

# Connecting Africa to Digitalization and Economic Growth: an Empirical Assessment

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ROME, 25 November 2021

## Introduction

The spread of Information and Communication Technology contributes to the economic growth of each country. This reality has been amply demonstrated in numerous academic studies.

Starting from this fact, this study aims to evaluate the effect of the use of ICT Infrastructure on the economic growth of African countries over 10 years (2010-2019).

With the aim of better understanding what contribution is offered by each component of the ICT infrastructure, the study separately analyses three parts of the diffusion in the use of ICT infrastructures: the growth of broadband subscriptions, the growth of international connectivity, and the evolution of end-user spending in Information Technology.

For each of the drivers analysed, the level of correlation with the trend of GDP in the entire African continent and a selected set of countries is determined, to estimate in qualitative terms the positive influence that these elements can generate in the economy.

In the case of broadband, using the ITU model, the contribution to the economy that the spread of broadband subscriptions has produced on the economy of the whole of Africa and a selected set of countries is also determined.

The analysis carried out has found that the increase in broadband penetration, the increase in international connectivity and the spread of Information Technology are associated with the economic growth of countries.

Governments can stimulate the development of the economy also by encouraging the use of ICT services such as fixed and mobile broadband, international connectivity, Information Technology.

Happy reading.

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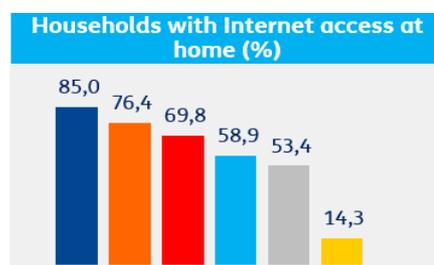
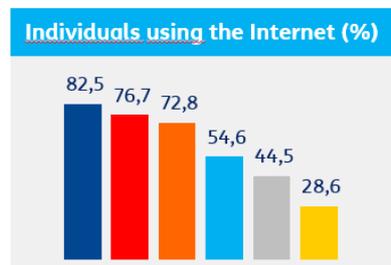
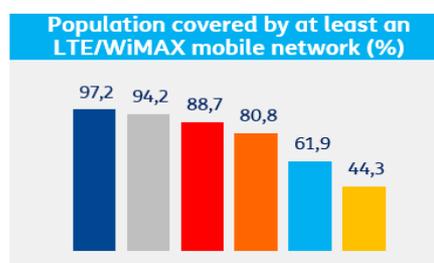
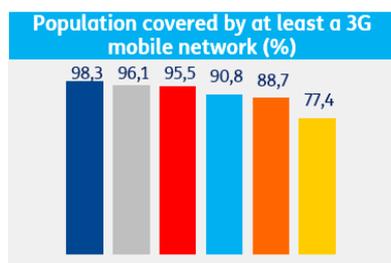
# Digital trends in Africa

## Key Figures and benchmark

The Africa region has a population of 1,34 billion.<sup>1</sup>

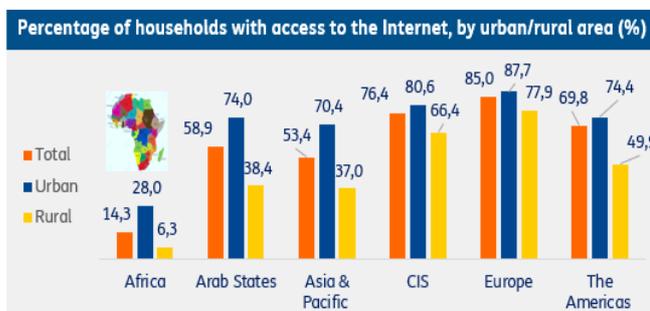
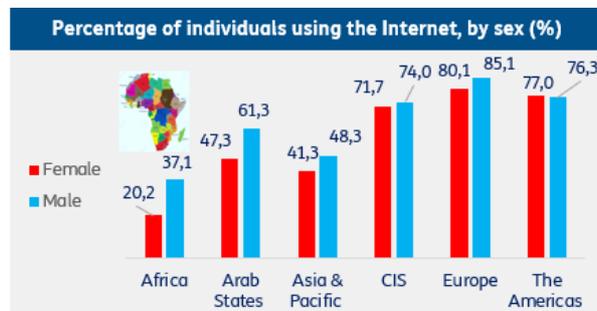
It is one of the world's most challenged regions in terms of its economic development and socio-economic structure, whose economic and social development would run faster and more sustainable if it were less burdened by conflicts and structural barriers.

The benchmark of digitization indicators highlights the size of the divide, compared with the other macro-regions, especially in terms of fixed-line access while mobile indicators are relatively good.



Source: ITU

The gender gap in the Africa region is one of the largest in the world. The rural/urban divide is evident.

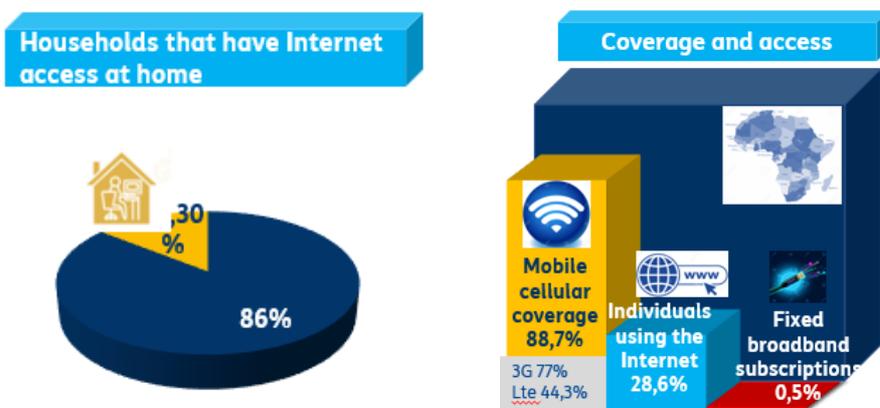


Source: ITU

<sup>1</sup> This chapter is an elaboration of the ITU report "Digital Trends in Africa 2021"

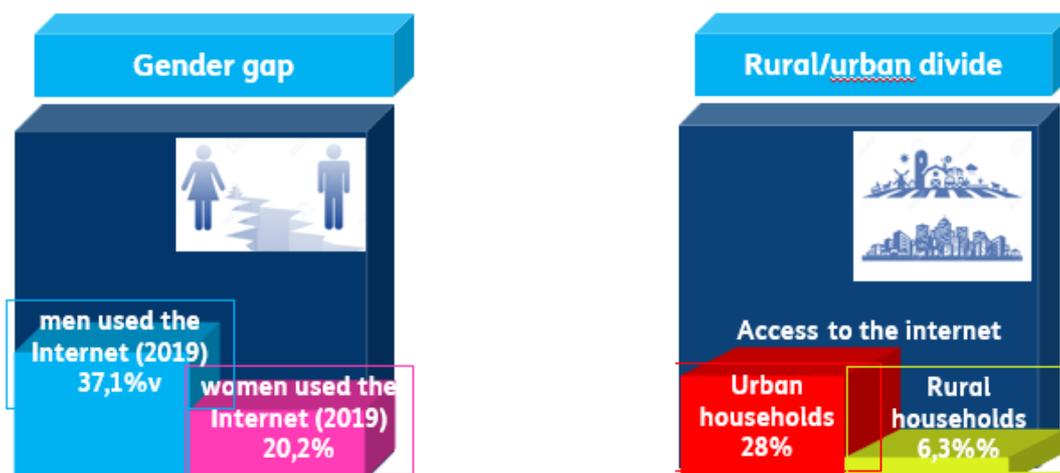
## Digital trends in Africa

Over recent years, the region has registered continued, albeit slow growth in most components of ICT infrastructure, access and use. Mobile cellular coverage in Africa, referring to the percentage of the population that lives within reach of a mobile cellular signal, is estimated by ITU to be at 88.4 per cent. Just over 77 per cent of the population is now within reach of a 3G signal, and 44.3 per cent is within reach of a long-term evolution (LTE) mobile broadband signal. The percentage of individuals using the Internet was 28.6 per cent, with households having Internet access at home increased up to 14.3 per cent (end 2019).



Source: ITU

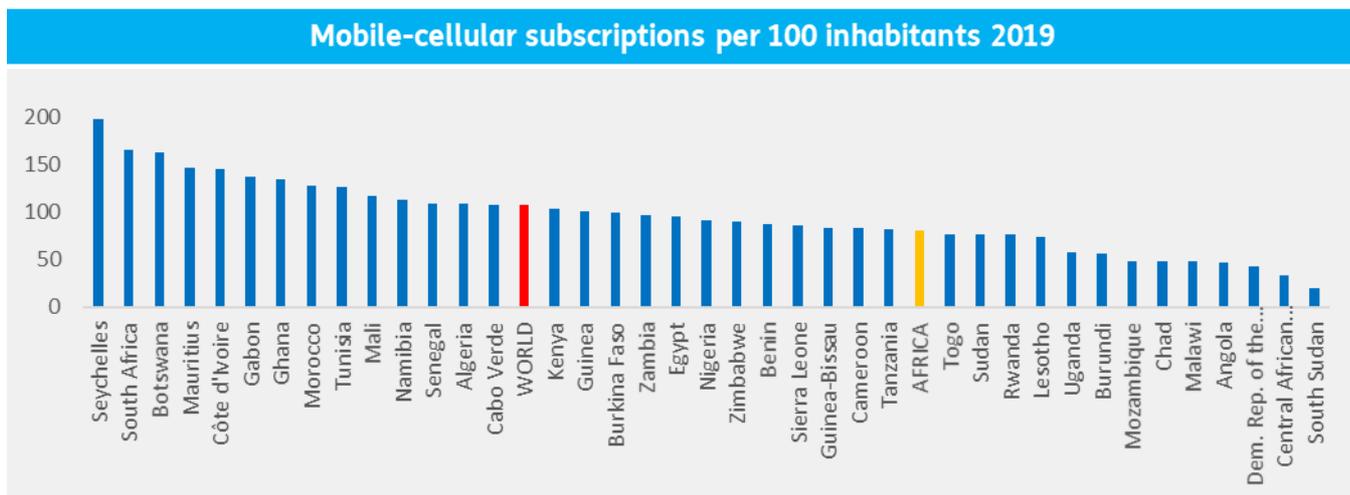
A very significant gender gap and a rural/urban divide persist. In 2019, only 20.2 per cent of women used the Internet, compared with 37.1 per cent of men. Moreover, only 6.3 per cent of rural households had access to the Internet in 2019, compared with 28 per cent of urban households.



Source: ITU

## Infrastructure and adoption

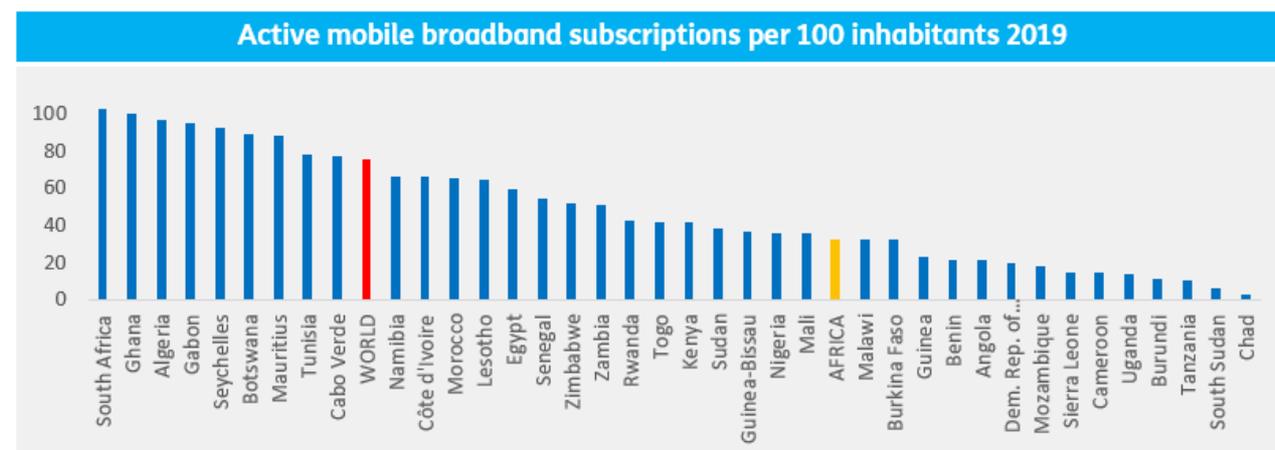
The African mobile market is very diverse. Mobile cellular subscriptions per 100 inhabitants are far more than 100 in 17 out of 39 countries, 13 countries have subscription rates per 100 inhabitants below the African average of 80.1 and 7 countries have less than 50 subscriptions per 100 inhabitants.



Source: ITU

Active mobile broadband subscriptions per 100 inhabitants were 32.1 in 2019, while the world average was 75.

Nine countries had active mobile broadband subscription rates per 100 inhabitants above the world average. Fourteen countries had subscription rates below the African average of 32.1 per 100 inhabitants.

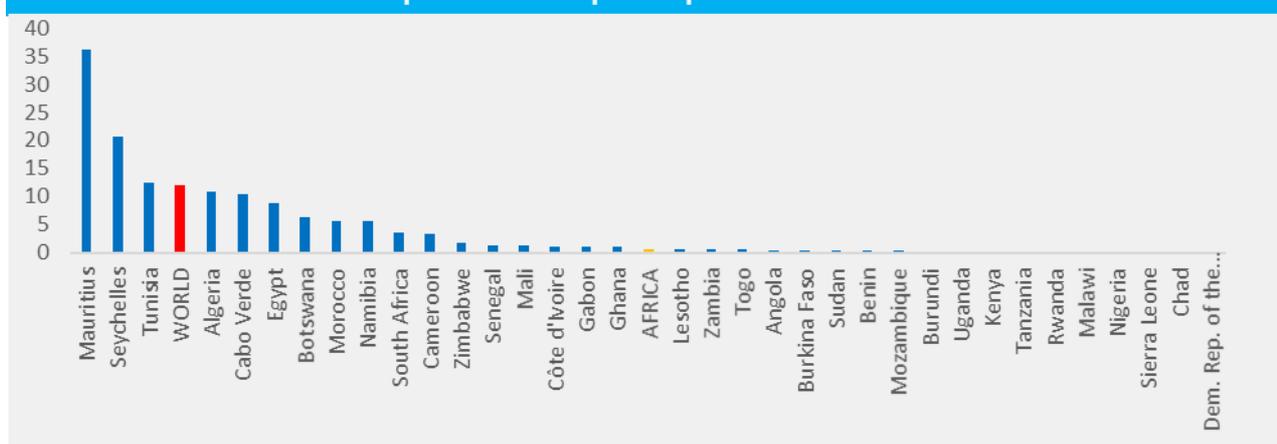


Source: ITU

## Digital trends in Africa

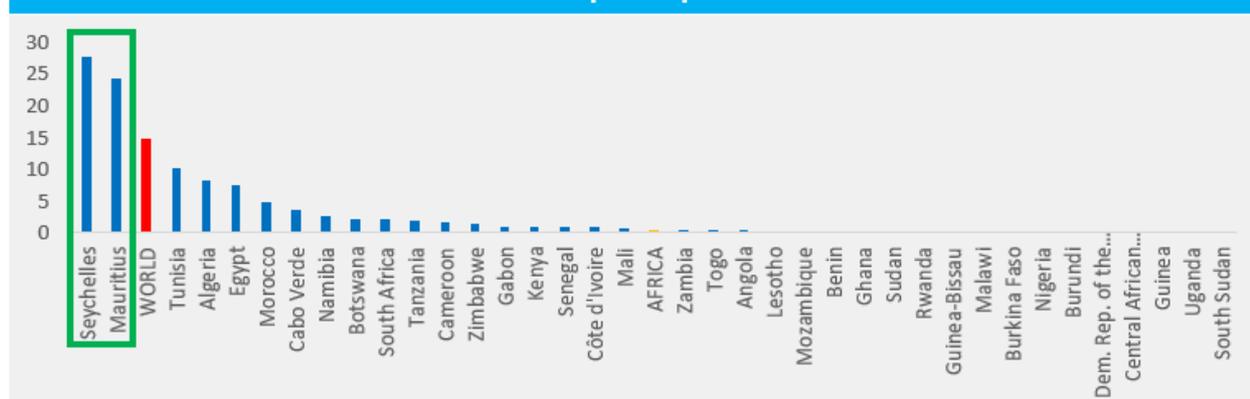
Africa has one of the lowest fixed broadband subscription rates mainly due to the absence of legacy infrastructure and relatively lower costs of deploying wireless broadband infrastructure.

Fixed telephone subscriptions per 100 inhabitants 2019



Source: ITU

Fixed broadband subscriptions per 100 inhabitants 2019



Source: ITU

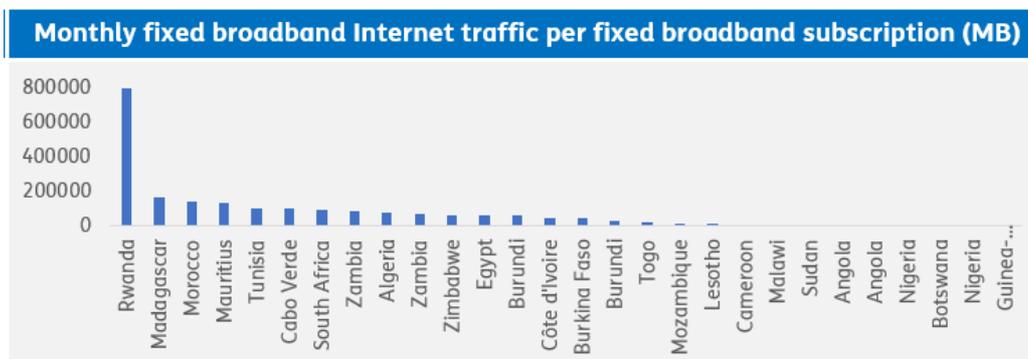
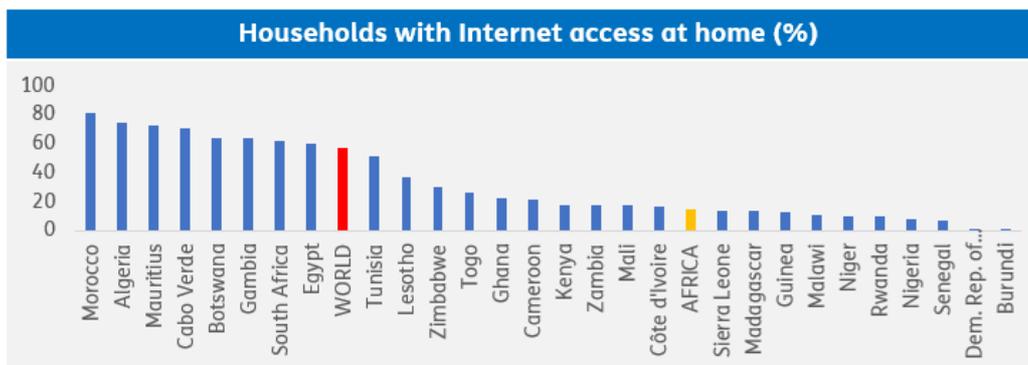
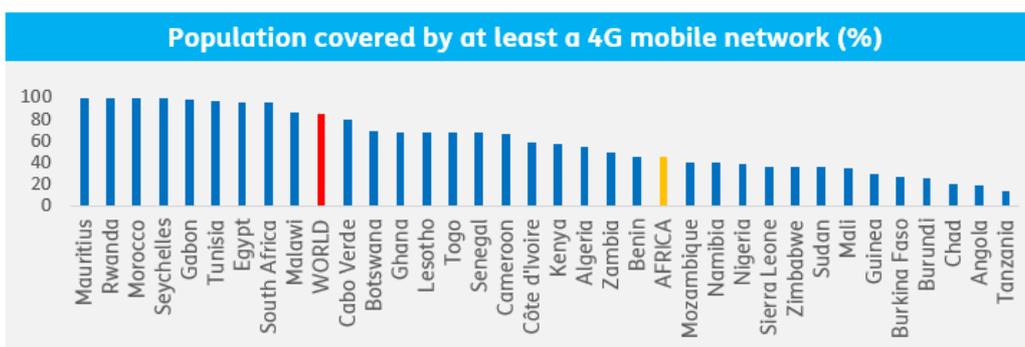
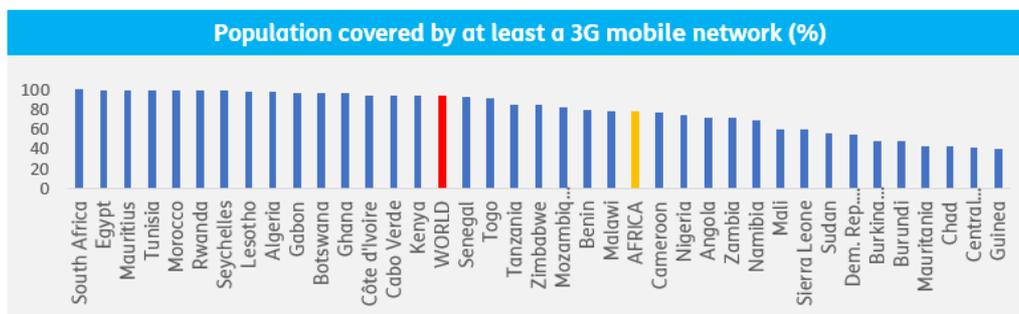
The fixed broadband subscription rate was 0.5 per 100 inhabitants for Africa in 2019, a figure that is well below the global average of 14.8.

Two-thirds of the countries slightly increased their fixed broadband subscription rates in the period 2018-2019. Just under one-third of countries show declining subscription rates for the same period.

Seychelles and Mauritius are two significant outliers, with fixed broadband subscription rates per 100 inhabitants well above the world average, recording sizable increases for 2018-2019.

## Digital trends in Africa

Africa is a «mobile» region: mobile-cellular network covers almost 90% of the population. In contrast, the penetration rate of subscriptions in the fixed network is low.



Source: ITU

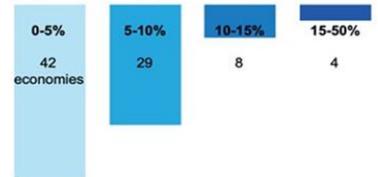
# ICT Skills

Percentage of people with advanced ICT skills, latest year available in 2017-2019

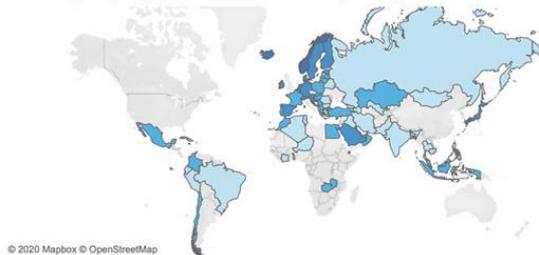


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Distribution of economies according to the proportion of their population having advanced skills

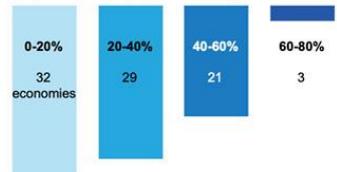


Percentage of people with standard ICT skills, latest year available in 2017-2019



© 2020 Mapbox © OpenStreetMap

Distribution of economies according to the proportion of their population having standard skills

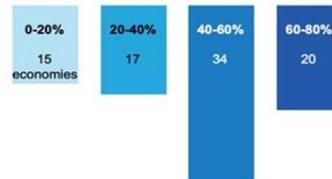


Percentage of people with basic ICT skills, latest year available in 2017-2019



© 2020 Mapbox © OpenStreetMap

Distribution of economies according to the proportion of their population having basic skills



There is a clear gap in terms of ICT skills. In many countries of the African continent, even basic or standard skills concern a low percentage of the population.

Individuals with standard ICT skills (%)



Individuals with basic ICT skills (%)



Individuals with advanced ICT skills (%)



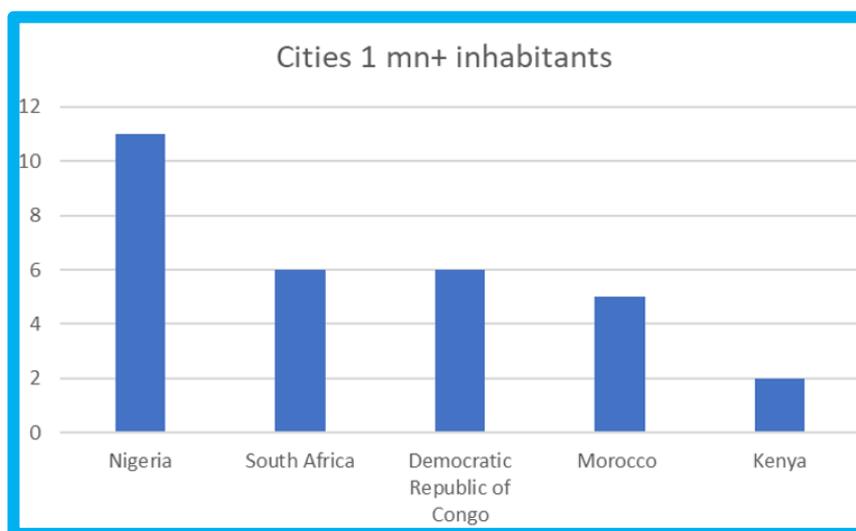
Source: ITU

Nineteen of the top 20 fastest-growing countries in the world are in Africa. Urbanization is on the rise, and an increasingly young and educated population is driving higher consumption of online services.

The African Union (AU) is building the single largest free trade zone in the world through the African Continental Free Trade Area (AfCFTA), enacted in May 2019.

Despite a negative macroeconomic outlook because of COVID-19, the African Internet economy is expected to be resilient

Africa is experiencing rapid urbanization, with 68 cities each of one has to over one million inhabitants in 2020; the number of those cities is expected to increase to 85 by 2025.



Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020.

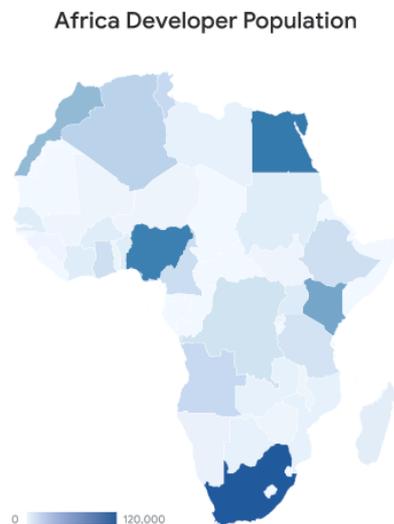
In addition, there has been a general improvement in life expectancy, as Sub-Saharan Africans expect to live nearly six years longer than a decade ago.

Tech talent in Africa is at a historical peak and continues to rise. There are nearly 700,000 professional developers across Africa, more than 50% of whom live concentrated in five African markets: Egypt, Kenya, Morocco, Nigeria, and South Africa.

## Digital trends in Africa

African developers use both formal and informal education channels to gain skills and access to well-paying jobs. The top two developer training pathways are through university programs and self-taught channels.

Country	Total Developers
<b>Target Markets</b>	<b>467,744</b>
Egypt	86,599
Ethiopia	17,989
Ghana	17,488
Ivory Coast	8,866
Kenya	58,175
Morocco	46,483
Nigeria	83,609
Rwanda	3,983
South Africa	118,541
Tanzania	15,008
Uganda	11,003
<b>Rest of Africa</b>	<b>220,387</b>
<b>Total Africa</b>	<b>688,131</b>



Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020.

Training programs from companies like Decagon, Gebeya, Google, Moringa School, Semicolon, and Umuzi, blend traditional learning with online, flexible learning and Bootcamp-style experiences. These STEM-related programs, outside of formal education institutions, fill knowledge and skills gaps.

Women currently comprise one in five of the total population of developers in Africa. While this number is still low, the ecosystem growth has begun creating many opportunities for women coders, especially in Egypt, Morocco, and South Africa.

As the ecosystem grows, entrepreneurs must develop soft skills essential for launching and managing a startup, such as leadership, communication, and project management.

As startups expand into different countries and regions, there is also an increasing demand for employees who can navigate the cultural and linguistic differences across regional markets.

## Digital trends in Africa

The demand for developer communities is increasing as their member bases expand and they offer more frequent events. These groups present an array of opportunities stimulating both inspiration and healthy competition for the ecosystem. These efforts create regional cohesion, are bolstered by developer groups, technical experts, mentors, local communities, and student groups.

A 2019 World Bank report estimated that most countries across the region have workforces severely lacking digital skills; in fact, levels are only half of the global average.

South Africa, Nigeria, and Kenya outrank other countries in the penetration rate and variety of digital skills.



Source: Google/Accenture, "Africa Technology Ecosystem, Africa," April 2020.

Across the continent, the skills with the highest penetration today are social media and graphic design, while the fastest-growing skills are digital literacy and web development.

Advanced topics such as artificial intelligence, scientific computing, and human-computer interaction remain relatively unpenetrated.

# Broadband contribution to GDP

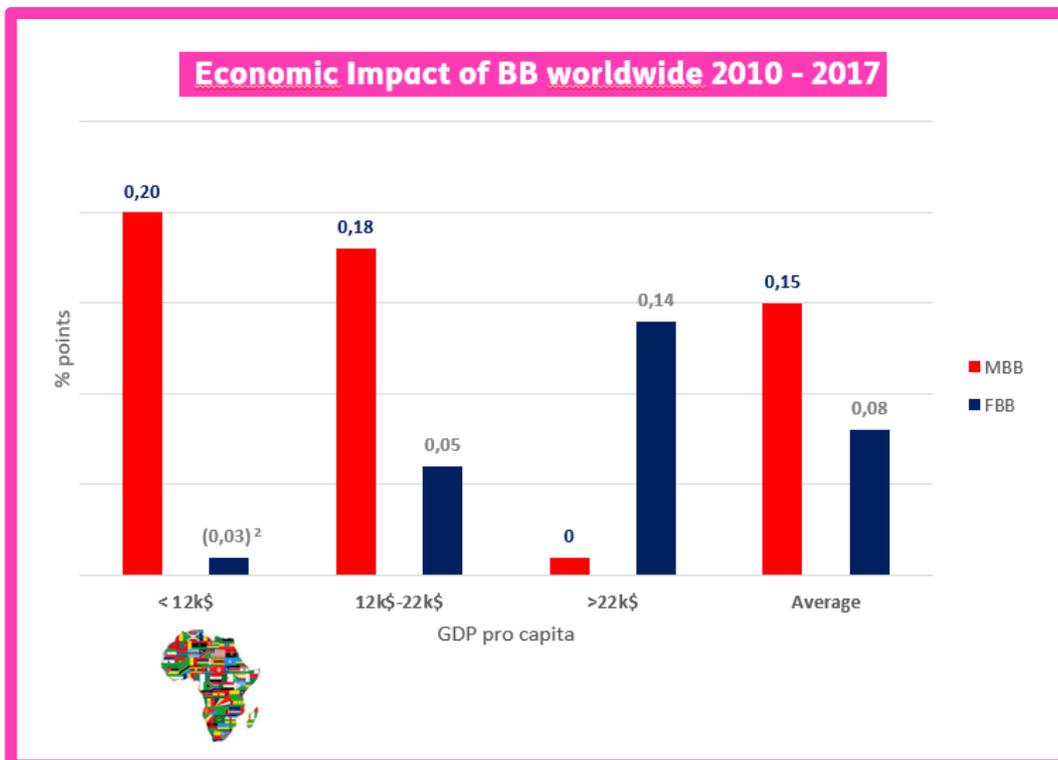
## Economic Impact of Broadband

Extensive econometric analysis at a worldwide level has shown the correlation between broadband penetration and economic development.

Fixed and Mobile Broadband have a different impact depending on the level of income of a country (GDP per capita):

- Overall Mobile Broadband (MBB) has resulted in a higher impact than Fixed Broadband (FBB)<sup>1</sup>
- FBB impact is higher in more developed countries
- MBB impact is higher in less developed countries

Africa can be ranged in the countries (<12k\$ GDP per capita) where only MBB has a measurable economic impact.



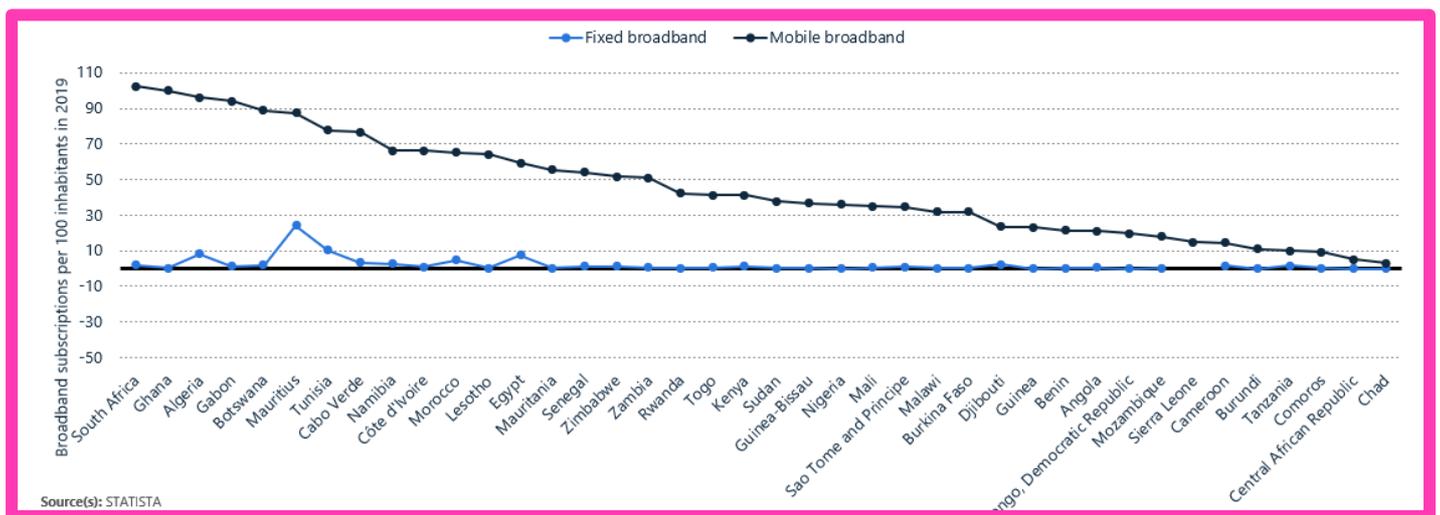
<sup>1</sup> Source: ITU\_The economic contribution of Broadband, digitization and ICT Regulation (2018)  
Economic impact for 1 p.p increase in BB penetration

<sup>2</sup> not statistically relevant for the model, can be considered as 0

## The impact on African Countries

An econometric analysis at the regional level including 34 African countries has shown a similar correlation between broadband penetration and economic development<sup>1</sup>

- Only MBB is relevant considering FBB penetration rates
- Each 10% increase in MBB penetration yields an economic impact of 2,5% in GDP

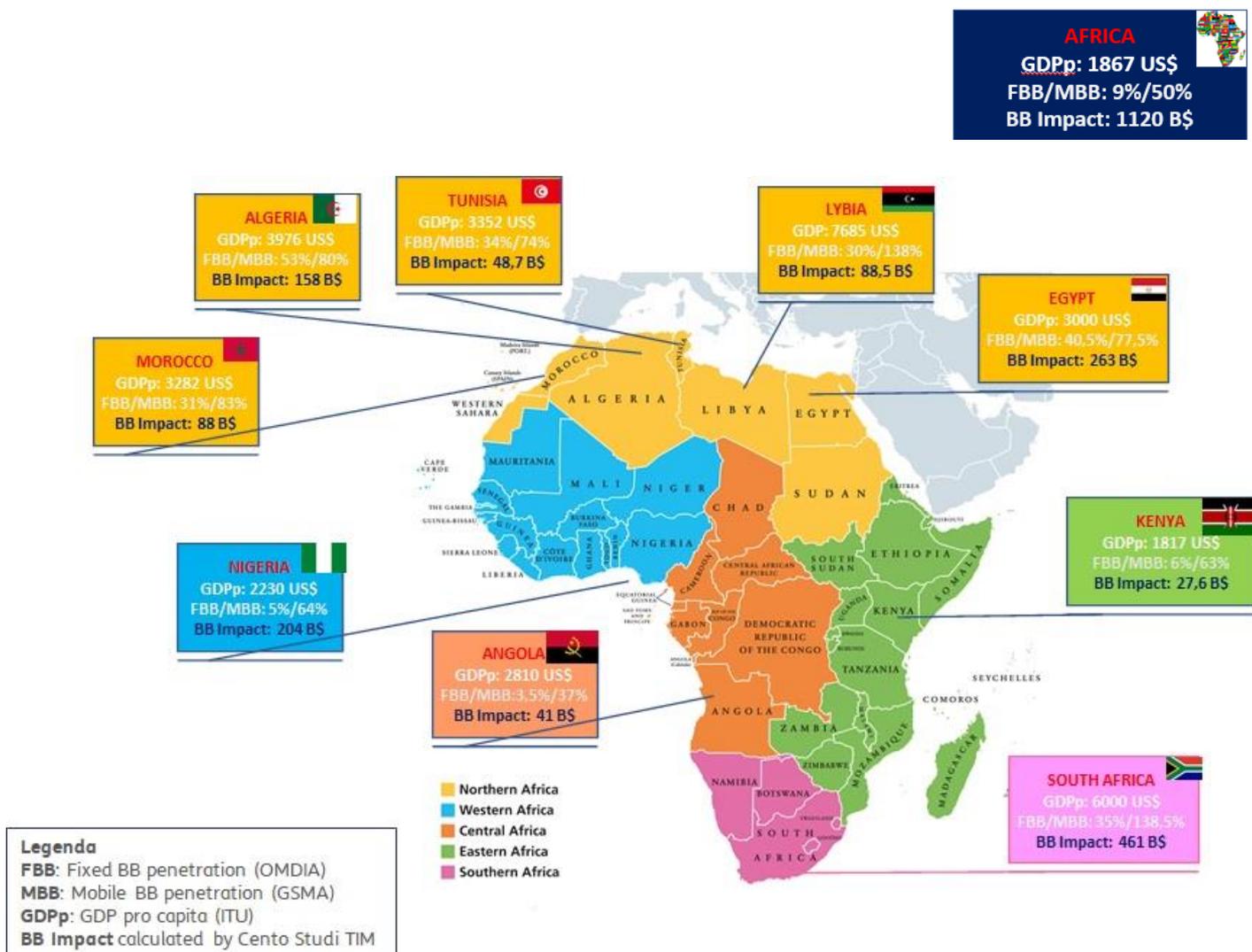


<sup>1</sup> Economic contribution of broadband, digitization and ICT regulation: Econometric modelling for Africa (2019)

## Broadband contribution to GDP

Northern Africa is the region with very high Mobile Broadband penetration (and a relevant Fixed Broadband penetration). In this region, countries have on average the highest GDP per capita, and all this results in the most important economic impact for Broadband across the Continent.

South Africa has the highest GDP per capita and Mobile Broadband penetration rate, and therefore the highest economic impact as a single country.



## Regional level analysis

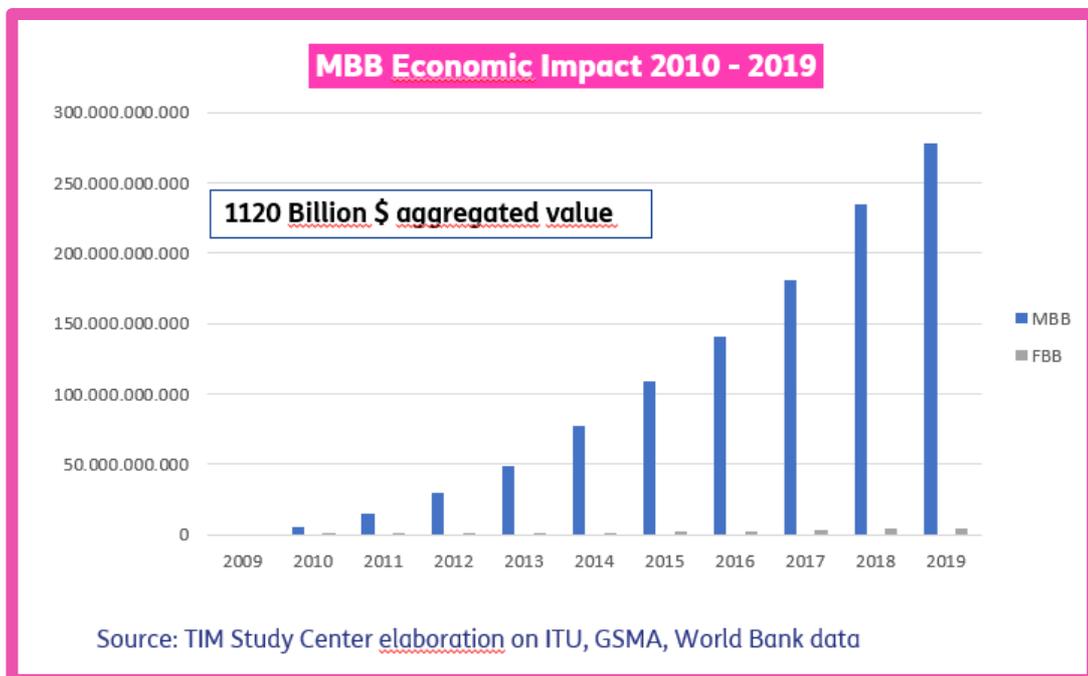


Africa is a continent with 1867 US\$ of GDP per capita (2019).

Mobile is the most relevant broadband infrastructure with 50% of average penetration (2020). Fixed Broadband penetration has reached only 9% of households and has no economic impact.

In 2019 the MBB economic impact reached 277,7 Billion\$ with an overall aggregated value over 2010 – 2019 of 1120 Billion\$.

Starting from these assumptions, this study calculated the contribution generated by the spread of broadband in most African countries in about 10 years (2010-2019).

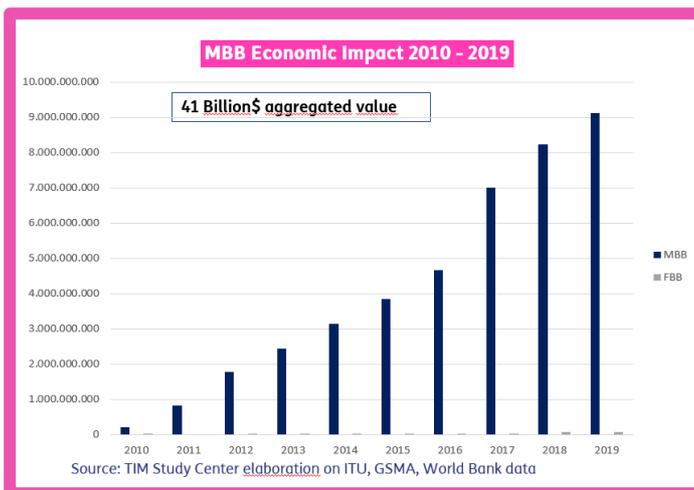


## Country Level analysis

**Angola:** a country with 2810 US\$ of GDP per capita (2019).

Mobile is the most relevant BB infrastructure but with only 37% of penetration (2020), Fixed BB penetration has reached 3.5% and has no economic impact.

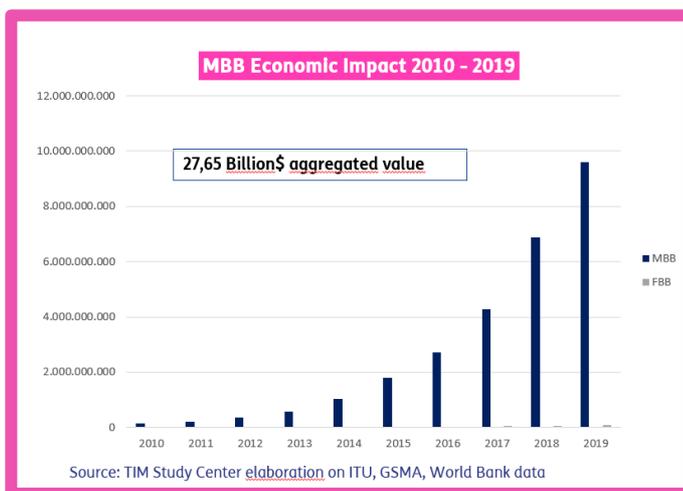
Calculated MBB economic impact reached over 9 Billion\$ in 2019 with an overall aggregated value over 2010 – 2019 of 41,25 billion US\$



**Kenya:** a country with 1817 US\$ of GDP per capita (2019).

MBB is the most relevant BB infrastructure with 63% of penetration (2020), FBB penetration has reached only 6% and has no economic impact.

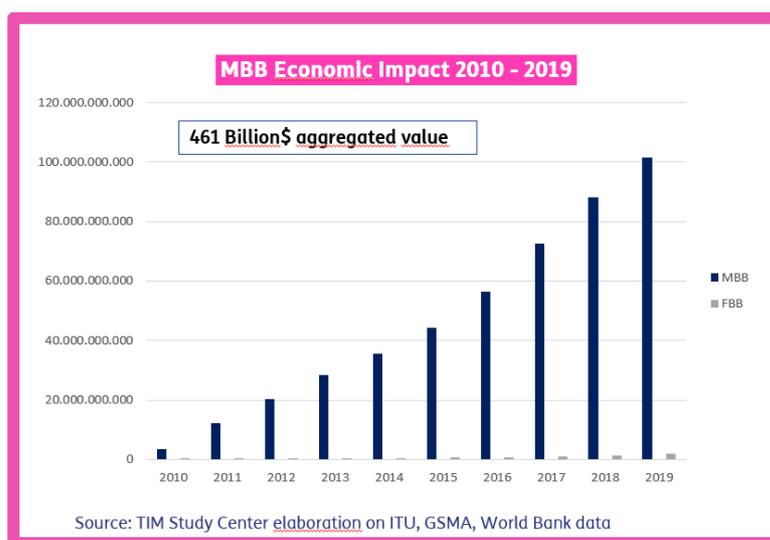
Calculated MBB economic impact reached 9,65 Billion\$ with an overall aggregated value over 2010 – 2019 of 27.6 billion US\$.



South Africa is a country with 6000 US\$ of GDP per capita (2019), the highest of the whole continent

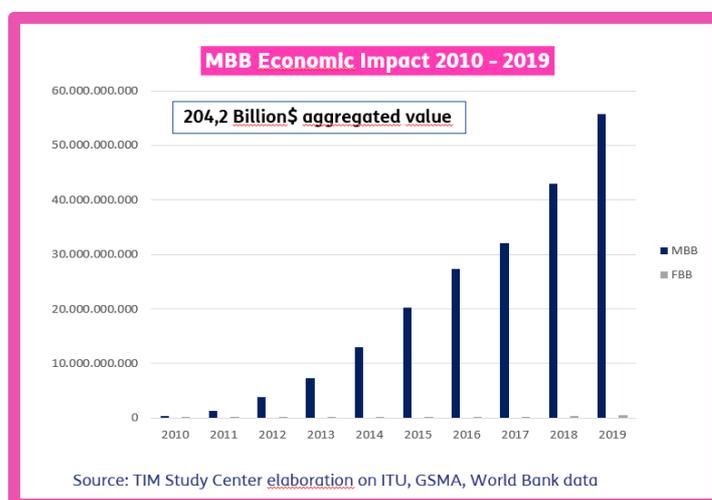
Mobile is the most relevant BB infrastructure with a penetration of 138.5% (2020), while FBB penetration has reached 35% but is economically less relevant.

Calculated MBB economic impact reached 101 Billion\$ with an overall aggregated value over 2010 – 2019 of 461 billion US\$.



Nigeria is a country with 2230 US\$ of GDP per capita (2019).

Mobile is the most relevant BB infrastructure with 64% of penetration (2020), FBB penetration has reached 5% and has no economic impact. Calculated MBB economic impact reached 55.8 Billion\$ with an overall aggregated value over 2010 – 2019 of 204.2 billion US\$.

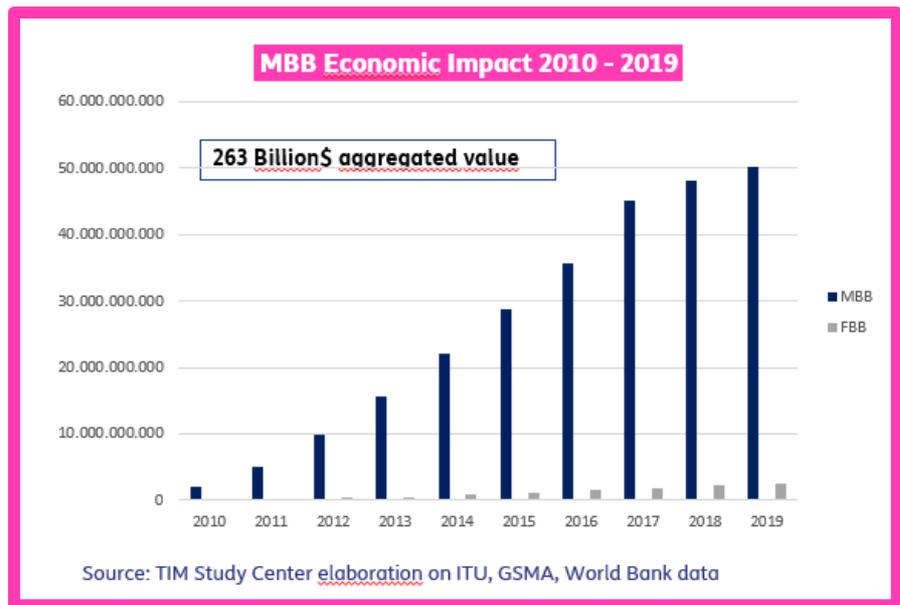


## Broadband contribution to GDP

Egypt is a country with 3000 US\$ of GDP per capita (2019)

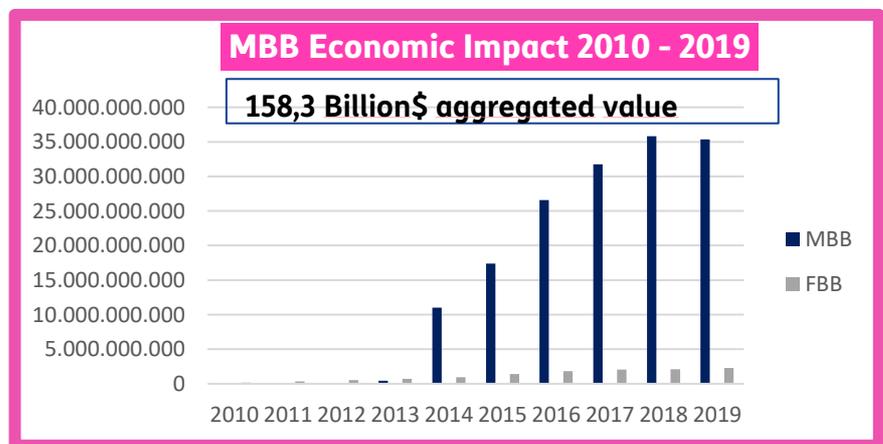
Mobile is the most relevant BB infrastructure with 77.5% of penetration (2020). FBB penetration has reached 40.5% amongst the highest in Africa.

Calculated MBB economic impact reached 50 Billion\$ with an overall aggregated value over 2010 – 2019 of 263 billion US\$.



Algeria is a country with 3976 US\$ of GDP per capita (2019). Mobile is the most relevant BB infrastructure with almost 80% of penetration FBB penetration has reached 53%.

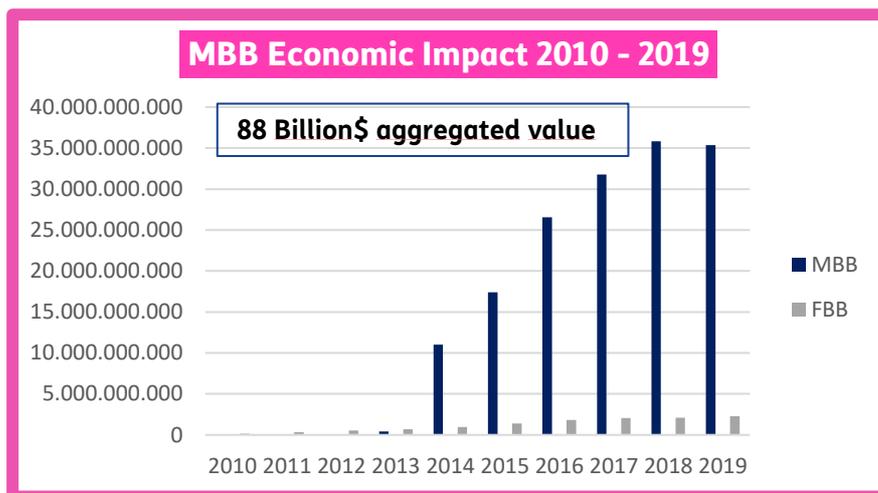
Calculated MBB economic impact reached 35.4 Billion\$ with an overall aggregated value over 2010 – 2019 of 158.3 billion US\$.



Morocco is a country with 3282 US\$ of GDP per capita (2019).

Mobile is the most relevant BB infrastructure with an 83% of penetration rate (2020). FBB penetration has reached 31%.

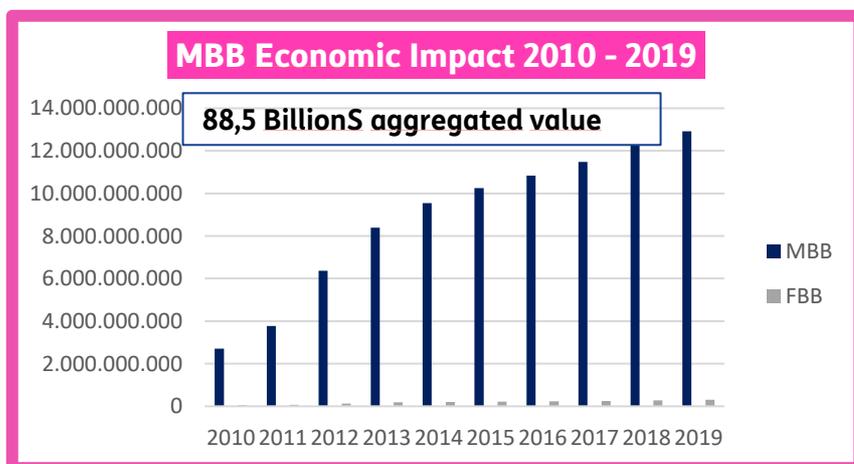
MBB economic impact reached 20 Billion\$ with an aggregated value over 2010 – 2019 of 88 billion US\$.



Source: TIM Study Center elaboration on ITU, GSMA, World Bank data

Libya is a country with 7685 US\$ of GDP per capita (2019).

Mobile is the most relevant BB infrastructure with 138% of penetration (2020). FBB penetration has reached almost 30% (2020) amongst the highest in Africa. MBB economic impact reached 13 Billion\$ (2019) with an aggregated value over 2010 – 2019 of 88,5 billion US\$.

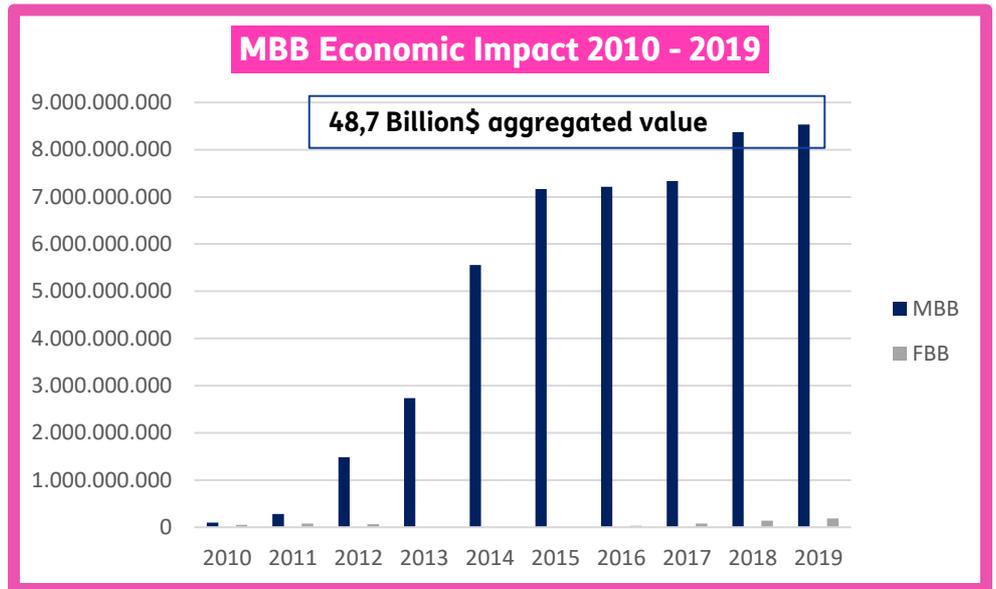


Source: TIM Study Center elaboration on ITU, GSMA, World Bank data

## Broadband contribution to GDP

**Tunisia:** is a country with 3352 US\$ of GDP per capita (2019)

Mobile is the most relevant BB infrastructure with 74% of penetration (2019). FBB penetration has reached 34% amongst the highest in Africa. MBB economic impact reached 8,5 Billion\$ (2019) with an aggregated value over 2010 – 2019 of 48.76 billion US\$.



Source: TIM Study Center elaboration on ITU, GSMA, World Bank data

# International connectivity contribution to GDP

## International connectivity trend for African Countries

Africa's international Internet bandwidth growth along an exponential curve, reaching 15.289 Tbps by December 2019.

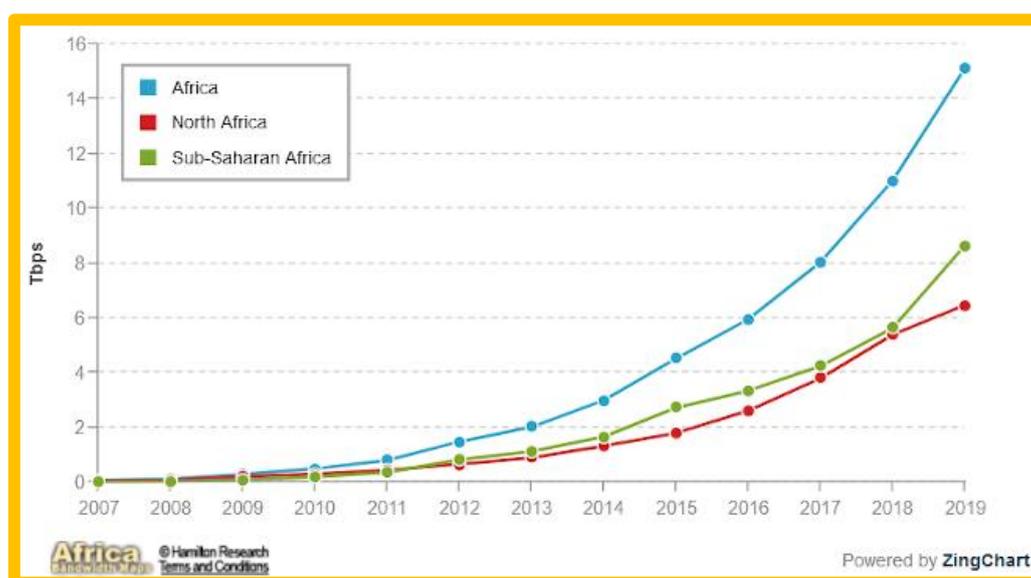
Total international bandwidth of 15.289 Tbps Sub-Saharan Africa reached 8.814 Tbps (+54% vs 2018).

North Africa reached 6.475 Tbps (+20% vs 2018).

All of Africa's international bandwidth is supplied by submarine cables, terrestrial networks connected to submarine cables, or satellites.

Of the total bandwidth of 8.814 Tbps in Sub-Saharan Africa by December 2019, 8.126 Tbps (92.2%) was supplied directly by submarine cable, and 678 Gbps (7.7%) was supplied by terrestrial cross-border networks connected to submarine cables.

Ten years ago in December 2009, the amount of international bandwidth supplied by submarine cable was 276 Gbps.

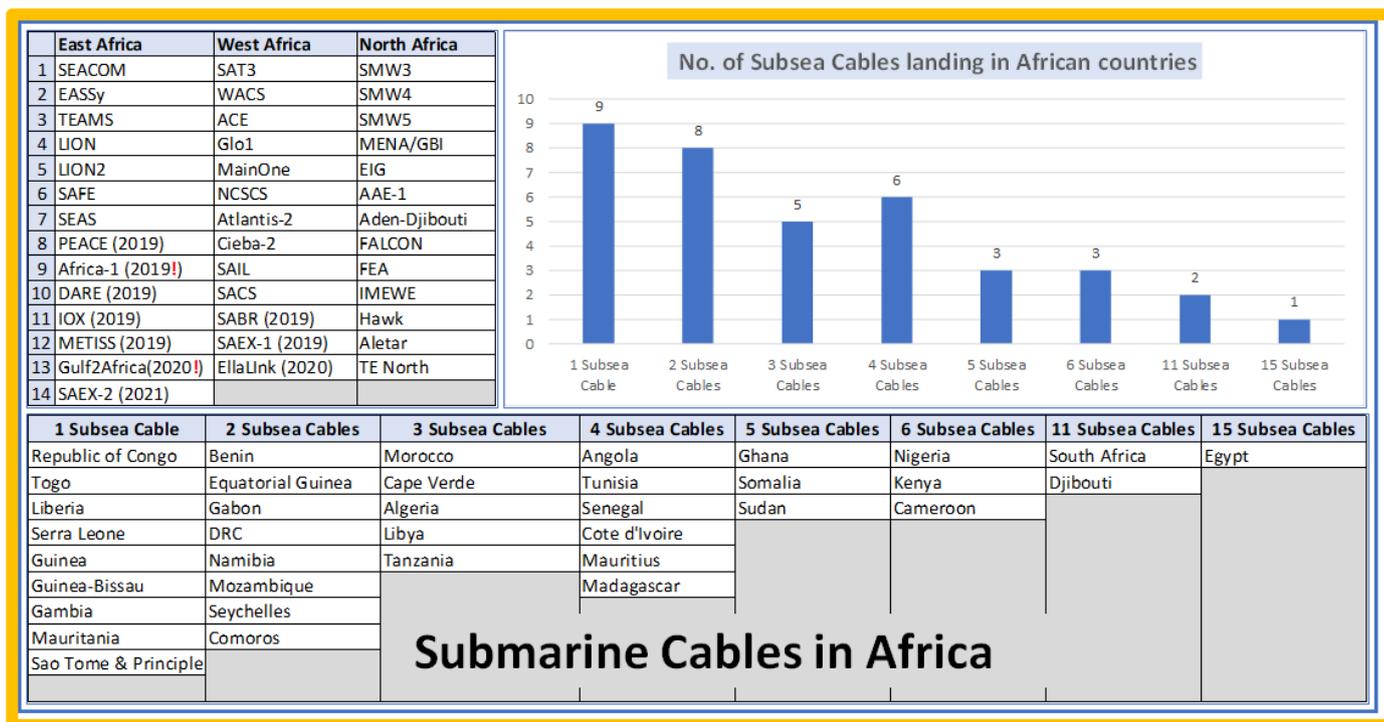


## International connectivity contribution to GDP

Africa is one of the most important growth markets globally, embracing digital transformation enabled by resurgent economic progress.

Among the 54 African countries recognized by United Nations, 38 countries have seashore and 16 are landlocked. Out of these 38 countries that have seashore, 37 countries have at least one submarine cable landing. The lone exception is Eritrea, recognizing Western Sahara is considered a disputed territory.

By the end of 2019, among the 37 countries that have at least one subsea cable landing, 11 countries have only 1 subsea cable, 10 countries have 2 subsea cables, 6 have 3 subsea cables, and 10 have more than 3.



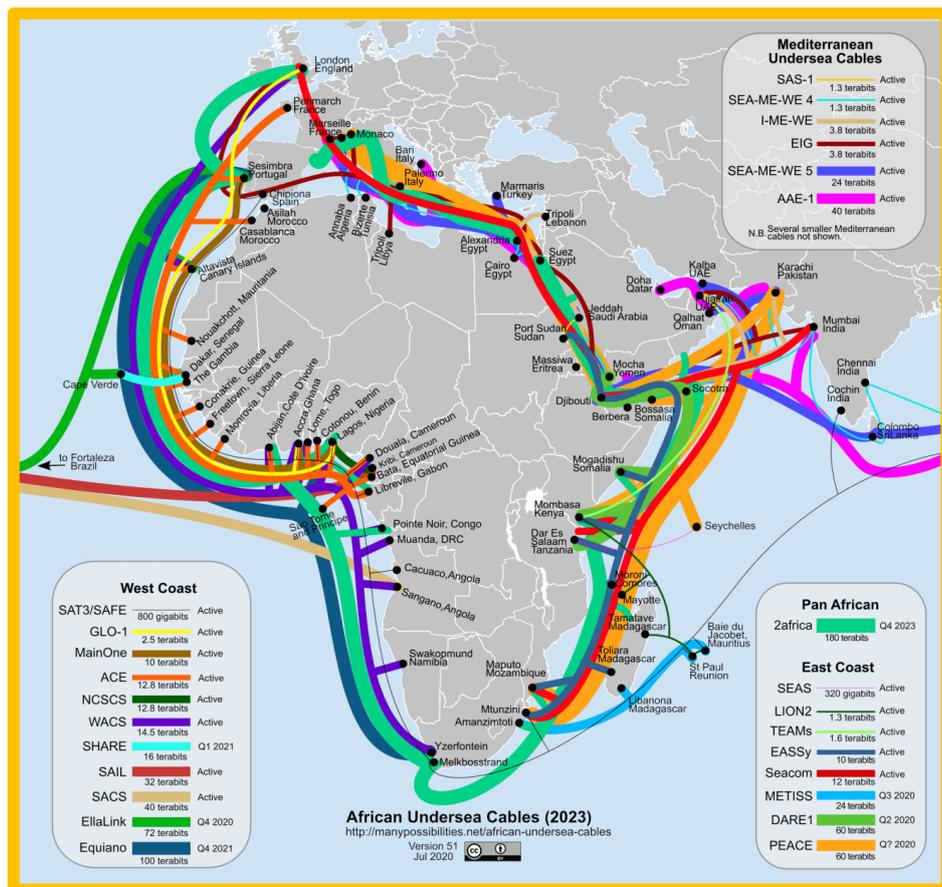
Source: Submarine Cable Networks

## International connectivity contribution to GDP

In Sub-Saharan Africa, 8.1226 Tbps are provided in 2019 out of total design the capacity of at least 230.5 Tbps (potentially now available on the 27 submarine cables serving the region in December 2019).

This total design capacity has increased from 226.5 Tbps on 26 operational cables in 2018, 134.5 Tbps on 23 cables in 2017, 94.4 Tbps on 20 cables in 2016, and 70.4 Tbps on 18 cables in 2015.

The completion of new terrestrial cross-border links, and the expansion of capacity on others, has seen the volume of intra-regional traffic (backhauled to submarine cable landing points) increase by 28% in the last year to reach 678 Gbps in December 2019 (530 Gbps in 2018, 380 Gbps in 2017, 267 Gbps in 2016, and 154 Gbps in 2015 vs ... only 10 Gbps ten years ago in December 2009)

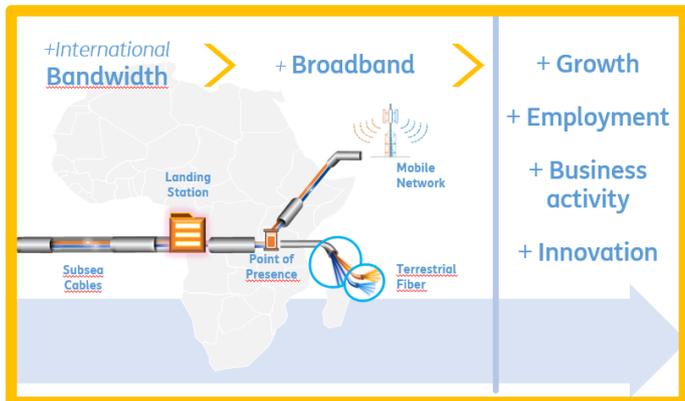


Source Submarine Cable Networks <https://www.submarinenetworks.com/en/africa>

## International connectivity contribution to GDP

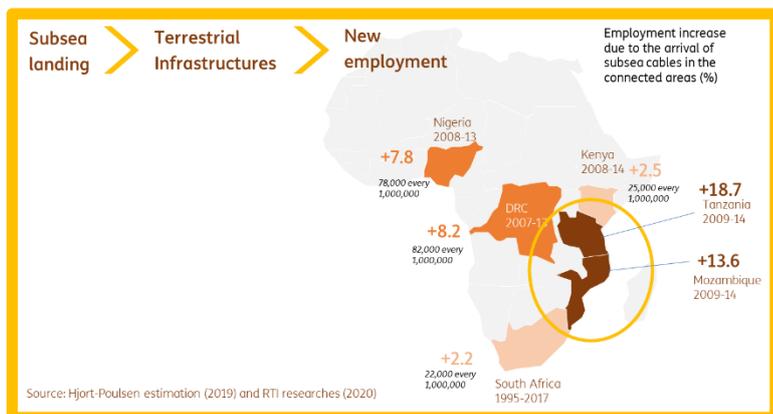
### The economic and social relevance of International Bandwidth

Investments in connectivity in international bandwidth enable broadband adoption and contribute to economic development.



As Internet and broadband usage increases, demand for international bandwidth also rises, activating a virtuous circle to the benefit of the overall economy.

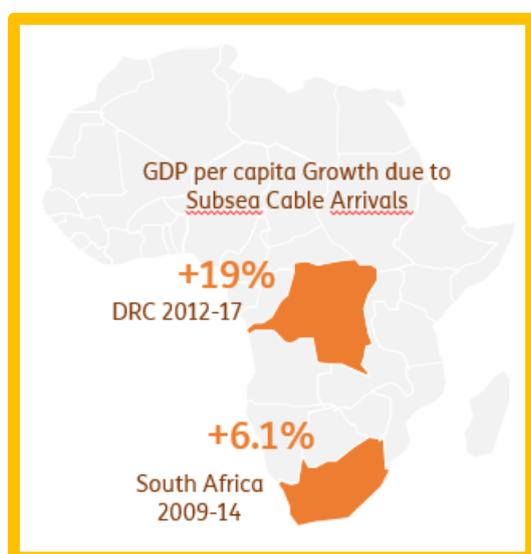
Many types of research and studies have found empirical pieces of evidence of the benefit activated by the arrival of subsea cables in Africa on employment.



Increase in likelihood of being employed in areas connected to a terrestrial fiber infrastructure in selected African Countries: from 22,000 to 82,000 new people employed every 1,000,000 people living in a connected area.

The effect is higher for people living very near to the network or in urban areas. Tanzania: 18.7% increase in the likelihood of being employed, if one lives within 200 meters of fiber infrastructure. 13.6% increase in employment for urban university-educated people who live within a few hundred meters of the terrestrial fiber infrastructure.

Many pieces of research and studies have found empirical pieces of evidence of the benefit activated by the arrival of subsea cables in Africa on GDP per capita growth.



**Historical Effects:** Long Term Impact: according to a recent RTI's study, each 10% increase in South Africa's International bandwidth consumption per use led to a 0.15% increase in GDP per capita over the past 22 years (1995 to 2017).

In 2014, 5 years after the first of Major Subsea cable arrivals, South Africa's actual GDP per capita was 6.1% greater than expected.

A larger effect was observed in the Democratic Republic of Congo. The economic activity catalyzed by the West African Cable System leads to a 19% increase in GDP per capita by the end of 2017.

Provisional Effects: new investments in international bandwidth and connectivity could lead to a 0.42% to 0.58% economic impact on African GDP per capita in the first 2-3 years of activity (Source: RTI, "Economic Impact of 2Africa")

According to an Analysys Mason recent study for Facebook, aiming at evaluating the impact of its connectivity initiatives in Sub-Saharan Africa, this project could generate an additional \$50 billion over the period 2020-24 in nominal current GDP terms. (Source: Analysys Mason 2020)

### The correlation between international bandwidth and GDP in Africa

The amount of bandwidth capacity which is activated (equipped) and sold is increased by increments in line with demand.

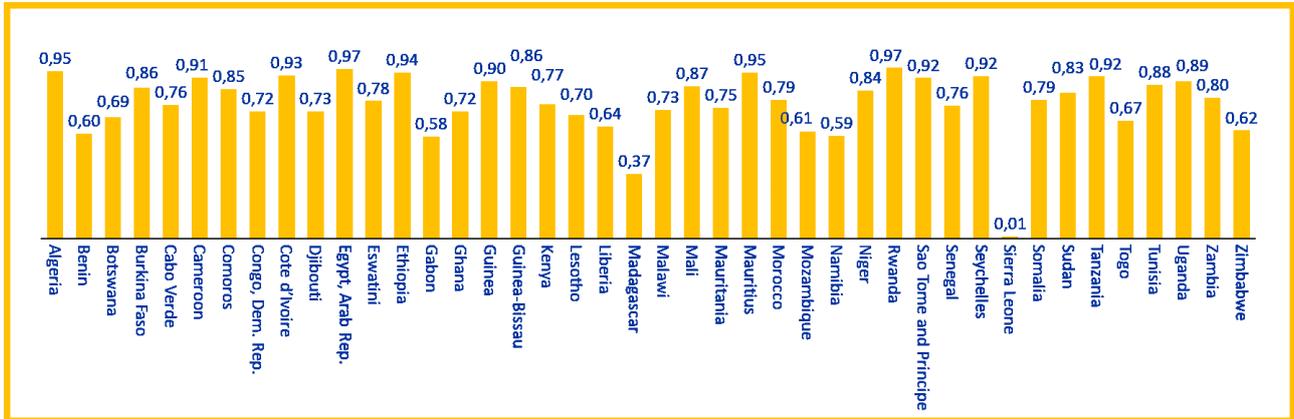
Demand grows with an increase in population and GDP per capita.



Source: TIM Study Center elaboration on ITU, World Bank data

## International connectivity contribution to GDP

A strong positive correlation (average 0.77) exists between GDP per capita and international connectivity per capita in 42 out of a total of 54 African countries.

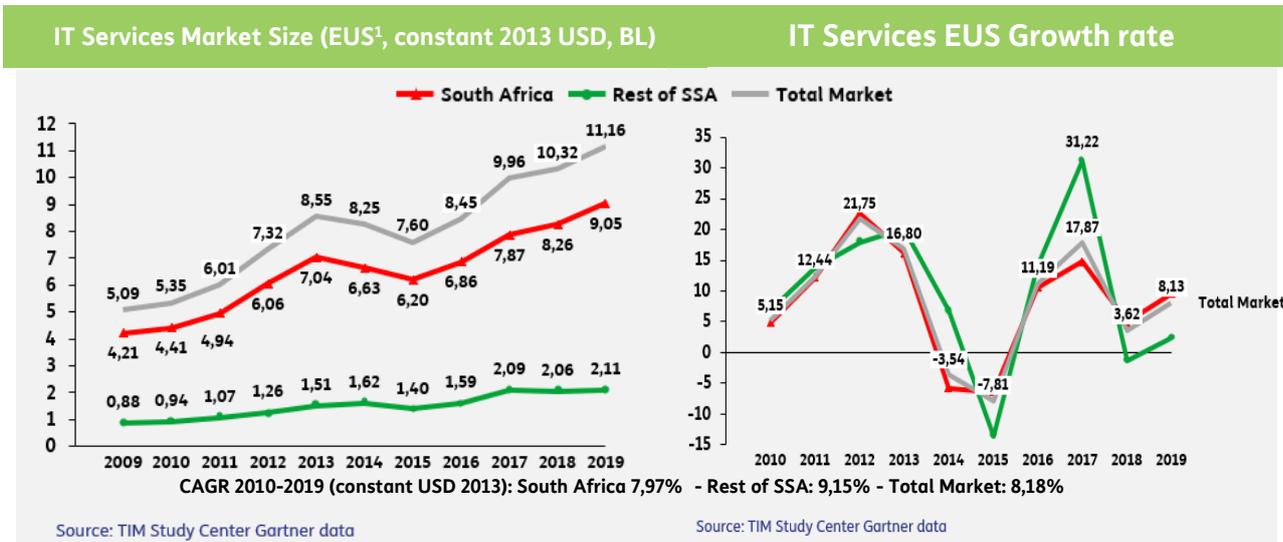


Source: TIM Study Center elaboration on ITU, World Bank data

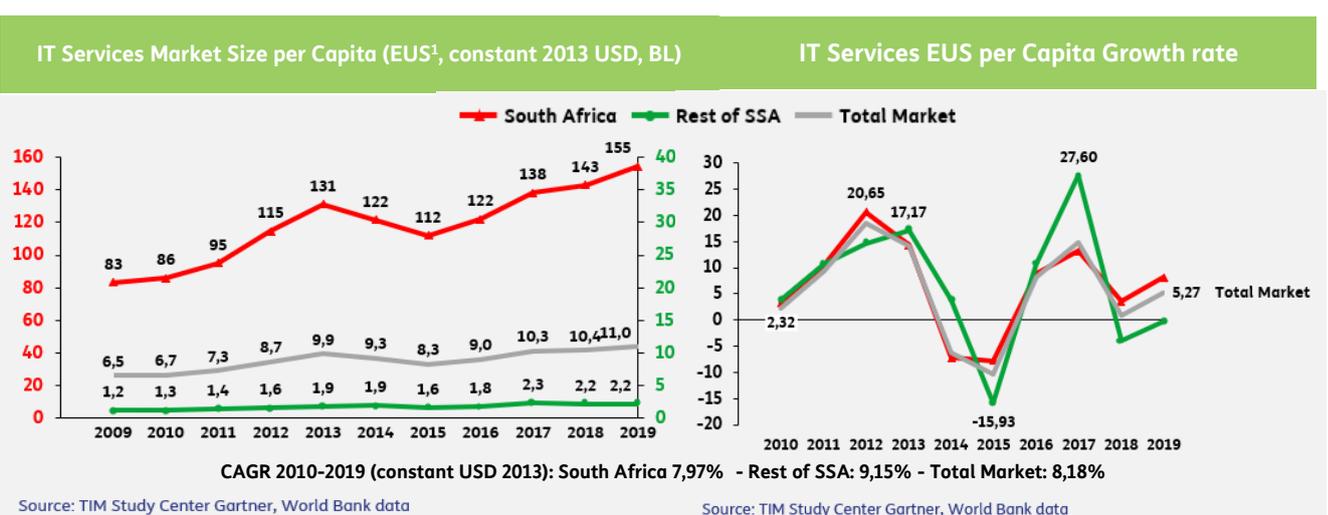
# Information Technology contribution to GDP

## IT trends in Sub Saharian Africa

Total Market Size 2019 in current USD is 7,97 B. In constant USD 2013 South Africa is worth around 80% of the overall Sub-Saharan market. In current USD, in 2019 it was 76% of the SSA region. The rest of the SSA trend is similar to the South African one, although with some lag and in excess (both in increasing and decreasing trends).



South Africa numbers are outstanding and anticipate the general trend

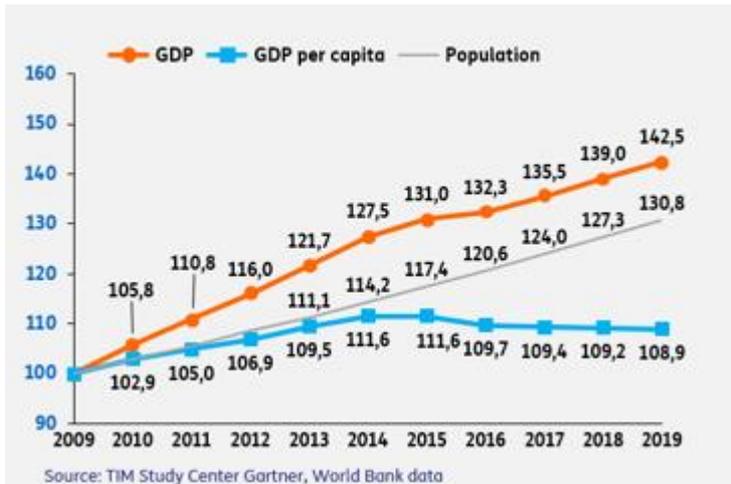


<sup>1</sup>End User Spending

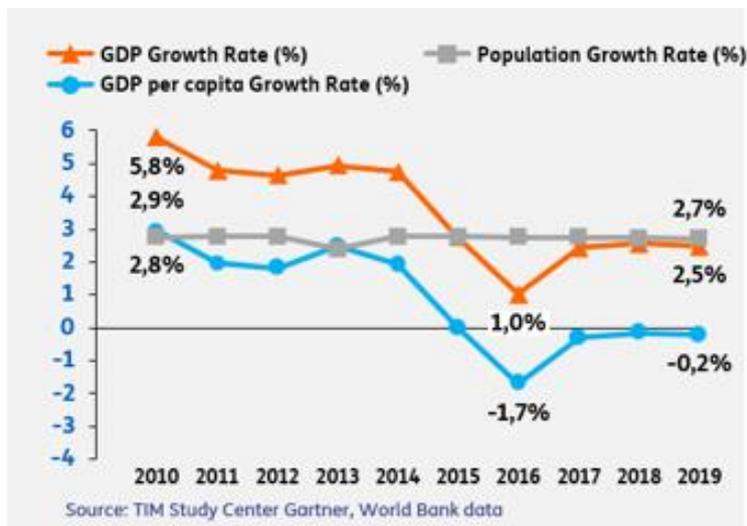
## Information Technology contribution to GDP

The population has been steadily increasing with a 2.7% avg. rate. After 2014 GDP Growth rate had a slump down and GDP per capita started to decrease. Trends for GDP per Capita and absolute GDP Growth Rates have similar shapes, but values are different.

### Indexes (2010=100)

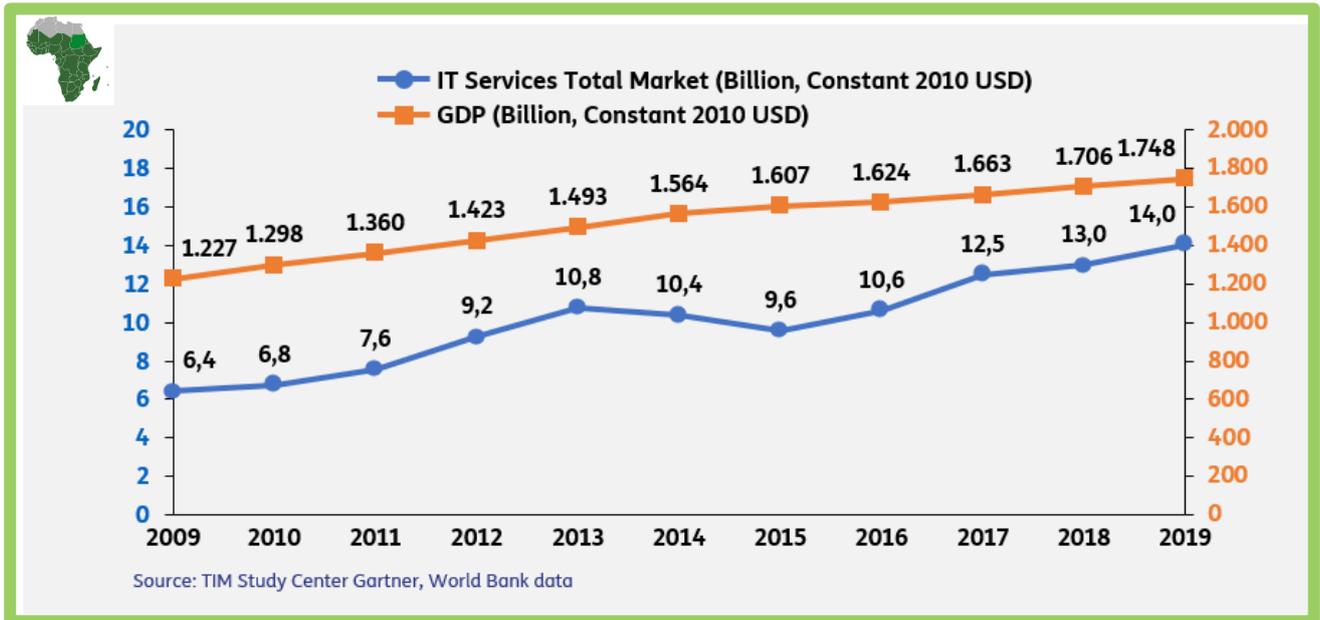


### Growth rates

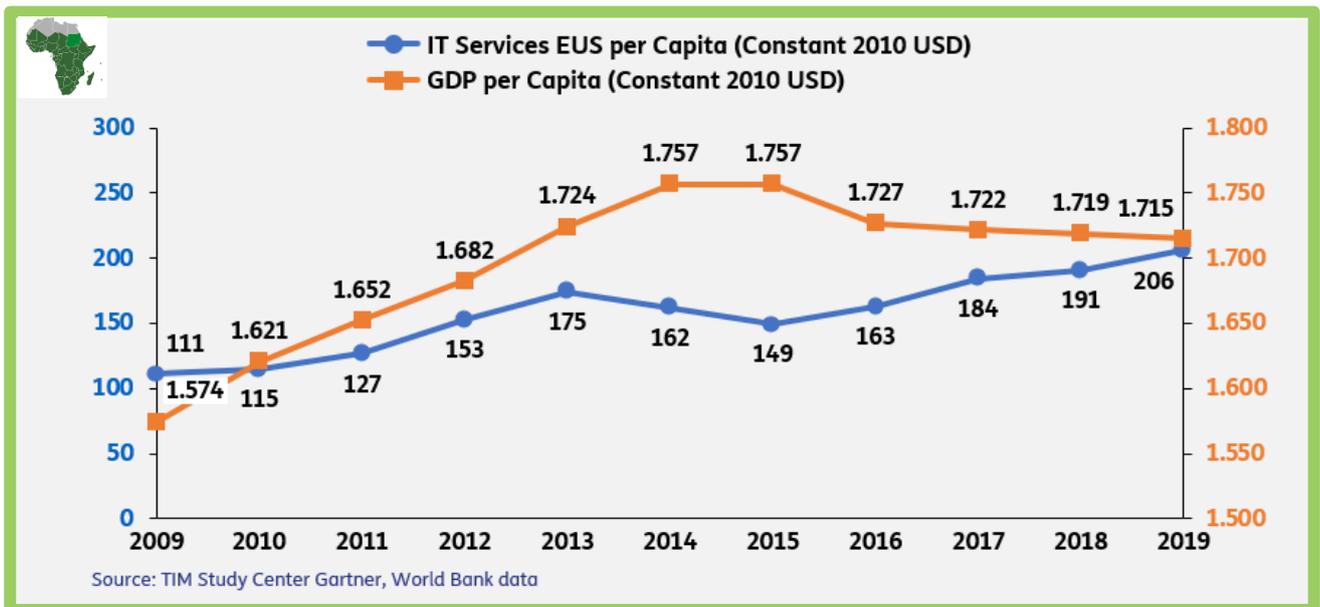


## IT and GDP trends

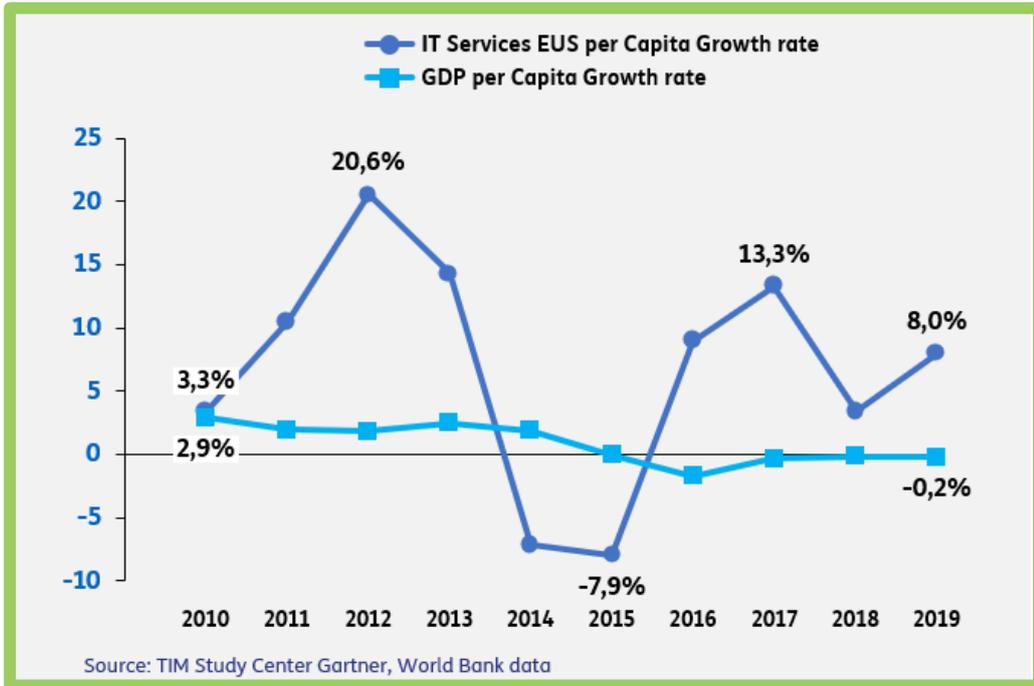
IT Services Market Size and GDP have a high correlation coefficient (0,95). However, the GDP cannot be depending only on IT services spending; a linear regression of the GDP on the IT service EUS shows a high probability of low significance.



IT Services Market Size per Capita and GDP per Capita have a high correlation (0,73).

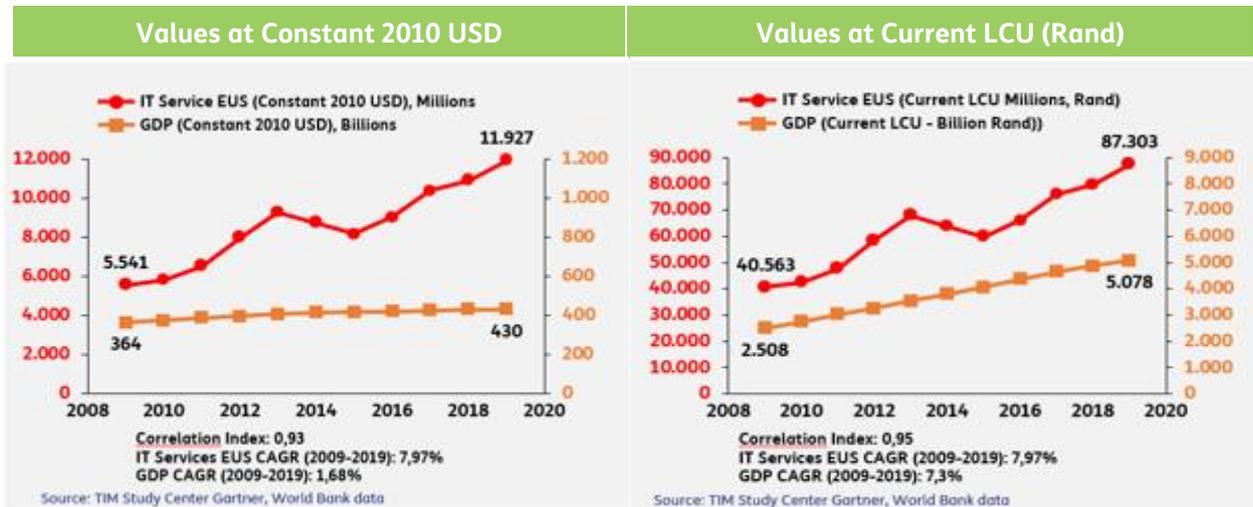


IT services market is much more dynamic than GDP per capita. There is no evidence of correlation.

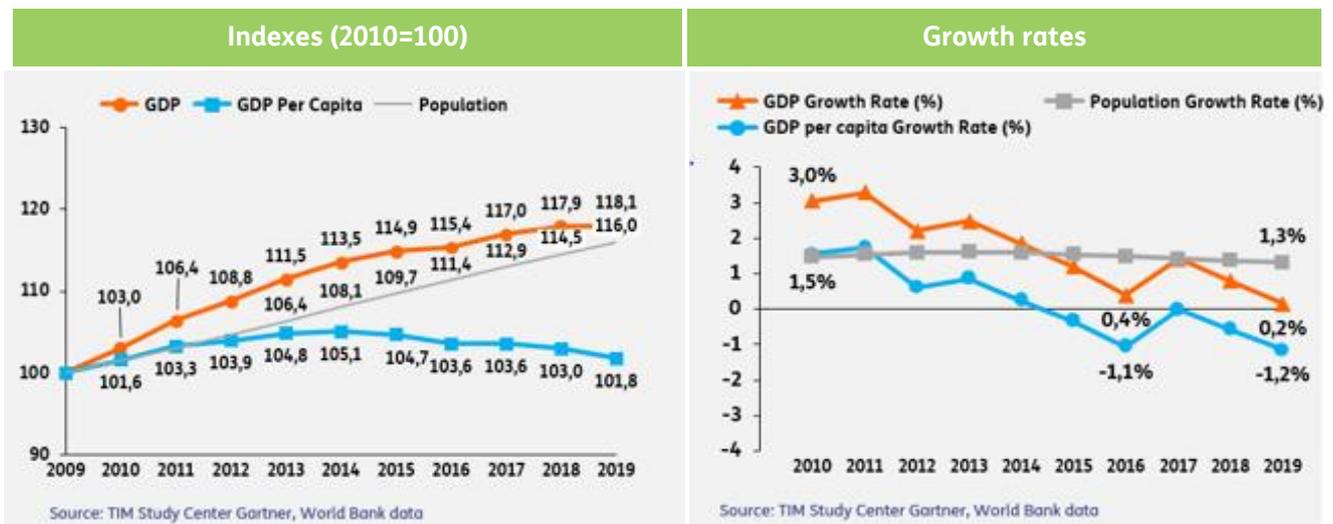


## IT and GDP correlation in South Africa

IT Services EUS vs GDP: trends are different, but the correlation index is however very high, both in constant USD and in current LCU (Rand).<sup>1</sup>

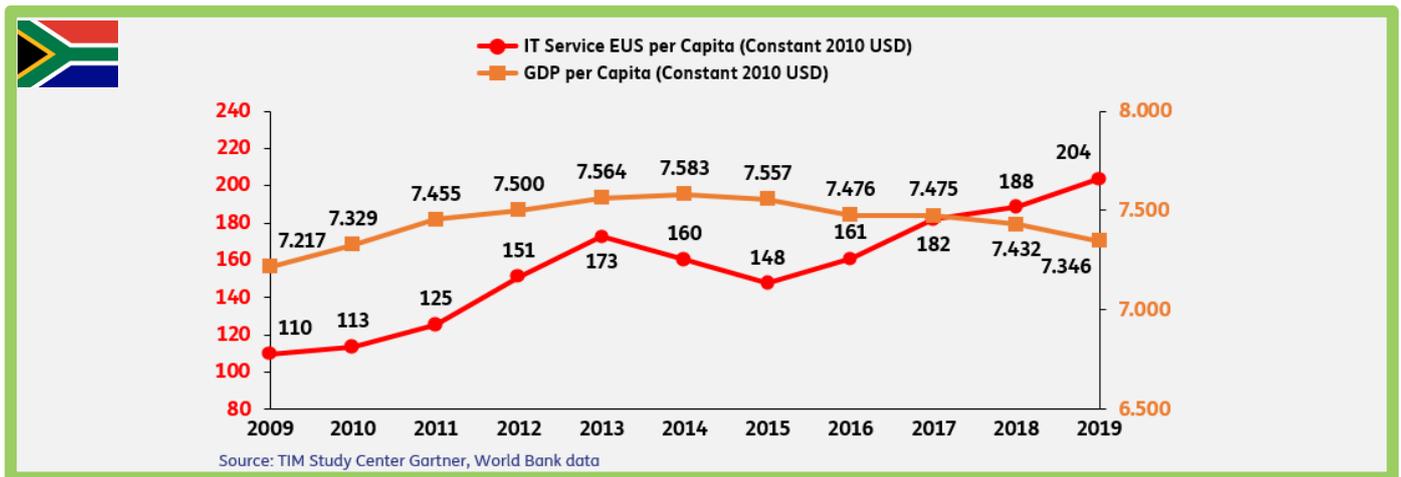


South Africa shows peculiar figures. The population increased by half than in the rest of SSA but GDP did not grow enough to sustain GDP Per Capita, which in 2019 went back to the level of 2010.

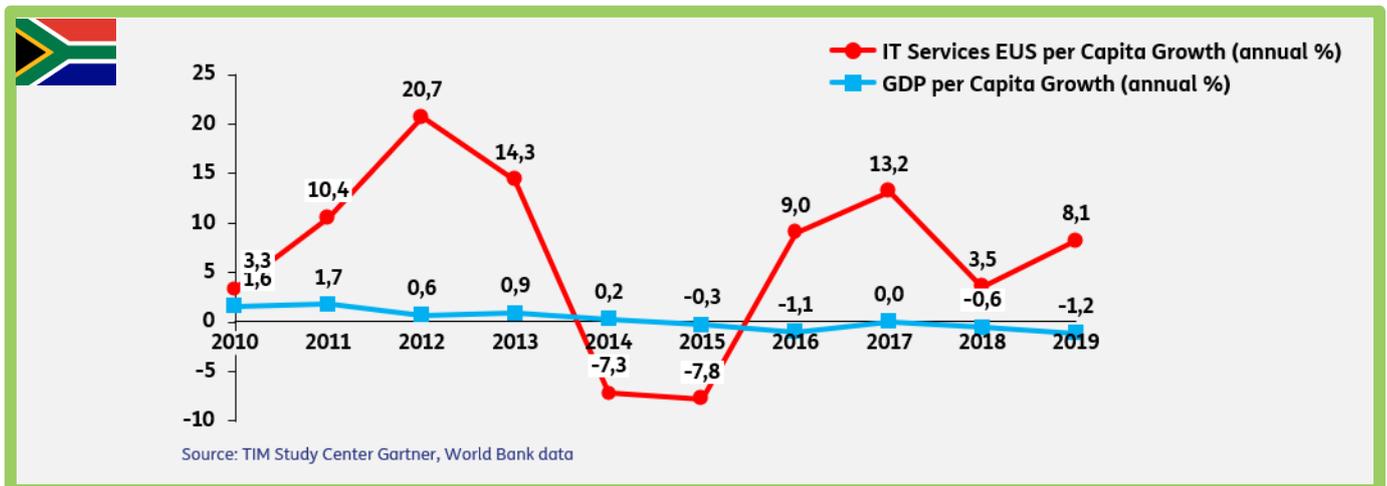


<sup>1</sup> EUS CAGR is the same in both diagrams as reported EUS numbers can vary according to exchange rates (constant, current) but do not take into account inflation. EUS USD 2010 is calculated taking rand values each year and multiplying by the rand/USD rate of 2010

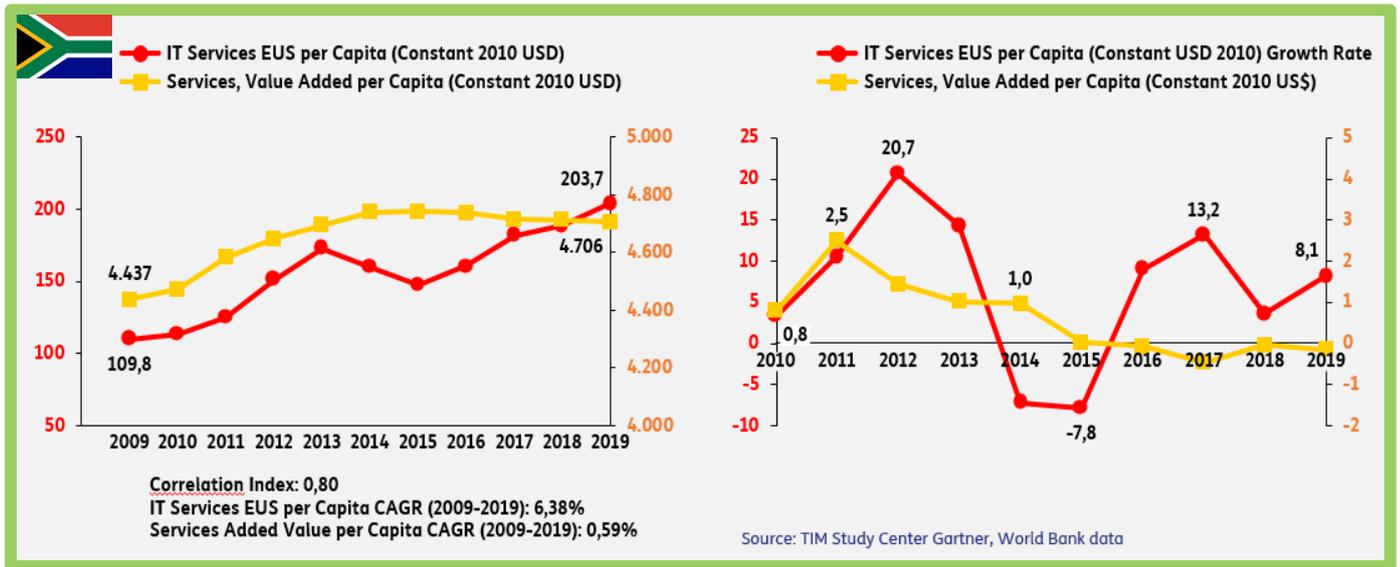
IT Services EUS Per Capita vs GDP Per Capita (Constant 2010 USD: due to the specific indexes of South Africa, the correlation is weak: just 36%. However, In the current local currency unit (Rand) and with nominal GDP (i.e. including inflation), the correlation is 95%. The average ratio of IT EUS PC vs GDP PC is 2.1%.



The GR of IT Services EUS had a fluctuating trend in the past years, while GDP per capita GR smoothly decreased year after year.

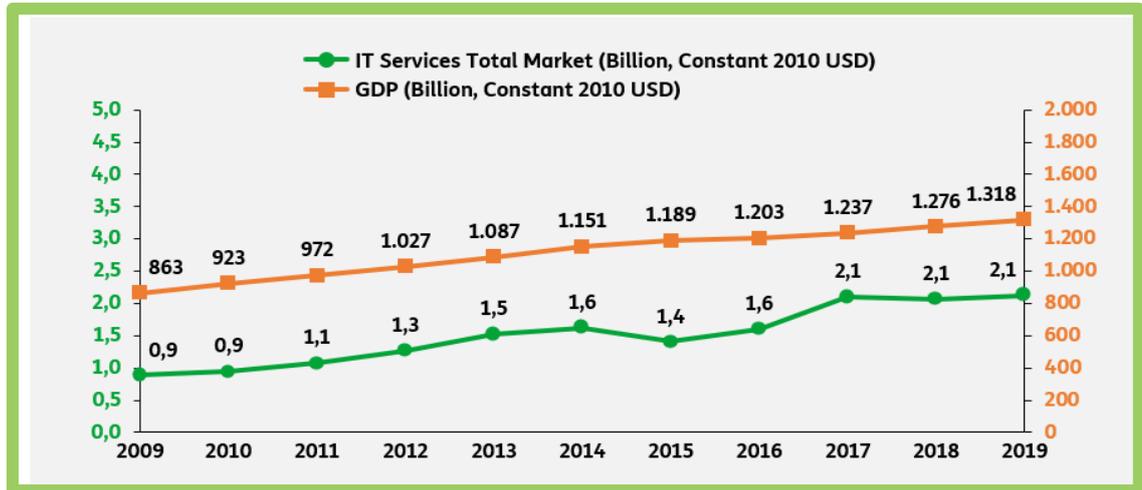


A comparison per Capita of IT Services EUS with Services Added Value shows a good Correlation: 80%. The IT services per Capita GR is proving again peculiar in front of Services Added Value GR.

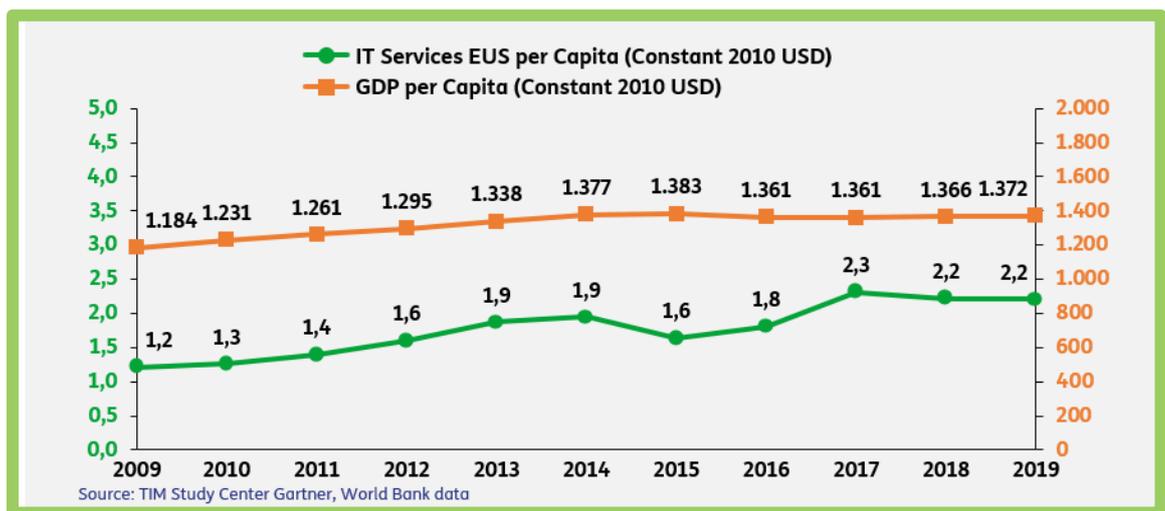


## IT and GDP correlation in rest of Sub-Saharan Africa

In the rest of Sub-Saharan Africa, there is a high correlation coefficient (0,95) between IT services market size and GDP.



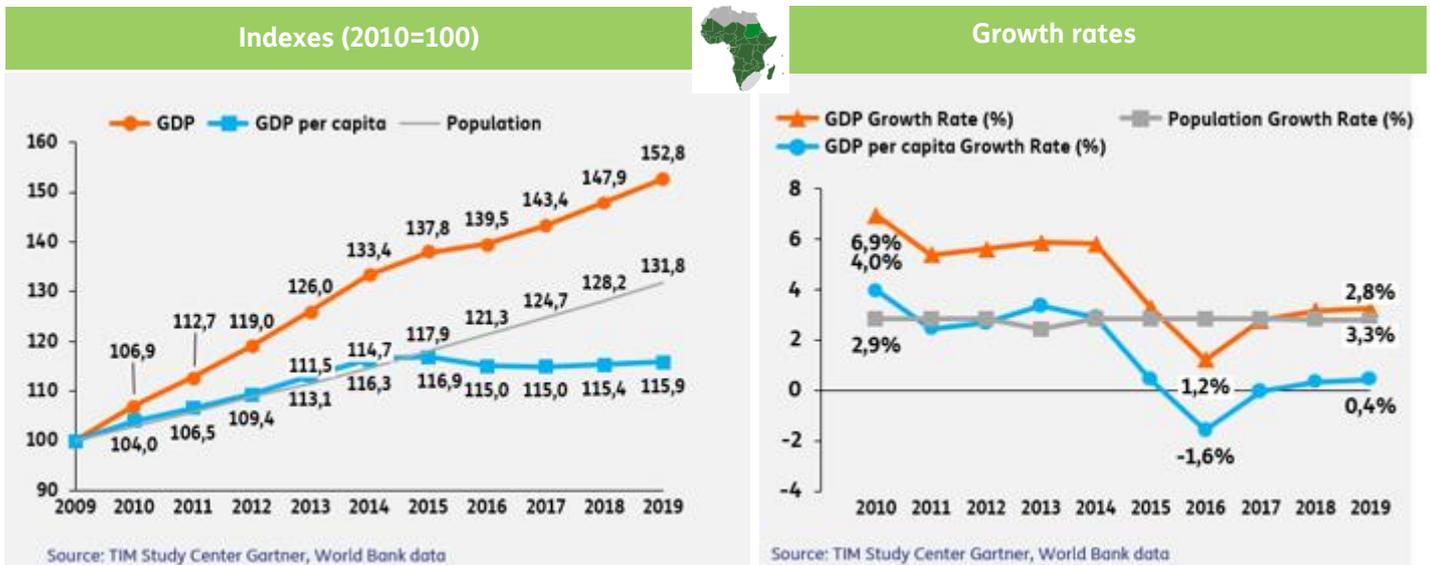
The correlation Index is still high per Capita value: 0.83. The IT services value per Capita is very low (around 2 USD). The average ratio of IT EUS PC vs GDP PC is 0.13% (for South Africa it is 2%).



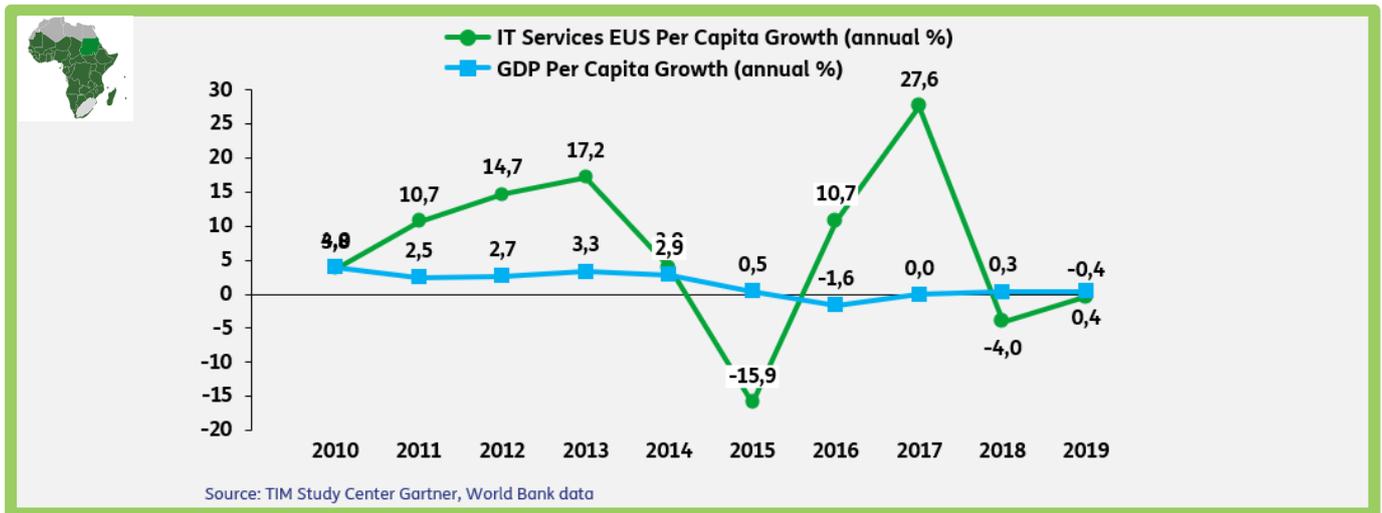
## Information Technology contribution to GDP

The population has been steadily increasing with a 2.8% average rate. Trends are similar to those of the whole SSA area.

GDP per capita in 2019 was still below the 2015 level.



The strong performance of IT Services EUS; after 2014-2015 drop GDP per Capita stopped growing significantly.



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