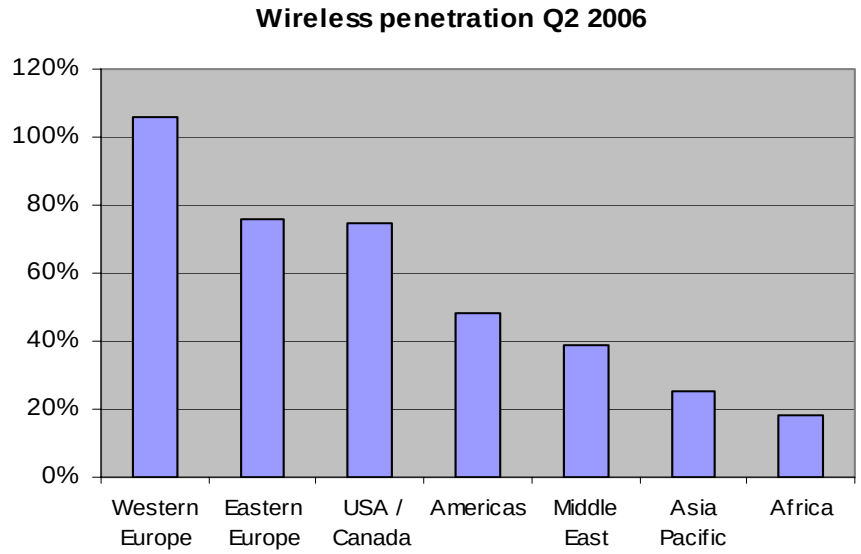
TABLE OF CONTENTS

1 The Universal Access and Universal Service market

1.1 The market opportunity

The annual value of the mobile market is now around US$ 700 billion and is growing at around 10% year on year. There are more than 2.5 billion mobile subscribers, representing a global penetration of 40% that ranges from over 100% in most Western European countries to below 10% in some African and Asian countries.



80% of the future subscriber growth will come from developing markets, primarily in Africa, Asia Pacific and the Americas[1]. However, revenue growth will be more balanced between developed and developing markets.

20% of the world's population do not yet have access to mobile services. There are a number of examples in developing markets, however, where market coverage has already reached 90% population coverage. By 2010 we expect 90% mobile population coverage globally. Ultimately private investment will deliver around 95% population coverage. But the final 2-5% of the global population is currently expected to be uneconomic to serve.

Marginal revenues in rural areas are lower than urban areas and investments required to reach these rural areas are disproportionately high. To serve rural areas, operators must pay increasing attention to the total cost of ownership (TCO) of their networks, to minimize both capital and operating costs. The taxes, duties and regulatory fees imposed by governments on both mobile consumers and operators also represent a portion of the overall cost base in serving rural areas.

Mobile operators have competing, though not necessarily conflicting, opportunities to grow:

- Expanding network coverage and increasing penetration of existing services in the areas already covered and / or
- Competing with fixed networks as the bearers of advanced broadband services.

[1] Wireless Intelligence, July 2006

1.2 Defining terms: Universal Service and Universal Access

Universal Service (US) and *Universal Access (UA)* are terms that are closely related but very different. US refers to the provision of telecoms services to all households within a country. UA refers to the provision of services on a shared basis. UA programs typically promote the installation of public payphones or public access businesses in rural villages or low-income urban areas with the aim of providing basic telecoms services[2].

Mobile operators are providing UA in the majority of developing markets and have done so at a pace unimaginable a few years ago. This is in part due to the lower costs and speed of mobile network deployment verses fixed networks. In an increasing number of developing markets, mobile operators are already close to offering US in urban areas will become the bearers of US nationally. In developed markets, where penetration rates are already above 100%, US has already been achieved.

Universal Access (UA)	Ensuring all people have reasonable means of *access* to a publicly available telephone and emergency services in their communities
The solution is mobile	In the vast majority of countries more than 95% of the total population are economically reachable with mobile networks.

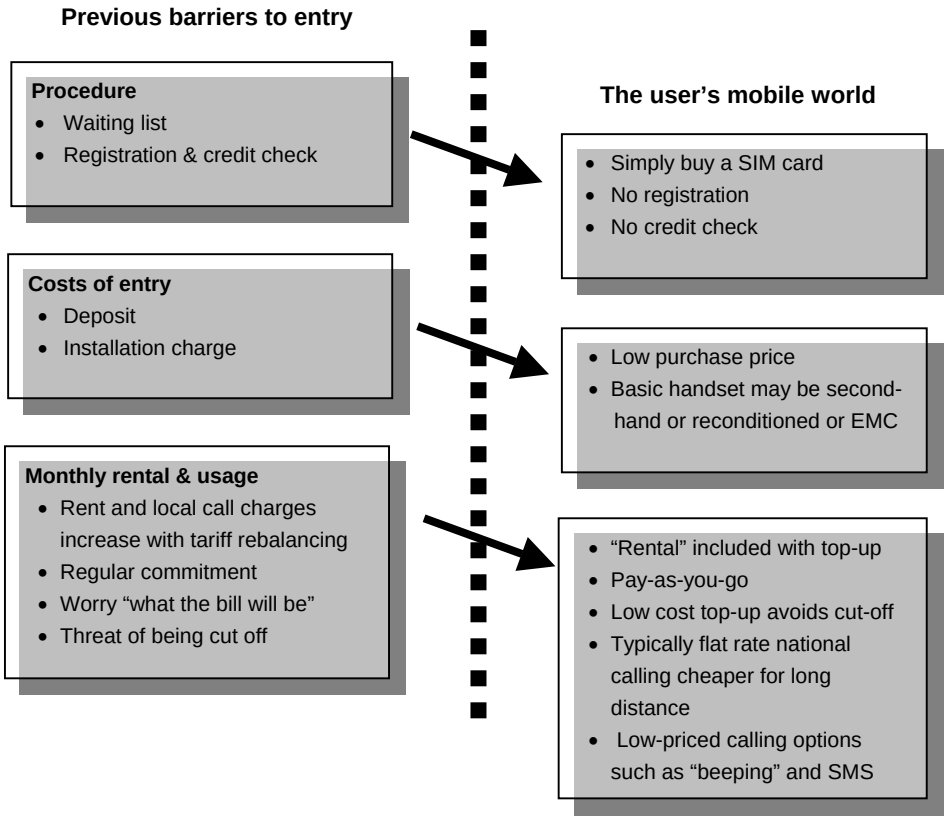
Universal Service (US)	The provision of basic telephone services to every household, in high teledensity (urban or rural) areas, where exclusion from having *private* access would place people at a social and economic disadvantage.
Mobile has the target in reach	The penetration of mobile service has already reached 75% of households in many urban areas.
Increasingly affordable	The ongoing trend towards more affordable handsets and tariff packages means that mobile operators are de facto US providers.
Technology is no barrier	With the rapid transition of GSM networks in developing countries to GPRS[3], EDGE[4], 3G[5] and HSPA[6], mobile operators can also offer enhanced data, facsimile, Internet and ICT services.

1.3 Removing barriers to access for low income users

In developing countries mobile has eclipsed the fixed networks and has become the means to bring communications services to everyone. Mobile has now emerged as the dominant and preferred route to UA and US. Several studies have also illustrated the economic impact of mobile penetration[7], while others have demonstrated the size and nature of demand and the extensive use of mobile services by the poor[8].

[2] The definitions of Universal Service (US) and Universal Access (UA) in this paragraph are as usually contained in official documents of the International Telecoms Union (ITU). They are quoted directly from the most recent publication entitled "What rules for Universal Service in an IP-Enabled NGN Environment?," ITU, April 15, 2006.
[3] General Packet Radio Service
[4] Enhanced Data rates for GSM Evolution
[5] Third Generation
[6] High Speed Packet Access
[7] For example, "The Impact of Telecoms on Economic Growth in Developing Countries", Leonard Waverman, Meloria Meschi, Melvyn Fuss; Vodafone Policy Paper Series, No. 2, March 2005; "The Economic Benefit of mobile services in India", By Ovum for the GSM Association, January 2006; and "The Economic Impact of Mobile Services in Latin America", Ovum, for the GSMA, GSM Latin America and AHCIET, December 2005.
[8] Rural demand studies by Intelecon Research & Consultancy Ltd. in Nigeria, Uganda, Mozambique, Burkina Faso, Mongolia and Russia have consistently shown that expenditures on telecoms– especially mobile services - exceed 5% of household income, often reaching 7-8%, create savings in areas such as reduced transportation costs, increase business opportunities, increase family contact and generally have a broad economic impact.

Mobile operators have been able to meet demand for basic voice services in a much more rapid and flexible way than fixed line operators, eliminating many of the barriers for people on low incomes to subscribe and use communication services.



There are a number of areas where pre-pay mobile services provide the opportunity to remove barriers for low income people include:

- Removal of virtually all bureaucratic formalities and non-monetary entry barriers to accessing service through the simplicity of the pre-pay model;
- Reducing initial access costs through low SIM card prices;
- Reducing ongoing connection costs through tariff packages that, combined with Calling Party Pay (CPP), require little outbound calling or SMS activity to retain the account, plus access to incoming calls during grace periods;
- Reducing the budget-control concerns of low income people, through small-denomination top ups;
- Enabling airtime credit transfers that allow low income people to receive credit from peers; and
- Effectively enabling reverse-charge calling through free "call-me sms" messages and "beeping" to signal the called party.

All these factors are now implemented in most developing countries. Furthermore, technological developments, economies of scale and market forces have brought the price of handsets significantly down to less than 15% of the total cost of ownership[9].

[9] According to the economic models of GSMA's study "Tax and the digital divide" the price of the handset represents on average 14% of the TCO over a sample of 50 emerging markets.

1.4 Providing shared and public access

Public access to mobile services, whether formal or informal, via shared phones, kiosks, "phone ladies" and branded franchise outlets, emerge wherever mobile networks exist in developing markets. There are many different variations and approaches of mobile public access in existence today, with new ones emerging regularly.

Types of Mobile Public Access		
Type	**Description**	**Example**
Micro-credit led community phones	MFI members assume loan in exchange for mobile phone kit	Grameen VP, MTN Uganda VP, Rwanda VP, Nigeria Rural Telephone Project
Mobile Payphones	Payphone deployment to further UA objectives and obligations	Vodacom South Africa, MTN Uganda
Independently owned, operator-specific kiosks	Network-specific public access kiosks with operator branding	Celtel Burkina Faso, MTN Nigeria, MTNN umbrella ladies
Independent franchise companies	Private company provides public access to existing networks	OnePhone Mozambique, Fones4U Botswana
Company initiated franchises	Mobile operator offers direct franchise opportunities	Spice Telecom, India
The GSMA shared phone and shared-phone software initiative	Using various terminal types, including low-cost handsets, the GSMA is linking up with a number of operators to help streamline the model, lower costs and broaden the deployment of public access.	Shared access pilots are taking place in South Africa, Nigeria, Kenya, India & Albania

1.5 Value-added & m-banking applications

There are extensive value-added, SMS-based information applications and services that are well positioned to leverage the increased access to rural clientele. For example, the Kenya Agricultural Commodity Exchange (KACE) provides real-time market prices for the country and the region to farmers, as does Drum Net. In Uganda the FOODNET Livestock Market Information System provides information on commodity prices and market opportunities to agricultural stakeholders. Other services aimed at the agricultural and fishing industries exist in Senegal and South Africa run by Manobi.

Mobile banking is providing many million of people with access to benefits of financial services for the first time. In the Philippines SMART and Globe lead in providing mobile banking along with over-the-air remittances from Filipino workers abroad. Rural and low income citizens who were previously excluded from the banking sector can now benefit from financial services; MTN Banking launched last year and Safricaom has developed M-PESA.

1.6 Sizing the market

Intelecon's two-step methodology first calculates the per capita and household incomes of the rural population in each country in the world, using their income distribution (Gini) curves. The potential revenue available for telecoms is based on the assumption that unserved rural people are willing to pay a percentage of their disposable income for services[10]. By applying an affordability estimate (e.g. 5% of household income) against the income level of the unreached proportion of the population, calculated individually for each country based on the country's GDP and income distribution (Gini) curve, it is possible to estimate the total potential telecoms expenditure of the whole unreached population.

The estimate assumes a solution in which operators provide *both* private service *and* public or shared access. In practice, a well executed UA strategy, in which public access phones

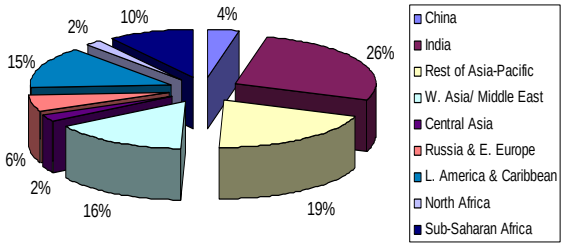
[10] Reference to extensive recent studies undertaken by Intelecon in Nigeria, Burkina Faso, Mozambique and Mongolia, all of which demonstrate demand and affordability for mobile service in rural areas amounting to 5-11% of household income are available at http://www.inteleconresearch.com/pages/news.html#results2

.

emerge at the village level and government, institutional and business customers are also served, can achieve 50-75% of a rural market's potential.

Using this model, the potential annual revenues from the rural population of all developing countries is estimated to be around US$ 95 billion in 2006. Approximately 63% of this market already has mobile coverage, leaving 37% still uncovered, amounting to a totally untapped market of at least US$ 36 billion today. Assuming a growth projection of 7% per annum over the next five years, the untapped market will exceed US$ 47 billion by year 2010.

Distribution of the World's uncovered markets



The model tracks the unreached proportion of the market. This is calculate using GIS based coverage data submitted to the GSMA by all of the world's GSM operators. India accounts for around 27% (US$ 10 billion) of the untapped market, and the remainder of the Asia Pacific region, including China, a further 24% (US$ 8.5 billion). The untapped market in the rest of the world is around US$ 17.5 billion with sub-Saharan Africa, at US$ 3.5 billion, contributing 10% of the world's untapped potential.

The incoming revenue market multiplies the opportunity from rural expansion

The second step estimates the incoming call element. Assuming an equal balance of incoming and outgoing call minutes, the incoming call revenue contributes US$36 billion. The total untapped market, including new revenues originated in both rural and urban localities, could therefore be US$ 72 billion. However in countries that do not have allow for mobile termination rates, or where these rate are low, the inbound element will not be realised or greatly diminished, meaning many remote base stations will not be profitable.

Reaching the rural areas of developing countries could add at least 10% to the current global mobile market, but if developed properly, allowing for viable mobile termination rates, the total rural could add up to 15%.

1.7 Universal Service and affordability

1.7.1 Affordable tariff packages

The majority of operators in developing countries now have low priced tariffs that allow subscribers to stay connected even if they make only a few outgoing calls. This study compared "least priced tariffs" with pre-paid ARPUs for 61 operators[11].

The average least price tariff, calculated on a monthly basis, was less than US$ 2 (mostly below this in the developing country samples) and amounted to only 17% of the surveyed companies' pre-paid ARPUs. The trend is for these lowest available prices, to become even lower, as well as for users to be able to top up their accounts with very small denomination refills increasing the affordability of mobile services.

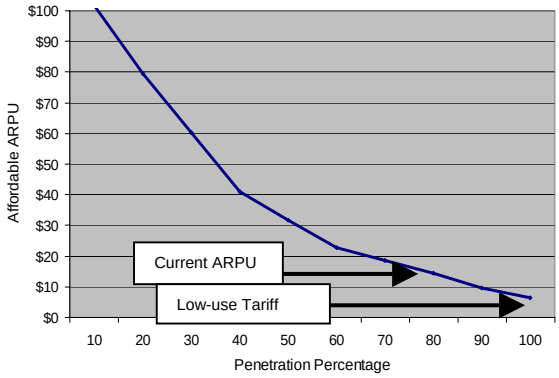
1.7.2 How many households can afford mobile services?

An analysis of developing country household incomes and observed demand from developing markets indicates that once service arrives most households can afford mobile services.

[11] The sources were ARPUs reported by operators to the GSMA, and least-cost tariffs identified from pre-pay tariffs published on operator websites.

Intelecon's world telecoms model creates household affordability curves for every country, by superimposing any assumed level of household affordability (e.g. 5%, which is today known to be a realistic minimum) on a household income curve constructed from the country's Gini curve. Operators' ARPUs usually decline along a curve that loosely resembles a Gini curve, as penetration increases.

South Africa household affordability

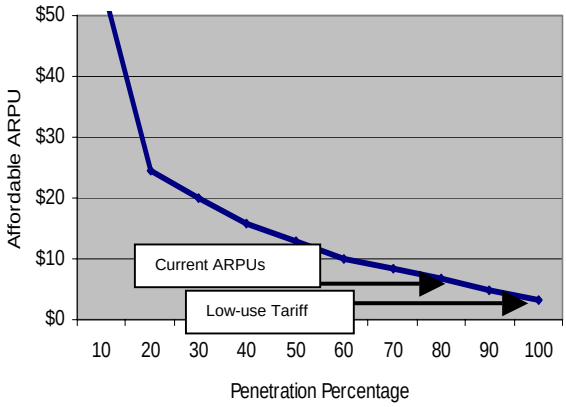


The graph is the household affordability curve the lower income ranges spends 5% on telec official household expenditure survey) the household can afford mobile services
Since pre-paid ARPUs in South Africa curre are already serving many households in the lo to achieving universal service. At least one of tariff that allows customers to stay connect outgoing calls. South Africa's individual ma household penetration is estimated to be 85-9

Taking the Philippines as a lower income mo potential for connecting the lowest income people. Current pre-paid monthly ARPUs are between US$ 5-6 and the lowest monthly pre-paid tariff for low-usage customers is US$ 1.24. The leading Philippine operators are highly innovative and profitable, even at low ARPUs. They have achieved network coverage to over 99% of population, 40% market penetration and an estimated 67% household penetration. They have offered a range of innovative products such as micro top-ups (less than US$ 1.00) and e-banking geared to the needs of low-income and rural users, as well as important internal cost-saving measures which include the popular e-Load (electronic top-up) feature.

Even with very low tariffs and low-priced handsets, up to 30% of rural households may only be able to use the network through public and informal shared access. Therefore having access to the payphone or to a shared use reseller will be important for those without private service for some time to come.

Philippines household affordability



[12] The estimate of household penetration assumes that a majority of mobile connections represent second or third phones in the house, business use, or second SIMs,

2 Benchmarking Mobile Coverage

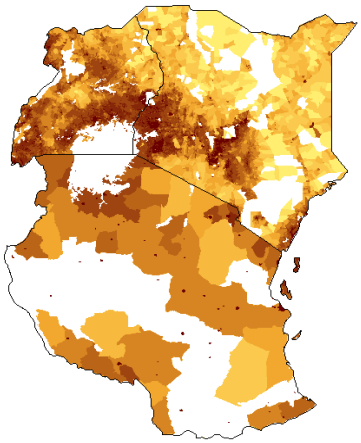
2.1 Methodology

To estimate the network coverage of the GSM operators, two sets of map data have been processed using GIS software (ESRI ArcView): these are GSM coverage and population distribution. A single consistent methodology is applied across all countries. GSM coverage maps are produced quarterly, by Europa Technologies on behalf of the GSM Association, and are compiled through the reporting by all GSM operators. The target resolution for coverage is a geographic cell size of 200 metres and the reporting guide also specifies signal strength and quality[13]. The map layer for each country is a compilation of the most up to date coverage information provided by all that country's network operators at the time of publication.

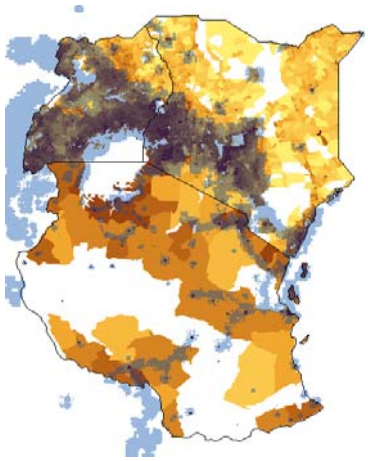
The map layer for population density[14] contains millions of pixels, with each individual pixel assigned a value representing the number of people per square kilometre.

- In step 1, the total population of a country is calculated by summing the total of all pixels for that country and cross-referenced against UN Statistics datasets to ensure accuracy.
- In step 2, the layer defining the GSM signal coverage is superimposed over the population density. A subset of the population pixels is created to quantify the total number of people under the GSM coverage layer.
- In step 3, dividing the population under GSM coverage by the total population of the country derives the percentage of population covered by a GSM signal.

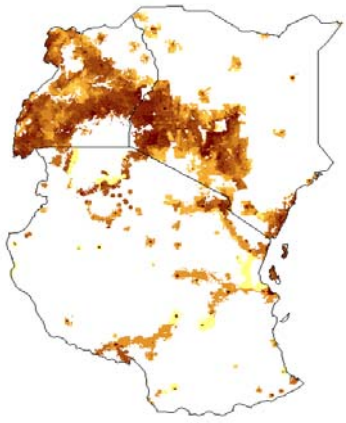
Step 1: Population densities Uganda, Kenya & Tanzania



Step 2: GSM coverage superimposed on population density



Step 3: Populations covered by GSM are extracted



The methodology has been applied to all countries in the world, using data available from the GSM operators in Q2 2006.[15]

[13] In the Coverage Data Submission Guide, v1.4, published to operators by Europa Technologies Limited, "strong" signal coverage is specified as a signal strength of at least -92 dBm, and "variable" at least -100dBm.

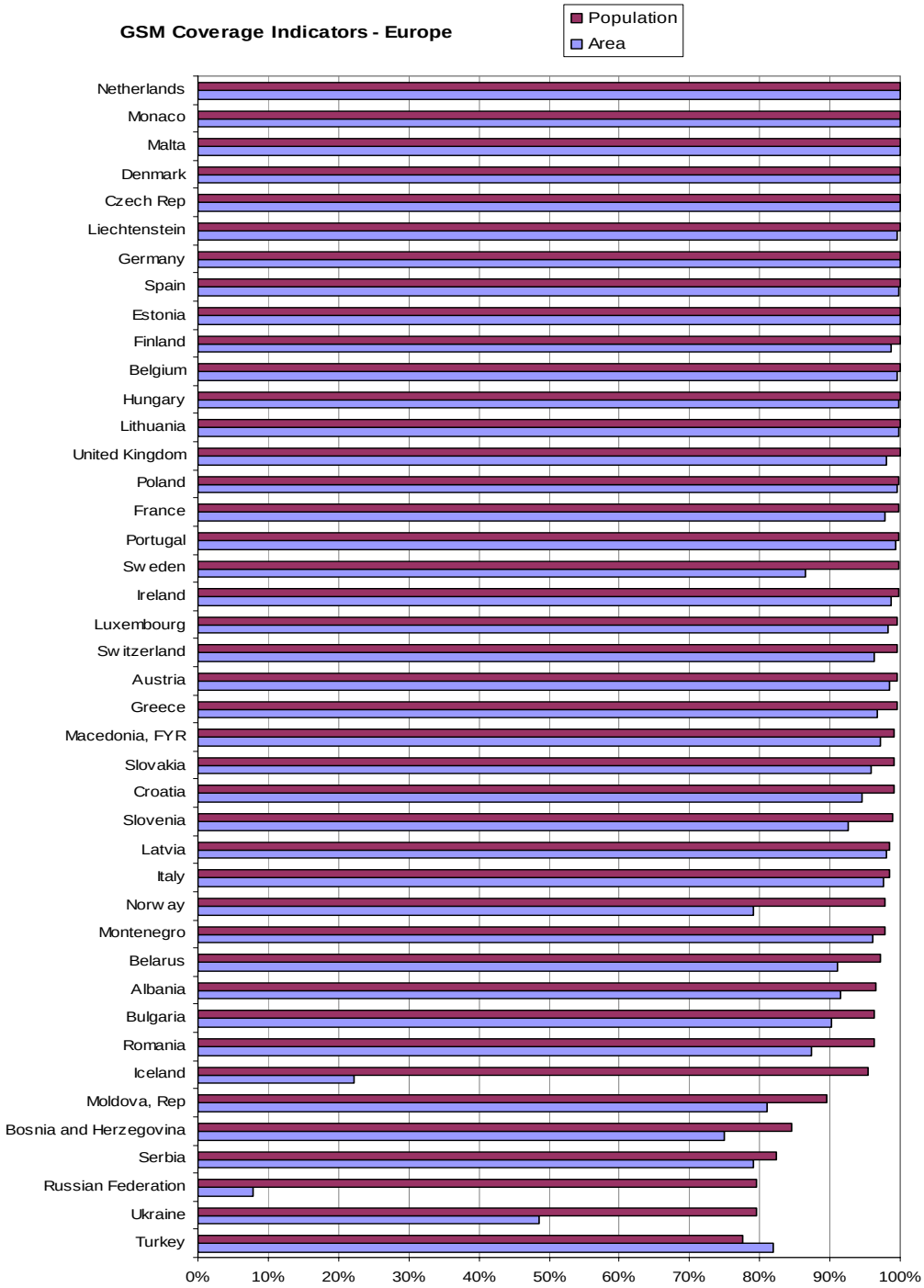
[14] Source: Center for International Earth Science Information Network (CIESIN), Columbia University; International Food Policy Research Institute (IFPRI); The World Bank; and Centro Internacional de Agricultura Tropical (CIAT), 2004. Global Rural-Urban Mapping Project (GRUMP), Alpha Version: Population Density Grids. Palisades, NY: Socioeconomic Data & Applications Center (SEDAC), Columbia University, at http://sedac.ciesin.columbia.edu/gpw. (May 2006). The Global Rural-Urban Mapping Project (GRUMP) consists of estimates of human population by 30 arc-second (1km) grid cells and associated datasets. Its purpose is to allow analysis of urban and rural population figures based on a consistent global data set for the number of people per square kilometre. The dataset used was the most recent which has been developed, and was published in November 2005.

[15] The model output depends on GSM operators' own coverage data inputs to the GSMA.

2.2 European & other high-end benchmarks

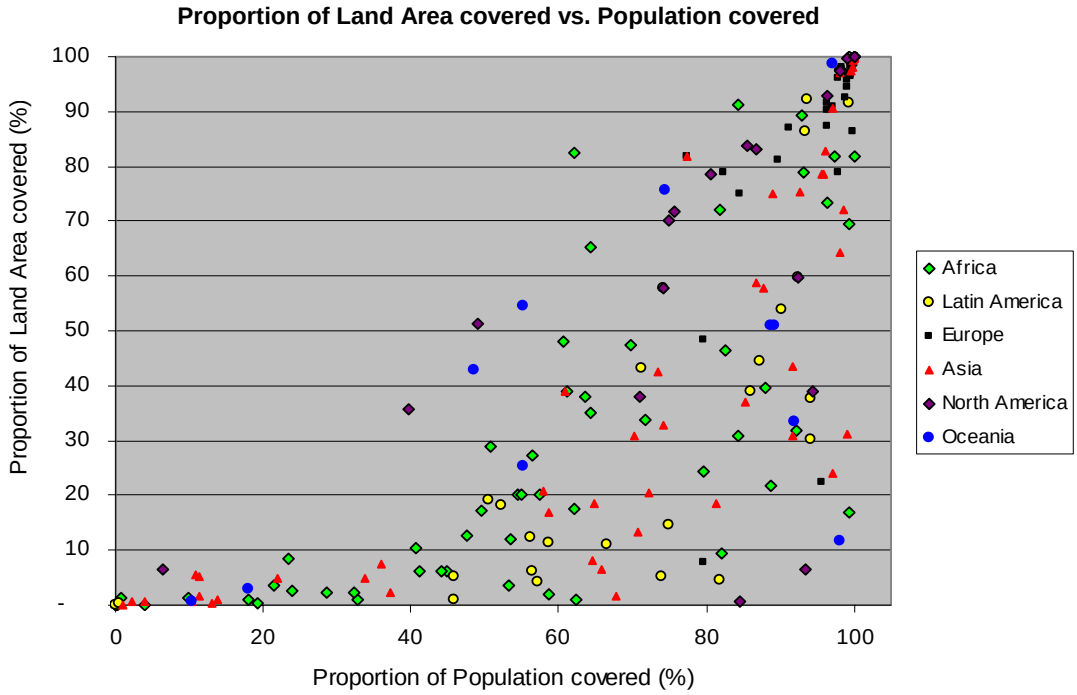
The following chart shows the European benchmarks for population and geographic coverage. All countries in the region, except Turkey (currently at 77%), have achieved more than 80% population coverage. A total of 38 countries in the European region have achieved greater than 95% population coverage. The USA has achieved 94% population coverage and Canada 93%. Australia has achieved 98% population coverage with New Zealand at 93%.

It is important to note that the USA, Canada and Australia are amongst the very few OECD countries to require a Universal Service Fund (USF). Almost all leading European countries have concluded that since UA and US have essentially been achieved commercially, and since even the imposition of US obligations (USOs) has only marginal associated costs in the advanced market context, the establishment of a USF is not necessary.



2.3 World benchmarks

The following diagram shows population coverage and geographic coverage together for all countries in the world. In countries with uneven and very sparsely populated areas, population coverage can exceed geographical area coverage by many times. In Europe, where countries have achieved virtual universal coverage, the ratios are typically 1:1. South Africa has achieved 1.2:1. Most ratios are less than 5:1, even in very unevenly populated countries.



2.4 Ranking the country sample

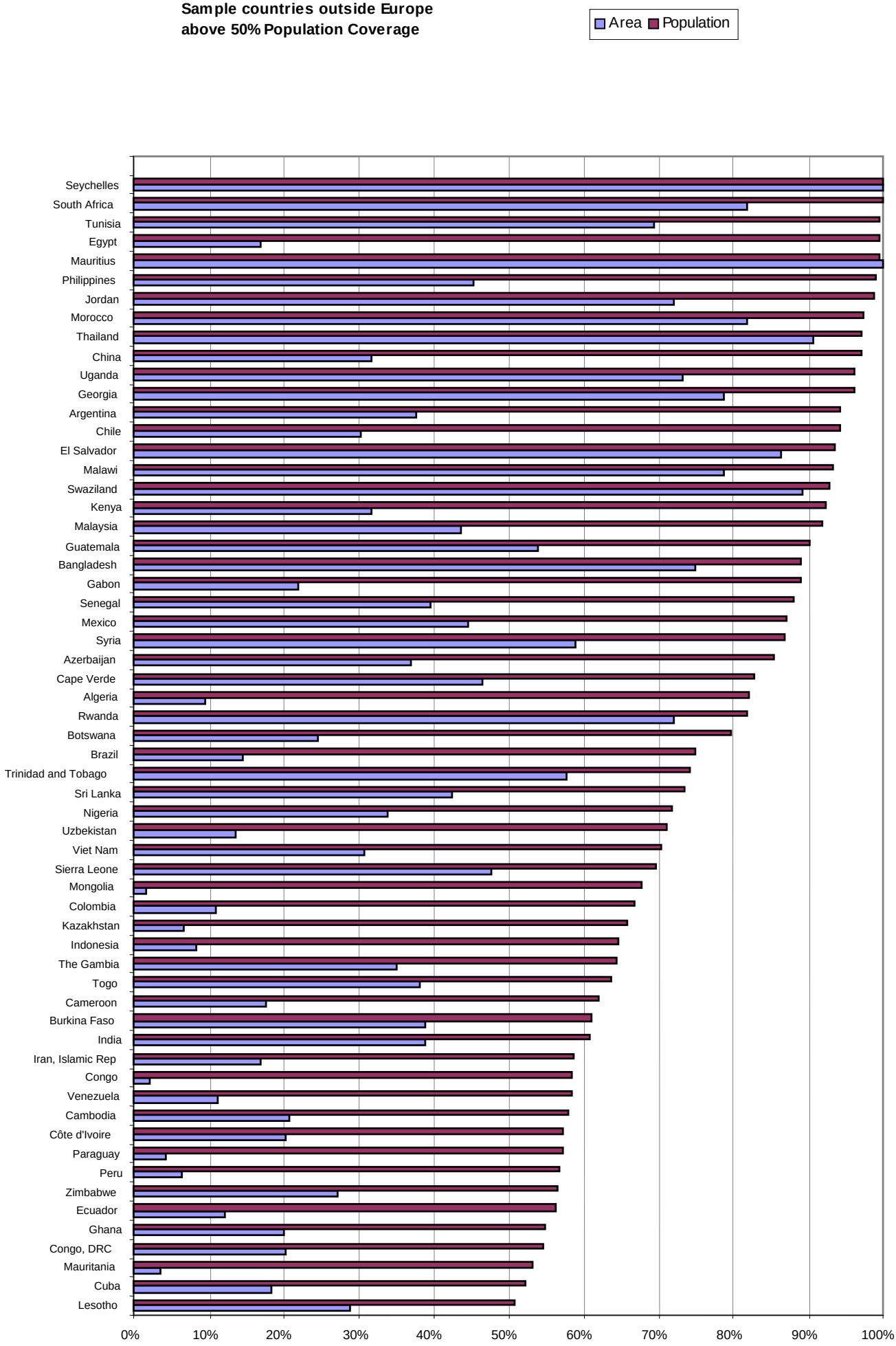
The sample of 92 emerging market and developing countries represents a combination of 75 countries, for which the ITU published a summary of UA and US policy and USF funding in 2005, and all countries included in the GSMA 2006 study on taxation[16]. According to the reported coverage data of the 92 countries, approximately two-thirds (60 countries) have achieved better than 50% population coverage. A total of 36 countries have achieved better than 70% population coverage and 30 countries better than 80%.

Amongst the highest population coverage countries all regions of the world and a wide range of country types and per-capita incomes are represented. However, there are significant variations in penetration across these countries. For example, Uganda, Malawi, Rwanda, Sierra Leone and Uzbekistan have penetrations below 10% of inhabitants, though they have more than 70% of population under GSM coverage. Geography and high population density play an important role in the population coverage. The factors that explain differences in penetration are discussed in Chapter 3.

In several cases, the level of population coverage may be under represented as coverage data may report may lag actual coverage. Also, operators submit coverage data for "strong" signal coverage. If "variable" quality coverage were also reported, a significant increase in the coverage would be noted. The population and geographic figures are therefore conservative.

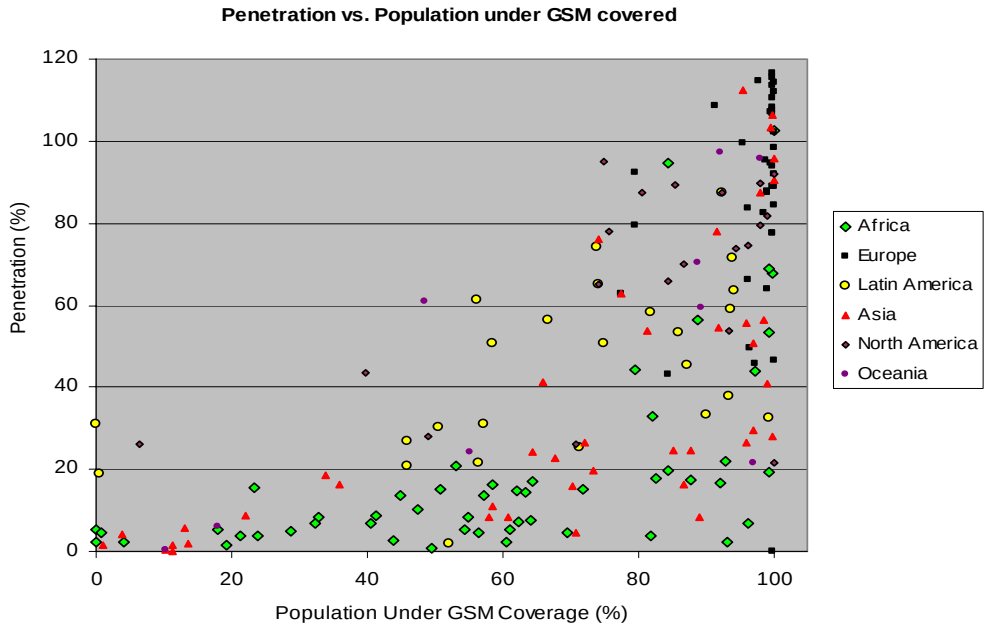
[16] "Tax and the Digital Divide", GSM Association, September 2005

Sample countries outside Europe above 50% Population Coverage

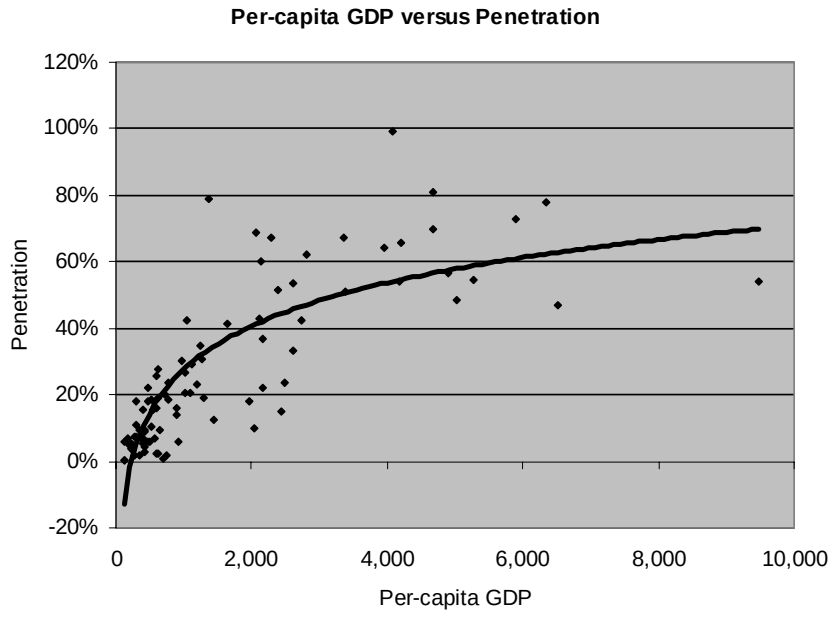


2.5 Relating penetration to population coverage

The following diagram tracks market penetration against population coverage. It shows the degree to which African and Asian countries and those in the Americas make up the vast majority of countries with *both l*ow penetration *and* low percentage of population currently under GSM signal coverage.



The clearest correlation that explains penetration is, of course, per-capita income, as shown in the following diagram for the 92 sample countries. Penetration depth depends on matching tariff options to customer affordability, so long as operators are able to maintain their costs at commercially sustainable levels in the service area in question. In this regard, there is interplay of geographic, commercial and policy factors that explain the wide variations that may also exist in country performance even when their per-capita incomes may be similar. Both geography and policy influence operators' total cost of ownership and their ability to maintain commercially viable margins.

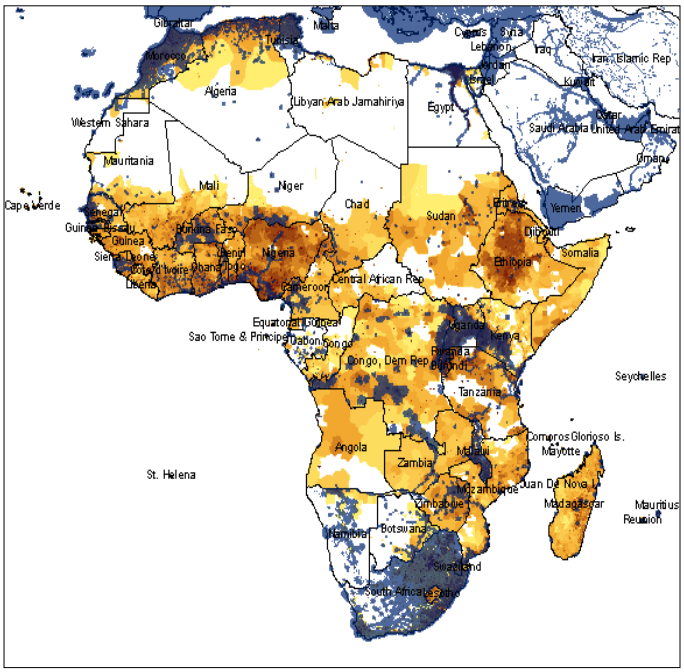


2.6 Population coverage versus penetration by region

The following subsections provide a detailed summary of the population and geographical coverage and penetration benchmarks.

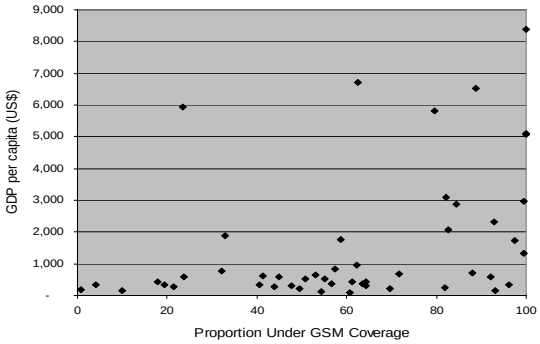
2.6.1 Africa

The growth rate is the fastest in the world and already contains some very significant success stories. Amongst the 43 African countries in the sample, 10 have achieved GSM coverage greater than 90% of population and a further 8 have coverage of 70% or greater.



Approximately half of African countries face a great challenge to bring greater geographical and population coverage to markets where penetration and affordability are low. These are generally low income countries, mostly with large geographical areas or topographical barriers and weak transportation and electricity supply infrastructures, which contribute to high operator costs.

Per-cap GDP vs. Population coverage - Africa

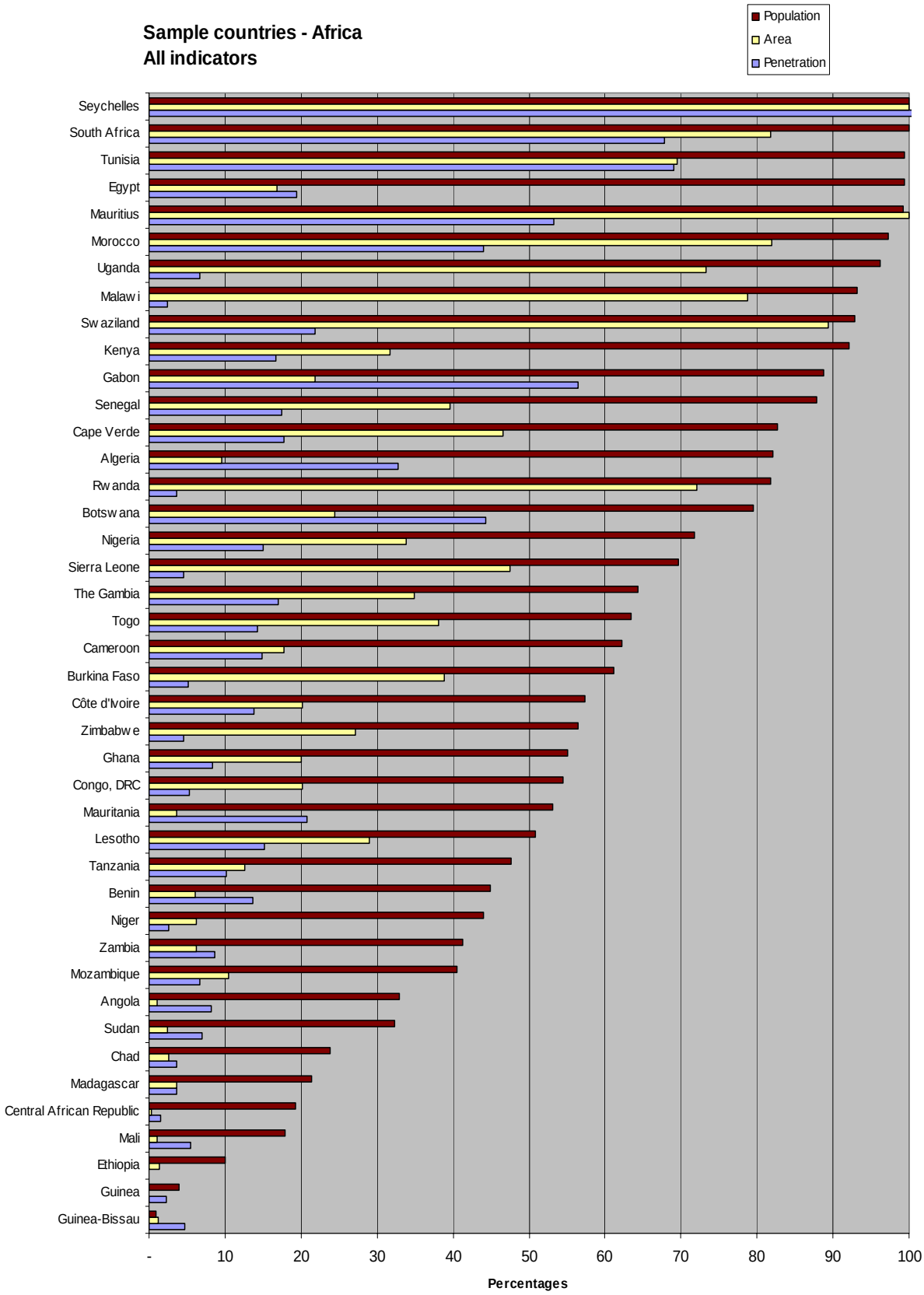


Close analysis of the per-capita GDP vs. population coverage diagram indicates that 8 of the 18 countries which have achieved better than 70% population coverage have per-capita incomes less than US$ 1,000. In several cases, the coverage achievements can be attributed to positive market conditions and enabling policy. However, most are also relatively small geographically or have relatively high population densities[17].

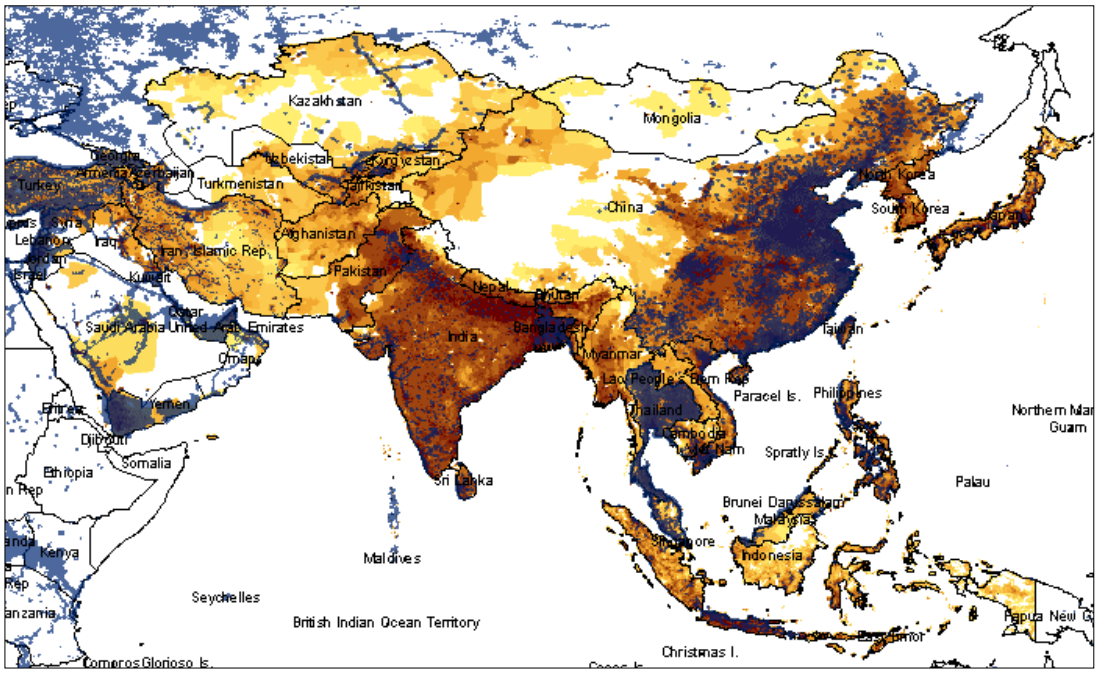
All except one (Angola) of the 24 countries with less than 70% population coverage has per-capita incomes less than US$ 1,000. Half are geographically large, with variable population densities. A combination of low income, large and geographically challenging areas and variable population densities substantially increase the cost of providing telecoms services. Better regulation could substantially increase the industry's performance. A recent GSMA study estimated that US$5 billion more would have been invested in sub-Saharan Africa if regulation was more predictable and fairly balanced[18].

All of the African countries in the sample are presented in order of their population coverage in the following bar chart.

[17] While several of these countries do have sparsely populated areas – e.g. Nigeria, Kenya and Uganda – the percentage of population inhabiting these areas is typically less than 5-10% of total.
[18] "Regulation and the Digital Divide", a GSM Association study www.gsmworld.com/regulation


Sample countries - Africa
All indicators
Population
Area
Penetration
Seychelles
South Africa
Tunisia
Egypt
Mauritius
Morocco
Uganda
Malawi
Swaziland
Kenya
Gabon
Senegal
Cape Verde
Algeria
Rwanda
Botswana
Nigeria
Sierra Leone
The Gambia
Togo
Cameroon
Burkina Faso
Côte d'Ivoire
Zimbabwe
Ghana
Congo, DRC
Mauritania
Lesotho
Tanzania
Benin
Niger
Zambia
Mozambique
Angola
Sudan
Chad
Madagascar
Central African Republic
Mali
Ethiopia
Guinea
Guinea-Bissau
-
10
20
30
40
50
60
70
80
90
100
Percentages

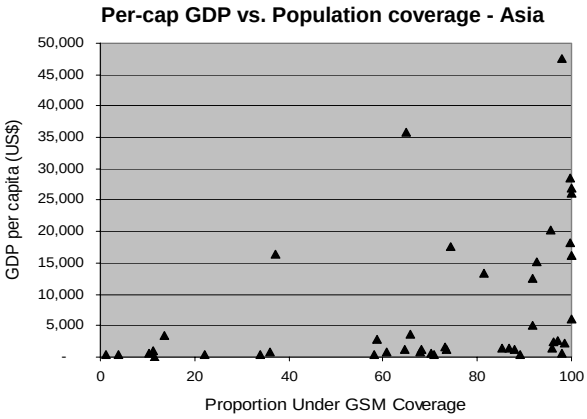
2.6.2 Asia: including the Middle East, Central Asia and Asia-Pacific

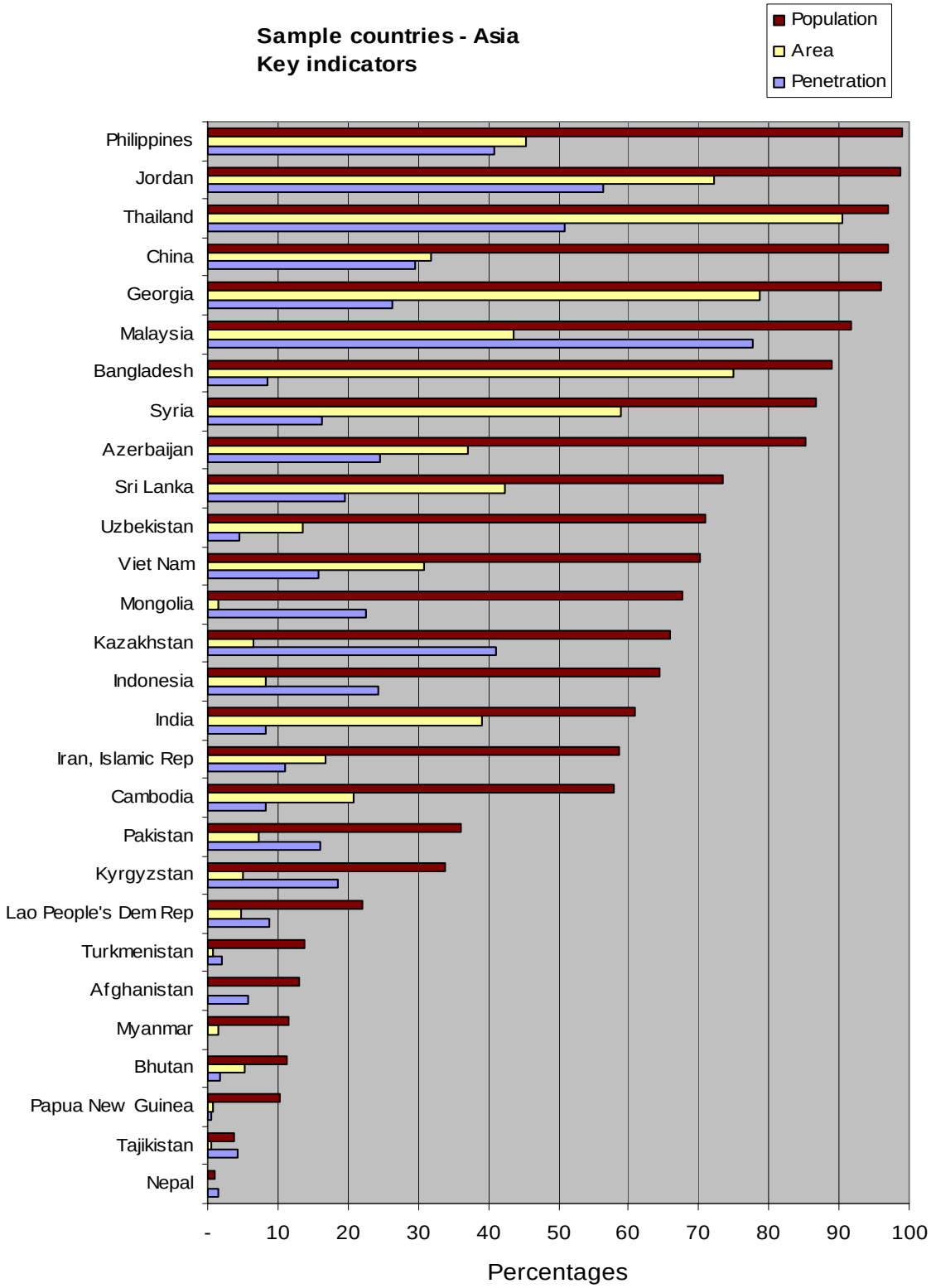


The Asian countries in the sample contain three distinct groups:

- 9 countries, with widely differing geographical, demographic and economic circumstances, which have achieved better than 80% population coverage. These include Philippines, Thailand, Malaysia and China in the Asia-Pacific Region, Bangladesh, Jordan and Syria.
- 9 countries also with widely differing characteristics that have achieved approximately 60-70% population coverage. These include India, which has surged from 30% to 61% over the last twelve months, Sri Lanka, Iran, Indonesia, Kazakhstan and Mongolia; and
- 10 countries that have achieved less than 40% population coverage, though at least one of these (Pakistan) is expanding rapidly.

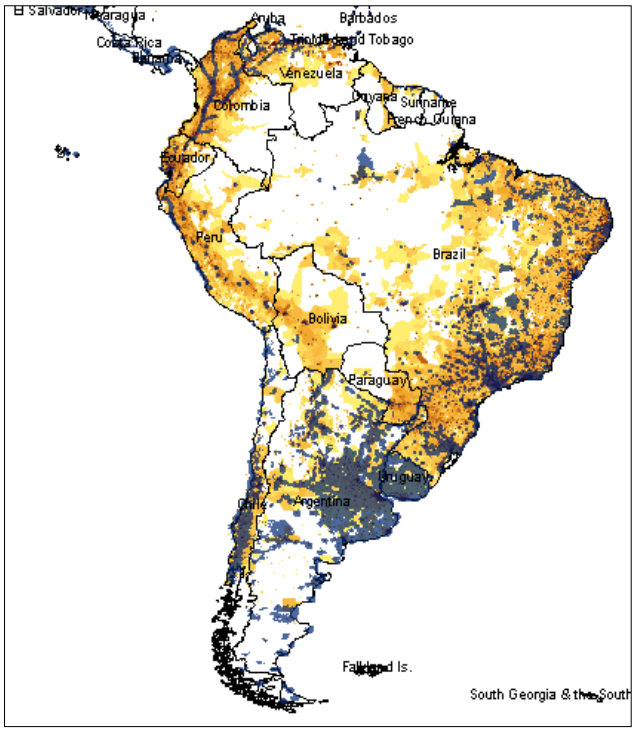
Some countries, even with relatively low income and challenging geography, have been able to show the way forward and can be taken as examples for others to follow. Asia is notable for having a relatively large number of countries with per-capita incomes around or below US$ 1,000 that have achieved high levels of population coverage. These include Philippines and Bangladesh above 90% population coverage and a total of 13 low-income countries with better than 70% population coverage.



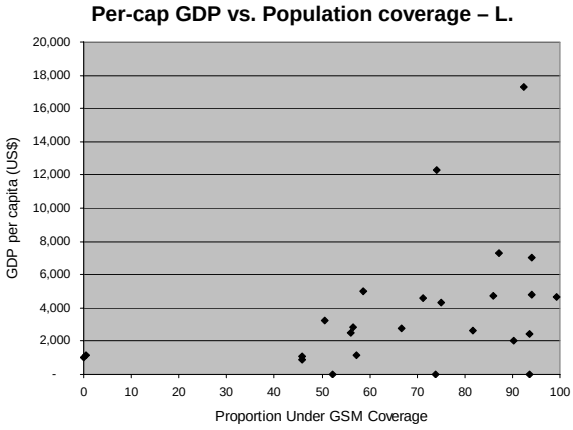

Sample countries - Asia
Key indicators
Population
Area
Penetration
Philippines
Jordan
Thailand
China
Georgia
Malaysia
Bangladesh
Syria
Azerbaijan
Sri Lanka
Uzbekistan
Viet Nam
Mongolia
Kazakhstan
Indonesia
India
Iran, Islamic Rep
Cambodia
Pakistan
Kyrgyzstan
Lao People's Dem Rep
Turkmenistan
Afghanistan
Myanmar
Bhutan
Papua New Guinea
Tajikistan
Nepal
-
10
20
30
40
50
60
70
80
90
100
Percentages

2.6.3 Latin America

The South American continent is a challenging environment for communications. Of the 18 Latin American countries studied, 8 have achieved 90% population coverage, though five (Mexico, Puerto Rico, El Salvador, Panama and Guatemala) are in central and North America or the Caribbean. Only three (Uruguay, Chile and Argentina) are in South America.



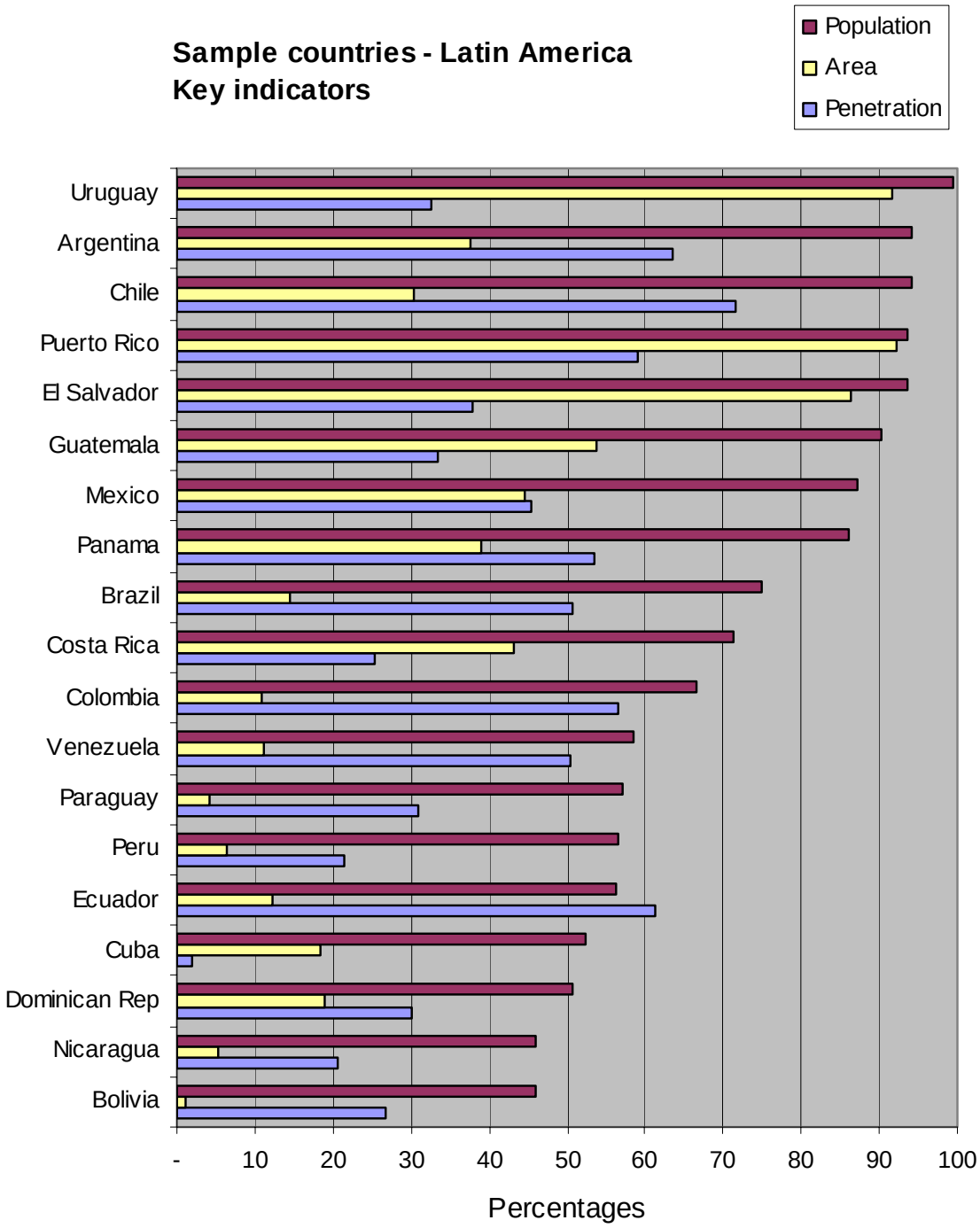
All except two Latin American countries studied (Nicaragua and Bolivia) have achieved greater than 50% population coverage. However, large size and challenging geography limits *area coverage* to well less than half in all cases except for four relatively small countries, Uruguay, Guatemala, Puerto Rico and El Salvador. Ten of the countries have less than 20% area coverage, hence achieving good rural telecom coverage is challenging in these countries.



Many Latin American countries were also late adopters of the GSM standard and operate with only the GSM 1800 frequency band, which makes geographic reach relatively more expansive than the GSM 900 band that has a higher cell site radius.

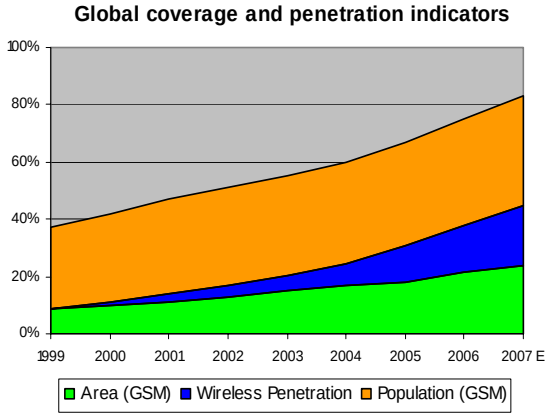
Although some countries have low penetration, the average level of penetration is higher than the Asian or African sample countries because of a) higher average per-capita income and b) higher level of urbanisation that allows operators to reach a higher population.

Latin America has had the most experience of universal access funding. Funds have been established and subsidy competitions held in Chile, Peru, Colombia, Guatemala, Bolivia, Nicaragua and El Salvador, and are in process of being established in Venezuela, Paraguay and Ecuador. Long term plans for funds in Mexico and Brazil have never come to fruition. In almost all cases, the operational funds have been used for fixed line public payphone services, though it is now intended to include mobile network expansion in several programs.

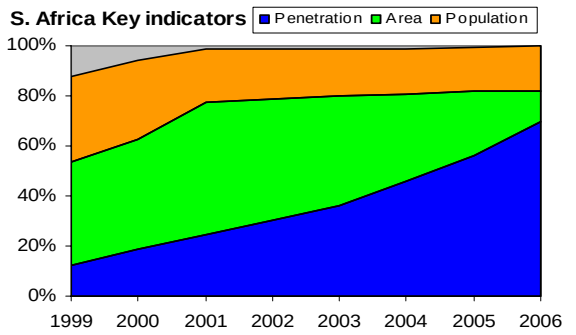

Sample countries - Latin America
Key indicators
Population
Area
Penetration
Uruguay
Argentina
Chile
Puerto Rico
El Salvador
Guatemala
Mexico
Panama
Brazil
Costa Rica
Colombia
Venezuela
Paraguay
Peru
Ecuador
Cuba
Dominican Rep
Nicaragua
Bolivia
-
10
20
30
40
50
60
70
80
90
100
Percentages

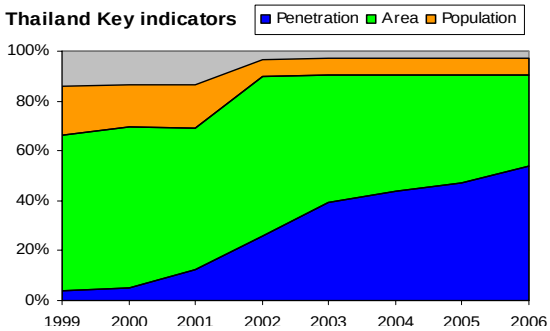
2.7 Rates of change

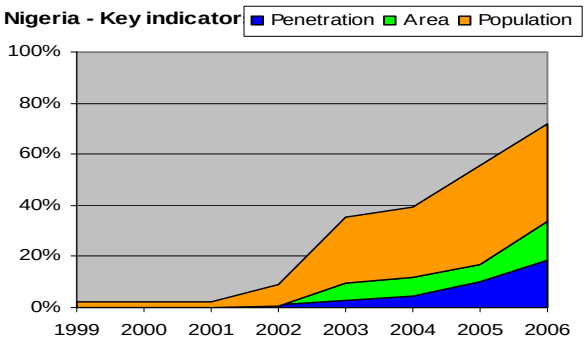
Mobile penetration in the developing world has grown at an average compound rate of 65% per annum over the last five years. Population coverage has also grown rapidly. Total world GSM coverage has expanded from below 40% of population in 1999 to 80%[19] in 2006. We expect 90% population coverage to be reached by 2010.

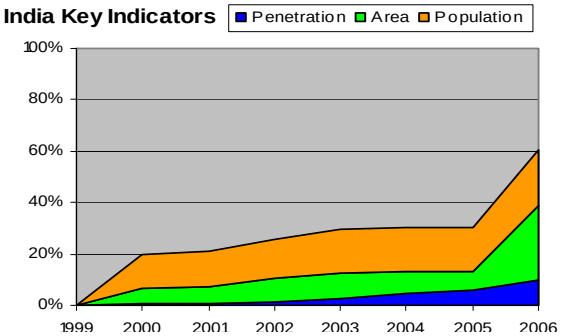


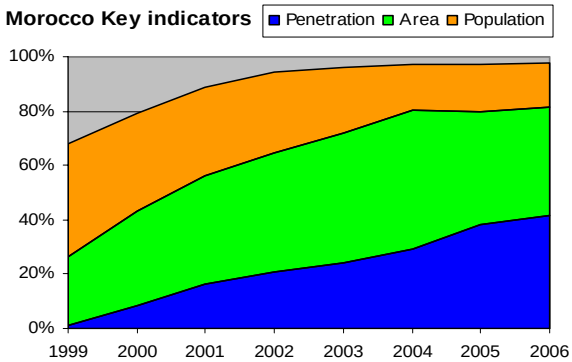
Changes vary widely from country to country. The following graphs give a sample, from the subset of 12 profiled countries. The more developed countries generally achieved high population coverage by year 2002. The early expansion typically became a platform for public access as described in Section 1.4, but they also saw steady penetration growth with increasing competitive pressure and price reductions. Sometimes a "growth spurt" occurred due to an event such as new competition.

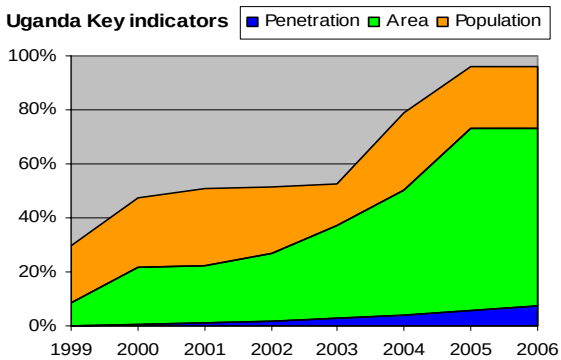








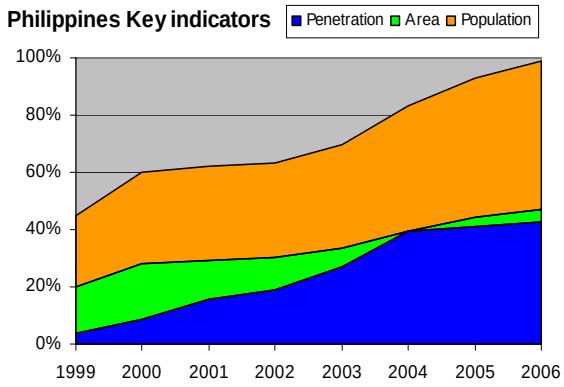


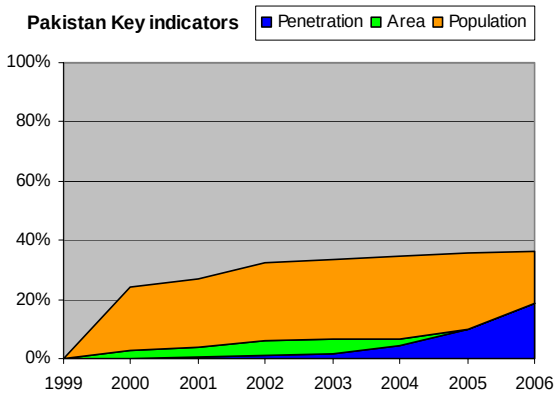


[19] The Graph uses the figures calculated from the GIS model for GSMN operators, which are conservative due to late reporting by many operators and because fringe "variable signal strength" areas are often not reported.

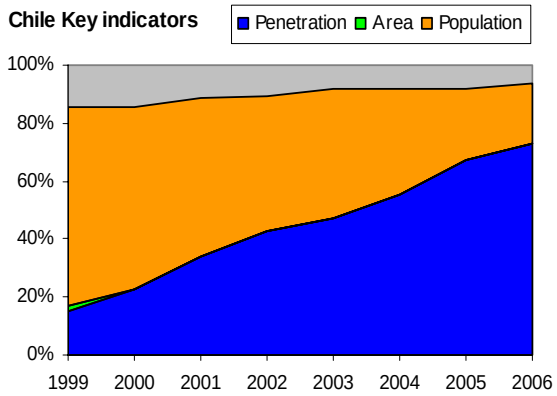
The lower income countries have generally seen their growth more recently, in some cases due to competition or other market changes (described in Chapter 3), or because of a late start (e.g. Nigeria's first GSM licences were awarded only in late 2001).

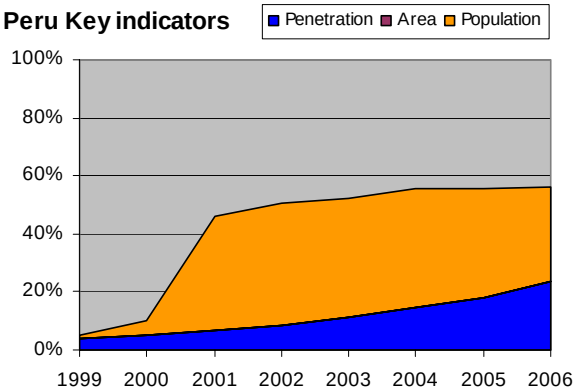
Operators in Philippines, a relatively low income country, made steady progress in penetration following their early expansion, then coverage was extended to virtually the whole country in a second growth phase which commenced in 2003. Progress has been made with relatively low ARPU levels, combined with aggressive territorial expansion. Another country now making rapid progress in penetration despite low income is Pakistan[20].

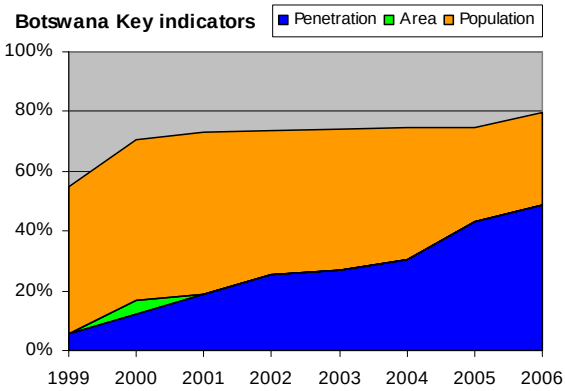


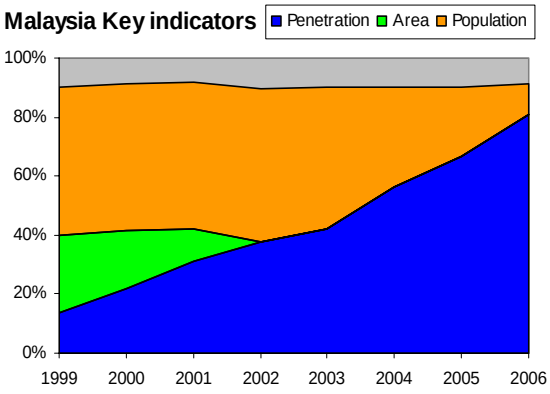


Four countries with middle to high incomes but challenging geography (Chile, Peru, Malaysia and Botswana) have made steady progress with penetration within the limited *geographical* areas that hold most of the population and which they are realistically able to cover.









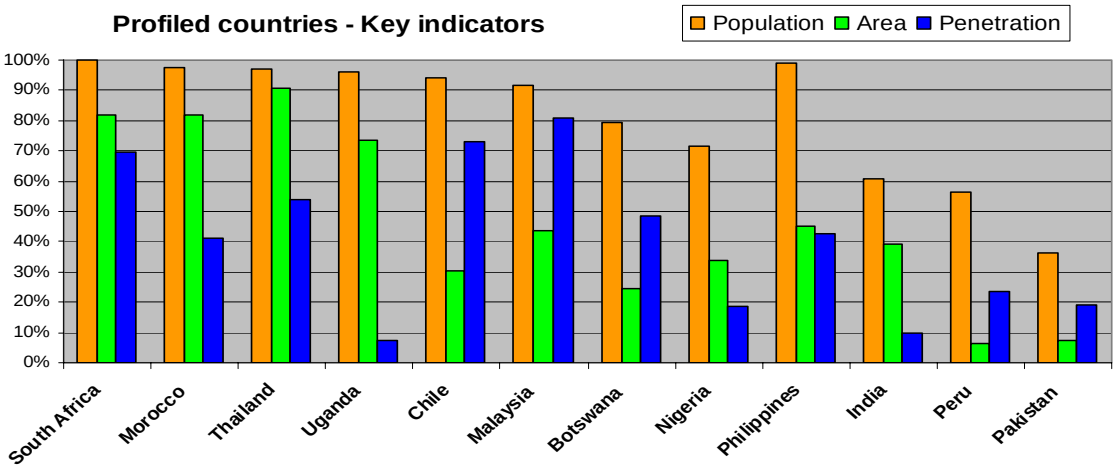
[20] While some operators, notably in India, have reported a major growth spurt from 30% to 61% over the past year, it appears however that the Pakistani operators have not updated their reported coverage data for the last 2-3 years, to reflect the improved population coverage most likely achieved to date.

3 Country examples and profile analysis

12 countries, all of which have universal access policies and USFs in existence or planned, have been profiled. The primary objective of the profiles is to outline and comment on what appear to have been the key influencing factors to explain each country's performance. This section draws out the key findings from the country profile analysis.

3.1 Overview

The documented population coverage of the profiled countries in Q2 2006 ranges from over 99% in South Africa down to the 38% reported for Pakistan. Current penetration levels range from 81% in Malaysia down to 7% in Uganda. There is also a wide range in *combinations* between population coverage and penetration, which can only be explained by geographic, economic and/or policy and regulatory differences.



Each country profile in the Annex provides the following data:

- Population density map;
- GSM coverage map, Q1 2006;
- Recent 6 year history for GSM population and geographic area coverage, and market penetration;
- ARPU affordability curve, based on the country's income distribution (Gini Curve);
- Universal Service Fund graphic showing % operator levy and years in operation.

Where possible, the profiles comment on how each country's operators and policy makers are addressing these issues and the role and relevance of special universal service funding.

3.2 Summary and themes

3.2.1 High level comparison

The most readily comparable statistic is market penetration versus per-capita income. The graph below represents this relationship for the 12 profiled countries.

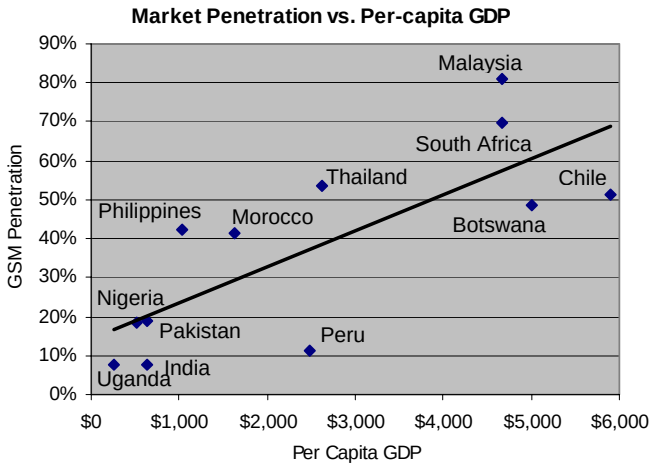
3.2.2 Observations and lessons learned

- ***Most countries above a per-capita income of US$ 1,000 have achieved relatively high individual and household penetration***

  Affordability is not a barrier to achieving high penetration at the minimum available access prices, in all but the lowest income countries.

- ***Low ARPUs are not an insurmountable barrier for operators***

  Evidence indicates that companies operating in a low ARPU environment are often profitable. For example, Philippine operators have some of the lowest ARPUs and highest reported EBITDA's in the world, and Indian operators' EBITDAs have increased significantly over the last two years, while ARPUs have reduced. An analysis of 61 operators in the country sample, confirms this as shown below[21].



  Philippine operators have marketed their services innovatively with products such as micro-refills (less than US$ 1.00), e-banking and related services. They have very low tariffs for low-usage customers to allow them to stay connected for less than US$ 2.00 per month. The operators have also reduced their own distribution and other internal costs through measures such as "e-Load" (electronic prepaid top-up). A recent benchmarking study of Indian mobile operators has also shown increasing EBITDA levels due to economies of scale and cost-cutting measures over the last 3 years, as ARPU levels have decreased[22].

- ***Competition between multiple operators results in more rapid growth***

  Almost all of the high achievement countries have three or more GSM operators. In most cases, where transition from slow to rapid growth in population coverage been observed, an increase in the number of operators (to more than two) is partly responsible. Policy makers need to be transparent and explicit in the initial licence(s), so that market conditions are not changed without warning.

- ***USFs have little impact on increasing UA and US by mobile operators***

  Some funds, such as those in India and Malaysia have either excluded mobile operators from participating fund disbursement by mandating fixed solutions, despite requiring USF contributions from the mobile industry.

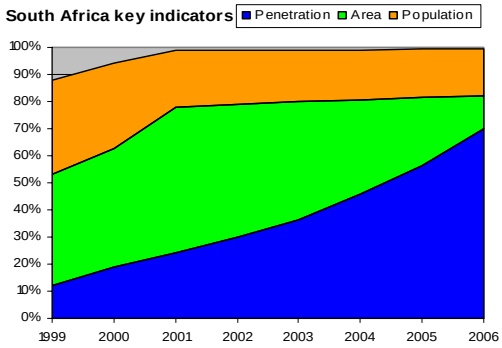
  Uganda, however, is one of the few countries where the USF had some impact. The two main operators declared which sub-counties they could or would not serve, thus relinquishing their exclusivity rights in those areas, thus the operators cooperated in formulating sector policy. A demand study of rural areas that make up 88% of the population was commissioned by the regulator and shared with the operators.

  Tenders were then drawn up for the sub-counties that the operators would not be served. The tenders would include subsidies from the USF. The winning bid would call for the lowest subsidy. The tenders were won by MTN, which began to roll out its village phone in the unserved areas.

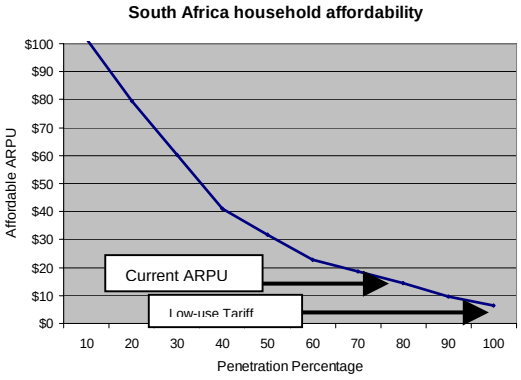
[21] Using Q4/2006 EBITDA and ARPU data reported to the GSMA (Wireless Intelligence Database)
[22] "Indian GSM Cellular Benchmarking Study 2005", PriceWaterHouseCoopers, Cellular Operators Association of India (COAI), April 2006

3.3 Uganda compared with South Africa

These countries are compared because both countries, with widely differing economies, show the impact of liberalisation, competition and policy leadership in the mobile sector and both have achieved high population and geographic coverage. Penetration, however, differs greatly.



South Africa's mobile market had competition since the mid 1990's. Encouraged by an aggressive government policy that required mobile operators to meet roll-out targets and to provide public access telephones at concessionary prices, the operators were reaching over 80% of the population and 50% of land area before 1999.

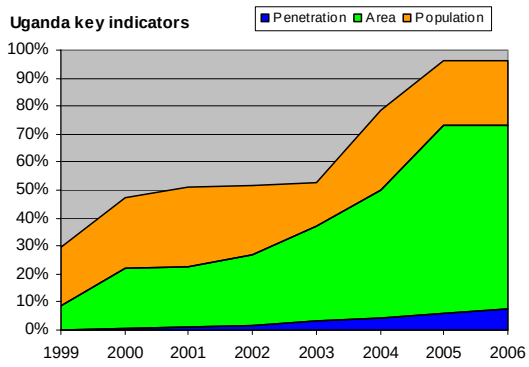


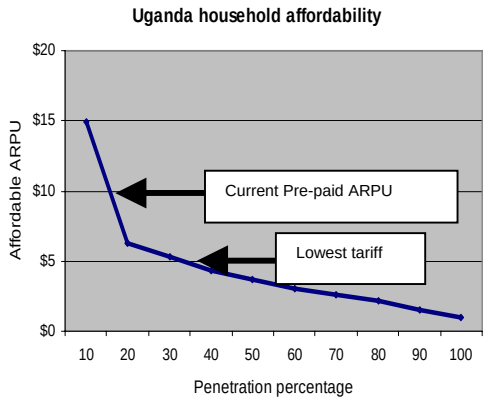
In South Africa, high penetration has been achieved through the commercial market structure. Despite being focused on low teledesnity areas, the USF, a levy of 0.5% on operator revenues, has had only limited impact.

South Africa's geography and population distribution are conducive to communications. Growth in penetration was moderate but steady in the early years but has recently accelerated to 70% of inhabitants by mid 2006. Despite having many low-income people, South Africa's per capita income is high by African standards and recent political and economic developments have markedly reduced income disparity and increased affordability. Low tax on mobile consumers has assisted the operators achieve coverage and penetration.

Uganda's story illustrates the immediate impact of competition. The second national operator, using mainly GSM technology, received its licence in 1998. Prior to this, the country had a nationalised incumbent fixed line operator and one GSM mobile operator with only limited coverage. Rapid roll-out of the new entrant led to 50% population coverage within less than two years. The granting of a third mobile licence to the privatised incumbent, and publication of a strong universal access policy integrated with a USF strategy in 2002 led to a second stage of rapid expansion from 2003 to 2005.

The operators have reached 96% of the population today. By late 2006, the distribution of competitive USF subsidies to a GSM operator to cover the highest cost and least populated regions will result in near 100% coverage. Uganda's USF levies 1% of operators gross revenues. With the support of the World Bank, the USF has committed to distributing more on subsidies for voice and high speed Internet services than it has collected to date.

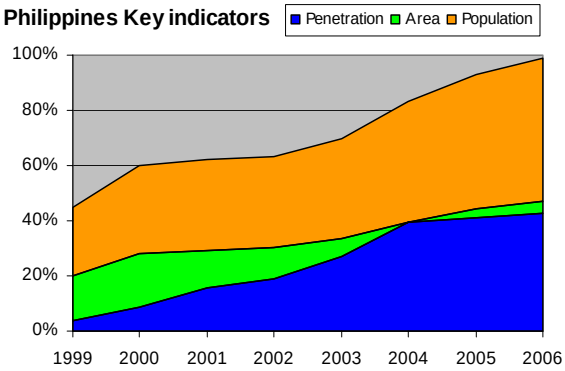




However, despite wide coverage, the country has only achieved low market penetration of around 6%. The reason is largely economic. With Uganda's low per-capita income, household affordability is lower than US$ 10 per month even in the second income decile when penetration would be 20% of households. Pre-paid ARPUs are currently around US$ 10 and the lowest connection tariff available is still around US$ 5 per month.

Uganda's market problems are compounded by the fact that the country has a punitive tax regime affecting the communications sector, contributing 30% to the cost of mobile ownership, which surely impacts significantly Uganda's level of affordability and achievable market penetration at the country's level of income.

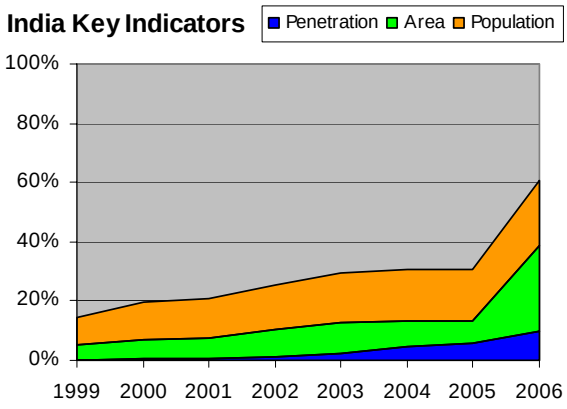
3.4 India compared with Philippines

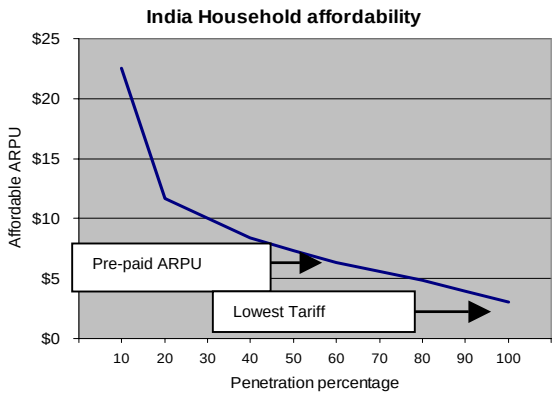


India and the Philippines have per-capita incomes (2004) of US$ 641 and US$ 1,041 respectively, but very different population coverage and penetration rates. The two countries have also been impacted in very different ways by government policy.

As the key indicators show, the Philippines had achieved 60% population coverage by 2000, as the government's "carrot and stick" licensing regime of pairing Metro Manila licenses with regional territories provided incentive for the operators to expand geographically at the outset. The Philippines has almost 100% population coverage today. In contrast, India has achieved only 60% population coverage.

The Philippines population is 62% urbanised, compared to 29% for India. In Philippines, almost the entire population has been served while covering only 50% of the geographical territory, while India has reached just 60% population coverage with area coverage of 40% and is therefore more challenging geographically. Nevertheless, the Philippines' island landscape is not necessarily easily propagated.





In terms of penetration, India has achieved 11% while penetration in the Philippines is 40%. Although geography and population distribution has an impact on penetration, other contributing factors to the different development of the mobile sectors are major variation in the policy and regulatory environment. In the Philippines, the mobile sector was liberalised early, starting with two operators launched in 1994, and the third and fourth operators in 1999 and 2003. Overall, the country has had a conducive environment for the private sector and

the mobile industry, which commenced with an innovative territorial licensing regime. Mobile consumer taxation has been low.

By contrast, while the first Indian cellular operators were licensed in 1991, they faced several hurdles, some of which were the result of over-zealous bidding during the initial licence competition, while others were related to regulation. Excessively high licence fees were demanded, and frequency allocation was slow. Further, a suitable interconnect framework was lacking as the government owned incumbent operator was also the policy-maker and regulator. Industry development stalled.

In 1999, the National Telecom Policy changed the licensing regime to an entry fee plus revenue share model. It also allowed more competition into mobile services, with the third and fourth cellular operators being licensed in 1999 and 2001 respectively.

But progress was threatened again by the wireless local loop (WLL) limited mobility issue. In 2001, the government permitted fixed operators to use their CDMA spectrum that was given for fixed wireless access, to offer 'limited' mobility (within a city) service under their existing licenses for no extra fee. As these limited mobility operators had the advantage of free entry into mobility, better interconnect terms and a calling party pays system, the GSM operators challenged this service. By end 2003, the dispute was finally resolved by the government amending policy to introduce a Unified Access Licensing (UAS) regime, which allowed the fixed operators to legitimately migrate to UAS and to offer full mobility. UAS resulted in 2-3 fixed operators in every service area migrating to full mobility, thus increasing the competitive strength to 6-7 mobile operators in each service area.

Today, while improvements have been made, Indian mobile operators are still burdened with levies and duties which are among the highest in the world, including a 12.24% service tax, license fees between 5-10% of Adjusted Gross Revenues (AGR) which includes a 5% USO contribution and spectrum charges amounting to a further 6% of AGR, in addition to access deficit payments made to the fixed operators @1.5% of AGR[23]. The majority of the USOF funds are accumulating with the government and not being spent on the intended purpose. By overcharging, the USOF deprives the industry of crucial investment for network roll-out. Further, the Indian USOF to date has explicitly excluded mobile services from competing for subsidies, even though they must contribute.

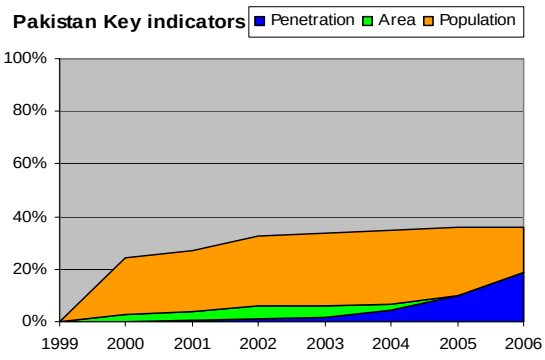
The USOF now finally plans to invest U$$ 1 billion back into the mobile industry through the financing of up to 10,000 towers in rural areas, complete with back-up power supply. It is intended that operators will share the passive infrastructure and receive a one time subsidy each from the government for the same. However, it still remains to be seen whether the USOF's approach will be market oriented and enable operators to cut their costs while expanding in an otherwise commercially sustainable manner, or whether the finance could have been better used in a less directed fashion.

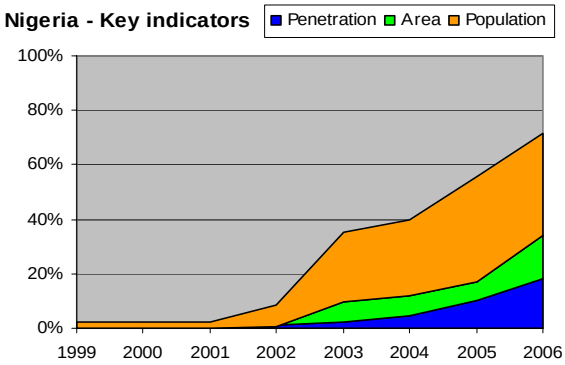
Indian user affordability is high. Some operators offer minimum pre-paid tariffs allowing users to stay connected below $2.00 per month and India also has one of the lowest average per minute call charge rates in the world. A recent benchmarking study on Indian mobile operators[24] also demonstrated that even with lowering ARPUs (currently around US$6.00), Indian operators have emulated their Philippine counterparts by reducing costs and increasing average EBITDA to 44%. Although cost control will be an issue with further geographic expansion, Indian mobile operators could doubtless already have driven network expansion even further, if fewer levies were imposed on them.

[23]It may be noted that ADC was first applied on a call by call basis and was as high as 10% of telecom sector revenues. In March 2006, the levy was slashed down to 1.5% and applied /imposed as a percentage revenue share.
[24] PriceWaterHouseCoopers, 2006

3.5 Nigeria compared with Pakistan

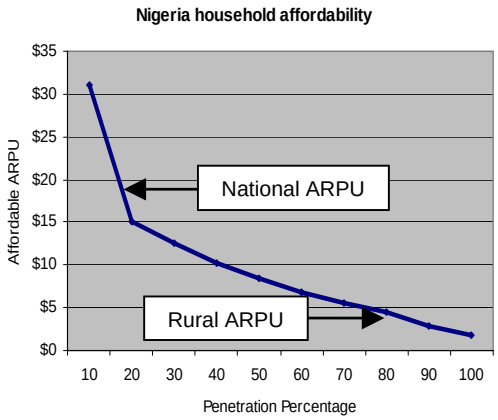
Pakistan and Nigeria are both relatively late starters in terms of GSM growth. The first GSM operators were licensed in Nigeria only in 2001 and Pakistan's operators started to expand their market rapidly in the least few years due to changes in government policy with penetration jumping from 5% to 25% in the last two years. Both countries have multiple national operators – Nigeria has four and Pakistan five. The two countries have similar geographical size and large populations, but significant variations in population density.





Competitive but high cost market: The Nigerian market is a relatively high cost market for operators as they have had to construct their own backbone infrastructure due to the unreliability and high interconnect fees of the fixed incumbent's transmission network. As well, the lack of reliable electricity supply outside the main cities and weak physical infrastructure, combined with security risks, substantially increase capital and operating costs.

To compensate, prices and monthly ARPUs have been high, US$ 60 in 2001 falling to US$ 18 today. Operators are now focusing on rural areas and offering lower priced tariff packages. A recent rural demand study carried out by Intelecon for the regulator, indicated that at least 70% of rural households can afford mobile services at ARPUs of US$ 4. With 23% penetration from just 60% population coverage, operators have achieved over 60% household penetration in the areas of the country that has coverage. The market should be able to double over the next few years as the operators continue to expand geographically.



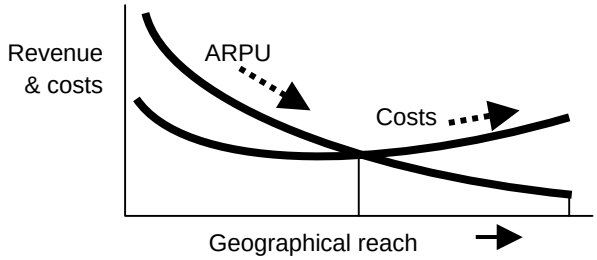
Limited role of USF: While the Nigerian regulator has plans for a USF, operators have already expanded commercially into many areas that were originally targeted by the USF. The regulator has therefore purposefully held back from attempting to subsidise services in areas that operators are reaching commercially. By 2010, the only areas that may require subsidies will be remote, accounting for about 5% of the population. The lesson from Nigeria is that USFs should only be considered once the commercial market is well developed.

The Nigerian experience offers guidance to Pakistan, which has a smaller geographical area, higher population density and higher level of affordability. The Pakistani government, however, has also established a USF that levies 1.5% of operator revenues and has reportedly collected US$ 33 million to date. Learning from the Nigerian experience, the government should postpone the collection of additional USF levies as the mobile networks are advancing quickly. At the appropriate time, the USF focus on subsidising only the most remote and difficult to reach areas. A lower levy of 1% would be sufficient.

4 Mobile operators and the future of UA & US

4.1 Exploring the limits of the market

This section addresses the potential of mobile operators to achieve further progress into rural areas without subsidy. Policy makers and regulators rightly wish to ensure that the benefits of telecoms should extend to regions that are under-served and hard to reach. Policy makers therefore must understand the total cost of ownership so that policies can be geared at facilitating the success and effectiveness of the commercial model.



4.2 Operator's Total Cost of Ownership (TCO)

Even if the total marginal revenue can be improved through deeper coverage, the cost of network expansion and operation in rural and low population density areas rises exponentially. Many rural areas combine low ARPU with higher costs due to high backhaul expenditures and poor infrastructure such as roads and electricity supply.

To maintain EBITDA levels with reduced ARPU, operators have to focus on driving down operation costs.

Specific developments to services in ever lower-spending segments include electronic top-up, particularly geared to the micro-prepaid segment. These result in cost savings across the board, but particularly beneficial in rural areas. For example, one Philippine operator reports that 90% of its whole customer base now top up electronically using its e-Load service. This has enabled the operator to lower related distribution costs, rationalize dealer commissions while expanding the distribution network. Similar trends are taking place in other markets.

Business management costs

- Marketing & sales
  - Branding
  - Advertising
  - Segmentation
  - Subscriber acquisition
- Subscriber management
  - Subscriber retention
  - Billing & charging
- General & administration
  - Corporate overhead & offices
- Interconnect/Roaming
  - Payment to other operators

Network costs

- Network operations
  - Operation & Maintenance
  - Spares
  - Power supply (incl. fuel)
  - Transmission backhaul Opex
  - Site rental
  - Support & training
  - Network performance efficiency technology (AMR, SAIC, etc.)
- Capex / Depreciation
  - base station Equipment
  - Transmission Equipment
  - Other site Equipment – Power Gen
  - Civil Works – Towers, Shelters, A/C

The reduction of network operating costs is particularly critical when building a business case for expansion into rural areas of lower population density. Both capital and operating costs increase if the number of base station sites per population increases and if more transmission hops are required per base stations.

Basic UA may be achievable with a few base stations that have a radius of 35 km and with fixed service points requiring pole-mounted receiving antennas. Achieving US, however, may be considerably more expensive, requiring double the number of base stations for example.

In a survey of GSM operators and leading suppliers carried out for this report (see below), a number of cost reduction and cost limiting measures were identified. These appear to be the primary areas in which operators are seeking to reduce their network costs and make further network expansions into rural areas.

Clearly, no single measure or set of measures is appropriate in all situations. However, operators will focus on reducing TCO where possible on all networks, but some specific measures reduce TCO in increasingly costly environments. The market guides operators, by geographical and population density, by local requirements, and sometimes by the need to standardize system-wide on a limited number of technical solutions to minimise operational and maintenance costs.

Governments and regulators can also play a critical role in promoting cost reduction and commercial network expansion through regulatory and fiscal / tax regimes that encourage operators to minimise costs and increase efficiencies, thus promoting network expansion.

Measure	Impact	Benefit	Capex	Opex
Improved ventilation, cooling and/or heat tolerance of base station electronics	Eliminate or reduce air conditioning requirement, with consequent lower power requirement	Reduce external electric power supply, or Eliminate or reduce requirement for diesel generator and fuel supply, or Enable more economic use of solar panels	 ✓ ✓	✓ ✓
Improved ventilation, cooling and/or heat tolerance of base station electronics, *as well as* smaller size for outside installation	As above	As above	✓	✓
Enhanced radio transmission performance	Improved and balanced "link budget" and longer signal range for "strong" signal coverage	Fewer base station sites, resulting in lower Capex and Opex costs	✓	✓
Enhanced network voice and data carrying technology (e.g. AMR[25])	Improved quality and capacity on existing networks and maximum growth efficiency	Fewer base station sites, and improved revenue versus cost relationship on existing and expansion networks	✓	✓
Enhanced radio & antenna technology to achieve extended range	Larger cell size applicable to and tailored to low density areas	Fewer base station sites in very high cost and low density areas	✓	✓
Enhanced transmission technology to achieve lower interference (e.g. SAIC[26])	Optimum signal processing performance & user capacity with lower transmitter output power	Lower power consumption for equivalent network performance		✓
Smaller base station equipment cabinet size	More portable and easier to install, easier site acquisition	Smaller shelters, more rapid deployment	✓	
Shared antenna configuration	Base stations expanded without the need for additional antennas	Reduced tower space	✓	
Mobile "softswitch" in appropriate regional location	Enables traffic to be switched locally or within a region	Minimising the need for backhaul transmission of all traffic to a central MSU		✓
Advanced pre-paid platform architecture update	More service features, automated support, etc.	Enables wider range of segments to be supported economically		✓
Market responsive site placement	Strong local community relationships	Reduced need for security guards and more rapid deployment		✓
Common backbone and tower infrastructure	Shared sites with common infrastructure has the potential to reduce build-out costs	Reduces the cost of transmission and some base station costs	✓	✓

[25] Adaptive Multi-Rate (AMR) codec technology is an audio data compression scheme optimizing speech and multimedia messaging services over GSM, GPRS, EDGE and W-CDMA networks. AMR supports dynamic adaptation to network conditions, using lower bit rates during network congestion or degradation while preserving audio quality.

[26] Single Antenna Interference Cancellation (SAIC) is a technique used for handset and base station signal enhancement, which reduces the overall interference and results in improved quality and capacity, reduces the required base station transmitter power and thus reduces TCO through improved network performance and power consumption.

5 Technical strategies for broadband

5.1 The trend to Internet

It is recognised that no country's telecoms and information policy can be complete without a broad vision and strategy for achieving access to an advanced broadband infrastructure, providing access to information services on a national scale and regionally balanced basis.

Mobile technology has a clear and seamless evolutionary path leading to broadband capability over the coming years. GPRS and EDGE services are widely available and HSPA, the first evolution of WCDMA, is delivering the full mobile broadband experience for millions of users across the world.

The Uganda UA Program

The UA policy and funding (RCDF) program was designed to cover both rural telephony and Internet and designed to leverage the digital backbones constructed by the two leading operators, Uganda Telecom Limited (UTL) and MTN Uganda. A techno-economic analysis determined that the use of commonly available broadband wireless options, with a coverage radius of 10-15 km, would ensure that Internet services could be provided as an overlay network in virtually all of the district centres, using base station towers in a very economical manner. One-time "smart subsidies" were therefore offered for the installation of Internet POPs and broadband access systems at 32 of the country's 56 district centres. The Internet POPs would ensure that all institutions, schools and businesses within line-of-sight of the district centres' central radio towers would be able to secure high quality Internet access at the same price as if they were located in the capital, Kampala.

The regulator, UCC, also decided that *along with* or *following immediately behind* each Internet POP, one public Internet café per district and at least one "vanguard institution" (e.g. a leading Internet-ready school or college) could be incentivised with "smart subsidies." As well, local training initiatives and regional content development could be supported from the RCDF. These would combine to promote the start-up of the local Internet market on a commercially sustainable basis.

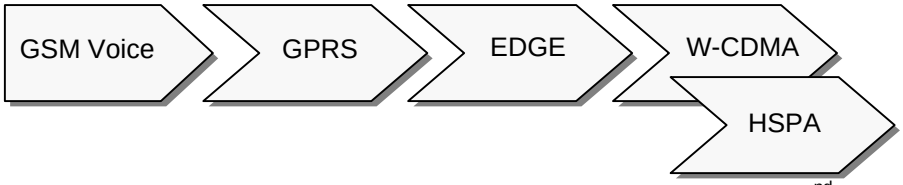
While the RCDF's strategy did not immediately guarantee that Internet service would be implemented ubiquitously, the strategy serves to stimulate the market and also greatly reduces every rural person's distance to the nearest Internet access by the placement of the POPs in each district centre. Rural users are now on the way to being able to access the Internet, at least through public Internet cafés or institutions that are close to them. Moreover, they also benefit from the network access extended to schools, NGOs, MFIs and other rural institutions that serve their interests.

5.2 The mobile path to advanced network services

The path to broadband on mobile mobile networks already provides the capability to deliver Internet service at medium speed today on virtually every existing network, while as many as 70 million subscribers around the world already subscribe to advanced broadband 3rd Generation (3G) services, on more than 122 networks and 55 countries[27]. This evolutionary path also maintains the generic benefits of mobile such as global roaming, seamless billing, network compatibility and huge economies of scale, which place mobile in a strong position to become the bearer of the full range of facilities and services envisaged as universal service.

The path, in simplified fashion, involves three technological steps, namely GPRS (General Packet Radio Service), EDGE (Enhanced Data rates for GSM Evolution) and W-CDMA (Wideband Code Division Multiple Access). The latter, otherwise known as 3GSM, will have various enhancements to deliver ever-increasing data speeds and feature-rich services, the first of which is HSPA (High Speed Packet Access).

[27] Global Mobile Suppliers Association, 6 September 2006



GPRS is a mobile data service which is now available with almost every 2nd Generation (2G) GSM network in the world. Based on Internet Protocols that support a wide range of applications, GPRS has throughput rates ranging up to 40 kbps. This offers a similar access speed to dial-up modems, but with the convenience of being able to connect from anywhere.

EDGE, a further enhancement to GSM networks, provides up to three times the data capacity of GPRS. Using EDGE, operators can handle three times more subscribers than GPRS; triple their data rate per subscriber, and/or add extra capacity to their voice communications.

Using EDGE, operators offer both mobile and fixed Internet service (e.g. to schools, homes and offices) and thus provide services envisaged by many UA policies. As of September 2006, there were 213 GSM/EDGE networks either in place or being deployed in 113 countries[28]. As a key example of developing country deployment, EDGE services are now available to 90% of the Bangladesh's mobile customers.

W-CDMA is the technology that delivers the Universal Mobile TelecomsSystem (UMTS) standard and which meets the full requirements of 3G mobile networks, as defined by the ITU. The 3GSM evolutionary path also has a series of well defined technology enhancements. The first to be realised is HSPA, which is a technology for improving the downlink performance of W-CDMA networks to deliver high speed Internet connections. HSPA, a software upgrade, provides data rates of around 1 Mb/s and peak rates of 14.4Mb/s.

For end-users, HSPA means shorter service response times, faster downloads, and new services. Operators are able to offer advanced services at lower costs, and with increased revenues and profitability. HSPA is the industry baseline for 3G for the full mobile broadband experience. There are currently 119 HSPA networks worldwide[29].

The strength of W-CDMA and HSPA as the emerging global standard for broadband deployment can also be seen in the number of operators that are moving to the standard for broadband needs. The trend is present across a wide range of former non-GSM countries, including Australia, Argentina, Bolivia, Brazil, Canada, Chile, Columbia, Mexico, Peru, Uruguay, Venezuela, to Japan, Korea, Singapore and the US.

5.3 Partnering with Policy Makers in UA Program development

It is clear from the speed with which current developments are taking place that mobile data networks can often solve the last mile problem quickly, reliably and economically. Pilot initiatives undertaken to date have found that there is significant demand for data services from low income consumers in both urban and rural areas.

- There is significant demand for data services from poor, rural consumers, and they are prepared to pay for access to data due to the high opportunity cost that results from a lack of information;
- It is important to offer relevant e-services as well as simple Internet access. The most popular services include job information, e-government, telemedicine, entertainment, news and school/university results[30];

[28] Global Mobile Suppliers Association, 28 August 2006
[29] Ibid.
[30] These findings are also corroborated by recent rural demand studies carried out by Intelecon in Nigeria, Mozambique, Burkina Faso and Mongolia, which discovered particularly that market and educational information is highly demanded.

- Governments and network operators should not treat this as charity. If initiatives are set-up correctly (generally commencing in population centres and localities where local partners are identifiable), projects will grow organically without financial assistance from external donors, delivering a positive social and economic impact at scale.

HSPA and EDGE used for public access in South Africa & Bangladesh

In South Africa, MTN is using HSPA to provide a high-speed connection to a local entrepreneur's payphone shop in the Alexandra township near central Johannesburg - one of the first 'Internet cafes' in the world to use HSPA. People renting time on the computers situated in the booth will be able to access the Internet at speeds of up to 1.8 megabits per second. Nine other township public booth sites are connected to the Internet via an EDGE network, allowing download speeds at about 120 Kbps.

Branded MTN@ccess, the service connects users to recruitment services, email services, universities, government departments and many more useful Web sites. The MTN pilot is scheduled to run for six months and could be a precursor to a much wider rollout of shared Internet access services across South Africa using HSPA and EDGE.

In Bangladesh, Grameen Phone is providing a similar shared Internet access pilot using EDGE technology for 16 'Community Information Centres' that are deployed across the country and run by local entrepreneurs.

The pilot may lead to large-scale rollouts that have the potential to transform millions of people's lives by giving them access to information and communications technologies for the first time.

By initiating projects in Africa, Bangladesh and India to test different mobile data solutions – from enhanced SMS-based data sourcing to high speed Internet solutions – involving partnerships with schools, health-authorities, post services, multinational companies and multilateral development organisations such as the UN and World Health Organisation, mobile operators are assisting policy makers in the development of the Internet and ICT / information service components of their UA programs.

6 The policy imperative – Market efficiency measures

6.1 Fundamentals

There is overwhelming precedence to guide policy-makers towards a general policy of liberalisation, competition and privatisation. The target should be to achieve the maximum efficiency in market operation. In particular, fully open competitive markets generally need only light-handed regulation focused on fair play, consumer protection, the correction of anomalies, and possibility of assistance to disadvantaged consumers.

In addition to providing national leadership, policy makers need to assess their country's geographic and economic challenges and focus interventions on areas that may lie outside of the market's capacity to be served commercially. In this regard it is very important that policy makers not waste resources or confuse issues by seeking to make interventions in areas that the market will reach and serve comprehensively by commercial means.

6.2 Universal Access and the market

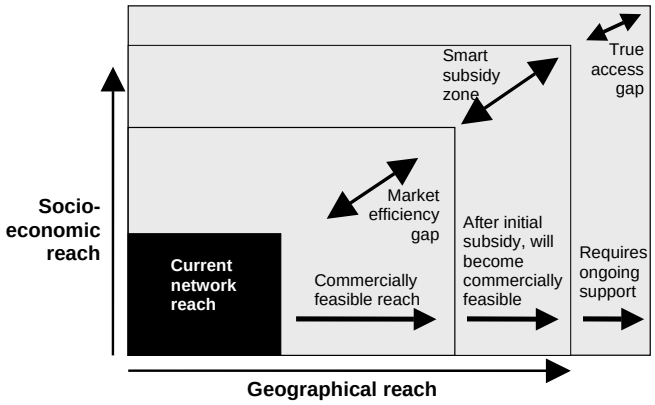
Since the reform and privatisation of the sector, investors have demonstrated a remarkable ability to respond competitively to all service licensing opportunities presented, with relatively little assistance. There is strong evidence, however, that the degree of success is affected by

the degree to which government enables and empowers the market to work efficiently and to push the frontiers by its own means. There is every possibility that this trend can continue and deepen into poorer areas.

The most common depiction of how to understand the achievement of UA or US in a country, and whether or not financial intervention may be required, is the three gap model.

The market efficiency gap depicts a less than perfect market operation. It is the gap that may exist between the service reach, which could be achieved in a fully liberalised and efficient market and what markets under existing conditions achieve. This gap can be bridged commercially, so long as the regulator removes barriers and creates a level playing field among all market participants. The only questions relate to how far and how fast the market can actually be reached commercially, and how best to implement and sequence more pro-market conditions to reach or extend the limits of the market.

The smart subsidy zone refers mainly to rural areas, population groups and service targets that may not be reached by the market alone for some time to come. Targeted financial intervention beyond normal regulatory measures may be considered to motivate or accelerate service provision to these population groups and areas[31]. This approach to subsidy also encourages cost minimisation and growth of the market. The important element of the smart subsidy zone is that an initial subsidy *will* make the project commercially viable on an ongoing basis. No further subsidies are needed if the service targets (e.g. the market penetration and level of access) are set realistically, with medium term commercial viability in view. Targeted interventions are typically implemented using a USF's resources. The main lesson is that the smart subsidy zone is shrinking in most markets, as mobile operators are reaching new areas previously thought to require subsidy through normal commercial expansion.



The true access gap comprises areas or communications targets that are beyond commercial viability for the foreseeable future and financial support is definitely required. For example, in areas that have very poor electricity supply, the temporary subsidisation of prime power generation, including fuel supply if necessary, could be considered. It is a political decision if and to what extent to subsidise ongoing service provision to areas and population groups that are beyond the limits of the smart subsidy zone. In most countries this gap may apply only to the last 2-5% of population or the last 20-30% of geographic territory.

6.3 Measures that close the market efficiency gap

Improvement in the regulatory environment will lower the total cost of ownership, improve service provision and affordability.

- ***Open competitive markets*** - Competition in the mobile sector and pricing flexibility was the prerequisite to its growth. The most significant price reductions and most rapid penetration growth occur when third and fourth operators enter the market.

[31] A *smart subsidy* is a once-only incentive that is designed to be results-oriented, and does not distort the market or add to the burden of operators in the sector in the long run.

- ***Spectrum harmonisation*** – The ITU's guidance on global harmonised spectrum had been the bedrock of the mobiles industry's growth; enabling lower equipment costs, further economies of scale and global interoperability.
- ***Tariff freedom*** – Regulators are often under pressure from politicians and special interest groups to regulate or control prices in competitive markets. Where competition is strong, the need to drive penetration to ever lower income users has led to price reductions. Market efficiency is achieved with a low touch in regulation, with the regulators' main task to ensure that players who are dominant do not abuse their power.
- ***Interconnection*** – Disputes over interconnection, typically between mobile and incumbent operators are a significant barrier to market growth as they increase uncertainty and operating costs. Key principles for interconnection are:
    - The terms must be based on transparent, public domain procedures;
    - Rates and practices must be monitored and enforced by an unbiased and independent regulator;
    - Rates should be based on long run incremental costs
- ***Geographically asymmetric termination rates*** – Rural users typically receive more calls than they make. For rural areas that may be unprofitable using termination rates that are higher than the average may make such areas economically viable. The application of this principle should be more widely considered as a market efficiency measure.
- ***Lower taxation*** – High taxes on handsets maintain entry barriers to new users, while high taxes on infrastructure components increase the operators' investment costs and lead to higher prices. Some governments have even placed additional taxes on air-time usage. All taxes raise the total cost of ownership, either for the operator or the user or both. Policy makers and regulators wanting to meet their UA and US targets should spare no effort in their inter-governmental activities to keep taxes low.
- ***Cost based licence and spectrum fees*** – There is no justification for charges beyond the financial cost of regulation and administration of monitoring and control mechanisms. Some countries set relatively high annual licence fees on private operators. As time goes on, fees that yield surpluses (which tempt government into treating them as additional revenue) should be reduced[32].
- ***Calling Party Pay (CPP) –*** Many developing countries have moved from Receiving Party Pays to CPP and seen penetration rates rise significantly[33]. CPP enables low-income users to use mobile services in a cost effective way. CPP also encourages more users to use their mobiles for business purposes since they are not burdened with any cost levied on incoming business enquiry calls[34]. The adoption of RPP and PP explains the relatively slow business user take-up of mobile communications in North America (RPP) as compared to Europe (CPP).

[32] In 2005, the Botswana TelecomsAuthority (BTA) reduced its licence fee rate from 5% of net operator revenue to 3% for reason that market growth had created an excess.

[33]See for example Mobile termination charges: Calling Party Pays versus Receiving Party Pays by Stephen Littlechild, TelecomsPolicy 30 (2006) 242-277; Calling Party Pays or Receiving Party Pays? The diffusion of mobile telephony with endogenous regulation, by R. Dewenter and J. Kruse, Department of Economics Discussion Paper 43, Helmut Schmidt University, Hamburg, November 2005.) On the other hand, some academic papers have questioned the causality link between CPP and increased penetration and explained certain benefits of Sender Keeps All interconnect arrangements for high penetration economies. However, for the time being, practical experience in *developing countries* still points to CPP as the more successful charging model for growing penetration.

[34] New technology is on the way which can improve tariff transparency to users (in particular, by displaying call charges on the phone screen both while a call is being set up and during the course of the call). If successful in the marketplace, we expect that this technology will provide new flexibility for charging and interconnection arrangements. It could allow real-time call price changes in response to changing loads, permitting a much more efficient usage of installed traffic capacity.

	Benefit	Impact	Result
Open markets – e.g. more than 2 mobile licenses	Choice for consumers, lower prices	Greater affordability	Growth & expansion
Fixed network liberalisation and technology neutral licensing - backbone, international gateway, etc.	More choice & innovation, reduced operating costs	Most economic service	Growth & expansion
Reduce import duties on handsets	Lower customer's cost of ownership	Higher demand for service	Growth & expansion
Reduce import duties on network infrastructure	Lower infrastructure costs	Lower Capex	Expand to more geographic areas
Annual license and spectrum fees no more than the cost of regulation	Lower costs	Lower prices and more service demand	Network growth
Fair interconnection	Revenues meet costs	Higher revenues in low-income areas	Expand network to more areas
Geographic asymmetrical Termination Rates for rural areas	Enables revenues to meet costs in high-cost rural areas	Increase the operator business case for rural investment	Expand network to more rural areas
Tariff freedom for operators	Revenues meet costs	Viable business plan	Growth & expansion
Calling Party Pay regime	Reduces costs for low-income people	Increased demand for service	Network growth

7 Beyond the Market Efficiency gap: Universal Service Funds

7.1 Introduction to USFs

USFs have been created in developing countries, often in cooperation with the World Bank, as policy tools for liberalised markets to provide financial assistance for:

- Meeting regional and rural service targets for both telephony and Internet services;
- Supporting users, such as community groups, schools, 'vanguard' institutions and commercial start-ups with Internet and ICT projects in regional and rural areas; and
- Supporting various other activities related to regionally balanced network and service development, such as Internet Exchange Points, regional points of presence (POPs), and national and local content.

The most recently designed funds seek to use the "Output-based Aid" approach to subsidy distribution. By this means, pre-determined maximum allowable subsidies designed to meet specified UA / US service targets in specified areas are competitively tendered. The one-time subsidies, which are calculated to fill the "financial gap" an operator would need to bring a loss-making investment to acceptable commercial viability, are awarded to the lowest bidder who is qualified in terms of corporate and financial stability and operational experience.

7.1.1 Transparency and Fairness

A USF that adheres to best practice provides a transparent means of allocating subsidies for the achievement of service targets in unviable areas. The alternative is to mandate targets in exchange for relief from USF levies or tax runs. In the case of China, where all operators were initially assigned geographical UA targets, disputes arose between operators and the government over comparative costs and fairness.

7.1.2 Ease and cost of management and emphasis on least cost solution

A best-practice USF has reasonable government targets based on national socio-economic goals and knowledge of market demands, along with the operators cost profile. The targets and the maximum allowable subsidies are set independently, using published principles based on technology neutrality, efficiency and least cost solutions.

7.1.3 USFs provide "pay or play" in practice

With a USF least subsidy tender, no operator is obliged to participate in the competition even though they will have contributed to the fund. The successful operators will receive back a portion of the funds they contributed to the fund, and may recoup more than 100%.

7.1.4 USFs can bring finance into the sector & reduce the cost to operators

USFs present a way for governments, or donors such as the World Bank, to contribute financially to UA in a liberalised market. In some smaller markets this has resulted in seed finance being contributed before the build-up of equity through operator contributions. In Chile, for example, the government contributed the whole amount and no levy was made on operators. In Uganda, a World Bank contribution resulted in the leading mobile operator receiving subsidies amounting to several times its contribution to the USF to date. In Botswana, the regulator has contributed seed finance to the USF and the government is considering providing the finance for the first competitive UA project.

7.1.5 The public interest is explicitly served

Good governance requires the explicit setting of objectives and targets, a process of consultation, buy-in by all stakeholders, and satisfaction by consumer representatives. This is typically best achieved when public tenders are used.

The most advanced fund in Africa, the Rural Communications Development Fund (RCDF) in Uganda, is currently distributing approximately US$ 6 million, won through a public tender for the expansion of mobile networks and placement of approximately 1,800 public access village phones. In Uganda, the leading mobile operator has also won the majority of the subsidy contracts to install high speed Internet POPs, centred on the company's base station's in rural district centres. A mobile operator also won Mongolia's first Internet POP competition, under World Bank finance. Other funds in Africa and elsewhere are emulating the same approach.

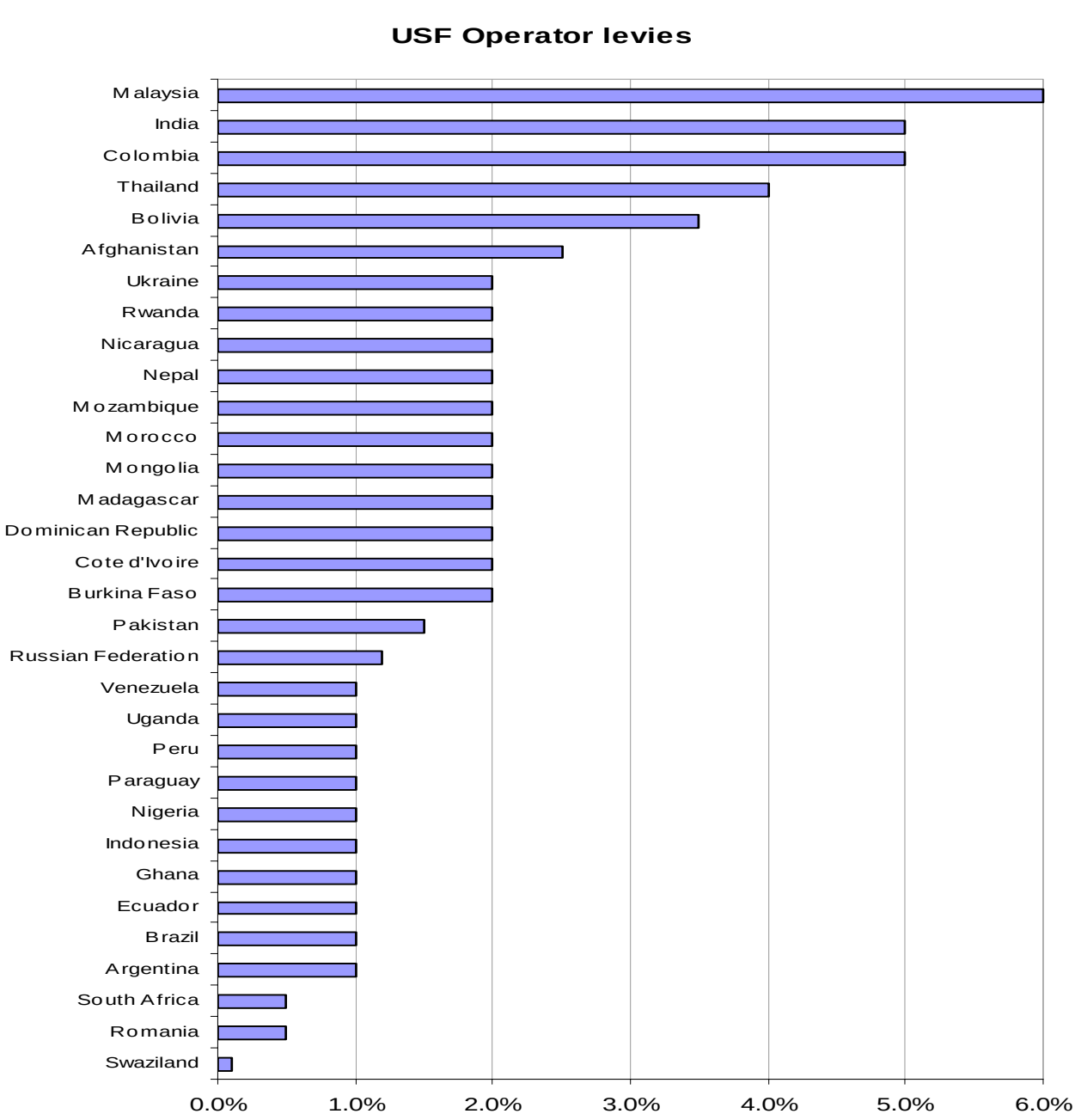
7.2 The trend – how many USFs?

There are a total of only 9 existing USFs in the most advanced Western and Eastern European and OECD markets[35]. However, amongst the 92 emerging market and developing countries sampled for this study, a total of 57 have plans to establish USFs.

32 countries have already set operator levies, which range from less than 1% of operator revenues in South Africa to 5% of in India and Colombia and 6% on certain revenues in Malaysia[36].

[35] The USA, Canada, Australia, France, Italy, Czech Republic, Bulgaria, South Korea and Oman

[36] Malaysia's USPF levies 6% of operator "weighted net revenues", which includes the following services: international calls; call termination service for foreign service providers, freephone service, ISDN, cellular mobile, international roaming, IP telephony, leased lines, other activities subject to an individual or class license. The levy is approximately equal to 2% of the sector's total gross turnover according to the regulator, MCMC. However it appears to be higher than this on mobile operators.



7.3 Performance of funds to date

A total of 15 funds in the developing markets that have already levied and distributed resources were studied in detail[37]. They have collected a total of approximately US$ 6.2 billion from operators, beginning in the late 1990's but mostly since 2001/2.

78% of the total collections (US$ 4.8 billion) came from two countries (India and Brazil), 9% (US$ 548 M) from Malaysia, and 2% (US$ 111 M) from Peru. The remaining 12 countries totalled less than 12% (US$ 725 M).

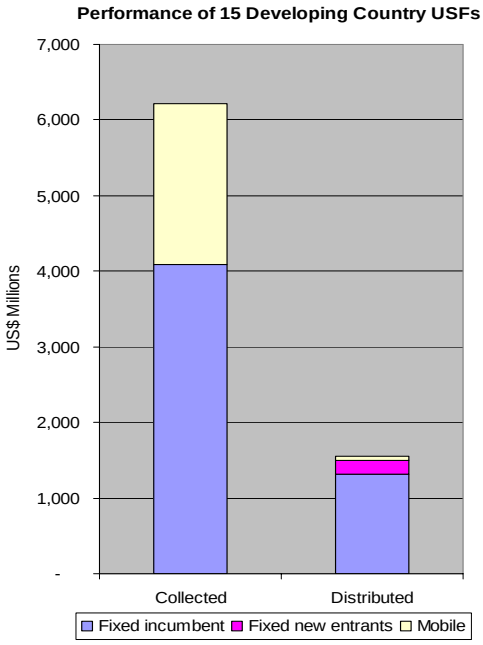
The total contribution of mobile operators to this amount has been US$ 2.1 billion, approximately one third. The proportion of mobile contribution will increase going forward, as the proportion of total sector revenues contributed by the mobile sector increases every year.

The 15 funds have also received a relatively small additional contribution of US$ 62.8 million from government and international donor sources[38].

[37] Bolivia, Brazil, Chile, Colombia, Dominican Republic, Guatemala, India, Indonesia, Malaysia, Nicaragua, Pakistan, Peru, South Africa, Uganda, Vietnam.
[38] Chile (government), Colombia (government), Uganda (World Bank).

The total amount distributed back to the sector for UA and US projects has amounted to approximately US$ 1.62 billion, just 26% of the total collected. This has been distributed in the following way:

- 81.0% to incumbent fixed line operators;
- 11.7% to new entrant fixed line operators bidding specifically for UA service;
- 4.6% to mobile operators; and
- 2.7% for ICT projects of various kinds.



The impact of these USFs to date has been poor. They have contributed little to mobile expansion or penetration, except in Uganda and Colombia. Almost all have distributed the funds to less efficient fixed networks. The lost potential for mobile expansion has been significant (see Section 7.6.4).

Of the three largest funds, Brazil's universal service fund, FUST, has had its resources tied up since the fund's inception in 2001 due to differing legal interpretations of the fund's objectives. The latest action, in January 2006, saw the nine fixed line providers file a motion to prevent the collection of any more money until the regulator, Anatel, determines the proper use of the existing funds. India's Universal Service Obligation Fund (USOF), which has to date distributed only 36% of the US$ 3.12 billion collected from operators since 2002, finally plans to invest U$$ 1 billion back into the mobile industry through the financing of up to 10,000 towers and supporting passive infrastructure in rural areas. However, it still remains to be seen whether the approach will be market oriented and enable operators to expand in an otherwise commercially sustainable manner, or whether the finance could have been better used in a less directed fashion. Malaysia, which has managed to distribute just 49% of its collections, is reportedly looking into ways in which the objectives of the fund could be more inclusive of mobile services[39].

7.4 Common and best practices

7.4.1 Who contributes, who benefits?

All major operators including mobile operators are typically required to contribute into modern USFs, although alternative operators, including ISPs have not been required to do so. In some cases, and especially in the case of two of the countries with the largest contributions – India and Malaysia – mobile operators have either been ineligible for many of the distributions or were required to compete for fixed-only solutions.

7.4.2 Calculation of levies

USF levies are best calculated on gross revenues from telecoms services. The main objective must be to achieve the least-cost solution and the lowest levy.

7.4.3 Realistic and feasible UA targets

UA targets must be realistic so that commercial operators, with some smart subsidy, can achieve them. The objective of a 'smart subsidy' calculation is to enable operators to bring a

[39] The Malaysian USP Fund had distributed approximately US$ 277 of the US$ 548 million collected to end 2004. Mobile operators have received US$ 49 million providing essentially fixed GSM public telephony or Internet access in USP designated areas.

potentially loss-marking or marginal project into a normal commercial rate of return after the one-time subsidy.

7.4.4 Industry Consultation

Strategic decisions concerning the USF must involve the Fund's contributors in key decision-making with respect to the uses of the Fund, the size of the levies and its governance. Stakeholder involvement is crucial for the credibility of the Fund and its management.

7.4.5 Fund Management

Often the independent regulator manages the USF on a day-to-day basis. In cases where the regulator would not have the capacity to manage the technical, administrative or financial aspects of the fund, outsourcing to an independent private sector agency is recommended[40].

7.4.6 Open least-subsidy tendering and technology neutral approach

Subsidies should be distributed through open tender competitions based on the emerging best-practice concept of "Output-based Aid" and least-subsidy auction. Many USFs, including that of India, have developed USF programs and tenders with specific technologies in mind. This prevents the most efficient technology from being used.

7.4.7 Financial transparency

The USF should have a separate bank account and distinct accounting systems. In a system that maintains separate accounting practices for the USF, balances can be monitored, expenditures can be tracked and thus the public's trust in the USF can be upheld. In USFs without proper accounting separation and standards, funds have been appropriated and been used for other purposes than initially intended.

7.4.8 Independent auditing and publication

The finances of the USF should be audited annually and an annual report of all the USF's activities, receipts and disbursements should be presented to the requisite government authority and be published for the general public.

7.4.9 Keeping administrative costs to a minimum

A good example of cost minimization is Peru, where the fund's administrative overhead costs per year were just 1% of the cash balance of the fund. While the actual percentage of administrative overhead cost may vary from country to country, based on the size of the funds and in-country costs, it is important that this percentage is monitored and kept to a minimum.

7.4.10 Efficient use of funds

The recent competitively tendered subsidy process in Uganda in 2005/6 saw an average of just 61% of the maximum available subsidies, in three separate competitions, utilized for the UA awards[41]. Using a competitive tender process, after the fund manager had estimated the *maximum allowable* subsidy, this created efficient use of resources through the market mechanism. The unused 39% of the fund could be returned to the operators or used to boost subsidize the purchase of handsets and SIMs to boost penetration.

[40] The Peruvian regulator, OSIPTEL, outsources the financial management of its USF (FITEL) to a Trust Company, and many USFs to date employ outside consultants or technical auditors to undertake UA/AS target area development, subsidy calculation, tender management and/or field inspections.

[41] By comparison, Chile's FDT program used 54% of its allocated subsidies in its main rural telecomssubsidy competitions and Peru's FITEL program used just 36%.

7.4.11 Evaluation and re-appraisal of the USF operation

USFs should be subject to a strategic policy and management review at least every 3 years. The evaluation should consider whether the fund has achieved its objectives and if so whether to return excess funds collected and/ or disband.

7.5 Observed pitfalls and limitations

7.5.1 Over-charging and high cost oriented solutions

India and Malaysia's funds have levied far more than they have been able to distribute, without finding a role for mobile operators. Brazil has also levied enormous amounts without being able to distribute any back to the industry. The first pitfall is thus over-charging to pay for out-of-date concepts and attempted implementation of high cost fixed line solutions. South Africa's fund, even though the levy has been only a small percentage, made huge errors of judgement in the early years and has large unspent reserves. These reserves should either be spent on the most efficient solution, mobile, or returned.

7.5.2 Slow pace of implementation can conflict with commercial expansion

In many countries, mobile network development has outpaced the regulator's efforts to promote UA. For example, due to funding and tender delays, half of the communities slated for subsidy in Uganda had, in fact, already been reached.

7.5.3 Potential misdirection or efficient use of funds

Policy-makers would do well to consider the implications of the experiences to date:

- If the net US$2.0 billion taken out of the mobile industry in USF levies, in the 15 developing countries with active funds, had been re-invested back into mobile network rollout focused on new rural areas, mobile operators could have extended coverage to an additional approximately 230 million people, i.e., 3.5 % of the world's population or almost 7% of those living in the rural areas of developing countries[42].
- Going one step further, if the total $4.4 billion still unallocated by USFs had been invested in mobile network expansion 500,000 million more people could be reached. This is the equivalent of 7.8% of the world's population or 14.3% of the rural population in developing countries.
- Finally, we estimate that all of the 32 existing or emerging USFs will together levy another US$3.8 billion from the mobile industry alone by the end of the decade. If 100% of these funds were spent on increasing mobile network reach, an additional 380 million, i.e., 6% of the world's population and 11% of the population of rural areas in developing countries, could be reached.

The combination of these scenarios implies that the amounts already levied and expected to be levied by 2010 should be capable of providing close to universal access to the whole world within the same time frame if directed efficiently towards expansion investments.

7.6 Conclusions

7.6.1 Prioritise the enabling of commercial solutions

Policy makers need to be careful not to waste time and resources planning interventions for areas that would be better served without intervention. Regulatory measures that create an environment more conducive to competitive network expansion and fiscal measures (e.g. tax

[42] The estimates are based on an average radius per station of 20 km; and population density at 15% of each country's average rural population density (assuming that extensions would be to sparsely populated, as-yet unreached areas). Of the world's 6.5 billion people today, approximately 3.3 billion inhabit the rural areas of developing countries.

reduction) that will make service and communications hardware more affordable to low-income users must be the priority.

7.6.2 Focus interventions on areas definitely needing assistance

Although difficult to predict which areas will need financial support when a market is still in its rapid expansion and growth phase, USF managers are better able to predict the areas requiring support once a market reaches some level of maturity.

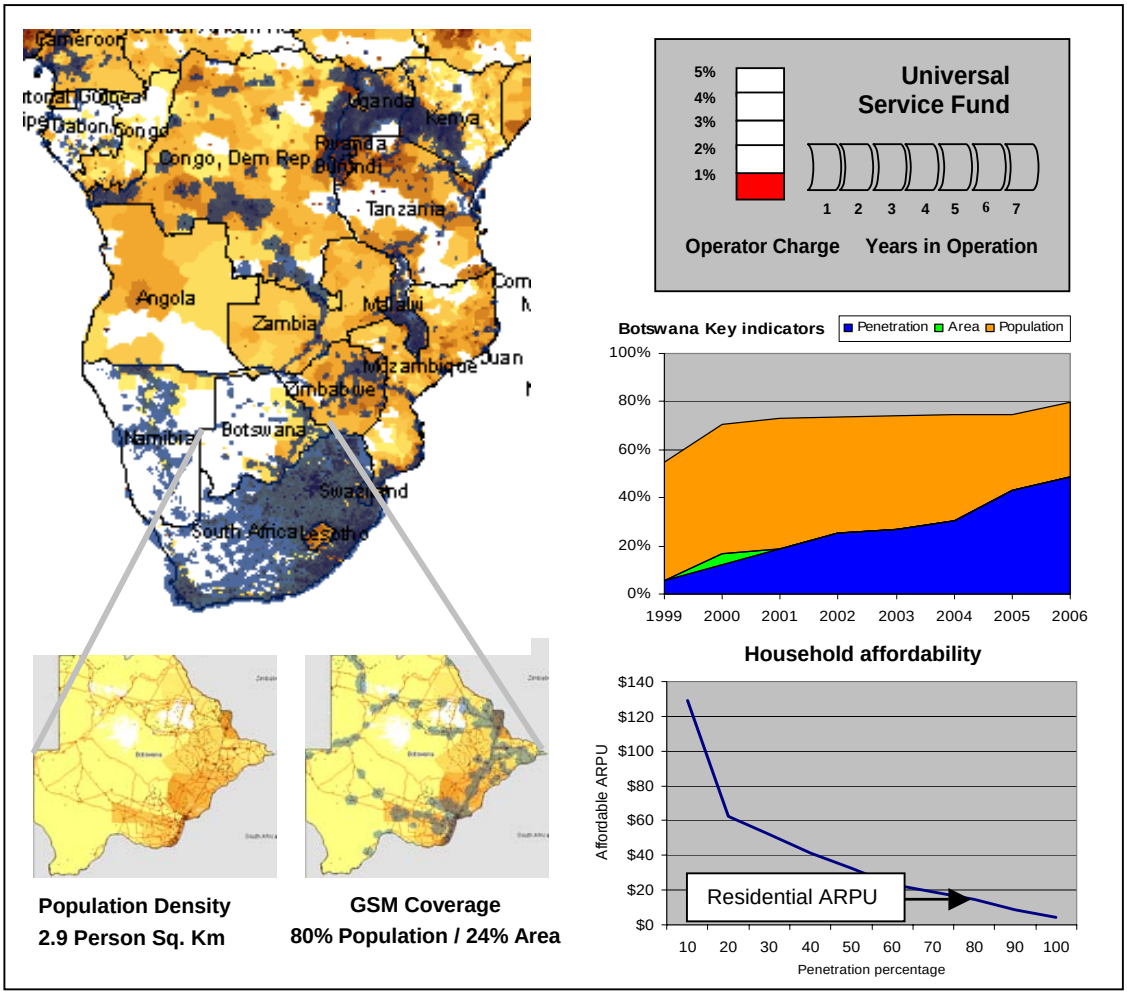
7.6.3 Best practice, time-bound evaluation and adjustment

USFs may be best executed during a limited period in a country's sector development, after which levies should be phased out as they will no longer serve the purpose.

7.6.4 Consultation between the industry and government

In summary, there is an urgent need for regulators and the industry to work together towards a) strengthening the functioning of the market so that it is capable of providing universal access and service commercially; and b) identifying where government intervention can assist operators to reach the actual "access gap" which is in the most difficult and challenging environments (i.e. the geographically largest and least developed regions) and/or supporting the development of emerging ICT markets.

Botswana



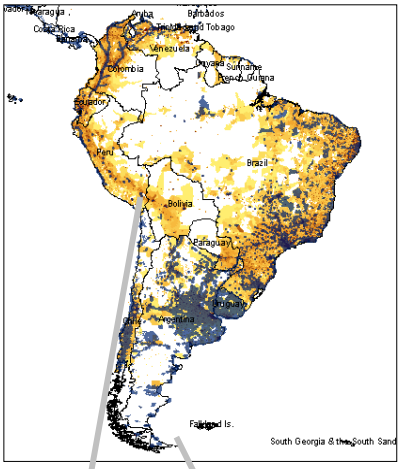
Summary

Botswana's telecoms sector has been only partially liberalised since the two mobile operators were licensed in 1998. The fixed line incumbent, Botswana Telecoms orporation (BTC) has had a monopoly over fixed services, long distance and the international gateway until this year. As well, BTC has only been granted the right to own a mobile license this year, with the introduction of a technology neutral licensing regime. The two mobile operators initially received regional build-out and UA (public payphone) obligations, which were exceeded within the first year, but the operators were also required to utilise BTC's long distance backbone infrastructure and only permitted to construct their own transmission if BTC was unable to guarantee service. This has resulted in almost total reliance on BTC. Some areas that would be viable for mobile service provision are still waiting for backbone connections.

Nevertheless, the two mobile operators, Mascom and Orange, have achieved almost 80% population coverage and approximately 88% if fringe (variable quality) areas are included. Affordability is high, mobile penetration currently stands at 50% and household penetration is above 75% in urban areas. The lowest access prices are very low (approximately $1.00 per month) and affordable to all. With the further liberalisation announced in June 2006, the mobile operators can now self-provide their own transmission and have their own international gateways. Further commercial expansion is expected.

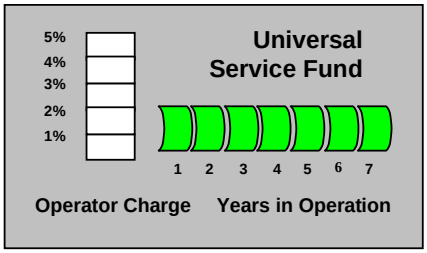
The government will establish a USF later this year and will levy 1% of operator revenues, to be applied towards competitive tendering of service provision in remote rural areas and the phased roll-out of Internet POPs in district and village population centres. To enable rapid program roll-out and to limit the amount of levy required, the regulator, BTA has committed to seed fund the USF with approximately US$ 1.7 million of its licence fee surplus and the government will also finance the initial rural telecoms tenders, which are projected to require up to US$ 15 million in subsidy for four regional rural licence territories. These represent virtually all of the areas not served to date by either the mobile operators or BTC. While the rural telecoms tenders have been modelled on the South African "underserved area licence" concept, it is expected that in Botswana, all existing operators will be invited to bid for the subsidies and that the mobile operators will thus have a strong chance of winning tenders, since they have already reached some of the areas.

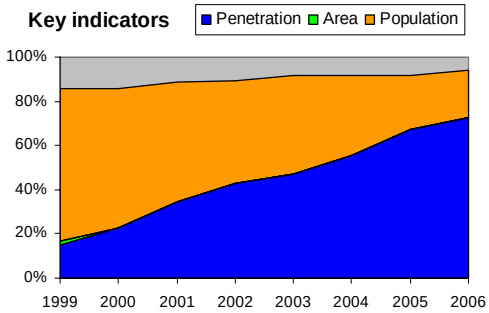
Chile



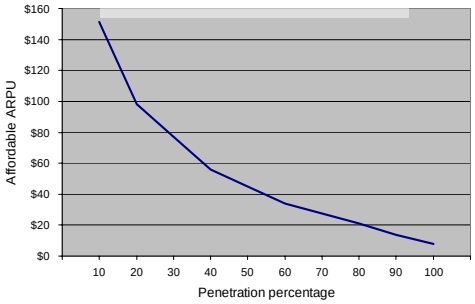
Population Density
21.1 Persons / Sq. Km

GSM Coverage
94%Population / 51% Area





Household Affordability



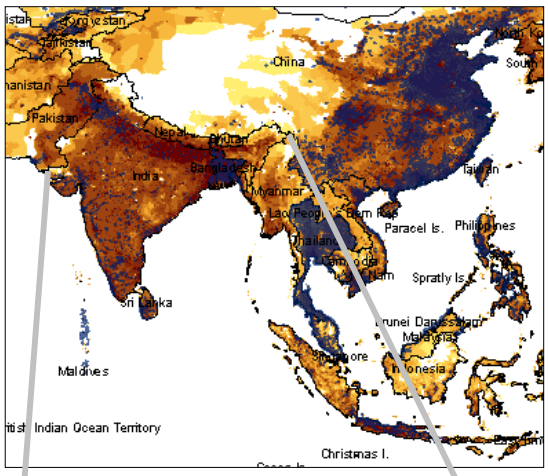
Summary

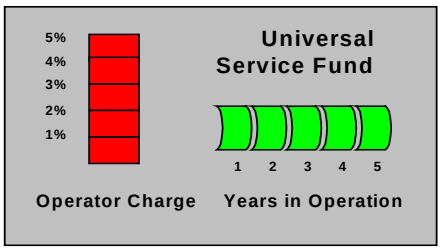
Chile's mobile telephony operators boast the highest levels of coverage in the world for its income bracket: 100% population coverage and 70% penetration, probably achieving between 80-90% *household penetration*. Even within the lowest 10% of the household income groups, the ARPU would still be around US$ 10, thus universal service is achievable commercially. The country has benefited from a number of key factors which have influenced the expansion of mobile telephony including:

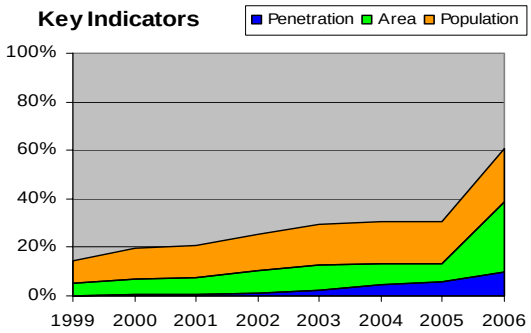
- Liberalising the mobile market at an early stage, starting in 1989;
- High urbanisation (87%) and high income;
- The introduction of CPP for the mobile sector in the late 1990s.

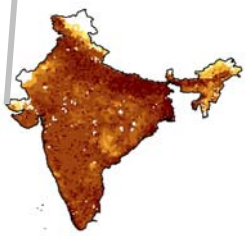
The country's Universal Access program, the Telecoms Development Fund, is the oldest Fund that used government subsidies to commercial operators for installing and operating payphones in rural and remote areas, awarded through a competitive tender program. While very successful, it was implemented mostly during the second half of the 1990's, when mobile services were not fully on the radar screen, and thus had no impact on the mobile achievements. However, it did not tax the mobile operators for the UA fund either.

India



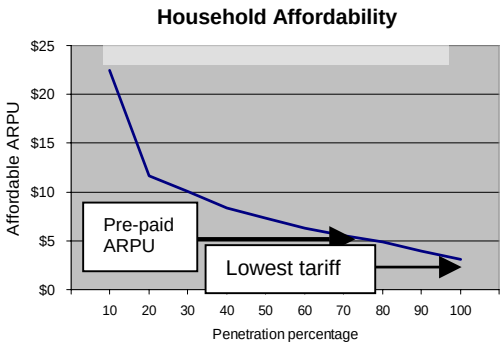






Population Density
329 pers / Sq. KM

GSM Coverage
61% Population / 39% Area



Summary

India's mobile network coverage doubled last year to reach over 60% of the population. A raft of changes to the regulatory environment has supported this recent expansion. The introduction of a 'calling party pays' regime in 2003, for example, has had a significant impact on network rollout, as has the further liberalisation of the sector. India now has six to eight major mobile operators in all services areas[43].

India has a mobile penetration rate of 11%, and this is growing rapidly as operators provide more affordable services. India's average pre-paid ARPU is US$ 5[44].

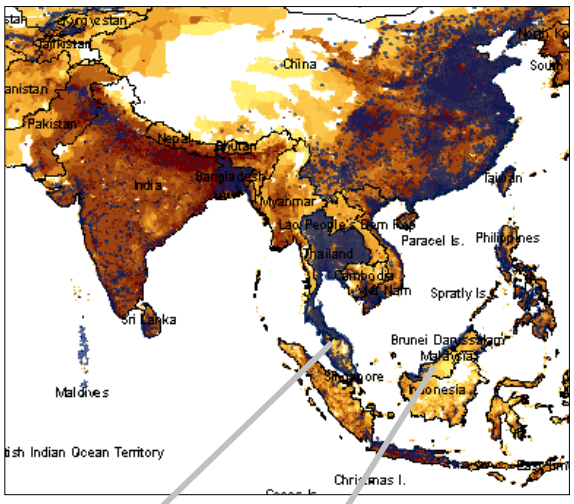
The mobile sector has been held back by some of the world's highest taxes, such as 5-10% license fees and 2-6% spectrum fees levied on operators' adjusted gross revenue. Mobile operators also pay an access deficit charge of 1.5%, which is equivalent to approximately US$750 million annually. This fee is re-distributed to the fixed line incumbent. India is also an intensely competitive market; per minute call charges are among the lowest in the world. High duties and regulatory charges, combined with low prices means mobile operators have lower free cash flows, which has held back mobile operators from expanding further to rural areas

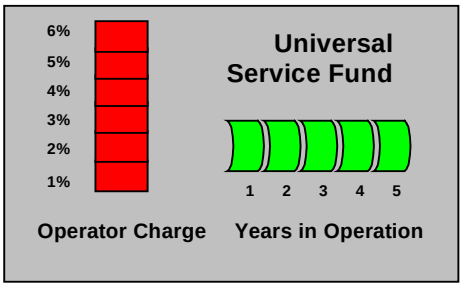
India's universal service fund collects an average of 5% from mobile operators' gross revenues each year, but mobile operators are excluded from receiving any of the funds. Most of the fund disbursements are allocated to the incumbent, BSNL.

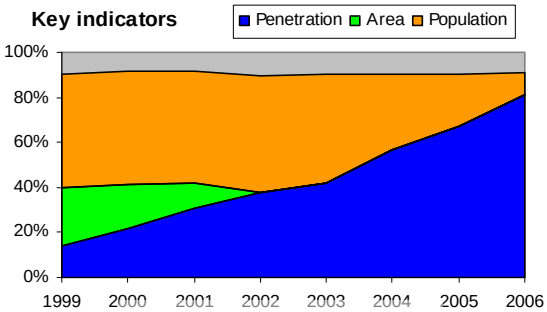
Since 2002, India's universal service fund has collected around US$3 billion and has allocated less than 29% of the monies. Non-disbursals to date are close to US$2 billion and are predicted to rise. The mobile industry is being deprived of resources that it could otherwise use to invest in network rollout and meet universal service objectives.

[43] The average number of operators per service area is six, there are only two states viz. Punjab & Rajasthan, which have eight operators.
[44] As per the private GSM benchmarking study for December 2005, the average prepaid ARPU for the private GSM industry was Rs. 218, i.e. USD 4.66 per subscriber per month.

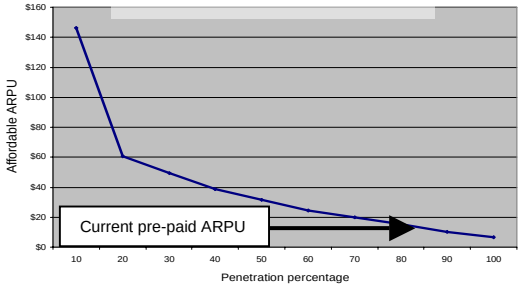
Malaysia







Household Affordability



Population Density: 75.5 persons / Sq. Km

GSM Coverage: 92% population / 44% Area

Summary

Malaysia's three mobile operators provide coverage to 92% of the population, according to the data submitted by mobile operators, with a penetration rate just above 80%, which is above average for its per-capita income. The success of mobile in Malaysia can be attributed to a combination of:

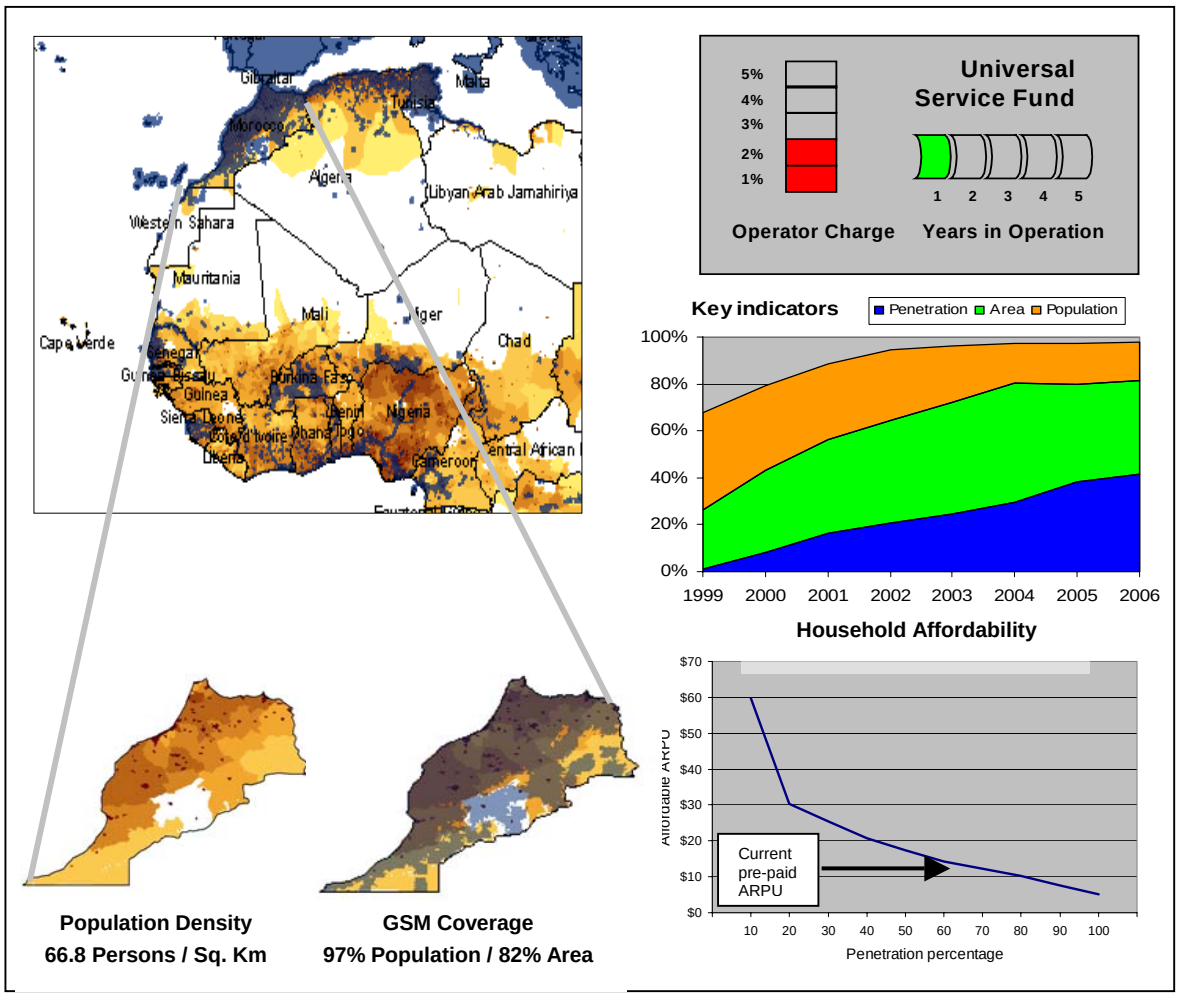
- Licensed multiple mobile operators at a relatively early stage (1989) in the mobile sector's development;
- High percentage of urban population (64%) as well as relatively high per-capita income and consequently affordability;
- The regulatory framework provided mobile operators the benefit of technology neutrality; and
- The strength of the mobile operators.

Malaysia's current Pre-paid ARPU averages US$ 13 per month; this is equivalent to the expenditure expected from marginal customers at the 80% household penetration level. With an *individual penetration* of 80% and 4.7 persons per household, it is likely that Malaysia has already virtually achieved Universal Service within the 92% population coverage areas.

Malaysia had a Universal Service Obligation (USO) regime imposed on the PSTN incumbent from 1st January 1999 to 31st December 2000. The regulator, MCMC, established universal service targets from 1st January 2001 onwards, to be supported by the Universal Service Provision Fund (USPF). The US policy and specific USPF funded targets relate mainly to areas with low PSTN penetration, but include other services such as Internet provision. The targets do not yet specifically include mobile services, even though it has become evident that the vast majority of people use mobile services as their first and basic telephone service when available. While mobile operators are asked to contribute to the USPF 6% of their "weighted net revenues" (which across the sector appears to be equivalent to approximately 2% of gross revenues), they have had limited avenue to participate in the fund's disbursements. Despite this, they have received approx. 18% of the fund's disbursements for the provision of "fixed mobile" or other fixed (e.g. Internet) services.

Overall, it appears that the USPF has been overcharging relative to targeted US needs, as it has been able to distribute only 49% of collected amounts and had a balance of about US$ 277 million at the end of 2004. This is estimated to have since grown to around US$ 440 million currently idle and thus unavailable to contributors for network expansion investments.

Morocco



Summary

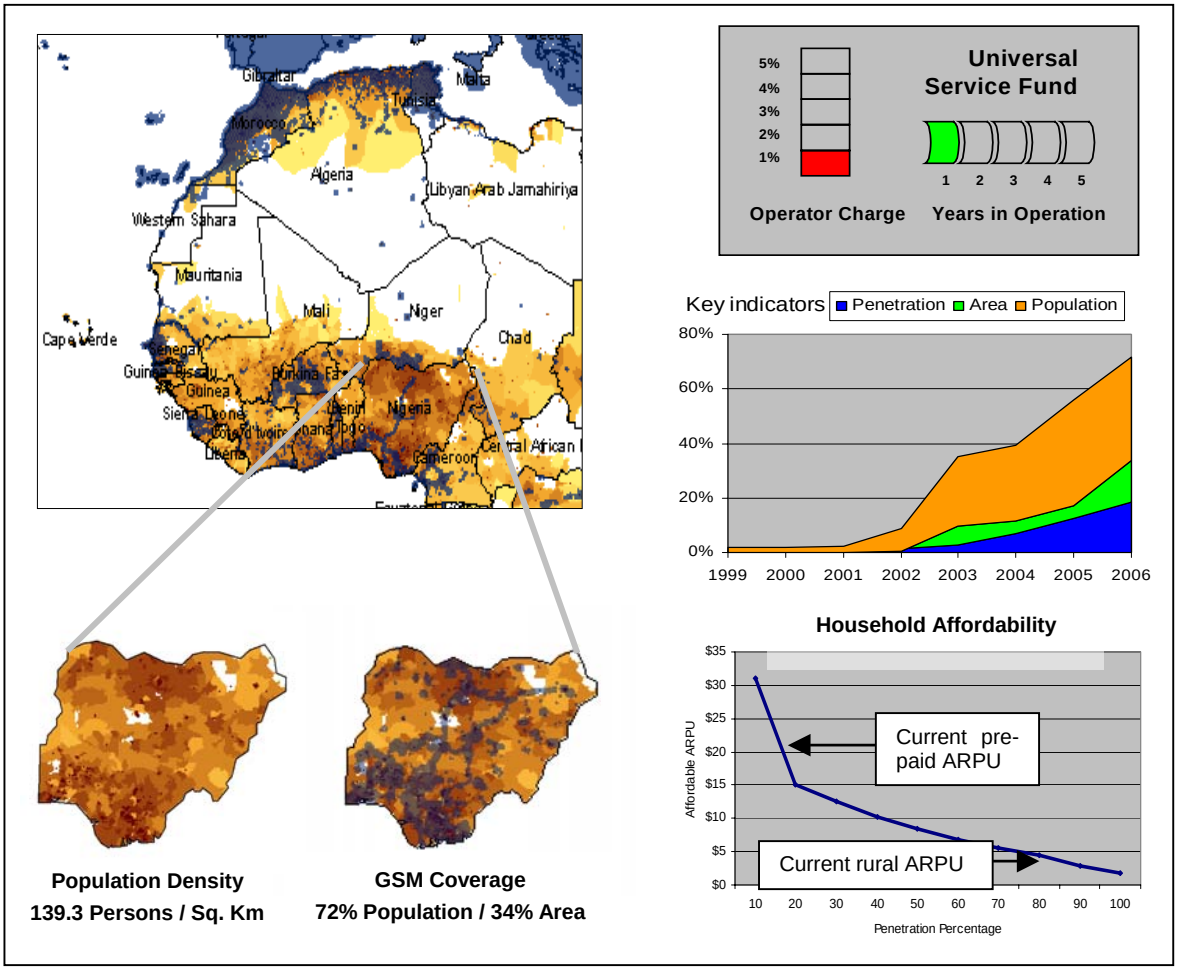
Morocco's two mobile operators are able to provide coverage to approximately 96% of the population, and have a penetration rate of 44%. Morocco has achieved high levels compared with other countries in the same income level, though Philippines, with a much lower income level, has achieved similar penetration with lower population coverage. The pre-pay ARPU of Maroc Telecom is US$ 12, with the operator enjoying a market share of 67%. Based on the ARPU affordability curve, slightly above 60% of households should be able to afford service.

The reasons for the success of mobile in Morocco include:

- The combination of Morocco's relatively small geographic area with a moderate population density;
- The regulator's relatively early pursuit of liberalisation in comparison to many of its other African peers, introducing a second mobile operator in 1999;
- The roll-out obligation on MediTel to cover 40% of the Moroccan population and 2,000 km of main road arteries, needing to reach 75% of the population and 6,000 km of main road arteries after 5 years. Since around 50% of Moroccans live in rural areas this meant that the second mobile operator had to cover 25% of the rural population;
- The independence and effectiveness of the regulator, ANRT, while undertaking the liberalisation process.

Morocco's Universal Service Fund, only recently established, has just approved coverage expansion plans proposed by the mobile operator Meditel and Maroc Telecom (mobile and fixed) to be financed under its program, at a cost estimated at US$ 30 million, to serve unviable areas. While it is too early to judge the success, it is clearly willing to invite the mobile industry to receive funds on an equal footing with the fixed line incumbent.

Nigeria



Summary

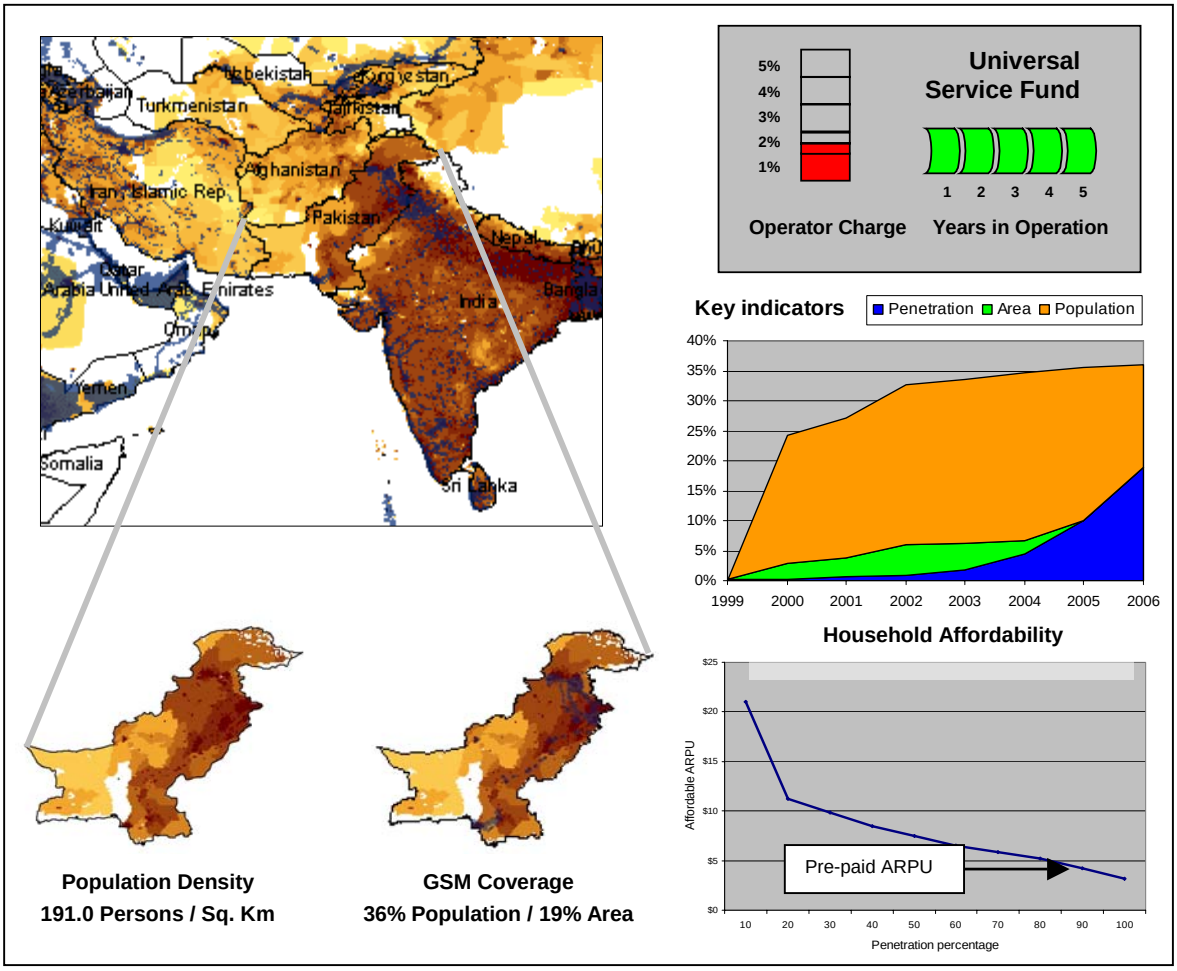
Africa's most dynamic telecoms market is home to 22 fixed line and four mobile operators. Nigeria's mobile coverage reaches slightly over 70% of its 128.7 million people and has a penetration rate of 18%, which is above average for sub-Saharan Africa outside of South Africa. The market shows every sign of continuing to grow at a strong pace for the next year or two, though the theoretical level of affordability is low. Demand and market studies have shown that Nigerians make up for this apparent lack of income by displaying a propensity to spend a high level of their income on telecoms (over 7%).

Reasons for mobile's success include:

- Overall very poor fixed network with hardly any national reach;
- Very competitive mobile market with four operators, of which two are well financed;
- Fairly progressive regulator seeking to ensure mobile growth and healthy competition;
- High population density;
- Few regions with mountains that would prove difficult to cover with mobile signal.

The country has no officially accepted Universal Access policy or an established fund, though it does have recommendations on both. A technical assistance project by the World Bank has initiated three pilots for Universal Access, comprising backbone, public telephony and Internet targets. Interestingly, while the results of the bidding process for the 2nd and 3rd pilot are still outstanding, interest by mobile operators has been low. The main reason for this is considered to be that the size of the pilots and subsidies are fairly small compared with the growth opportunities elsewhere, the fact that some mobile operators are 'outpacing' the efforts of the USF by reaching many new areas commercially every year, and strained relations between mobile operators and the regulator due to interconnection regulation.

Pakistan



Summary

Pakistan's six mobile operators have been calculated to cover slightly above 36% of the population, and the penetration rate has grown very rapidly, and is nearing 20%. However, it is likely that the mobile coverage maps have not been updated for the past 1-2 to reflect the true coverage situation, since penetration has sharply increased and it is highly likely that coverage has similarly improved.

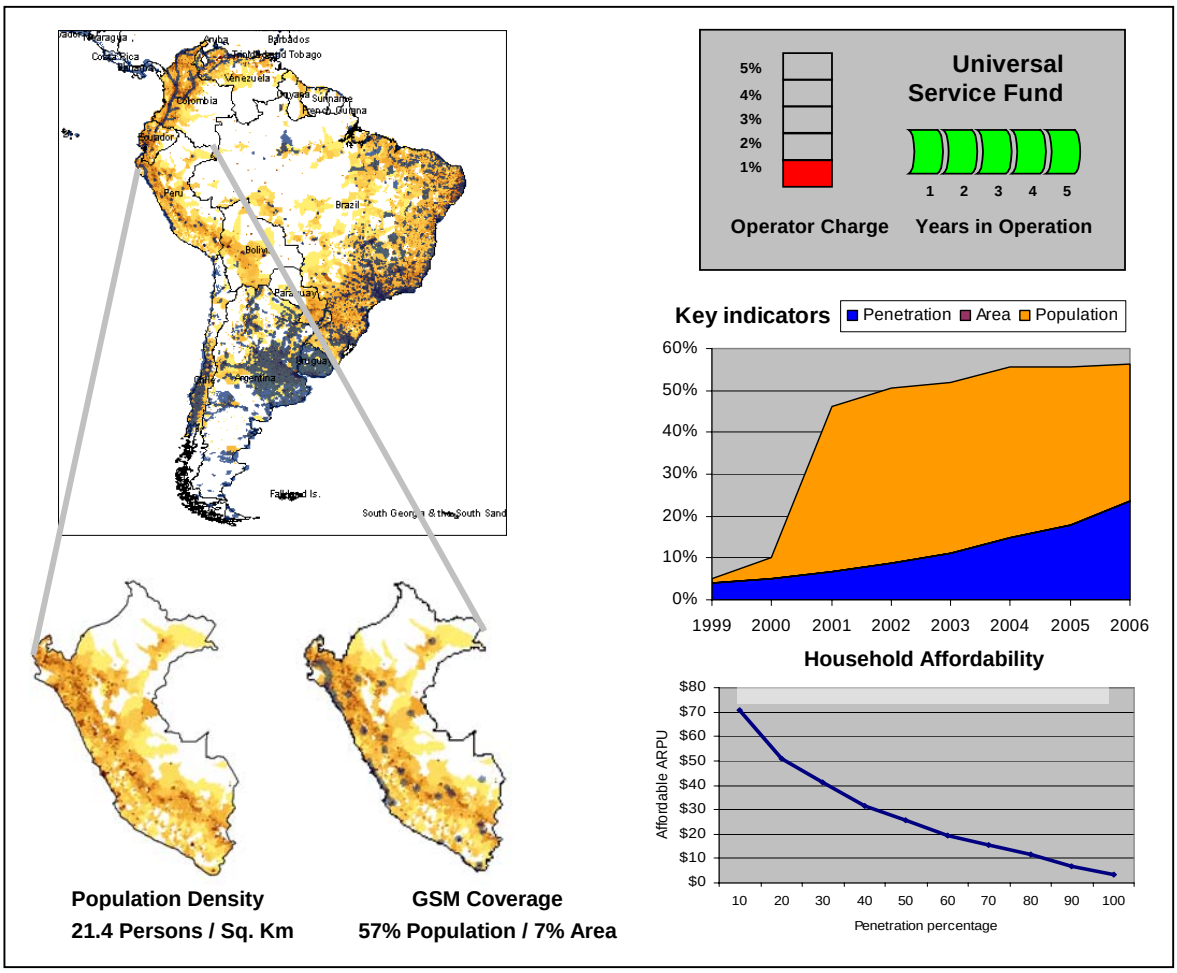
Pre-paid ARPU is very low with US$ 4. While this monthly ARPU is affordable to up to 90% of households, further penetration appears to be limited by the low population coverage (36%) and geographic coverage (7%) to date, although, as noted above, it is possible that the operators have not reported their latest coverage data. Even if there is unreported coverage, within Asia and compared to similar income countries, Pakistan's population coverage is probably still low. This is mainly due to the fact that its mobile development only took off three years ago and thus the country is a late-comer. However, penetration has grown from 3% to almost 20% in three years, likely allowing for further roll-out investment.

Reasons for mobile's recent success in Pakistan include the following:

- Licensing of six competitive operators with sufficient financial resources;
- Progressive policy and regulation for the mobile industry, including the publishing of clear guidelines distinguishing between mobile and WLL services, and the cutting of import duties on mobile handsets to zero ;
- Introduction of CPP in 2000;
- High population density;
- Significant proportions of the population live in areas relatively amenable to mobile coverage however there is still a long way to go.

A Universal Access Fund is established and a levy of 1.5% collected on operators revenue, including mobile operators, currently amounting to US$ 33 million. No disbursements have been made yet. Mobile operators will be eligible to received funds from the USF if they provide services in rural areas. Details of the process or of the UA program are not known at the moment.

Peru



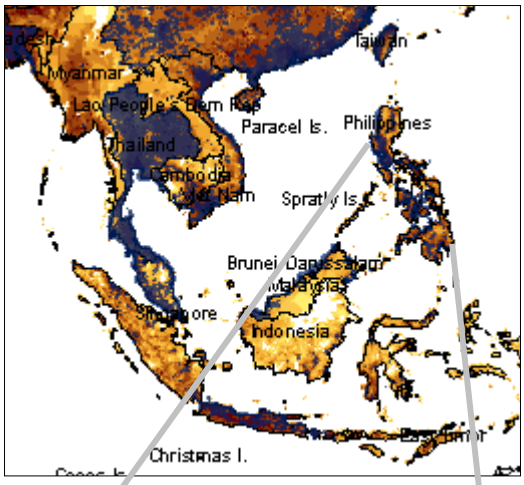
Summary

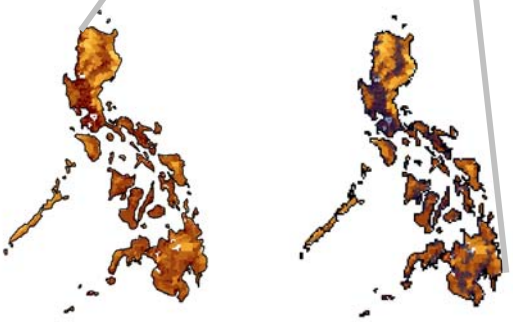
Only slightly above 55% of Peru's population is covered by a mobile signal, which is not even equivalent to the total urban population, that makes up 74%. Lima's population is approximately 30% of the total, and operators in Peru can capture 40% of the population by serving the top 5 cities. At 21%, Peru has a lower than average level of mobile penetration compared with other countries in its income bracket. This could be explained by:

- Currently only two mobile operator, if Nextel, with its push-to-talk service is excluded;
- Lack of other mobile operators: until recently, there was just one mobile operator, limiting true competition as customers wishing to switch operator needed to purchase a new handset for mobile;
- Consequently comparatively high mobile tariffs;
- High taxes on handsets (29%) and mobile services (19%) amounting to 20% of total ownership costs;
- Mountainous topography that is difficult to cover with a mobile signal.

Peru's Universal Access Fund, FITEL, executed its main tenders to provide payphones in rural and remote locations between 1998 and 2001. Only the incumbent operator and VSAT providers responded, as mobile services were not wide-spread, more expensive for consumers, and less economic at the time. In 2003 and 2004, the regulator OSIPTEL conducted a review of FITEL as well as how mobile operators could be involved in UA. Subsequently, a CDMA 450 pilot project was implemented and a project with Telefonica Moviles is currently to be approved. Also, cellular expansion in rural areas took place without subsidy from FITEL, because the government imposed coverage expansion obligations on Telefonica in conjunction with granting approval on the acquisition of Bellsouth last year.

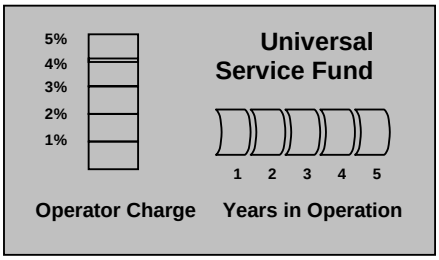
Philippines

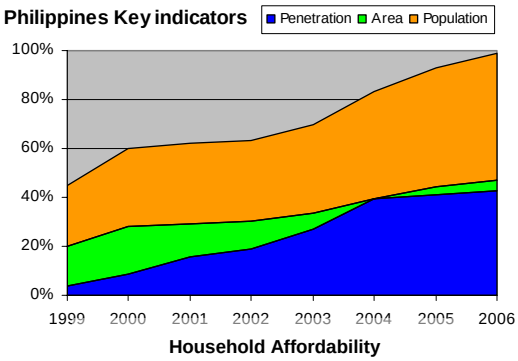




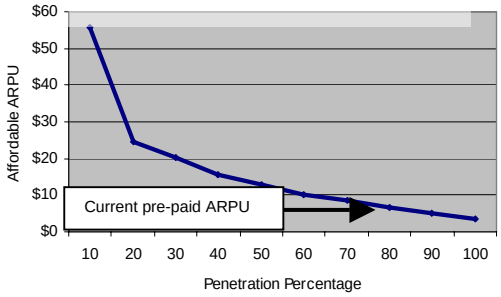
Population Density
272.1 Persons / Sq. Km

GSM Coverage
99% Population / 47% Area





Household Affordability



Summary

Mobile coverage in the Philippines has recently reached 99% of the country's 81.6 million people. The country has a penetration rate slightly above 40%. Reasons for Philippines' impressive results in the mobile sector include:

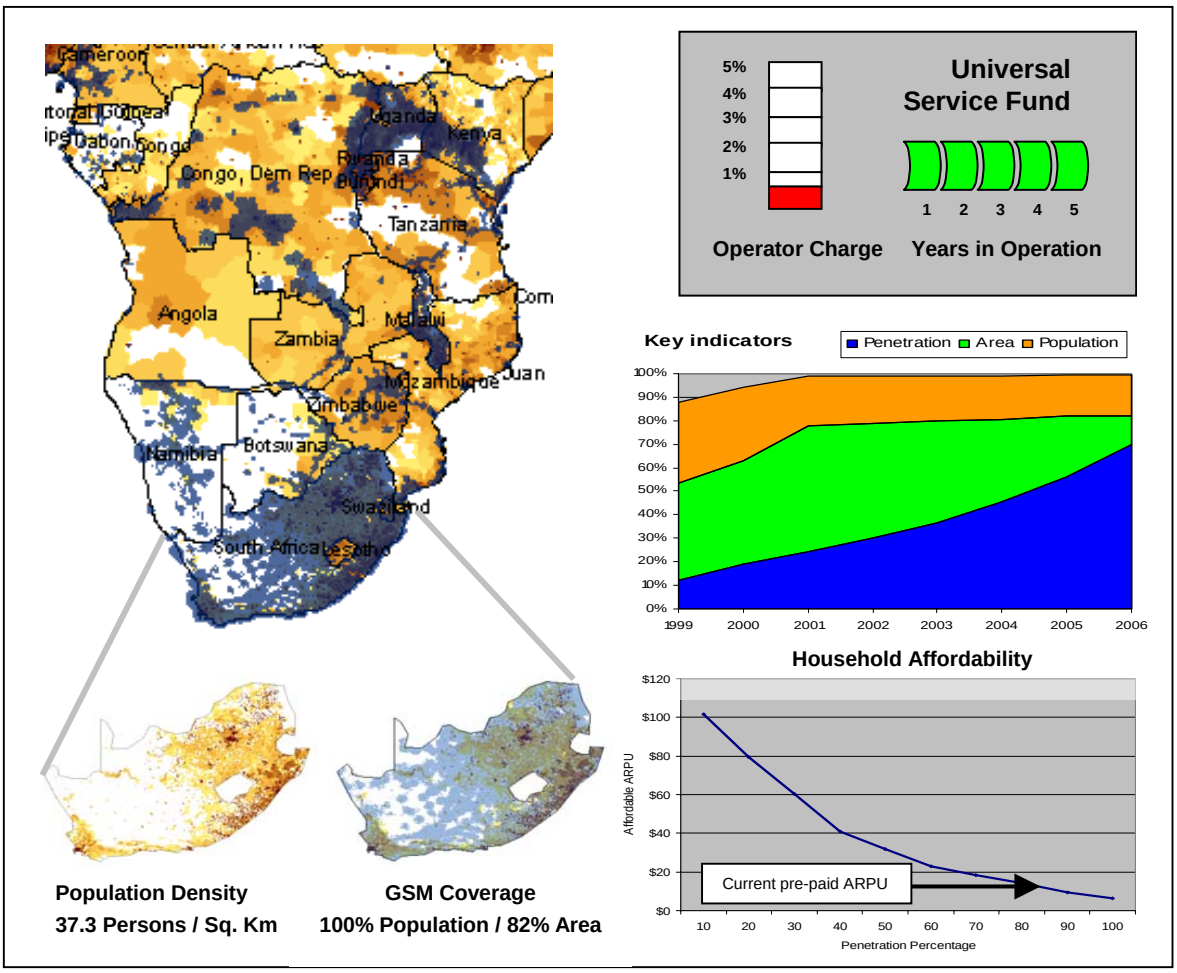
- Early liberalisation of the mobile sector (starting with two operators launching in 1994, third operator in 1999 and fourth in 2003);
- Conducive regulatory environment for mobile competition to prosper;
- Affordability of SMS led to early global leadership in SMS use per capita;
- Innovation of "micro-prepay" in 2003 boosted penetration;
- CPP regime;
- Early (from 1993) policy requiring coverage obligations from both fixed and mobile operators.

The household affordability model indicates that Philippines's current Pre-paid ARPU, which averages US$ 5.5 per month, is equivalent to the expenditure expected from marginal customers at the 70% household penetration level. This implies that at 40% teledensity *per inhabitant*, Philippines has probably achieved 50-70% *household penetration*. Philippines' mobile operators have managed their affairs in a low ARPU environment very efficiently, with a combination of innovative customer products and cost-cutting techniques well-suited to the environment.

To reach full household penetration, low-cost handsets are required, and marginal ARPU's would need to go down US$ 2-3. However, operators are offering very low tariffs (less than US$ 2 monthly) for users to stay on the network with few outgoing calls. The operators appear to have managed to expand geographically to all key rural population centres, maintaining controllable Capex and Opex costs.

The government's current Universal Access Policy is vague and the Fund is only established in law but not implemented, and thus had not played any role in the achievements so far. It is not clear if a fund is required for voice services but could possibly be useful to help fund broadband Internet deployments.

South Africa



Summary

South Africa has achieved by far the highest population coverage and penetration in Sub-Saharan Africa. Some parts of East Africa compare for coverage but not in terms of penetration. The household affordability model indicates that South Africa's current Pre-paid ARPU, which averages US$ 11-14 per month, is equivalent to the expenditure expected from marginal customers at the 80% household penetration level. This implies that at 70% teledensity *per inhabitant*, South Africa probably has achieved better than 80% *household penetration*.

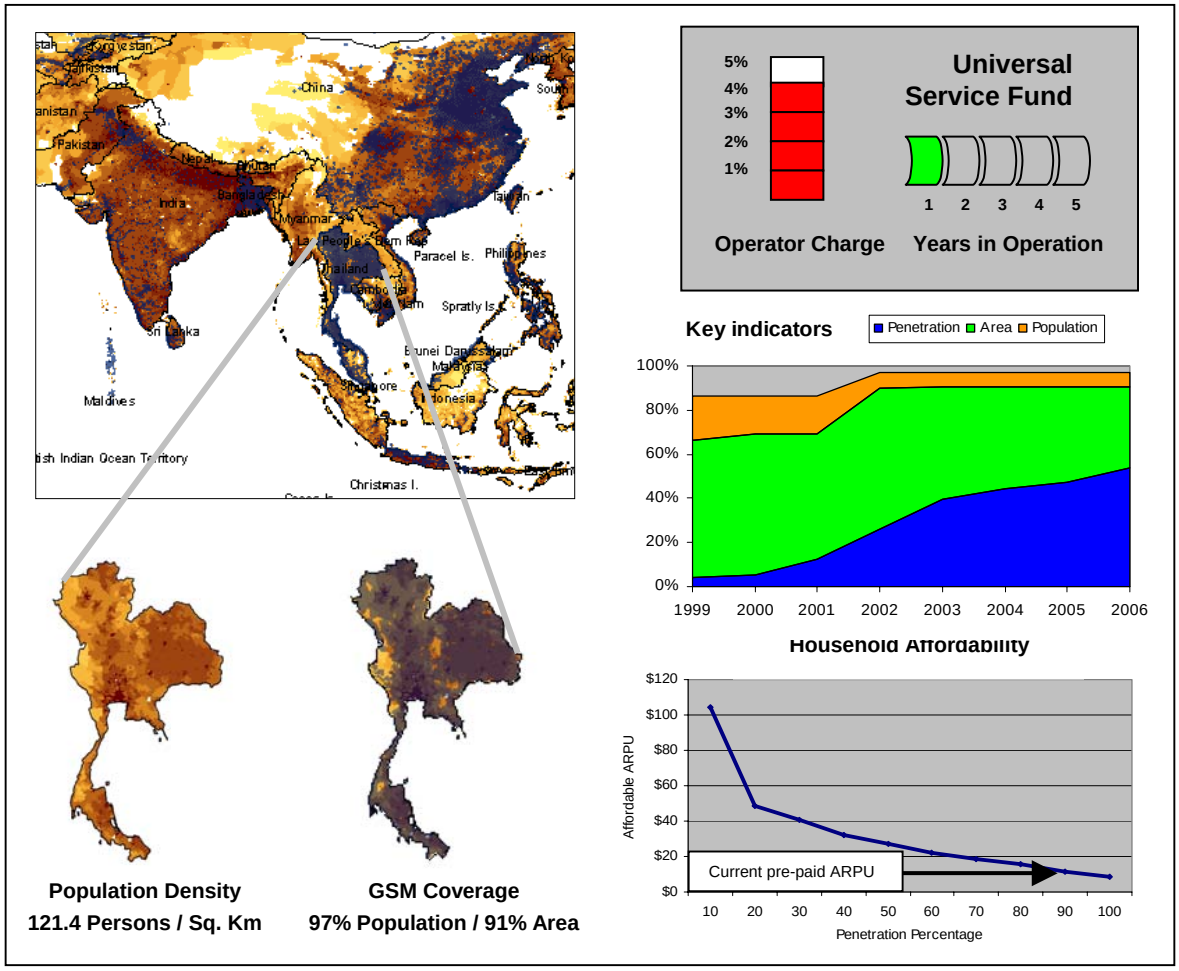
The second lowest income decile (i.e., those who will become subscribers between 80%-90% household penetration) will spend less than US$ 10 monthly and above 90% penetration expenditures will average US$ 6 per month. It would appear that with over 99% of population already covered, mobile is on target to be able to achieve universal service commercially in South Africa.

High coverage and high market penetration has been achieved in South Africa due to:

- Large population, mid-level per capita income & large total economy;
- High density population concentrations;
- Terrain relatively flat and easy to cover;
- Competition in mobile sector since mid 1990's;
- Government imposed roll-out and public access obligations on mobile operators, that had the impact of spreading coverage and a telecoms culture which led to high market penetration.

The government's Universal Access Policy and low-cost USF Strategy (0.5% of operator revenues) has had only limited direct impact, though it focused attention on areas of low teledensity, in which the mobile operators have subsequently achieved high penetration. The USF and other related initiatives also laid the groundwork and set agenda for ICT initiatives that are currently making progress in public access to the Internet and ICT services.

Thailand



Summary

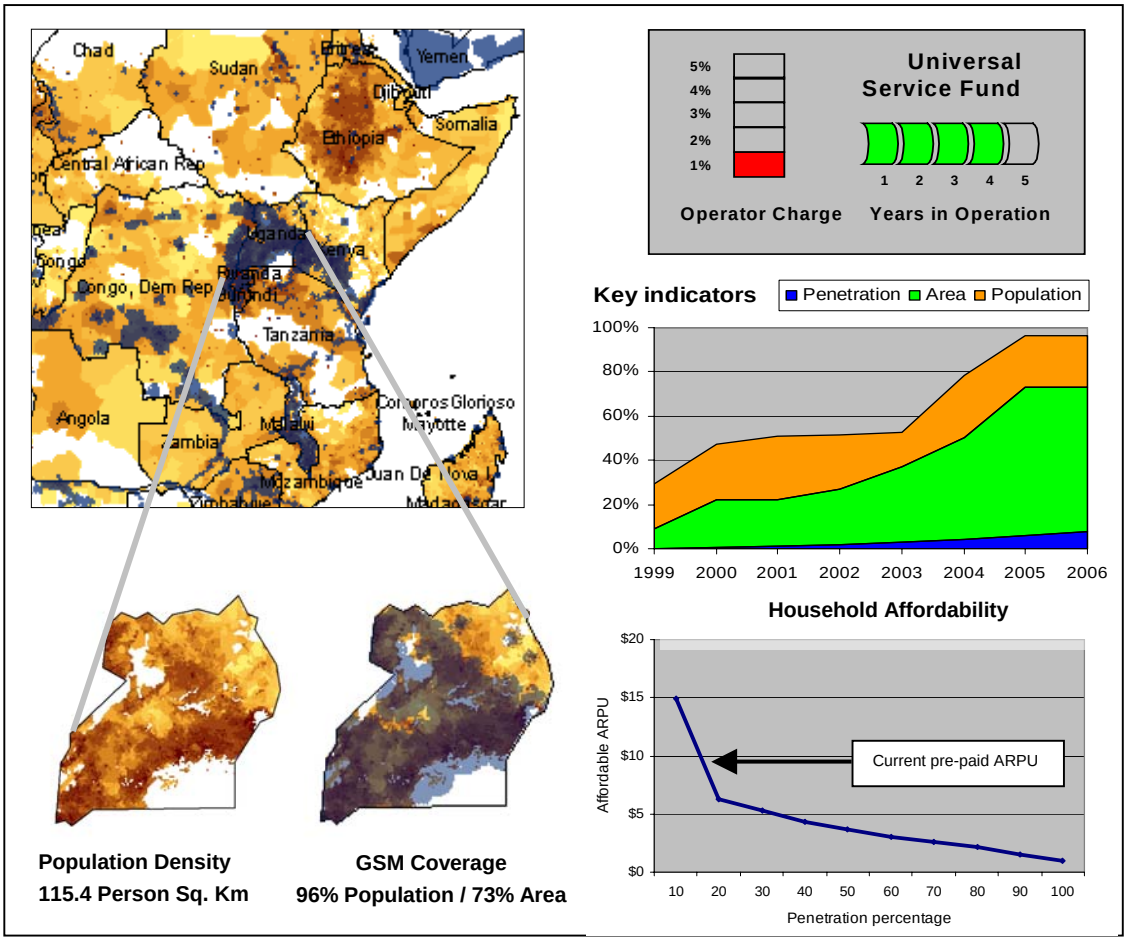
Thailand's five mobile operators reach over 95% of the population, which is slightly above average among other countries with the same income levels. Penetration levels, at 50%, are also above the trend line for countries of similar income. The key reasons for the success of mobile in Thailand are primarily the following:

- High level of competition between multiple operators, with ongoing price war leading to low tariffs affordable to the lower ,middle class;
- Availability of low-end handsets; and
- Limited coverage of fixed line telephones (still currently only at about 10%).

Thailand's current pre-paid ARPU averages US$ 8.50 per month; that is equivalent to the expenditure expected from marginal customers at the 85% *household* penetration level. To reach the remaining 15% of households, the marginal ARPU would have to go below US$ 8.50, however at least two of the operators are already offering monthly tariffs below US$ 2.00 for low-calling customers to stay connected. Hence the financial potential for achieving universal service commercially should be good if other conditions were favourable. On the other hand, UA by means of mobile is a challenge as only one operator has access to the GSM-900 frequency band. The mobile operators are also paying concession fees, access charges and excise taxes totalling between 23-39% of gross revenues. The ability to reach the last areas and 5% of population, and to achieve a positive return on capital for this segment, is therefore difficult to achieve for most operators.

A Universal Service Fund is established, but has not been operational, thus had no influence on the achievements to date. Operators are asked to either pay a 4% levy on revenue or provide services to remote areas. It is unclear at this point how this play or pay scheme will be operated in detail. Also, the targets set as 7 "lines" for every village do seem arbitrary and not necessarily related to demand or viability, though on balance probably achievable by mobile operators except for terrain factors.

Uganda



Summary

With 96% population coverage achieved via mobile networks in challenging economic conditions, the Uganda Communications Commission (UCC) has demonstrated how a least cost subsidy auction strategy can stimulate network rollout. Uganda is one of the few countries where universal access policy and its universal service fund have had a significant positive impact, delivering voice and data services countrywide. The policy, developed in 2000, in collaboration with the mobile industry, required the two main operators to declare which rural sub-counties they could or could not serve, thus relinquishing their exclusivity rights in specific areas.

UCC made available to operators a demand study for communication services in rural areas, which comprises 88% of the population. 154 non-exclusive sub-counties were identified and least cost subsidy tenders were won by MTN Uganda, a member of the South African group in 2005 and 2006. Along with its regular portfolio of services, MTN also maintains more than 4000 shared access village phones in those previously un-served areas. The reasons why mobile has been able to provide universal access in Uganda include:

- the introduction of competition using technology neutral licensing in 1998, prior to the privatisation of the incumbent operators;
- the presence of a trusted, independent regulator, which created a stable and competitive environment;
- the establishment of a universal access policy, which ensured that 100% of the universal service fund was allocated to mobile communications; and
- the existence of a universal service fund, which is focused primarily on reaching the last remaining geographical areas, as well as boosting national access to data communications.

Despite Uganda being in the top-tier of countries that have a high proportion of their population covered by mobile networks, it has a penetration level of 7%, which is below the average for Sub-Saharan Africa. This can be largely attributed to the punitive tax burden on mobile consumers, amounting to more than 30% of the total cost of ownership[45]. Uganda's priority must now be to lower taxes, so that the 25 million people who have access to mobile networks can afford to connect to, use and benefit from them.

[45] "Tax and the Digital Divide"