

# Can mobile communications close the Digital Divide?

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White Paper

Mobile communications holds the greatest  
potential for bridging the world's technology gap.

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# 1 Executive summary

World leaders have recognized that the technology gap – the so-called ‘Digital Divide’ – between the world’s richest and poorest nations is a symptom of wider inequality. However, technology is also recognized as an enabler to close the gap – in economic, social and political terms.

Real-life examples from all corners of the developing world show how mobile networks are providing voice and data connectivity that can improve billions of lives.

Not dependent on foreign or state aid, mobile services are being run by operators as sustainable, profit-making businesses. They are helping to boost local economies, deliver important social services like healthcare and education, improve democracy and generally raise standards of living.

The statistics speak for themselves. With three billion mobile phones already in use, and network coverage extending over 80 per cent of the world population, mobile communications is the best tool to use in bridging the Digital Divide.

There are still barriers to the roll-out of mobile communications for all – the price of the services themselves, the cost of ownership for operators and the complicated issue of government subsidies, regulation and taxation. But the development of affordable handsets, more efficient network equipment, new business models and a more enlightened government approach to the telecoms market is bringing down the barriers to universal mobile communications access.

What is more, the future looks exciting. Whereas much of the developed world is still relying on the 100 year-old fixed-line telecommunications network to deliver many of its broadband Internet services, emerging markets are set to leapfrog using a raft of new mobile broadband-based technologies.

The 3GPP family of standards gives operators a clear, cost-efficient roadmap from basic GSM voice and GPRS data services to true mobile broadband services based on EDGE and WCDMA/HSPA technology.

## 2 What is the Digital Divide?

Since 2000 and the declaration of the United Nations' eight Millennium Development Goals, there have been concerted efforts to eradicate the poverty, hunger, disease, discrimination and lack of education that reduces the quality of life of billions of people.

Around the world, politicians, academics, businesses and charities have taken up the challenge of reducing the huge gap in living standards between the developed and developing world.

In today's information society, it is hardly surprising that the Digital Divide – the lack of access to Information and Communication Technology (ICT) – is being seen as a key part of the equation.

One part of the world has experienced spectacular advances in electronics, computers and telecommunications during the past 15 years, and enjoyed a host of new opportunities for economic, social and personal development. But the majority of the world's population has, until recently, been largely bypassed.

Technology companies have been accused of discriminating against those living in remote or rural areas because providing them with a service is not 'economically viable'. Even where they do provide it, there are fears that the world's poorest either cannot afford to pay or don't have the education to use it.

While providing global access to ICT is not classed as one of UN's eight key development goals, the UN recognizes that it has a direct correlation with them. Closing the technology gap can play a major role in bridging the wider divide between the developing world and the developed world – boosting economies, improving healthcare, encouraging democracy. In the words of the former Secretary General of the United Nations, Kofi Annan: "There is a tremendous yearning, not for technology *per se*, but for what technology can make possible."

To this end, the United Nations sponsored a major conference on the subject – the World Summit on Information Society (WSIS) – which was held in Geneva in 2003 and Tunis in 2005. It set goals for improving access to ICT, with a deadline of 2015.

## 2.1 The Digital Divide is shrinking

The latest WSIS analysis (May 2007) reports that the Digital Divide is shrinking – the number of people around the world using ICT has doubled since 1998. Emerging markets are closing the gap with developed nations in terms of fixed line and broadband penetration, Internet usage and mobile phone subscribers. The world's least developed countries are also making progress in most areas apart from fixed lines.

The figures for monthly mobile subscriber growth in many developing countries are astonishing: every month India and China together add 13 million new subscribers. And it is not just in these fast-growing economies that mobile use is soaring. Pakistan adds over two million and Egypt adds over one million new users per month.

Uptake of mobile services rises more quickly – once penetration has reached two per cent – in emerging markets than it did in the developed world, as can be seen in Figure 1. People in these regions have a much stronger relationship with the mobile phone than the computer – for most of them it is their first and only gateway to telephony or the Internet.

It is with good reason, therefore, that the WSIS report claims mobile telephony “holds the greatest potential to bridge the Digital Divide”.

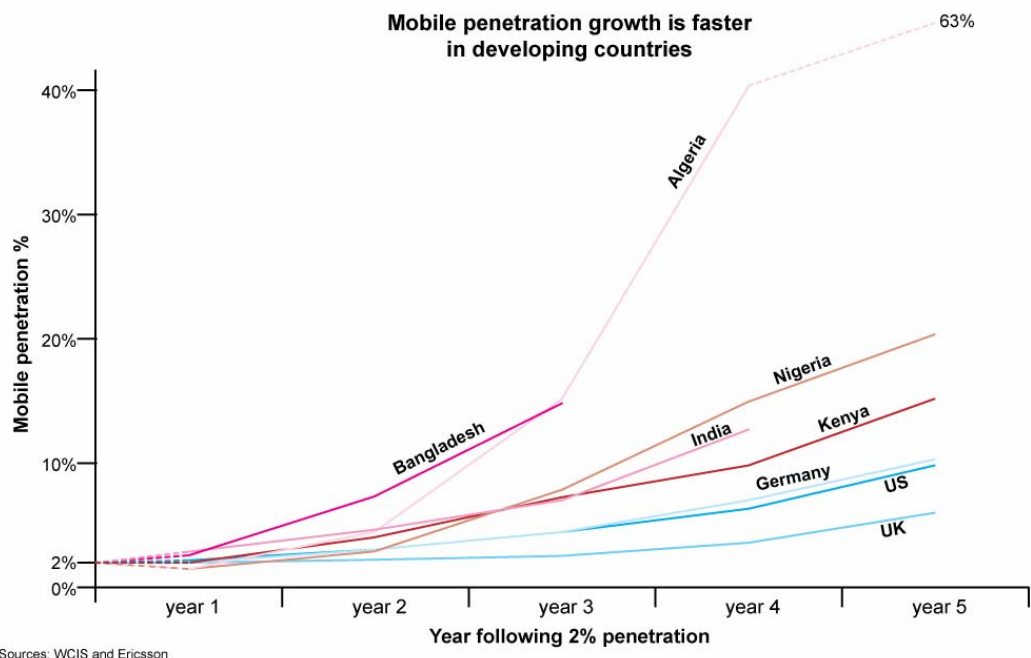


Figure 1. Mobile penetration growth in developed and developing countries.

### 3 How can mobile communications bridge the divide?

Broadband communications may be revolutionizing the way people work and spend their leisure time in the developed world, but the fixed-line, PC-based approach that is prevalent there is far too expensive for most people in the developing world to consider. In many of these countries the cost of an hour's Internet access exceeds the average daily income.

While mobile phones do not have the rich functionality of a broadband-connected PC, they are more suited to life in the parts of the world that ICT struggles to reach. They are cheaper and easier to use, they don't need a regular power supply and can be used by people who don't have a previous experience of technology. They have all the voice and data capabilities needed to bring people into the digital society.

Many countries in the developing world are pioneering new mobile applications and services that are improving the lives of millions of people.



Figure 2. The value of mobile communications.

#### 3.1 The new mobile mass market

According to the latest figures from the World Cellular Information Service, there are already well over three billion mobile subscribers. Although landline telephones have been around for 100 years, they are now outnumbered three-to-one.

The contrast is sharpest in the least developed nations, where mobiles outnumber fixed line telephones by seven-to-one, or even nine-to-one in sub-Saharan Africa. In Africa as a whole, the mobile phone is now the main form of electronic communication, and subscriber numbers have grown from 15 million in 2000 to 240 million by mid-2007.

Ericsson predicts that there will be five billion subscribers by 2012. However, most of these new subscribers will be on low incomes and spend less than US\$5 per month on mobile communications, as shown in Figure 3.

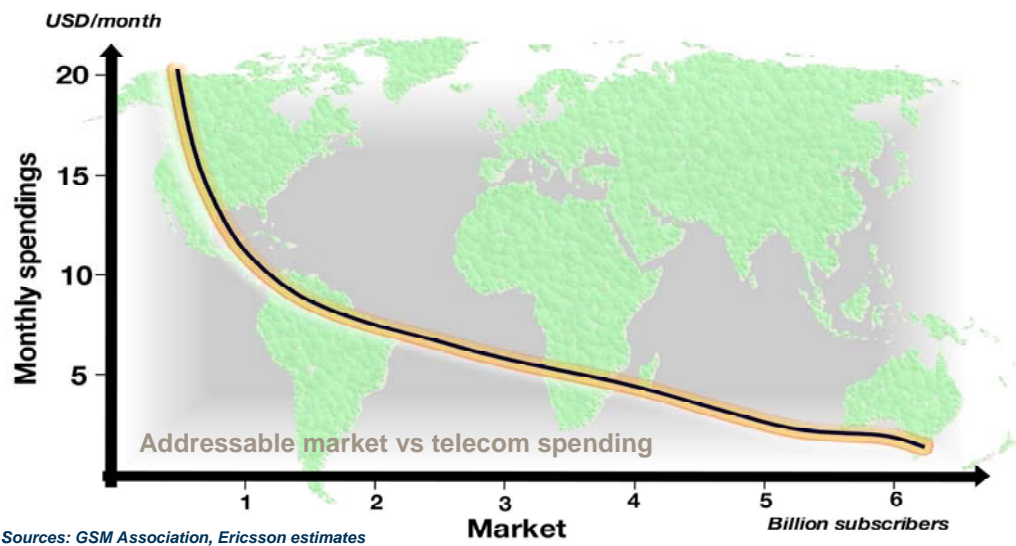


Figure 3. The next three billion mobile subscribers will typically spend less than US\$5 per month on communications.

### 3.2 Mobile benefits to the economy

Raising incomes for the world's poorest people is a vital step towards reaching the UN's Millennium Goals. Mobile communications is helping to achieve this in several ways.

One example is Tradenet, an eBay-style trading forum that helps farmers across West Africa find the most profitable market for their agricultural produce. Using simple SMS messages on mobile phones, the system can provide farmers in their fields with the latest information on stock levels and food prices across the region.

In Kenya, the GSM Association is working with local mobile operator Safaricom on the Simu ya Jamii project. This has provided 100 physically disabled Kenyans with specially adapted wheelchairs that double as GSM-enabled payphones. It is not a charity effort – Safaricom has worked out that selling phone calls this way is actually more cost-effective than operating a roadside kiosk.

Mobile communications is not only helping existing businesses in the poorest nations, they are also creating new business opportunities. For example, a whole new industry sector has built up in many parts of the world around selling airtime, top-up cards and mobile handsets, or providing maintenance and repair services.

A number of academic studies have now established that telecommunications boosts an economy.

A 2005 report by Leonard Waverman of the London Business School estimates that the average developing nation sees its economic growth rise by 0.6 per cent for every 10 per cent growth in the number of mobile phone subscribers. In 2007, the GSM Association applied Waverman's methodology to a group of 57 developing nations and found that the impact was doubled, boosting economic growth by 1.2 per cent for every 10 per cent rise in mobile users.

#### ***Mobile phones help Kerala fishermen***

Mobile phones have been used by fishermen in Kerala for a decade. Fishing is a vital industry in this part of south-west India, employing over one million people. The Harvard economist Robert Jensen has studied the effect that the spread of mobile communications has had on the fishermen's livelihoods.

The arrival of mobile phones in the region meant that fishermen could compare prices and demand for fish across the area. This led to the setting of a single rate for sardines along the Kerala coast, eliminated any wasted catches and saw a fall in consumer prices.

This more efficient market benefited everyone. Consumer prices fell by an average of four per cent and there was an eight per cent rise in the average fisherman's profits, meaning that mobile phones usually paid for themselves within the first two months.

### **3.3 Mobile benefits to society**

As well as boosting economies, mobile communications are also helping to raise the quality of healthcare and education, improve the democratic process and make life a little bit easier for millions of people.

In some areas mobile operators and technology companies, NGOs, governments and businesses are working together to make the initial steps or speed up progress.

In India's Tamil Nadu region, the Gramjyoti Rural Broadband Project is using WCDMA/HSPA mobile communications technology to provide communities with their first access to high-speed Internet services. Eighteen villages and 15 towns near Chennai are taking part in the trial, which gives them access to mobile broadband applications including interactive educational classes, a video-conference 'check-up' with a doctor, online access to government application forms and initiatives, local information on weather and market prices and live TV.

Further south in the country, in the Madhya Pradesh region, the Indian Government has launched a project to deliver mobile versions of its services to 60 million residents. It plans to include services for online bill payment, taxes, land records, income certificates, loans, driving licenses, birth and death certificates and various government entitlement programs.

In Rwanda and Indonesia the GSM Association's Development Fund is working with the World Health Organization (WHO) to enable health workers in the field to capture data on new outbreaks of HIV/AIDS and avian 'flu. Health workers can input information about the spread of a disease via SMS or a GPRS data channel to a central database. Previously, they had to make time-consuming voice calls to interactive voice systems. The projects in both countries are designed to be scalable and easily replicated elsewhere in the world.

One great advantage of mobile communications technology is the speed at which it can be deployed. In 2002 Ericsson was part of a team that worked with the United Nations to set up a complete mobile telecommunications network in Kabul, Afghanistan, to help the humanitarian relief agencies working there. The system was rolled out in just 15 days.

### 3.4 Mobile benefits to the individual

High-profile projects aside, the mobile phone is enhancing the quality of life for individuals and their families across the world.

One key application is money transfers, which play a vital role in many developing countries where only a minority of residents have access to a bank account. New international services are enabling expatriates to send money home via their mobile phone rather than using more expensive money transfer services. Domestic services are used by city dwellers, who often support their families in rural areas.

Two leading Philippine operators, SMART and Globe Telecom, both offer SMS remittance services. These allow Filipino workers abroad to deposit money with partnering banks or remittance companies and send it via an SMS message to SMART or Globe subscribers back home. The recipient can pick up the money at a partner institution in the Philippines. The sender is charged a maximum of one per cent commission per transaction – much less than using a traditional wire service.

Both services have proved popular, with Globe's G-Cash system handling over US\$100 million a day by mid-2006. With nearly nine million Filipinos working abroad, these SMS remittance services have a huge potential customer base.

SMS remittance services have also proved popular in Africa. Statistics show that migrant African workers send over US\$90 billion back home each year.

Mobile phones are also enhancing the work prospects of millions of micro-enterprises – the street vendors, day carers, handymen or security guards who must find their own income-generating opportunities. Ericsson studies have shown that being contactable by mobile phone can double or triple these people's incomes.

Research from Ericsson's ConsumerLab work in Kenya and Nigeria has produced other examples of how mobile communications is making life easier. For example, it helps distant relatives keep in touch, enables shopkeepers to check supplier prices and order new stock, and lets carers obtain medical advice or book health centre appointments.

## 4 Breaking down barriers

The growth in access to mobile communications is remarkable, considering the barriers in its path. Subscription costs, poor infrastructure, low competence levels, high phone prices, regulation and taxation all challenge attempts to close the Digital Divide.

However, mobile equipment suppliers and operators are adopting some innovative approaches to overcoming these barriers.

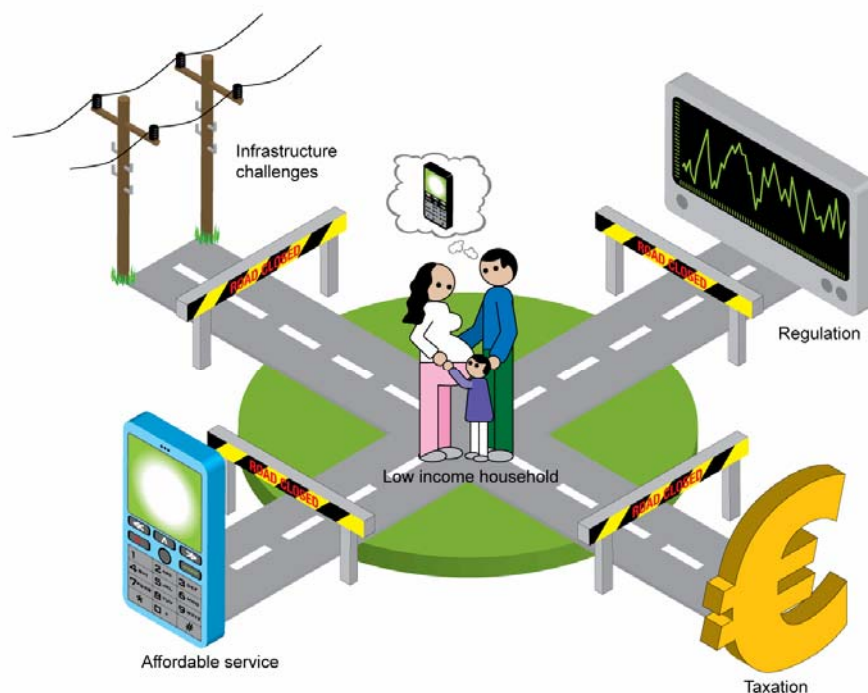


Figure 4. There are several barriers to mobile communications growth.

### 4.1 Low incomes require low costs

It is no good delivering mobile communications to the whole planet if half of the population cannot afford to use it.

Eighty per cent of future mobile subscribers will be on low incomes, and mobile operators need to take innovative steps to provide communications to households with a daily income of US\$3 or less.

Ericsson believes people with an income of US\$2 per day should be able to afford a mobile subscription. Our research shows that such people are willing to spend 5–10 per cent of their income, or around US\$3-6 per month, on communications.

Up to a few years ago, the cheapest GSM phones available cost around US\$50–80 on the wholesale market. However, recent advances in component integration have meant that low-end devices are now available in the US\$20–30 price bracket. This has enabled millions of people to own their own mobile phone for the first time.

Operators are introducing new business models in order to succeed in low-income sectors. By setting low tariffs and relying on high traffic volumes – rather than high Average Revenue Per User (ARPU) – cutting handset subsidies, offering low-denomination top-ups and reducing the cost of acquiring new customers, these operators are able to produce profit margins that many of their developed-world counterparts would be jealous of.

For instance, Indian operators have among the lowest ARPU in the world – at about US\$7–8 per month. But thanks to tight control of costs, and massive economies of scale, they can generate profit margins of up to 40 per cent. High SMS message levels in the Philippines have helped local operators generate margins of up to 70 per cent.

However, even with handsets and tariffs at these low levels, the GSM Association estimates that 1–1.5 billion people are still priced out of mobile ownership. To combat this, the GSM Association has launched ‘Shared Access to Voice’ schemes in Algeria, India, Kenya, Nigeria and South Africa. The GSM Association works with operators in these countries to equip local entrepreneurs with software that sits on their mobile phone SIM card and turns the device into a payphone. The software stores operator tariffs, monitors usage and calculates an airtime charge for each call. As well as extending the accessibility of communications, it creates jobs for the people operating the payphones. Each phone is shared by an average of 30 customers.

## 4.2 Infrastructure challenges

The main infrastructure hurdles facing operators in emerging markets are a lack of transport network and power supply. Building new mobile networks requires substantial investment – particularly in rural areas with a low population density, where it can be hard to justify a large investment against potential subscriber revenues.

Nonetheless in India, for example, operators plan to spend US\$20 billion on network expansion in the two years to 2009. One of the reasons they can afford this is a new government policy that mandates the sharing of base station towers – every new rural tower has to be shared by three operators – cutting both capital expenditure and running costs.

New developments in network equipment and technology are also helping operators to reduce capital and operating expenditure. New radio, satellite and microwave transmission equipment is enabling them to provide greater coverage with fewer base stations, while using less power. IP-based technology and optimization techniques enable traffic to be carried more efficiently, reducing operating expenses even further.

India's largest mobile operator, Bharti Airtel, is working on a massive extension of its network into rural areas and is using a new range of GSM radio and microwave transport products, which Ericsson believes can cut costs by 30 per cent or more in new coverage areas.

Telecom infrastructure requires a reliable supply of electricity, and the standard way to provide this in 'off-grid' rural areas is to install diesel generators. However, fossil fuel prices are rising, and it can be difficult or costly to deliver supplies to remote areas. What is more, the fuel can be a target for thieves.

In many areas, fossil fuel diesel can be replaced with bio-diesel, which can be made from a variety of locally available plant matter. In India's Maharashtra state, operator Idea Cellular is running base stations on biofuel from a variety of local sources, including waste vegetable oil from local restaurants and the jatropha plant.

In addition, by employing more efficient network designs and network equipment, operators can cut power consumption significantly, and make alternative energy sources an even more viable option. For example, solar-powered radio base stations have been widely deployed in Ethiopia, Morocco and Vietnam and trials are underway in many other countries, including Cambodia, Indonesia and Iraq.

Although more advanced network equipment involves higher initial capital expenditure, the operating expenditure is greatly reduced, especially where solar and wind energy can be harnessed. Ericsson studies have shown that for low- to medium-capacity base stations, solar energy can prove a more cost-effective power source than diesel fuel within about two years.

## 4.3 Taxation

Governments play a vital role in encouraging the roll-out of telecommunications services. Customs duties, handset sales taxes and service taxes all influence the take-up of mobile communications.

Despite the positive impact of mobile communications, many countries still have tax regimes that discourage its take up. A 2007 report from the GSM Association and consultants Deloitte on the mobile taxes collected in 101 countries discovered some wide variations. Turkey levies the highest tax on mobile users, at 44 cents from each dollar spent by consumers, while in East Africa mobile subscribers are taxed at almost twice the 17.4 per cent global average. Tax accounts for nearly 25 per cent of total handset sale prices on average, with 45 countries imposing specific import duties on handsets.

The GSM Association has called on many countries to treat mobile communications as a basic need, not a luxury, and to start reducing taxes accordingly. It suggests that, in many cases, the loss in tax revenues can be mitigated as mobile penetration grows, and boosts the economy and subsequent VAT and corporation tax revenues.

Many nations are subsidizing the development of domestic telecommunications networks with a Universal Service Fund (USF) that levies contributions from mobile and fixed operators. The GSM Association found that 32 of the 92 developing nations it surveyed had set up USFs, collecting more than US\$6 billion, one-third of which had come from the mobile industry.

However, less than 30 per cent of these funds have so far been redistributed to help pay for network expansion. And 93 per cent of the US\$1.62 billion that had been spent had gone on extending fixed-line links instead of mobile networks. At this stage it seems that, in most cases, USFs have acted more as a tax on mobile operators than an incentive.

USFs can help subsidize the introduction of mobile services to areas that normal economic forces have failed to reach – usually because a population is very poor or geographically remote. But they should be used as a last resort by governments that have liberalized their national market and removed the impediments to healthy competition.

## 4.4 Regulation

The single most important measure that a government can take to boost mobile coverage is to liberalize its telecoms market. In nearly every case, the licensing of multiple operators has resulted in strong growth, as competition encourages investment and reduces access costs for consumers.

Nigeria has five nationally-licensed operators and a number of regional operators. As a result of the fierce competition for subscribers, the country has seen a 102 per cent annual growth rate in subscribers over the past four years. This compares with an already impressive 52 per cent annual growth rate seen in sub-Saharan Africa as a whole over the same period.

On the other side of the African continent, Ethiopia has just one mobile operator (the Ethiopian Telecommunications Corporation), and market penetration is just 1.62 per cent.

However, competition in many developing markets remains weak – relative to the developed world – with some countries maintaining mobile operator monopolies and others having only one or two players. In some cases this is because regulators have been too generous in assigning radio spectrum to individual operators. Elsewhere they have failed to issue licenses for available spectrum. Both tactics serve to limit the number of operators that can enter a market

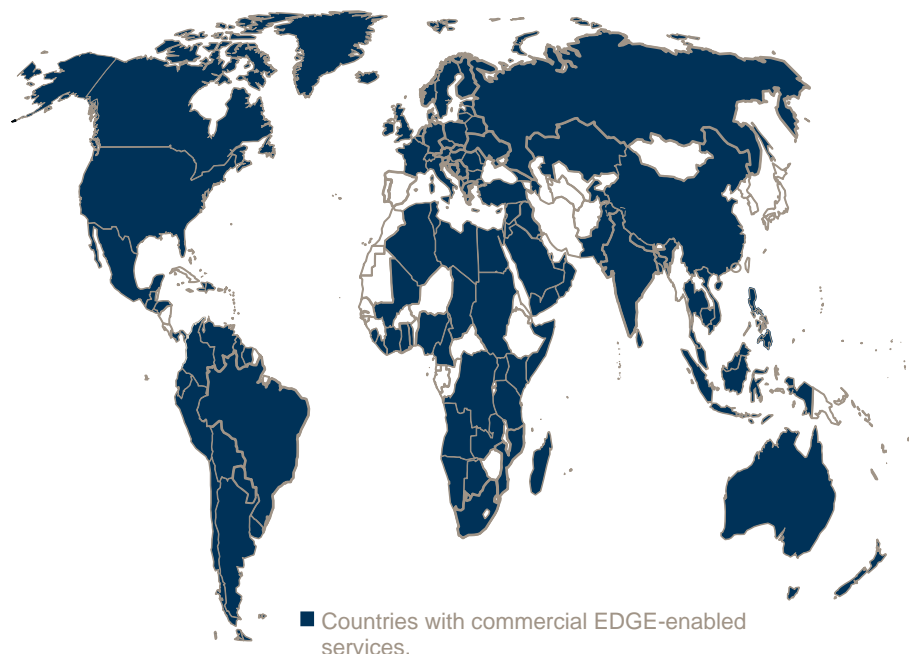
Governments also need to help tackle the other impediments to the competitive roll-out of mobile networks – streamlining the planning process and encouraging the building of new road and power infrastructure, for example.

## 5 Where next?

Mobile operators are realizing that there is a business case for providing affordable high-speed data services as well as basic voice and data services in developing countries. Not only are new mobile communications networks being rolled out in these areas, many are quickly being upgraded to deliver advanced mobile data services.

One way GSM operators can roll out high-speed mobile data services cost-effectively is through a software upgrade to EDGE technology. This low-cost, simple upgrade to existing GSM/GPRS networks improves user experience and typically results in a three-fold increase in uptake for mobile data services.

EDGE connectivity is already being used in more than 300 networks to deliver Internet-based services. One example is in rural Bangladesh, where Grameenphone – the country’s largest operator – has set up community information centers to provide shared voice, data and Internet services. Each of the 500 centers serves up to 40,000 people in the local community, who can now videoconference with relatives, access health advice or government services and find local job and market price data. Users buy data access by the minute, without having to subscribe to an ‘always-on’ broadband link. The centers are franchised, independent businesses, providing local jobs.



*Figure 5. There are over 300 EDGE networks worldwide (source: GSA).*

The harmonization of global spectrum has led to a rapid growth in the number of GSM/EDGE services – but this is only the first step towards a world of mobile broadband services. The 3GPP group of standards has defined a smooth upgrade path to higher-speed data services, based on WCDMA/HSPA and later on, LTE/SAE technology.

As regulators release new radio spectrum operators are investing in this new technology to provide even higher mobile data speeds and capacity.

Because GSM and WCDMA have similar radio propagation properties, they can share the same radio sites and transport resources in addition to a shared core network. In Europe more than 90 per cent of GSM macro radio sites have been reused for WCDMA, for example. Within a few years, economies of scale will mean that WCDMA handsets become affordable for the low-income consumers that today only have access to voice and simple data services. WCDMA networks support HSPA high-speed data services – which can bring true mobile broadband to the developing world.

In South Africa, operator MTN has rolled out a series of Internet cafés that use its HSPA- and EDGE-enabled network to provide some of the country's poorest areas with access to online services at broadband speeds. As well as offering business and communication tools such as email, fax, phone and Internet, the MTN service features an online portal with access to information on training and job opportunities.

The introduction of mobile Internet connections at broadband speeds is changing the attitude of governments and investors. Many governments are now looking at spending more of their US\$ cash on subsidizing mobile broadband projects. Because there is a clear evolutionary path from GSM to EDGE- and WCDMA/HSPA-based services, the transition is cost-effective and straightforward.

The trend is clear: phones first, broadband next, using the same core network.

## 6 Conclusions

The tremendous rate at which mobile coverage is being rolled out around the developing world is proof that the world's poorest people can be provided with affordable access to ICT, while operators can earn a profit from doing so.

By adapting or reinventing many of the strategies used in the developed world, businesses, governments and not-for-profit organizations have created a host of innovative new business models and services that are helping to drive the take-up of mobile communications in emerging markets.

The spread of mobile communications benefits all concerned – the telecommunications industry is opening up new high-growth, profitable markets, and disadvantaged countries have a valuable digital weapon in their battle to bridge the socio-economic gap between them and the developed world.

The mobile phone is not just closing the Digital Divide, it is empowering millions of the world's poorest people to improve their quality of life.

## 7 Glossary

**3GPP:** 3<sup>rd</sup> Generation Partnership Project – a group of international standards organizations and mobile communications companies working to define new technologies for GSM-based mobile networks

**ARPU:** Average Revenue Per User – a common way of measuring a telecom operator's income

**EDGE:** Enhanced Data Rates for Global Evolution – a mobile network technology that allows increased data transmission

**GPRS:** General Packet Radio Service – a data transmission service for GSM networks

**GSM:** Global System for Mobile communications – the world's most popular mobile network standard

**HSPA:** High-Speed Packet Access – part of the WCDMA evolution, it allows operators to deliver high-speed data services including mobile broadband and TV

**ICT:** Information and Communication Technology

**IP:** Internet Protocol – the computer networking protocol used on the Internet

**LTE/SAE:** Long Term Evolution/System Architecture Evolution – the next step in terms of user-service experience, improving latency, capacity and throughput. A natural evolution of 3GPP GSM and WCDMA networks, LTE will allow data rates above 100Mbit/s

**SMS:** Short Message Service – text messaging, a means of sending short messages between mobile phones

**UN:** United Nations

**USF:** Universal Service Fund – a government tax on telecoms companies that is intended to help subsidize the roll-out of communications to all consumers, including those in low-income, rural or remote areas

**WCDMA:** Wideband Code Division Multiple Access – a type of 3G mobile network that provides higher data speeds and capacity than previous 2G GSM services

**WSIS:** World Summit on Information Society – a pair of United Nations-sponsored conferences on the subject of global ICT issues

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