COMPETITION COMMISSION
INQUIRY INTO THE DATA SERVICES MARKET

Assessing key outcomes in the market for mobile data services in South Africa

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EXECUTIVE SUMMARY

South Africa’s Competition Commission recently launched an inquiry into the market for data services and has invited stakeholders that would like to participate in this inquiry to make formal submissions. The Commission has provided a list of questions as a guide for these submissions.

Vodacom has asked Frontier Economics (“Frontier”) to provide support in responding to these questions. In particular, Frontier has been asked submit an expert report reviewing key outcomes in the South African market for data services, covering two broad themes:

**Data prices**
- We review existing evidence on how data prices in South Africa compare with prices in other countries. In particular, we consider whether the Commission’s assertion that “…data prices in South Africa are significantly higher than many other countries, both in Africa and internationally.” is justified in relation to mobile data services.

**Access to spectrum and mobile backhaul**
- We consider the role of spectrum and fixed backhaul in South Africa’s mobile data services and set out the potential benefits that improved access to these resources would bring.

In compiling this report we have relied on publicly available information and evidence provided by Vodacom. As such, our conclusions and recommendations are based on that evidence. Given this, our report is focused on mobile data pricing in South Africa and does not consider evidence on the pricing of fixed data (broadband) services. This does not mean, however, that we believe that the Commission’s inquiry should be limited to a focus on mobile data prices.

**Our findings**

Overall, we do not find that the available evidence supports the Commission’s assertion that “…data prices in South Africa are significantly higher than many other countries, both in Africa and internationally.” Notwithstanding the inherent challenges associated with comparing mobile data prices across countries, which we describe in detail below, the available benchmarking evidence from ICASA and RIA does not show that headline data prices in South Africa are persistently or materially higher than in most African countries.

These findings are further supported by analysis of comprehensive datasets from ITU and GSMA, which shows that prices in South Africa are often among the lowest priced in the sample of all African countries and typically below the sample average. Even when considering a wider sample of all 150 countries from the GSMA database, headline prices in South Africa are broadly in line with the overall

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2 Q1 of the CC’s Call for Submissions: Data Services Market Inquiry
sample average, when taking into account differences in income levels across countries.

In addition, the GSMA data shows that South Africa is outperforming the rest of Africa on key non-price factors, such as coverage and speed of data services, and that South Africa offers one of the best ‘values for money’ in relation to mobile data services.

Whilst the available evidence indicates that the mobile market in South Africa is performing well relative to African countries, making more spectrum available and improving access to fixed backhaul for mobile services should help to reduce operator costs and therefore prices and improve quality of service.

We find that mobile operators in South Africa currently have significantly less spectrum available to them than operators in many other countries, particularly in the more developed OECD region. Making spectrum suitable for 4G services (i.e. 800 MHz, 1800 MHz and 2600 MHz) available as soon as possible could therefore be expected to bring a number of benefits. In particular, it would allow operators to increase coverage and capacity to meet rapidly rising demand in a cost-efficient manner.

We also find that improving access to fixed backhaul for mobile services, by granting operators access to existing duct and pole infrastructure, would help to ensure that the potential benefits of additional spectrum are to be fully realised.

The rest of this executive summary sets out our key findings in more detail.

**Benchmarking mobile prices is challenging and it is important to consider differences in economic and geographic factors across countries**

Measuring and comparing mobile prices is a complex exercise which requires a detailed analysis to draw any meaningful conclusions.

For example, most countries have many different mobile tariffs, with pricing promotions frequently being added and updated. A mobile tariff will have a number of different prices, such as a fixed recurring cost (if a post-paid contract), data prices, SMS/MMS prices, voice prices and prices for various value-added services. Therefore, the effective price depends on how a consumer uses that tariff plan as well as other factors (such as specific promotions) which is difficult to fully capture in cross-country comparisons.

Furthermore, it is important to take into account non-price outcomes, such as speed and coverage, and to recognise that these factors could vary significantly both across countries and over time. Without accurately capturing these non-price factors, it is not possible to correctly assess ‘value for money’ that end users receive from purchasing mobile data services.

Significant variation in economic and geographic factors across countries further complicates drawing robust conclusions from international benchmarking studies. For example, average income, which is likely to be closely linked to the level of development in the telecommunications sector, is significantly lower in South Africa.
than in the OECD region and varies significantly across the African and BRICS countries. Similar levels of variability are seen for other key factors, including average data consumption and the proportion of the population living in cities. Again, without taking into account differences in key underlying factors which affect both the structure and pricing of mobile data services in a given country, it is difficult to conclude what the observed prices actually say about the functioning or effectiveness of the mobile market in question.

The difficulties in developing meaningful comparisons are significantly enhanced as the size of the comparator group increases. This is because the variation in economic and geographical factors becomes more acute when considering a wider sample of countries at very different stages of development, both in terms of the evolution of telecommunications market and the wider economy.

Therefore, in determining whether prices in a given jurisdiction are “high”, the results of any price benchmarking should be analysed in detail and considered alongside a range of other evidence, particularly evidence relating to non-price factors.

Available evidence shows that South Africa performs well on headline price outcomes compared with other African countries. Notwithstanding these challenges with cross-country benchmarking, Frontier has looked at the available benchmarking evidence to assess the Commission’s assertion that data prices in South Africa are significantly higher than in many other countries. In particular, we reviewed existing studies that compare mobile prices in South Africa with prices in other African countries from ICASA and Research ICT Africa (RIA). These studies show that mobile data prices are typically lower in South Africa than the average for African countries, even before we take into account any differences in non-price outcomes in benchmark countries.

These findings are further supported by analysis of more comprehensive datasets from ITU and GSMA, which show that headline prices in South Africa are often among the lowest in their sample of African countries. Specifically, according to GSMA’s pricing index, South Africa is consistently the third cheapest country in Africa, behind only Egypt and Mauritius.

Even when considering a wider sample of all 150 countries in the GSMA database, and taking into account differences in income levels across these countries, headline prices in South Africa are actually broadly in line with the overall sample average. That is, South Africa does not seem to be underperforming on headline prices vis-à-vis the wider international sample.

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3 In line with the standard approach for mobile price benchmarking, the studies referred to in this report typically adopt a “hypothetical basket” approach which compares the price of the cheapest available plan in each country that delivers a particular combination (or basket) of voice, messaging and data. This is likely to typically correspond to the headline price of a bundle, which may in practice offer more data than is required to satisfy the basket.
South Africa’s mobile market performs well on non-price outcomes

As noted above, there are also multiple factors beyond the headline price of a bundle that affect mobile consumer outcomes including network coverage, network quality and data speeds. These non-price outcomes vary significantly across countries and it is therefore important to take them into account when benchmarking South Africa’s performance.

We find that South Africa performs well in comparison to a range of international benchmarks when considering key non-price outcomes for consumers that will affect their overall valuation of mobile services. For example:

- South Africa has the highest level of 3G coverage in Africa and South Africa and even ranks above significantly more developed countries like Canada, Ireland, Germany, Finland and Sweden.
- Coverage of 4G services in South Africa is significantly above the average for African countries.
- Take up of mobile (data) services is 2nd highest in Africa.
- Average download and upload speeds are far above other African countries

Studies that combine non-price factors with price factors to give a measure of overall value for money also indicate that South Africa is performing well relative to other African countries. In particular, according to the GSMA’s connectivity index (based on 2016 data) South Africa ranks second across the whole of Africa. It also performs in line with the wider sample average when considering all 150 countries (taking into account differences in income levels).

MNOs in South Africa currently have more limited access to spectrum than operators in other countries

Operators in South Africa have to rely on using just the 900MHz, 1800MHz and 2100MHz bands whilst in many other countries, operators already have access to additional spectrum which is suitable for the delivery of 4G data services – in particular, the 800MHz and 2600MHz bands, and in some cases also 700MHz.

Releasing this spectrum for mobile use would bring significant benefits to consumers in South Africa.

- Faster deployment of more efficient mobile technologies (4G/5G) will allow operators to provide better quality mobile data services at lower unit costs.
- The release of more low frequency spectrum for existing mobile operators will help to extend coverage and bring high quality data services to rural areas. This would help to achieve the Government’s vision for a “widespread...
communication system that will be universally accessible across the country”, as set out in South Africa Connect.

- The release of more high frequency spectrum will help operators to increase capacity to meet growing demand for data, especially in urban areas

Furthermore, by allowing existing operators to increase network capacity and coverage, the release of spectrum should also further deepen competition in the wholesale market in the future. Indeed, as we set out in our report submitted as a part of Vodacom’s response in ICASA’s Priority Markets Review, the auction would be likely to allow each operator to improve its position in relation to different competitive dimensions.

The benefits of additional spectrum would be further enhanced by increased investment in fixed infrastructure for use as mobile backhaul. To date, MNOs have partly relied on microwave backhaul. However, going forward, microwave services are unlikely to offer sufficient capacity, given the amount of traffic generated, and operators will become increasingly reliant on fibre backhaul. Providing alternative operators with access to existing duct and pole infrastructure would help to incentivise competitive investment in fibre by significantly reducing the costs of network roll-out. Infrastructure access would also make it more viable for mobile operators to build their own backhaul rather than relying on other operators to provide it.

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5 Frontier Economics, Assessment of the state of competition
6 For an explanation of key differences between fibre and microwave backhaul, see for instance http://www.rfwireless-world.com/Terminology/Fiber-vs-Microwave.html
1 INTRODUCTION

South Africa’s Competition Commission recently launched an inquiry into the market for data services and has invited stakeholders that would like to participate in this inquiry to make formal submissions. The main objectives of the inquiry are:

1. To gain a better understanding of the data services value chain
2. Assess the state of competition in the market
3. Benchmark South African data services pricing against those of other countries
4. Establish whether data supply quality and coverage is adequate by international standards and the country’s developmental needs

The Commission has provided a list of questions as a guide for stakeholder submissions in respect of the above objectives.

1.1 Context and purpose of this report

Vodacom has asked Frontier Economics to provide support in responding to the Commission’s Call for Submissions. Specifically, Frontier has been asked to submit an expert report reviewing key outcomes in the South African market for mobile data services, covering two broad themes:

Data prices

- We review existing evidence on how data prices in South Africa compare with prices in other countries. In particular, we consider whether the Commission’s assertion that “data prices in South Africa are significantly higher than many other countries, both in Africa and internationally” is justified in relation to mobile data services.

Access to spectrum and mobile backhaul

- We consider the role of spectrum and fixed backhaul in South Africa’s mobile data services and set out the potential benefits that improved access to these resources would bring in relation to mobile data services.


Ibid
1.2 Structure of this report

The rest of this report is structured as follows:

- Section 2 highlights the challenges associated with price benchmarking and considers available evidence on how price and non-price outcomes in South Africa’s mobile data market compare with outcomes in other countries.
- Section 3 considers the role of spectrum and fixed backhaul in mobile markets and sets out how South Africa would benefit from improved access to these key inputs.
MOBILE DATA PRICES IN SOUTH AFRICA

The Commission has asserted that “…data prices in South Africa are significantly higher than many other countries, both in Africa and internationally”. Based on the available evidence, this statement does not seem to be supported by the available evidence, at least not in relation to mobile data services.

With regards to mobile data prices specifically, we recognise that undertaking a meaningful comparison of prices across countries is a complex exercise and any evidence from benchmarking studies needs to be interpreted carefully.

Notwithstanding these challenges, the available evidence from existing studies by ICASA and RIA shows that, when compared to African countries, data prices in South Africa are generally below the sample averages. These findings are further supported by analysis of more comprehensive data sets compiled by the GSMA and ITU, which show that South Africa is generally outperforming other African countries on headline prices for mobile data services and that South Africa compares favourably also with a wider international sample, when taking into account differences in income levels.

The GSMA data also show that South Africa is outperforming the benchmark sample on key non-price factors, such as coverage and speed of data services and it is among the best performing countries in Africa in terms of ‘value for money’ for mobile data services (i.e. taking into account both price and non-price factors).

Below, Frontier:

- provides some background on the current state of competition in the South African mobile telecommunications market;
- discusses best practice and potential challenges in comparing mobile data prices across different markets; and
- presents existing evidence on prices for mobile data services in South Africa compared with international benchmarks.

2.1 Background on the state of competition

Data services in South Africa are delivered either via fixed networks (e.g. fibre or copper) or mobile networks. As take up of fixed broadband is low (and fell from 3.2% to 2.6% between 2014 and 2015), the majority of customers’ data consumption is served by the mobile sector.

Mobile data services are available to 99% of South Africa’s population and are delivered through the competing infrastructures of four mobile network operators (MNOs). In addition to the four network operators, a number of virtual network operators (MVNOs) offer important niche services to customers, thereby increasing customer choice and competition at the retail level.

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9 Q1 of the CC’s Call for Submissions: Data Services Market Inquiry
10 South Africa is below average across a range of pricing measures considered in existing benchmarking studies, with the only exception being the ‘500MB’ usage basket introduced in the latest ICASA’s benchmarking study covering the period from January 2016 to June 2017.
11 Vodacom and MTN cover 99% population with their own mobile network infrastructure, while Cell C and Telkom rely on roaming agreements for full coverage.
As we set out in detail in our Priority Markets report, despite differences in market shares, the MNOs compete across a range of dimensions, including:

- Prices;
- Coverage;
- Data speeds;
- Innovation; and
- Customer service.

They also face competition from a number of virtual network operators (MVNOs) that offer important niche services to customers at the retail-level, thereby increasing customer choice.

As a result no operator can act independently of its competitors and customers. Reasons for this include:

- Spectrum is distributed fairly evenly between the operators in South Africa;
- operators have the option to replicate each others’ coverage by extending their own network coverage or engaging in commercially negotiated roaming agreements and facilities-leasing based on the optimal strategy to minimise costs;
- operators are required to invest substantially to maintain their market positions;
- smaller operators exert a stronger competitive constraint than is suggested by market shares alone; and
- Vodacom is capacity constrained which may reduce its ability to maintain a leading position on speed and coverage in future.

The significant capital expenditure on mobile networks, made over the period 2012-2016 (particularly by the largest operator, Vodacom) also indicates that operators have to continuously invest and innovate to deliver a high level of customer satisfaction. Such behaviour is consistent with competition working effectively.

Furthermore, evidence relating to both price and non-price factors, set out in detail below, indicates that competition in the mobile sector is delivering good outcomes for consumers.

### 2.2 Comparing data service prices across countries

In this subsection, Frontier explains why:

- benchmarking mobile prices is inherently challenging and the results of benchmarking studies therefore need to be interpreted carefully;

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12 Frontier, Assessment of the state of competition, Section 4.1
13 See section 4.1.1 of Frontier’s Priority Market report for a more detailed description
14 Frontier, Assessment of the state of competition, Section 4.1.1, page 41
significant variation in key economic and geographic factors across countries makes it difficult to compare headline prices in South Africa with other countries;

any benchmarking of mobile prices also needs to take into account non-price factors such as coverage and speed; and

conclusions based on price benchmarking studies need to be balanced and considered against appropriate thresholds.

2.2.1 Benchmarking mobile prices is challenging

Measuring mobile prices is a complex exercise, so a detailed analysis is needed to assess prices both within specific countries and across countries. In comparing prices it is particularly important to recognise that non-price factors, such as speed and coverage, vary significantly both across countries and over time. Therefore, it is misleading to conclude that one country is more expensive than another country based on a simple comparison of headline prices, without taking into account differences in these non-price factors, in order to assess value-for-money more accurately.

The following sub-sections highlight the challenges faced when comparing prices both within and across countries. These challenges should be taken into account when interpreting different pricing studies and should be addressed, to the extent possible, in the Commission’s own pricing analysis, should it conduct such a study.

Challenges with measuring prices within a given country

Most countries have many different mobile tariffs, with pricing promotions frequently being added and updated. A mobile tariff will have a number of different prices, such as a fixed recurring cost (if a post-paid contract), data prices, SMS/MMS prices, voice prices and prices for various value-added services. Therefore, the effective price depends on how a consumer uses that tariff plan, which is not typically considered in price comparisons given the challenges in obtaining actual usage data. To get around this issue, many studies define different hypothetical consumption baskets (i.e. a given number of calls, SMS/MMS and data usage) and then find the cheapest tariffs for the given level of consumption. However, such an approach towards assessing prices requires due consideration of:

- **The fact that data, voice and messaging services are often sold as bundles:** Data is often sold as part of a combined bundle with voice and SMS/MMS messaging, and not as a separate service, making it challenging to isolate the price of data for comparison across countries. This is further complicated by the fact that handsets are often also included in mobile bundles.

- **Differences in non-price factors.** The approach assumes that consumers solely select their tariffs based on price, so simply choose the cheapest tariff available given their required consumption. However, consumers may also select operators on other factors, such as differences in network quality and customer service. As mentioned by RIA, “This is a clear indication that in a data environment, subscribers are not only concerned about the cost of going online;
other factors such as quality - coverage and speed - appear to be something for which users are willing to pay a premium." Therefore, it is unclear whether the estimated prices based on a hypothetical consumption basket will closely correspond to the value actually achieved by consumers.

- **Promotions.** Promotions play an important role in mobile markets. Prices can differ significantly for consumers depending on the point at which they renew contracts, or sign up to pre-paid tariffs because tariffs are often being introduced and withdrawn. For example, ICASA has stated that:

  “Promotions, bundles and dynamic pricing options reduce the effective tariff paid by subscribers.”

Comprehensive collection of data on promotions is important for pricing analysis as many consumers will take advantage of these promotions. We note that some studies have not included all tariffs in the market and may not capture promotions. Further, the point in time at which tariffs are collected for tariff analysis may significantly affect the relative prices of operators given the promotions available at the time.

- **Dynamic pricing and personalised offers.** A number of operators, such as Vodacom and MTN, offer dynamic pricing where they offer customers discounts depending on the congestion on the network in a given location. In addition, personalised offers may give customers access to tariffs designed to meet their needs and hence lower effective prices. These offers are difficult to capture in pricing indices and may not be included in many studies. For example, RIA’s most recent study excludes Vodacom’s “Just 4 You” tariff, mentioning “Vodacom’s 1GB offered under the “Just 4 You” promotion has an advertised price of R79, almost half the price of their 1GB product - incredible value for those using data primarily as text and voice substitutes. As the validity of “Just 4 You” products is customised for consumers, validity cannot be determined for the purposes of basket measurement and is therefore excluded.”

- **Relationship between the hypothetical consumption basket and the actual size of the bundled allowance.** As set out above, voice and data services are often sold in bundles. The cheapest tariff selected may in some cases have bundled allowances that far exceed the size of the hypothetical consumption basket. For example, under a basket approach, it may be that the cheapest tariff offers 100 minutes, whereas the hypothetical consumption is only 50 minutes. Actual usage will also affect the cost (and hence price) of supplying a particular bundle, since operators will need to invest in sufficient network to meet expected actual usage.

- **Expiry periods vary.** Operators, including Vodacom, often offer bundles with shorter expiry periods for a lower price as a way of widening access to data services to customers with different needs and preferences.

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11 Source: RIA, Policy Brief July 2017
12 ICASA – Briefing to Select Committee on Communications and Public Enterprises - “Briefing on Cost to Communicate and ECS/ECNS Compliance” (2 August 2017)
13 Source: RIA, Cost to Communicate, 2016
In addition to the challenges of measuring prices within countries, there are further complexities with comparing prices across countries:

- **Demand for mobile services**, and therefore prices, will be dependent on income which in turn depends on how well developed a country’s economy is. For instance, higher income countries are likely to have higher penetration of smartphones and thus higher demand for data services. The resulting higher quality of data services offered could be expected to be reflected in higher headline prices in these countries. Furthermore, we might expect to see lower prices for data services in countries where the market for data is still in its nascent stage, in order to encourage customers to migrate from traditional handsets to smartphones.

- **Network and service quality and coverage** may differ also across countries. Indeed, these differences seem to be acute across Africa. For example, operators may decide to increase the level of capital expenditure to deliver a better quality of service in a country. As we set out in detail below, South Africa is performing well compared to its peers when it comes to network. As such, a

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18 These challenges are also relevant for cross-country comparisons – e.g. out of bundle prices for the same basic package could differ between countries.
comparison of prices across countries which does not take these differences into account will not give an accurate picture of the different consumer experience in each country.

- **Network costs** are likely to differ by country, for example due to differences in geographic and demographic features that affect the cost of providing mobile services (e.g. population density, urbanisation), as well as differences in spectrum allocations. As such, differences in tariffs need to be interpreted with care – as they may relate to cost differences, rather than differences in the underlying level of competition.

- Benchmarking studies tend to provide a snapshot and therefore do not reflect the competitive dynamics between operators over time. For example, a market where operators have only recently upgraded their networks and increased network capacity may exhibit lower data prices which reflects MNOs' efforts to incentivise take up of data services, attract users to their network and thus increase network utilisation. Similarly, in markets where operators are currently facing capacity constraints data prices may be relatively high to help manage network congestion.

Given all these potential differences, cross-country price comparisons should be treated with caution. This is highlighted by the next section, which demonstrates that key economic and geographic factors, which are likely to affect the level of mobile pricing, vary significantly across countries and thus make robust comparisons with South Africa challenging.

### 2.2.2 Significant variation in key economic and geographic factors across countries makes comparisons with South Africa challenging

As noted above, in any cross-country comparison, there may often be significant variation in important demand and supply side factors across countries, which makes it challenging to develop robust conclusions.

To illustrate this point, this section compares South Africa with different international benchmarks (namely other African countries, the other BRICS countries and the OECD members) across a number of dimensions that are likely to influence prices.

For instance, the majority of the OECD economies are in a more advanced phase of development than South Africa's. This is illustrated by Figure 2, which shows that GDP per capita in South Africa and the other BRICS and African countries is significantly lower than the average for OECD members. The lower level of economic development will likely affect the level of development in the telecommunications sector and the nature of demand for mobile services. In particular, a number of studies have demonstrated that income is a key driver of demand for mobile services.\(^{19}\)

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\(^{19}\) See, for example, Kalba K. (2008), The Global Adoption and Diffusion of Mobile Phones http://pirp.harvard.edu/pubs_pdf/kalba/kalba-p08-1.pdf
At the same time, BRIC countries, whilst grouped together because of their faster economic growth history and prospects, represent a small sample of large and very diverse economies. For example, GDP per capita in Russia is currently around $23,000, whilst in India it is less than $7,000. On the other hand, India’s economy has grown at an average annual rate of 6.9% over the past five years (2012 – 2016), whilst Russia’s has grown by less than 1% on average over the same period. This makes any direct comparison of an ‘average’ BRIC mobile market outcome performance with South Africa challenging. We also note from Figure 2 that there is significant variation within Africa in terms of economic development and that GDP per capita in South Africa is significantly higher than in the majority of African countries.\(^{20}\)

These differences in the relative level of economic development appear to be reflected in demand for data services. In particular, data consumption is significantly lower in South Africa than in more developed regions such as North America and Western Europe, as shown in Figure 3.\(^{21}\)

\(^{20}\) We have tried to take into account these differences in the level of economic development in our comparison of prices across a wider international sample of 150 countries, as discussed in more detail in Annex A.

\(^{21}\) Note, Cisco’s forecasts combine the rest of Africa with the Middle East (excluding Saudi Arabia). It is therefore not possible to compare usage in South Africa with the Rest of Africa.
We also note that the mobile market in South Africa and other African countries is predominantly based on pre-paid offers, whilst mobile markets in OECD countries tend to be predominately post-paid. The relative share of pre-paid versus post-paid subscribers is likely to affect the costs of serving customers (on a per unit basis), and hence prices.

As noted above, geographic factors will also have an influence on the cost of supplying mobile data services. South Africa has a significantly lower proportion of its population living in cities than the OECD average (see Figure 4). However, significant differences in the urban/rural split also exist between African countries – 65% of South Africa’s population is urban compared to just 16% in Uganda. The proportion of the population living in urban areas is likely to affect the development of mobile networks and the cost of deployment. For example, the fact that cities tend to be more densely populated could mean that they are easier to cover and, all else being equal, a higher number of people served per square km covered should lead to a reduction in unit costs due to economies of scale. On the other hand, higher demand for mobile data services in cities may drive higher levels of network investment.

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22 According to Telegeography data, the pre-paid shares of subscribers for African operators are typically above 80%

23 For example, post-paid customers commit up front to a particular bundle and are typically on fixed term contracts. This means that they are likely to exhibit lower churn rates and may have more stable consumption patterns.
The above analysis shows that there is significant variation in factors that can be expected to influence mobile market outcomes, both across and within regions, highlighting the challenges associated with international benchmarking.

The difficulties in developing meaningful comparisons are enhanced as the size of the comparator group increases. This is because variations in economic and geographical factors become more acute when considering a wider sample of countries at very different stages of development, both economically and in terms of the evolution of the telecommunications market.

It is therefore important to consider variations in these exogenous factors, which are not directly related to competitive conditions, when interpreting evidence from international price benchmarking studies. In addition, as we set out below, one needs to consider non-price outcomes together with the results of price benchmarking.

### 2.2.3 Price benchmarking needs to take into account non-price factors such as quality

As explained above, there are factors beyond the headline price of a bundle that are likely to influence mobile consumer outcomes including network coverage, quality and speeds. In comparing prices it is particularly important to recognise that these non-price factors vary significantly both across countries and over time. Therefore, it is misleading to conclude that one country is more expensive than another country based on a simple comparison of headline prices, without taking into account differences in consumer outcomes other than price.
The existing benchmarking studies that we have identified, which we cover below, largely focus on a simple comparison of headline prices. When considering South Africa’s performance relative to other African countries, based on existing studies and data sources, we therefore try to take into account both price and non-price outcomes where possible, allowing us to more accurately assess the overall value for money that consumers of mobile data services obtain, across our benchmarking sample.

2.2.4 Conclusions based on price benchmarking studies need to be balanced and considered against appropriate thresholds

The relative performance of one country is typically assessed against some statistical ‘threshold’ measure, such as a sample mean (average), median or a certain quartile. Depending on which threshold is used, one can draw conclusions on the relative performance of the country in question, for instance, if it is consistently above or below the sample average.

Therefore, when evaluating any benchmarking evidence, it is important to carefully consider the appropriate ‘threshold’ for identifying relative underperformance, as well as allowing for a margin of error given the inherent complexities of undertaking any benchmarking across countries.

The Commission’s statement itself does not provide any clarity on what is the appropriate comparator measure, but simply states that data prices in South Africa are significantly higher than in ‘many other countries’. We understand that the Commission’s objective is to assess whether the competitive conditions in South Africa result in prices that may not be fully consistent with a competitive outcome. Therefore, in the absence of information on the competitive conditions in benchmark countries, for a benchmarking analysis to be indicative of a significant concern, prices in the country of interest, once appropriate adjustments have been made for other factors that could explain price differences (e.g. quality), would need to be consistently and materially higher than the average (or median) of a benchmark sample.

Below, we discuss existing benchmarking evidence that considers mobile data prices in South Africa relative to other African countries. We then evaluate additional evidence on non-price quality measures allowing us to better assess if South Africa represents good value for money, compared with relevant benchmarks.

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For example, consider a hypothetical scenario where (quality adjusted) mobile data prices in South Africa are lower than median prices in a benchmarking sample of 41 countries. This implies that prices in South Africa would be consistently lower than at least half of the countries considered in the sample, yet it could still be true that prices in South Africa would be higher than in ‘many’ other countries.
2.3 Available evidence does not indicate that South Africa is underperforming relative to other countries

In relation to the pricing of mobile data services, we do not believe that there is any evidence to suggest that South Africa is consistently underperforming vis-à-vis other countries.

In fact, when comparing prices using the most comprehensive set of price indices available (constructed by GSMA), the evidence suggests that South Africa is performing at a relatively good level compared to other African countries and, furthermore, that data prices in South Africa are in line with the best value for money countries in Africa, once we take into account key non-price factors such as speed and coverage. In particular:

- Whilst we note the problems associated with price benchmarking of this sort, existing studies from ICASA and Research ICT Africa (RIA) that look at headline mobile data prices in African countries do not imply that prices in South Africa are persistently and materially higher than those observed in other African countries.
- South Africa performs well in a comparison of GSMA and ITU data price indices with other African countries, with only two African countries (Mauritius and Egypt) identified as having consistently lower prices for mobile data.
- Even when considering a wider sample of all 150 countries in the GSMA database, and taking into account differences in income levels, headline prices in South Africa are actually broadly in line with the overall sample average.
- South Africa outperforms other African countries on non-price factors - take-up, coverage and speed of mobile data services.
- When taking into account non-price factors to derive ‘value for money’ measures for mobile data services, South Africa offers the second the best value for money for mobile data services in Africa: according to the GSMA connectivity index, South Africa ranks 2nd only behind Mauritius. Again, South Africa compares broadly in line with the wider international sample also when considering the GSMA connectivity index measure.

We discuss this in more detail below.

2.3.1 South Africa performs well on headline price outcomes compared with other African countries

In this subsection, we consider evidence from existing benchmarking studies regarding headline data price outcomes in South Africa relative to the rest of the African countries.
Headline data prices in South Africa are below relevant benchmarks, even before considering non-price factors

We have reviewed the existing studies on prices in South Africa from the ICASA and Research ICT Africa (RIA), which compare headline data prices with those in other African countries, and have analysed benchmarking indices constructed by ITU and GSMA.

As we set out in detail above, benchmarking studies that focus on headline prices are problematic as they fail to account for important variations across other dimensions. In particular, the existing benchmarking studies that we have reviewed, from ICASA and RIA, do not take into account the fact that quality of mobile services is higher in South Africa than in most other African countries. Nevertheless, the results from these studies do not point towards mobile prices being consistently higher in South Africa than in other countries.

In fact, they show that mobile prices are lower in South Africa than in many other African countries. This is reinforced by our analysis of GSMA and ITU data, which allows for a more comprehensive comparison of prices across countries and has South Africa ranking consistently amongst the cheapest countries in Africa across a range of data usage categories (entry, medium, high).

ICASA studies

ICASA publishes a periodical review of tariffs whereby it compares tariffs of different operators within South Africa. ICASA has also presented a comparison of tariffs across SADC countries (see Figure 5). According to ICASA’s own price benchmarking, South Africa’s prices are below the average for 1GB and 2GB bundles and fairly closely aligned with those of comparator countries. ICASA stated that:

“The benchmark exercise illustrates that on average, the data prices of the comparator countries are relatively higher than those of South Africa’s operators Vodacom, MTN, Cell C and Telkom Mobile.”

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25 Southern African Development Community
26 Pg. 17 ICASA “An analysis of Tariff Notifications submitted to ICASA for the period 01 July 2016 to 30 September 2016
27 ICASA – Briefing to Select Committee on Communications and Public Enterprises - “Briefing on Cost to Communicate and ECS/ECNS Compliance” (2 August 2017)
ICASA recently updated its benchmarking analysis 28, which broadly confirms results for 1GB and 2GB bundles 29. The update also introduces a comparison of

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28 ICASA (October 2017), Bi-annual report on the analysis of tariff notifications submitted to ICASA for the period 01 January 2016 to 30 June 2017
29 A comparison of the cheapest available 1GB packages shows South Africa to be below the sample average for Q1 2017. For 2GB, ICASA presents the same chart as above and reiterates its statement that
the cheapest prepaid 500MB tariff for a selection of African countries, with South Africa ranking 14th out of the 19 countries considered, some of which lie outside the SADC region.\(^{30}\)

It is important to note that ICASA’s analysis draws on a subset of African countries and that the group of comparator countries varies across bundles. It is not clear what the basis for country selection was and it seems to be partly determined by whether pricing data was readily available.

We also note that a more comprehensive analysis of 500 MB offers based on the GSMA and ITU data indicates that South Africa is performing well in relation to 500 MB basket, and even more so when controlling for differences in income levels across countries (this is discussed below under the GSMA evidence). This, together with the more general challenges associated with price benchmarking (noted above) makes it difficult to draw strong conclusions from the analysis.

Overall, the above evidence does not imply that mobile data prices in South Africa are persistently and materially higher than those observed elsewhere.

**RIA studies**

Over the years, Research ICT Africa (RIA) has been running several studies on mobile prices, comparing tariffs across countries in Africa and among operators within a country. Figure 6 presents the results for South Africa from a range of RIA’s studies.

<table>
<thead>
<tr>
<th>Figure 6</th>
<th>Results from main price benchmarking exercises by RIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RIA - OECD 1GB Basket (Q2 2017)</td>
</tr>
<tr>
<td>Methodology</td>
<td>The price is the cheapest offer available for a 1GB data basket per month in a given country</td>
</tr>
<tr>
<td>Results for South Africa</td>
<td>28th/ 50 African countries</td>
</tr>
</tbody>
</table>


“on average, the data prices of the comparator countries are relatively higher than those of South Africa’s operators.”

\(^{30}\) ICASA (October 2017), Bi-annual report on the analysis of tariff notifications submitted to ICASA for the period 01 January 2016 to 30 June 2017

\(^{31}\) [http://www.researchictafrica.net/pricing/ramp.php](http://www.researchictafrica.net/pricing/ramp.php)

\(^{32}\) Considers prepaid data top-ups or bundled top-ups only.

\(^{33}\) Where: Qi=volume of each bundle component, Pb=bundle final Price, Pi=USD value assigned to each bundle component i (voice, sms, data). The same values apply to all countries and they are:

1 on-net SMS = 0.0005 USD
Within these, South Africa is generally towards the cheaper end of all countries, particularly on measures that do not just focus on single prices. For example, for the 2017 Value for Money Index (VMI), which compares the value of the contents of a bundle with the bundle price, South Africa is 10th cheapest of 35 African countries. Furthermore, the index does not take into account all non-price measures, such as network speeds or coverage, so is likely to understate South Africa’s performance.

The most recent study looks at the headline price of the cheapest offer available for a monthly 1GB data basket across 50 African countries, with South Africa ranking around the middle of the sample (28th), with average prices below the sample average. RIA also presented some updated benchmarking analysis to Parliament in October 2017, which tells a similar story - South Africa ranked in the middle (25th out of 50) for the 1GB basket in Q3 2017.

**International Telecommunication Union (ITU) data**

ITU calculates and publishes the price of a standard 500MB prepaid (handset) basket for international comparisons. Analysis of this data shows that South Africa ranks 14th cheapest amongst a sample of 39 African countries. The ITU also presents a 1GB basket focusing on mobile broadband for computer-based access; South Africa is 4th cheapest in the sample.

**GSMA data**

In addition to reviewing the above benchmarking studies, we have analysed GSMA price index data, which allows for a more comprehensive comparison of prices across countries. The GSMA calculates an index for three different usage baskets (entry, medium and high data usage), where the price of mobile tariffs is expressed relative to the average income level in a given country (based on Gross National Income per capita measure in line with the ITU methodology). The GSMA normalises these values to obtain a score between 0 and 100, where a high score means lower prices.

South Africa outperforms other countries in Africa on headline prices

Figure 7 presents the GSMA pricing index values for 41 African countries included in the GSMA database. As the charts show, South Africa is consistently ranked amongst the cheapest in Africa.

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1 anytime SMS = 0.001 USD  
1 on-net minute = 0.001 USD  
1 anytime minute = 0.002 USD  
1 MB (for Social Media only) = 0.005 USD  
1 MB data = 0.01 USD

34 Note, unlike other measures referred to below, “value for money” in this context does not reflect non-price factors. Rather, it is a measure of the value of the data, voice and SMS included in the bundle relative to the price of the bundle.

35 RIA (October 2017), Data pricing trends in South Africa - PPC presentation by Research ICT Africa, slide 4

36 Gross National Income (GNI) per capita is used as a proxy for average income in a country, and is presented in Purchasing Power Parity (PPP) terms to take into account differences in purchasing power across countries.
Figure 7  GSMA Mobile sub-basket scores

Entry basket (100MB)

Medium Basket (500MB)

High Basket (1GB)

Source: Frontier analysis using GSMA Mobile Connectivity Index data
South Africa performs in line with the sample average when considering a wider set of international benchmarks

As we set out in Section 2.2 above, we recognise that variations underlying economic and geographic factors make it difficult to compare directly prices across different countries. In particular, the results of the above benchmarking will to some degree reflect the fact that South Africa is at a more advanced stage of development than many other African countries. Similarly, it is difficult to draw meaningful conclusions from a direct comparison of prices in South Africa with more developed countries in the OECD.

We have therefore undertaken some initial statistical analysis across the whole GSMA sample of 150 countries, which takes into account differences in income levels across countries. Our analysis of this data indicates that there is a positive and high correlation between the per capita income level of a country and the level of mobile data price scores, varying by the size of the data bundle. Since a higher price score in the GSMA dataset indicates lower headline prices, this means that a country with higher average per capita income tends to have cheaper mobile data baskets (measured as a percentage of GNI per capita), all else the same (see Annex A for more detail).

The results from this analysis suggest that, once we take differences in these factors into account, prices in South Africa are broadly in line with the overall sample average. This is illustrated in Figure 8 below, which plots the GSMA price index for the 500 MB mobile basket against the GSMA score for average income (GNI per capita). As can be seen on the horizontal axis, South Africa has an average income score around 55, which puts it towards the middle of the sample. Given this level of income, the correlation analysis suggests that we would expect South Africa's price score to be below 60, i.e. if we project South Africa's income level on the correlation line (see dotted red line on the chart). Nevertheless, the actual price score for South Africa (the dark green dot) is above the correlation line and the actual price score is above 60 (see the full red line on the chart). The fact that South Africa is above the fitted line implies it outperforms the sample on headline prices for the 500 MB usage basket, i.e. the observed headline prices are below expected level after adjusting for differences in average income.

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37 The GSMA standardises all of the individual indicators meaning that they take on a value between 0 and 100, with 100 being the best score. For example, if a country has an average income score of 100, it means that the incomes in the country are the highest in the sample. Similarly, if its mobile data price is 100, then it means that the price is very low. A linear relationship between the price scores and income levels per capita fits the actual data with an accuracy of 57-80%.

38 It has to be noted that the price scores in the GSMA Intelligence data are already as a percentage of the GNI per capita of the country, which would explain the high degree of correlation. Nevertheless, this would not affect the linear fit, and South Africa's performance with respect to it.
These findings hold also for the other two usage baskets in the GSMA sample, 100 MB and 1 GB usage baskets: when taking into account income differences across countries, headline prices in South Africa for these baskets are broadly in line with the sample average (see Annex A).

South Africa also performs well on ‘value for money’ measures relative to other benchmarks.

The GSMA has recently constructed a connectivity index for the mobile sector, which incorporates both price and non-price factors. The index is designed to measure mobile internet connectivity by considering four connectivity enablers: infrastructure (which effectively captures quality and availability), affordability (which captures price and income factors), consumer readiness and content. A range of indicators feed into these four enabler categories. Indicators are weighted to construct the scores for each enabler and each enabler is given a weight of 25% to construct the overall score.

As shown Figure 9, South Africa is ranked second best in the whole of Africa on this index, behind only Mauritius.

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39 Input data is adjusted to remove outliers (that might affect the skewness of the data for example) and then the data is normalised so that all indicators are measured on a scale of 0 to 100. The “min-max methodology is then used which transforms all indicators so that they lie within a range between 0 and 100” As part of the normalisation process, all indicators are also transformed such that they have the same orientation – i.e. a higher score always represents a ‘better’ score.
Again, when considering the whole sample of 150 countries, South Africa’s performance is in line with expectations given the current level of economic development (see Annex A).

The Broadband Value for Money Index (VMI) study by Research ICT Africa from 2014 is the only other study we are aware of that takes account of quality factors such as speeds when comparing data offers by operator across all African countries. The study found that data offers from Vodacom and MTN ranked 6th and 8th respectively in terms of value for money, across all African operators.

Innovative features of mobile offers are not captured by comparisons of headline prices

The mobile market has been characterised by a number of innovations in the way operators offer their services to consumers in recent years, which are not captured by the headline price benchmarking summarised above. These include

- **Zero-rating of data**: MNOs have tariffs with zero-rated data for applications like WhatsApp and Facebook. In addition, data used in accessing university websites by students is zero rated. This means end customers are not charged for data used on these applications.

- **Value added content**: Operators also attract customers by providing value added content through their networks. For instance, MTN launched an online music platform in March 2017, with the data for music streaming being zero-rated to all MTN customers with an active bundle. Similarly, Telkom Mobile offers a free online e-learning service to all its customers.

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### Source: Frontier analysis using GSMA Mobile Connectivity Index data

### Figure 9  GSMA Mobile Connectivity Index scores

![GSMA Mobile Connectivity Index scores graph](image_url)

The study looks at ratio of the average download and upload speeds (kbps) over the price (USD) of 1GB of data per month. The higher the score, the higher the value for money.
Other pricing innovations: There have been other innovations by operators when it comes to pricing and data. MTN launched a service called ‘Shifta’ that allowed users to customise their own contracts by choosing the amount of data and minutes to be included, as well as the duration. Cell C launched a service that allows users to link multiple SIM cards to one primary SIM, while another service by MTN allows an MTN customer to share their data bundle with other MTN numbers. Operators like Vodacom and MTN also have dynamic pricing, with varying discounts to customers based on the traffic over their networks.

Overall, the available evidence shows that South Africa performs well on price outcomes compared with other countries.

Notwithstanding the limitations associated with price benchmarking, the existing evidence summarised above does not suggest that prices in South Africa are high relative to other African countries. On the contrary, prices in South Africa are below the sample average for the majority of price measures considered.

Within Africa, South Africa also ranks amongst the best in terms of value for money for mobile data services, based on price indices which take into account non-price factors.

In addition, when taking into account differences in levels of income across countries, headline prices and ‘value for money’ measures in South Africa are broadly in line with a wider sample of international comparators available in the GSMA database.

2.3.2 South Africa outperforms other African countries on non-price outcomes

Below, we present additional evidence regarding non-price outcomes in South Africa relative to the rest of the African countries.

South Africa outperforms African countries on take-up, coverage and quality

South Africa performs well in comparison to a range of international benchmarks when considering the range of non-price outcomes for consumers that will affect a consumer’s overall valuation of their consumption of mobile services. In particular, analysis conducted for our Priority Markets report found that:

- South Africa has the highest level of 3G coverage in Africa and even ranks above significantly more developed countries like Canada, Ireland, Germany, Finland and Sweden.
- Coverage of 4G services in South Africa is significantly above the average for African countries.
- Take up of mobile (data) services is 2nd highest in Africa.
- Average download and upload speeds are far above other African countries.
- On latencies, South Africa is doing much better than African countries.
- On international bandwidth, South Africa is outperforming all other African countries.
Figure 10 summarises South Africa’s ranking relative to all African countries and the SADC countries used in ICASA’s recent pricing benchmark across the range of non-price measures we considered.

**Figure 10  Summary of non-price benchmarks (ranked)**

<table>
<thead>
<tr>
<th></th>
<th>All African countries</th>
<th>SADC countries used in ICASA’s recent pricing benchmark (see below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of countries in</td>
<td>41</td>
<td>12</td>
</tr>
<tr>
<td>sample</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall take-up</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>2G coverage</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>3G coverage</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>4G coverage</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Download speeds</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>Upload speeds</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*Source: Frontier based on GSMA and Telegeography*

We also note that South Africa performs significantly better in terms of 3G/4G coverage and mobile speeds than the two countries that consistently out-perform it on price - Egypt and Mauritius. This illustrates the importance of considering non-price data alongside the evidence from the price benchmarking studies set out above.

### 2.4 Conclusions on mobile data prices

The available evidence suggests that the Commission’s assertion that data prices in South Africa are ‘significantly higher than a number of other countries’ is not justified in relation to mobile data services.

In fact, notwithstanding the issues associated with price benchmarking highlighted above, the evidence suggests that South Africa is performing at a relatively good level compared with other African countries on headline prices. Furthermore, prices in South Africa are in line with best value for money in Africa when we account for non-price outcomes. In particular:

- South Africa performs well on headline data prices compared with other African countries, with existing studies reporting data prices in South Africa below sample average and only two African countries (Mauritius and Egypt) identified as having consistently lower prices for mobile data when compared using GSMA’s mobile price index dataset;
- When compared with a wider set of benchmark countries available within the GSMA dataset, South Africa performs broadly in line with the sample average on headline prices, when taking into account differences in income levels across countries;
- South Africa ranks highly on value for money measures, which take into account non-price factors such as coverage, quality, availability and affordability: according to the GSMA connectivity index, South Africa ranks 2<sup>nd</sup>
only behind Mauritius and is in line with the wider international sample, when taking into account income differences; and

- South Africa performs very well compared to other countries on non-price factors (take-up, coverage and speed of mobile data services).
3 ACCESS TO SPECTRUM AND BACKHAUL

3.1 Introduction

As set out above, the available evidence suggests the Commission’s assertion that data prices in South Africa are high does not appear to be justified in relation to mobile data services. It is nevertheless important to note that making more spectrum available and improving access to mobile backhaul should help to reduce operator costs and therefore prices.

This section looks at the role of spectrum and backhaul in the mobile market and considers how they affect the costs and quality of data services in South Africa. We find that:

- access to spectrum and to fibre backhaul capacity plays a critical role in allowing operators to increase capacity to meet growing demand and to improve coverage;
- the delay in the release of 4G spectrum is likely to give rise to capacity constraints and to make it more expensive for operators to expand 4G coverage;
- making additional spectrum available as soon as possible would bring significant benefits including alleviating capacity constraints, reducing the cost of network expansion, allowing the deployment of more efficient technologies and enhancing competition; and
- improving access to fibre backhaul – in particular, through the implementation of duct and pole access regulation – will be vital to ensure that the potential benefits of the additional spectrum can be fully realised.

3.2 Access to spectrum and to backhaul is critical for MNOs’ ability to offer high quality data services at an efficient cost

Spectrum and backhaul are critically important to mobile networks. Spectrum relates to the radio frequencies that are used to transmit signals between base stations and mobile handsets, whilst backhaul is the infrastructure that connects mobile base stations to the operator’s core network. Network capacity to meet demand for data is delivered by a combination of the number of base stations, spectrum and backhaul capacity.

The total amount of spectrum available as well as the type of spectrum in use plays a pivotal role in determining the cost and quality of mobile data services that MNOs are able to offer within their Radio Access Network (RAN). Access to low frequency spectrum reduces operators’ cost of increasing coverage and improving in-building coverage by reducing the number of new sites and investment in network equipment required. This is because low-frequency transmissions can travel greater distances before losing their integrity, and can pass through dense objects.

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Vodacom’s functional response to the ICASA’s Priority Market Review, Annexure A, Section 5.1, page 16
more easily.\textsuperscript{43} Higher frequency spectrum, on the other hand, has poorer propagation properties but can carry more data and can therefore reduce the cost of expanding capacity.

Mobile backhaul also has an important role to play in expanding network capacity and coverage. Increasing demand for mobile data services and the increasing amount of data traffic generated within RANs imply that MNOs will have to increasingly rely on fixed backhaul services to connect base stations to the core network. To date, MNOs have partly relied on microwave backhaul, which is inferior to fibre. Going forward, microwave services will not offer sufficient capacity given the amount of traffic generated.\textsuperscript{45} Since backhaul costs represent a considerable proportion of total network costs for mobile operators, it is important that mobile operators have access to fibre backhaul at an efficient cost, either by renting capacity from other operators on fair and reasonable terms or by using Telkom’s ducts and poles to roll out their own networks. As an illustrative example of the relative importance of backhaul costs, Ecorys for instance estimated that:

“20%-40% of annual mobile network capex is dedicated to backhaul due to high equipment costs. In addition, backhaul costs account for anywhere between 30% and 40% of network operating costs, notably on leased links. Backhaul-related capex is thus significant and can represent up to 40% of total mobile network costs”\textsuperscript{47}

3.3 MNOs in South Africa currently have more limited access to spectrum than operators in other countries

Operators in South Africa have to rely on using just the 900MHz, 1800MHz and 2100MHz bands whilst in many other countries, operators already have access to additional spectrum which is suitable for the delivery of 4G data services – in particular, the 800MHz and 2600MHz bands, and in some cases also 700MHz.\textsuperscript{48} As a result, mobile operators in South Africa have smaller spectrum holdings than operators in many other developed countries. For example, and despite the issues with releasing spectrum in some countries in the EU, Vodacom still has significantly less spectrum in South Africa.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure11.png}
\caption{Spectrum holdings for Vodacom/Vodafone across different countries}
\end{figure}

\begin{small}
\textsuperscript{43} https://www.gsma.com/spectrum/what-is-spectrum/
\textsuperscript{44} https://www.gsma.com/spectrum/what-is-spectrum/
\textsuperscript{45} Frontier, An assessment of the state of competition, Section 4.4.4, page 86
\textsuperscript{46} http://www.dwireless-world.com/Terminology/Fiber-vs-Microwave.htm
\textsuperscript{47} Ecorys – “Future electronic communications markets subject to ex-ante regulation” (18 September 2013)
\textsuperscript{48} https://www.gsmaintelligence.com/research/?file=ce83a15f514406924d00ecbc155de304&download
\end{small}
At the same time, South Africa is facing rapidly increasing demand for mobile data. According to estimates from Cisco⁴⁹, mobile traffic per user in South Africa will reach 4,008 MB per month by 2021, up from 564 megabytes per month in 2016.

Further delay in the release of new spectrum to meet growing demand could mean that South Africa ends up with significantly less spectrum (per mobile user) than other developed countries. To demonstrate this, we have looked at how forecast consumption per user in South Africa compares with current consumption per user in a number of major European countries that already have access to additional 4G spectrum. As Figure 11 below shows, data consumption per user in South Africa was lower than in the other countries considered in 2016 but is set to exceed current levels in these countries by a significant margin by 2021.

**Figure 12  Comparison of monthly mobile data consumption per user**

This would imply that, unless further spectrum is released, the availability of spectrum relative to the level of demand for data in South Africa will fall well below current levels observed in other developed countries where 4G spectrum is already available.

Limited access to spectrum already appears to be giving rise to capacity constraints, which in turn will drive up costs. In particular, Vodacom has noted that at present, the only low frequency spectrum that operators have access to, is in the 900MHz band. Since Vodacom still needs to use spectrum to serve 2G and 3G customers, it does not have sufficient capacity to re-farm it for 4G. This means that it has had to rely on 1800MHz, which makes the provision of 4G more expensive as the lower range offered by higher frequencies means that more sites are needed.⁵⁰ Vodacom also envisages that operators are likely to become increasingly capacity constrained in the absence of additional high frequency spectrum as data usage increases. It points out that the lack of spectrum would mean that more sites and equipment will be needed to increase capacity, which would push up costs.

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⁴⁹ https://www.cisco.com/assets/sol/sp/vni/forecast_highlights_mobile/#–Country
⁵⁰ Vodacom’s functional response to the ICASA’s Priority Market Review, Annexure A, Section 5.1, page 16
3.4 An early release of additional spectrum for mobile services would lead to significant benefits

The importance of providing additional spectrum for the mobile sector in South Africa has been recognised by a number of authorities. In particular, ICASA itself has noted that “The delayed assignment of high demand spectrum (700MHz, 800MHz) hampers ability of industry to provide latest broadband technology such as LTE” and that “The unavailability of additional spectrum remains a key constraints to operators’ ability to reduce data costs”. Similarly, the Government’s South Africa Connect report stated that “the cost of not making this spectrum available is high.”

ICASA issued the Invitation to Apply (ITA) on 15 July 2016, for a radio frequency spectrum licence to provide mobile broadband wireless services in urban and rural areas using the complementary bands 700MHz, 800MHz and 2.6GHz. However, this ITA is currently subject to a legal challenge which entails further delays. Releasing this spectrum for mobile use would bring significant benefits to consumers in South Africa.

- Faster deployment of more efficient mobile technologies (4G/5G) will allow operators to provide better quality mobile data services at lower unit costs. As the chart below shows, successive mobile technologies have brought dramatic reductions in cost.

**Figure 13 Unit costs for successive mobile technologies**

![Image of the chart showing unit costs for successive mobile technologies](https://www.gsma.com/spectrum/wp-content/uploads/2012/03/22092009182239.pdf)

*Source: https://www.gsma.com/spectrum/wp-content/uploads/2012/03/22092009182239.pdf*
Each new technology generation also allows operators to offer significantly faster data speeds and brings other benefits, such as lower latency and greater reliability.

The release of more low frequency spectrum will help to extend coverage and bring high quality data services to remote / rural areas. This would help to achieve the Government's vision for a “widespread communication system that will be universally accessible across the country”, as set out in South Africa Connect.  

The release of more high frequency spectrum will help operators to increase capacity to meet growing demand for data, especially in urban areas. By allowing operators to increase capacity and coverage, the release should also improve competition in the wholesale market in the future. Indeed, as we set out in our priority market report, the auction envisaged in the ITA would be likely to allow each operator to improve its position in relation to different competitive dimensions.

The benefits of additional spectrum would be further enhanced by increased investment in fixed infrastructure for use as mobile backhaul. To date, MNOs have partly relied on microwave backhaul. Going forward, microwave links are unlikely to offer sufficient capacity given the amount of traffic generated. Operators will therefore become increasingly reliant on fibre backhaul capacity.

Providing alternative operators with access to existing duct and poles infrastructure would help to incentivise competitive investment by significantly reducing the costs of network roll-out. Infrastructure access would also make it more viable for mobile operators to build their own backhaul rather than rely on other operators to provide it.

It is important that the design of any duct and pole access remedies in South Africa take into account international precedent in this area. In particular, ICASA should draw upon the experience of EU countries where passive infrastructure has already been introduced, such as the UK, Spain and Portugal. We set out in our priority market report a number of features that duct and pole access regulation should include, based on this experience. These include minimal usage restrictions, mechanisms to guard against discrimination, enforcement penalties and access for all operators to up-to-date information about the location and availability of ducts and poles.

54 Department: Communications - SOUTH AFRICA CONNECT: CREATING OPPORTUNITIES, ENSURING INCLUSION (20 November 2013), page 2  
55 Frontier, An assessment of the state of competition, Section 4.2.2, page 76  
56 For an explanation of key differences between fibre and microwave backhaul, see for instance http://www.rfwireless-world.com/Terminology/Fiber-vs-Microwave.html  
57 Frontier, An assessment of the state of competition, Section 5.2.2, page 103
3.6 Conclusions on access to spectrum and backhaul

Overall, we find that, whilst South Africa appears to be performing well relative to other African countries on both price and non-price outcomes, making 4G spectrum available to operators as soon as possible would bring a number of significant benefits, particularly in the context of rapidly rising demand for data.

However, it is likely that operators will struggle to fully realise the potential benefits associated with this additional spectrum without adequate access to fixed infrastructure for mobile backhaul. Granting access to existing passive infrastructure (i.e. ducts and poles) has a key role to play here, by reducing the cost of deploying fibre and incentivising competitive roll-out.
ANNEX A COMPARING MOBILE DATA PRICES BASED ON A WIDER INTERNATIONAL SAMPLE

A.1 Introduction

As set out in Section 2.2 above, studies which seek to benchmark mobile prices across different countries should also take into consideration other factors that differ across countries and can potentially influence mobile data pricing.

In this annex, we specifically consider variations in the level of economic development across countries and how to take this into account when undertaking a price benchmarking exercise across a wide range of comparators. We then show how South Africa performs in terms of price outcomes against a wider international sample when we take into account differences in income levels as a proxy for level of economic development.

A.2 Analysis

A.2.1 Income is an important driver of mobile market outcomes

Available research indicates that a level of economic development will likely affect the level of development in the telecommunications sector and the nature of demand for mobile services. In particular, a number of studies have demonstrated that income is an important driver of demand for mobile services and as such is likely to have an effect on mobile market outcomes in a given country, including mobile prices.

As shown in Figure 14 below, there is a large variation in terms of average income (measured as GNI per capita) across the sample of 150 countries available in the GSMA database. This large variation in income levels makes it challenging to directly compare mobile market outcomes across countries.

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58 See, for example, Kalba K. (2008), The Global Adoption and Diffusion of Mobile Phones http://pirp.harvard.edu/pubs_pdf/kalba/kalba-p08-1.pdf
59 We use Gross National Income (GNI) per capita as a proxy for average income in a country, and we present GNI data in Purchasing Power Parity (PPP) terms to take into account differences in purchasing power across countries.
60 As explained in the main report, the GSMA database is our most comprehensive dataset for comparing prices of mobile data services across countries.
For example, average income in South Africa is significantly lower than the average of OECD countries, with average income per capita only about a third of the average for OECD countries. At the same, the average income in South Africa is more than twice as high as the average of other African countries, see Figure 15 below.

This means that neither the more developed OECD nor the less developed African countries are an ideal comparator for South Africa, unless we take into account differences in income. In the remainder of this annex we therefore compare mobile prices in South Africa with the other countries in the GSMA database, whilst taking into account these differences in income levels.
A.2.2 South Africa performs broadly in line with the sample average on headline prices when taking into account the differences in income levels

Our analysis examines pricing data from two sources: firstly, from the GSMA and secondly, alternative pricing data from International Telecommunication Union (ITU). However, our conclusions remain unchanged and South Africa performs in line with the overall sample, independent of the price measures used.

**GSMA data**

The analysis below uses 2016 GSMA data to study the degree of correlation between GSMA mobile data price scores and per capita income levels for the 150 countries included in the GSMA database.

Our analysis of this data indicates that there is a positive and high correlation between the per capita income level of a country and the level of mobile data price scores, varying by the size of the data bundle. Since a higher price score in the GSMA dataset indicates lower headline prices, this means that a country with higher average per capita income tends to have cheaper mobile data baskets (measured as a percentage of GNI per capita), all else the same.

Also, the GSMA standardises all of the individual indicators meaning that they take on a value between 0 and 100, with 100 being the best score. For example, if a country has an average income score of 100, it means that the incomes in the country are the highest in the sample. Similarly, if its mobile data price is 100, then it means that the price is very low.

As can be seen on a horizontal axis from Figure 16 below, South Africa has an average income score around 55, which puts it towards the middle of the sample. Given this level of income, the correlation analysis suggests that we would expect South Africa’s price score to be around 50, i.e. if we project South Africa’s income level on the correlation line. Nevertheless, the actual price score for South Africa (the dark green dot) is closer to 60 and above the correlation line. The fact that South Africa is above the fitted line implies it outperforms the sample on headline prices for the 100 MB usage basket, i.e. the observed headline prices are below expected level after adjusting for differences in average income.

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1. A linear relationship between the price scores and income levels per capita fits the actual data with an accuracy of 57-80%.
2. It has to be noted that the prices scores in the GSMA Intelligence data are already as a percentage of the GNI per capita of the country, which would explain the high degree of correlation. Nevertheless, this would not affect the linear fit, and South Africa’s performance with respect to it.
These findings hold also for the other two usage baskets in the GSMA sample, 500 MB and 1 GB usage baskets, i.e., when taking into account income differences across countries, headline prices in South Africa for these baskets are again broadly in line with the sample expectation.
Figure 5. Correlation between high basket (1 GB) price scores and GNI per capita

Source: Frontier analysis using GSMA Intelligence data
Note: Higher scores imply lower prices

ITU data

In order to investigate if these results are robust to alternate data sources, we have also rerun this analysis using ITU data on mobile data prices. As explained above, the GSMA pricing score considers headline prices as a percentage of GNI per capita. On the other hand, the ITU provides headline prices in US dollars for 500 MB and 1 GB baskets. We have therefore considered the correlation between these ‘unadjusted’ headline prices and GNI per capita across a sample of 150 countries.

As ITU mobile data prices are in US dollars, the correlation with income is negative, i.e. the higher the average income in the country, the lower the headline price of the mobile data service, all else equal.\textsuperscript{63} This is shown in the charts below, which look at the headline price of ITU 500 MB and 1 GB usage baskets and the average income (GNI per capita).\textsuperscript{64} It can be again seen that South Africa performs better than the linear expected value, i.e. it has headline prices that are at or below the sample average given its income level per capita.

\textsuperscript{63} The correlation between ITU’s ‘unadjusted’ headline prices in USD and average income is weaker than what we observe for the GSMA pricing data, where headline prices are presented as percentage of GNI per capita. Nevertheless, the relationship between ‘unadjusted’ headline prices and average income is still statistically significant.

\textsuperscript{64} The relationship between the GNI per capita and headline prices is skewed and has a few outliers, which makes it harder to interpret the data. We have thus applied a logarithmic transformation to the values of GNI per capita as well as the headline prices in USD, in order to reduce the effect of these few outlier countries and make the relationship easier to understand.
A.2.3 South Africa performs relatively well even when considering GSMA’s ‘value for money’ measure

Finally, we have considered South Africa’s performance against the wider set of international benchmarks in relation to the overall GSMA Connectivity Index. This index reflects a range of enabling factors that affect the performance of the sector,
including factors such as infrastructure, affordability, consumer readiness and content.

This index is supposed to provide an aggregate measure of how well the mobile sector is performing in different countries and can be used as a proxy for the ‘value for money’ that customers receive from their mobile data services. The enabling factors are based on a range of individual indicators, which are drawn from data sources such as GSMA Intelligence, the World Bank and the ITU. The GSMA Mobile Connectivity Index is then calculated by giving appropriate weights to each of these 38 individual indicators.

As can be seen from the chart below, South Africa performs in line with expectation when we look at the overall GSMA Connectivity Index and take into account average income levels.

**Figure 10. Correlation between GSMA Connectivity Index scores and GNI per capita**

![Graph showing correlation between GSMA Connectivity Index scores and GNI per capita]

*Source:* Frontier analysis using GSMA Intelligence data  
*Note:* Higher scores imply better performance

Overall, therefore, the available evidence shows that difference in income levels is likely to be an important factor to consider when comparing mobile data prices across countries. The evidence also suggests that South Africa performs at least in line with expectations on price outcomes compared with a wider set of benchmarks, after we account for the level of economic development of each country.

Nevertheless, as explained in Section 2.2 above, there are other factors that likely affect mobile market outcomes and which tend to vary significantly across 

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As explained above, the GSMA has standardised all of the individual indicators meaning that they take on a value between 0 and 100, with 100 being the best score.
countries. Therefore, we recognise that a more detailed benchmarking analysis should also take into account the variation in these other factors.