Connected Society

Mobile Connectivity Index
Launch Report

GSMA Intelligence

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Executive Summary

Understanding the Mobile Connectivity Index

This report marks the launch of the GSMA's Mobile Connectivity Index. The index helps to measure the performance of 134 countries, accounting for more than 95% of the world's population, against the key enablers of mobile internet connectivity. Anybody interested in the internet connectivity agenda is encouraged to explore it.

This new product has been developed with a clear and simple motivation – to support the efforts of the mobile industry and the wider international community to deliver on the ambition of universal access to the internet. Already more than 3 billion people around the world are connected to the internet, but that still leaves more than 4 billion people offline, excluded from the powerful opportunities for social and economic development that the internet enables.

More people get online using mobile than any other technology, and mobile will have an even more important role to play in bringing the internet to the unconnected population who live predominantly in developing countries, where widespread deployment of fixed access networks is often not economically viable.

The Mobile Connectivity Index has been designed as a tool to help focus the efforts and resources of the mobile industry and wider international community on the right projects in the right markets at the right time, so progress towards universal access can be as swift and economically sustainable as possible.

The index measures how the key enabling factors for mobile connectivity differ across markets. It seeks to answer two key questions:

- What factors need to be in place to create the right conditions for supply and demand to flourish?

- How can countries at the beginning of the journey towards universal access benefit from the experience of those further along?

As an input index, the Mobile Connectivity Index does not measure the sophistication or advancement of mobile ecosystems across countries, nor does it measure the different ways in which consumers engage with mobile technology. Rather, the focus is on measuring the enablers that will allow each country's offline population to connect to the internet via mobile.

The index is built around four key enablers of mobile internet connectivity: infrastructure, affordability, consumer readiness and content. These enablers are built up through analysis of 38 individual indicators using best-in-class source data. We plan to update the index annually to track the performance of countries going forward.

Key findings

There are no shortcuts to creating a strong enabling environment for mobile internet connectivity. The countries with the best enabling environments, which lead to the highest levels of actual mobile internet penetration, perform strongly across all four key enablers. It is not possible to succeed by pushing on just one or two levers.

Sub-Saharan Africa needs the greatest levels of support to improve the strength of its enabling environment. Countries from this region account for 16 of the 20 lowest index scores. More than 700 million people across Sub-Saharan Africa, 76% of the population, are not making use of the mobile internet. The weak enabling environment reflects a combination of supply-side and demand-side issues. Providing access to infrastructure is a key issue, affecting more than 55% of the population, but the skills, affordability and locally relevant content enablers also need development.

Development efforts need to be rebalanced towards demand-side issues. There is a strong sense among many policy-makers and development agencies that the key roadblock to greater mobile internet adoption is network coverage. However, the evidence does not always support this; a large number of countries have big population groups that are covered by 3G (or 4G) networks but have not adopted the mobile internet. In fact, this 'usage gap' of

2.5 billion people is considerably larger than the 1.6 billion people living outside the footprint of 3G network (the 'access gap'). This suggests much more work needs to be done, by the private and public sectors, to address network performance, affordability, awareness, digital skills and locally relevant content and services. Innovative solutions are also required to bring coverage to areas where it is economically unviable.

The development community needs better data. The Mobile Connectivity Index has been built using the best available data sources and, where possible, has incorporated primary research to improve the quality of the data. However, in some cases it has proven difficult to develop indicators that precisely measure the key enablers for all the countries in the index. In particular, there is a need to develop better indicators to measure and monitor digital skills and content.

Focus on clusters, not the precise score or position of a country in the index. Although we have developed a robust structure and methodology for the index, there is inevitably some margin for error, especially given the need for better data described above. A country in a given part of the index will share many characteristics with other countries around it. Consider countries in the context of their clusters to derive the most valuable insights.

The Mobile Connectivity Index in numbers
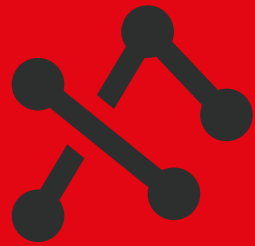
1 Index
Measures the strength of a country's building blocks to support mobile internet adoption

4 Enablers
Define the key characteristics a country needs to have in place to support mobile internet adoption

13 Dimensions
Feed into the four key enablers of mobile internet adoption

38 Indicators
Form the foundation of the index and feed into the 13 dimensions
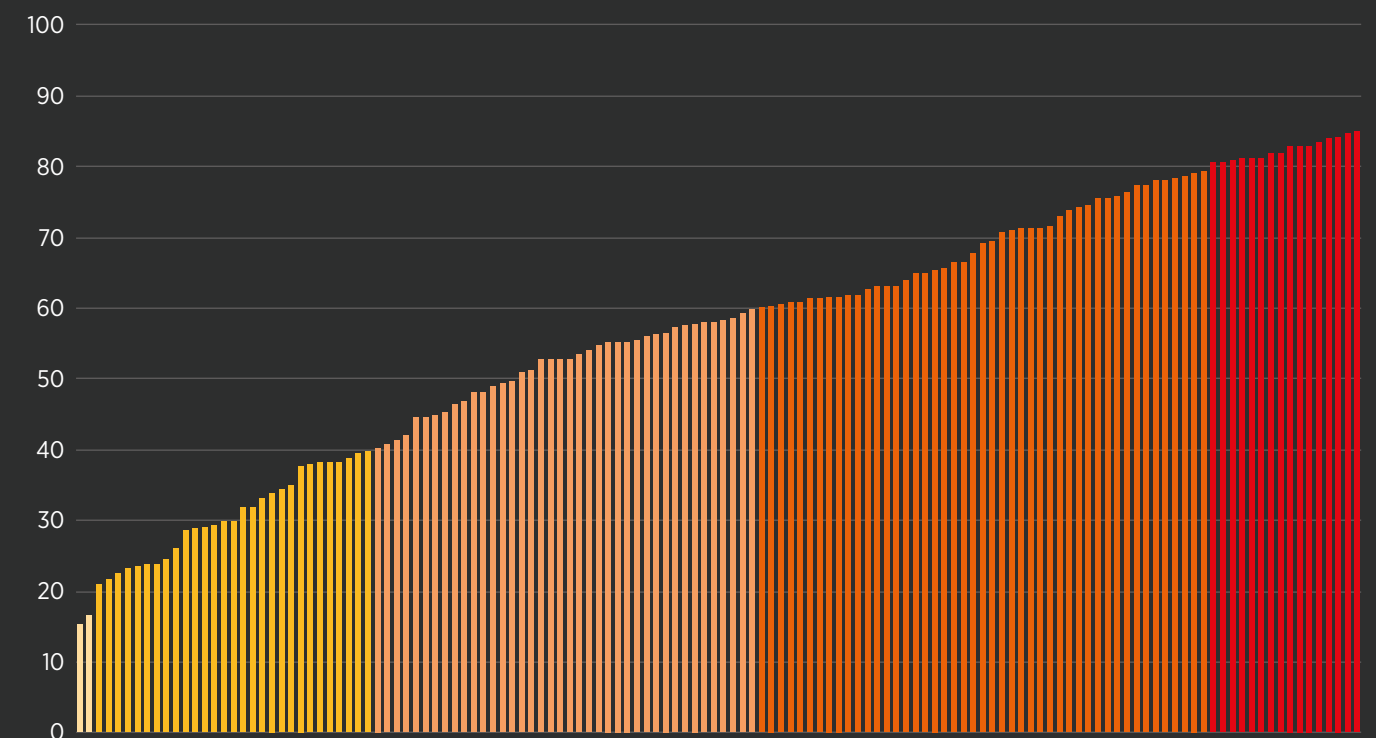
134 Countries
Included in the index

7.0 billion People
Covered by the index, representing more than 95% of the world's population
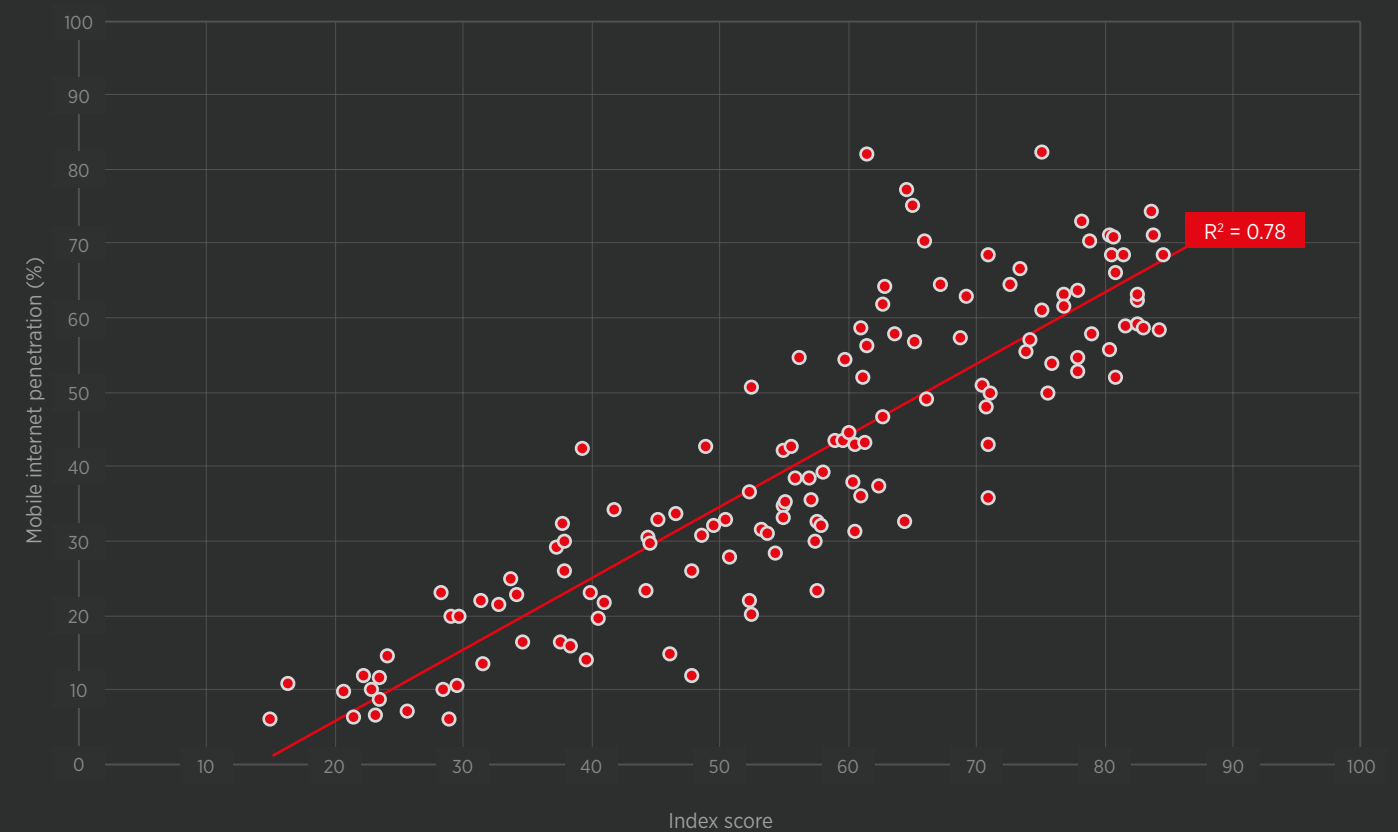
Mobile Connectivity Index score (based on 2014 data)

LOWEST SCORING COUNTRIES   HIGHEST SCORING COUNTRIES

Mobile internet penetration and index score (based on 2014 data)

R² = 0.78

Mobile internet penetration (%)

Index score

1
Mobile internet connectivity

Why the internet matters

The internet has developed into one of the most powerful forces for social and economic development of our time. It is a platform for reducing poverty and improving healthcare, education, commerce, information sharing, employment and innovation. Internet connectivity is an essential foundation to achieving all of the United Nations Sustainable Development Goals.

The economic benefits of connectivity and access to the internet have been well documented by,

for example, the World Bank[1] (subsequently updated by Scott[2]), Czernich et al[3] and Zaballos[4]. A number of studies also demonstrate the specific benefits of mobile, such as those by the GSMA[5] and Gruber et al.[6] These show that, aside from the direct contribution of mobile internet to economic growth, it has also brought about material increases in productivity, providing more efficient ways for consumers, workers and businesses to trade, communicate and access information.

| Table 1 | | |

Economic impacts of broadband – summary

AUTHOR	SCOPE	FINDING
Qiang et al (2009)	Global, 1980–2006	A 10% increase in broadband penetration increases GDP per capita growth by 1.21 percentage points in high-income countries and 1.38 percentage points in low/middle-income countries
Scott (2012)	Global, 1980–2011	A 10% increase in broadband penetration increases GDP per capita growth by 1.19 percentage points in high-income countries and 1.35 percentage points in low/middle-income countries
Czernich et al (2009)	OECD, 1996–2007	A 10 percentage-point increase in broadband penetration increases GDP per capita growth by 0.9–1.5 percentage points
Garcia and Rivas (2012)	Latin America and the Caribbean, 2003–2009	A 10% increase in broadband penetration increases GDP by 3.19% and productivity by 2.61%
Deloitte and GSMA (2012)	Global, 2008–2011	A 10% increase in mobile penetration increases average annual GDP per capita growth by 0.65 percentage points
		A 10% increase in 3G penetration increases average annual GDP per capita growth by 0.15 percentage points
Gruber et al (2011)	Global, 1990–2007	Mobile telecommunications contributes 0.2% to annual GDP growth in high-income countries and 0.11% in low-income countries

Source: GSMA Intelligence

The benefits of the internet are not limited to economic development. The internet also enables a wide range of opportunities for social development, including improved access to education, communication, public services, banking, healthcare and employment.[7] For countries that have near-universal access, the internet has become an essential part of their national infrastructure, like energy and transport.

1. Economic Impacts of Broadband, World Bank, 2009
2. Does Broadband Internet Access Actually Spur Economic Growth?, Colin Scott, 2012
3. Broadband Infrastructure and Economic Growth, CESifo, 2009
4. Socioeconomic Impact of Broadband in Latin American and Caribbean Countries, Inter-America Development Bank, 2012
5. What is the impact of mobile telephony on economic growth?, GSMA, Deloitte and Cisco, 2012.
6. Mobile telecommunications and the impact on economic development, Gruber and Koutroumpis, 2011

7. World Development Report 2016: Digital Dividends, World Bank Group

The role of mobile in providing access to the Internet

The mobile industry has a critical role to play in delivering the ambition of universal internet access. Between 2010 and 2014, the number of unique mobile internet subscribers increased by 120% worldwide.[8] This compares to growth of 42% in the number of fixed broadband subscriptions over the same period.[9]

The relationship between mobile and the internet is a natural one. Being online is an increasingly personal experience that people want to be able to tap into at their own convenience wherever they happen to be and whatever the time of day. Even in the home or office, connections are often made wirelessly using a mobile device.

# The status of mobile internet connectivity around the world

According to GSMA Intelligence, at the end of 2015 3.24 billion people (44% of the global population) were connected to the mobile internet. Of this connected population, 1.18 billion were accessing the internet using 2G networks and 2.06 billion were using 3G or 4G networks.

More than 4 billion people remain offline, unable to benefit from the social and economic development opportunities of the internet. Of this offline population, the 'usage gap' comprises 2.5 billion

people who live within the footprint of a mobile broadband network (3G or above). That leaves an 'access gap' of 1.6 billion people who live outside the footprint of a mobile broadband network. These people are typically in lower income groups, living in rural locations with little or no fixed infrastructure. The commercial challenges of covering these population groups with mobile broadband connectivity are by no means straightforward, but they are more easily addressed than the challenges of deploying copper or fibre-based fixed networks.

Figure 1

Connected and unconnected populations, Q4 2015
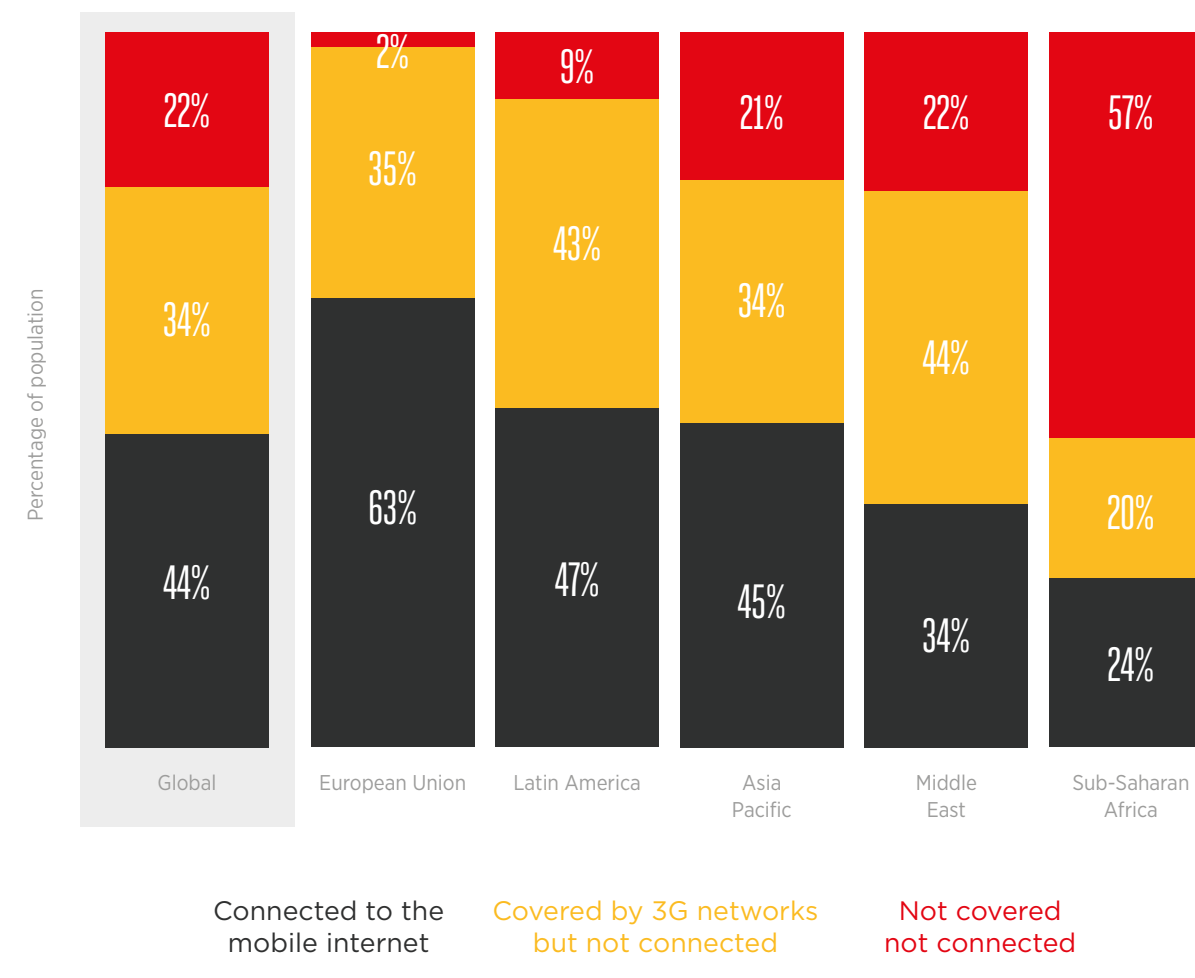
Source: GSMA Intelligence

Connecting the offline population via mobile internet will have a number of social and economic benefits. Below we highlight the key links between mobile connectivity and the UN Sustainable Development Goals.

MOBILE NETWORKS ARE ESSENTIAL IN THE DELIVERY OF THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

Mobile networks are transforming the world and are a revolutionary force in overturning the status quo. Mobile networks are essential in the delivery of the UN Sustainable Development Goals.

8 DECENT WORK AND ECONOMIC GROWTH
Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

In 2015, the mobile industry generated 4.2% of global gross domestic product (GDP), a contribution that amounts to over $3.1 trillion of economic value across 196 countries and is expected to increase to $3.7 trillion by 2020. 17 million jobs were directly supported by the mobile ecosystem in 2015, expected to rise to approximately 20 million by 2020.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

The world is experiencing a rapid transition to connected devices, and mobile networks remain the proven technology. The mobile industry is projected to invest $900 billion between 2016 and 2020 into mobile infrastructure to continue to fuel this growth, and is working to deliver innovation such as SIM-enabled solutions and the continued roll-out of mobile broadband.
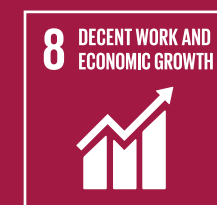
1 NO POVERTY
End poverty in all its forms everywhere

Mobile money services enabled by mobile networks are now available in 89 developing countries, providing millions of unbanked people access to transfers, insurance or other financial services.

2 ZERO HUNGER
End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Agriculture is the main contributor to GDP in emerging markets and the largest employer. Mobile operators are leading delivery of critical information and leveraging access to financial services for smallholder farmers. They are also delivering nutritional information to improve the health of citizens in emerging markets.

10 REDUCED INEQUALITIES
Reduce inequality within and among countries

For many marginalised groups around the world, mobile is the first step to inclusive participation in a connected society. Mobile has a key and transformational role to play in formal identity and access to banking.

11 SUSTAINABLE CITIES AND COMMUNITIES
Make cities and human settlements inclusive, safe, resilient and sustainable

Mobile network operators provide life-saving connectivity in the face of natural disasters, conflict and war. Mobile networks connect 4.6 billion people, and they can be used to increase resilience to disasters through early warning systems, SIM-enabled monitoring and big data analytics.

3 GOOD HEALTH AND WELL-BEING
Ensure healthy lives and promote well-being for all at all ages

1200+ mobile health initiatives have been deployed to date, meaning mobile is having a profound impact on the healthcare industry. Mobile networks enable the delivery of mobile health to people and places previously unreached, providing healthcare to those who need it most.

4 QUALITY EDUCATION
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Mobile operators are working to support students and teachers in integrating mobile technologies into the classroom. Mobile also enables access to education for youth in the poorest villages and most remote locations, opening new channels for learning.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Ensure sustainable consumption and production patterns

Mobile operators are using renewable energy sources to power an estimated 118,000 new or existing off-grid base station sites in developing countries, extending the reach of mobile networks to the most remote locations.

13 CLIMATE ACTION
Take urgent action to combat climate change and its impacts

Mobile operators are reducing their energy consumption and adopting more efficient energy practices. Green technologies have the potential to reduce carbon emissions by approximately 40 million tonnes annually.

14 LIFE BELOW WATER
Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Internet of Things technology using mobile networks for connectivity is being used to monitor environmental conditions in aquaculture helping conserve and sustain marine resources.

5 GENDER EQUALITY
### Achieve gender equality and empower all women and girls

200m fewer women than men own mobile phones in low- and middle-income countries. The mobile industry is working to close this gender gap and deliver socio-economic benefits to women, such as increased access to financial, health, education and employment services and opportunities.

6 CLEAN WATER AND SANITATION
Ensure availability and sustainable management of water and sanitation for all

262m people lack access to improved drinking water but are in areas covered by GSM networks, and 1.8 billion people without access to improved sanitation facilities are covered by mobile networks. Mobile technology and infrastructure could support water and sanitation coverage extension and improve existing water and sanitation services.

7 AFFORDABLE AND CLEAN ENERGY
Ensure access to affordable, reliable, sustainable and modern energy for all
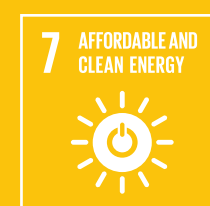
643m people lack access to electricity but are covered by mobile networks. Mobile technology can increase access and efficiency to reliable energy through new mobile payment and smart energy metering solutions.

15 LIFE ON LAND
Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss

Mobile networks are enabling smarter agriculture initiatives aimed at improving crop yields while reducing water consumption, as well as using monitoring networks to prevent deforestation.

16 PEACE AND JUSTICE STRONG INSTITUTIONS
Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

SIM-enabled digital identity allows individuals to establish a legal identity for the first time, participate in the formal economy and receive government services.

17 PARTNERSHIPS FOR THE GOALS
Strengthen the means of implementation and revitalise the global partnership for sustainable development

Mobile operators play a significant role in achieving the UN's Sustainable Development Goals. In fact, mobile technology is critical to delivering 15 of the 17 UN SDGs.

Four key enablers driving adoption of the mobile internet

Four key enablers need to be in place in any given country to support greater adoption of the mobile internet:

Infrastructure

The availability of high-performance mobile internet network coverage.

Without network coverage, people cannot get online. Furthermore, without high performing networks they will be less inclined to get online and less able to access the full potential of the internet.

Affordability

The availability of mobile services and devices at price points that reflect the level of income across a national population.

Aside from prices and incomes, affordability is also affected by the level of taxation as well as inequality: if income distribution is skewed towards a small proportion of the population, the mobile internet will remain unaffordable for many people.

Consumer readiness

Citizens with the awareness and skills needed to value and use the internet and a cultural environment that promotes gender equality.

Without the necessary skills and supporting cultural environment, individuals will not understand how to use the mobile internet or appreciate how it can benefit them. Individuals, especially women, might also find themselves prevented from accessing the mobile internet. It is therefore important to consider the skills and education levels of a country, as well as the degree of gender equality in education, finance and in the labour market.

Content

The availability of online content and services that are accessible and relevant to the local population.

Consumers are less likely to connect to the mobile internet unless there is online content and services that they can see is of relevance and benefit to them. This might be as simple as having content in the native language or the availability of certain apps or services such as social media, banking or education. It is therefore important to consider content that is developed within a country (e.g. e-government services and website creation) as well as content developed outside but which is still of relevance (e.g. mobile applications).
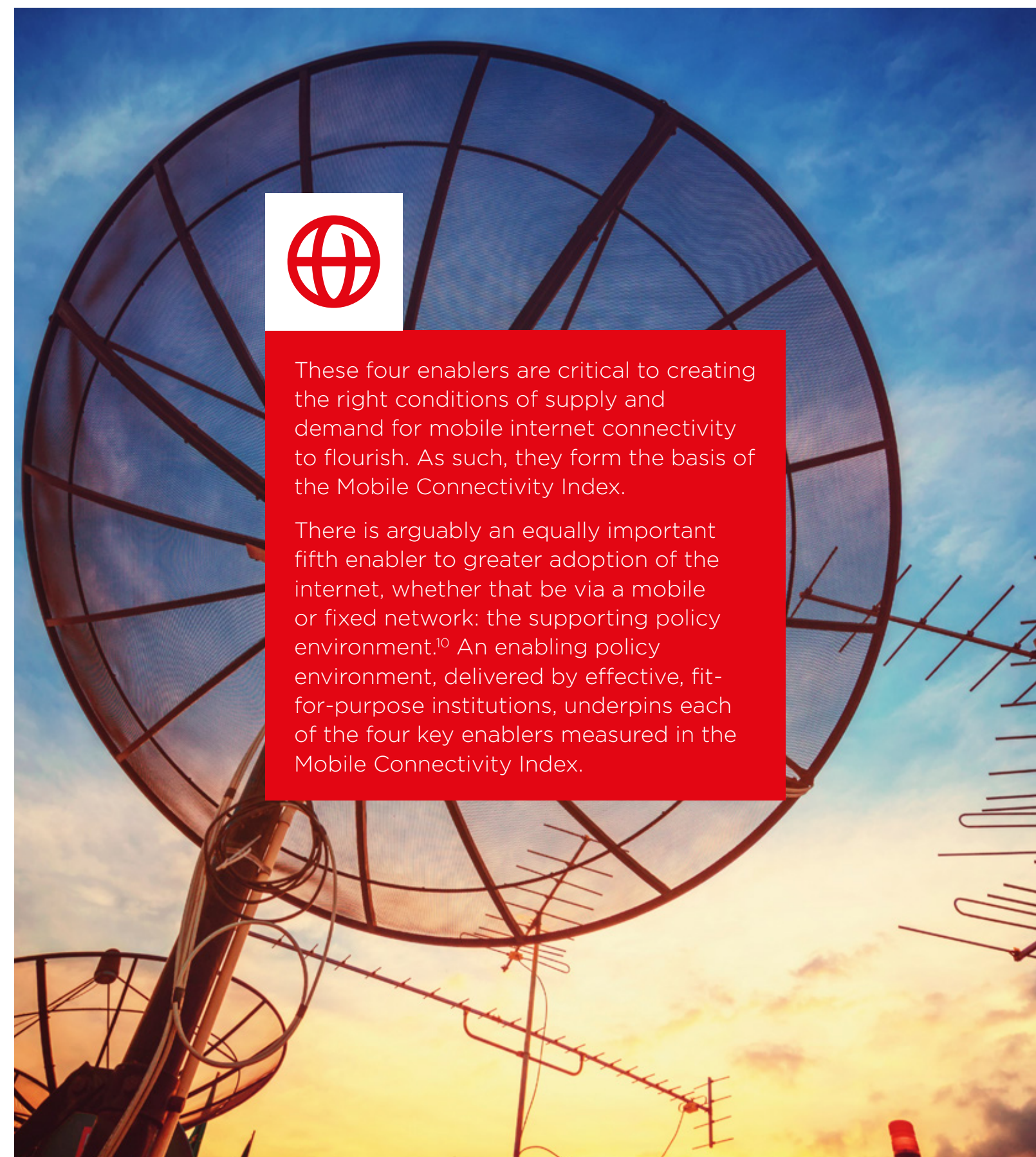
These four enablers are critical to creating the right conditions of supply and demand for mobile internet connectivity to flourish. As such, they form the basis of the Mobile Connectivity Index.

There is arguably an equally important fifth enabler to greater adoption of the internet, whether that be via a mobile or fixed network: the supporting policy environment.[10] An enabling policy environment, delivered by effective, fit-for-purpose institutions, underpins each of the four key enablers measured in the Mobile Connectivity Index.

10. This 'analogue' dimension was highlighted recently by the World Bank in World Development Report 2016: Digital Dividends

2 The Mobile Connectivity Index

The GSMA Mobile Connectivity Index is an analytical tool that measures the performance of 134 countries, representing more than 95% of the world's population, against the four key enablers of mobile internet adoption – infrastructure, affordability, consumer readiness and content.

Scores for each of these enablers are combined to produce a single composite measure for a given country of the strength of the foundations to support widespread adoption of the mobile internet.
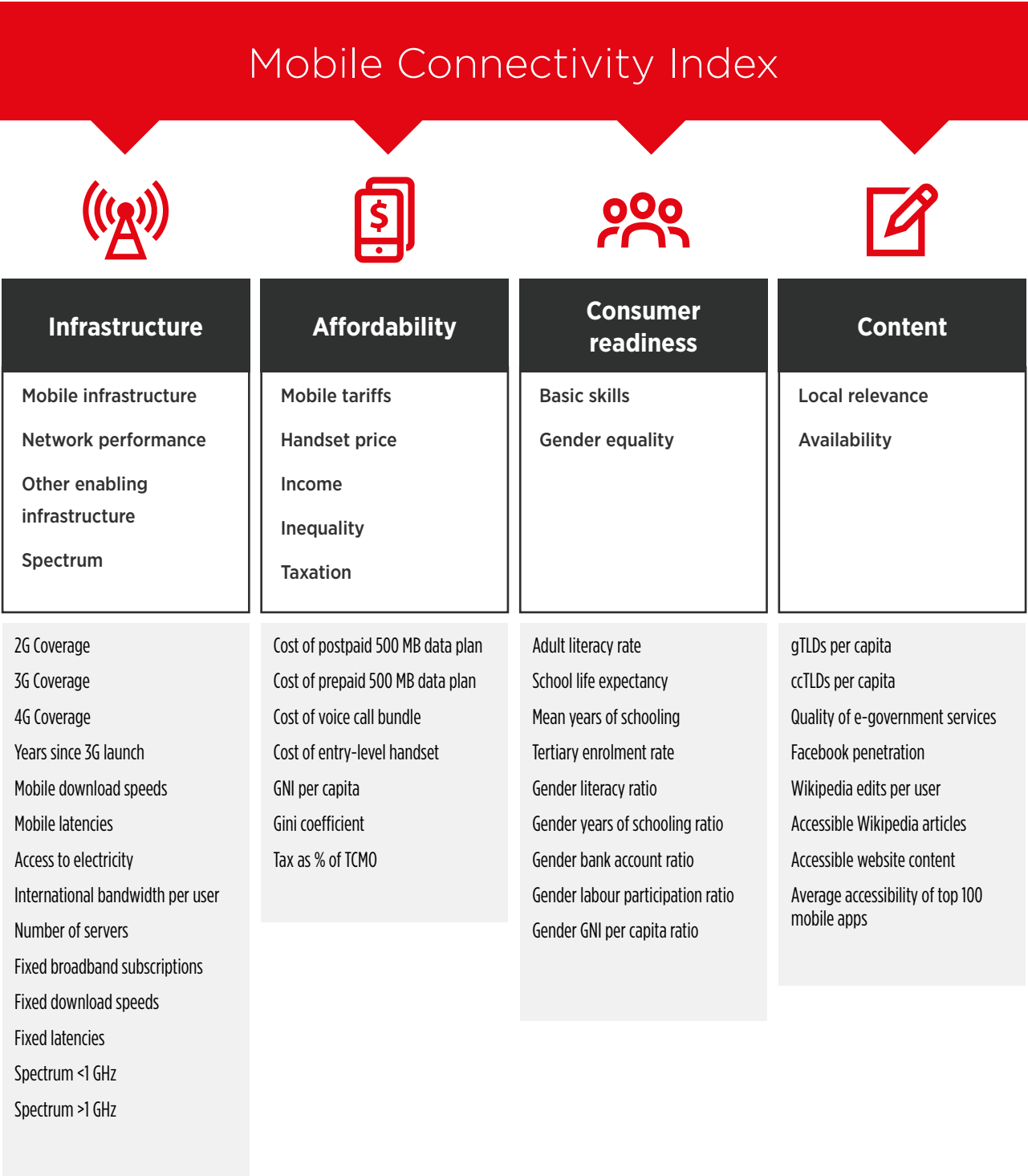
The Mobile Connectivity Index is therefore an input index. It measures the performance of a range of key metrics that we believe are essential to create an effective enabling environment for mobile internet adoption. The corresponding output measure is the number of people accessing the internet via the mobile internet.

As an input index, it is important to note that the Mobile Connectivity Index does not measure the sophistication or advancement of mobile ecosystems across countries, nor does it measure the different ways in which consumers engage with mobile technology. For example, it does not measure the extent to which consumers use mobile for financial or identity services, and it does not measure how intensively they use mobile as part of their everyday lives. Rather, the focus is on measuring the enablers that will allow each country's offline population to connect to the internet via mobile, regardless of what they use it for and how much they use it.

Figure 2 illustrates the structure of the Mobile Connectivity Index. Each of the four enablers comprises dimensions, which in turn comprise individual indicators.

Mobile Connectivity Index structure

Infrastructure	Affordability	Consumer readiness	Content
Mobile infrastructure	Mobile tariffs	Basic skills	Local relevance
Network performance	Handset price	Gender equality	Availability
Other enabling infrastructure	Income		
Spectrum	Inequality		
	Taxation		
2G Coverage	Cost of postpaid 500 MB data plan	Adult literacy rate	gTLDs per capita
3G Coverage	Cost of prepaid 500 MB data plan	School life expectancy	ccTLDs per capita
4G Coverage	Cost of voice call bundle	Mean years of schooling	Quality of e-government services
Years since 3G launch	Cost of entry-level handset	Tertiary enrolment rate	Facebook penetration
Mobile download speeds	GNI per capita	Gender literacy ratio	Wikipedia edits per user
Mobile latencies	Gini coefficient	Gender years of schooling ratio	Accessible Wikipedia articles
Access to electricity	Tax as % of TCMO	Gender bank account ratio	Accessible website content
International bandwidth per user		Gender labour participation ratio	Average accessibility of top 100 mobile apps
Number of servers		Gender GNI per capita ratio	
Fixed broadband subscriptions			
Fixed download speeds			
Fixed latencies			
Spectrum <1 GHz			
Spectrum >1 GHz			

Source: GSMA Intelligence

Why develop an index?

The GSMA Mobile Connectivity Index has been developed with a clear and simple motivation – to support the efforts of the mobile industry and the wider international community to deliver on the ambition of universal access to the internet.

There is no single barrier or enabler to mobile connectivity. A number of prerequisite conditions need to be in place for a country's population to be able to access and use the mobile internet. An index is the best way to combine and evaluate multiple enabling factors and complex, multi-dimensional relationships.

The GSMA Mobile Connectivity Index has been designed as a tool to help focus the efforts and resources of the mobile industry and wider international community on the right projects in the right markets at the right time, so that progress towards universal access can be as swift and economically sustainable as possible. It is a tool to help policy-makers understand what key elements need to be in place to promote greater adoption of mobile internet services and to help them effectively prioritise their efforts.

What makes the Mobile Connectivity Index different?

There are a number of other high-quality indices, each measuring a specific aspect of connectivity and/or the broader ICT sector. Examples include the ITU's ICT Development Index, the WEF Networked Readiness Index, the Web Index, the Huawei Global Connectivity Index and the Alliance for Affordable Internet Index. Although the indices are, in some ways, complementary to the GSMA Mobile Connectivity Index, the latter is unique and has three key characteristics that together distinguish it from other indices:

• The GSMA Mobile Connectivity Index focuses specifically on mobile connectivity rather than internet connectivity in general (including fixed).

Given that the digital inclusion gap in the developing world is expected to be addressed to a significant extent by mobile, it is important to understand the enablers of mobile connectivity specifically. The indicators and data considered in the index reflect the focus on mobile technology.

• It is an input index that seeks to measure the performance of countries against a set of key enabling characteristics, rather than an output index that measures internet take-up and usage.

• It is a global index, encompassing 134 countries that account for more than 95% of the world's population.

How does the Mobile Connectivity Index work?

The GSMA Mobile Connectivity Index has been constructed according to the best-practice guidelines set out by the OECD and the European Commission's Joint Research Centre (JRC)[11] as well as insights from other composite indicators.

One of the key steps in building the index has been to define a set of quantifiable indicators that accurately capture country-level performance on the four enablers on a consistent basis. The indicators that have been included in the index draw on a range of best-in-class data sources including GSMA Intelligence, the World Bank and the ITU. They have been chosen based on a number of criteria, specifically:

• **relevance:** the indicator should measure a barrier or an enabler in the take-up of mobile internet services

• **accuracy:** the indicator should correctly estimate or describe the quantities or characteristics it is designed to measure

• **coverage:** the data should cover as many countries as possible, as the Mobile Connectivity Index is a global index

• **timeliness:** the data should be collected consistently over time. For this version of the Mobile Connectivity Index, the majority of most recent data is available for 2014, so this is used as the reference year. If countries have since made significant progress on some indicators, this will be reflected in the next version of the index.

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11. Handbook on constructing composite indicators: methodology and user guide, OECD and JRC, 2008

A key consideration in the assessment of accuracy is to include, to the greatest extent possible, 'hard' indicators that are objective and can be quantified. These are distinct from 'soft' indicators that are usually based on qualitative data from surveys or case studies. Such indicators are typically used to measure things that are difficult to quantify, for example the quality of governance and corruption levels. Although soft indicators are useful for some indices, particularly those where hard indicators are difficult to measure, they are not used in the Mobile Connectivity Index. This is to ensure that countries have objective benchmarks on which to target improved performance.

Although the indicators included in the Mobile Connectivity Index have all been carefully chosen based on the above criteria, there are some cases where data constraints require the use of proxy indicators if it is not possible to perfectly measure a certain enabler. For example:

- Indicators such as international bandwidth per user and fixed broadband penetration are included as proxies for the quality of a country's core network. This is because end-to-end mobile services require resilient and high-capacity backhaul and core networks.

- There is currently no data comparing a large number of countries in the area of digital skills or awareness. More traditional education indicators are therefore used to measure the ability of consumers to effectively use and engage with digital technology.

Although the vast majority of the indicators are highly correlated with mobile internet penetration, suggesting that on average they are associated with higher take-up, there may be specific countries where they work less well as proxy indicators. These indicators will be assessed going forward and, where they can be improved, will be incorporated into future versions of the index.

The GSMA Mobile Connectivity Index is unique in developing a diverse set of indicators that measure the availability of locally relevant content across more than 100 markets. This includes a metric that quantifies the accessibility of mobile applications in each country. As with some of the non-content indicators, certain metrics have required the use of proxy measures (for example, we use language as a way of identifying content that is available and relevant to a given population) and so may be further developed in the future. However, the current indicators all exhibit strong correlation with mobile internet penetration, demonstrating their usefulness and relevance for the index.

In total, the index is built using 38 individual indicators. These are then grouped into a set of dimensions that in turn make up the four key enablers. Table 2 shows the structure of the index and lists each of the indicators we have used, along with their sources. The latter have provided the source data for our indicators. All subsequent data treatment, imputation and normalisation has been carried out exclusively by GSMA Intelligence.

Table 2 also presents the weightings that have been used to aggregate the indicators into dimensions, the dimensions into enablers, and the enablers into an overall index score. The weightings chosen for the enablers, dimensions and indicators reflect a combination of statistical analysis, interpretation of GSMA Intelligence's consumer survey results and expert judgement.

Each indicator is normalised to ensure consistent units of measurement, before being aggregated to produce scores at the dimension, enabler and overall index level. For the Mobile Connectivity Index, indicators are normalised using the 'min-max' method, such that each country has a score within a range of 0 to 100, with a higher score representing stronger performance.

Mobile Connectivity Index web tool

The GSMA Mobile Connectivity Index is accessible through a web-based interface that allows users to explore in detail the performance of individual countries, compare countries against each other and investigate the different dimensions and indicators that feed into each of the enablers. The tool can be found at **www.mobileconnectivityindex.com**

Figure 3

Mobile Connectivity Index web tool
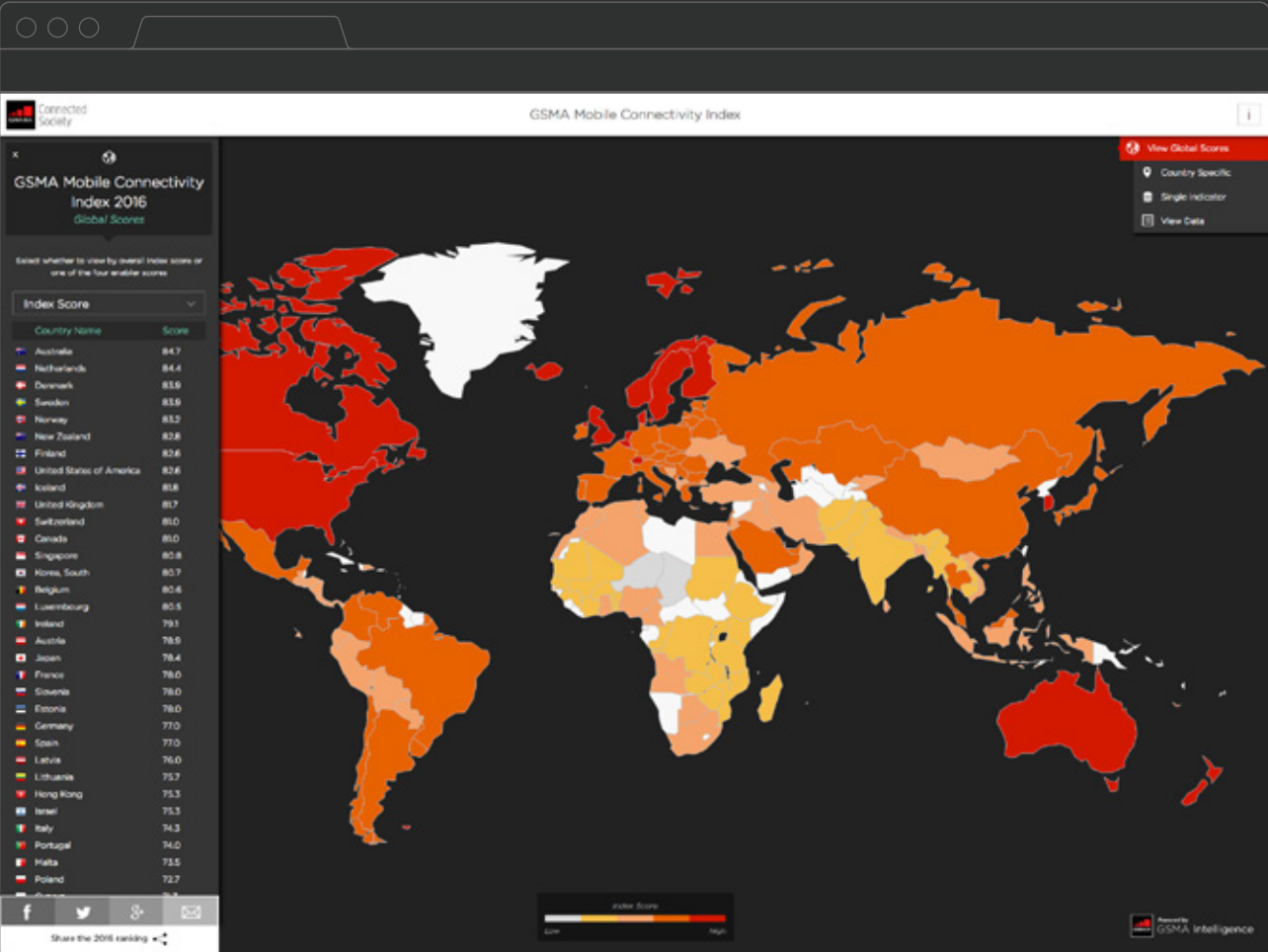
Table 2

Index structure, weightings and sources

ENABLER	DIMENSION	INDICATOR	SOURCE
Infrastructure (25%)	Mobile infrastructure (30%)	2G network coverage (20%)	ITU
		3G network coverage (30%)	GSMA Intelligence
		4G network coverage (25%)	GSMA Intelligence
		Years since 3G network launch (25%)	GSMA Intelligence
	Network performance (30%)	Mobile download speeds (50%)	OpenSignal
		Mobile latencies (50%)	OpenSignal
	Other enabling infrastructure (20%)	Access to electricity (25%)	World Bank
		International bandwidth per user (20%)	ITU
		Number of servers per 1 million people (20%)	World Bank
		Fixed broadband subscriptions (15%)	ITU
		Fixed download speeds (10%)	Measurement Lab (M-Lab)
		Fixed latencies (10%)	Measurement Lab (M-Lab)
	Spectrum (20%)	Spectrum assigned to mobile operators <1 GHz[12] (65%)	GSMA Intelligence
		Spectrum assigned to mobile operators >1 GHz (35%)	GSMA Intelligence
Affordability (25%)	Mobile tariffs[13] (20%)	Cost of postpaid 500 MB data plan (40%)	ITU/World Bank
		Cost of prepaid 500 MB data plan (40%)	ITU/World Bank
		Cost of voice call bundle (20%)	ITU/World Bank
	Handset price (20%)	Cost of entry-level handset[14] (100%)	GSMA/World Bank
	Income (20%)	GNI[15] per capita (100%)	World Bank
	Inequality (20%)	Gini co-efficient (100%)	World Bank/CIA World Factbook
	Taxation (20%)	Tax as a % of TCMO[16] (100%)	GSMA

ENABLER	DIMENSION	INDICATOR	SOURCE
Consumer (25%)	Basic skills (50%)	Adult literacy rate (25%)	UNESCO[17]/CIA World Factbook
		School life expectancy[18] (25%)	UNESCO
		Mean years of schooling[19] (25%)	UN
		Tertiary enrolment rate (25%)	UNESCO
	Gender equality[20] (50%)	Gender literacy ratio (30%)	UNESCO
		Gender years of schooling ratio (30%)	UN
		Gender bank account ratio (20%)	World Bank Global Findex
		Gender labour participation ratio (10%)	ILO
		Gender GNI per capita ratio (10%)	UN
Content (25%)	Local relevance (50%)	Number of gTLDs[21] per capita (25%)	TLDLogic and ZookNIC
		Number of ccTLDs[22] per capita (25%)	TLDLogic and ZookNIC
		Quality of e-government services[23] (25%)	UN
		Facebook penetration rate (15%)	Facebook
		Wikipedia edits per user (10%)	Wikipedia Statistics
	Availability (50%)	Accessible Wikipedia articles for the average person (10%)	Wikipedia Statistics and Ethnologue[24]
		Accessible website content for the average person (10%)	W3Techs.com and Ethnologue
		Average accessibility of the top 100 mobile apps to the average person (80%)	App Annie and Ethnologue

12. This measures the amount of spectrum that has been assigned to mobile network operators in a country at bands below 1 GHz (e.g. 800 MHz and 900 MHz). The second spectrum indicator measures spectrum assigned to operators at bands above 1 GHz (e.g. 1800 MHz and 2600 MHz).
13. Each of these indicators is calculated as a proportion of GNI per capita
14. Calculated as a proportion of GNI per capita
15. Gross national income
16. Total cost of mobile ownership

17. UNESCO Institute of Statistics
18. This is the total number of years of schooling (primary to tertiary) that a child can expect to receive given current enrolment rates. It is therefore a forward-looking indicator.
19. This measures the average number of years of education received by people aged 25 and older, based on current attainment levels. It is different from school life expectancy because the latter is calculated using enrolment rates.
20. Each of the indicators in this dimension is calculated by dividing the relevant female indicator (e.g. female adult literacy) by the relevant male indicator (e.g. male adult literacy).
21. Generic top-level domain
22. Country code top-level domain
23. This uses the Online Service Index score developed by the UN's e-Government Survey
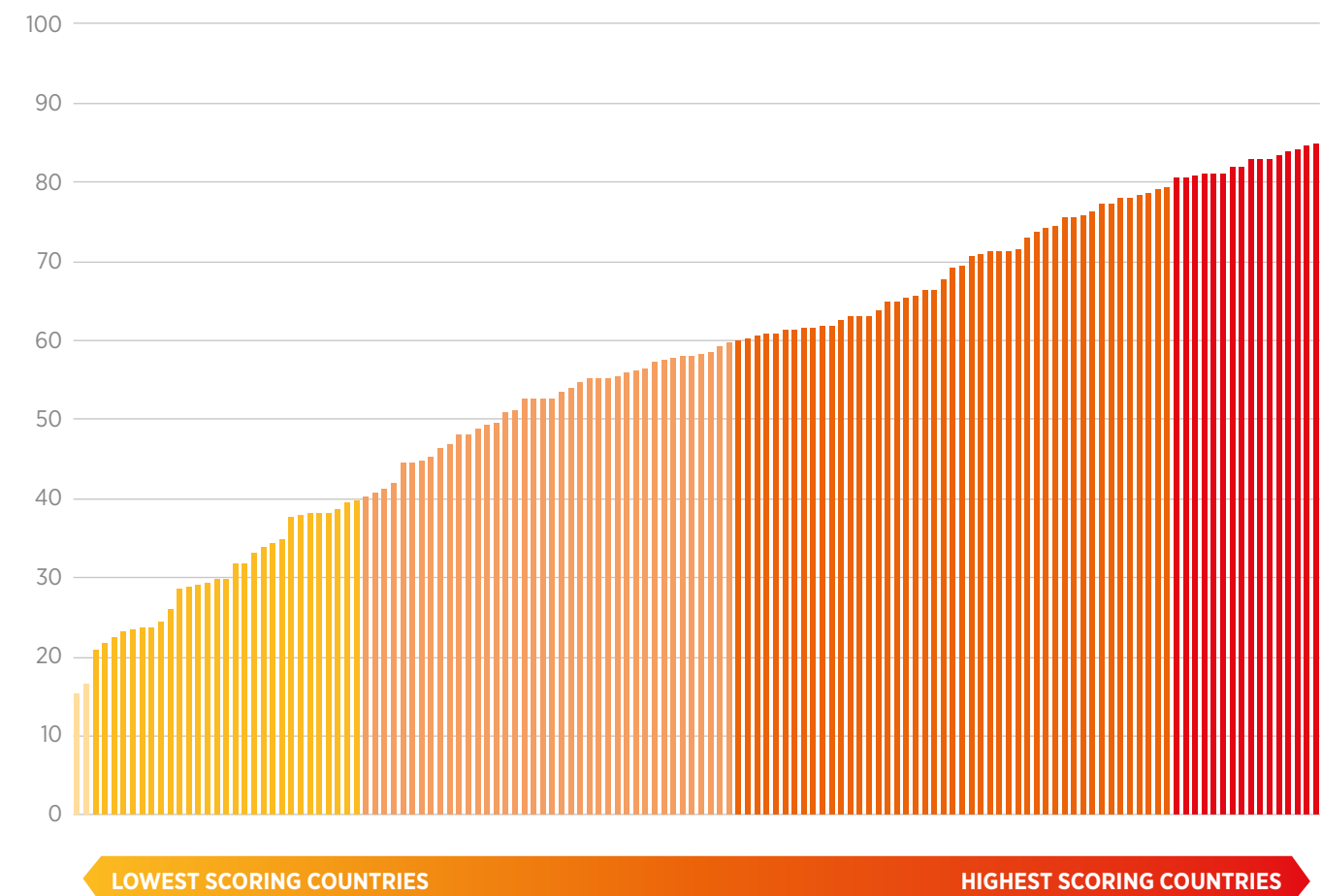24. 18th Edition, 2015

3
Mobile Connectivity Index results

Figure 4 shows the top-level score for all 134 countries in the Mobile Connectivity Index.

Mobile Connectivity Index scores (based on 2014 data)

LOWEST SCORING COUNTRIES   HIGHEST SCORING COUNTRIES

Source: GSMA Intelligence

Many factors explain the spread of performance across different countries. In some instances it is due to highly controllable factors, such as positions on specific policies (e.g. spectrum allocation or sector-specific taxation). In other instances, it is due to less controllable factors such as the proportion of the population living in rural locations, and geography.

It is most appropriate to consider the top-level results in sets of country clusters rather than place too much emphasis on an individual country score or position in isolation. For this reason, we have intentionally chosen not to allocate each country a specific rank.

As shown in Table 3, the country with the highest index score, Australia, is not materially different in the overall enabling environment to the next 10 or more countries. They all share broadly similar characteristics that are enabling high levels of mobile internet adoption.

Equally, the country with the lowest index score, Niger, is not materially different in overall enabling environment to the 10 or more countries above it. They all share broadly similar characteristics that are inhibiting the adoption of the mobile internet.

Table 3

Index scores – top 25 and bottom 25 performers

TOP 25 PERFORMERS	INDEX	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Australia	**84.7**	73.2	82.4	94.9	89.9
Netherlands	**84.4**	78.9	79.2	89.1	91.2
Denmark	**83.9**	81.7	76.0	93.9	85.1
Sweden	**83.9**	78.9	80.1	90.6	86.4
Norway	**83.2**	72.5	83.5	92.5	85.7
New Zealand	**82.7**	73.9	77.8	92.2	88.3
Finland	**82.6**	76.0	80.9	92.6	81.9
USA	**82.6**	80.7	72.5	92.3	86.4
Iceland	**81.8**	73.6	81.0	91.7	81.8
United Kingdom	**81.7**	72.7	77.1	88.1	90.3
Switzerland	**81.0**	77.5	85.1	84.5	77.5
Canada	**81.0**	70.1	76.1	91.4	88.1
Singapore	**80.9**	76.4	75.5	85.7	86.4
South Korea	**80.7**	82.7	81.0	86.6	73.1
Belgium	**80.6**	75.3	78.2	89.8	79.7
Luxembourg	**80.5**	79.5	81.6	78.6	82.3
Ireland	**79.1**	68.0	73.5	90.8	86.2
Austria	**78.9**	69.1	81.4	83.8	82.3
Japan	**78.4**	76.1	80.4	83.9	73.5
France	**78.0**	71.5	75.4	85.9	80.2
Slovenia	**78.0**	71.4	77.3	91.3	73.4
Estonia	**78.0**	71.0	75.2	89.9	77.2
Germany	**77.0**	63.1	78.1	87.8	81.4
Spain	**77.0**	69.6	73.3	87.5	78.9
Latvia	**76.0**	72.9	71.2	87.6	73.4

BOTTOM 25 PERFORMERS	INDEX	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Rwanda	**37.7**	31.7	35.0	54.8	33.3
Bhutan	**37.5**	33.4	61.6	43.4	22.1
Cote d'Ivoire	**34.8**	28.4	48.0	34.8	31.0
Swaziland	**34.3**	25.8	54.4	66.2	15.0
Pakistan	**33.8**	23.3	54.7	24.9	41.0
Senegal	**33.0**	32.2	44.5	32.7	25.2
Mozambique	**31.7**	25.3	35.1	37.6	30.2
Tanzania	**31.6**	23.5	39.3	55.5	19.4
Uganda	**29.7**	27.2	34.9	50.8	16.3
Benin	**29.7**	22.3	41.1	34.1	24.8
Zambia	**29.2**	21.0	38.5	54.8	16.5
Madagascar	**29.0**	18.2	24.2	62.5	25.6
Myanmar	**28.6**	22.6	44.9	60.7	10.8
Sudan	**28.4**	18.5	52.1	38.7	17.4
Togo	**25.7**	20.5	30.9	44.6	15.5
Mali	**24.3**	17.3	40.9	26.6	18.5
Ethiopia	**23.7**	15.5	43.1	35.9	13.1
Mauritania	**23.6**	25.0	48.1	33.7	7.6
DRC	**23.2**	17.2	21.4	47.6	16.6
Burkina Faso	**23.0**	14.7	37.4	32.4	15.6
Afghanistan	**22.4**	27.4	41.1	10.7	20.8
Malawi	**21.6**	20.1	19.8	47.3	11.5
Guinea	**20.8**	15.4	34.9	24.1	14.6
Chad	**16.5**	7.5	38.2	24.0	10.7
Niger	**15.1**	14.2	27.2	9.5	14.1

Index scores and mobile internet penetration

The true test of the GSMA Mobile Connectivity Index is how well country performance maps to actual levels of mobile internet penetration. Broadly speaking, a high index score should be mirrored by a high level of unique mobile internet subscriber penetration.

Figure 5 shows the relationship between the Mobile Connectivity Index score and unique mobile internet subscriber penetration for all 134 countries analysed. There is a strong, positive correlation between the two metrics. This demonstrates that the Mobile Connectivity Index is measuring the right input

measures, in the right combination, to accurately predict the level of the primary output measure – mobile internet connectivity.

This means the index can be a powerful analytical tool for the mobile industry, policy-makers and wider international community. It provides clear insights into the key characteristics that have enabled certain countries to achieve high levels of mobile internet connectivity. It also provides a tool to compare how lower-scoring countries perform against those same key enablers, and which levers should be addressed for maximum effect.

Figure 5

Mobile internet penetration and index score (based on 2014 data)


$R^2 = 0.78$
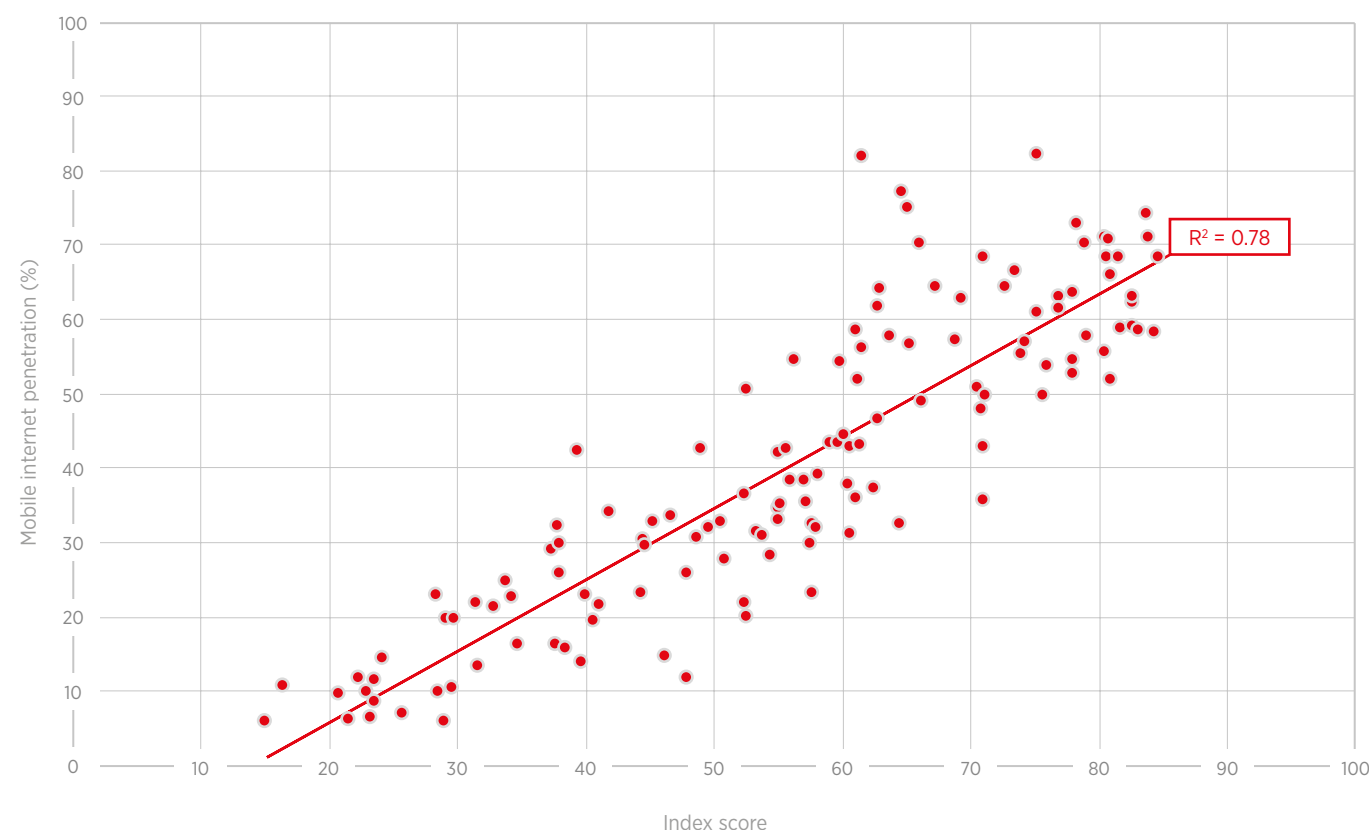
Source: GSMA Intelligence

Index scores by region

Figure 6 maps the Mobile Connectivity Index scores by region against mobile internet penetration. It shows a strong and clear regional clustering in

performance both from an input measure and output measure perspective.

Figure 6

Mobile internet penetration and index score by region

Americas   Asia   Europe   MENA   SSA
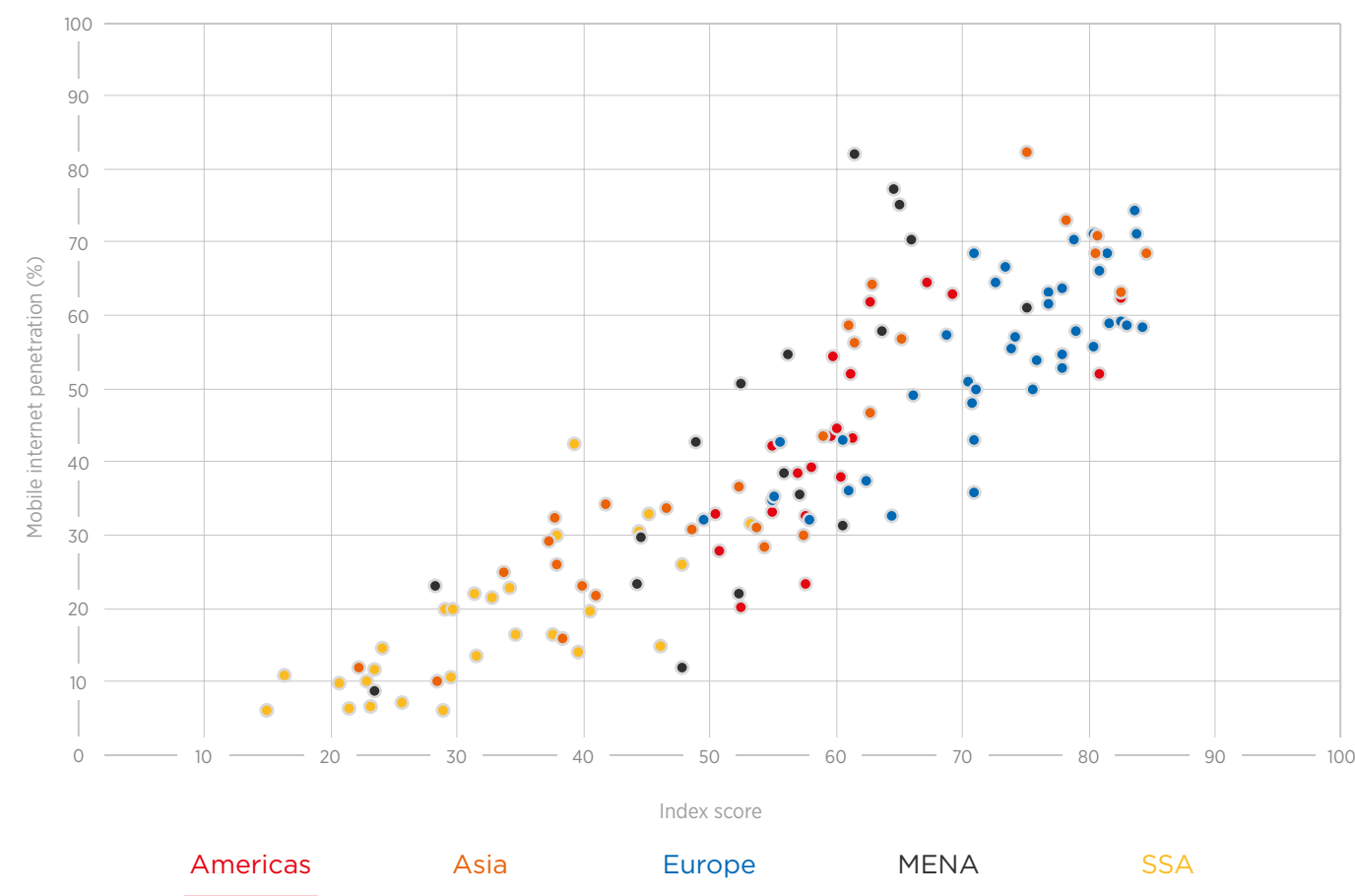
Source: GSMA Intelligence

Europe dominates the highest scores for both the Mobile Connectivity Index and mobile internet penetration. This is not a particularly surprising result given the high levels of income, education, equality and enabling infrastructure across the region.

Sub-Saharan Africa dominates the lowest scores for both the Mobile Connectivity Index score and mobile internet penetration. Again, this is not a particularly surprising result given the low levels of income and education, as well as the lack of enabling infrastructure (such as electrification) across the region.

Countries from both **Asia** and the **Americas** are distributed fairly evenly across the spectrum of index scores and appear to have mobile internet penetration levels consistent with the strength of the enabling environment (as measured by the index score). Asia is an especially diverse region for mobile internet connectivity.

The **MENA** region is of particular interest, with a number of countries notably outperforming on mobile internet penetration given their index score (e.g. Kuwait, Qatar and UAE), while others are underperforming (e.g. Egypt).

Grouping countries into clusters

Although the regional analysis provides useful insight into the relationship between enabling environment and mobile internet penetration, it does not fully explain the patterns. To uncover further insights it is necessary to look beyond regional classifications and to group countries according to the unifying characteristics of their enabling environments and mobile internet penetration rates.

Studying the scatter plot of Mobile Connectivity Index score against mobile internet penetration, five clear groupings or clusters emerge, as illustrated in Figure 7.

Figure 7

Mobile internet penetration and index score by cluster

Leaders   Fast transitioners   Transitioners   Emerging   Discoverers
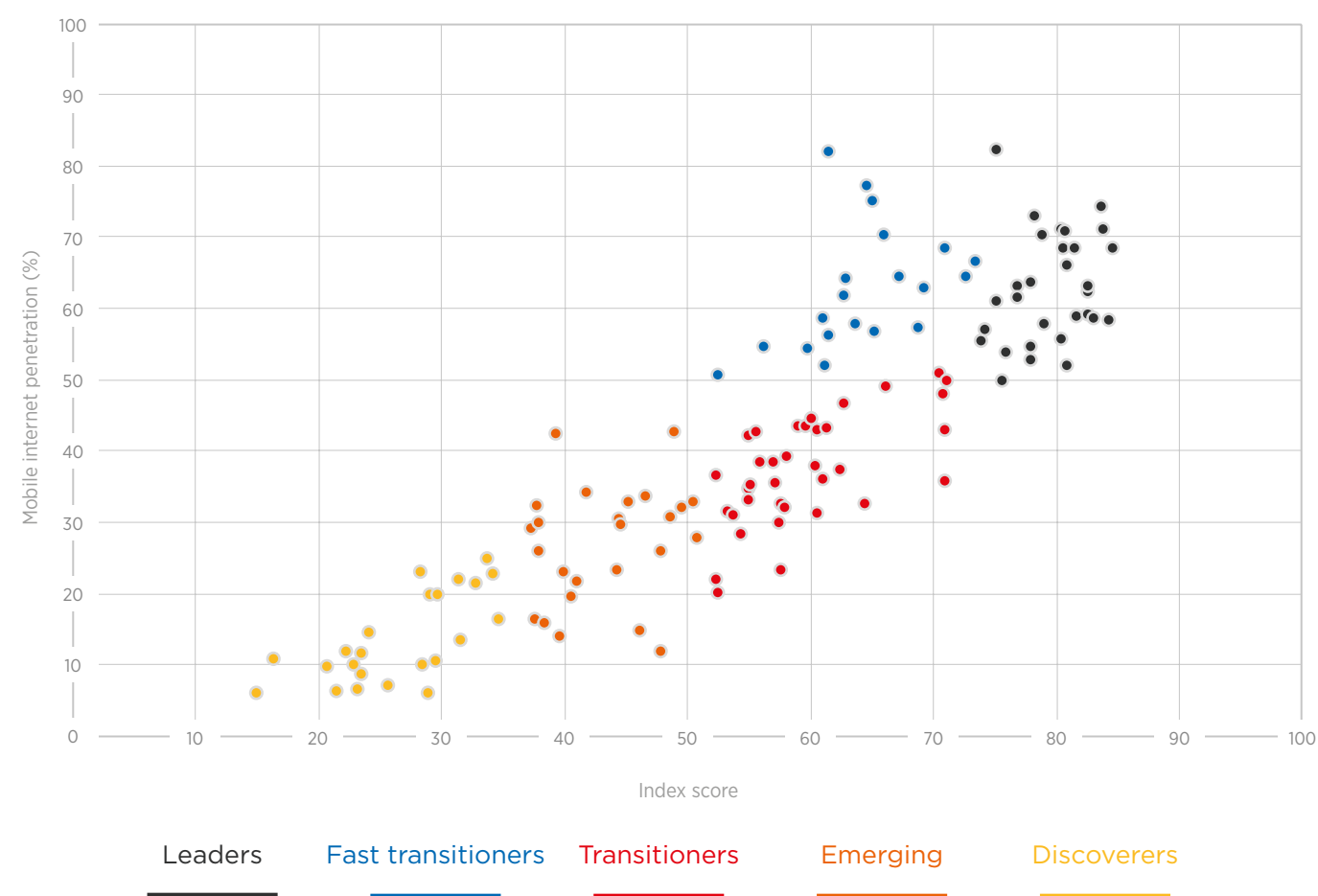
Source: GSMA Intelligence

We have categorised each cluster as follows:

LEADERS generally perform very well across all enablers and have corresponding high levels of mobile internet penetration.

FAST TRANSITIONERS perform well on at least two or three enablers and have mobile internet penetration rates that are higher than would be expected for their index score.

TRANSITIONERS perform well on at least two or three enablers and have mobile internet penetration rates consistent with their index score.

EMERGING countries perform fairly well on one or two enablers but show room for improvement on others.

DISCOVERERS show room for improvement across all four enablers and have correspondingly low levels of mobile internet penetration.
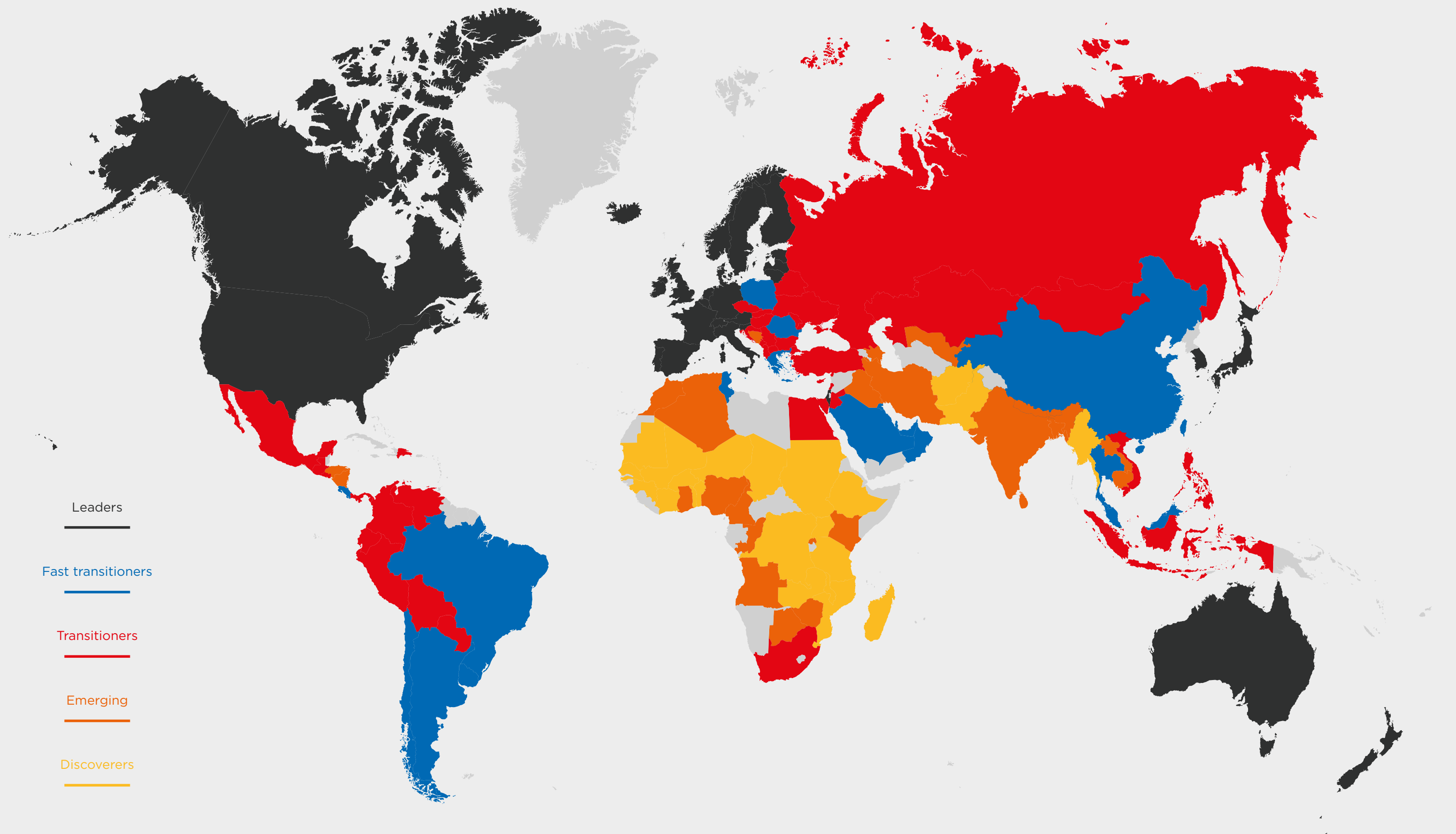
Leaders

Fast transitioners

Transitioners

Emerging

Discoverers

Table 4

The Leaders cluster

LEADERS	OVERALL INDEX SCORE	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Average	80	73	77	88	82
High	85	83	85	95	91
Low	74	63	68	79	73

Total countries: 30 (Americas – 2; Asia – 6; Europe – 21; MENA – 1; SSA – 0)
Australia, Netherlands, Denmark, Sweden, Norway, New Zealand, Finland, USA, Iceland, UK, Switzerland, Canada, Singapore, South Korea, Belgium, Luxembourg, Ireland, Austria, Japan, France, Slovenia, Estonia, Germany, Spain, Latvia, Lithuania, Hong Kong, Israel, Italy, Portugal

Source: GSMA Intelligence

The Leaders cluster is dominated by countries from Europe (21 out of 30) with the remaining places coming from Asia (6), Americas (2) and MENA (1). There are no Sub-Saharan African countries in the Leaders cluster. Countries in this cluster typically have high scores across all four enablers and also have high levels of mobile internet penetration. These countries require relatively little active intervention from the policy or development communities but, rather, set the benchmark for others to follow and learn from.

Table 5

The Fast Transitioners cluster

FAST TRANSITONERS	OVERALL INDEX SCORE	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Average	64	54	70	75	62
High	73	65	84	88	81
Low	53	42	51	55	46

Total countries: 20 (Americas – 5; Asia – 4; Europe – 4; MENA – 7; SSA – 0)
Malta, Poland, Greece, Uruguay, Romania, Chile, Bahrain, Malaysia, United Arab Emirates, Qatar, Saudi Arabia, Thailand, Argentina, Brunei Darussalam, Kuwait, Brazil, China, Costa Rica, Oman, Tunisia

Source: GSMA Intelligence

The Fast Transitioners cluster comprises a relatively even spread of countries from the Americas, Asia, Europe and MENA. There are no Sub-Saharan African countries in the Fast Transitioners cluster. Countries in this cluster typically have similar levels of mobile internet penetration compared to the Leaders cluster despite having lower index scores. Fast Transitioners typically have high scores across at least two or three enablers, often affordability and consumer readiness. The average scores for infrastructure and content are notably lower compared to countries in the Leaders cluster.

Countries in this cluster will typically benefit from targeted support, especially to help improve the availability of high-performance infrastructure and to promote the continued development of locally relevant content ecosystems.

Table 6

The Transitioners cluster

TRANSITIONERS	OVERALL INDEX SCORE	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Average	60	47	65	76	55
High	71	69	81	90	75
Low	53	35	53	49	31

Total countries: 36 (Americas – 11; Asia – 6; Europe – 14; MENA – 4; SSA – 1)
Cyprus, Slovakia, Hungary, Czech Republic, Croatia, Russian Federation, Bulgaria, Kazakhstan, Montenegro, Venezuela, Belarus, Serbia, Lebanon, Mexico, Colombia, Peru, Philippines, Ecuador, Moldova, Dominican Republic, Paraguay, Georgia, Turkey, Panama, Jordan, Albania, Macedonia, El Salvador, Ukraine, Bolivia, Vietnam, Indonesia, South Africa, Guatemala, Egypt, Mongolia

Source: GSMA Intelligence

The Transitioners cluster is dominated by countries from Europe (14) and Americas (11), with the remaining countries coming from Asia (6), MENA (4) and Sub-Saharan Africa (1). Countries in this cluster typically have similar overall index scores to countries in the Fast Transitioners cluster but have lower levels of mobile internet penetration. Similar to countries in the Fast Transitioners cluster, countries in this cluster typically perform well on two enablers (affordability and consumer readiness) but less well on infrastructure and content.

Like the Fast Transitioners, these countries would benefit from targeted support, especially to help improve the availability of high-performance infrastructure and to promote the continued development of locally relevant content ecosystems.

Table 7

The Emerging cluster

EMERGING	OVERALL INDEX SCORE	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Average	43	34	56	57	36
High	51	45	71	80	60
Low	37	23	35	42	17

Total countries: 25 (Americas – 2; Asia – 9; Europe – 1; MENA – 4; SSA – 9)
Honduras, Nicaragua, Bosnia and Herzegovina, Morocco, Sri Lanka, Iraq, Botswana, Azerbaijan, Cameroon, Ghana, Algeria, Nigeria, Iran, Kyrgyzstan, Bangladesh, Angola, Nepal, Congo, Kenya, Laos, Zimbabwe, India, Cambodia, Rwanda, Bhutan

Source: GSMA Intelligence

The Emerging cluster is dominated by countries from Asia (9) and Sub-Saharan Africa (9), with the remaining countries coming from MENA (4), Americas (2) and Europe (1). Countries in this cluster typically score best on just one or two enablers (and typically affordability and/or consumer readiness). Scores for the infrastructure and content enablers are typically much lower than the scores for affordability and consumer readiness.

Countries in the Emerging cluster would likely benefit from a broader range of support compared to the Transitioners clusters, with a bias towards infrastructure and content.

Index enabler scores for each cluster

Source: GSMA Intelligence

Table 8

The Discoverers cluster

DISCOVERERS	OVERALL INDEX SCORE	INFRASTRUCTURE	AFFORDABILITY	CONSUMER READINESS	CONTENT
Average	27	21	39	39	19
High	35	32	55	66	41
Low	15	8	20	9	8

Total countries: 23 (Americas – 0; Asia – 3; Europe – 0; MENA – 2; SSA – 18)
Cote d'Ivoire, Swaziland, Pakistan, Senegal, Mozambique, Tanzania, Uganda, Benin, Zambia, Madagascar, Myanmar, Sudan, Togo, Mali, Ethiopia, Mauritania, DRC, Burkina Faso, Afghanistan, Malawi, Guinea, Chad, Niger
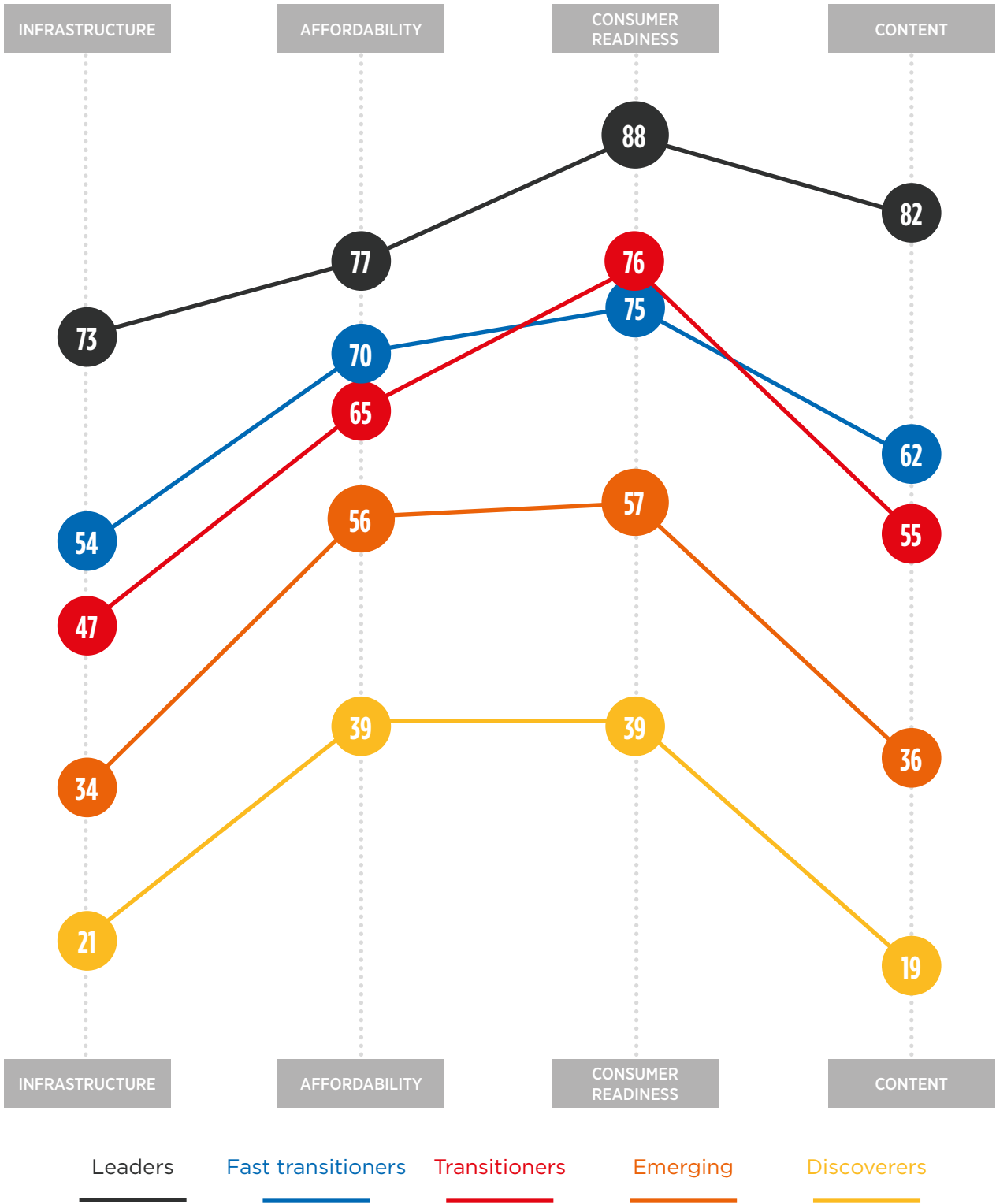
Source: GSMA Intelligence

The Discoverers cluster is dominated by countries from Sub-Saharan Africa (18), with the remaining countries coming from Asia (3) and MENA (2). Countries in this cluster typically score poorly across all four enablers and have correspondingly low levels of mobile internet penetration. Discoverer countries tend to score notably better on affordability and consumer readiness relative to the infrastructure and content enablers. Low Infrastructure scores reflect the geography of the dominant region represented in the cluster, Sub-Saharan Africa. Sub-Saharan Africa countries tend to have high levels of rural population, which compromises the commercially viable of network coverage.

Countries in this region typically require a holistic suite of support to strengthen the overall enabling environment. There clearly needs to be a heavy bias towards improving the availability and performance of infrastructure but this cannot and should not be the sole focus of development activities. Widespread availability of infrastructure counts for little if citizens cannot afford access or do not have the skills to take advantage of online opportunities.

The importance of good governance and institutions

The indicators that make up the Mobile Connectivity Index are key inputs in achieving increased take-up of mobile internet services. However, the inputs themselves are conditional on a number of prerequisites. In particular, a country's performance across all enablers is likely to improve with good governance and institutions.

Table 9 sets out correlation coefficients between the Mobile Connectivity Index and Enabler scores and the World Governance Indicators developed by the World Bank.

All of the correlations are high, particularly for rule of law, government effectiveness and regulatory quality. This suggests that good enabler scores are generally conditional on the existence of good governance, institutions and a strong regulatory framework.

This finding is also supported by the analysis in Figure 9, which plots the Mobile Connectivity Index against the World Bank's Doing Business scores (specifically the Distance to Frontier metric).

There is a significant positive correlation between these two metrics, demonstrating again the importance of a strong and predictable regulatory and legal framework in fostering the environment to support access to mobile internet connectivity.

| Table 9 |

Correlation between enabler and index scores and World Governance Indicators

GROUP	INFRASTRUCTURE	AFFORDABILITY	CONSUMER	CONTENT	INDEX
Rule of law	0.84	0.65	0.65	0.76	0.79
Government effectiveness	0.88	0.74	0.73	0.82	0.86
Regulatory quality	0.86	0.65	0.68	0.78	0.82
Political stability	0.70	0.56	0.67	0.58	0.68
Voice and accountability	0.73	0.45	0.59	0.69	0.69
Control of corruption	0.79	0.62	0.60	0.73	0.75

Source: GSMA Intelligence and World Bank

| Figure 9 |

Relationship between Index Score and Doing Business Score

Source: GSMA Intelligence and World Bank

Table 10

Mobile Connectivity Index scores

Country	Index Score	Country	Index Score	Country	Index Score	Country	Index Score
Australia	84.67	Hungary	71.08	Paraguay	57.75	Nepal	40.05
Netherlands	84.43	Greece	71.04	Georgia	57.50	Congo	39.67
Denmark	83.93	Czech Republic	70.87	Turkey	57.35	Kenya	39.41
Sweden	83.86	Croatia	70.57	Panama	57.04	Laos	38.43
Norway	83.23	Uruguay	69.37	Oman	56.41	Zimbabwe	38.06
New Zealand	82.75	Romania	68.93	Jordan	56.01	India	37.98
Finland	82.64	Chile	67.37	Albania	55.71	Cambodia	37.94
United States of America	82.64	Russian Federation	66.34	Macedonia	55.22	Rwanda	37.72
Iceland	81.77	Bahrain	66.14	El Salvador	55.14	Bhutan	37.47
United Kingdom	81.68	Malaysia	65.37	Ukraine	55.11	Cote d'Ivoire	34.84
Switzerland	81.04	United Arab Emirates	65.10	Bolivia	55.06	Swaziland	34.32
Canada	80.98	Qatar	64.66	Vietnam	54.42	Pakistan	33.79
Singapore	80.85	Bulgaria	64.63	Indonesia	53.85	Senegal	32.96
Korea, South	80.72	Saudi Arabia	63.74	South Africa	53.36	Mozambique	31.68
Belgium	80.56	Thailand	63.05	Guatemala	52.64	Tanzania	31.58
Luxembourg	80.50	Kazakhstan	62.93	Tunisia	52.57	Uganda	29.75
Ireland	79.08	Argentina	62.91	Egypt	52.51	Benin	29.67
Austria	78.92	Montenegro	62.48	Mongolia	52.50	Zambia	29.24
Japan	78.37	Brunei Darussalam	61.57	Honduras	50.87	Madagascar	28.97
France	78.04	Kuwait	61.57	Nicaragua	50.65	Myanmar	28.56
Slovenia	78.00	Venezuela	61.39	Bosnia and Herzegovina	49.59	Sudan	28.38
Estonia	77.99	Brazil	61.29	Morocco	49.09	Togo	25.74
Germany	77.05	Belarus	61.18	Sri Lanka	48.70	Mali	24.30
Spain	77.04	China	61.08	Iraq	47.96	Ethiopia	23.68
Latvia	76.01	Serbia	60.69	Botswana	47.93	Mauritania	23.58
Lithuania	75.70	Lebanon	60.69	Azerbaijan	46.77	Congo, Democratic Republic	23.23
Hong Kong	75.32	Mexico	60.46	Cameroon	46.20	Burkina Faso	23.00
Israel	75.32	Colombia	60.26	Ghana	45.25	Afghanistan	22.37
Italy	74.30	Costa Rica	59.92	Algeria	44.68	Malawi	21.58
Portugal	74.00	Peru	59.68	Nigeria	44.50	Guinea	20.83
Malta	73.49	Philippines	59.17	Iran	44.43	Chad	16.50
Poland	72.71	Ecuador	58.25	Kyrgyzstan	41.97	Niger	15.08
Cyprus	71.25	Moldova	58.00	Bangladesh	41.06		
Slovakia	71.15	Dominican Republic	57.79	Angola	40.71		

Source: GSMA Intelligence

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