# TELECOMMUNICATIONS PERFORMANCE INDICATORS 2021

## Curaçao ICT sector Benchmarking & Analysis


STATISTICAL PUBLICATION
END OF YEAR 2020

**BUREAU TELECOMMUNICATIE EN POST**
MULTI-SECTOR REGULATORY AUTHORITY

## DISCLAIMER

The information and statistics in this report are derived from a variety of sources but are mainly based on data obtained from the local telecommunication service providers. In case of incomplete or untrusted information, estimates are used based on careful analysis of existing data, extrapolation and market intelligence. In following publications estimates will be replaced with official data when received from service providers and/or other trusted sources. This report does not constitute commercial or other advice. No warranty, representation or undertaking of any kind, express or implied, is given in relation to the information and statistics contained in this report.

Publication date: November 2021

Bureau Telecommunicatie en Post
Beatrixlaan 9, Emmastad
Willemstad, Curacao

www.btnp.org

# TABLE OF CONTENTS

# 1 List of tables and figures

## Tables



## Figures

# 2 ABOUT THIS REPORT

This report offers a detailed overview of the local trends in the telephony market (comparing fixed prices and prices for mobile-voice services), broadband internet market (mobile and fixed broadband), subscription television market (pay-tv) and other related Information and Communication Technologies indicators (from here on: ICT-indicators) in Curaçao. This publication is the eight-telecommunications market report by the Bureau Telecommunicatie en Post[1] (from here on: BT&P) and the data is collected through an internationally standardized questionnaire organized by the International Telecommunication Union[2] (from here on: ITU) in combination with questions relevant to the BTP.

The questionnaire was sent to all local telecom operators end of January 2021, requesting information representing 2020, more specifically related to the date of December 31st, 2020 (from here on: End-of-Year, EOY 2020). Most of the data was received by BT&P in the second and third quarters of the year 2021. The data collected by BT&P from local telecom operators based on the standardized questionnaire was subsequently submitted to the ITU for benchmarking purposes and to be processed in several international publications. In this report some information is gathered and analyzed separately from the ITU questionnaire data, for example the fixed and mobile telephone subscriptions, mobile broadband information, fixed broadband penetration as a percentage of households (domestic internet), average download speeds, and data centers related information. Most of the benchmarking analysis are conducted on the previous year (EOY 2019) as the information of EOY 2020 from other sources was not readily available at the time of production of this report.

In 2018 the ITU introduced a new diverse price baskets methodology to monitor the all-round development of the telecommunication market. This restructured method has been functional since the price-data collection questionnaires starting in 2019 for the End-of-Year information of 2018. Therefore, the ICT price benchmarks from 2018 and forward are not directly similar then those of the previous years. Since last year the BT&P has been using the new method to monitor the telecommunication market.

[1] Multi-sector regulatory authority in Curacao. For more information visit www.btnp.org.
[2] Visit www.itu.int for more information.

To compare the previous method with the current method. The previous method consisted of 3 baskets; fixed telephony basket, mobile cellular basket and the fixed broadband basket. Each sub-basket was calculated separately, and the three results were added together in a predetermined formula. Finally, the average of these baskets was calculated, and the resulted indicator was representative for the whole telecommunication sector and was further used for international benchmarking purposes.

The current Price Basket has been extended to five baskets; fixed-broadband, mobile-voice, mobile-data-only, and mobile-data-and-voice basket including high and low consumption baskets. More attention is being given to internet services as a predominant factor in the telecommunication industry and fixed telephony (tariffs) benchmarking is removed from the ITU benchmarking analysis. For this reason in this report again, fixed-broadband, mobile-voice and mobile-data are also the main topics that will be analyzed with regards to the ICT Price Basket. The other difference with the current and previous method is, that for the current method each basket is benchmarked separately. Therefore, there is no aggregate result that can benchmark the overall telecommunication sector just by using a single indicator.

Telecommunication authorities worldwide collect the standardized ITU questionnaire data and ICT Price Basket information. Most of the available data is published yearly by the ITU in the 'Yearbook of Statistics'. Specific pricing related information can be found in the "Measuring digital development - ICT-Price Trends" reports by the ITU. Through the ITU World Telecommunication/ICT indicators (WTI) database (2020), BT&P was able to benchmark the Curaçao data against peers in the Caribbean region, South and Central America, including World averages and some other specific countries. In this report, the BT&P does not share what is considered to be market sensitive information belonging to telecom operators. In addition, BT&P uses international studies and datasets from recognized bodies like the World Bank database and the Central Bureau of Statistics Curaçao to add interesting market information to this report. This is how BT&P keeps an eye on ICT-trends and developments in the local and international markets and is able to develop fact-based policy.

# 3 FIXED TELEPHONE NETWORK

## 3.1 Fixed-telephone subscriptions

The chart below shows the trend regarding fixed-telephone subscriptions in Curaçao over the last twelve years. In the end of 2020, the number of fixed telephone subscriptions decreased to 53.5 thousand, representing an overall 5.1 thousand decrease or 8.7 percent drop in subscriptions from the previous year.

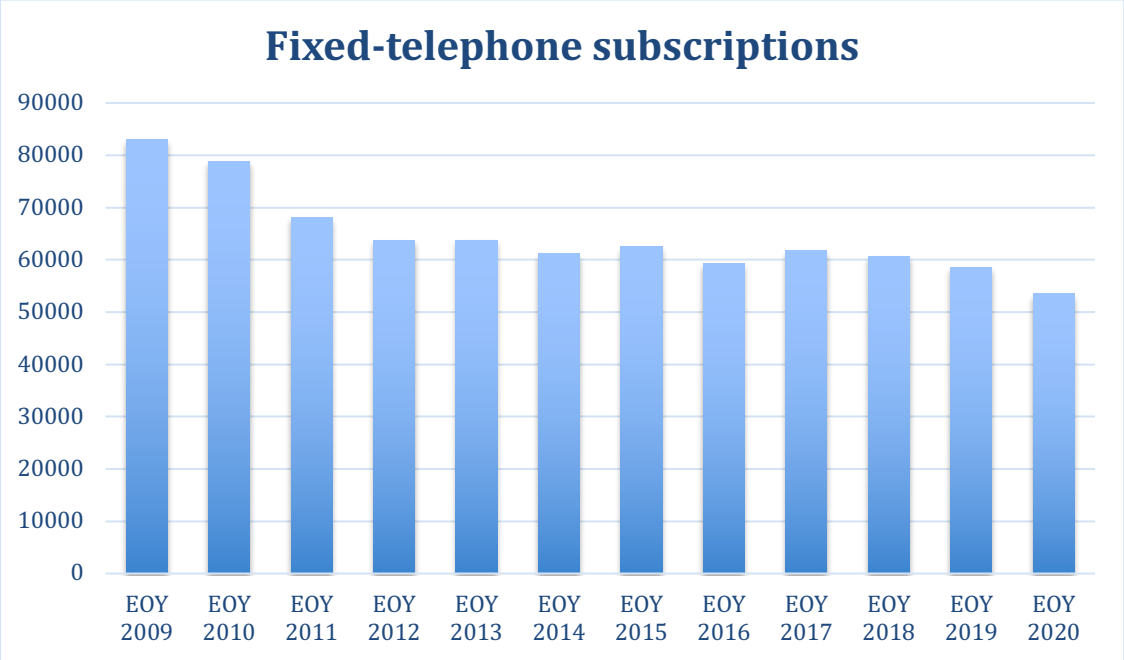



*Figure 1: Fixed-telephone subscriptions, EOY 2009 - EOY 2020*

The use of fixed telephone has changed considerably from 83.0 thousand in 2009 to 53.5 thousand subscriptions at the beginning of this year. The proportion of households with fixed telephone access in Curaçao has generally been declining since 2009, but since 2012 the number of fixed telephone subscribers have maintained relatively stable up to the year 2019. Last year, in 2020, the number of fixed telephone subscribers fell considerably with more than 5000 subscriptions.

The total number of fixed-telephone subscribers in Curaçao has declined around 36 percent over the last 11-year period. This change has come mostly from subscribers using mobile telephony or alternative apps for making calls via the internet. This is a normal worldwide trend as a consequence of technology advancements and as such the same developments can also be seen in other markets.

### 3.2 Fixed telephony per 100 inhabitants

The standard metric recognized internationally to measure the adaption of fixed voice services penetration is calculated based on the number of fixed voice subscriptions per 100 of the population. The EOY 2019 fixed voice penetration was calculated at 32.7, which is 9.42 percent lower than the previous year. This means that in 2019 there were approximately 32 fixed voice subscriptions available to every 100 persons in Curaçao.

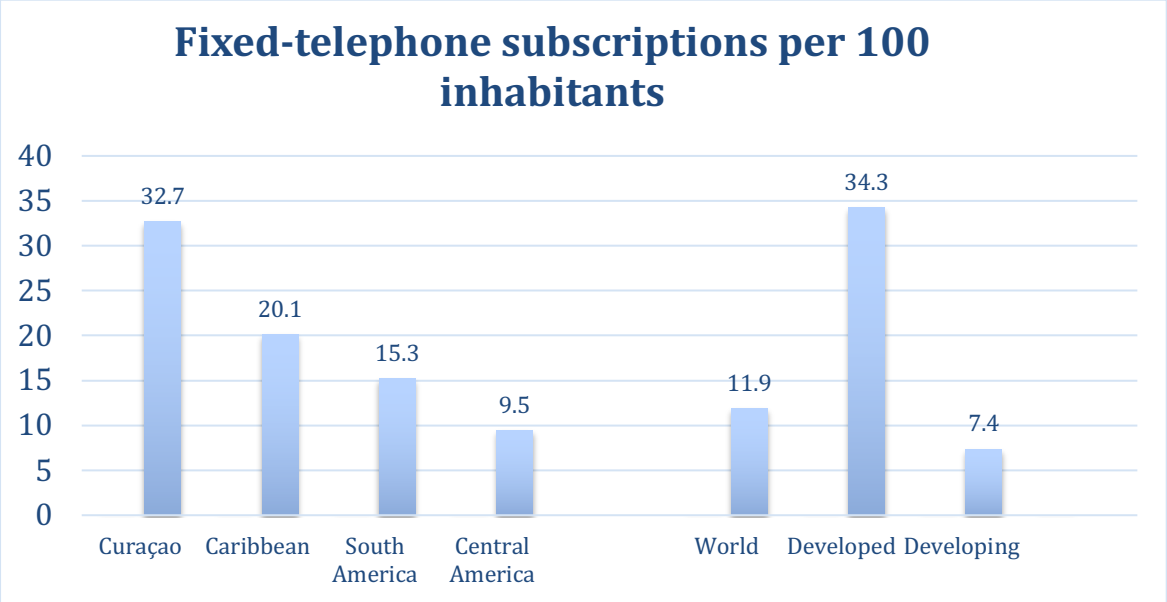



*Figure 2: Fixed-telephone subscriptions per 100 inhabitants compared to the region and the world, EOY 2019*

If compared the fixed-telephone subscription penetration rate in the Caribbean, Curaçao scores quite high. In the Caribbean, Barbados is the island with the highest score with a rate of 44.6 and Curaçao follows with a rate of 32.7. As shown in figure 2, Curaçao scores lower compared to developed[3] countries. The classification used according to the United Nations results show the overall globally score of 11.9, followed by 34.3 and 7.4 for developed and developing countries respectively. See Appendix D1 for list of countries and source data.

[3] The classification used for developed/developing countries is according to the UN M49. The M49 is a standard for area codes used by the United Nations for statistical purposes, developed and maintained by the United Nations Statistics Division. Based on the M49, countries are classified according to macro geographical regions and sub-regions, and selected economic and other groupings, see: http://unstats.un.org/unsd/methods/m49/m49regin.htm.

### 3.3 Fixed-telephone tariffs

In previous publications the ITU used the method of USD costs per three-minute call, including any call set-up charges and taxes, for both peak and off-peak calls to benchmark the fixed telephone tariffs. As the fixed-telephone market faced a slowdown stage in the developed markets with no technology advancements, the ITU policy is setting more priorities and focus on the infrastructure and services of fixed and mobile and broadband. Some trends in consumer behavior are being observed recently. Voice calls are being placed more frequently on mobile networks, in clear substitution of fixed networks. The emergence of over-the-top providers (OTT) has enabled the use of a myriad of new services via mobile networks, and some of these services are very similar to those offered by traditional operators. A call can be placed today via any operator network or by using the open Internet with the use of a specific app, bypassing the traditional business offer of the operator. Therefore, the ITU stopped collecting data on fixed-telephone tariffs since 2018. BT&P however has continued collecting this data to monitor the market development and related activities in Curaçao. The table below provides an overview of a one-minute fixed-telephone call during peak hours including set-up fees and 1st minute charges for the period 2012-2020.

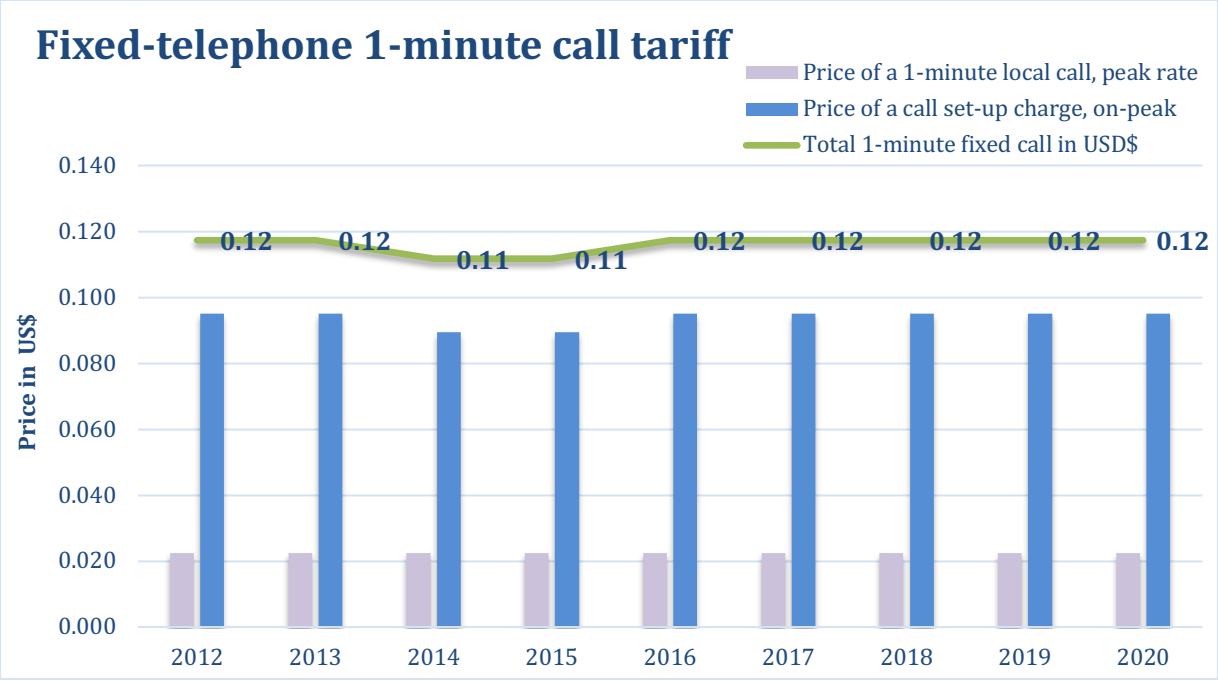



*Figure 3: Fixed-telephony tariffs in USD, EOY 2012-2020*

The first-minute fixed-telephone call during peak hours for the year 2020 would cost around 0.21 ANG / 0.12 USD including taxes. This is calculated based on information of the largest market share operator which applies a per-minute rate of 0.04 ANG and 0.17 ANG call set-up charge for each fixed local call. This is for the most part consistent with the previous years. Furthermore, the largest market share operator makes no distinction between peak and off-peak prices. The graph shows clearly as stated before the lack of developments with regards to fixed telephony tariffs for the last years.

# 4 FIXED BROADBAND INTERNET

## 4.1 Fixed-broadband internet subscriptions

Telecommunication service providers in Curaçao use a mix of technologies to provide fixed broadband internet services to the public. Fixed broadband internet services employ Digital Subscriber Line (DSL) over copper cables, Hybrid Fiber-Coax (HFC) networks utilizing the latest DOCSIS technology, as well as a mix of Fiber to the Curb (FttC), Fiber to the Business (FttB), or Fiber to the Home (FttH) topologies and terrestrial fixed-wireless broadband.

The market for fixed broadband[4] subscriptions continues to show growth in 2020. Figure 4 illustrates the figures for fixed broadband subscriptions of 51.5 thousand subscriptions end of year 2020. The growth thereby represents an increase of 3.9 percent or an additional 1.9 thousand subscriptions compared to December 2019. The presented numbers are based on residential subscriptions (fixed domestic internet) and may include small businesses. Fixed broadband subscriptions contracted by public and private organizations (non-residential customers), are not considered in this analysis. The fixed (wired) internet penetration has reached a level of 84% in EOY 2020 on terms of connected households.

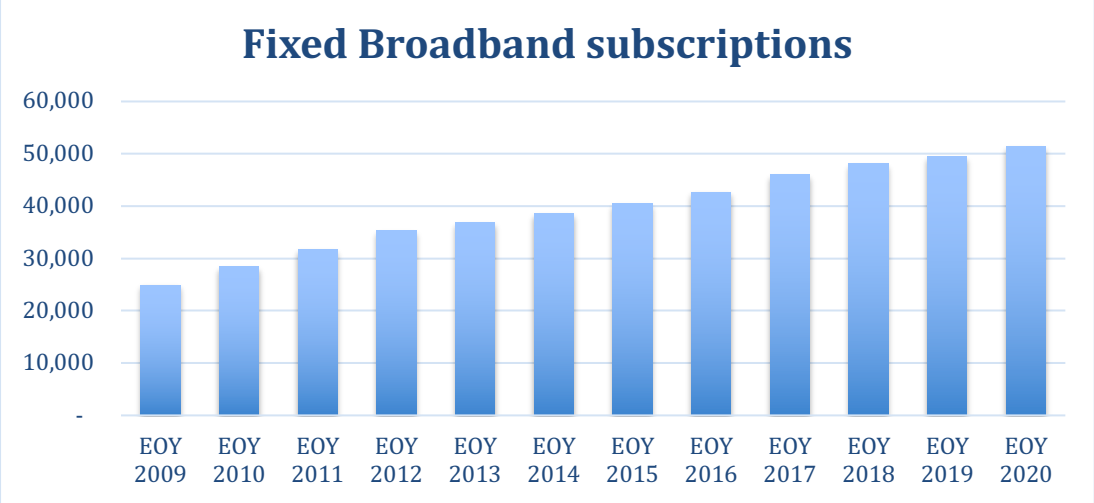



*Figure 4: Fixed (wired) broadband subscriptions, EOY 2009 - EOY 2020*

[4] Fixed (wired)-broadband subscriptions refer to subscriptions to highspeed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This threshold of speed can be reached with different fixed or wireless 'fixed' technologies: digital subscriber line (DSL), coaxial cable, optical fibre cable (fibre to the home/ premise, FTTx), in-building Ethernet Local Area Networks (LANs) and fixed wireless such as WiMAX and other technologies.

### 4.2 Fixed broadband subscriptions by speed

Total fixed broadband subscriptions reached a total of 53.4 thousand for the EOY 2020 including enterprise connections. The broadband speeds between 30 Mbit/s to 100 Mbit/s represents the largest category in EOY 2020 with nearly 47% of the total connections (see figure 5 below). The speeds of in between 2 Mbit/s to 10 Mbit/s were represented by 20.8% of the connections, whereas 32.5% of the connections were of speeds of in between 10 and 30 Mbit/s. The speed group below 2 Mbit/s has diminished in the last few years as the fixed broadband subscriptions for this category are not available anymore since 2017. The lowest available entry-level fixed internet subscription offered by the largest ISP in Curaçao at this moment starts at 100 Mbit/s download speed.

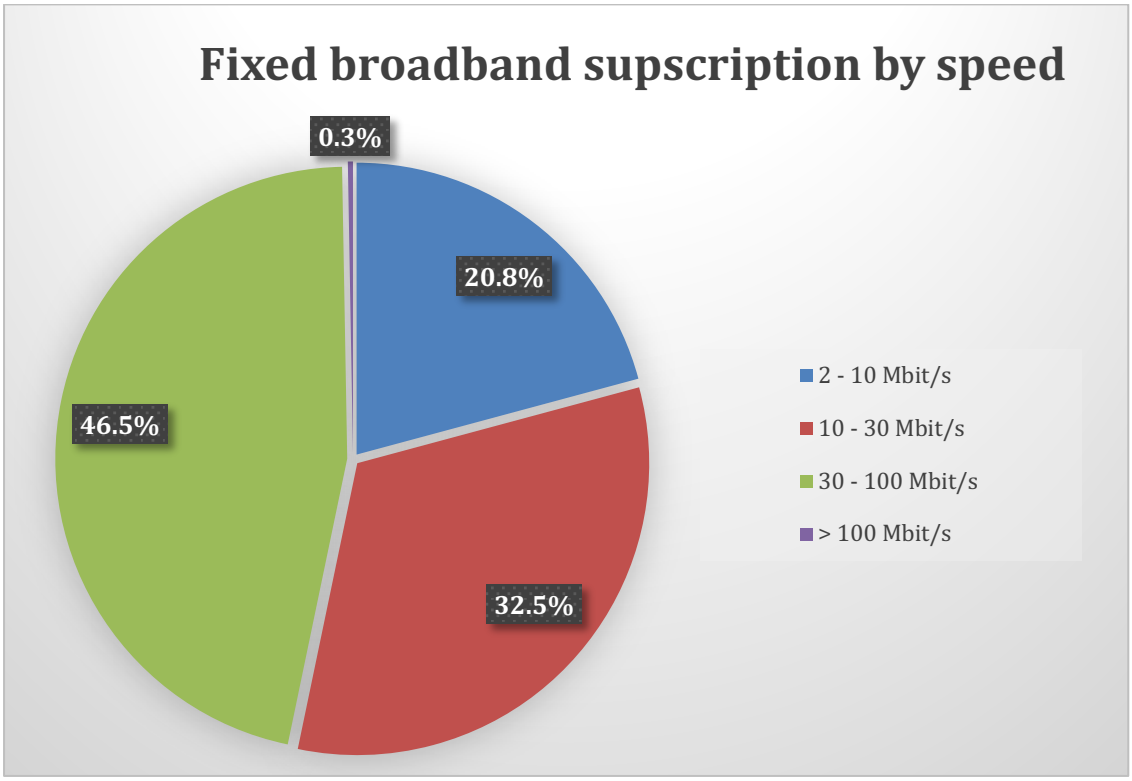
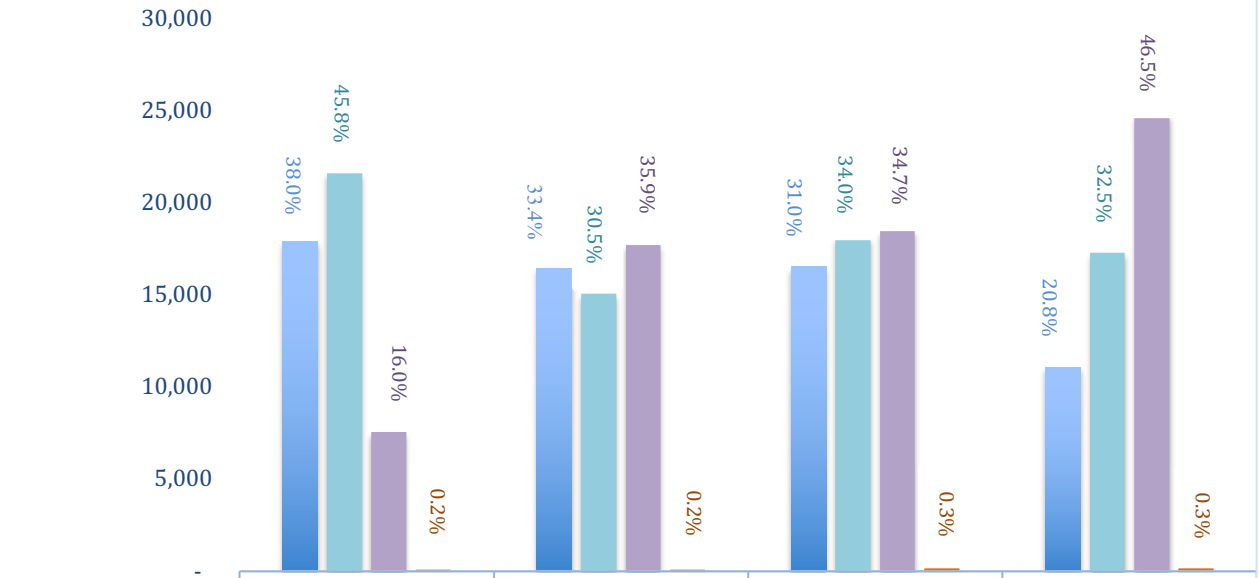



*Figure 5: Fixed (wired) broadband subscriptions by speed in percentages, EOY 2020*

Figure 6 below shows the development of the fixed broadband subscriptions based on speed categories from 2017 up to 2020. We can clearly see a progress in speeds of higher than 30 Mbit/s up to 100 Mbit/s since 2018. There's a clear development and shift in connectivity as right now the majority of the population is connected with speeds of 30 – 100 Mbps.




| | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|
| 2 - 10 Mbit/s | 17,914 | 16,479 | 16,538 | 11,105 |
| 10 - 30 Mbit/s | 21,623 | 15,071 | 18,105 | 17,317 |
| 30 - 100 Mbit/s | 7,553 | 17,740 | 18,515 | 24,784 |
| > 100 Mbit/s | 103 | 108 | 150 | 150 |
| Totaal | 47,193 | 49,398 | 53,308 | 53,356 |

*Figure 6: Fixed (wired) broadband subscriptions by speed, EOY 2017-2020*

An international benchmarking based on entry-level fixed-broadband median speeds shows that Curaçao with 25.0 Mbit/s in EOY 2020 is above the world median but felt behind when compared to specific regions as South America and the Caribbean (figure 7). The median entry-level fixed-broadband speeds for the Caribbean is at 26.2 Mbit/s, while the most developed countries including Europe are big steps ahead with entry-level subscriptions of around 40.0 Mbit/s. Nowadays Curaçao has already reached entry-level plans of 100 Mbps. Nevertheless, many households are still connected with speeds lower than 100 Mbps according to their existing contracts and service level agreements.

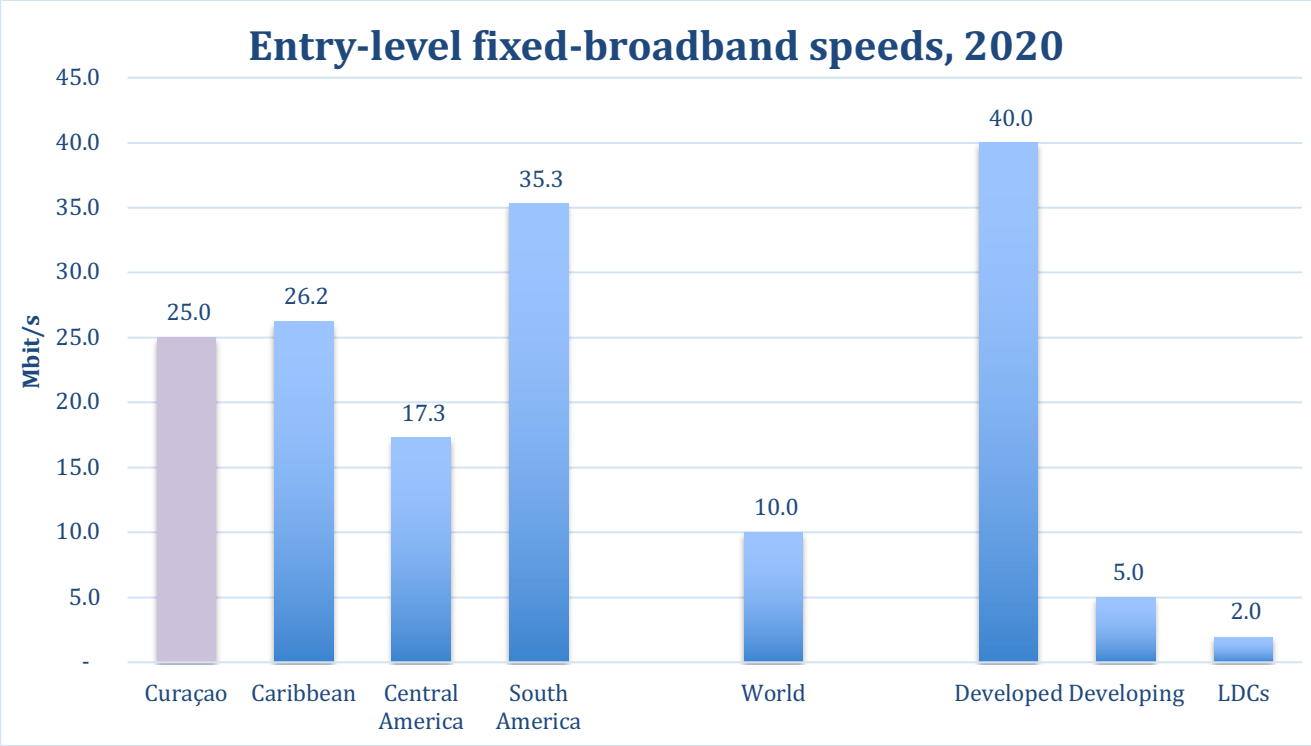



*Figure 7: Entry-level fixed-broadband median speeds, EOY 2020*

## 4.3 Fixed broadband per 100 inhabitants

The term fixed-broadband refers to a high-speed TCP/IP connection to the public Internet at downstream speeds equal to, or greater than, 256 Kbit/s. ITU uses the term (indicator) fixed-broadband subscriptions per 100 inhabitants to measure the amount of subscriptions for every 100 inhabitants in a particular region. This represents the penetration of fixed broadband internet in a country in terms of population.

### 4.3.1 Fixed broadband subscriptions per 100 inhabitants

In December 2019, Curaçao had a fixed broadband penetration of 32.6 in terms of population. This implies that there were approximately 33 fixed (wired) Internet subscriptions for every 100 inhabitants in Curaçao. In comparison with EOY 2018, there is an increase of 2.6% fixed (wired) Internet subscriptions for every 100 inhabitants in Curaçao. This is a consistent with the technology advancements, new internet developments and related available services of the last few years.

If compared to the region as shown in figure 8, Curaçao has a remarkable higher fixed broadband penetration rate than other countries in the Caribbean region. See Appendix D1 for list of countries and source data. This indicator for Curaçao is almost equal to those of developed countries.

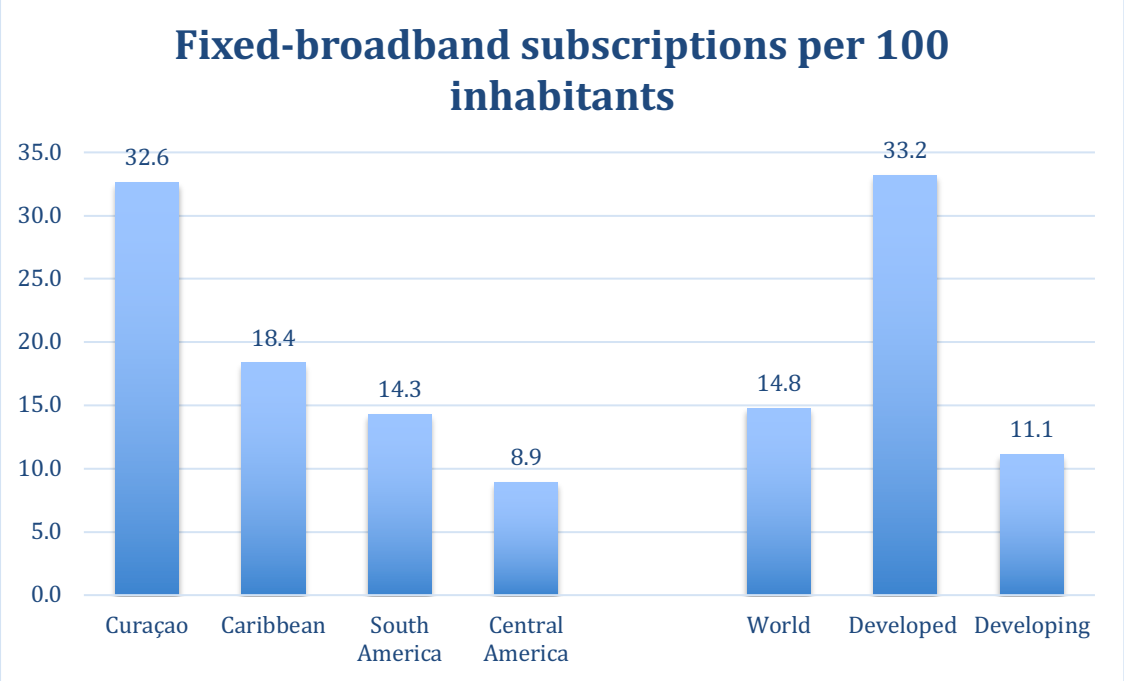



*Figure 8: Fixed (wired) Broadband subscriptions per 100 inhabitants, EOY 2019*

### 4.3.2 Curaçao fixed-broadband subscription per 100 inhabitants compared to the region, 2012-2019

In this section a comparison is made of the fixed broadband subscription per 100 inhabitants between Curaçao, Caribbean, and Central- and South America over a period of eight years. The figure below shows a relative linear growth for the entire region, with the exception of the Caribbean who shows in contrast to the previous years a slight decrease. For Curaçao the fixed broadband subscription per 100 inhabitants has been consistently higher than the rest of the region. Since 2016 an even more substantial increase is noted compared to the rest of the region.

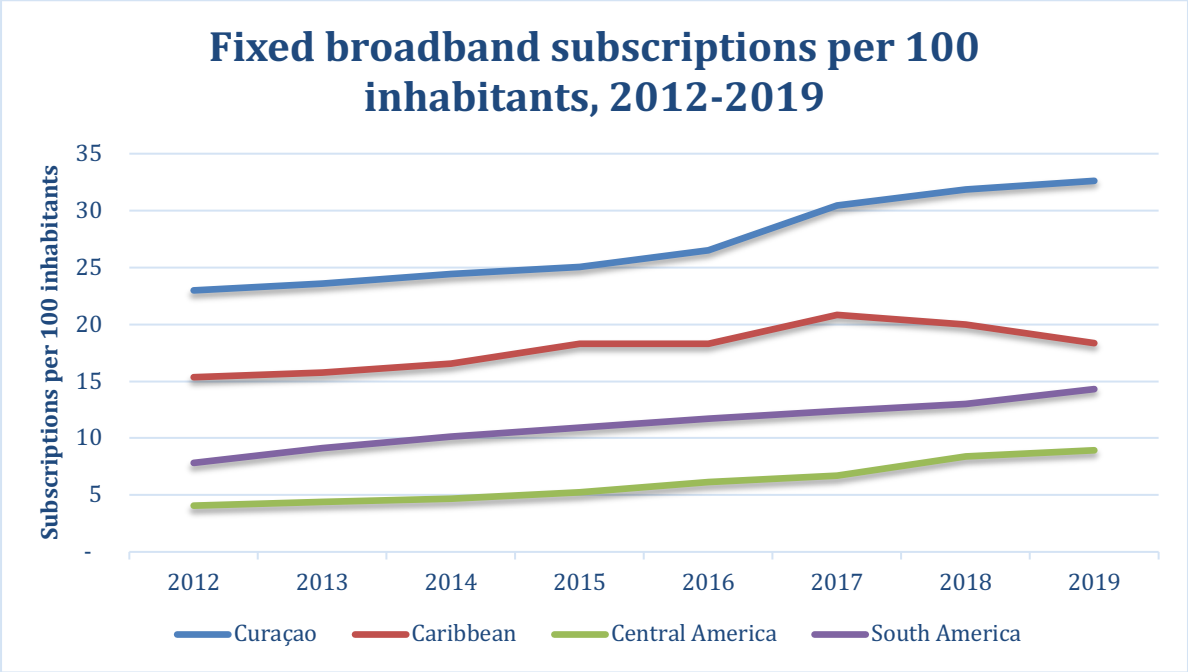



*Figure 9: Fixed (wired) Broadband subscriptions per 100 inhabitants, EOY 2012- EOY 2019*

### 4.3.3 List of regional broadband penetration levels

Compared to the list of broadband internet subscription per 100 inhabitants of the Caribbean region, South- and Central America in 2019, Curaçao stands at second place. In 2018 Curaçao was ranked in the first place with a penetration level of 31.85 per 100 inhabitants. This was the first time in history Curaçao was ranked at number 1, surpassing

Barbados that has been leading for the last previous years[5]. For the year 2019 Curaçao penetration level saw a slight increase of 0.76, meanwhile Barbados saw a sharp increase from 31.17 to 37.21 placing Barbados again at the first place. An absolute increase of 6.04 in the fixed broadband penetration level per 100 inhabitants which is quiet remarkable.

| Rank | Economy | Fixed (wired) Broadband subscriptions per 100 inhabitants |
|---|---|---|
| 1 | Barbados | 37.21 |
| **2** | **Curaçao** | **32.61** |
| 3 | Uruguay | 29.25 |
| 4 | Trinidad and Tobago | 24.33 |
| 5 | Grenada | 22.84 |
| 6 | Bahamas | 21.13 |
| 7 | Puerto Rico | 20.79 |
| 8 | Saint Vincent and the Grenadines | 20.34 |
| 9 | British Virgin Islands | 19.74 |
| 10 | Argentina | 19.64 |
| 11 | Chile | 18.10 |
| 12 | Costa Rica | 17.92 |
| 13 | Brazil | 15.59 |
| 14 | Suriname | 13.83 |
| 15 | Colombia | 13.81 |
| 16 | Panama | 12.61 |
| 17 | Ecuador | 12.04 |
| 18 | Jamaica | 10.78 |
| 19 | Venezuela | 8.98 |
| 20 | Dominican Rep. | 8.66 |
| 21 | El Salvador | 8.14 |
| 22 | Belize | 7.58 |
| 23 | Bolivia (Plurinational State of) | 6.49 |
| 24 | Paraguay | 5.36 |
| 25 | Honduras | 4.01 |
| 26 | Nicaragua | 3.32 |
| 27 | Cuba | 1.61 |
| 28 | Haiti | 0.28 |
| | **Selected Countries** | |
| - | Malta | 45.99 |
| - | Netherlands | 43.63 |
| - | United States | 34.73 |
| - | Singapore | 25.91 |

*Table 1 - List of broadband penetration in the Caribbean region 2019*

[5] This benchmarking is done using ITU's World Telecommunication/ICT indicators database including a list of countries of which data is available and trusted.

## 4.4 Affordability of fixed-broadband internet

The affordability of the fixed-broadband internet is benchmarked based on the cheapest (entry-level) broadband internet subscription offered. For internet service providers applying a data-cap, a minimum of 5 GB data monthly usage should be considered. To make distinct prices comparable different methodologies may be followed. The benchmarking method chosen by ITU as well as by many other international institutions is based on defining a consumption basket, i.e., specific consumption of voice and data per month and per user, that represents what the average consumption of a user would be. This basket approach matches the assumed consumption for at least one service with each of the available prices being offered by operators and from there a final expenditure is obtained for each price, given the consumption volumes assumed ex ante.

### 4.4.1 Fixed broadband tariffs

In December 2020, the price for an entry-level fixed-broadband internet service in Curaçao was approximately at USD 54,- monthly for a connection speed of 25 Mbps. The local internet service providers for fixed broadband internet (as in many other countries) do not offer their services based on maximum data usage cap. For this reason, the 5 GB data cap is not relevant for the local analysis. However, international benchmarking will still be conducted based on this factor as this is the general approach utilized by the ITU.

A comparison with the region as shown in figure 10 reveals an average price for entry-level fixed-broadband in the Caribbean of USD 46,- monthly. The average price in Central- and South America is lower, at USD 33,- and USD 24,- respectively. The Global average is at USD 23,- and the developed countries is at USD 28,- monthly. The price in the developing countries is more in line with the global average, at an average price of USD 22,- for entry-level fixed-broadband monthly. The entry level price in Curaçao is about twice as high compared to the developed countries. For this price of USD 54,- in Curaçao a subscriber will receive a connection speed of 25 Mbps. The necessary caution is needed when conducting one on one benchmarking in this category as the prices for entry-level fixed broadband plans can be related to a very broad range of offered download speeds (from 1 Mbit/s up to 150 Mbit/s) and for this reason quality and performance is not considered in this analysis.

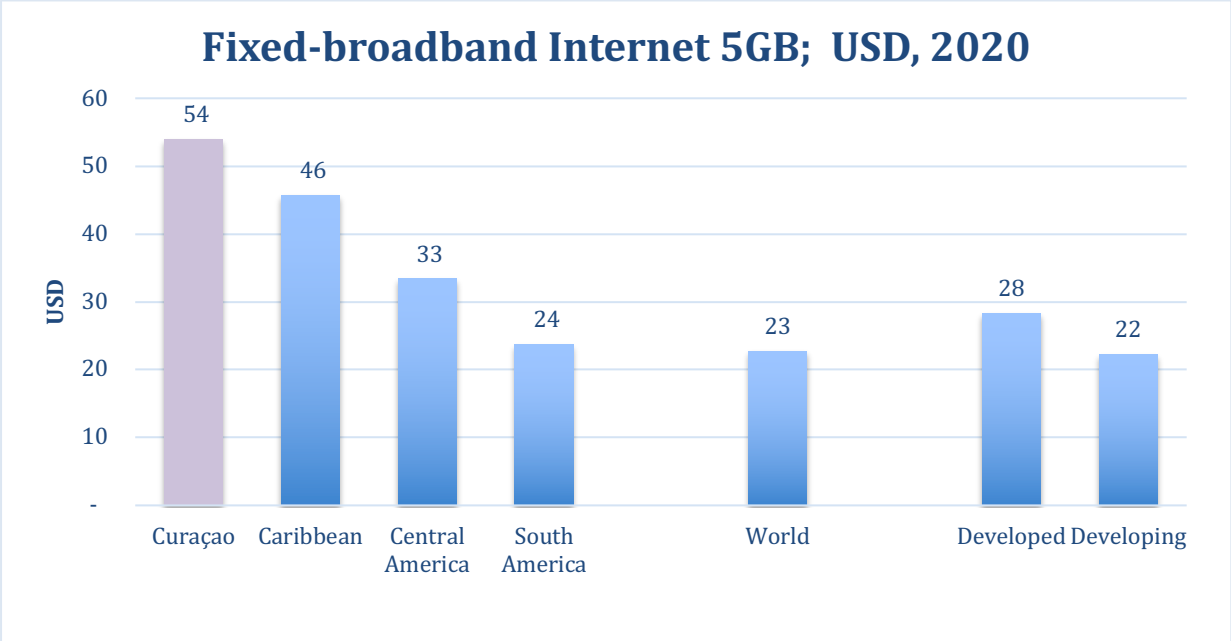



*Figure 10: Fixed-broadband internet benchmark in USD, EOY 2020*

### 4.4.2 Fixed-broadband basket

Fixed-broadband prices have been collected by BT&P and compared with available ITU data for the rest of the region. To be able to compare prices of broadband and the affordability of these services, BT&P is following the ITU method for comparison of entry-level broadband plans. The fixed-broadband plan methodology represents an entry-level postpaid fixed-broadband plan, with a minimum speed of 256 kbit/s and a monthly usage of (a minimum of) 5 Gigabyte (GB). The prices of the operator with the largest market share (measured by the number of subscriptions) are used. Prices are presented in USD and also calculated as a percentage of the GNI per capita, to provide an insight into the affordability of fixed broadband. Countries are ranked according to the price of fixed broadband as a percentage of GNI p.c. The lower the percentage, the lower the relative cost of the service.

For Curaçao, the entry-level fixed broadband internet service plan is at 99,00 ANG / 54,40 USD for the largest market share operator with a speed of 25 Mbit/s, including taxes. The Gross National Income (GNI) per capita of 20.370 USD is collected through the Central Bureau of Statistics using the latest available information as from 2019. Therefore, the entry-level broadband plan in 2020 comes at 3.20% of the GNI per capita

in Curaçao, which is clearly 1.20% above the United Nations Broadband Commission for Sustainable Development 2025 target[6] of 2%. How this and other related indicators relates to the realization of the United Nations' Sustainable Development Goals (SDGs) will be further treated and analyzed in chapter 5.4. Curaçao ranks at number 10 in terms of fixed broadband affordability compared to countries in the Caribbean region, South- and Central America. However, with the exception of Chile, Curaçao offers a higher entry level speed compared to the rest of the region. Consequently, a per Mbps comparison of the tariffs will place Curaçao in the top three.

| Rank | Economy | as % of GNI p.c. | USD | Speed, in Mbit/s | Tax rate included (%) | GNI p.c., USD, 2020 |
|---|---|---|---|---|---|---|
| 1 | Puerto Rico | 1.17 | 21.17 | 0.50 | 11.50 | 21,740 |
| 2 | Bahamas | 1.50 | 34.71 | 8.00 | 12.00 | 27,780 |
| 3 | Trinidad and Tobago | 1.64 | 21.04 | 5.00 | 12.50 | 15,410 |
| 4 | Costa Rica | 1.78 | 17.02 | 1.00 | 13.00 | 11,460 |
| 5 | Brazil | 1.99 | 13.00 | 10.00 | 40.15 | 7,850 |
| 6 | Uruguay | 2.10 | 27.65 | 3.00 | 22.00 | 15,830 |
| 7 | Chile | 2.33 | 26.18 | 200.00 | 19.00 | 13,470 |
| 8 | Dominican Rep. | 2.82 | 17.06 | 4.00 | 30.00 | 7,260 |
| 9 | Saint Kitts and Nevis | 2.96 | 42.90 | 6.00 | 17.00 | 17,400 |
| **10** | **Curaçao** | **3.20** | **54.40** | **25.00** | **6.00** | **20,370** |
| 11 | Antigua and Barbuda | 3.59 | 42.59 | 10.00 | - | 14,250 |
| 12 | Barbados | 3.73 | 45.00 | 60.00 | - | 14,460 |
| 13 | Peru | 3.87 | 19.36 | 15.00 | - | 6,010 |
| 14 | Colombia | 3.88 | 18.70 | 30.00 | 0.00 | 5,780 |
| 15 | Paraguay | 4.65 | 19.93 | 20.00 | 10.00 | 5,140 |
| 16 | Saint Lucia | 5.06 | 37.04 | 25.00 | 12.50 | 8,790 |
| 17 | Ecuador | 5.08 | 23.41 | 5.00 | 12.00 | 5,530 |
| 18 | Argentina | 5.13 | 38.15 | 50.00 | 21.00 | 8,930 |
| 19 | Panama | 5.56 | 55.00 | 60.00 | | 11,880 |
| 20 | Grenada | 6.10 | 44.44 | 50.00 | | 8,740 |
| 21 | Jamaica | 6.14 | 23.63 | 1.00 | 15.00 | 4,620 |
| 22 | Dominica | 6.15 | 35.19 | 15.00 | 15.00 | 6,870 |
| 23 | Suriname | 6.32 | 29.03 | 10.00 | 8.00 | 5,510 |
| 24 | St. Vincent & Grenadines | 7.27 | 44.44 | 50.00 | 16.00 | 7,340 |
| 25 | Guatemala | 7.59 | 28.40 | 10.00 | 12.00 | 4,490 |
| 26 | Bolivia | 8.36 | 22.29 | 10.00 | 13.00 | 3,200 |
| 27 | El Salvador | 9.21 | 28.00 | 10.00 | - | 3,650 |
| 28 | Belize | 10.43 | 34.50 | 10.00 | 12.50 | 3,970 |
| 29 | Honduras | 15.27 | 28.00 | 10.00 | 15.00 | 2,200 |
| 30 | Nicaragua | 27.89 | 42.99 | 20.00 | 15.00 | 1,850 |

[6] https://www.broadbandcommission.org/about/Pages/default.aspx

| | Selected Countries | | | | | |
|---|---|---|---|---|---|---|
| - | Singapore | 0.78 | 35.81 | 1024.00 | 7.00 | 54,920 |
| - | Malta | 1.07 | 22.67 | 30.00 | 18.00 | 25,370 |
| - | Qatar | 1.94 | 90.66 | 50.00 | 0.00 | 56,210 |
| - | Mexico | 2.17 | 15.35 | 20.00 | 16.00 | 8,480 |

*Table 2 - Affordability of fixed broadband basket 2020*

### 4.5 Average download speeds

Fixed broadband internet has had a very rapid growth in terms of penetration achieved over households and firms. At the beginning of the 2000´s the first fixed internet connections were offered via the copper-based network of the incumbent operator. Data speeds were low. In the following years, with the different xDSL upgrades and the introduction of cable-TV networks using several DOCSIS transmission standards, higher and higher speeds were offered. Also, with the later introduction of fiber networks in Curacao in the last decade, even more higher transmission speeds were made possible. The broadband internet speed developments over the last ten years can clearly be seen in figure 11.

Similar to the last years, the national average download speed continued its upward trend in 2020 and 2021. In 2021 a much larger increase in download speeds has been identified compared to the previous years. This is mainly contributed to the large-scale digitalization that took place due to the COVID-19 pandemic in which individuals, organizations and educational institutions were forced to work from home. For this a stable, reliable and high-speed broadband connection was critically needed which forced the upgrading of thousands of connections with the Internet Service provider. In this period the ISP's also started offering higher connection speeds against more affordable prices. Existing internet packages were doubled in speed for the same price and entry-level packages were driven up towards 100 Mbps.

In 2020, the estimated average download speed recorded was approximately 30.70 Mbit/s. In October of 2021 the national average download speed was substantially higher at 64.0 Mbit/s. This data is retrieved from the Ookla Speedtest Intelligence tool for which special user rights and access were obtained by the Bureau Telecommunicatie en Post to conduct in-depth data analysis. Although Curaçao is very well positioned in the region with an average download speed of 64.0 Mbit/s, the most developed countries in the world are showing average national download speeds of around 100 to 200 Mbit/s and up.

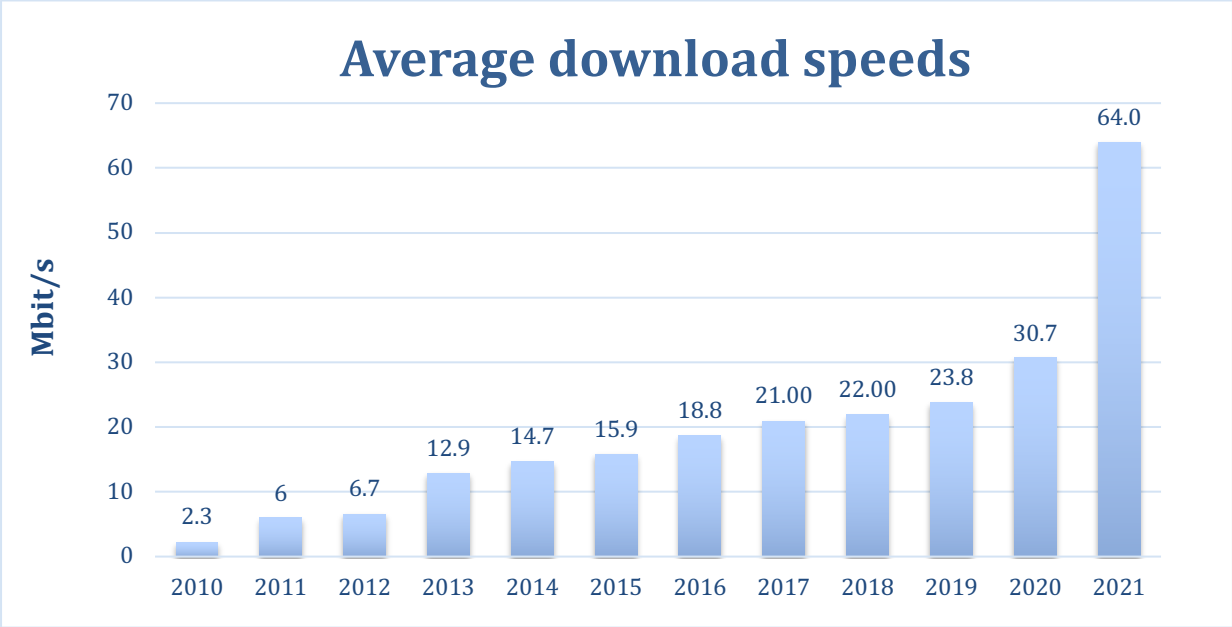



*Figure 11: Average download speeds, 2010 – 2021*

# 5 MOBILE-CELLULAR NETWORK

## 5.1 Mobile-cellular-voice telephone subscriptions

Over the past years the mobile market experienced a continuous downward trend in terms of number of subscriptions except for 2017. In EOY 2017 the mobile market slightly increased with 540 subscriptions, or 0.3 percent when compared to 2016. During 2020 the total number of mobile cellular subscriptions increased by 474 subscriptions, or 0.26 percent compared to 2019.

Over the last 11 years the total number of mobile subscriptions declined with a total amount of approximately 19.3 thousand subscriptions from 204.0 thousand in EOY 2010 to 184.7 thousand in EOY 2020, representing an overall 9.0% decrease in the mobile market.

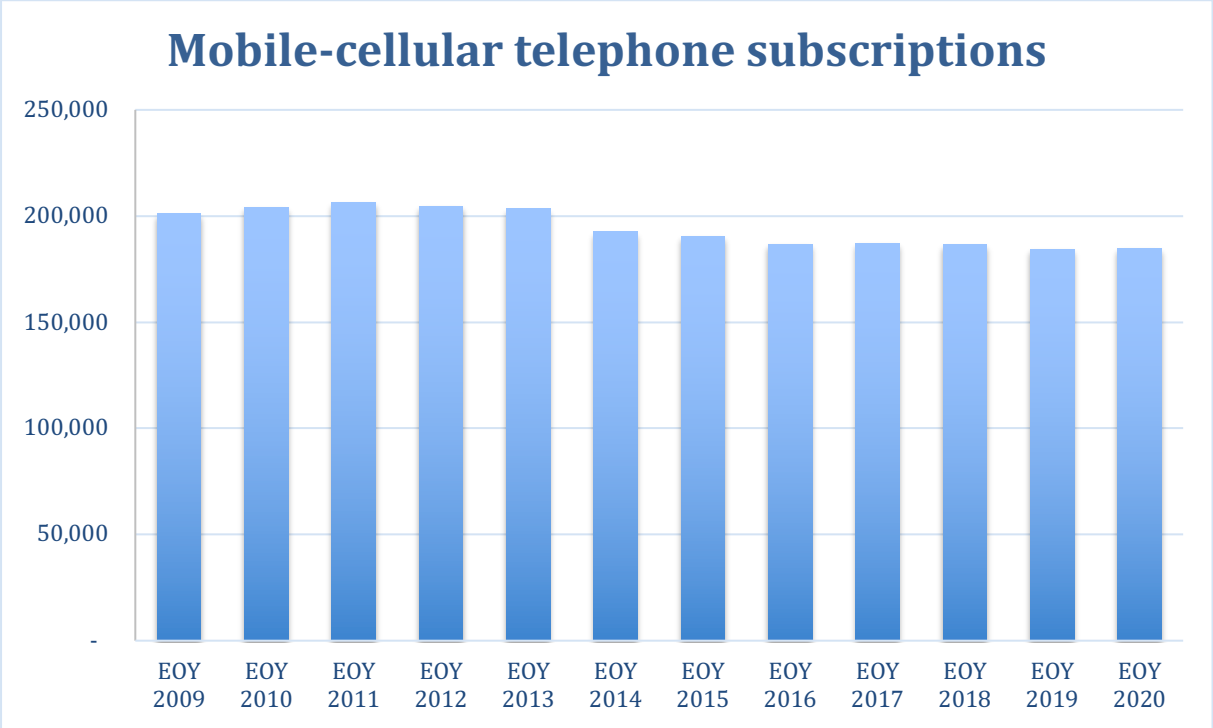



*Figure 12: Mobile-cellular telephone subscriptions, EOY 2009 – EOY 2020*

## 5.2 Mobile-cellular-voice per 100 inhabitants

The ITU uses the term (indicator) mobile-cellular-voice per 100 inhabitants to measure the number of subscriptions for every 100 inhabitants in a particular region. This indicator is calculated as the number of mobile-cellular telephone subscriptions divided by the population and multiplied by 100. This gives an overall good indication of the mobile penetration levels in a specific country.

### 5.2.1 Mobile-cellular-voice subscriptions per 100 inhabitants

In December 2019, the mobile penetration rate in Curaçao was 112.7. This means that there were approximately 112.7 mobile-cellular-voice subscriptions per 100 inhabitants in at the end of 2019. As shown in figure 13, the mobile penetration rates in Curaçao are comparable to region average of South- and Central America. The Caribbean is showing an overall lower mobile-cellular-voice subscription per 100 inhabitants rate compared to the other regions. See Appendix D1 for a list of countries and source data.

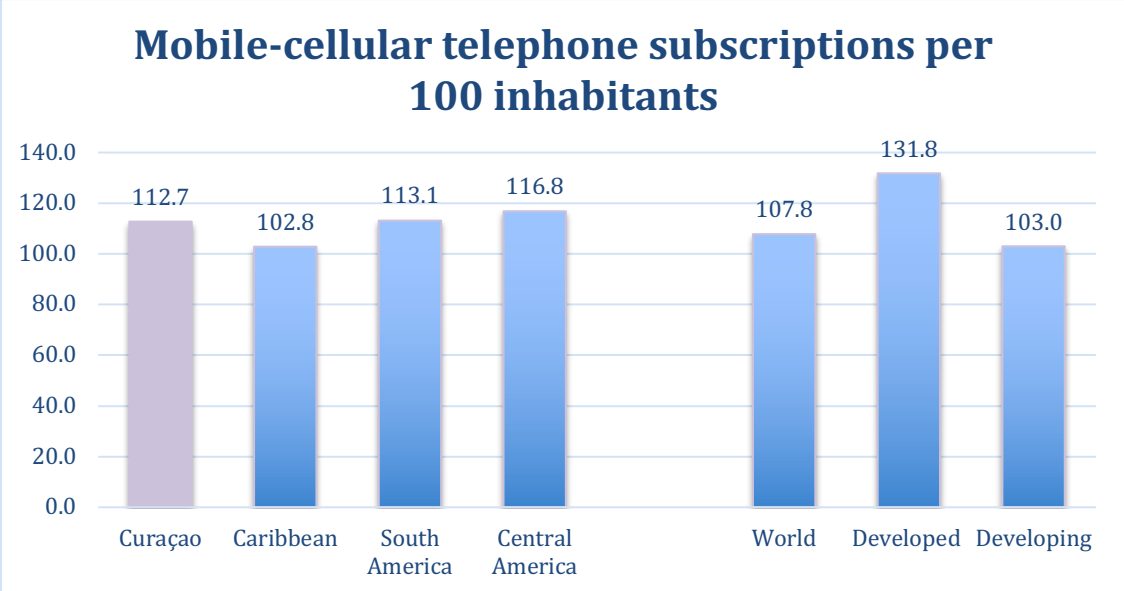



*Figure 13: Mobile-cellular voice subscriptions per 100 inhabitants, EOY 2019*

Figure 14 gives a projection of the numbers of mobile-cellular-voice subscriptions per 100 inhabitants related to the total number of subscriptions from the years 2012 to 2020. One of the factors contributing to the decreasing numbers of subscriptions over the last few years has to do with the fact that in the past many end users had two mobile phones

with subscriptions to both local established mobile operators. Nowadays many circumstances in the mobile market has changed and for this reason end users nowadays are mostly carrying one smart phone connected to one mobile operator which gives them lots of communication possibilities that were not possible in the past.

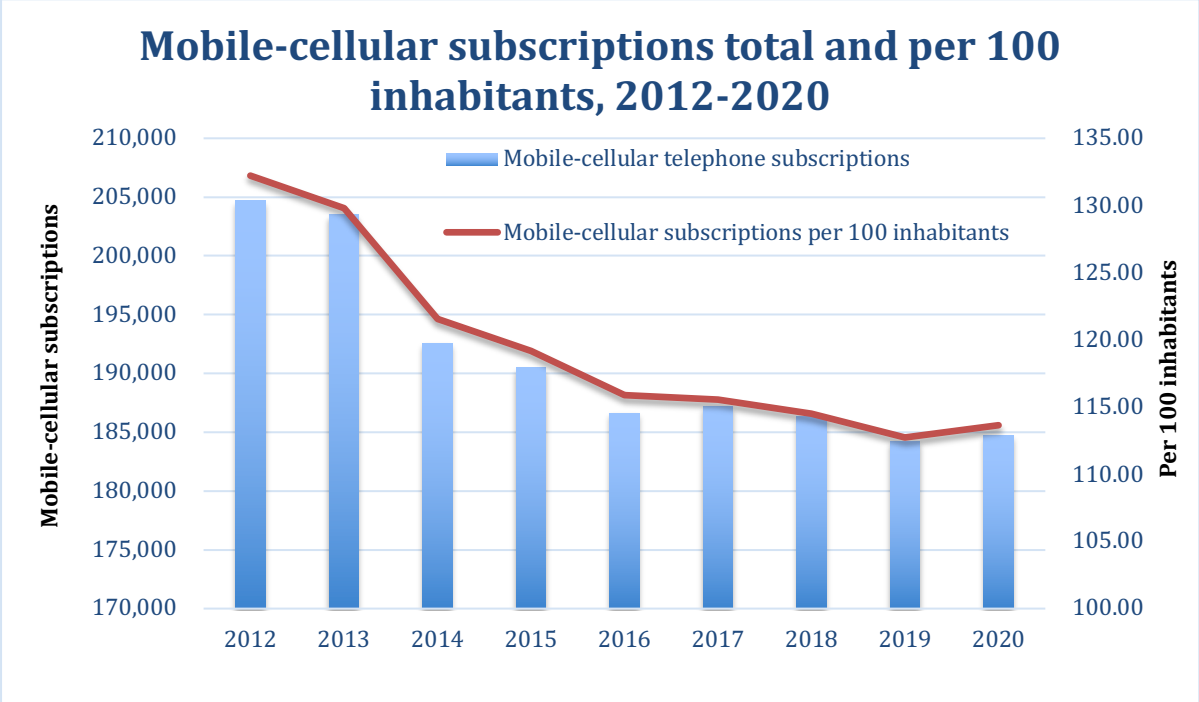



*Figure 14: Mobile-cellular subscriptions total and per 100 inhabitants, EOY 2012- 2020*

### 5.2.2 Curaçao mobile-cellular-voice subscription per 100 inhabitants compared to the region, 2012-2019

The figure below gives an indication of the rate for mobile-cellular-voice subscriptions per 100 inhabitants over the period 2012 to 2019 between Curaçao, the Caribbean, Central- and South America. We can clearly see an overall decreasing trend over the last few years but still with penetration levels of above 100%. As explained before, these are normal expectations for the region as technology improves, mobile data services are becoming dominant and more and more people are sticking with one provider rather than using two mobile phones connected to different operators.

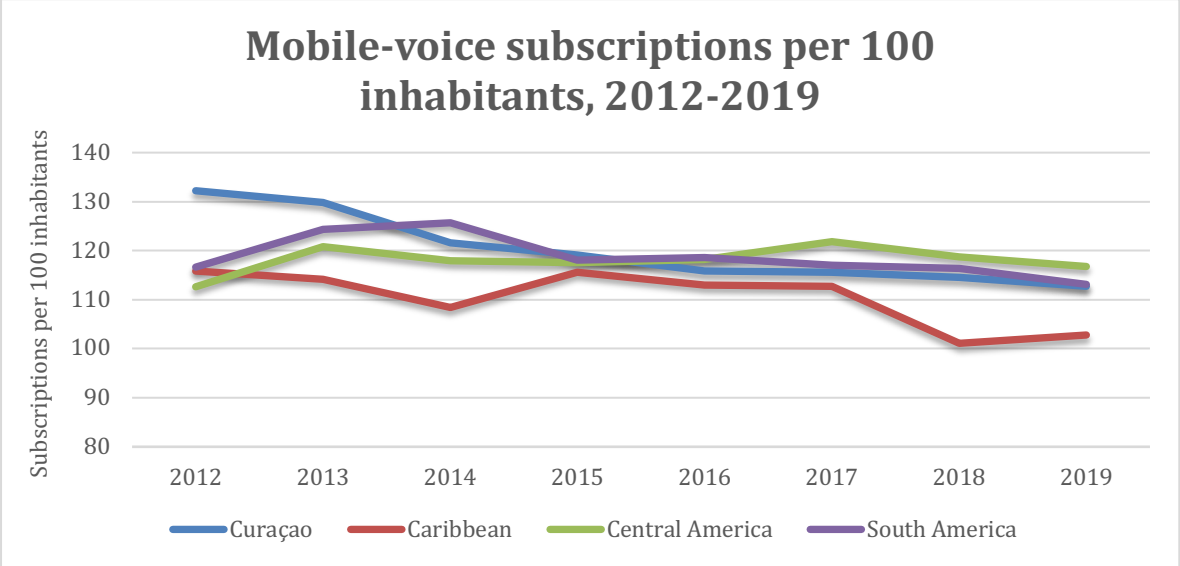



*Figure 15: Mobile-cellular-voice subscriptions per 100 inhabitants, EOY 2012-2019*

### 5.2.3 List of regional mobile-cellular-voice subscriptions per 100 inhabitants

In this paragraph the list of the mobile-cellular-voice subscription per 100 inhabitants is presented for comparison purposes for the whole Americas region. Curaçao shows an exact rate of 112.73, for which it is ranked at the 14$^{th}$ place in EOY 2019 see table 3. However, care must be taken when interpreting and benchmarking this specific set of data as market circumstances and economy variations may lead to different results in different markets. For example, for this specific indicator a low penetration level (but still close to 100%) doesn't necessarily mean a lack in sector development. The contrary might be the case under certain specific circumstances. As a matter of fact, in a well-

developed market there's no reason for end users to carry two mobile phones connected to distinct operators, only if luxury permits.

| Rank | Economy | Mobile-cellular-voice subscriptions per 100 inhabitants | Ranking 2018 |
|---|---|---|---|
| 1 | Costa Rica | 169.39 | 1 |
| 2 | El Salvador | 161.10 | 3 |
| 3 | Trinidad and Tobago | 155.11 | 4 |
| 4 | Suriname | 139.99 | 10 |
| 5 | Uruguay | 138.07 | 2 |
| 6 | Panama | 137.19 | 5 |
| 7 | Chile | 132.18 | 6 |
| 8 | Colombia | 131.67 | 11 |
| 9 | British Virgin Islands | 131.65 | 7 |
| 10 | Argentina | 125.84 | 8 |
| 11 | Guatemala | 118.73 | 12 |
| 12 | Puerto Rico | 114.95 | 16 |
| 13 | Barbados | 114.74 | 14 |
| **14** | **Curaçao** | **112.73** | **15** |
| 15 | Paraguay | 110.18 | 17 |
| 16 | Bahamas | 109.25 | 23 |
| 17 | Jamaica | 102.56 | 21 |
| 18 | Bolivia | 101.53 | 22 |
| 19 | Brazil | 95.72 | 24 |
| 20 | St Vincent & Grenadines | 92.87 | 25 |
| 21 | Ecuador | 91.25 | 26 |
| 22 | Nicaragua | 88.43 | 13 |
| 23 | Dominican Rep. | 83.32 | 27 |
| 24 | Honduras | 77.57 | 28 |
| 25 | Belize | 65.30 | 30 |
| 26 | Venezuela | 64.79 | 29 |
| 27 | Haiti | 60.76 | 31 |
| 28 | Cuba | 53.32 | 32 |

| Selected Countries | | |
|---|---|---|
| - | Singapore | 155.65 |
| - | Qatar | 138.33 |
| - | Malta | 144.06 |
| - | United States | 134.46 |
| | Netherlands | 127.28 |

*Table 3 - List of mobile-cellular-voice subscription per 100 inhabitants in the Caribbean region*

### 5.3 Mobile-cellular population coverage by type of network

In this section of the report specific attention is given to indicators related to mobile-cellular subscriptions and mobile broadband in terms of network coverage by type of technology and related advancements over the last years. Mobile cellular networks are increasingly used for a number of services: voice, messaging, accessing the Internet, cloud services, gaming, online meetings, and to carry out other digital services, such as e-banking, e-commerce (utilizing mobile payments) and e-administration. These networks have gone through a rapid growth and degree of technological innovations over the last years. Every decade a new international standard came into place and the mobile networks in Curacao were right on top of these technological advancements.

Mobile communications began with analogue first generation (1G) networks that launched the mobile revolution worldwide. This was followed by 2G networks that used digital technology and introduced simple messaging services (SMS). Later came the 3G/UMTS set of technologies by which mobile broadband became a reality. Less than 10 years ago a new standard was developed: 4G/LTE, supporting much higher data connection speeds and with it came a whole new world of digital applications that demanded high capacity and speed networks with better performance. Recently, the new 5G standard is already being implemented in many countries of the world. This will make ultra-high speed and minimal latency for a completely new line of services (i.e. connected vehicles, emergency services and public safety, massive and industrial machine type communications, etc.) a new reality.

In Curacao the mobile broadband market experienced for the first time a significant increase in numbers of subscriptions in 2013 with the introduction of High-Speed Packet Access (HSPA+). The move towards 3G networks has paved the way for the provision of services at broadband mobile internet access speeds, a significant step up from the 2.5G technology (i.e. Enhanced Data Rates for GSM Evolution – EDGE). With the introduction of LTE since 2015, the total number of subscriptions has reached even higher numbers.

Since mobile network usage has become the predominant method of telecommunications across the world, it is highly important to measure the coverage of these networks. Coverage implies that a specific population or land area receives an adequate signal

offered by an operator such that the service, be it making calls or accessing the Internet, is possible. Mobile network coverage provides a good approximation of the universality of Internet access and is also used as a tracking indicator for Sustainable Development Goals (SDG, see chapter 6.4).

Figure 16 below gives a good representation of how the mobile technologies developed over the last six years in Curacao with regards to coverage by type of network. This is very much in line with other international developments as projected by the ITU.

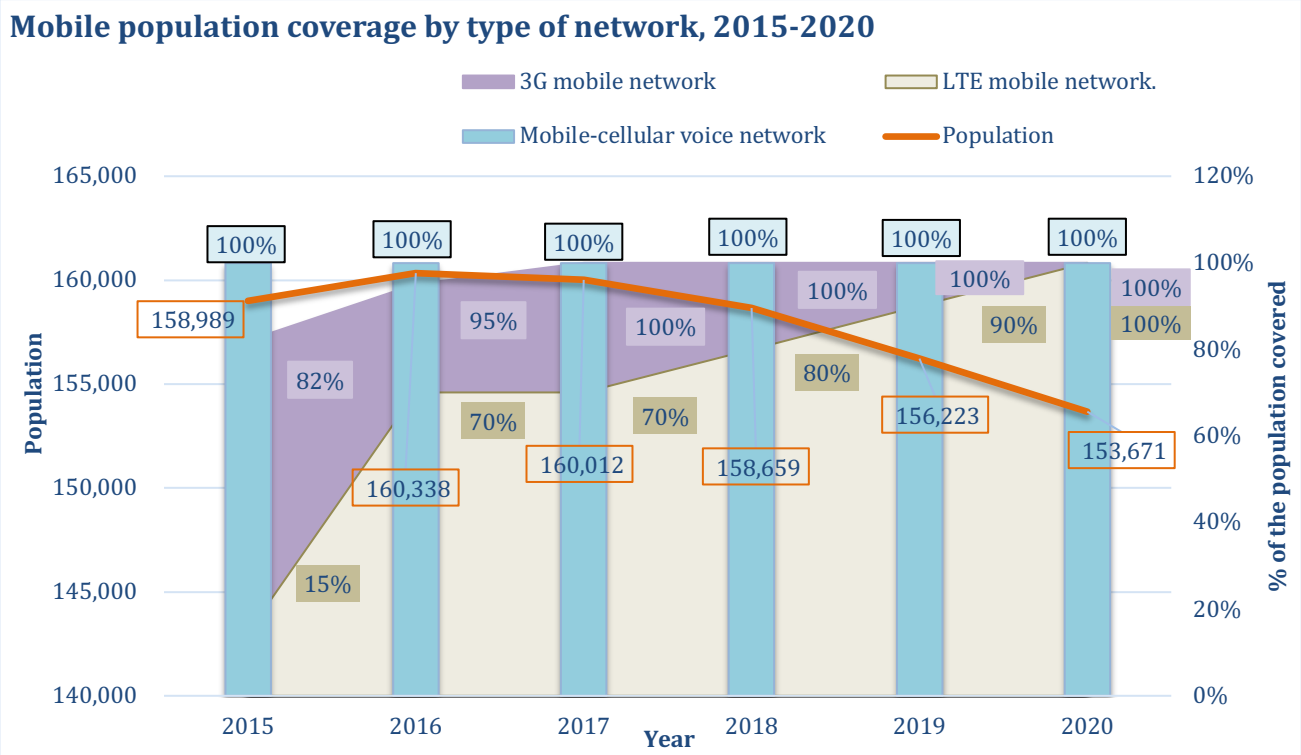



*Figure 16: Mobile coverage by type of network*

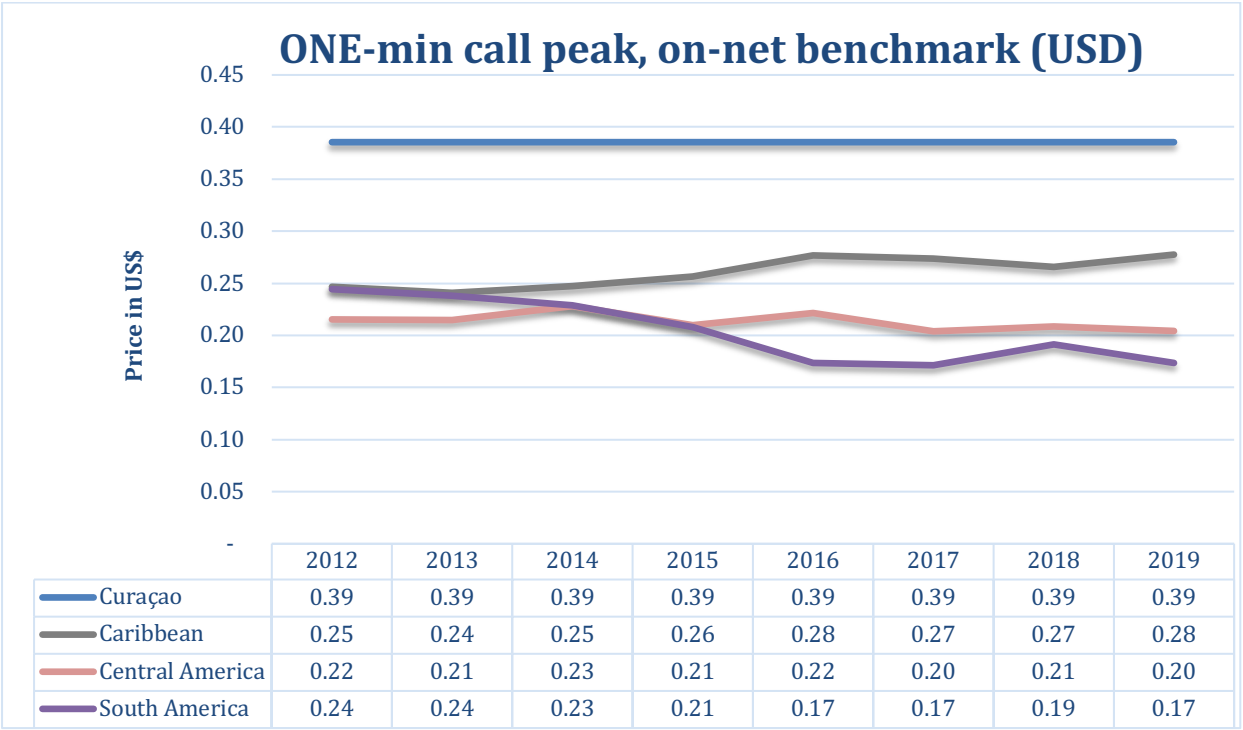
## 5.4 Affordability of mobile-cellular services

For the affordability of mobile services, the mobile-cellular-voice tariffs and mobile-broadband (data only) packages will be analyzed in this paragraph. Local prices will be analyzed and then compared against the region and other specific countries in the world using ITU's predefined benchmarking criteria.

### 5.4.1 Mobile-cellular-voice telephone tariffs

Mobile-cellular-voice telephone tariffs can be analyzed and benchmarked according to different indicators and metrics. Prices may be different based on the terminating network, either fixed or mobile, on-net calls to the same network or off-net calls to a different provider, or calls made during peak or during off-peak hours. For this analysis we will focus on the tariffs of a one-minute on-net call during peak hours.

In Curaçao an one-minute mobile-cellular-voice on-net call on peak hours has been consistent at 0.39 USD (including 6% tax) for the last eight years. The prices in Curaçao at this moment from local mobile services providers are still significantly higher than the Caribbean average and the Central- and South America. See figure 17 below for a graphical representation and appendix D2 for a detailed list of countries and source data.




| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| Curaçao | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| Caribbean | 0.25 | 0.24 | 0.25 | 0.26 | 0.28 | 0.27 | 0.27 | 0.28 |
| Central America | 0.22 | 0.21 | 0.23 | 0.21 | 0.22 | 0.20 | 0.21 | 0.20 |
| South America | 0.24 | 0.24 | 0.23 | 0.21 | 0.17 | 0.17 | 0.19 | 0.17 |

*Figure 17: Mobile-cellular price of 1-min peak call, on-net, compared to the region,2012-2019*

### 5.4.2 Mobile-cellular-voice basket

This section analyses the prices for the mobile-cellular-voice basket. With this new revised ITU method, the basket is calculated based on a combination of voice and text messages only, without any mobile-data allowance. The data used for this calculation is based on the price for 70 voice minutes and 20 text messages per month in predetermined on-net/off-net/fixed ratios. The previous mobile-voice basket applied until 2017, contained 30 calls and 100 text messages.

The calculated mobile-cellular-voice basket in Curacao for EOY 2020 is USD 32. As shown in figure 18 below, this is much higher when compared to the Caribbean, Central- and South America, and the World average. The average price of the mobile-cellular-voice basket in the Caribbean is USD 22 which is USD 10 cheaper than the price in Curaçao.

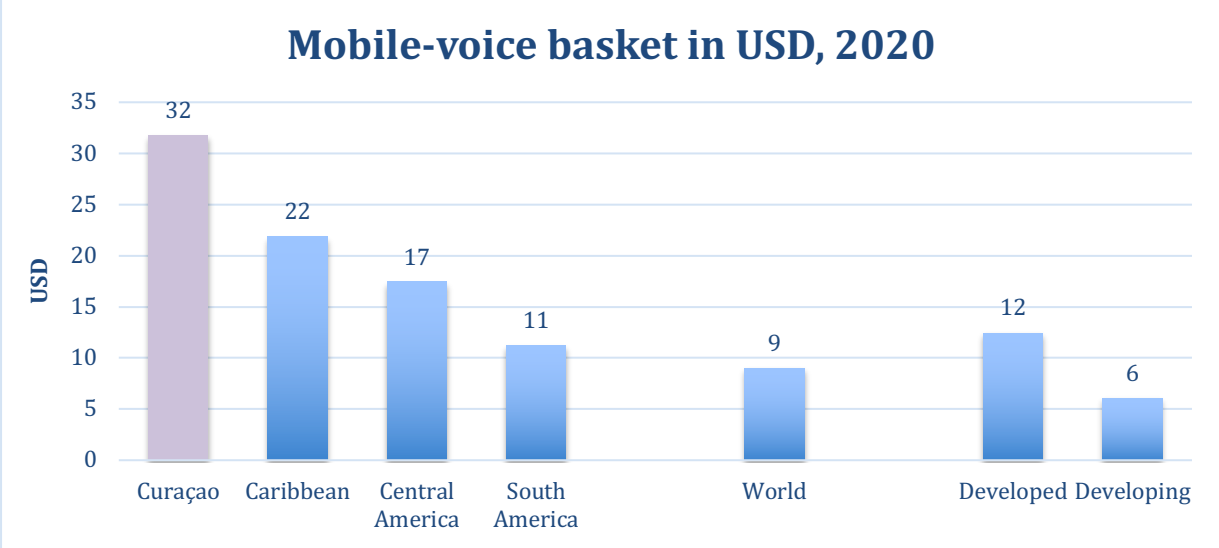



*Figure 18: Mobile-cellular-voice basket in USD, EOY 2020*

While absolute prices are important, comparing these with the average net income per month for the country gives better insight in the affordability of mobile cellular usage. Table 4 below gives an overview of this analysis and benchmark for the region. Curaçao positions itself on the 12$^{th}$ place with a mobile-voice-basket of 1.87 percent of the GNI p.c.

| Rank | Economy | as % of GNI p.c. | USD | Tax rate included % | GNI p.c., USD, 2020 |
|---|---|---|---|---|---|
| 1 | Costa Rica | 0.52 | 4.96 | 13.00 | 11,460 |
| 2 | Panama | 0.85 | 8.40 | 7.00 | 11,880 |
| 3 | Bahamas | 0.86 | 19.94 | 12.00 | 27,780 |
| 4 | Uruguay | 0.96 | 12.69 | | 15,830 |
| 5 | Chile | 1.04 | 11.72 | | 13,470 |
| 6 | Brazil | 1.14 | 7.43 | 40.15 | 7,850 |
| 7 | Trinidad and Tobago | 1.15 | 14.74 | 12.50 | 15,410 |
| 8 | Colombia | 1.16 | 5.58 | 23.00 | 5,780 |
| 9 | Jamaica | 1.17 | 4.49 | 25.00 | 4,620 |
| 10 | Saint Kitts and Nevis | 1.69 | 24.56 | | 17,400 |
| 11 | Dominican Rep. | 1.78 | 10.75 | 30.00 | 7,260 |
| **12** | **Curaçao** | **1.87** | **31.80** | **6.00** | **20,370** |
| 13 | Paraguay | 2.10 | 9.00 | 10.00 | 5,140 |
| 14 | Peru | 2.13 | 10.66 | | 6,010 |
| 15 | Puerto Rico | 2.15 | 39.03 | 11.50 | 21,740 |
| 16 | Barbados | 2.21 | 26.61 | 21.00 | 14,460 |
| 17 | Antigua and Barbuda | 2.22 | 26.33 | | 14,250 |
| 18 | Argentina | 2.72 | 20.21 | 26.26 | 8,930 |
| 19 | Suriname | 2.78 | 12.77 | 8.00 | 5,510 |
| 20 | Ecuador | 2.84 | 13.10 | 12.00 | 5,530 |
| 21 | Grenada | 3.06 | 22.26 | | 8,740 |
| 22 | Saint Lucia | 3.13 | 22.96 | 12.50 | 8,790 |
| 23 | Bolivia | 3.52 | 9.39 | 13.00 | 3,200 |
| 24 | El Salvador | 3.65 | 11.10 | 18.00 | 3,650 |
| 25 | Dominica | 3.88 | 22.20 | 15.00 | 6,870 |
| 26 | Haiti | 4.25 | 4.43 | 10.00 | 1,250 |
| 27 | Saint Vincent and the Grenadines | 4.49 | 27.44 | 16.00 | 7,340 |
| 28 | Belize | 6.56 | 21.70 | 12.50 | 3,970 |
| 29 | Guatemala | 7.00 | 26.20 | 12.00 | 4,490 |
| 30 | Honduras | 8.37 | 15.35 | 15.00 | 2,200 |
| 31 | Nicaragua | 22.38 | 34.50 | 15.00 | 1,850 |
| 32 | Aruba | - | 26.50 | | - |
| | Selected Countries | | | | |
| - | Malta | 0.54 | 11.34 | 18.00 | 25,370 |
| - | Mexico | 0.48 | 3.37 | 16.00 | 8,480 |
| - | Qatar | 0.29 | 13.68 | 0.00 | 56,210 |
| - | Singapore | 0.39 | 17.94 | 7.00 | 54,920 |

*Table 4 - Mobile-voice basket, 2021*

### 5.4.3 Mobile broadband tariffs

The prices for offered mobile broadband services can be analyzed and compared in several ways. Figure 19 below gives an overview of the development of mobile broadband tariffs for a 30-day plan offered by the local operators over the last six years. As can be seen, there's a broad range of mobile data services offered starting from entry-

level packages with low data consumption up to more expensive packages including higher data caps[7].

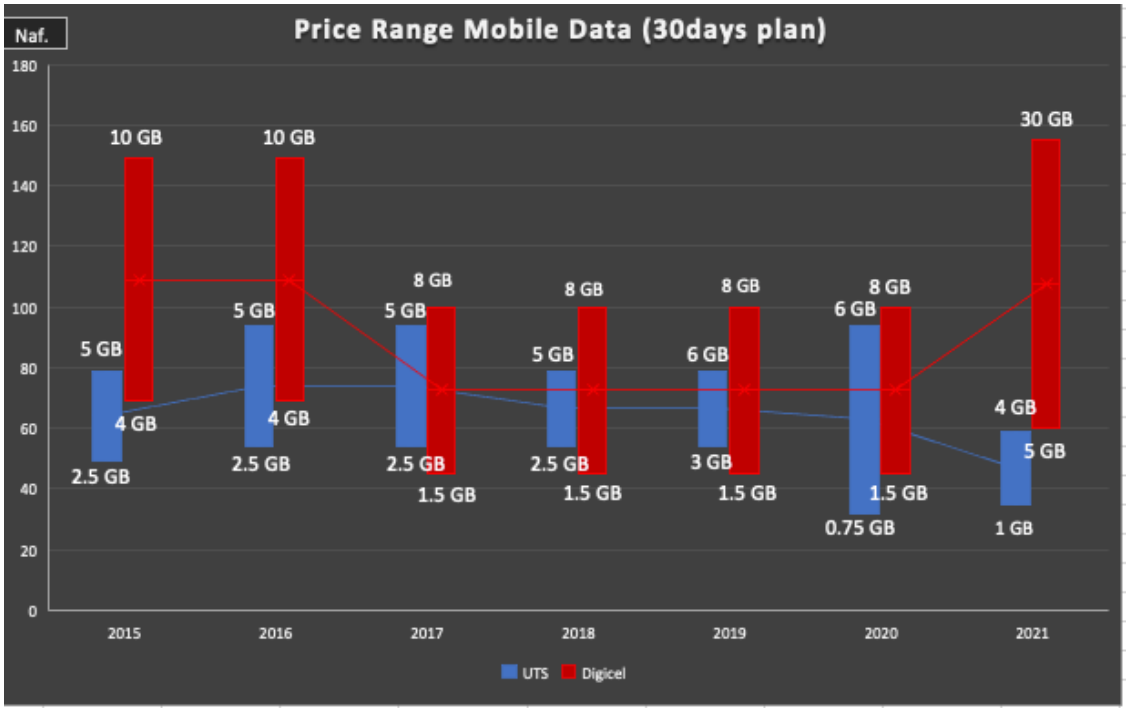



*Figure 19: Prices of mobile broadband packages in NAf, 2015 - 2021*

To be able to compare prices of mobile broadband, BT&P is following the ITU method for comparison of entry-level plans based on a minimum of 1.5 GB data allowance per month. See figure 20 below for the benchmarking results with the rest of the region. In December 2020, the price for an entry-level mobile-broadband internet service in Curaçao was approximately at USD 33. This was offered for 4 GB of data. A comparison with the region shows an average price for entry-level mobile broadband in the Caribbean of approximately USD 28 monthly. The average price in Central-America, North-America and South-America is lower, at USD 13, USD 19 and USD 9 respectively.

[7] The prices are expressed in local NAF. guilders as this is not an internationally benchmarked standard.

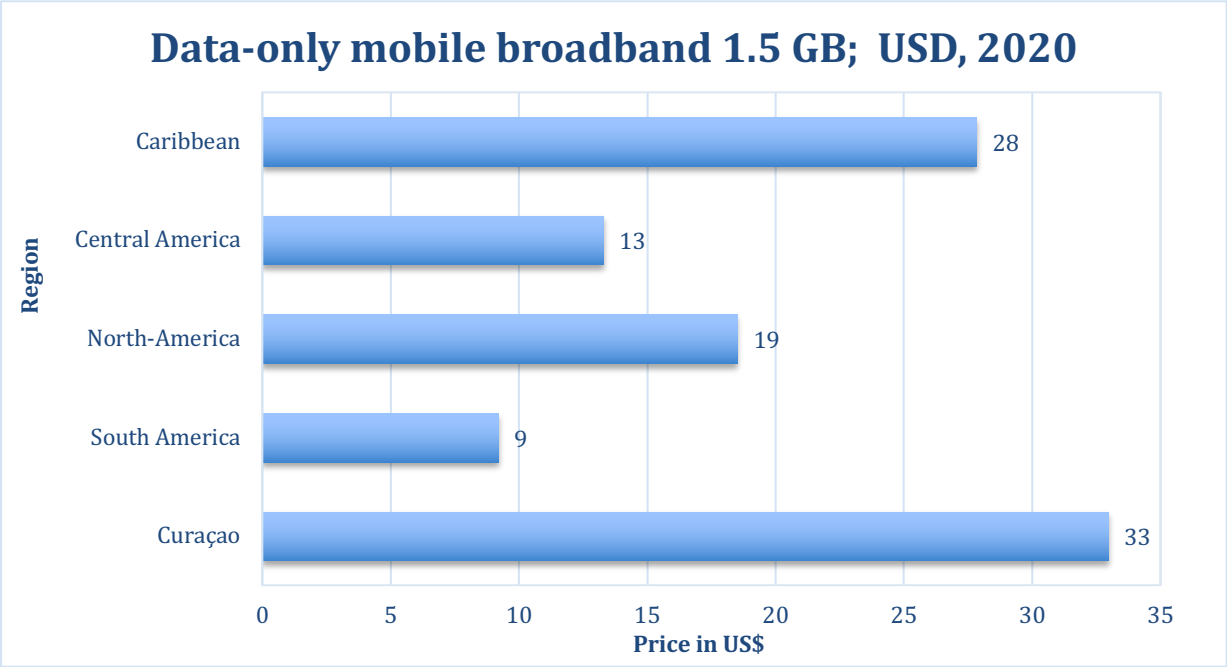



*Figure 20: Mobile broadband internet (1.5 GB data) benchmark in USD, EOY 2020*

### 5.4.4 Mobile data basket

Mobile broadband prices have been collected by BT&P and compared with available ITU data for the rest of the region. To make the right comparisons and benchmark the affordability of these services, BT&P uses the ITU method of entry-level plans based on the mobile data basket approach. The mobile-data basket is defined by the cheapest price for a data plan with a monthly allowance of at least 1.5 GB. The selected plan should not necessarily be the one with the cap closest to 1.5 GB, but must include a minimum of 1.5 GB. The as % of the GNI p.c. is calculated by dividing the monthly price for the data plan by the monthly average GNI of a specific country. Table 5 on the next page shows the ranking of the entry-level broadband services affordability based on GNI p.c. Curaçao is ranked in the 7$^{th}$ place with a result of 1.94% of the GNI p.c.

| Rank | Economy | as % of GNI p.c. | Price USD | Monthly data allowance (in GB) | Tax rate included % | GNI p.c., USD, 2020 |
|---|---|---|---|---|---|---|
| 1 | Bahamas | 0.63 | 14.55 | 2.00 | 12.00 | 27,780 |
| 2 | Chile | 0.67 | 7.48 | 6.00 | - | 13,470 |
| 3 | Costa Rica | 0.72 | 6.88 | 2.00 | 13.00 | 11,460 |
| 4 | Argentina | 0.78 | 5.82 | 4.00 | 26.26 | 8,930 |
| 5 | Uruguay | 0.82 | 10.78 | 3.00 | - | 15,830 |
| 6 | Brazil | 1.14 | 7.43 | 3.00 | 40.15 | 7,850 |
| **7** | **Curaçao** | **1.94** | **32.96** | **4.00** | **6.00** | **20,370** |
| 8 | Puerto Rico | 2.15 | 39.03 | 2.00 | 11.50 | 21,740 |
| 9 | Panama | 2.16 | 21.40 | 1.50 | 7.00 | 11,880 |
| 10 | Colombia | 2.19 | 10.55 | 1.80 | 19.00 | 5,780 |
| 11 | Barbados | 2.28 | 27.50 | 5.00 | 21.00 | 14,460 |
| 12 | Ecuador | 2.43 | 11.20 | 1.00 | 12.00 | 5,530 |
| 13 | Suriname | 2.48 | 11.39 | 4.00 | 8.00 | 5,510 |
| 14 | Saint Kitts and Nevis | 2.55 | 37.04 | 10.00 | - | 17,400 |
| 15 | Trinidad and Tobago | 2.58 | 33.17 | 7.00 | 12.50 | 15,410 |
| 16 | Bolivia | 2.72 | 7.24 | 2.00 | 16.00 | 3,200 |
| 17 | Paraguay | 2.76 | 11.81 | 3.00 | 10.00 | 5,140 |
| 18 | Dominican Rep. | 3.01 | 18.20 | 3.00 | 30.00 | 7,260 |
| 19 | Jamaica | 3.08 | 11.84 | 2.50 | 25.00 | 4,620 |
| 20 | Antigua and Barbuda | 3.12 | 37.04 | 7.00 | - | 14,250 |
| 21 | El Salvador | 3.29 | 10.00 | 5.00 | - | 3,650 |
| 22 | Guatemala | 3.43 | 12.84 | 8.00 | 12.00 | 4,490 |
| 23 | Grenada | 3.86 | 28.15 | 1.00 | - | 8,740 |
| 24 | Saint Lucia | 4.04 | 29.59 | 1.00 | - | 8,790 |
| 25 | Belize | 5.29 | 17.50 | 5.50 | 12.50 | 3,970 |
| 26 | Nicaragua | 5.31 | 8.18 | 1.50 | 15.00 | 1,850 |
| 27 | Dominica | 5.50 | 31.48 | 20.00 | - | 6,870 |
| 28 | Saint Vincent and the Grenadines | 5.75 | 35.19 | 10.00 | 16.00 | 7,340 |
| 29 | Honduras | 8.84 | 16.20 | 5.00 | 15.00 | 2,200 |
| 30 | Aruba | - | 27.37 | 4.00 | - | - |
| | **Selected Countries** | | | | | |
| - | Qatar | 0.35 | 16.48 | 3.50 | 0.00 | 56,210 |
| - | Singapore | 0.39 | 17.94 | 20.00 | 7.00 | 54,920 |
| - | Malta | 0.80 | 17.01 | 3.00 | 18.00 | 25,370 |
| - | Mexico | 1.25 | 8.80 | 3.50 | 16.00 | 8,480 |

*Table 5 – Mobile-data basket, 2021*

## 5.5 Mobile spectrum allocation

Mobile communications use the spectrum available, which is public and scarce resource. Spectrum is divided into several specific frequency bands and they define the capacity to transmit signals over airwaves. Spectrum is a vital resource that the Bureau Telecommunicatie en Post allocate to operators with a valid license to provide connectivity for all. The innovations and technological improvements that have taken place in wireless networks allows mobile connectivity, increasing capacity and speed rates, low latency, and high-quality communications.

This section analyzes the total amount of spectrum allocated to mobile operators for International Mobile Telecommunications (IMT) systems. The ITU identifies the following blocks of frequency bands for IMT:

1. Frequency bands below 1 GHz;
2. Frequency bands in between 1 GHz and 6 GHz;
3. Frequency bands above 6 GHz.

These frequency blocks are broken down again into several sub-bands by the regulatory administrations. It is one of BTP's duties to make the most efficient possible use of our spectrum resources, and where appropriate to free up more spectrum for new services. Table 6 on the next page gives an overall representation of how these frequency bands are divided into several sub-bands of particular relevance in Curacao, including the amount of allocated and licensed spectrum to mobile operators. As can be seen, from a total available of 1010 MHz spectrum, only 310 MHz is licensed to operational mobile telecom providers. As 5G will make its introduction in the near future, there will be enough spectrum for operators to expand their services. With the additional allocations of the frequency bands above 6 GHz, there will be no shortage in spectrum for the time being.

| | IMT licensed spectrum and allocations | |
|---|---|---|
| | **Licensed to operators** | **Allocated by BTP** |
| | | |
| **Sub 1 GHz block** | | |
| 700 MHz band | 30 MHz | 90 MHz |
| 850 MHz band | 40 MHz | 60 MHz |
| 900 MHz band | 40 MHz | 40 MHz |
| **Sub total** | **110 MHz** | **190 MHz** |
| | | |
| **1 - 6 GHz block** | | |
| 1800 MHz band | 90 MHz | 150 MHz |
| 2100 MHz band | 30 MHz | 100 MHz |
| 2300 MHz band | 80 MHz | 80 MHz |
| 2500 - 2700 MHz band | 0 MHz | 190 MHz |
| 3300 - 3400 MHz band | 0 MHz | 100 MHz |
| 3400 - 3600 MHz band | 0 MHz | 200 MHz |
| 3600 - 4200 MHz band | 0 MHz | Not yet defined |
| **Sub total** | **200 MHz** | **820 MHz** |
| | | |
| **6 GHz and higher block** | | |
| 26 GHz | 0 MHz | Not yet defined |
| 40 GHz | 0 MHz | Not yet defined |
| 66 GHz | 0 MHz | Not yet defined |
| **Sub total** | **0 MHz** | **-** |
| | | |
| **Total allocated and licensed spectrum** | **310 MHz** | **1010 MHz** |

*Table 6 – IMT licensed spectrum and allocations*

# 6 OTHER INDICATORS

## 6.1 International internet bandwidth

Domestic and international backbones are important building blocks of Internet infrastructure. The international internet bandwidth refers to the average traffic load (expressed in Mbit/s) of international subsea fiber optic cables for carrying internet traffic. The used international internet bandwidth in Curaçao over 2020 is 46.3 Gbit/s. This figure refers to the total used capacity over the fiber-optic cables connecting Curaçao to the rest of the world over a 12-month period for all operators combined. As can be shown from figure 21 below, the international bandwidth capacity for Curaçao has increased significantly over the last years.

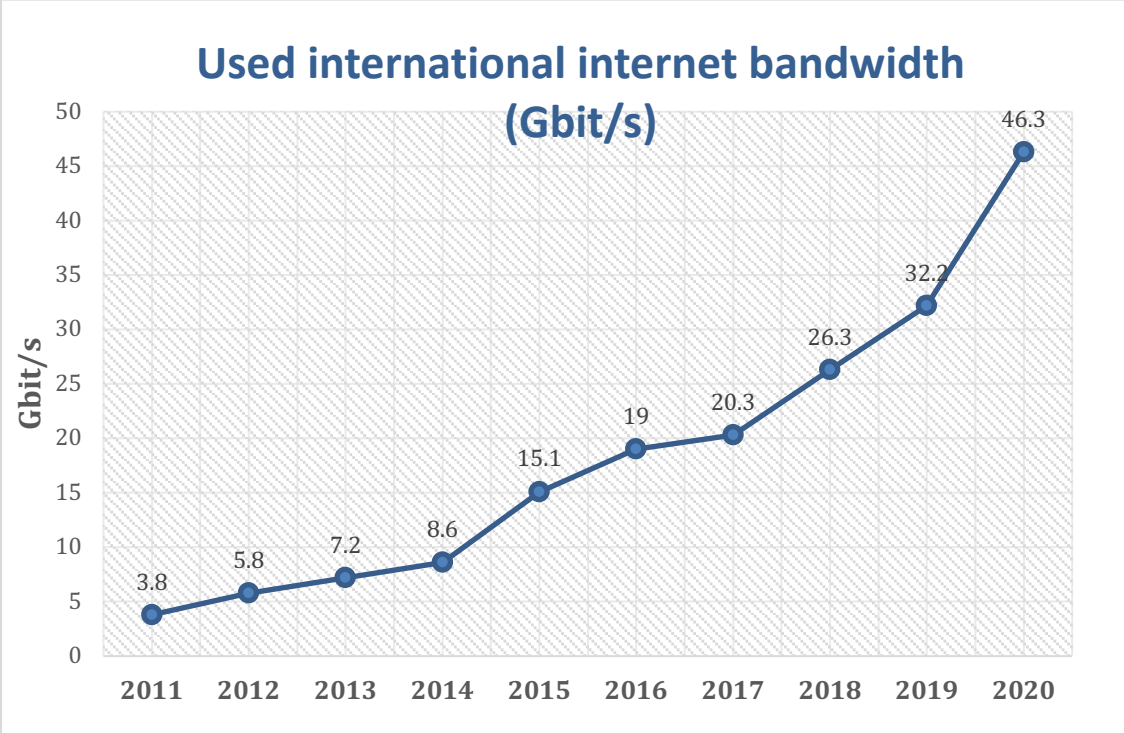



*Figure 21: Used international internet bandwidth (Gbit/s), 2011-2020*

The growth of international bandwidth capacity has been driven by the need to support ever growing data traffic, much of it exchanged between data centers (see chapter 6.2) and end users from across the globe. For the island of Curaçao, the vast majority of the international Internet traffic flows over optical fiber submarine cables connected to the rest of the region. For an overview of the international subsea cables connecting Curaçao to the rest of the world, refer to appendix G.

The presence of the AMS-IX Caribbean[8] Internet Exchange as one of the first and major internet exchanges in the region has also contributed in substantial ways to the development of the Internet ecosystem in Curaçao, with its interconnecting services, the overall quality and the availability of locally hosted international content (Akamai, Google, Cloudfare, etc.)

### 6.2 Data Centers in Curacao

Global growth in ICT usage presents significant opportunities for a local industry that is globally focused. The importance of ICT has not been diminished by the market instabilities of the last few years. Extensive usage of ICT across the whole economy continues to grow, now more than ever with the COVID-19 pandemic. Local ICT capabilities remain vital for the digital economy. A local industry that is responsive to market demand for new products and services has the potential to make a significant contribution to the economy. Data centres play a vital role in this whole ecosystem of ICTs and remote connectivity.

Curaçao has several data centers providing local and international hosting services, co-location, cloud services and disaster relief support (business continuity). These data centers are officially identified by the Government as critical infrastructures and are considered very important to support local ICT-services and the digital economy. The data centers range in category from several tier-III up to a tier-IV data center providing the highest level of security and redundancy/reliability. Refer to appendix H for a list of data centers in Curaçao.

### 6.3 Connected schools

As part of the education system digitalization project, the Government of Curacao and Digicel have signed an agreement for the later to offer high speed fiber-optic internet connectivity to 118 schools, 8 schoolboards and the Ministry of Education, under a joint plan overseen by the Ministry of Education and Bureau Telecommunicatie en Post, after Digicel's proposal was selected as the best-suited technically and economically. The

[8] https://www.ams-ix.net/car

project will use Digicel and its subsidiary TRES Networks' fiber-optic network to provide three levels of internet access speeds to the different entities that are part of the education eco-system on the island. In general, it can be stated that the eco-system consists of the Ministry of Education, Schoolboards, and the different school starting at kindergarten all the way to the University. A metro ethernet network is used to connect and all entities and provide broadband internet access through a centralized connection at a data center. The schools are provided internet connectivity based on the number of students and the type of school, currently schools are connected at base speeds of 100Mbps, 200Mbps, 300Mbps, or 500Mbps.

The objectives of the digitalization process are centralization of information, standardization of network elements, and normalization for information, this will lead to enable a decision-making process that is based on current information. The project has the objective to improve both the administrative and educational aspects of the islands education eco-system. The project is still in its infant shoes, but the following are some of the current achievements.

1. All schools have access to the internet;
2. The Ministry of Education have implemented a centralized education administrative application, enabling information normalization for group 8 pupils;
3. The Ministry has a proper insight into the IT needs of all schoolboards;
4. The Ministry is in progress with the implementation of Microsoft 365 across the education eco-system.

Future plans include:

1. Improve connectivity in all schools;
2. Provide all students with devices;
3. Improving the digital knowledge of all active in the education eco-system.

### 6.4 Terrestrial multichannel TV-subscriptions

The subscription television or pay-tv market on Curaçao nowadays is mainly being delivered by either cable-TV network based on a Hybrid Fiber-Coax (HFC) infrastructure using the latest DOCSIS technology, or IPTV-services over Fiber to the Home (FttH) network. Satellite television is not being analyzed in this section as this is not considered to be part of regulated terrestrial cable-television services.

For the last 20 years the citizens in Curaçao were able to receive over the air cable-TV signals using outdoor antennas. This technology was very popular and is better known as Multichannel Multipoint Distribution Systems (MMDS), but nowadays it is making place for the implementation of new 5G services.

The local subscription television market in 2020 again showed a considerable drop in comparison with the previous year as illustrated in Figure 22. For EOY 2020, the total number of terrestrial multichannel TV subscriptions is 20.5 thousand compared to 22.8 thousand the year before. This represents an overall 2.3 thousand drop or 10.2% decrease in subscriptions. This trend will most likely continue for the next few years, as with the evolution of the internet, Over-the-Top (video) services and streaming applications including mobile video are gaining more and more popularity amongst end users.

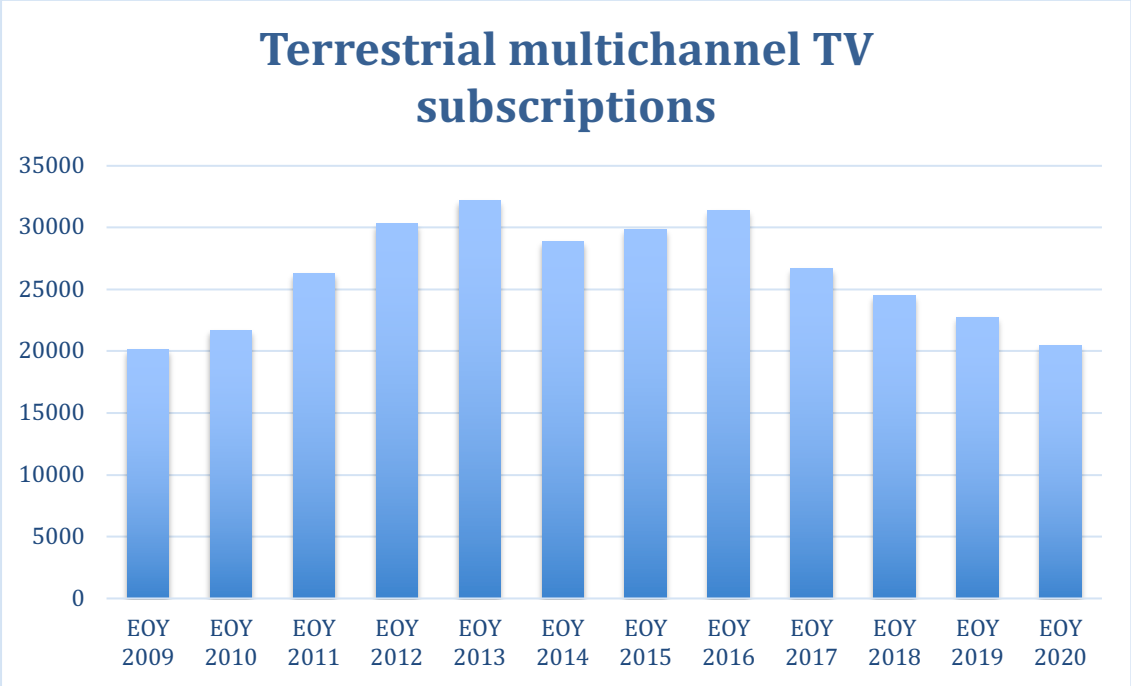



*Figure 22: Terrestrial multichannel TV subscriptions, EOY 2009 – EOY 2020*

## 6.5 Measuring progress towards the SDGs

One of the main targets of the Bureau Telecommunicatie en Post as regulator of the telecommunications and ICT-sector is to create a well-balanced and healthy competitive environment for service providers at one hand, but then also with the necessary elements to promote availability, accessibility and affordability (universal access) of broadband internet to the whole community. A well-connected nation has much better opportunities to equally participate in the worldwide digital economy and this on its turn will realize much better overall economic developments and progress.

With the analyzed fixed- and mobile broadband internet indicators in chapters 3 and 4 - broadband coverage and penetration levels by households and individuals, available networks and services by latest technology, affordability of entry-level internet packages, number of subscriptions by speed categories, and national average download speed - it can be concluded that Curacao is well on its way towards the United Nation's Sustainable Development Goal (SDG) number 9: "Industry, Innovation and Infrastructure".



One of the main targets is to significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet. Curaçao ranks at number 10th in terms of affordability with 3.20% of the GNI p.c. in comparison with the rest of the region for the fixed broadband basket and number 9th with 1.94% of the GNI p.c. with regards to the mobile data basket. It should be noticed that high entry-level speeds for fixed broadband is a critical factors when considering the digital divide.

It is clear that Curaçao does not meet the 2% GNI affordability target as stipulated by the United Nations Broadband Commissions for sustainable Development. So, it's important that the regulator together with the local ISP's engage in a structural approach to make affordable entry-level packages fixed broadband available for the whole community. This is the only way to guarantee digital inclusion for every citizen, advanced e-learning possibilities, and an innovative and transformational digital economy that relies on accessible and affordable telecommunications infrastructure.

## Appendix A - Trends 2013-2020 for Curaçao

How to read the data:

1. Thousands are separated by an apostrophe (') and decimals by a period (.).
2. Other symbols used:

| | |
|---|---|
| … or "blank" | Data not available (yet). |
| \| | Zero or a quantity less than the unit shown. Also used for data items that are not applicable. |
| Italics | Data in italics are BTP estimates. |

3. Telecommunication/ICT data have been obtained from replies to ITU questionnaires from operators and the national statistics office. The main source of the telecommunication/ICT data for each economy is shown in the list of sources, see Appendix D.
4. The Yearbook has been prepared by the Bureau Telecommunicatie en Post Curaçao. Comments should be addressed to: Mr. Leonardo de Abreu Ladeira, Senior Policy and Market Regulation Advisor, Bureau Telecommunicatie en Post, Beatrixlaan 9, Willemstad, Curaçao.
5. Please refer to Appendix B for definitions.
6. Information about ITU statistics is available on: http://www.itu.int/ITU-D/ict

## CURAÇAO

| INDICATOR | EOY 2013 | EOY 2014 | EOY 2015 | EOY 2016 | EOY 2017 | EOY 2018 | EOY 2019 | EOY 2020 |
|---|---|---|---|---|---|---|---|---|
| **DEMOGRAPHY, ECONOMY** | | | | | | | | |
| Population | 154843 | 156971 | 158969 | 160337 | 160012 | 158665 | 156223 | 153671 |
| Households | 55751 | 56494 | 57274 | 58010 | 58502 | 58384 | N/A | N/A |
| **FIXED TELEPHONE NETWORK** | | | | | | | | |
| Fixed-telephone subscriptions | 63715 | 61130 | 62571 | 59231 | 61709 | 60598 | 58625 | 53513 |
| Fixed-telephone subscriptions per 100 inhabitants | 41.15 | 38.94 | 39.36 | 36.78 | 38.09 | 36.13 | - | |
| Price of a 1-minute local call, peak rate | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 | 0.022 |
| Price of a call set-up charge, on-peak | 0.095 | 0.089 | 0.089 | 0.095 | 0.095 | 0.095 | 0.095 | 0.095 |
| Total 1-minute fixed call in USD$ | 0.12 | 0.11 | 0.11 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| **FIXED (WIRED) BROADBAND** | | | | | | | | |
| Fixed (wired) Broadband subscriptions | 37000 | 38663 | 40536 | 42713 | 46120 | 48080 | 49514 | 51466 |
| Fixed (wired) Internet Broadband subscriptions per 100 inhabitants | *23.89* | 24.63 | 25.50 | 26.52 | 30.46 | 31.85 | 32.61 | - |
| Fixed (wired) Broadband subscriptions by speed: | | | | | | | | |
| 2 to less than 10 Mbit/s | | | | | 17,914 | 16,479 | 16,538 | 11,105 |
| 10 to less than 30 Mbit/s | | | | | 21,623 | 15,071 | 18,105 | 17,317 |
| 30 to less than 100 Mbit/s | | | | | 7,553 | 17,740 | 18,515 | 24,784 |
| Equal to or above 100 Mbit/s | | | | | 103 | 108 | 150 | 150 |
| **MOBILE-CELLULAR NETWORK** | | | | | | | | |
| Mobile-cellular telephone subscriptions | 203502 | 192569 | 190489 | 186644 | 187184 | 186390 | 184236 | 184710 |
| Mobile-cellular subscriptions per 100 inhabitants | 129.79 | 121.55 | 119.17 | 115.89 | 115.55 | 114.52 | 112.73 | 113.63(1) |
| Mobile population coverage by type of network: | | | | | | | | |
| 3G mobile network | | | 82% | 95% | 100% | 100% | 100% | 100% |
| LTE mobile network | | | 15% | 70% | 70% | 80% | 90% | 100% |
| Mobile-cellular voice network | | | 100% | 100% | 100% | 100% | 100% | 100% |
| Mobile-cellular prepaid – price of a one-minute local call (peak, on- net) in USD | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| **INTERNET** | | | | | | | | |
| International Internet bandwidth, in Mbit/s | *7200* | *8600* | *15100* | *19000* | *20300* | *26300* | *32200* | *46300* |
| **OTHER INDICATORS** | | | | | | | | |
| Terrestrial multichannel TV subscriptions | 32212 | 28858 | 29866 | *31394* | *26667* | *24489* | *22766* | *20453* |
| **PERFORMANCE INDICATORS** | | | | | | | | |
| Average download speed, in average Kb/s for the year (See appendix C for calculations) | 12895 | 14744 | *15893* | *18760* | *21011* | *22000* | *23800* | *30700* |

(1) Estimate.

*Table 7 – Curaçao data EOY 2013 – EOY 2020*

## Appendix B – Definitions

| INDICATOR | DEFINITION |
|---|---|
| DEMOGRAPHY, ECONOMY | The indicators in this category are useful for deriving ratios in order to make comparisons across countries. They are generally obtained from international organizations (see Sources) or national statistical offices. Readers are advised to consult the publications of the international organizations shown in Sources for precise definitions of the demographic and macro-economic data. |
| Population | The data for population are mid-year estimates. They typically refer to the de facto population within the present boundaries. |
| Households | The data for households refer to the number of housing units consisting of persons who live together or a person living alone. Estimates are based on growth rates between censuses. |
| FIXED TELEPHONE NETWORK | The indicators in this category refer to the fixed telephone network. |
| Fixed-telephone subscriptions | Fixed-telephone subscriptions refers to the sum of active number of analogue fixed-telephone lines, voice-over-IP (VoIP) subscriptions, fixed wireless local loop (WLL) subscriptions, ISDN voice-channel equivalents and fixed public payphones.<br><br>This indicator was previously called Main telephone lines in operation. |
| Fixed-telephone subscriptions per 100 inhabitants. | Calculated by dividing the number of fixed telephone subscriptions by the population and multiplying by 100. |
| Price of a three-minute local call to a fixed-telephone line, peak rate | Price of a three-minute local call (peak-rate) to a fixed-telephone line refers to the price of a three-minute peak local call from a residential fixed-telephone line, including any call set-up charges, within the same exchange area using the subscriber's own terminal (i.e. not from a public telephone). Taxes should be included. |
| Price of a three-minute local call to a fixed-telephone line, off-peak rate | Price of a three-minute local call to a fixed-telephone line refers to the price of a three-minute off-peak local call from a residential fixed-telephone line, including any call set-up charges, within the same exchange area using the subscriber's own terminal (i.e. not from a public telephone). Taxes should be included. If not included, it should be specified in a note including the applicable tax rate. |
| Price of a one-minute local call to a fixed-telephone line, peak rate | Price of a one-minute local call (peak-rate) to a fixed-telephone line refers to the price of a one-minute peak local call from a residential fixed-telephone line, excluding any call set-up charges, within the same exchange area using the subscriber's own terminal (i.e. not from a public telephone). |
| Price of a call set-up charge on-peak | Price of a call set-up charge. |
| MOBILE CELLULAR NETWORK | The indicators in this category refer to mobile cellular networks. |
| Mobile-cellular telephone subscriptions | Mobile-cellular telephone subscriptions refers to the number of subscriptions to a public mobile-telephone service that provide access to the PSTN using cellular technology. The indicator includes (and is split into) the number of postpaid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months). The indicator applies to all mobile-cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB |

| | |
|---|---|
| | modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services. |
| Mobile-cellular subscriptions per 100 inhabitants | Calculated by dividing the number of mobile-cellular telephone subscriptions by the population and multiplying by 100. |
| Mobile-cellular prepaid – price of a one-minute local call (peak, on- net) | Refers to the price per minute of a peak prepaid call from a mobile- cellular telephone with a prepaid subscription to another subscriber in the same network. Taxes should be included. If not included, it should be specified in a note including the applicable tax rate. |
| Price of a one-minute local call to a mobile-cellular phone, peak rate | The price of a one-minute local call from a residential fixed-telephone line to a mobile-cellular number during peak time. |
| Percentage of the population covered by a mobile-cellular network | Percentage of the population covered by a mobile-cellular network refers to the percentage of inhabitants within range of a mobile-cellular signal, irrespective of whether or not they are subscribers or users. This is calculated by dividing the number of inhabitants within range of a mobile-cellular signal by the total population and multiplying by 100. |
| Mobile-cellular connection charge | Initial, one-time charge for a new prepaid mobile-cellular subscription. Refundable deposits should not be counted. The connection fee corresponds usually to the price charged for the subscriber identity module (SIM) card, but may include other fees. It should be noted if free minutes, free SMS or other free services are included in the connection charge. |
| Data-only mobile broadband 1.5 GB, price of the plan | Price (in local currency) of the base plan selected for data-only mobile-broadband basket with 1.5 GB volume of data. |
| Data-only mobile broadband 1.5 GB, cap, in GB | Maximum amount of Internet data, in gigabytes (GB), included in the base plan selected for data-only mobile-broadband basket with 1.5 GB volume of data. |
| Data-only mobile broadband 1.5 GB, price of excess usage, per GB | Price per additional gigabyte (GB) of Internet data downloaded once the allotted limit of the base plan selected for data-only mobile-broadband basket with 1.5 GB is used. |
| Data-only mobile broadband 1.5 GB, validity of plan (days) | Validity (in number of days) of the base plan selected for data-only mobile-broadband basket with 1.5 GB. |
| Data-only mobile broadband 1.5 GB, technology used | Type of technology used (e.g. UMTS, LTE) for the plan selected for data-only mobile-broadband basket with 1.5 GB. |
| INTERNET | The indicators in this category refer to Internet. |
| International Internet bandwidth, in Mbit/s | International Internet bandwidth refers to the total used capacity of international Internet bandwidth, in megabits per second (Mbit/s). It is measured as the sum of used capacity of all Internet exchanges (locations where Internet traffic is exchanged) offering international bandwidth. If capacity is asymmetric (i.e. more incoming (downlink) than outgoing (uplink) capacity), then the incoming (downlink) capacity should be provided. |
| Lit/equipped international bandwidth | Total lit/equipped international bandwidth capacity refers to the total lit/equipped capacity of international links, namely fiber-optic cables, international radio links and |

| | |
|---|---|
| capacity, in Mbit/s | satellite uplinks to orbital satellites in the end of the reference year (expressed in Mbit/s). If the traffic is asymmetric (i.e. incoming traffic and outgoing traffic is not equal), then the higher value out of the two should be provided. |
| FIXED (WIRED) BROADBAND BY TECHNOLOGY | The indicators in this category refer to fixed (wired)-broadband subscriptions by technology. |
| Fixed (wired)-broadband subscriptions | Fixed (wired)-broadband subscriptions refers to subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 kbit/s. This includes cable modem, DSL, fibre-to-the- home/building and other fixed (wired)-broadband subscriptions. This total is measured irrespective of the method of payment. It excludes subscriptions that have access to data communications (including the Internet) via mobile-cellular networks and technologies listed under the wireless-broadband category. |
| Fixed (wired)-broadband subscriptions per 100 inhabitants. | Calculated by dividing the number of fixed (wired) broadband Internet subscriptions by the population and multiplying by 100. |
| Fixed (wired)-broadband monthly subscription charge | Fixed (wired)-broadband monthly subscription charge refers to the monthly charge subscription charge for fixed (wired)-broadband Internet service. Fixed (wired) broadband is considered to be any dedicated connection to the Internet at downstream speeds equal to, or greater than, 256 kbit/s. If several offers are available, preference should be given to the 256 kbit/s connection. |
| Fixed (wired)-broadband speed, in Mbit/s | Fixed (wired)-broadband speed, in Mbit/s refers to the advertised maximum theoretical download speed, and not speeds guaranteed to users associated with a fixed (wired)-broadband Internet monthly subscription. |
| 256 Kbit/s to less than 2 Mbit/s subscriptions | Refers to all fixed-broadband Internet subscriptions with advertised downstream speeds equal to, or greater than, 256 Kbit/s and less than 2 Mbit/s. |
| 2 Mbit/s to less than 10 Mbit/s subscriptions | Refers to all fixed-broadband Internet subscriptions with advertised downstream speeds equal to, or greater than, 2 Mbit/s and less than 10 Mbit/s. |
| 10 Mbit/s to less than 30 Mbit/s subscriptions | Refers to all fixed-broadband Internet subscriptions with advertised downstream speeds equal to, or greater than, 10 Mbit/s and less than 30 Mbit/s. |
| - 30 Mbit/s to less than 100 Mbit/s subscriptions | Refers to all fixed-broadband Internet subscriptions with advertised downstream speeds equal to, or greater than, 30 Mbit/s and less than 100 Mbit/s. |
| Equal to or above 100 Mbit/s subscriptions | Refers to all fixed-broadband Internet subscriptions with advertised downstream speeds equal to, or greater than, 100 Mbit/s. |
| Fixed-broadband connection charge | Fixed-broadband connection charge refers to the initial, one-time charge for a new fixed-broadband Internet connection. The tariffs should represent the cheapest fixed-broadband plan on the basis of a 5 gigabyte (GB) monthly usage. Refundable deposits should not be counted. |
| Fixed-broadband monthly subscription charge | Fixed-broadband monthly subscription charge refers to the monthly subscription charge for fixed-broadband Internet service. Fixed broadband is considered to be any dedicated connection to the Internet at downstream speeds equal to, or greater than, 256 Kbit/s. If several offers are available, preference should be given to the cheapest meeting the criteria of the basket (e.g. on the basis of a 5 gigabyte (GB) monthly usage). |
| Fixed-broadband cap, in | Fixed-broadband cap refers to the maximum amount of Internet data, in gigabytes |

| | |
|---|---|
| GB | (GB), that can be transferred within a month, included in the fixed- broadband monthly subscription. |
| WIRELESS BROADAND | The indicators in this category refer to wireless broadband. |
| Wireless-broadband subscriptions | Wireless-broadband subscriptions refers to the sum of satellite broadband, terrestrial fixed wireless broadband and active mobile-broadband subscriptions to the public Internet. |
| Mobile- broadband subscriptions | Mobile-broadband subscriptions refers to the sum of standard mobile-broadband and dedicated mobile-broadband subscriptions. It covers actual subscribers, not potential subscribers, even though the latter may have broadband enabled- handsets. |
| Mobile-broadband subscriptions per 100 inhabitants | Calculated by dividing the number of mobile-broadband Internet subscriptions by the population and multiplying by 100. |
| OTHER INDICATORS | |
| Terrestrial multichannel TV subscriptions | Terrestrial multichannel TV subscriptions refers to the number of subscriptions to terrestrial multichannel TV such as cable TV, Internet protocol television (IPTV), digital terrestrial TV (DTT), microwave multipoint distribution systems (MMDS). |
| Percentage of the population covered by at least a 3G mobile network | Percentage of the population covered by at least a 3G mobile network refers to the percentage of inhabitants that are within range of at least a 3G mobile-cellular signal, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by at least a 3G mobile-cellular signal by the total population and multiplying by 100. It excludes people covered only by GPRS, EDGE or CDMA 1xRTT. |
| Percentage of the population covered by at least an LTE/WiMAX mobile network | Percentage of the population covered by at least an LTE/WiMAX mobile network refers to the percentage of inhabitants that live within range of LTE/LTE-Advanced, mobile WiMAX/Wireless MAN or other more advanced mobile-cellular networks, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by the previously mentioned mobile-cellular technologies by the total population and multiplying by 100. It excludes people covered only by HSPA, UMTS, EV-DO and previous 3G technologies, and also excludes fixed WiMAX coverage. |

*Table 8 – Definitions*

## Appendix C – Download speeds

| YEAR AVERAGES in Kbps | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Average download speeds per year | 6726.7 | 12895.14 | 14744.24 | 15893 | *18760* | *21011* | *22110* | *23830* | *30700* | *64000* |

| MONTHLY RESULTS in Kbps | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| January | 6490.05 | … | 10823.17 | 14050.00 | … | … | … | … | … | 31500 |
| February | 6633.30 | … | 13679.56 | 14200.00 | … | … | … | … | … | 33280 |
| March | 6529.43 | … | 14335.05 | 13500.00 | … | … | … | … | … | 35870 |
| April | 6603.65 | 12814.36 | 14344.65 | 16000.00 | … | … | … | … | … | 39700 |
| May | 6613.32 | 13042.97 | 14754.09 | 17000.00 | … | … | … | … | … | 74910 |
| June | 6577.46 | 13849.50 | 16106.32 | 17500.00 | … | … | … | … | … | 90080 |
| July | 6986.88 | 13095.30 | 15327.46 | 19000.00 | … | … | 22110.00 | … | 26550 | 60080 |
| August | 7846.57 | 13454.28 | 15922.03 | … | … | … | … | … | 28000 | 63970 |
| September | 7593.47 | 13176.01 | 16034.84 | … | … | … | … | … | 29050 | 64820 |
| October | 6451.46 | 13079.28 | 15801.44 | … | … | … | … | … | 30700 | 65410 |
| November | 5763.54 | 11557.14 | 14986.73 | … | … | … | … | … | 31050 | … |
| December | 6631.60 | 11987.44 | 14815.57 | … | … | … | … | … | 29520 | … |

*Table 9 – Yearly and monthly download speed results*

The average yearly download speed data is calculated from the yearly average of monthly results in a year until 2015. From 2016 to 2019, on estimates are made by calculating the weighted average of subscribers per speed from the Largest Market Share operator. Since 2020 the Bureau Telecommunicatie en Post started using the Ookla Speedtest Intelligent analysis tool.

Notes:

- As from April 2013, Curaçao is recorded separately, so as of 2013 measurements from April to December are used for higher accuracy;
- From 2015 on, Ookla only shows graphs, no more raw data per country. The download speeds of 2015 are derived from that graph;
- From August 2015, Ookla data viewing is discontinued and therefore not available anymore;
- For the month of July 2018, the measurement of 22110.00 was reported by Ookla speed test (download).
- For the years 2020 and 2021, the most recent available information from the Ookla Speedtest Intelligent system is used at the time of publication.

## Appendix D1 – List of countries and comparison data

| General Statistics | | Fixed-telephone subscriptions per 100 inhabitants | Fixed (wired)-broadband subscriptions per 100 inhabitants | Mobile-cellular telephone subscriptions per 100 inhabitants | Mobile broadband subscriptions per 100 inhabitants |
|---|---|---|---|---|---|
| **Curaçao** | | **32.7** | **32.6** | **112.7** | **65.7** |
| **Caribbean** | | **20.1** | **18.4** | **102.8** | **52.1** |
| **South America** | | **15.3** | **14.3** | **113.1** | **75.5** |
| **Central America** | | **9.5** | **8.9** | **116.8** | **57.7** |
| | | | | | |
| **World** | | **11.9** | **14.8** | **107.8** | **74.2** |
| **Developed countries** | | **34.3** | **33.2** | **131.8** | **123.9** |
| **Developing** | | **7.4** | **11.1** | **103.0** | **64.3** |
| **LDCs** | | **0.8** | **1.2** | **74.9** | **31.8** |
| **Caribbean region** | **Island** | **Fixed-telephone subscriptions per 100 inhabitants** | **Fixed (wired)-broadband subscriptions per 100 inhabitants** | **Mobile-cellular telephone subscriptions per 100 inhabitants** | **Mobile broadband subscriptions per 100 inhabitants** |
| Lesser Antilles - Leeward islands | Antigua and Barbuda | - | - | - | - |
| Lucayan Archipelago | Bahamas | 23.4 | 21.1 | 109.2 | 93.0 |
| Windward islands | Barbados | 44.6 | 37.2 | 114.7 | 42.2 |
| Lesser Antilles - Leeward islands | British Virgin Islands | 24.3 | 19.7 | 131.6 | 21.5 |
| Greater Antilles | Cayman Islands | - | - | - | - |
| Greater Antilles | Cuba | 12.8 | 1.6 | 53.3 | 18.2 |
| Curaçao | Curaçao | 32.7 | 32.6 | 112.7 | 65.7 |
| Windward islands | Dominica | - | - | - | - |
| Greater Antilles | Dominican Rep. | 11.3 | 8.7 | 83.3 | 67.2 |
| Windward islands | Grenada | - | 22.8 | - | - |
| Greater Antilles | Haiti | 0.1 | 0.3 | 60.8 | 27.2 |
| Greater Antilles | Jamaica | 13.5 | 10.8 | 102.6 | 55.3 |
| Greater Antilles | Puerto Rico | 23.4 | 20.8 | 115.0 | 87.1 |
| Lesser Antilles - Leeward islands | S.t Kitts & Nevis | - | - | - | - |
| Windward islands | Saint Lucia | - | - | - | - |
| Windward islands | St. Vincent & Grenadines | 11.7 | 20.3 | 92.9 | 58.2 |
| Windward islands | Trinidad and Tobago | 23.8 | 24.3 | 155.1 | 37.6 |
| ***AVERAGES*** | | **20.1** | **18.4** | **102.8** | **52.1** |
| **South America** | | | | | |
| | Argentina | 17.3 | 19.6 | 125.8 | |
| | Bolivia | 5.7 | 6.5 | 101.5 | 83.0 |
| | Brazil | 16.0 | 15.6 | 95.7 | 87.1 |
| | Chile | 14.5 | 18.1 | 132.2 | 95.0 |
| | Colombia | 13.9 | 13.8 | 131.7 | 58.7 |
| | Ecuador | 12.6 | 12.0 | 91.2 | 53.7 |

| | | | | | |
|---|---|---|---|---|---|
| | Paraguay | 3.9 | 5.4 | 110.2 | 61.2 |
| | Peru | | | | |
| | Suriname | 16.0 | 13.8 | 140.0 | 91.2 |
| | Uruguay | 33.7 | 29.2 | 138.1 | 97.6 |
| | Venezuela | 19.2 | 9.0 | 64.8 | 51.5 |
| ***AVERAGES*** | | **15.3** | **14.3** | **113.1** | **75.5** |
| | | | | | |
| **Central America** | | | | | |
| | Belize | 4.7 | 7.6 | 65.3 | 43.9 |
| | Costa Rica | 12.7 | 17.9 | 169.4 | 92.4 |
| | El Salvador | 13.8 | 8.1 | 161.1 | 60.6 |
| | Guatemala | 11.2 | | 118.7 | |
| | Honduras | 5.0 | 4.0 | 77.6 | 51.8 |
| | Nicaragua | 3.5 | 3.3 | 88.4 | 18.0 |
| | Panama | 15.3 | 12.6 | 137.2 | 79.3 |
| ***AVERAGES*** | | **9.5** | **8.9** | **116.8** | **57.7** |

*Table 10 – List of countries and comparison data (penetration) 1 January 2020*

## Appendix D2 – List of countries and comparison prices 1-min call peak, on-net benchmark (USD)

| Economy | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| **Curaçao** | **0.39** | **0.39** | **0.39** | **0.39** | **0.39** | **0.39** | **0.39** | **0.39** |
| **Caribbean** | **0.25** | **0.24** | **0.25** | **0.26** | **0.28** | **0.27** | **0.27** | **0.28** |
| **Central America** | **0.22** | **0.21** | **0.23** | **0.21** | **0.22** | **0.20** | **0.21** | **0.20** |
| **South America** | **0.24** | **0.24** | **0.23** | **0.21** | **0.17** | **0.17** | **0.19** | **0.17** |

| Caribbean | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| Antigua and Barbuda | 0.30 | 0.26 | 0.29 | 0.29 | 0.35 | 0.35 | - | 0.35 |
| Aruba | - | - | - | - | - | - | 0.41 | 0.44 |
| Bahamas | 0.33 | 0.33 | 0.33 | 0.33 | 0.35 | 0.35 | 0.37 | 0.37 |
| Barbados | 0.26 | 0.23 | 0.25 | 0.28 | 0.30 | 0.30 | 0.30 | 0.30 |
| British Virgin Islands | - | - | - | - | - | - | 0.29 | - |
| Cayman Islands | - | 0.26 | 0.30 | 0.30 | 0.30 | 0.34 | - | 0.30 |
| Cuba | 0.45 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 | - |
| Curaçao | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 | 0.39 |
| Dominica | 0.22 | 0.21 | 0.21 | 0.23 | 0.23 | 0.26 | 0.26 | 0.26 |
| Dominican Rep. | 0.20 | 0.18 | 0.18 | 0.17 | 0.17 | 0.16 | 0.16 | 0.15 |
| Grenada | 0.18 | 0.18 | 0.18 | 0.26 | 0.29 | 0.29 | - | 0.29 |
| Haiti | 0.11 | 0.11 | 0.10 | 0.10 | 0.08 | 0.04 | 0.03 | 0.07 |
| Jamaica | 0.12 | 0.10 | 0.09 | 0.09 | 0.10 | 0.06 | 0.05 | 0.05 |
| Puerto Rico | 0.11 | 0.11 | 0.11 | 0.11 | 0.25 | 0.25 | 0.25 | - |
| Saint Kitts and Nevis | 0.19 | 0.28 | 0.29 | 0.29 | 0.33 | 0.33 | - | 0.33 |
| Saint Lucia | 0.32 | 0.32 | 0.32 | 0.34 | 0.35 | 0.35 | 0.30 | 0.30 |
| St. Vincent & Grenadines | 0.32 | 0.32 | 0.32 | 0.33 | 0.35 | 0.37 | 0.37 | 0.37 |
| Trinidad and Tobago | 0.22 | 0.22 | 0.23 | 0.23 | 0.22 | 0.19 | 0.19 | 0.19 |
| ***AVERAGES*** | ***0.25*** | ***0.24*** | ***0.25*** | ***0.26*** | ***0.28*** | ***0.27*** | ***0.27*** | ***0.28*** |

| Central America | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| Belize | 0.34 | 0.34 | 0.34 | 0.34 | 0.26 | 0.26 | 0.26 | 0.26 |
| Costa Rica | 0.07 | 0.07 | 0.06 | 0.06 | 0.07 | 0.07 | 0.07 | 0.07 |
| El Salvador | 0.17 | 0.17 | 0.14 | 0.13 | 0.12 | 0.12 | 0.12 | 0.12 |
| Guatemala | 0.27 | 0.30 | 0.30 | 0.31 | 0.34 | 0.35 | 0.35 | 0.34 |
| Honduras | - | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.18 | 0.17 |
| Nicaragua | 0.32 | 0.34 | 0.46 | 0.34 | 0.45 | 0.34 | 0.38 | 0.36 |
| Panama | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 | 0.10 | 0.10 | 0.10 |
| ***AVERAGES*** | ***0.22*** | ***0.21*** | ***0.23*** | ***0.21*** | ***0.22*** | ***0.20*** | ***0.21*** | ***0.20*** |

| South America | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|
| Argentina | 0.29 | 0.27 | 0.38 | 0.41 | 0.28 | 0.29 | 0.47 | 0.32 |
| Bolivia | 0.22 | 0.22 | 0.22 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| Brazil | 0.61 | 0.53 | - | - | - | - | - | - |
| Chile | 0.14 | 0.18 | 0.21 | 0.18 | 0.18 | 0.18 | 0.19 | 0.17 |
| Colombia | 0.18 | 0.19 | 0.17 | 0.13 | 0.11 | 0.12 | 0.02 | 0.07 |
| Ecuador | 0.18 | 0.20 | 0.20 | 0.20 | 0.20 | 0.11 | 0.11 | 0.11 |
| Paraguay | 0.14 | 0.18 | 0.17 | 0.04 | 0.04 | 0.04 | 0.20 | 0.17 |
| Peru | 0.19 | 0.18 | 0.17 | 0.15 | 0.15 | 0.15 | - | 0.15 |
| Suriname | 0.18 | 0.18 | 0.22 | 0.21 | 0.16 | 0.18 | 0.18 | 0.18 |
| Uruguay | 0.32 | 0.32 | 0.31 | 0.26 | 0.27 | 0.28 | - | 0.21 |
| Venezuela | 0.25 | 0.18 | 0.22 | 0.31 | - | 0.19 | - | - |
| ***AVERAGES*** | ***0.24*** | ***0.24*** | ***0.23*** | ***0.21*** | ***0.17*** | ***0.17*** | ***0.19*** | ***0.17*** |

*Table 11 – List of countries and comparison prices 1-min call peak, on-net USD*

## Appendix E – Sources

CBS data 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019 and 2020

**TELECOMMUNICATION AND INFORMATION AND COMMUNICATION TECHNOLOGIES**

Data on these subjects are obtained from operators through the annual ITU questionnaire, completed by 'BTP aansluitpuntgegevens concessiehouders' and ITU publications.

A full list:

- ITU Enquete EOY 2012 - 2020 – UTS;
- ITU Enquete EOY 2012 - 2020 – Flow;
- ITU Enquete EOY 2012 - 2020 – Digicel;
- ITU Enquete EOY 2012 - 2020 – TRES;
- ITU Enquete EOY 2012, 2013, 2014 – Scarlet;
- ITU Enquete ICT Price Basket EOY 2012 – 2019;
- Curaçao Fixed Internet Penetration Indicators, BT&P;
- BTP aansluitpuntgegevens concessiehouders 2012 - 2020;
- BTP betaaltelevisie aansluitpunt gegevens;
- ITU EYE Data: http://www.itu.int/net4/itu-d/icteye/;
- ITU Yearbook of Statistics Telecom & ICT Indicators 2005-2019;
- ITU Fact and figures Key data 2005-2020;
- ITU Measuring the Information Society 2013, 2014, 2015, 2016, 2017, 2018;
- ITU World Telecommunication/ICT Indicators (WTI) database 2016 - 2021;
- ITU Handbook for the collection of administrative data on telecommunications/ICT, 2020 edition;
- CBS: Population and Population Growth of Curaçao; www.cbs.cw ;
- CBS: Gross national income of Curaçao; www.cbs.cw ;
- World bank: World development indicators, GNI per Capita (1-7-2020), (30-7-2021) downloaded from data.worldbank.org/indicator ;
- United Nations Development Programme, Human Development report 2019;
- AMS-IX Caribbean statistics portal: https://ams-ix.net/car;
- United Nations Sustainable Development Goals (SDGs) https://sdgs.un.org/ ;
- ITU ICT Prices trends 2017 - 2020.

**AVERAGE DOWNLOAD SPEEDS**

- Ookla Speedtest Intelligence analysis tool

## Appendix F – List of concession holders and broadband technologies

| Operator | Used technologies |
|---|---|
| United Telecommunication Services N.V. (UTS) | Fixed-Wired Broadband: DSL / Fibre-to-the-Home or Building<br>Wireless-broadband/mobile: HSPA+ / LTE<br>International communication |
| Columbus Communications N.V. (Flow) | Fixed-Wired Broadband: Cable / HFC<br>International communication |
| Digicel N.V. | Wireless-broadband/mobile: HSPA+ / LTE<br>International communication |
| TRES Networks | Fixed-Wired Broadband: Fibre-to-the-Home or Building<br>International communication |
| Smitcoms N.V. | International communication |
| Flamingo TV Bonaire | International communication |

*Table 12 – List of operators and used broadband technology*

## Appendix G – List of international subsea fiber optic cables

**Submarine Cable-systems landing in Curacao**

1. Arcos: providing connections to Puerto Rico, the rest of the Caribbean, Venezuela and the USA;
2. Americas II: providing connections to Venezuela, St. Croix and the rest of the Caribbean, including additional logical routes to Miami (USA) and Brazil;
3. Alonso de Ojeda: providing connection to Aruba;
4. EC-Link: providing connection to Trinidad & Tobago and Bonaire (Jerry Newton/EC-Link extension);
5. Amerigo Vespucci: providing connection to Bonaire;
6. PCCS (& Alonso de Ojeda II to Aruba): providing connections to the Caribbean, South America, and the USA.

## Appendix H – List of data centers in Curaçao

E-Commerce Park Curacao

Blue NAP Americas

CORE N.V. Curacao

Digicel/TRES Networks