Driven by business profitability and future outlook and
- The industry's willingness to invest: Driven by a stable and transparent regulatory environment that is conducive to doing business.

5.1.1



Ability to invest

Mobile operators in India have been faced with high financial burden which, in turn, impact their ability to make the investment required to upgrade consumer services, meet demand in highly populated urban areas and, expand networks to provide coverage to people living in rural areas. Having a successful mobile industry is a prerequisite to secure operators investment. Indian operators however, are among the countries facing the highest debt and lowest profitability ratios in the Asia-Pacific region. This can be explained due to high borrowings from operators to acquire spectrum, intense market competition which has driven down prices, a certain level of uncertainty and burden with regard to extraordinary high sector-specific regulatory charges that ultimately hamper the sector's profitability. Even, TRAI in its recent recommendations (9th September 2013)

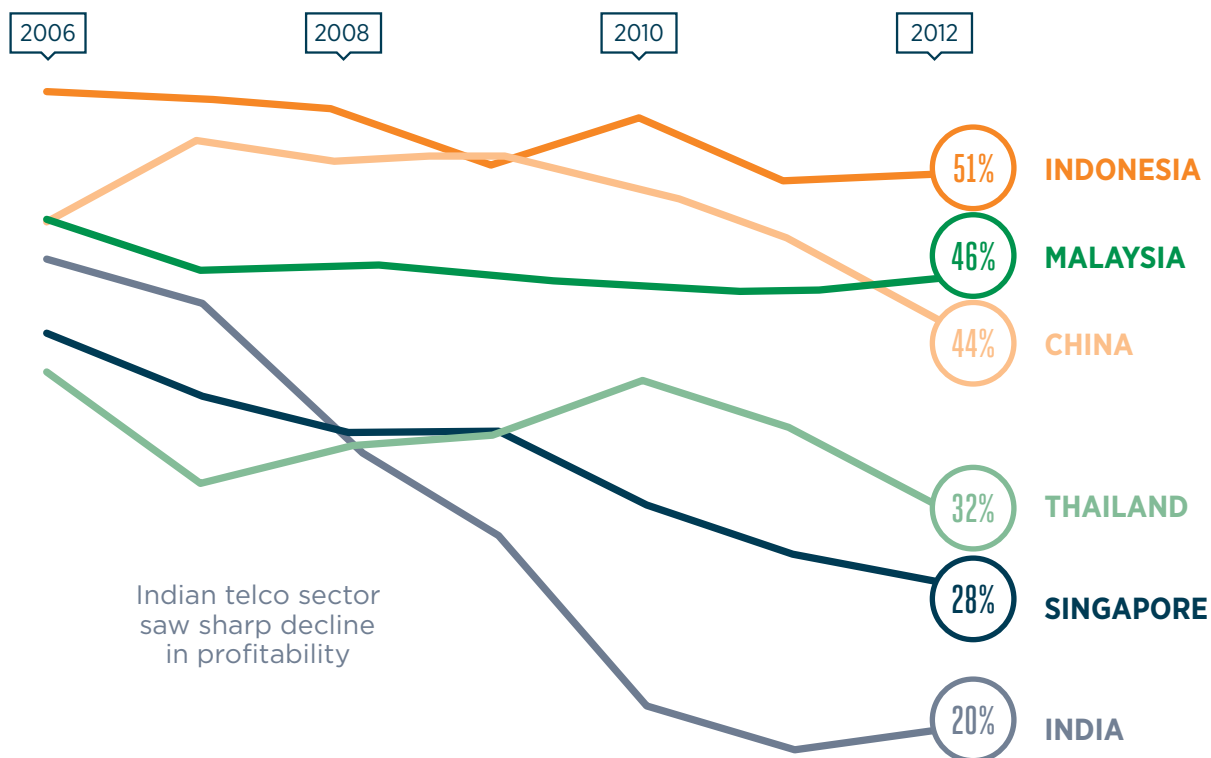
has appreciated that "The telecom sector has been going through financial duress over the past two years. Unrealistic pricing and indebtedness have taken a huge toll. Operating margins have fallen drastically. Some companies have negative operating margins; leave aside interest and taxation, they are not even able to cover depreciation and amortization charges."

Moreover, the EMF guidelines also hamper the operators' ability and willingness to invest. The response is therefore for telecoms companies to reduce and delay investment and/or pass the increased costs of operation on to their consumers. However, given the high investment requirements of mobile operations, driven by demands for network expansion and upgrades, reduced investment would adversely affect all stakeholders.

INDIAN OPERATORS—CHARACTERISED BY DECLINING PROFITABILITY AND HIGH DEBT

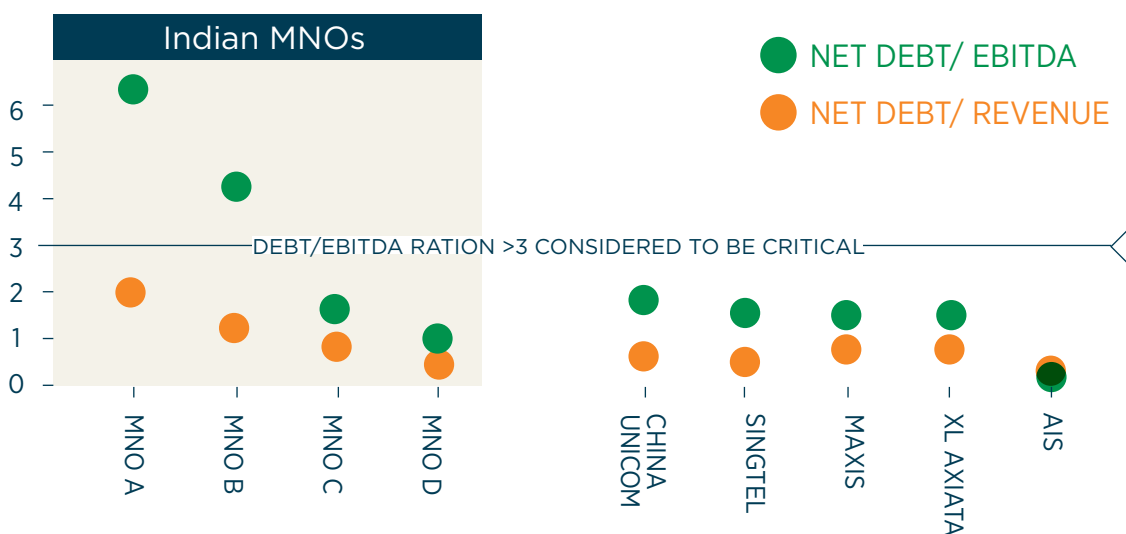
PROFITABILITY OF INDIAN TELECOMS AT LOW END OF THE PEER GROUP

%EBITDA / Revenue



INDIAN MNOS WITH HIGH DEBT LEVELS COMPARED TO OTHER APAC PLAYERS

Debt ratios



Source: TRAI, Annual reports, analyst reports, BCG analysis

Figure 19

5.1.2



Willingness to invest

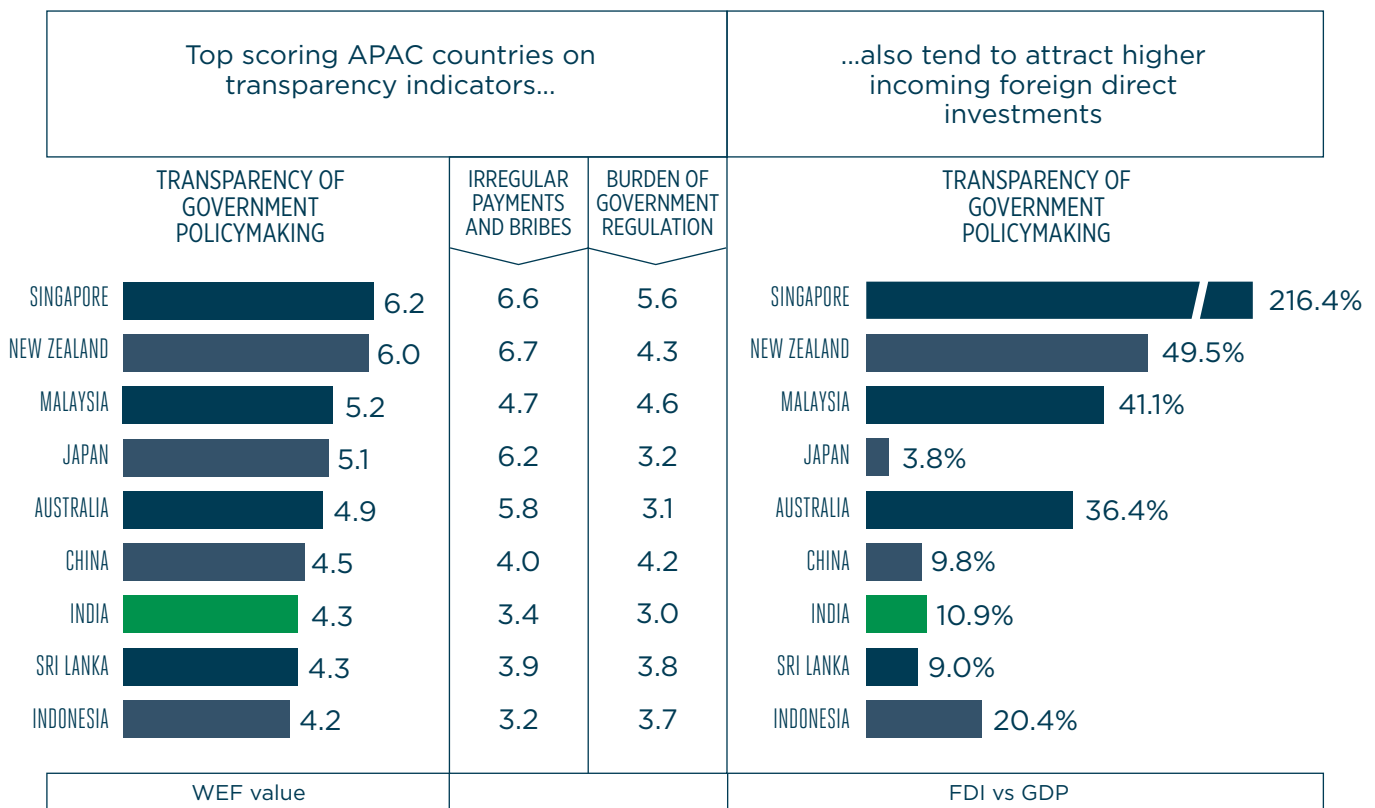
Operators have been at the forefront of mobile developments, investing in the network, enhancing the customer experience and adding new subscribers. With ~70% of the Indian population living in rural areas, and with the opportunity to continue to add subscribers in underserved regions and to drive non-voice revenue growth, India certainly offers some encouraging prospects for the industry.

However, given the long-term nature of their investment, mobile operators need a transparent and stable policy environment.

Countries whose performance on transparency and governance is high appear better placed to encourage domestic and foreign direct investment.

In contrast, unpredictable, retroactive policy changes create a challenging business environment for the mobile industry. This was recently highlighted via the one-time spectrum fee. Stability therefore is a key requirement when it comes to supporting investment in the telecom sector.

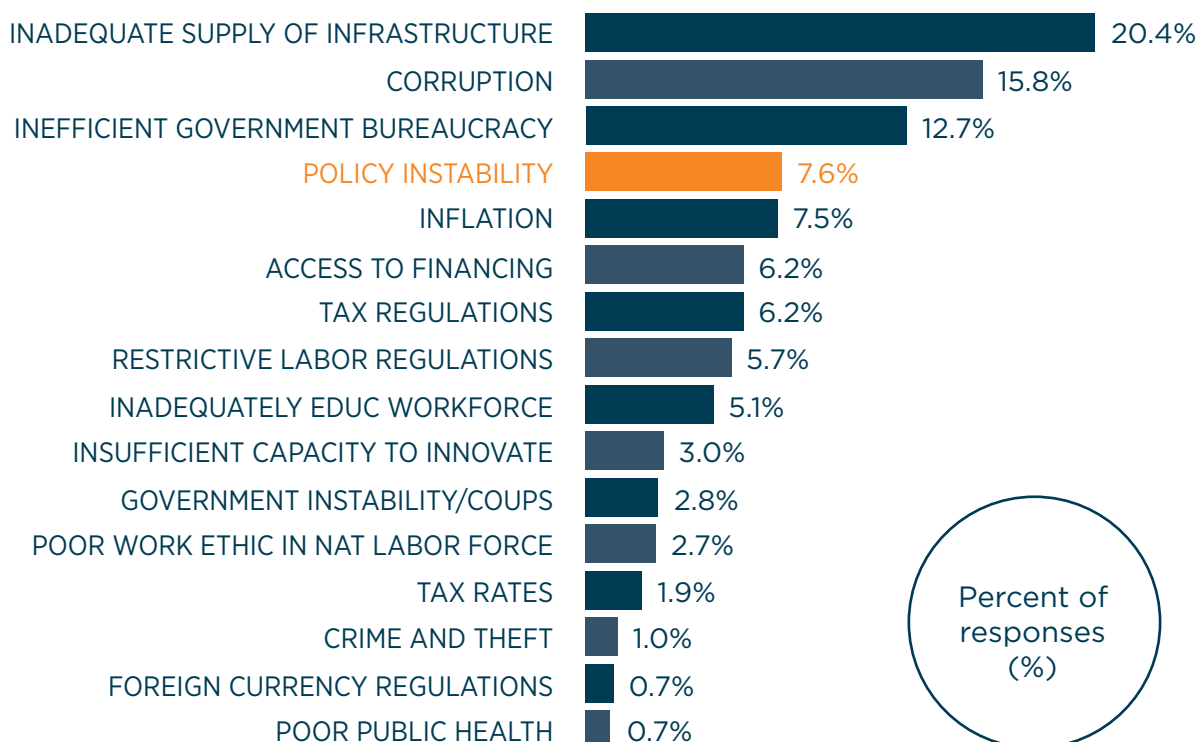
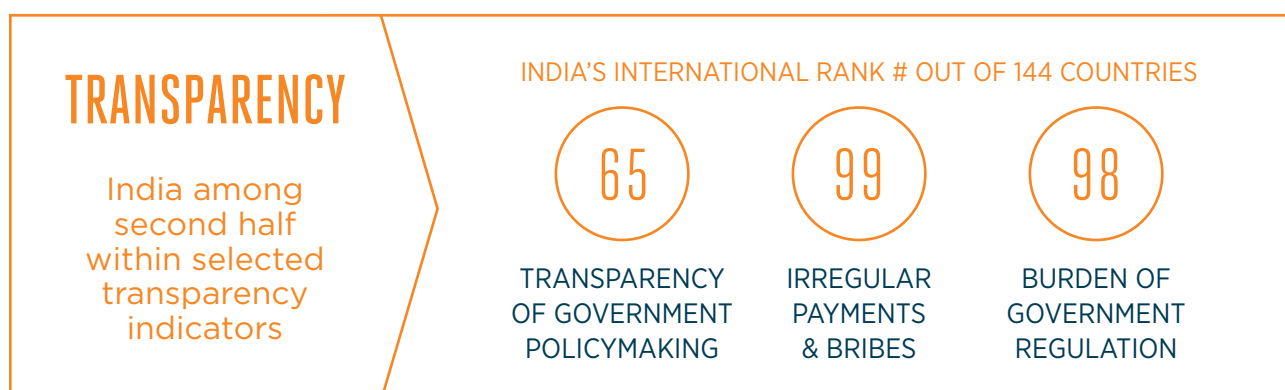
CORRELATION BETWEEN STABLE AND TRANSPARENT POLICY MAKING AND FOREIGN DIRECT INVESTMENT



Source: World Economic Forum, OECD, BCG Analysis

Figure 20

INDIA'S RATINGS ON TRANSPARENCY AND BARRIERS TO DOING BUSINESS



Transparency of government policy making: Ease for businesses to obtain information about changes in government policies and regulations affecting their activities. [1 = impossible; 7 = extremely easy]

Irregular payments and bribes: Commonality of firms to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favorable judicial decisions. 1 (very common) to 7 (never occurs).

Burden of government regulation: Burden for businesses to comply with governmental administrative requirements (e.g., permits, regulations, reporting). [1 = extremely burdensome; 7 = not burdensome at all]

Source: World Economic Forum, BCG Analysis

Figure 21

5.2

Policy Call to Action

Policy-makers from the government and TRAI should design a transparent and predictable regulatory framework to stimulate private sector investment. The government should move away from retrospective regulatory changes, which reduces investors' confidence.

When it comes to transparency and policy stability, India lags behind other nations, creating serious barriers to doing business. To fully benefit from a vibrant mobile industry and to ensure long-term investments from operators, government policies need to reduce uncertainty by providing policy predictability and stability.

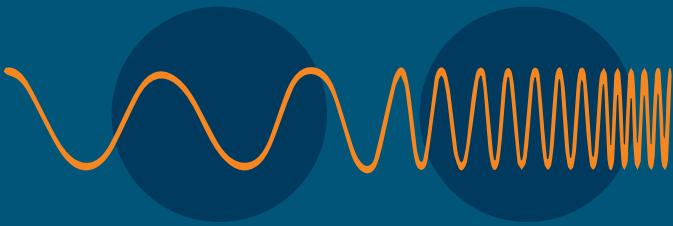
Three regulatory policies require particular attention in terms of transparency and stability to ensure long-term sustainability of the industry and operators' ability to achieve the objectives set in the NTP:

- Robust spectrum management
- Reduction of the Universal Service Obligation Fund (USOF) levy
- Balanced and evidence-based electromagnetic field (EMF) requirements

These policy priorities will, in turn, underpin companies' ability to invest.

SIX KEY ISSUES FACING THE REGULATOR AND SPECTRUM MANAGEMENT BEST PRACTICES

1. SPECTRUM AVAILABILITY



Release spectrum harmonised with ITU guidelines

2. TECHNOLOGY



Technology neutral

3. PRICING



Setting realistic spectrum pricing

4. CONTINUITY



Create certainty through presumption of license renewal

5. SPECTRUM TRADING AND SHARING



Multilateral trade and open sharing

6. SECTOR CONSOLIDATION



Regulation to foster sector consolidation

5.2.1



Robust Spectrum Management

Spectrum-related policy choices are critical to enabling investment. These include making spectrum available in line with International Telecommunications Union (ITU) recommendations, allocating relevant spectrum bands to mobile, and ensuring that spectrum earmarked for mobile is fully released in globally harmonized spectrum bands.

Also critical is aligning spectrum pricing with international benchmarks, after adjusting for local market conditions—such as ARPU and purchasing power parity (PPP)—and facilitating a market approach to spectrum sharing and trading.

The Indian Government faces seven key questions on spectrum management. This may involve trade-offs between different issues. Modern regulation is characterized by a set of choices on each of these seven dimensions.

In India, proposed policy changes on spectrum management include the following

- To improve availability of spectrum in line with ITU suggestions, relating to both relevant spectrum bands and the amount of spectrum available within these bands
- To align pricing with international benchmarks and local market conditions
- To facilitate a market approach towards spectrum sharing and trading



Spectrum Pricing

REGULATORS' KEY QUESTION

What is the pricing imperative?

CURRENTLY PURSUED OPTION IN INDIA

Max auction revenues

Auction set-up to maximize revenues, resulting in (partially) failed auctions Of 900 & 1800MHz

Industry Ask: to avoid spectrum remaining unsold and to support industry's ability to invest in broadband infrastructure, the TRAI should set low reserve prices for spectrum auctions.

Spectrum auction returns provide an attractive source of government income. However, the Indian government should also consider overall consumer value creation, private sector investment and job creation—all of which will ultimately lead to economic growth and additional tax revenues.

High spectrum prices generate government revenue in the short-term, but bring undesirable long-term costs that could be passed on to consumers and translate into higher tariffs, resulting in lower adoption of mobile services. If absorbed by operators, this could lead to higher debt ratios and reduced ability to invest in network infrastructure and upgrades. Given the benefits of mobile penetration, this could reduce the long-term revenue for governments from overall economic growth.

Government should therefore set reserve prices for spectrum auctions that are neither too low (which encourages non-serious bidders), nor so high that operators stay away or are forced to overpay. High reserve prices also increase the risk of spectrum blocks remaining unsold, decreasing government revenues in both the short- and long-term. Experience shows that low reserve prices do not necessarily result in low final auction prices, as can be seen from the example of Germany.

Case study:

Germany's 2011 4G auction

During the auction, players were involved throughout the entire process and were closely involved in setting up the auction, with their suggestions heard and included in the auction development process. The regulator decided to set the reserve price at a very low level. Operators then demonstrated the value they placed on spectrum through a competitive auction. The German 800 MHz auctions achieved record prices despite their historically low reserve prices.

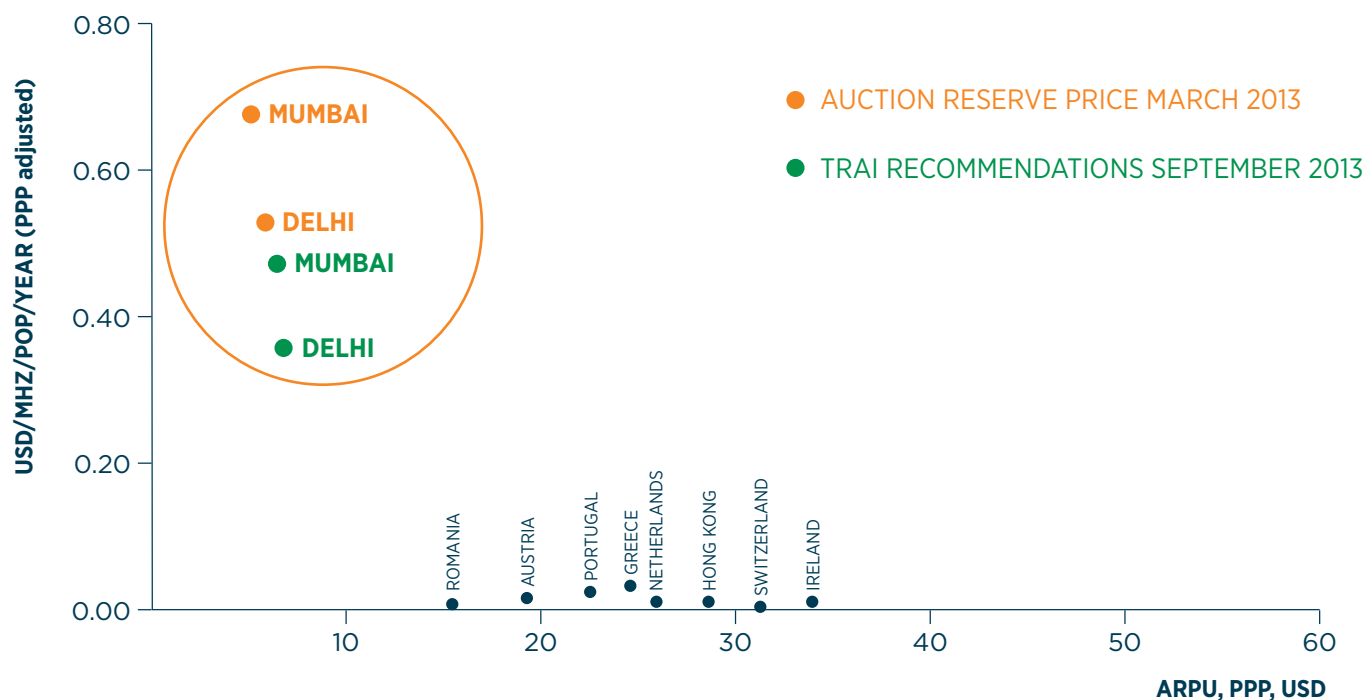
This example shows that, to achieve high final spectrum prices, facilitating the right market mechanisms is more important than imposing a high reserve price.

Benchmarking spectrum reserve prices after accounting for local market conditions has proved a good indicator for the right level of reserve prices. Figure 23 shows that relative spectrum reserve prices per MHz (adjusted for country population, license duration and purchasing power parity) typically increase with higher ARPUs. Mobile operators in India have to pay far more for a spectrum even though the ARPU is significantly lower, making the investment unattractive.

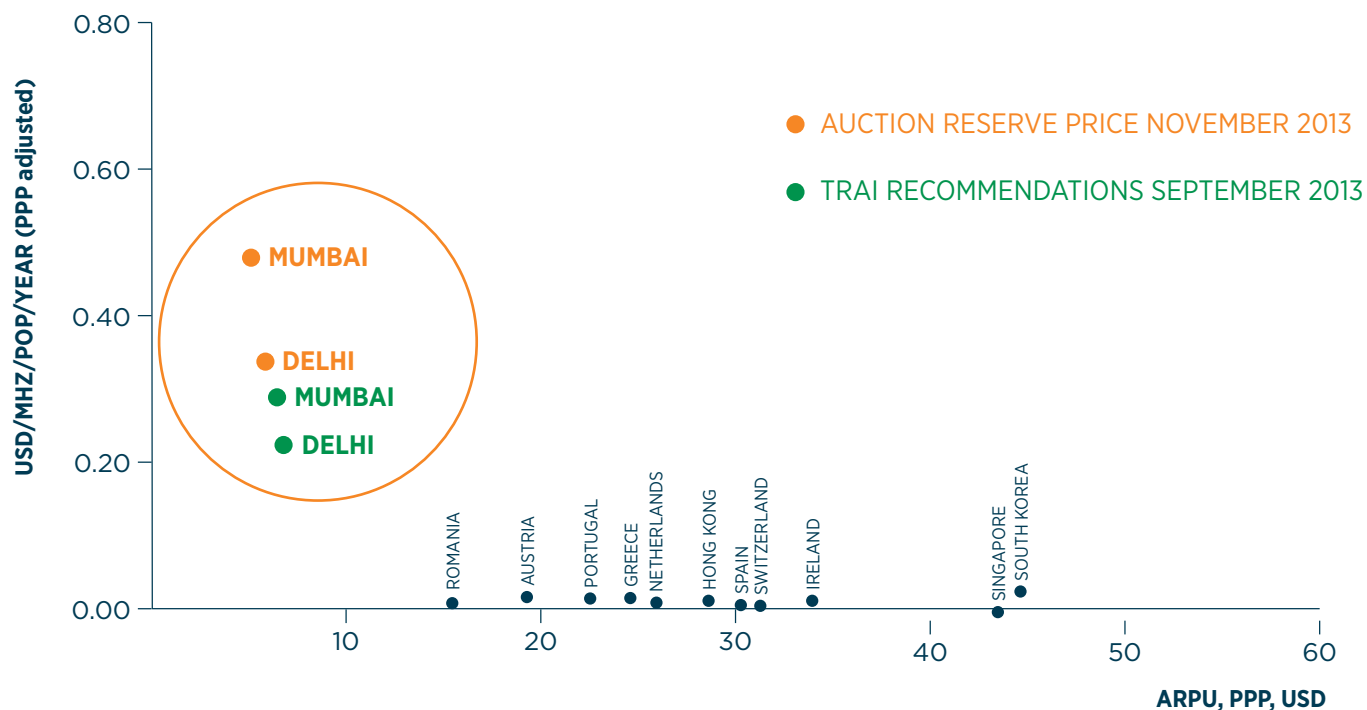
TRAI's recent recommendation to reduce ~40- 60% minimum auction price for 1800 and 900 MHz spectrum is in the right direction and will bring the reserve prices closer to the international benchmarks.

BENCHMARKING OF SPECTRUM RESERVE PRICES AT INTERNATIONAL AUCTIONS

900MHz RESERVE PRICE



1800MHz RESERVE PRICE



Reserve prices of spectrum in India exceed international benchmarks by far given very low ARPUs

Source: GSMA Intelligence, TRAI, regulator information, BCG analysis

Figure 23



Spectrum Availability

REGULATORS' KEY QUESTION

Which spectrum to be made available to telecommunications as per ITU suggestion?

CURRENTLY PURSUED OPTION IN INDIA

Reduced amount

2100MHz band not fully allocated to according to ITU guidelines; 700MHz and 2.5GHz not allocated, yet, other bands only partially allocated to telcos.

Industry Ask: To enable operators to deploy and upgrade technologies efficiently, the government needs to accelerate the harmonized allocation of available spectrum to mobile.

It should avoid fragmentation in spectrum allocations by ensuring that identified frequency bands are released in their entirety and licensed in larger blocks.

Larger blocks of spectrum allow the most efficient use with the latest technologies.

Spectrum is the basis for mobile operations and constitutes one of the operators' most important resources. To offer efficient mobile services to consumers and to provide good coverage, the amount of spectrum available to operators is also crucial. Spectrum demand is influenced by many factors such as network capabilities and data traffic in a certain area at peak times. The key driver for data traffic is subscriber density (particularly in urban areas) for example, in Delhi and Mumbai, the subscriber density is 6040/km² compared to Indonesia at 11/km².

COMPARISON OF SPECTRUM AVAILABILITY IN SELECTED ASIA PACIFIC COUNTRIES

INTERNATIONAL BENCHMARKS	AMOUNT OF SPECTRUM DISTRIBUTED WITHIN BANDS (IN MHZ)					
	700	800/900	1800	2100	2300	2500
SUBSCRIBER DENSITY						
Australia 3/km ²	2 x 30	2 x 45	2 x 60	2 x 60 20 TDD	91 TDD	2 x 70
South Korea 441/km ²	0	2 x 40	2 x 30 (2x30 to be allocated)	2 x 60	54 TDD	0 (2x30 to be allocated)
Singapore 6864/km ²	0	2 x 30	2 x 70	2 x 59.4 15.1 TDD	50 TDD	2 x 24 42 TDD
Malaysia 48/km ²	0	2 x 50	2 x 75	2 x 60	90 TDD	2 x 70 40 TDD
Indonesia 11/km ²	0	2 x 45.25 10 TDD	2 x 75	2 x 60	100 TDD	0
India 102/km ² Delhi, Mumbai 6040/km ²	0	2 x 38.6 ¹ (28.6- 38.6)	2 x 31.4 ¹ (30.8- 50.2)	2 x 20 ¹ (20-25)	40 TDD ¹ (40)	20 TDD ¹ (20)

1. Exemplary for Delhi circle – ranges depending on circles; 2. More spectrum available for telecommunications, yet, not allocated to MNOs; 3G & 4G combined
Note: Malaysia and Bangladesh also allocate spectrum in 450MHz band, others (eg. Australia) also allocate 3400MHz band

RELATIVE AVAILABILITY

- Best Practice
- Average
- Below Average

Source: GSMA Intelligence, ACMA, KCC, IDA, SKMM, BRTI, TRAI, BCG analysis

Figure 24

In a sharp contrast with many other developed (e.g., Australia) and emerging (e.g., Indonesia) countries, India is yet to allocate a comparable amount of spectrum to mobile in any band. It needs to make more spectrum available for mobile and to assign it to operators in line with internationally harmonised band plans. Figure 25 gives an overview of the amount of spectrum allocated and not allocated to telecom operators. Valuable frequencies have not yet been allocated or fully allocated to mobile, thereby limiting operators' ability to cope with already high demand in urban areas and to plan network expansion in rural areas.

SPECTRUM ASSIGNMENT IN INDIA



Note: Values based on averages across circles; Spectrum allocation pre 2G license cancellation
 Source: TRAI, DoT, BCG analysis

Figure 25

-
- Overall only 40% of the spectrum that is of relevance and interest to mobile operators has so far been allocated to mobile operators. Over 60% is yet to be allocated.
 - The entire 700 MHz and significant parts of the 1800, 2100 and other bands are yet to be allocated to mobile operators.
 - While alternative uses are important (e.g. defense and securities agencies), it is possible to free up spectrum, as seen from the Kerala circle example. While in India, an average of 2x28 MHz in the 1800 MHz band is assigned to non-telecoms uses, in Kerala this is only 2x4.4 MHz. Thus spectrum not assigned to telecom could also potentially be freed for use in other circles. Moreover, spectrum that is tagged could be vacated from alternative uses, for example, the spectrum in the 2100 MHz band which is currently used by defense services.
-

Success stories from other markets highlight the importance of making spectrum available. For example, in Indonesia, which in many ways is comparable to India in terms of mobile development, geographic structure, and outlook, operators have between 1.25 and 2.6 times more spectrum available across different bands than Indian operators, and above six times more spectrum available per connection than in India.

Regional and global implications need to be considered when assigning spectrum. Harmonization is a key factor in promoting the adoption of mobile services and brings many benefits, including the cost-effective roll-out of networks, more affordable consumer devices, reduced cross-border interference and international roaming. Without harmonization, the technical and economic efficiency of any future roll-out will be adversely affected.

This also is key when determining the block sizes released as this enables operators to efficiently exploit the latest technology and provide more data per MHz.

Early assignment of large blocks of spectrum through fewer rounds of auction will enable operators to acquire sufficient spectrum early on and hence deploy and run the network efficiently. This will reduce uncertainty for operators, as they do not have to bid for multiple blocks simultaneously or bet on success in future auctions to acquire further spectrum and be able to run a new technology.

Technology neutrality

REGULATORS' KEY QUESTION

Which technology is allowed to be used?

CURRENTLY PURSUED OPTION IN INDIA

Tech neutrality

Newly allocated spectrum to be auctioned as technology neutral

Industry Ask: Give the operators the flexibility to deploy any technology for the assigned spectrum provided it does not create interference.

This allows the operators to use scarce spectrum most efficiently, and upgrade their networks easily once a new technology is ready to be deployed. The key benefit of technology neutrality is realized when operators can decide when to introduce new technology, as long as they avoid interference issues.

However, new technologies may have different spectrum requirements, such as the amount of spectrum needed to work efficiently. In addition, spectrum frequencies have different characteristics that make them more or less suited to the deployment of certain technologies. To enable technology neutrality, the regulator has to consider the physical requirements of various technologies—particularly block sizes—when deciding on the set up of auctions. In addition, the regulator should also re-evaluate levels of technology neutrality on previously assigned spectrum.

Even without spectrum rights being re-assigned, authorities can achieve better use of spectrum by removing restrictions that create more costs than benefits. Many restrictions on use effectively create an artificial scarcity of spectrum. To maximize the benefits of their spectrum resources, governments should therefore remove these restrictions where possible.

Spectrum continuity / extension

REGULATORS' KEY QUESTION

What is the process for renewal of spectrum?

CURRENTLY PURSUED OPTION IN INDIA

Re-auction and subsequent liberalisation

Proposed re-auction of 900MHz and swap with 1800MHz. Significant CAPEX for BTS upgrade and replacement (under discussion).

Industry Ask: To ensure business certainty and service continuity for consumers, the government should create a presumption of license renewal.

Continuity of spectrum allocated to mobile services encourages long-term investment and minimize the risk of service disruption to customers. Operators require certainty to invest in deployment of network and new services. Investments with long payback periods will be deemed riskier in an uncertain environment, hampering operators' ability to raise capital from financial markets. In many countries, both operators and the extended ecosystem have benefited from stability brought by renewal of licenses. Incumbents should be allowed to follow a natural upgrade path for new technologies whilst ensuring that they are using the most cost-effective and spectrally-efficient solutions. Moreover, given the risks to ongoing investment in the sector, licensing authorities should determine their approach to license renewal as early as possible (at least 2-4 years).

Case study: New Zealand—license extension

In its license renewals process—known as the “Management Rights Regime”—New Zealand has adhered to the principles of license continuity and tradability. Spectrum licenses for 800 MHz, 900 MHz bands were due to expire in 2011 and 2012. The incumbents—Telecom NZ and Vodafone NZ—were allowed to renew the majority of licenses, eliminating the need to re-auction the spectrum or to re-shuffle spectrum holdings. This approach brought certainty around license holdings and investments and created transparency on license renewal.

Spectrum trading and sharing

REGULATORS' KEY QUESTION

What is the approach to spectrum trading?

CURRENTLY PURSUED OPTION IN INDIA

Trading prohibited
Currently trading of spectrum is not allowed.

Industry Ask: Spectrum trading should be an integral part of policies promoting sector consolidation

Given restrictions on spectrum trading, operators cannot optimize their spectrum portfolio or address the spectrum shortage. International examples offer a potential way forward for India. Some 70 percent of European countries surveyed have enabled spectrum trading, either on a bilateral or a multilateral basis.

Spectrum trading has proved an effective means of unleashing optimization and technology upgrades. In the UK, allowing operators to trade their spectrum created opportunities for it to be used more efficiently, bringing consumers improved mobile services.

Initially, allowing bilateral trading between operators could help India reconfigure its fragmented frequencies. Building on this, unconstrained bilateral trading could be permitted and—after establishing market mechanisms—market trading could take place.

Recent TRAI recommendations on permitting spectrum trading subject to certain conditions is positive for the operators and will help in sector consolidation.

REGULATORS' KEY QUESTION

What is the approach to spectrum sharing?

CURRENTLY PURSUED OPTION IN INDIA

Sharing within specific barriers

Conditional one time fee and Spectrum usage charge at slab rate

Industry Ask: To enable improvements in coverage and new technology roll-outs, additional fees should not be charged for spectrum sharing (within circles).

Spectrum sharing arrangements needs to be assessed carefully. International examples highlight the advantages of promoting spectrum sharing. In these examples, regulatory fees were not charged. Instead, terms and conditions were decided among the different players, general spectrum caps were applied and the plans required approval by the competition authority.

For example, in Sweden, Tele2 and Telenor entered a joint venture where they pooled spectrum but kept individual ownership (900 MHz and 2600 MHz). This enabled them to build one of the world's first 3G networks, covering the entire country. Similarly, in UK, to realize cost and spectrum efficiencies, T-Mobile UK and Orange UK entered a JV where they pooled their spectrum. Also, in Germany, operators were allowed to share spectrum in order to fulfill their rural coverage obligations, with terms and conditions decided upon among the players and no fees to regulator required.

Case study: Spectrum trading and spectrum swaps in Singapore and New Zealand

In Singapore, where Malaysian mobile internet company Green Packet has been able to enter the market by purchasing 30MHz in 2300MHz and 2600MHz spectrum from Singapore's Pacnet for US\$2.04 million. The deal gives Green Packet access to Singaporean WiMAX customers and network services to mobile network operators.

Meanwhile, in New Zealand, a spectrum swap took place between Vodafone New Zealand and CallPlus to transform a total of 65MHz of existing TDD spectrum in the 2600MHz into 2x30MHz of FDD spectrum. The new FDD spectrum holdings are located in LTE Band 7, which is characterized by small cell sizes, high capacity and high potential for re-use, allowing LTE services to be provided in crowded locations such as train stations and sports stadiums.

Source: IDA, RSM, company websites, BCG analysis

Sector Consolidation

With fierce competition, which is not seen in any other country in the region and many players struggling to achieve profitability, the only means of securing scale and financial sustainability will be through consolidation. This means that facilitating market consolidation could be an important policy focus. The Government has an important role to play here by setting guidelines that support these market developments.

PROFITABILITY ACROSS REGIONS FOR MOBILE NETWORK OPERATORS (OPERATORS)

CIRCLE	MNO A	MNO B	MNO C	MNO D	MNO E	MNO F	MNO G	MNO H	MNO I	Others
AP	36,70%	11,10%	13,50%	19,20%	5,60%	9,70%	0,00%	2,70%	1,50%	0,00%
Bihar & JH	44,10%	12,50%	6,50%	11,30%	11,50%	5,20%	0,00%	4,10%	4,90%	0,00%
Delhi	32,70%	26,70%	0,00%	10,80%	7,60%	6,40%	11,50%	0,00%	3,30%	1,10%
Maharashtra	19,50%	23,30%	12,30%	27,00%	5,00%	8,60%	0,00%	3,50%	0,70%	0,10%
MP and CG	23,20%	8,80%	9,40%	34,10%	17,30%	6,40%	0,00%	0,00%	0,00%	0,80%
Mumbai	19,00%	31,00%	0,00%	8,50%	9,20%	12,20%	18,10%	0,00%	2,00%	0,10%
NE	41,80%	12,50%	13,60%	3,50%	6,70%	0,00%	0,00%	0,00%	21,90%	0,00%
Orissa	37,80%	13,80%	16,80%	4,20%	10,90%	8,50%	0,00%	0,00%	8,00%	0,00%
Punjab	32,90%	18,10%	11,30%	21,20%	3,90%	7,20%	0,00%	0,00%	1,60%	3,90%
Rajasthan	38,80%	22,20%	9,50%	12,40%	4,40%	4,60%	0,00%	0,00%	5,10%	3,00%
Tamil Nadu	29,50%	21,80%	12,30%	3,00%	5,50%	6,70%	0,00%	0,00%	20,30%	0,80%
UP (East)	28,00%	27,80%	10,20%	13,20%	5,20%	5,10%	0,00%	6,60%	3,80%	0,00%
UP (West)	19,40%	23,10%	10,00%	28,00%	4,90%	7,10%	0,00%	6,60%	0,60%	0,40%
West Bengal	29,60%	33,70%	6,80%	6,40%	11,80%	3,30%	0,00%	0,00%	5,20%	3,30%

Note: Typically telcos are able to breakeven at 8% RMS in a circle (BCG Analysis)

■ Above 8%
■ Below 8%

Note: All revenues are GRs only for UASL and Mobile licenses; Market Share data based on GR for Q1-2013
Source: TRAI report on GRs for Jun 2013, BCG analysis











Figure 26

The regulation on M&A in the telecom sector is under development and is expected to be released soon. However, the draft guidelines have a couple of shortcomings. They do not mention spectrum sharing or trading. It allows for the speedy approval of operators only if the resulting entity has a market share of up to 35%. Beyond this and up to a threshold level of 60%, M&A proposals are expected to be reviewed on a case by case basis. In addition to the cap on market share, the draft regulation also suggests imposition of cap on the total spectrum held in the service area (pegged at 25% for GSM band and 10 MHz for CDMA).

Industry Ask: India should develop regulation that fosters consolidation and the long-term sustainability of the mobile industry.

Figure 27 below shows the international examples of the impact on spectrum due to the consolidation of operators in different countries. Increased spectrum allocation is a key driver of consolidation. Hence any impediments in spectrum aggregation in the wake of consolidations or mergers would reduce the attractiveness of consolidation. Internationally, regulators have been liberal in their requirements for consolidation and in some cases, a precondition of the deal is that there was no impact on the operator's spectrum allocation. In this regard, Government could draw on international examples in which operators have been able to retain spectrum (unless certain spectrum caps are breached).

CONSOLIDATION OF OPERATORS AND IMPACT OF THEIR CONSOLIDATION ON SPECTRUM

	ACQUIRER	TARGET	YEAR	# PLAYERS AFTER M&A	COMBINED SPECTRUM OF BOTH ENTITIES POST ACQUISITION
A UK			2009	3	-85% of 1800MHz
B AUT			2012	3	~40% of overall
C FRA			2007	3	~35% of overall
D AUS			2009	3	~40% in Metro areas ~26% in regions
E USA			2013	5	76MHz total in top 25 US markets

Source: BCG analysis

Figure 27



5.2.2

Moving Away from the Universal Service Fund approach

Industry Ask: The Indian Government should gradually reduce the USOF levy, one of the highest across the world, taking into consideration the disconnect between reducing telecoms access gap and accumulating funds in USOF.

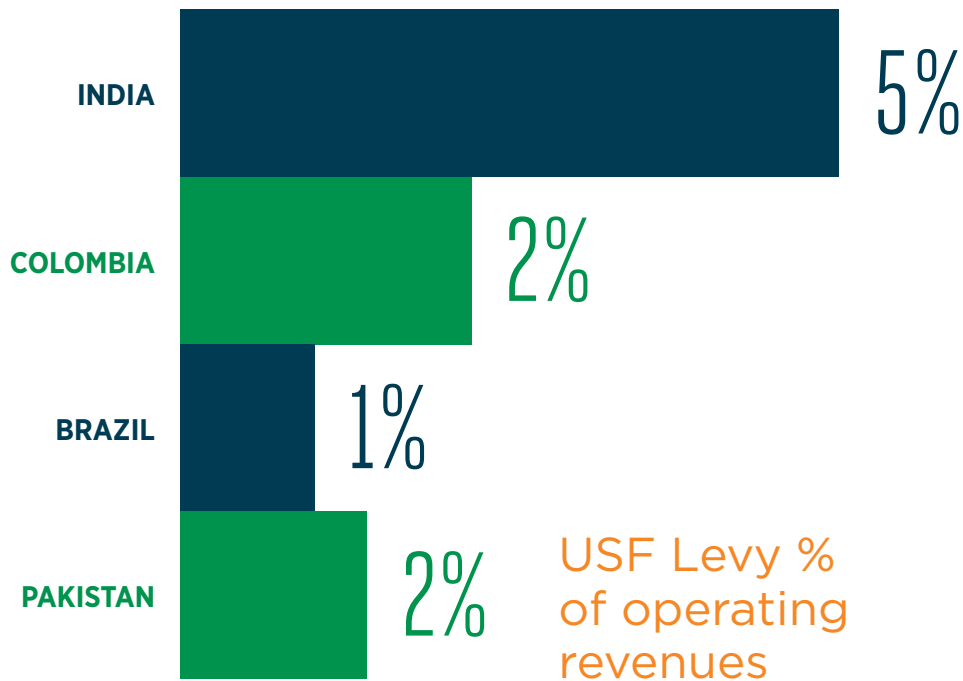
India's Universal Service Obligation fund (USOF) has a mixed track record. While goals such as rural tele-density (39.22 percent in March 2012)¹⁶ have been achieved, market forces have played the biggest role in this. Achievement of other goals such as internet penetration have fallen behind, with USOF programs designed to increase broadband connectivity achieving only about 42 percent of their yearly goals in March 2012. Meanwhile, objectives such as using USOF to build a national optical fiber network need to be reassessed, as they may be more easily achieved using market forces.

The USOF has been poorly utilised, with only 34 percent of funds allocated between 2007 and 2012 on an aggregated basis. Private sector operators have missed out on the execution of many USOF projects where BSNL, the state-owned telecom company, has been the dominant partner. This needs to be re-examined.

Finally, with one of the world's highest levies (at 5 percent, compared to 2 percent in Colombia, 1 percent in Brazil and 2 percent in Pakistan), India's USOF places heavy financial burdens on operators.

16. Source: TRAI (Telecom Regulatory Authority of India)

INDIA'S USOF LEVY RATES



Source: GSMA; EIU

Figure 28

In re-designing its USOF, India needs to set several priorities. It needs to align the funding demands made on operators with its funding needs and with the financial state of the operators, seeking alternative funding sources where appropriate. It also needs to develop clear, transparent policies that are aligned with defined short- and mid-term milestones. USO policies should also focus on needs not met by markets, such as extending access to mobile broadband to rural areas.

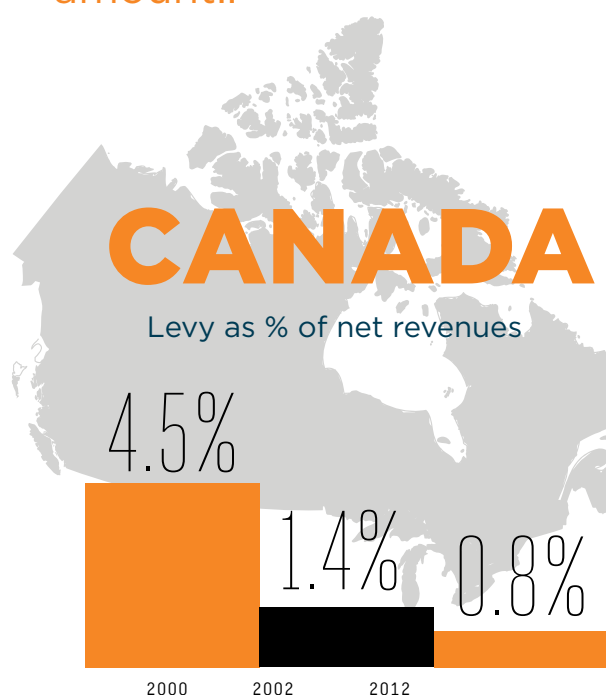
Finally India should explore alternative business models and drive best practices through, for example, public-private partnerships. In addition, better use of USOF can be achieved through a participative approach to policymaking, with operators consulted when defining targets, levies and use of funds, and greater participation of private players in the implementation of projects.

In identifying solutions to address these challenges, India can draw on best practices from other countries. Examples from Canada and Columbia demonstrate the success of using alternate business models and setting levy demands at appropriate levels.

ALIGNMENT OF USOF LEVY, ALTERNATIVE SOURCES OF FUNDING

However, successful USFs starting to reduce levy amount..

.. and are also exploring alternate means of fund-raising



Basic level of service (voice + internet) envisaged for all Canadians

Contributions from telecom providers **fully disbursed** each year

COLOMBIA

2.2%
of operating revenues
used for fund
(down from upto 5% previously)



Additional funds collected from use of spectrum



Contributions from successful bids for services such as VAS

86% fund utilization in 2011

Source: GSMA, BCG Analysis

Figure 29

5.2.3

Aligning Radio Frequency exposure limits to global norms

Industry Ask: India should align its radio frequency (RF) exposure limits with global standards and government should communicate the state of the science to citizens, to allay concerns about RF exposure.

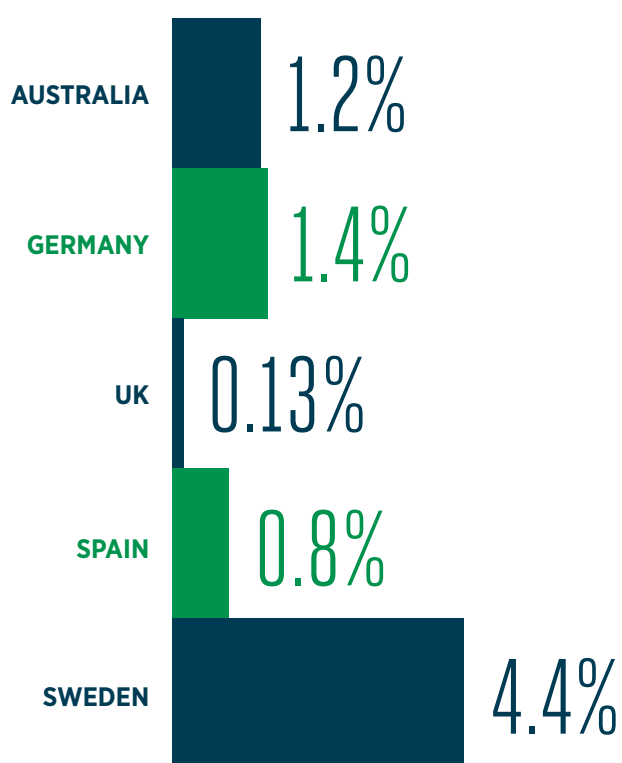
To ensure efficient roll-out costs and avoid significant delays and uncertainties in mobile network deployments, the Indian government should take an evidence-based, balanced approach to RF norms. This will provide for public safety without heightening anxiety or damaging service levels.

Best practices suggest that norms should be aligned with globally accepted scientific evidence based guidelines. In addition, pro-active communication with consumers and stakeholders is key to reduce their concerns.

Global norms for RF exposure—developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and endorsed by the World Health Organization—have been found to protect people against all established health hazards. Typical RF exposure in public areas has been found to be a small fraction of the limit permissible in the ICNIRP guidelines. Further, RF exposure from mobile network antennas sites is often lower than or comparable to other common sources of radio signals, such as broadcast transmitters and Wireless LAN.

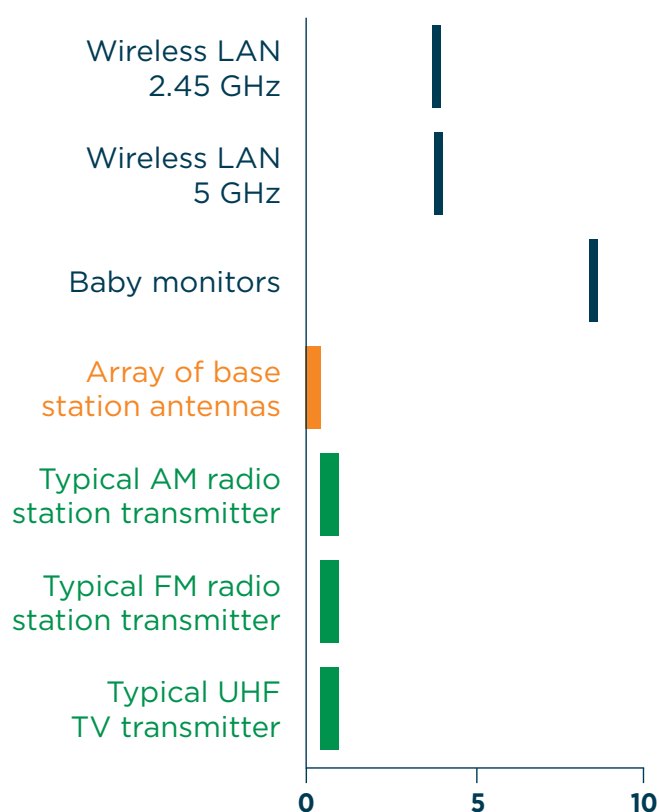
TYPICAL RF EXPOSURE NEAR BASE STATIONS, COMPARISON OF RF EXPOSURE ACROSS SOURCES OF RADIO SIGNALS

Typical RF exposure near base stations



High value observed
(% of ICNIRP)

Sources of radio signals



Typical exposure
levels (V/m)

Note: For Sweden, RF exposure is total exposure, of which mobile services is only a small part
 Note: exposure levels for Wireless LAN and baby monitors at 20 cm; exposure levels for radio transmitters average urban levels
 Source: GSMA & MMF - Implications for Mobile Communications Infrastructure of Arbitrary Radio Frequency Exposure Limits (2010);
 GSMA - "Impact of exclusion zone policies on sitting base stations" (2012);

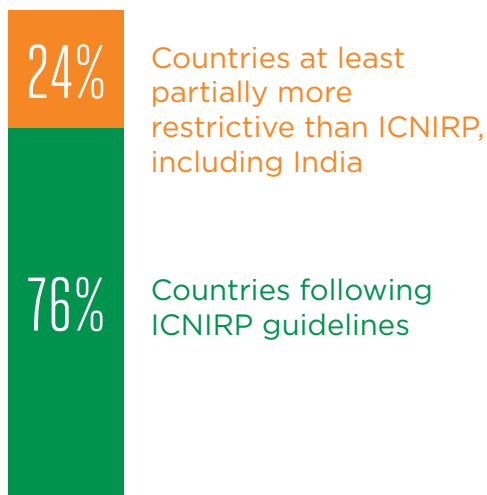
Figure 30

Most countries have followed the global RF exposure recommendations. A GSMA survey of 20 countries revealed that up to 16 of them follow the ICNIRP (or similar) guidelines on mobile network antenna RF exposure limits. A few countries have set more restrictive norms, often due to public concerns about the effect of mobile towers on public health. However, no scientific basis for such concerns has been found. An independent expert report for the UK's Health Protection Agency pointed out in April 2012 that: "although a substantial amount of research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects."

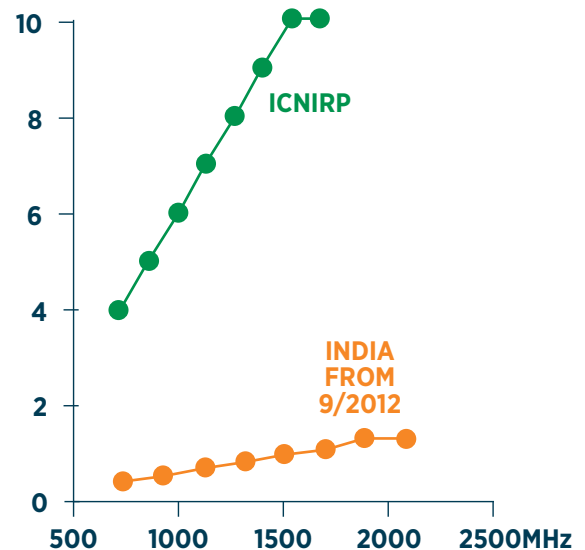
India is one of the countries that have responded to high perceptions of risk among its citizens by adopting a stricter RF regime. A nine-country study found that policies that included adoption of more restrictive limits for reasons of 'precaution' were associated with increased concern in study subjects.

STRICTER GUIDELINES IMPOSED BY NTP IN INDIA ON THE BASIS OF NON-EVIDENCE BASED CONCERNS

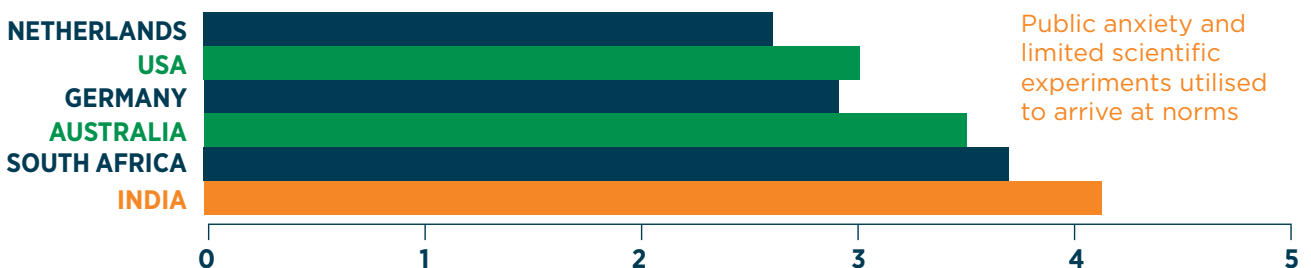
India among few countries with stricter RF exposure norms



Limits 10 times more restrictive than WHO endorsed guidelines



These strict guidelines largely due to public anxiety



1. Including countries following IEEE 1999 edition norms (that are more relaxed than ICNIRP for frequencies < 2 GHz); Source: GSMA; ICNIRP ; Note: includes India, which was slated to move to a stricter regime (10% of ICNIRP guidelines from 2012 September) | 2. Source: GSMA; Dept. of Telecom (GOI) | 3. Source: "When Precaution Creates Misunderstandings: The Unintended Effects of Precautionary Information on Perceived Risks, the EMF Case" - Wiedemann et al (2013) | 4. Source: Department of Telecom, Govt of India

Figure 31

Deviation from global radio frequency exposure norms could lead to a reduced quality of service. To comply with restrictive exposure norms, mobile operators would need to site the mobile network antenna further away from users. In regions of Belgium, for example, compliance distances may have to be increased more than 10 times to comply with restrictive limits. This forces companies to reduce the power of their antennas so that access to the compliance zone can be controlled, resulting in reduced coverage levels for the mobile network and lower quality of indoor signals.

Moreover, operators usually locate 2G and 3G cells in the same sites. Stricter norms would necessitate keeping 2G and 3G cells on separate sites, slowing down roll-out of technologies such as 3G and 4G. This has been demonstrated in Brussels, Belgium, where roll-out of 4G services has been delayed as a result of the restrictive exposure limit of 1.5 volts per meter, per operator.

Several countries have aligned their limits with global standards, simplified their procedures and communicated with the community to allay public concerns about RF exposure. These strategies safeguard service levels and maintain affordability, preventing an increase in tariffs and enabling operators to continue investing in the expansion of 2G and 3G services without delays—and ultimately promoting the positive socio-economic impact outlined in this report. Best practices therefore suggest that norms aligned with these global guidelines, combined with pro-active communication with the community, can successfully address all objectives.

17. Australia, Brazil, France, Germany, Japan, Kenya, Malaysia, Netherlands, New Zealand, Kingdom of Saudi Arabia, South Africa, Spain and the United Kingdom currently apply ICNIRP based limits and India followed ICNIRP when the survey was conducted. Canada and the USA have slightly more relaxed limits than ICNIRP. Chile, Egypt, Italy and Turkey apply more restrictive limits.

18. Independent Advisory Group on Non-ionizing Radiation (AGNIR). Health Effects from RF Electromagnetic Fields, April 2012.

19. "When Precaution Creates Misunderstandings: The Unintended Effects of Precautionary Information on Perceived Risks, the EMF Case", Wiedemann et al (2013).



For the full report on Mobile Economy:
India 2013 please visit the GSMA website at
www.gsma.com/mobileeconomyindia

