

# Telecommunications in developing countries: challenges

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Mario Marchese  
University of Genova



Genova, 01/07/2019

# Index

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- ⇒ Internet Evolution
- ⇒ “Digital Divide”
- ⇒ Nanosatellites
- ⇒ Interconnection benefits
- ⇒ Mobile phones
- ⇒ Case studies
  - Africa
  - Nigeria, Ghana, Togo



# Statistics

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- ⇒ Internet statistics (millions of users)
  - 4,383,810,342
  - March, 2019
- ⇒ <http://www.internetworldstats.com/stats.htm>



# Internet statistics (2008)

## WORLD INTERNET USAGE AND POPULATION STATISTICS

World Regions	Population ( 2008 Est.)	Internet Users Dec/31, 2000	Internet Usage, Latest Data	% Population ( Penetration )	Usage % of World	Usage Growth 2000- 2008
<u>Africa</u>	955,206,348	4,514,400	51,065,630	5.3 %	3.5 %	1,031.2 %
<u>Asia</u>	3,776,181,949	114,304,000	578,538,257	15.3 %	39.5 %	406.1 %
<u>Europe</u>	800,401,065	105,096,093	384,633,765	48.1 %	26.3 %	266.0 %
<u>Middle East</u>	197,090,443	3,284,800	41,939,200	21.3 %	2.9 %	1,176.8 %
<u>North America</u>	337,167,248	108,096,800	248,241,969	73.6 %	17.0 %	129.6 %
<u>Latin America/Caribbean</u>	576,091,673	18,068,919	139,009,209	24.1 %	9.5 %	669.3 %
<u>Oceania / Australia</u>	33,981,562	7,620,480	20,204,331	59.5 %	1.4 %	165.1 %
<b>WORLD TOTAL</b>	6,676,120,288	360,985,492	1,463,632,361	21.9 %	100.0 %	305.5 %



# Internet statistics (end 2011)

## WORLD INTERNET USAGE AND POPULATION STATISTICS December 31, 2011

World Regions	Population ( 2011 Est.)	Internet Users Dec. 31, 2000	Internet Users Latest Data	Penetration (% Population)	Growth 2000-2011	Users % of Table
<u>Africa</u>	1,037,524,058	4,514,400	139,875,242	13.5 %	2,988.4 %	6.2 %
<u>Asia</u>	3,879,740,877	114,304,000	1,016,799,076	26.2 %	789.6 %	44.8 %
<u>Europe</u>	816,426,346	105,096,093	500,723,686	61.3 %	376.4 %	22.1 %
<u>Middle East</u>	216,258,843	3,284,800	77,020,995	35.6 %	2,244.8 %	3.4 %
<u>North America</u>	347,394,870	108,096,800	273,067,546	78.6 %	152.6 %	12.0 %
<u>Latin America / Carib.</u>	597,283,165	18,068,919	235,819,740	39.5 %	1,205.1 %	10.4 %
<u>Oceania / Australia</u>	35,426,995	7,620,480	23,927,457	67.5 %	214.0 %	1.1 %
<u>WORLD TOTAL</u>	6,930,055,154	360,985,492	2,267,233,742	32.7 %	528.1 %	100.0 %



# Internet statistics (June 2015)

WORLD INTERNET USAGE AND POPULATION STATISTICS JUNE 30, 2015 - Mid-Year Update						
World Regions	Population ( 2015 Est.)	Internet Users Dec. 31, 2000	Internet Users Latest Data	Penetration (% Population)	Users % of Table	Growth 2000-2015
<a href="#">Africa</a>	1,158,355,663	4,514,400	313,257,074	27.0 %	9.6 %	6,839.1%
<a href="#">Asia</a>	4,032,466,882	114,304,000	1,563,208,143	38.8 %	47.8 %	1,267.6%
<a href="#">Europe</a>	821,555,904	105,096,093	604,122,380	73.5 %	18.5 %	474.8%
<a href="#">Middle East</a>	236,137,235	3,284,800	115,823,882	49.0 %	3.5 %	3,426.1%
<a href="#">North America</a>	357,172,209	108,096,800	313,862,863	87.9 %	9.6 %	190.4%
<a href="#">Latin America / Caribbean</a>	617,776,105	18,068,919	333,115,908	53.9 %	10.2 %	1,743.6%
<a href="#">Oceania / Australia</a>	37,157,120	7,620,480	27,100,334	72.9 %	0.8 %	255.6%
<b><a href="#">WORLD TOTAL</a></b>	<b>7,260,621,118</b>	<b>360,985,492</b>	<b>3,270,490,584</b>	<b>45.0 %</b>	<b>100.0 %</b>	<b>806.0%</b>



# Internet statistics (June 2017)

<b>WORLD INTERNET USAGE AND POPULATION STATISTICS JUNE 30, 2017 - Update</b>						
<b>World Regions</b>	<b>Population ( 2017 Est.)</b>	<b>Population % of World</b>	<b>Internet Users 30 June 2017</b>	<b>Penetration Rate (% Pop.)</b>	<b>Growth 2000-2017</b>	<b>Internet Users %</b>
<a href="#"><u>Africa</u></a>	1,246,504,865	16.6 %	388,376,491	31.2 %	8,503.1%	10.0 %
<a href="#"><u>Asia</u></a>	4,148,177,672	55.2 %	1,938,075,631	46.7 %	1,595.5%	49.7 %
<a href="#"><u>Europe</u></a>	822,710,362	10.9 %	659,634,487	80.2 %	527.6%	17.0 %
<a href="#"><u>Latin America / Caribbean</u></a>	647,604,645	8.6 %	404,269,163	62.4 %	2,137.4%	10.4 %
<a href="#"><u>Middle East</u></a>	250,327,574	3.3 %	146,972,123	58.7 %	4,374.3%	3.8 %
<a href="#"><u>North America</u></a>	363,224,006	4.8 %	320,059,368	88.1 %	196.1%	8.2 %
<a href="#"><u>Oceania / Australia</u></a>	40,479,846	0.5 %	28,180,356	69.6 %	269.8%	0.7 %
<a href="#"><u>WORLD TOTAL</u></a>	7,519,028,970	100.0 %	3,885,567,619	51.7 %	976.4%	100.0 %



# Internet statistics (June 2018)

## WORLD INTERNET USAGE AND POPULATION STATISTICS JUNE 30, 2018 - Update

World Regions	Population (2018 Est.)	Population % of World	Internet Users 30 June 2018	Penetration Rate (% Pop.)	Growth 2000-2018	Internet Users %
<u>Africa</u>	1,287,914,329	16.9 %	464,923,169	36.1 %	10,199 %	11.0 %
<u>Asia</u>	4,207,588,157	55.1 %	2,062,197,366	49.0 %	1,704 %	49.0 %
<u>Europe</u>	827,650,849	10.8 %	705,064,923	85.2 %	570 %	16.8 %
<u>Latin America / Caribbean</u>	652,047,996	8.5 %	438,248,446	67.2 %	2,325 %	10.4 %
<u>Middle East</u>	254,438,981	3.3 %	164,037,259	64.5 %	4,894 %	3.9 %
<u>North America</u>	363,844,662	4.8 %	345,660,847	95.0 %	219 %	8.2 %
<u>Oceania / Australia</u>	41,273,454	0.6 %	28,439,277	68.9 %	273 %	0.7 %
<u>WORLD TOTAL</u>	7,634,758,428	100.0 %	4,208,571,287	55.1 %	1,066 %	100.0 %





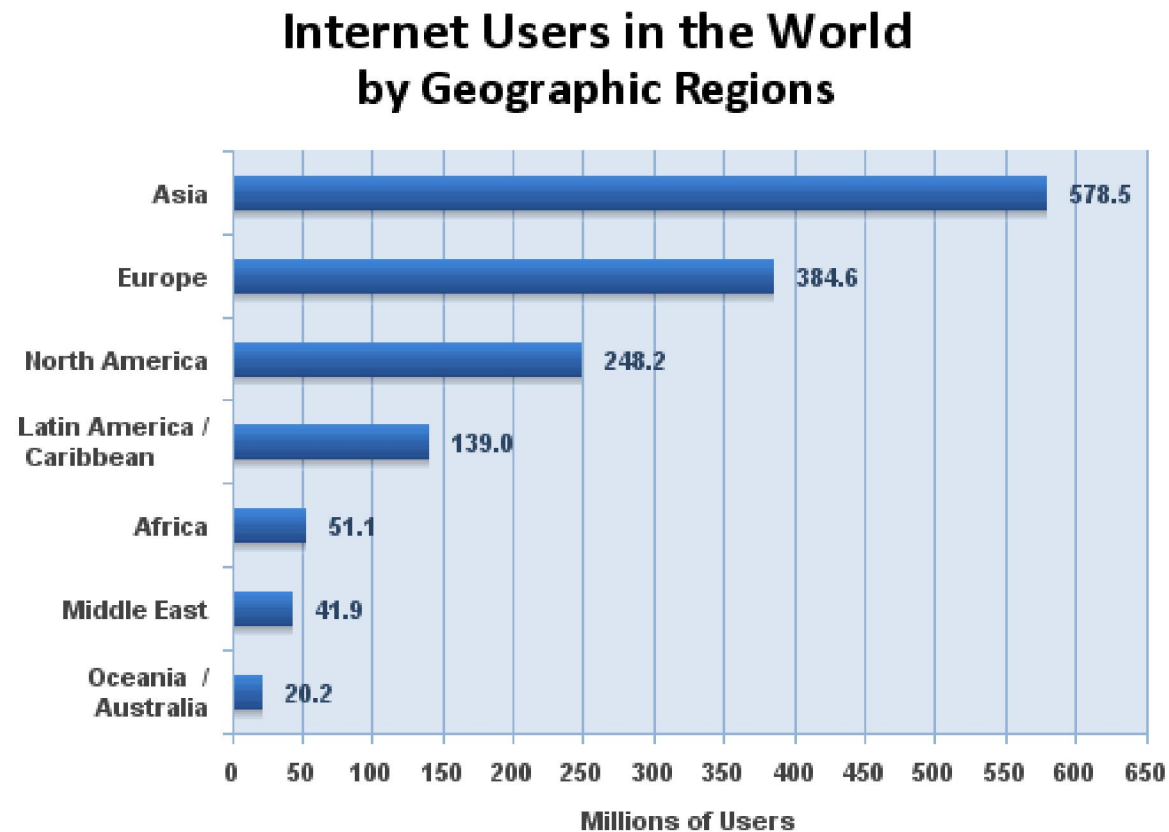
# Internet statistics (May 2019)

## WORLD INTERNET USAGE AND POPULATION STATISTICS MAY, 2019 - Updated

World Regions	Population (2019 Est.)	Population % of World	Internet Users 31 Mar 2019	Penetration Rate (% Pop.)	Growth 2000-2019	Internet Users %
<u><a href="#">Africa</a></u>	1,320,038,716	17.1 %	492,762,185	37.3 %	10,815 %	11.2 %
<u><a href="#">Asia</a></u>	4,241,972,790	55.0 %	2,197,444,783	51.8 %	1,822 %	50.1 %
<u><a href="#">Europe</a></u>	829,173,007	10.7 %	719,365,521	86.8 %	584 %	16.4 %
<u><a href="#">Latin America / Caribbean</a></u>	658,345,826	8.5 %	444,493,379	67.5 %	2,360 %	10.1 %
<u><a href="#">Middle East</a></u>	258,356,867	3.3 %	173,542,069	67.2 %	5,183 %	4.0 %
<u><a href="#">North America</a></u>	366,496,802	4.7 %	327,568,127	89.4 %	203 %	7.5 %
<u><a href="#">Oceania / Australia</a></u>	41,839,201	0.5 %	28,634,278	68.4 %	276 %	0.7 %
<u><a href="#">WORLD TOTAL</a></u>	7,716,223,209	100.0 %	4,383,810,342	56.8 %	1,114 %	100.0 %



# Internet Users - 2008



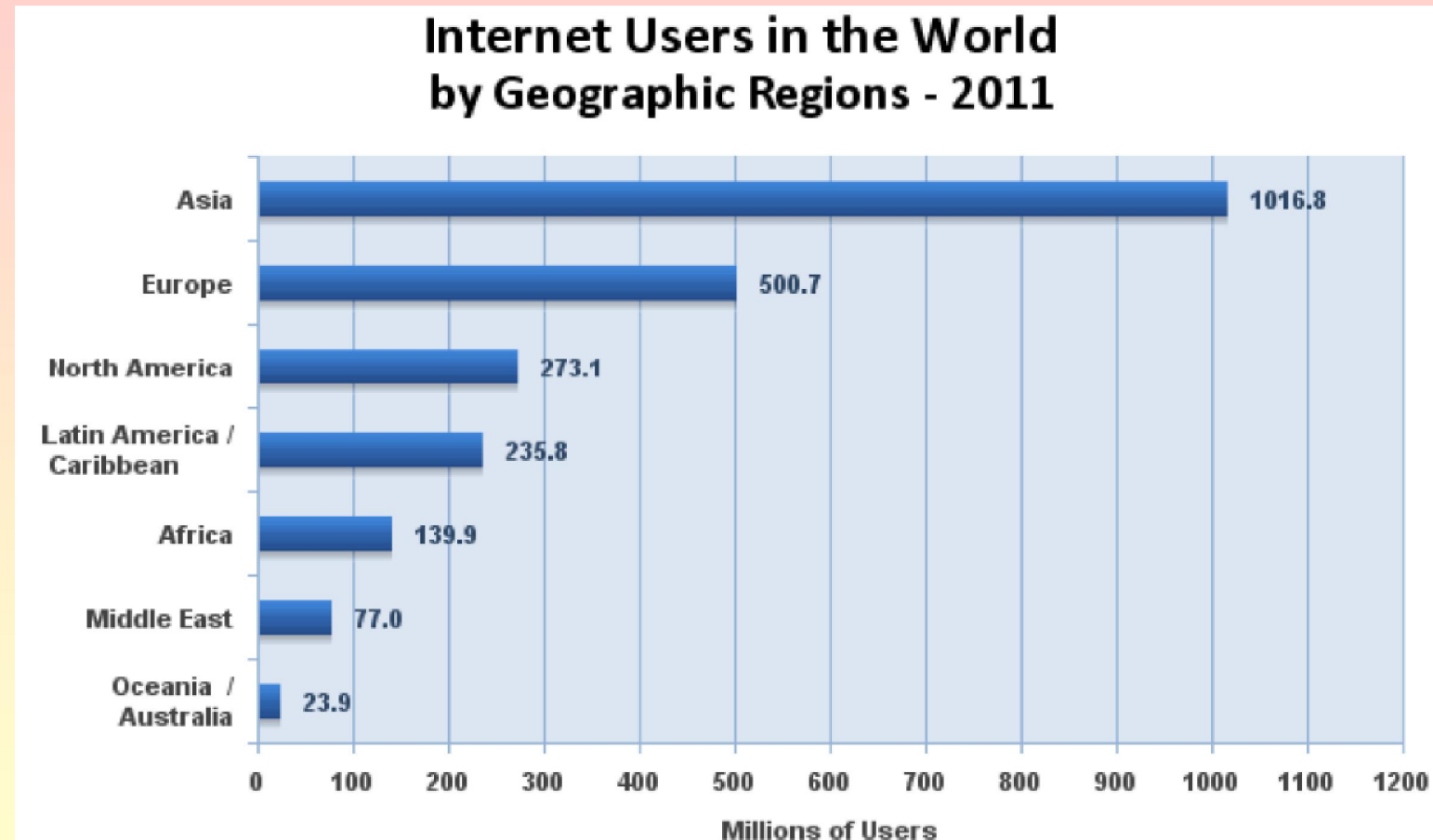
Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

Estimated Internet users is 1,463,632,361 for Q2 2008

Copyright © 2008, Miniwatts Marketing Group



# Internet Users - 2011



Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

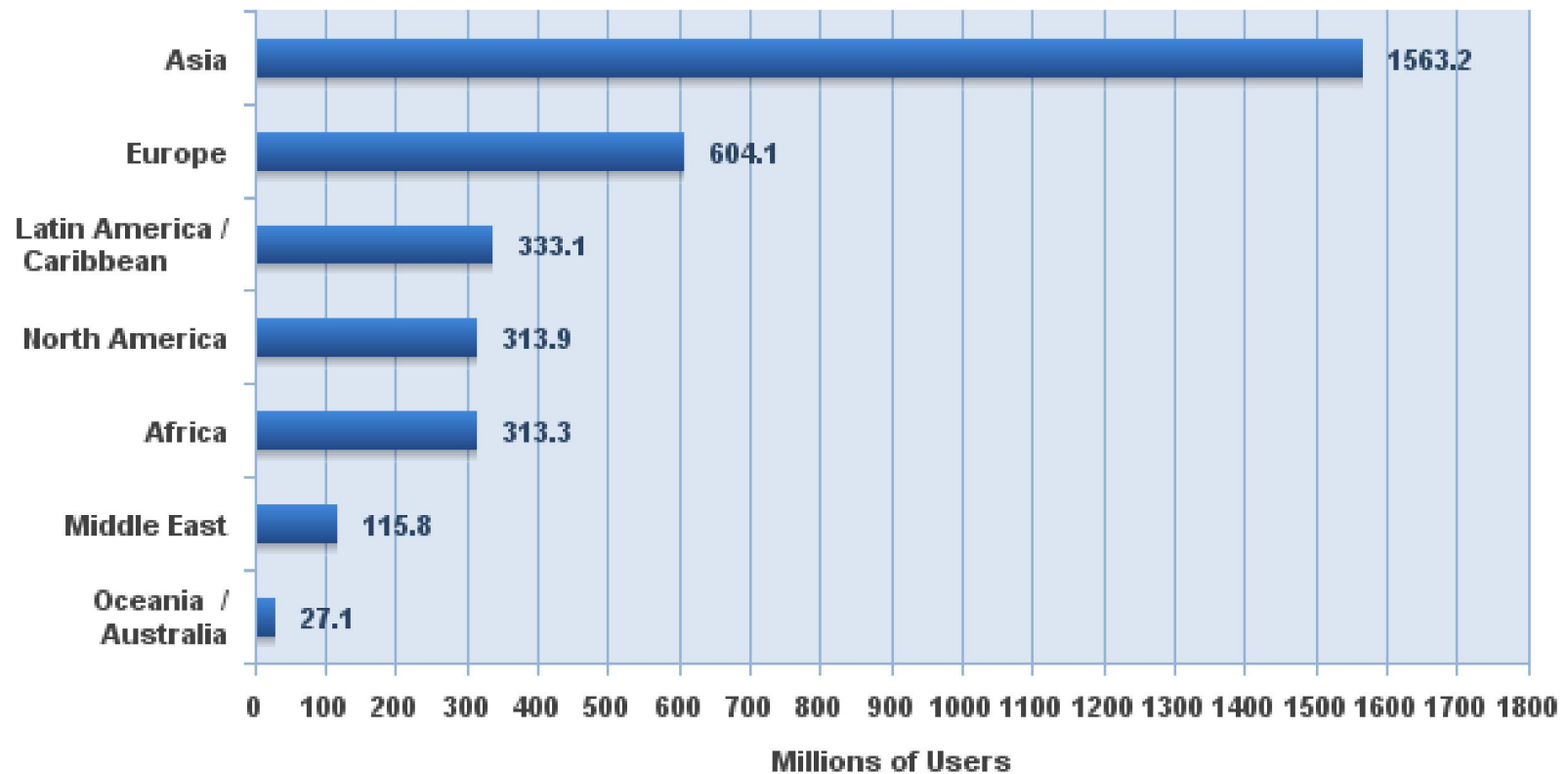
Estimated Internet users are 2,267,233,742 on December 31, 2011

Copyright © 2012, Miniwatts Marketing Group

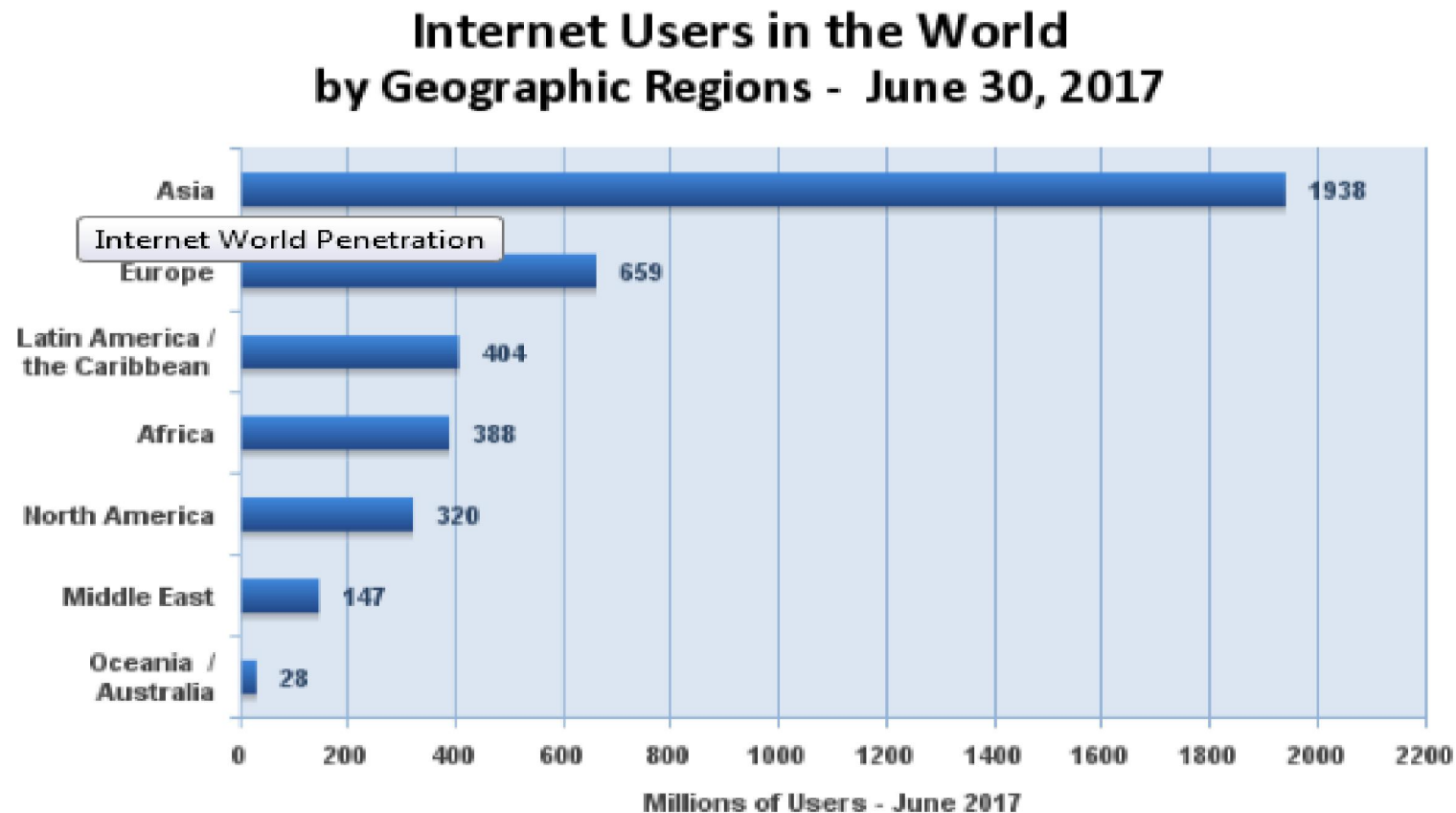


# Internet Users - 2015

**Internet Users in the World  
by Geographic Regions - 2015 Q2**



# Internet Users - 2017



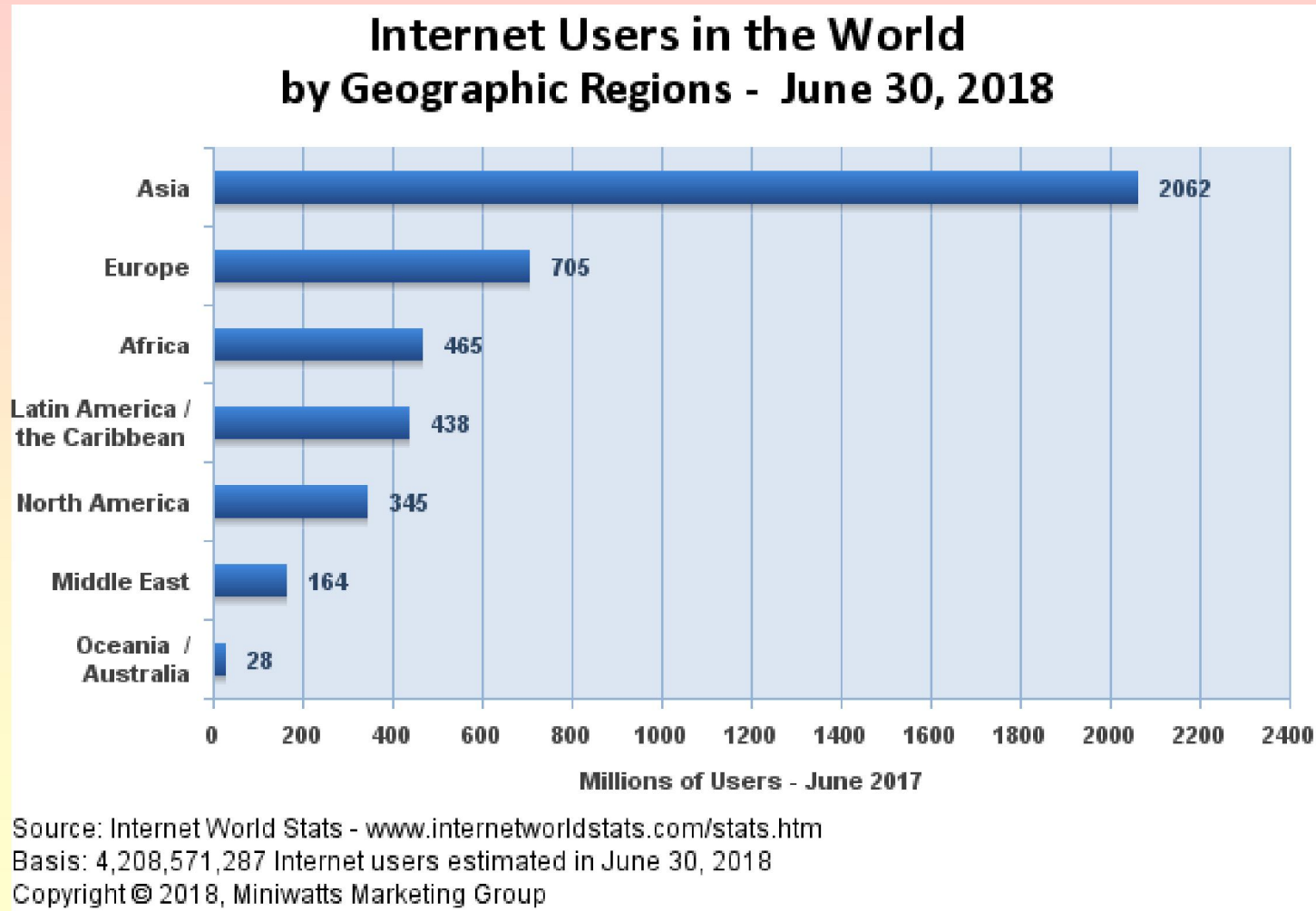
Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

Basis: 3,885,567,619 Internet users estimated in June 30, 2017

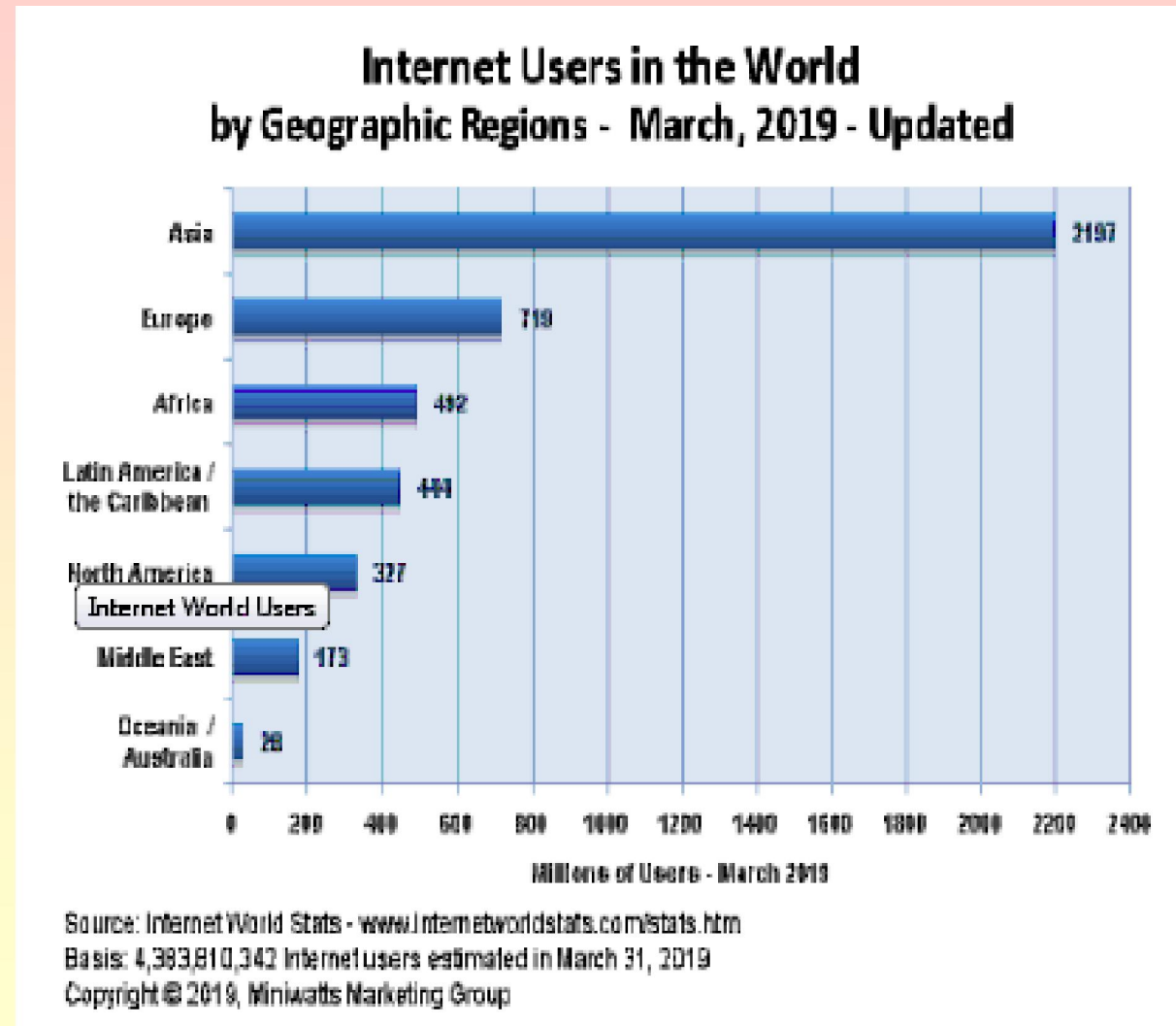
Copyright © 2017, Miniwatts Marketing Group



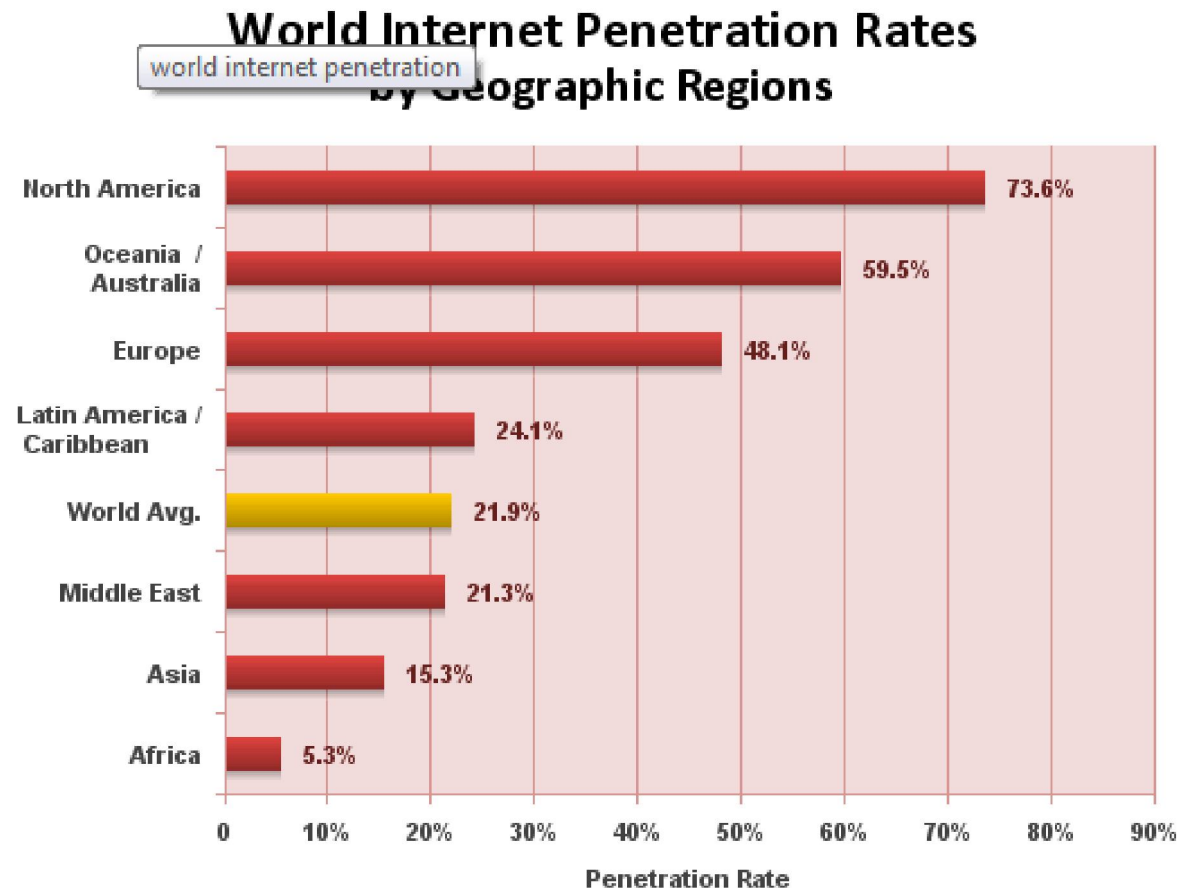
# Internet Users - 2018



# Internet Users - 2019



# Internet Penetration Rate - 2008

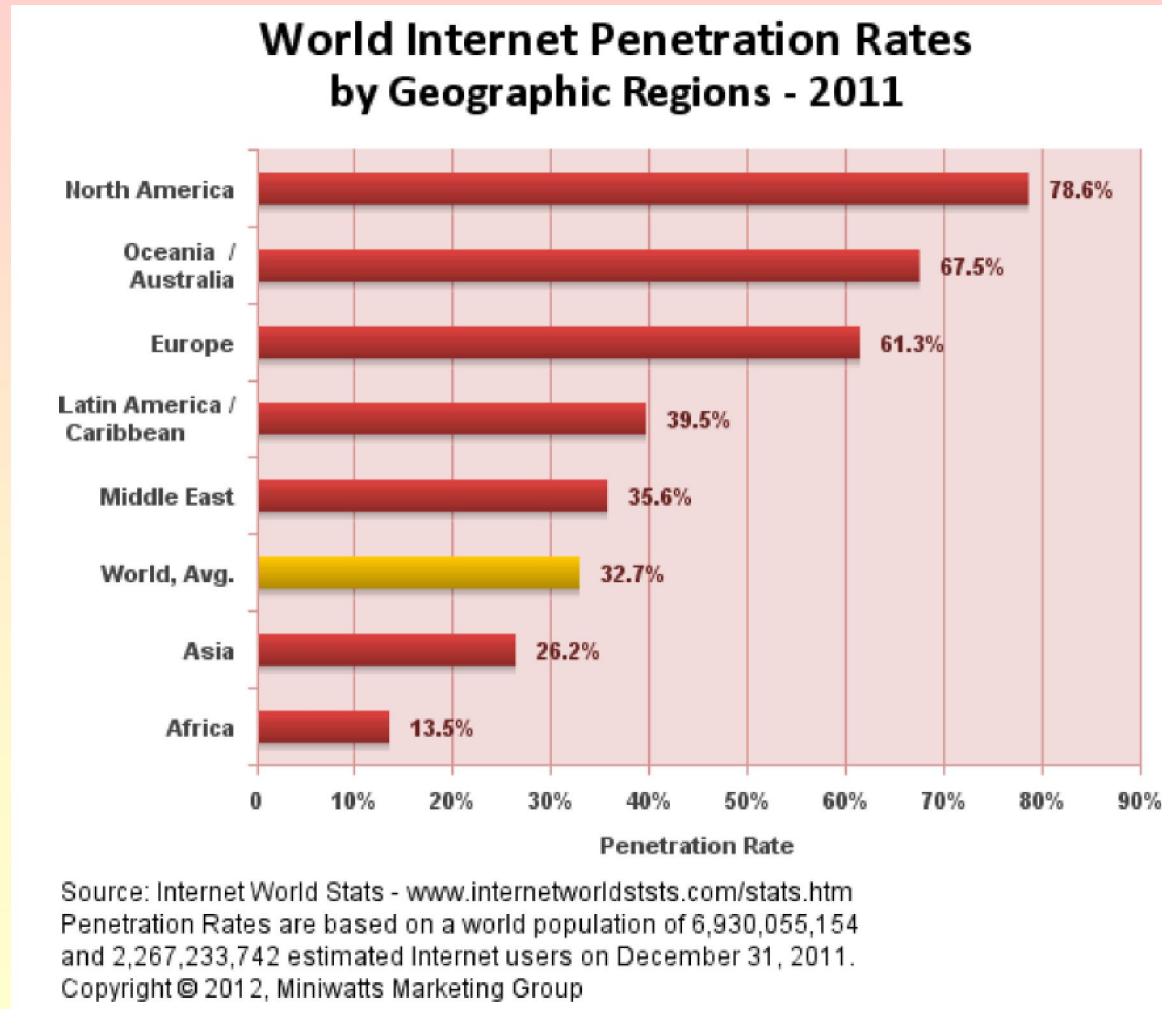


Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)  
Penetration Rates are based on a world population of 6,676,120,288 for mid-year 2008 and 1,463,632,361 estimated Internet users.  
Copyright © 2008, Miniwatts Marketing Group

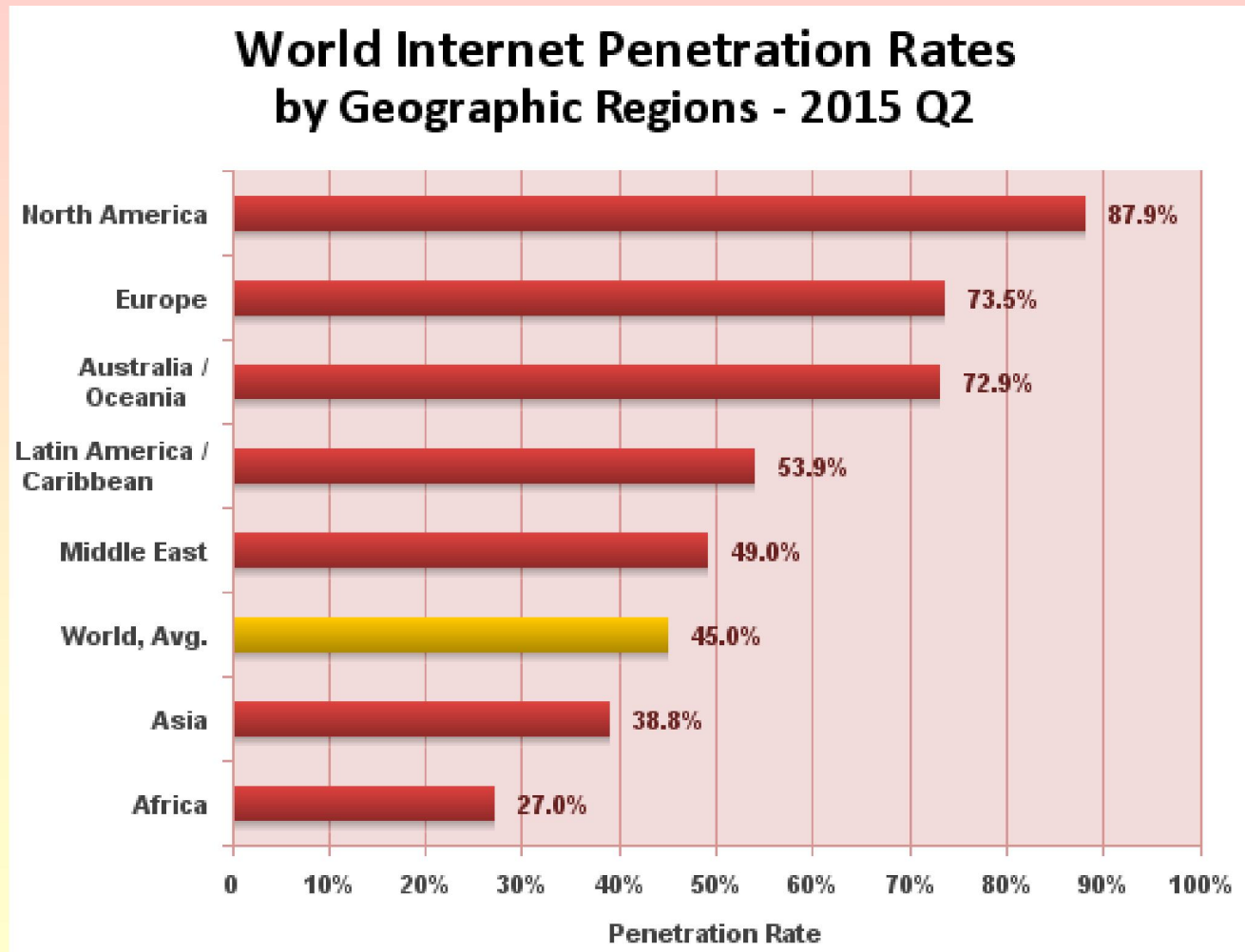




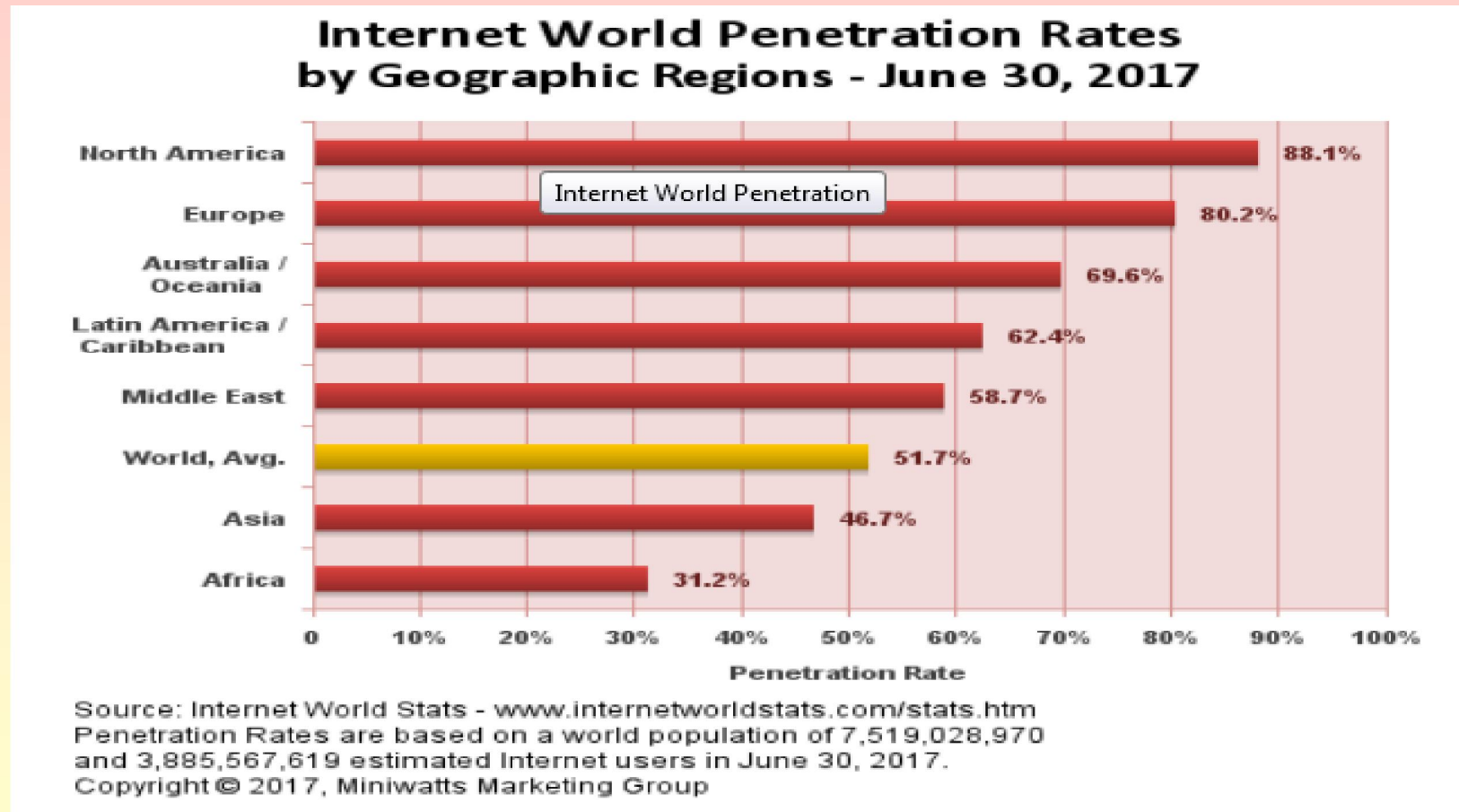
# Internet Penetration Rate - 2011



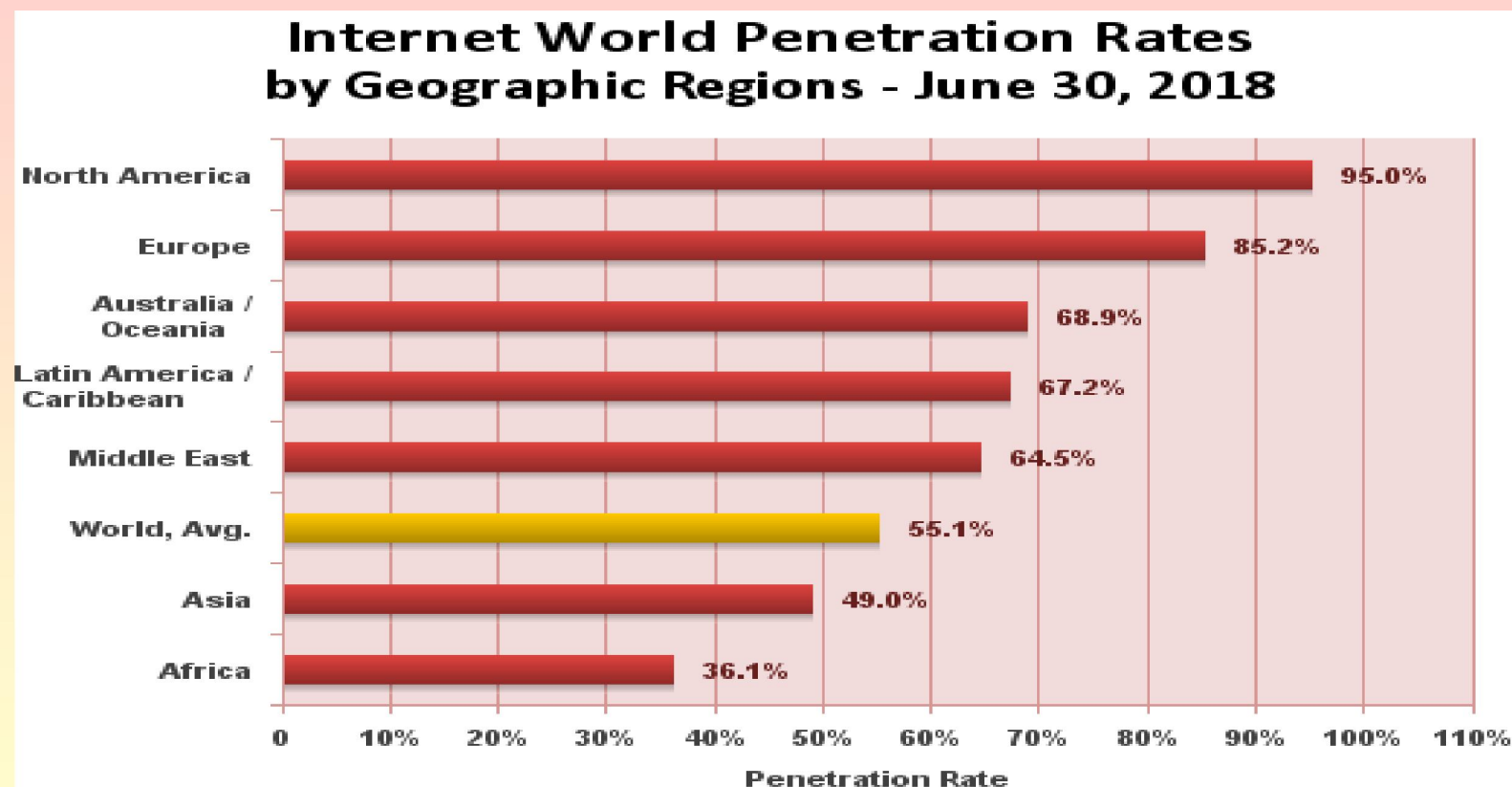
# Internet Penetration Rate - 2015



# Internet Penetration Rate - 2017



# Internet Penetration Rate - 2018

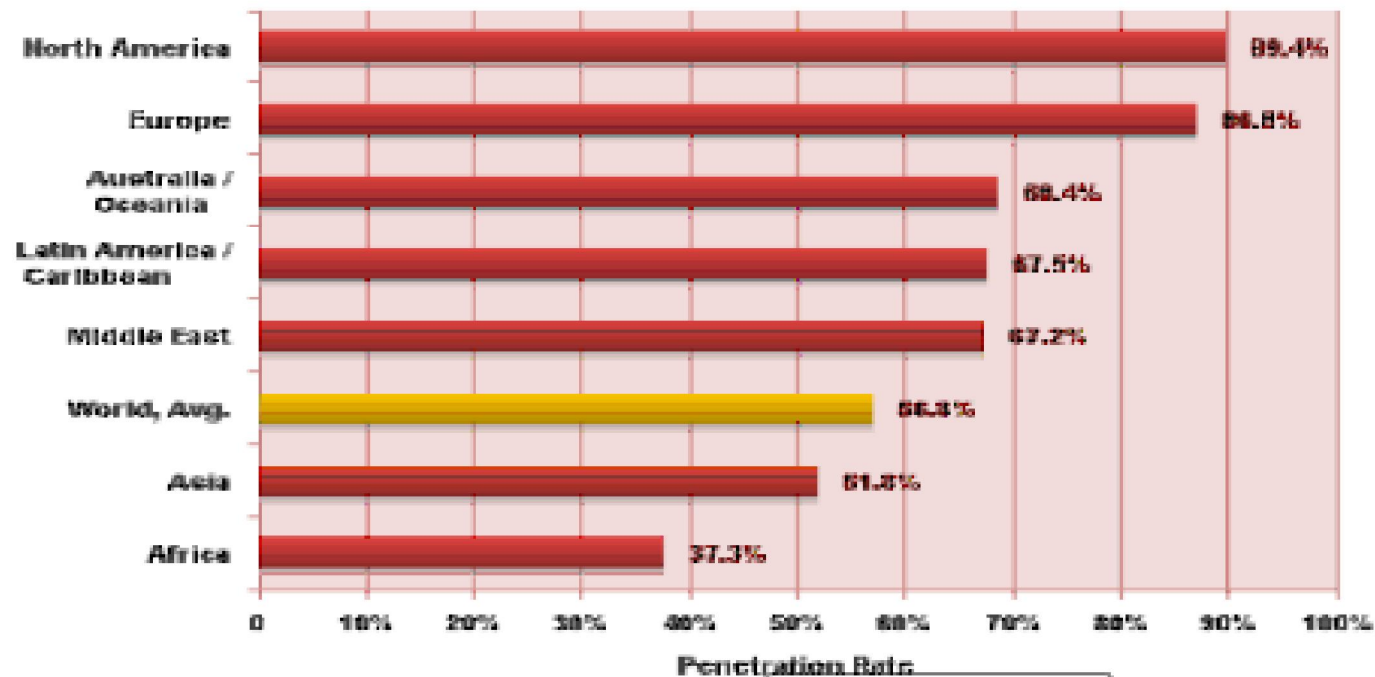


Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)  
Penetration Rates are based on a world population of 7,634,758,428  
and 4,208,571,287 estimated Internet users in June 30, 2018.  
Copyright © 2018, Miniwatts Marketing Group



# Internet Penetration Rate - 2019

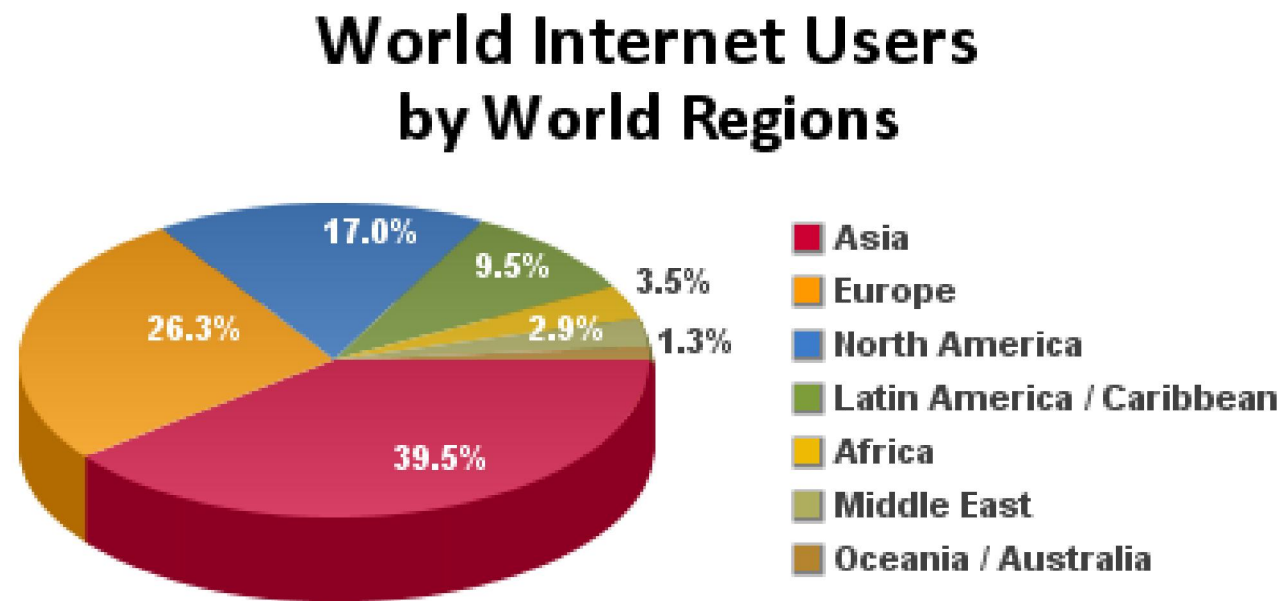
**Internet World Penetration Rates  
by Geographic Regions - March, 2019 - Updated**



Source: Internet World Stats - [www.internetworldstats.com](http://www.internetworldstats.com)  
Penetration Rates are based on a world population of 7,716,223,209 and 4,383,810,342 estimated Internet users in March 31, 2019.  
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# Internet user in the world - 2008

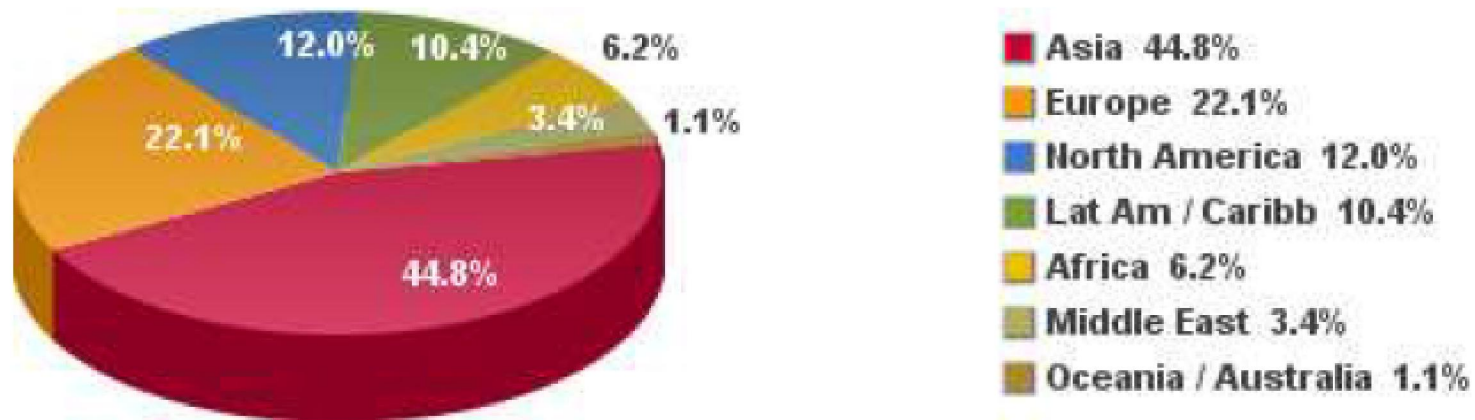


Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)  
1,463,632,361 Internet users for June 30, 2008  
Copyright © 2008, Miniwatts Marketing Group



# Internet user in the world - 2011

**Internet Users in the World  
Distribution by World Regions - 2011**



Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

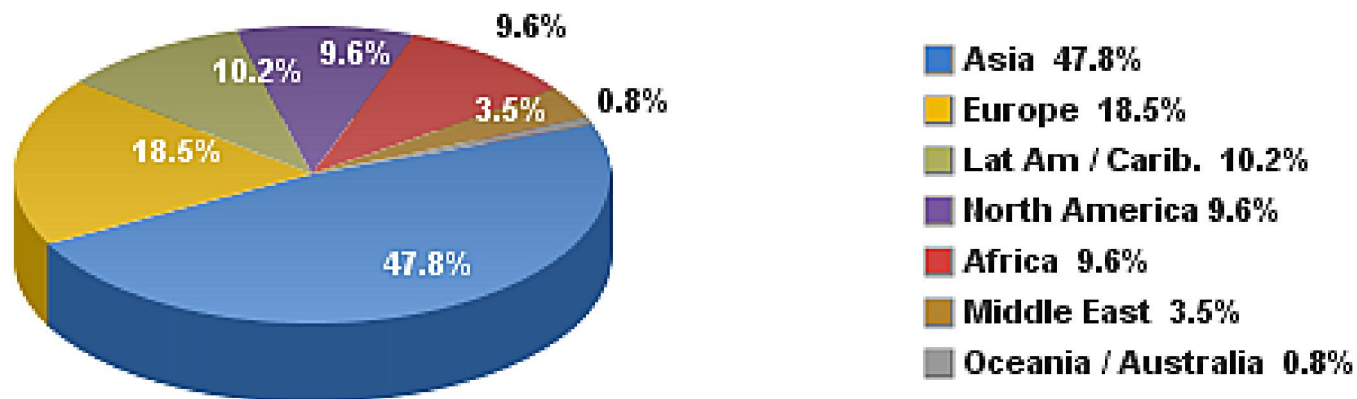
Basis: 2,267,233,742 Internet users on December 31, 2011

Copyright © 2012, Miniwatts Marketing Group



# Internet user in the world - 2015

**Internet Users in the World  
Distribution by World Regions - 2015 Q2**



Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

Basis: 3,270,490,584 Internet users on June 30, 2015

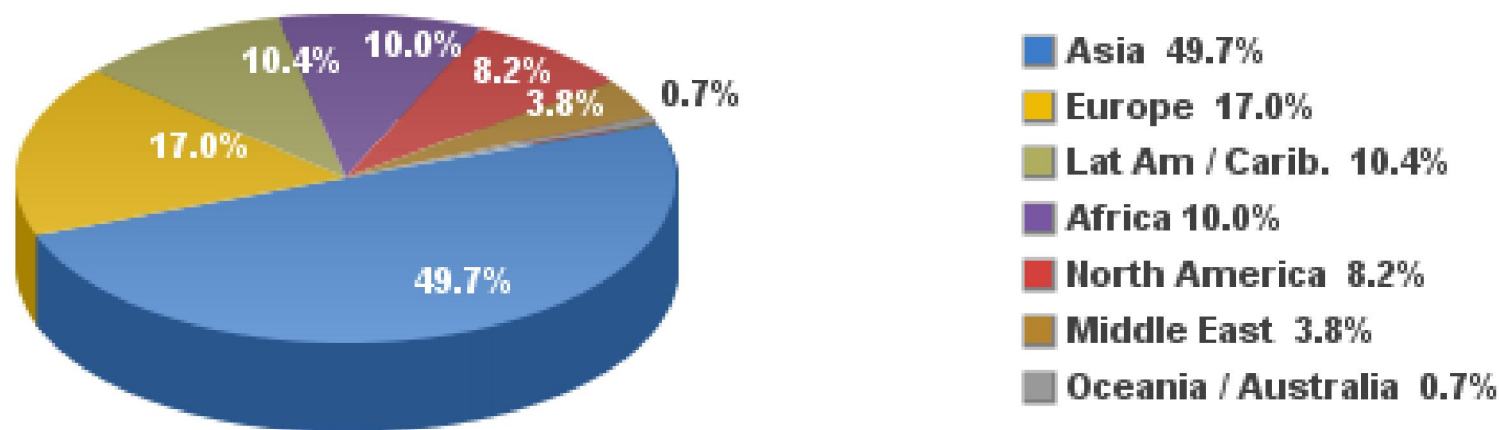
Copyright © 2015, Miniwatts Marketing Group





# Internet user in the world - 2017

## Internet Users in the World by Regions - June 30, 2017



Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

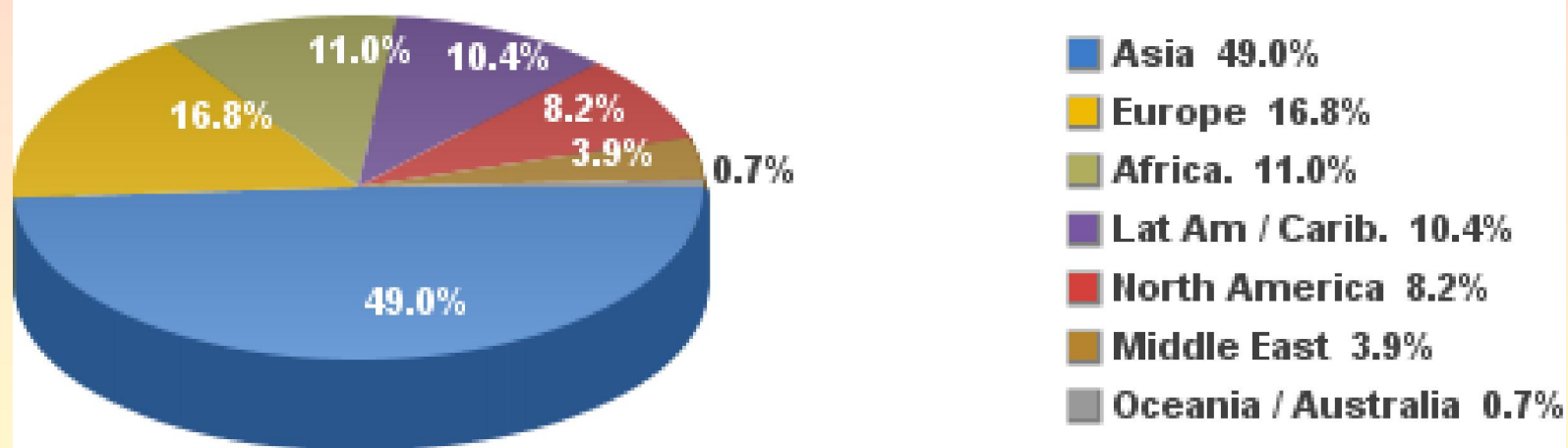
Basis: 3,885,567,619 Internet users in June 30, 2017

Copyright © 2017, Miniwatts Marketing Group



# Internet user in the world - 2018

**Internet Users in the World  
by Regions - June 30, 2018**



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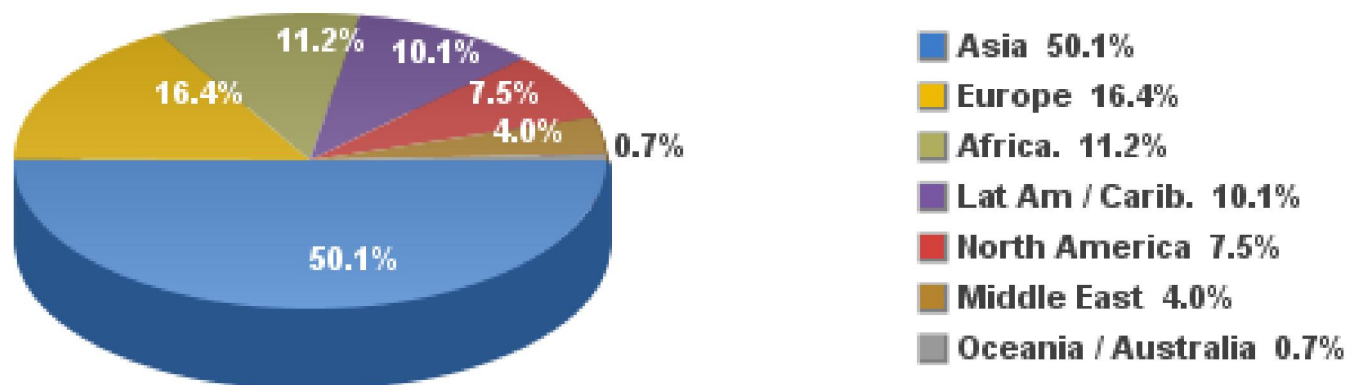
Basis: 4,208,571,287 Internet users in June 30, 2018

Copyright © 2018, Miniwatts Marketing Group



# Internet user in the world - 2019

**Internet Users in the World  
by Regions - March, 2019 - Updated**



Source: Internet World Stats - [www.internetworldstats.com/stats.htm](http://www.internetworldstats.com/stats.htm)

Basis: 4,383,810,342 Internet users in March 31, 2019

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# Internet evolution: Observations

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## ⇒ Negative Factor

- Relevant “Digital Divide”

## ⇒ Positive Factor

- Great Potential for Asia, Africa, Middle East, Latin America also due to the population
- Increase of Internet users



# Internet evolution: Observations

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- ⇒ Asia “penetration rate” slightly above 50%; number of Internet users well above 2 billions (50.1% Internet users in the world). This fact, associated to the huge increase in the period 2000-2019, 1822%, allows envisaging a key role for Asia in the future.
- ⇒ Africa “penetration rate” about 37% but an increase in the period 2000-2019 of 10815% , overall population well above 1 billion people



# Internet statistics (May 2019)

## WORLD INTERNET USAGE AND POPULATION STATISTICS MAY, 2019 - Updated

World Regions	Population ( 2019 Est.)	Population % of World	Internet Users 31 Mar 2019	Penetration Rate (% Pop.)	Growth 2000-2019	Internet Users %
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<u><a href="#">Asia</a></u>	4,241,972,790	55.0 %	2,197,444,783	51.8 %	1,822 %	50.1 %
<u><a href="#">Europe</a></u>	829,173,007	10.7 %	719,365,521	86.8 %	584 %	16.4 %
<u><a href="#">Latin America / Caribbean</a></u>	658,345,826	8.5 %	444,493,379	67.5 %	2,360 %	10.1 %
<u><a href="#">Middle East</a></u>	258,356,867	3.3 %	173,542,069	67.2 %	5,183 %	4.0 %
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# “Digital divide”: Motivations

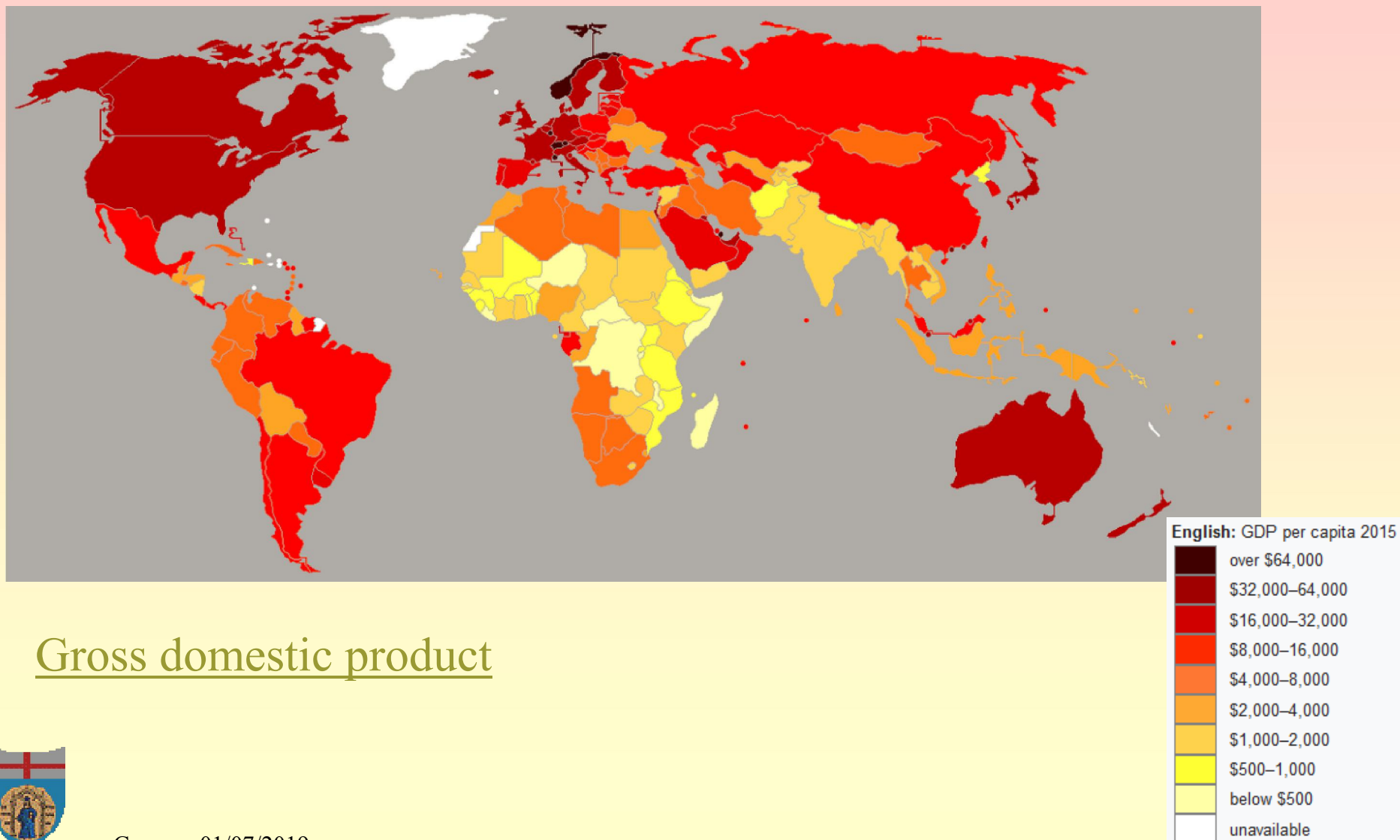
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- ⇒ Temporal (having time to use digital media)
- ⇒ Material (possession and income)
- ⇒ Mental (technical ability and motivation)
- ⇒ Social (having a social network to assist in using digital media),
- ⇒ Cultural (status and liking of being in the world of digital media)



J. van Dijk, The Evolution of the Digital Divide, Digital Enlightenment Yearbook 2012, J. Bus et al. (Eds.), IOS Press, 2012

# “Digital divide”: Motivations



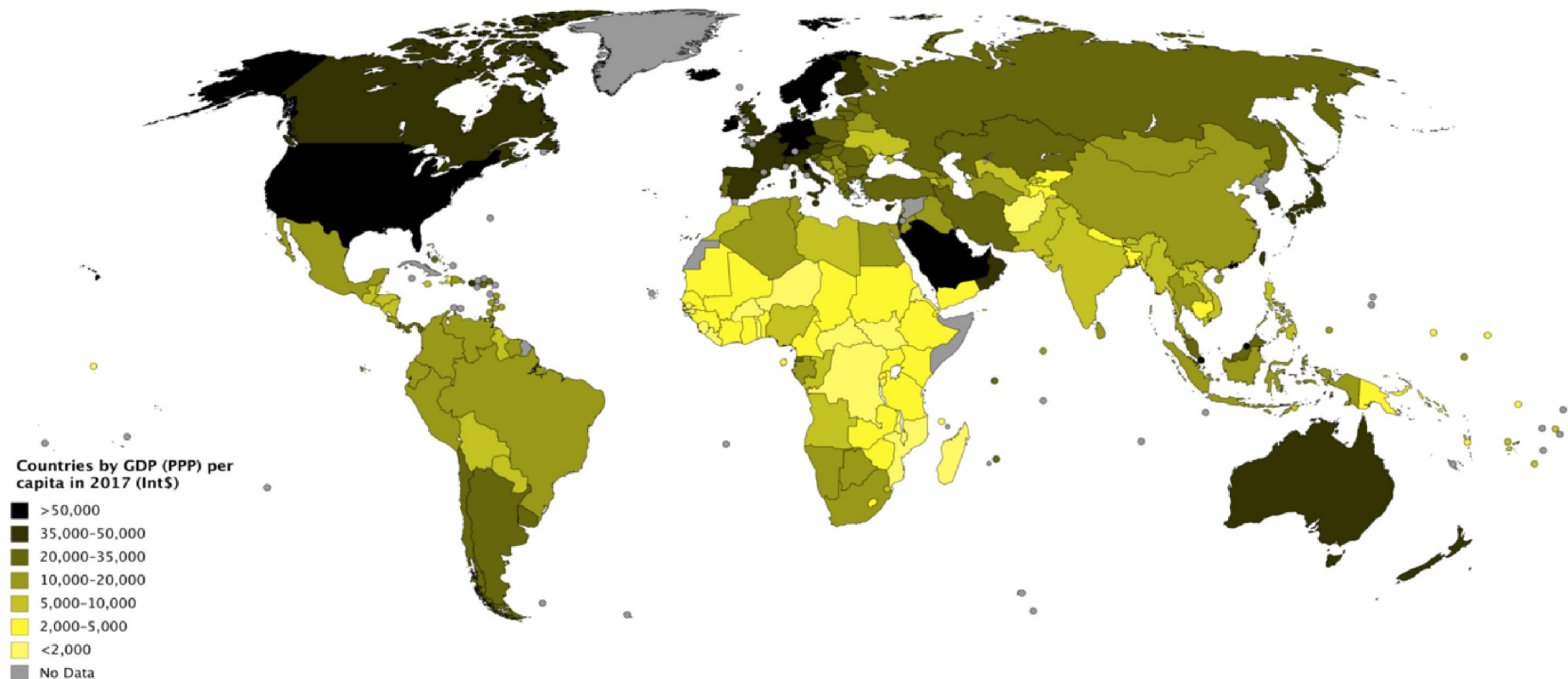
Gross domestic product



Genova, 01/07/2019



# “Digital divide”: Motivations



Genova, 01/07/2019

Gross domestic product (PPP) - Purchasing power parity (PPP) is a way of measuring economic variables in different countries so that irrelevant exchange rate variations do not distort comparisons.

# “Digital divide”: Motivations

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## ⇒ Lack of TLC infrastructures

- “One of the reasons is that a large amount of people lives in countries or in remote areas which do not have a suitable telecommunication infrastructure.”



# “Digital divide”: Motivations

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- ⇒ The costs needed to connect these areas by using cables and common infrastructures are very high, in particular if compared with economic benefits.
- ⇒ Satellite communications constitute a strategic sector for service provision in remote and low density population areas.
- ⇒ The challenge is if satellite technology can fill the digital divide at service cost, reliability and quality comparable to terrestrial solutions.
- ⇒ Current satellite technologies require high costs in the construction, launch and maintenance but **nanosatellites** have been recently proposed as a cost-effective solution to extend the network access in rural and remote areas.



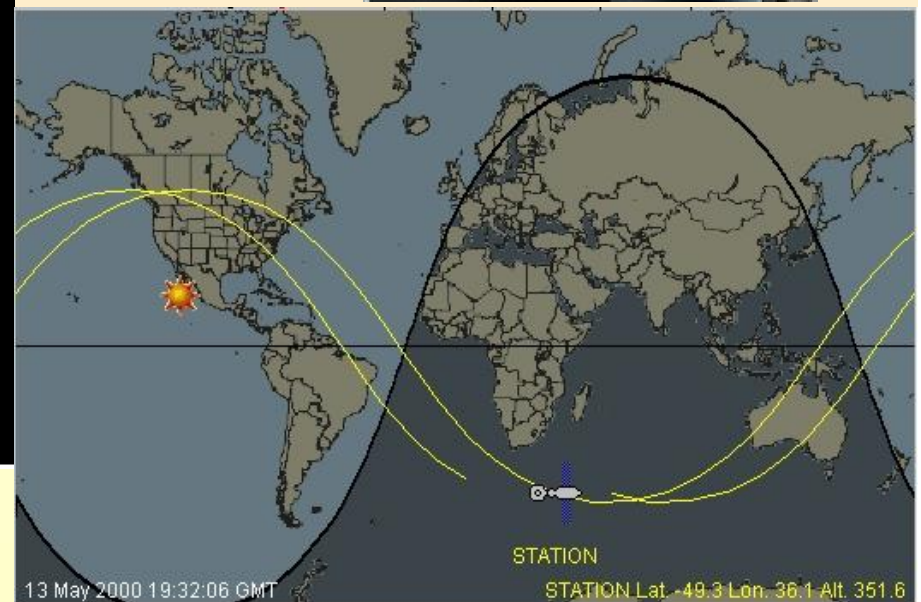
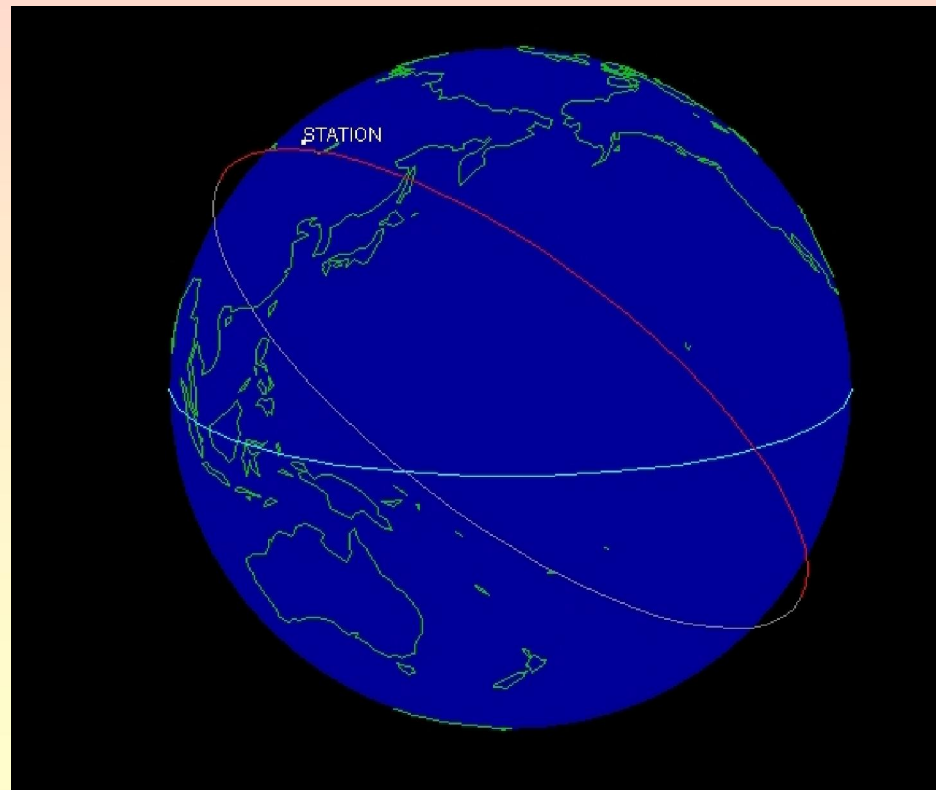
S. Burleigh, "Nanosatellites for universal network access." Proceedings of the 2013 ACM MobiCom Workshop on Lowest Cost Denominator Networking for Universal Access (LCDNet 2013), Miami, FL, USA, September, 2013.

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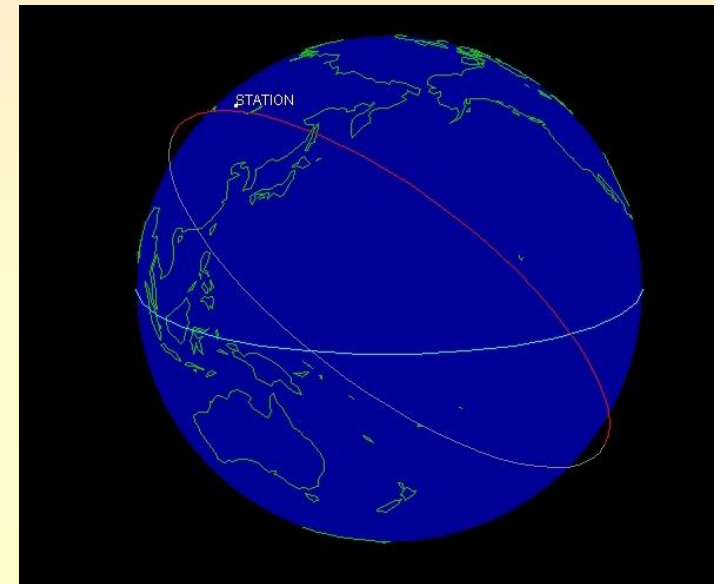
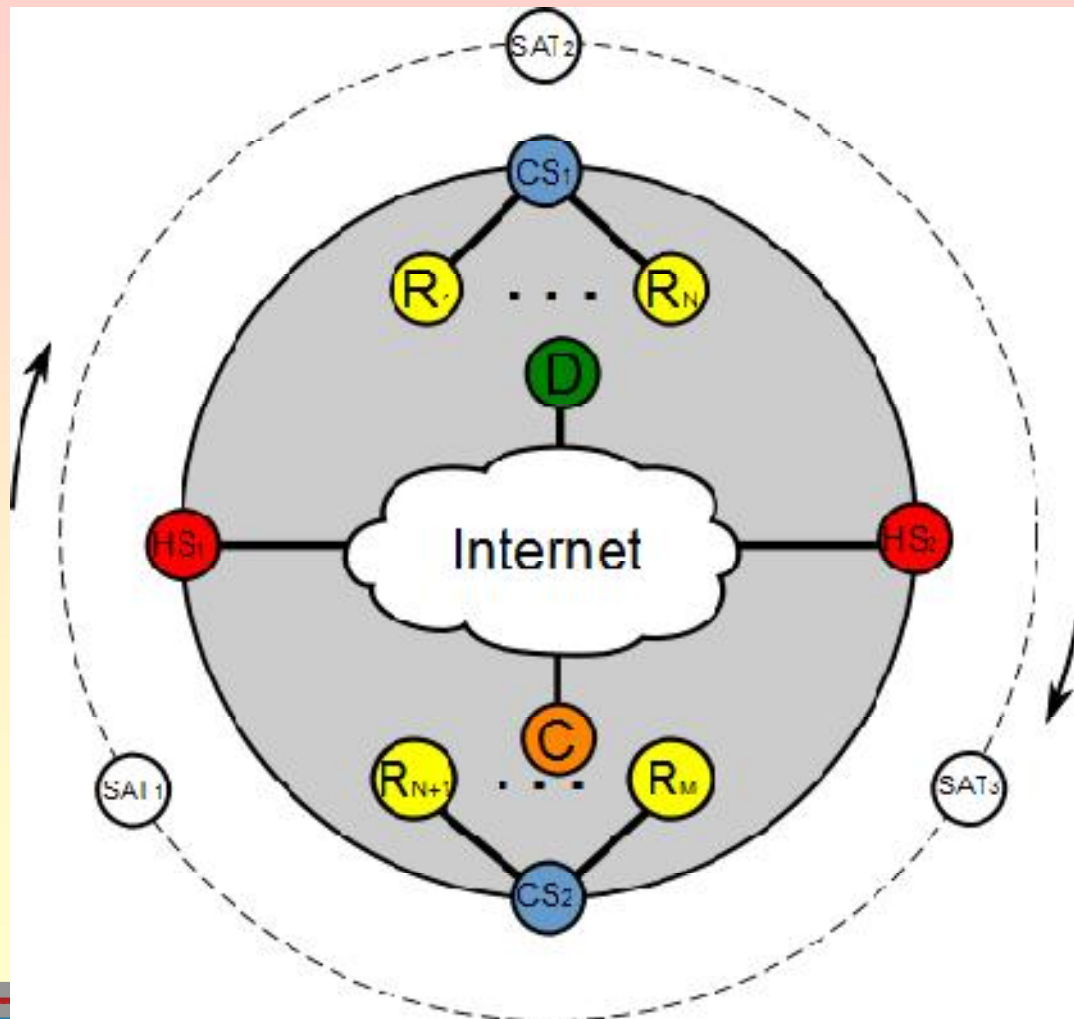
# Nanosatellites

⇒ 1-10 Kg, constellations, swarms

⇒ altitude: 370 km, speed: 7.37 km/s, period: 90 min/giro



# Nanosatellites



# UAV – Unmanned Aerial Vehicle

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Humanitarian UAV Missions: Nepal, Haiti, Dominican Republic



Genova, 01/07/2019



# Interconnection benefits

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- ⇒ The economics of computer acquisition and utilization shows that computers are maximally used when systematically networked to each other, accessories, and communication facilities.
- ⇒ The interconnection of computers, accessories, and other equipment offers enormous benefits to dispersed and disorganized use.
- ⇒ It can be shown that connecting even two computers makes at least economic sense.



# Interconnection benefits

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- ⇒ A network enables us to share expensive printers, computers, Internet and other communication links, and costly application and utility software.
- ⇒ A network also supports voice/video/fax/data communications and sharing of valuable information, hence facilitating and supplementing office/factory automation, electronic learning/commerce, teleworking, and telemedicine.
- ⇒ Thus, a network significantly reduces wastage of paper, work time, and many other perishables/consumables.





# Interconnection benefits

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- ⇒ More compelling, a network stretches the life cycle of computer and accessories by enabling sharing of computational resources of powerful but outdated computers. For example, a computer that may need to be replaced after five years can now be operated for more years by using the processor and memory of new computers through time pipelining hardware and/or software such as terminal servers.

*IEEE Global Communications Newsletter,  
Computer Communications in Developing Countries  
By Atli L. Gebretsadik, Ethiopia*





# Mobile phone penetration rate 2018

Rank	Total Population	Online Population	Smartphone Penetration	Smartphone Users
1	<u>United Arab Emirates</u>	9,543,000	82.2%	7,845,000
2	<u>Sweden</u>	9,987,000	74.0%	7,391,000
3	<u>Switzerland</u>	8,524,000	73.5%	6,268,000
4	<u>South Korea</u>	50,897,000	72.9%	37,114,000
5	<u>Taiwan</u>	23,611,000	72.2%	17,050,000
6	<u>Canada</u>	36,958,000	71.8%	26,531,000
7	<u>United States</u>	328,836,000	71.5%	235,156,000
8	<u>Netherlands</u>	17,085,000	71.0%	12,129,000
9	<u>Germany</u>	80,561,000	71.0%	57,200,000
10	<u>United Kingdom</u>	65,913,000	70.8%	46,639,000



# Mobile phone penetration rate 2018

11	<u>Belgium</u>	11,513,000	69.7%	8,020,000
12	<u>Spain</u>	46,117,000	69.5%	32,069,000
13	<u>Australia</u>	24,967,000	69.3%	17,292,000
14	<u>Azerbaijan</u>	10,070,000	69.1%	6,961,000
15	<u>Italy</u>	59,788,000	68.5%	40,938,000
16	<u>Saudi Arabia</u>	33,300,000	68.3%	22,748,000
17	<u>Portugal</u>	10,229,000	68.0%	6,954,000
18	<u>France</u>	65,206,000	67.8%	44,225,000
19	<u>Czech Republic</u>	10,563,000	67.3%	7,106,000
20	<u>Poland</u>	38,523,000	66.5%	25,635,000

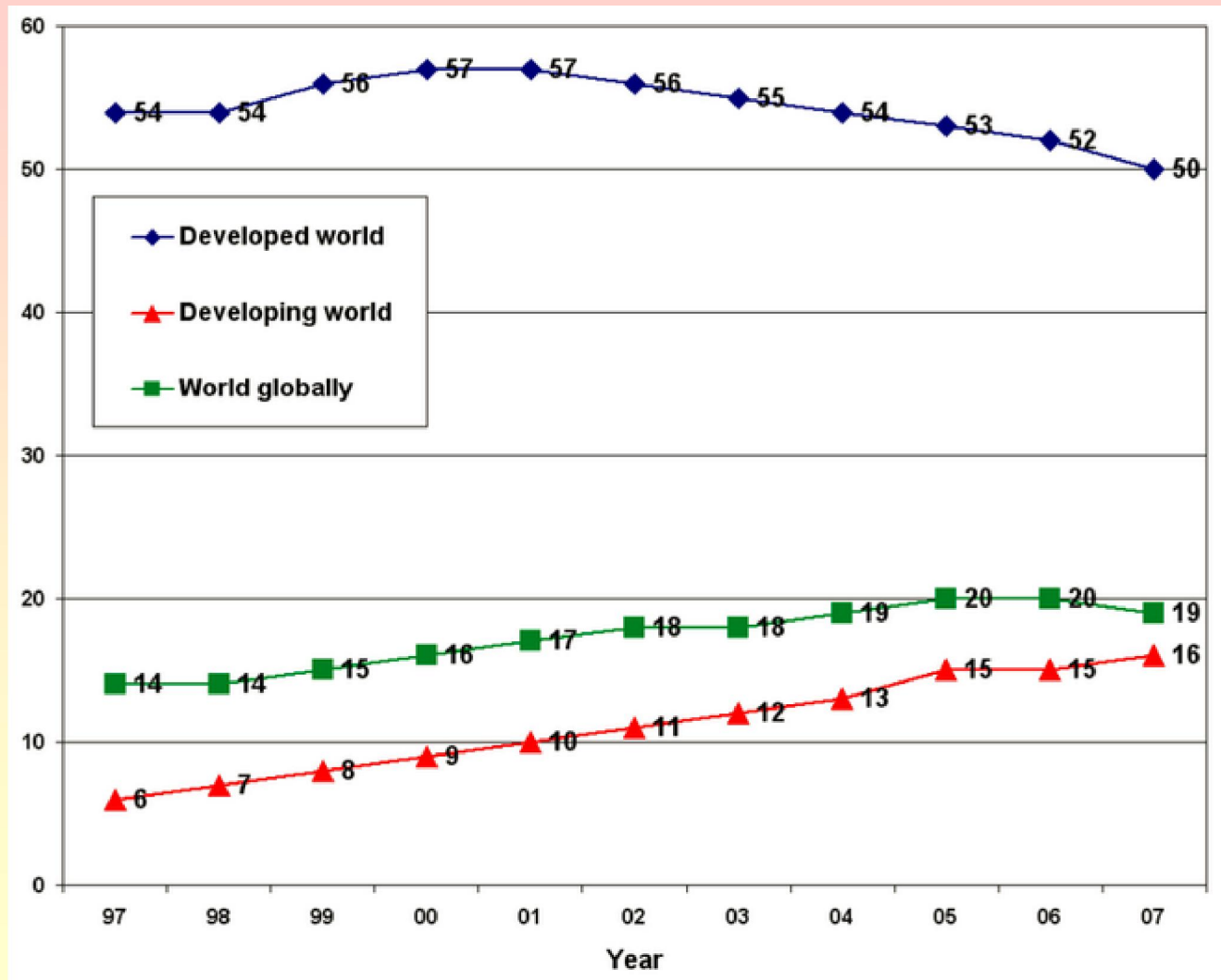


# Mobile phone penetration rate 2018

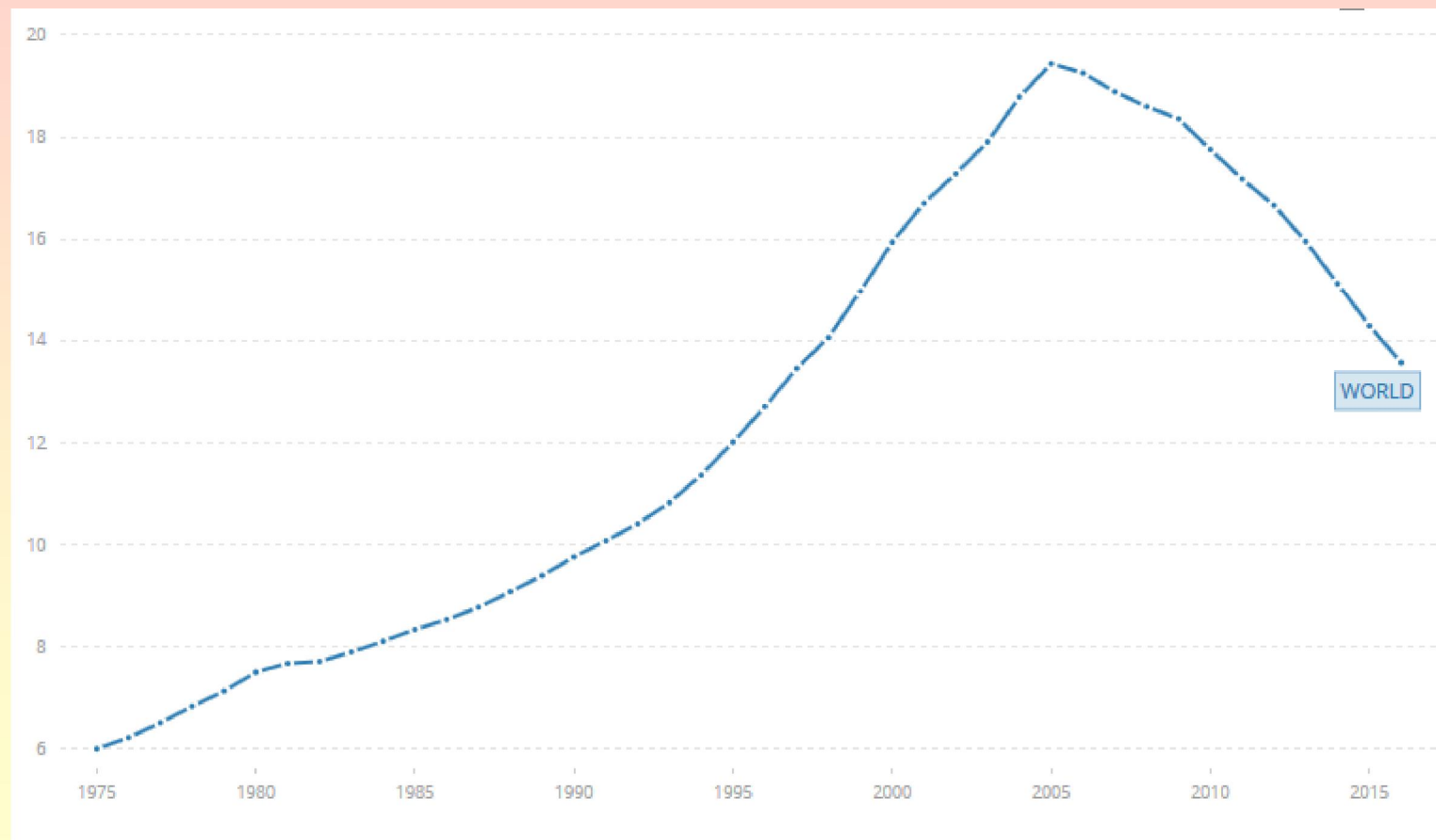
40	<a href="#"><u>Algeria</u></a>	41,730,000	38.1%	15,887,000
41	<a href="#"><u>Egypt</u></a>	97,007,000	36.7%	35,622,000
42	<a href="#"><u>Vietnam</u></a>	96,357,000	30.1%	29,043,000
43	<a href="#"><u>Ukraine</u></a>	44,170,000	28.6%	12,649,000
44	<a href="#"><u>India</u></a>	1,358,138,000	28.5%	386,934,000
45	<a href="#"><u>Philippines</u></a>	105,341,000	27.2%	28,627,000
46	<a href="#"><u>Indonesia</u></a>	266,357,000	25.4%	67,570,000
47	<a href="#"><u>Iran</u></a>	39,751,000	24.2%	9,627,000
48	<a href="#"><u>Nigeria</u></a>	196,753,000	18.5%	36,445,000
49	<a href="#"><u>Pakistan</u></a>	200,663,000	11.6%	23,228,000
50	<a href="#"><u>Bangladesh</u></a>	166,735,000	5.4%	8,921,000



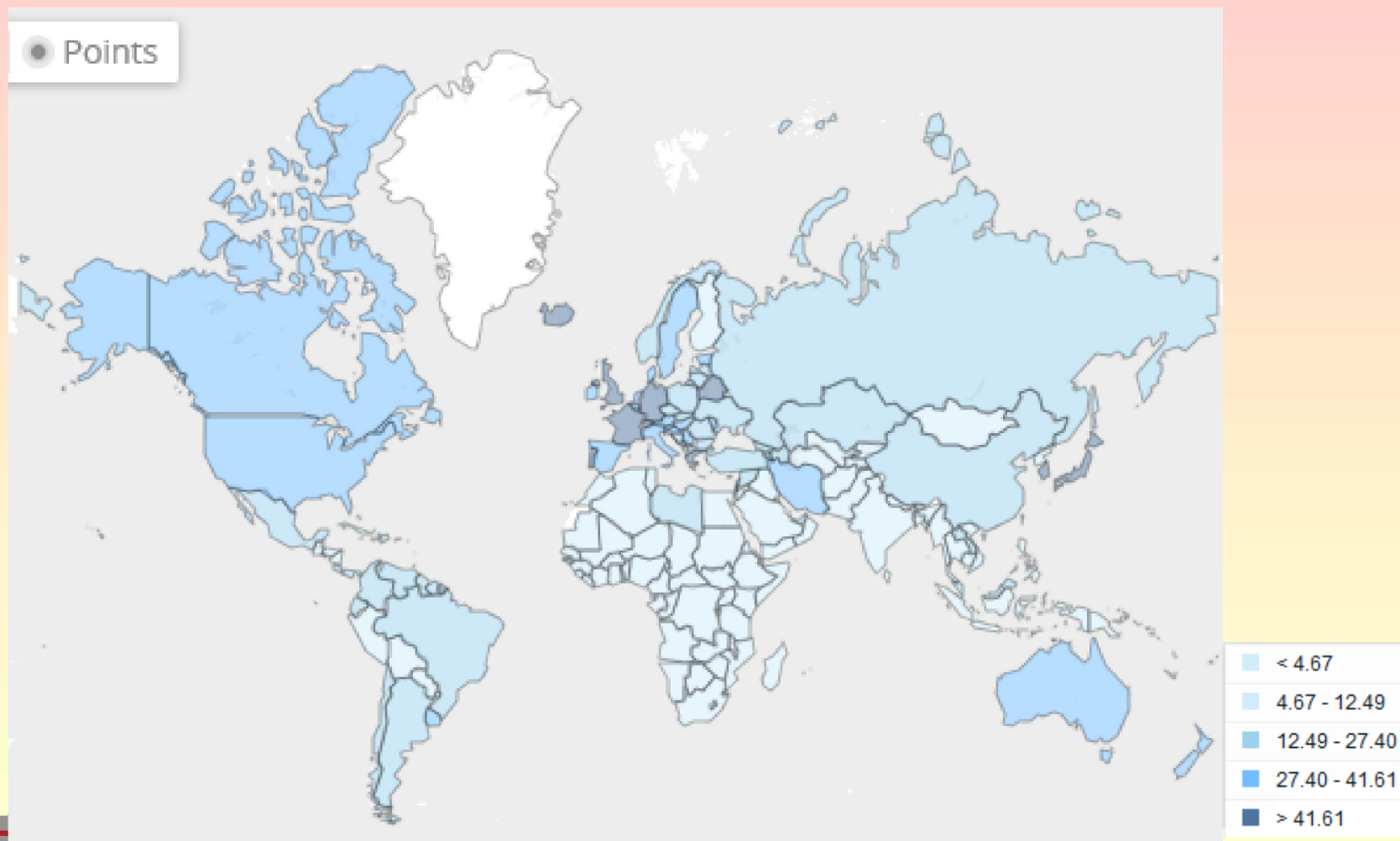
# Fixed phones: 1997-2007 (ITU)



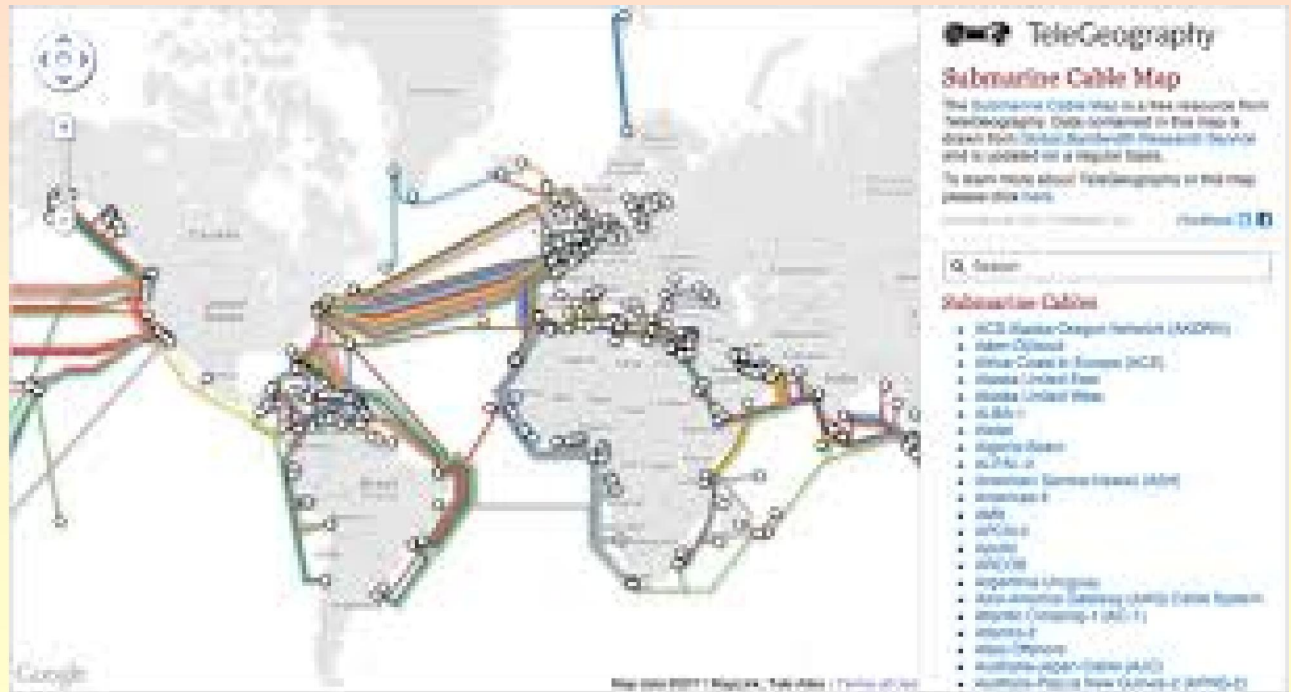
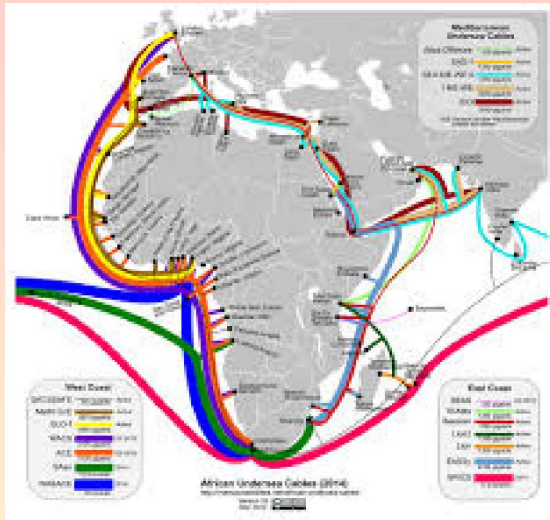
# Fixed phones: 1975-2016 (World Bank)



# Fixed phones 2016 (World Bank)



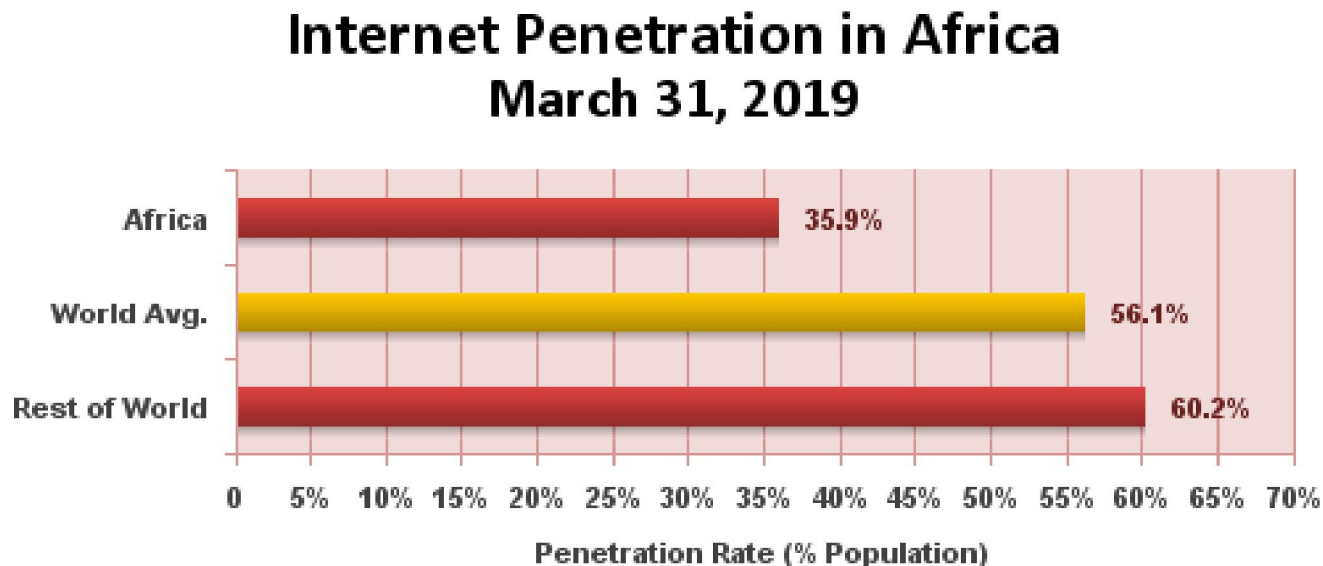
# Case Study: Africa – submarine cables



Genova, 01/07/2019



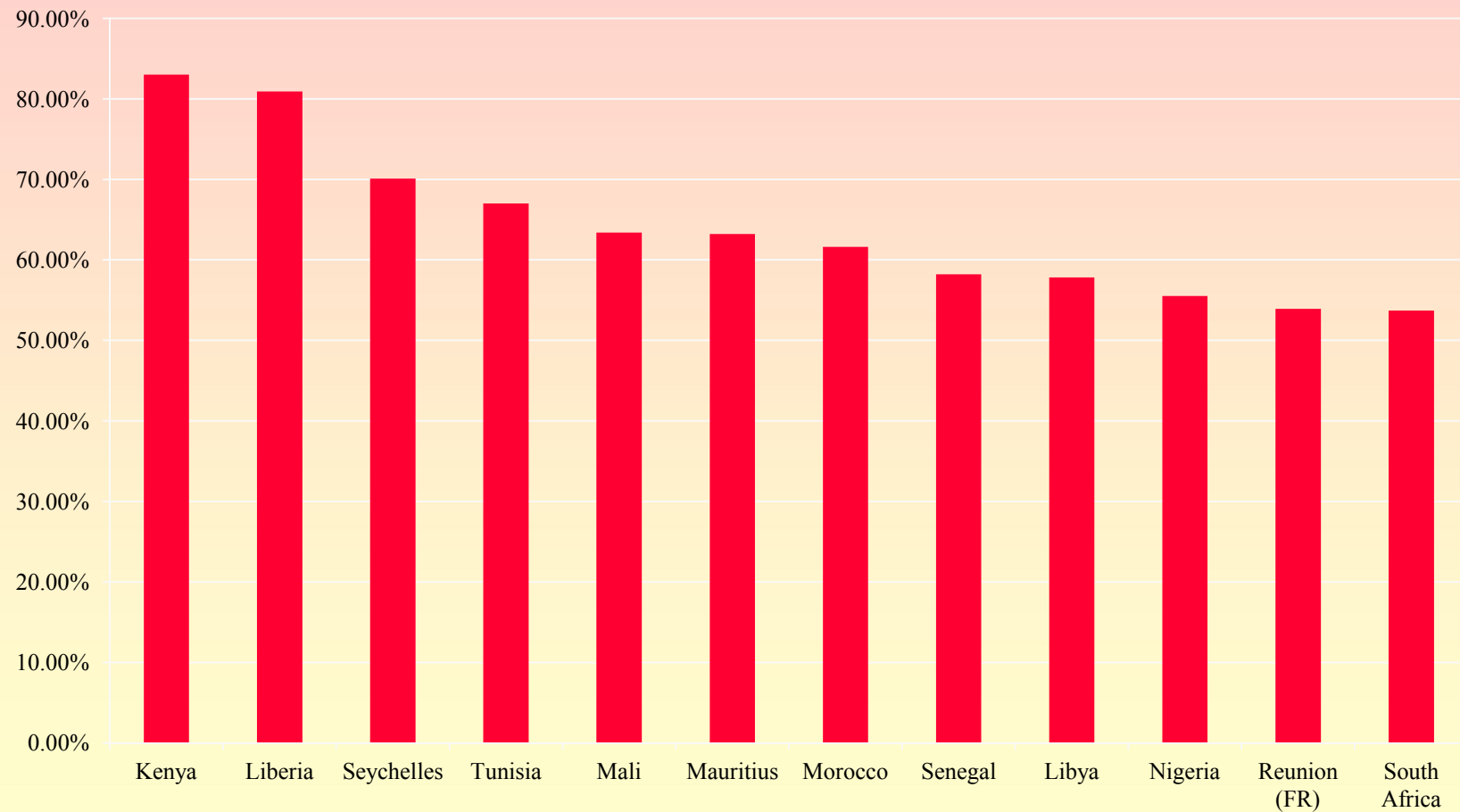
# Case Study: Africa (March 2019)



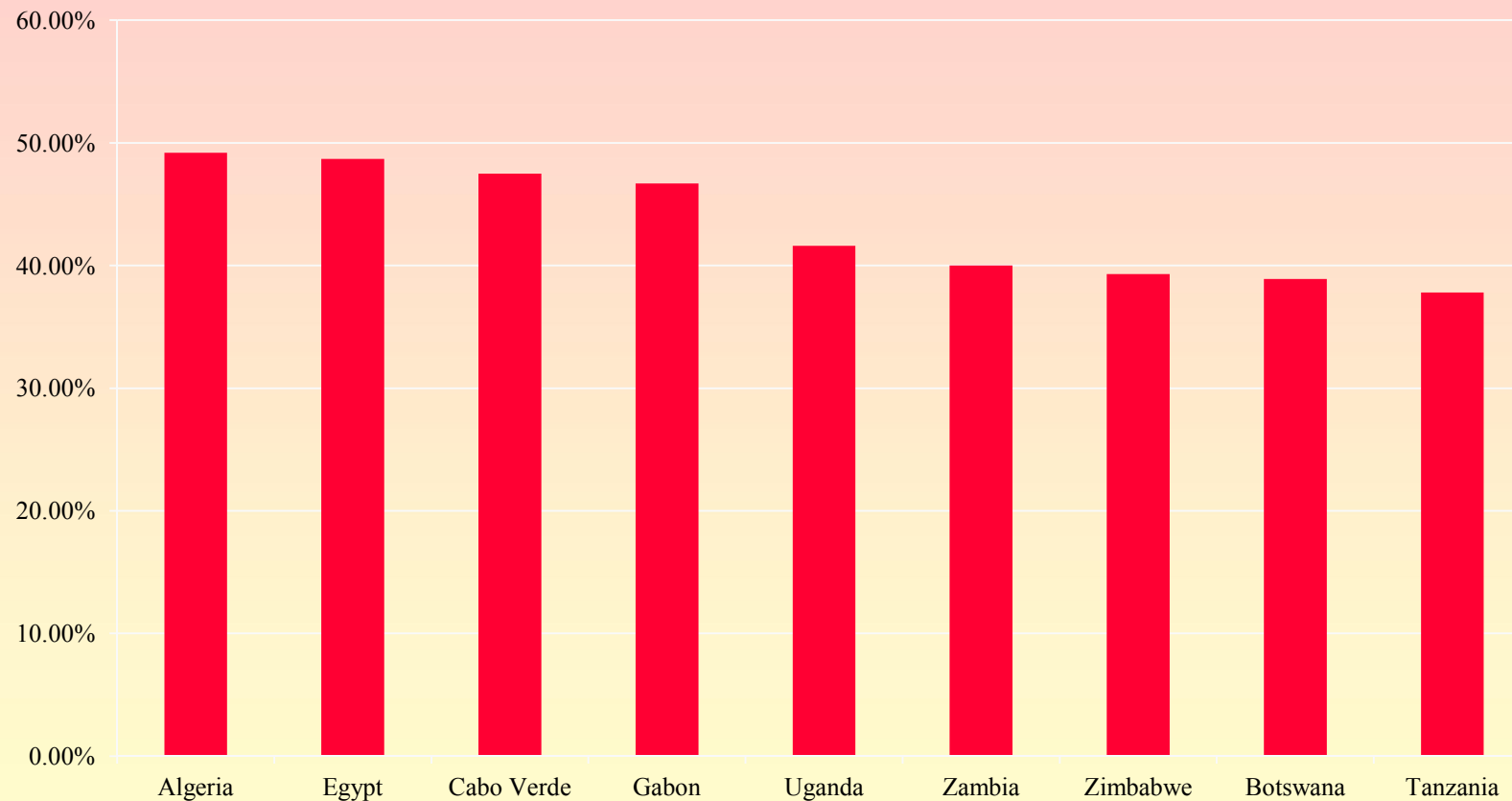
Source: Internet World Stats - [www.internetworldstats.com/stats1.htm](http://www.internetworldstats.com/stats1.htm)  
474,120,563 estimated Internet users in Africa in March 31, 2019 and  
4,346,561,853 Internet users in all the World in March 31, 2019  
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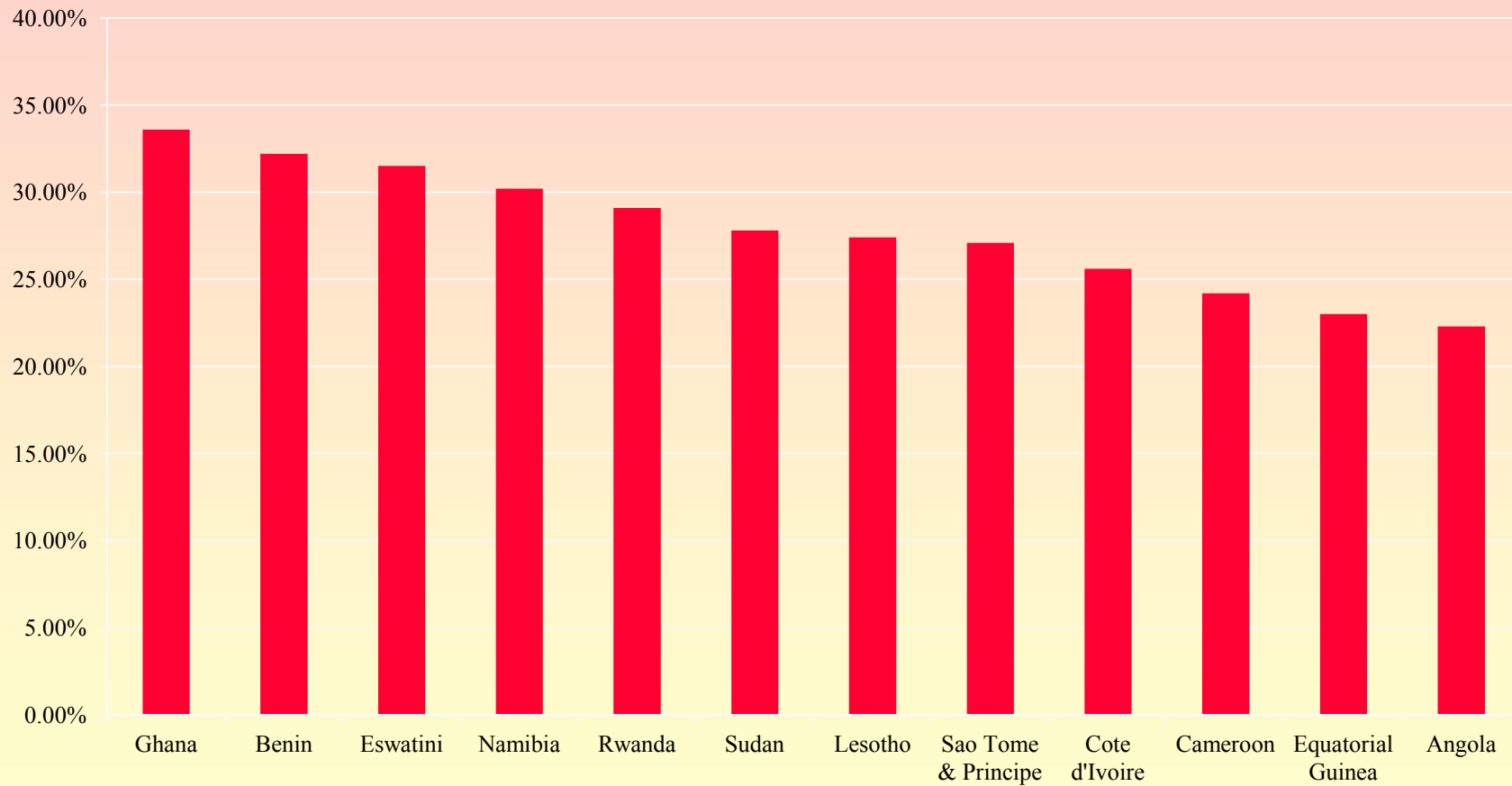
# Case studies: Penetration Rate, March 2019, Africa



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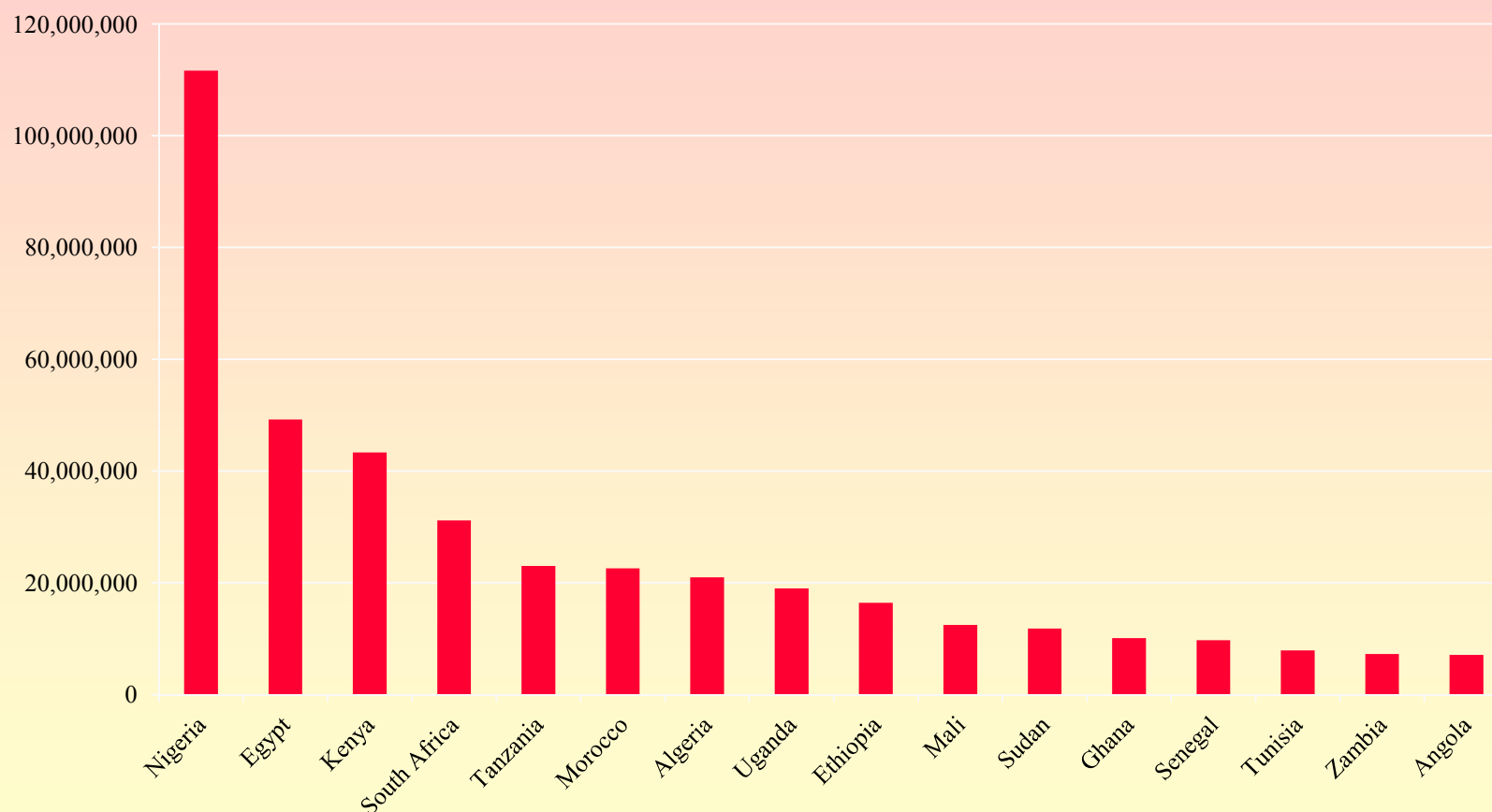


# Case studies: Penetration Rate, March 2019, Africa

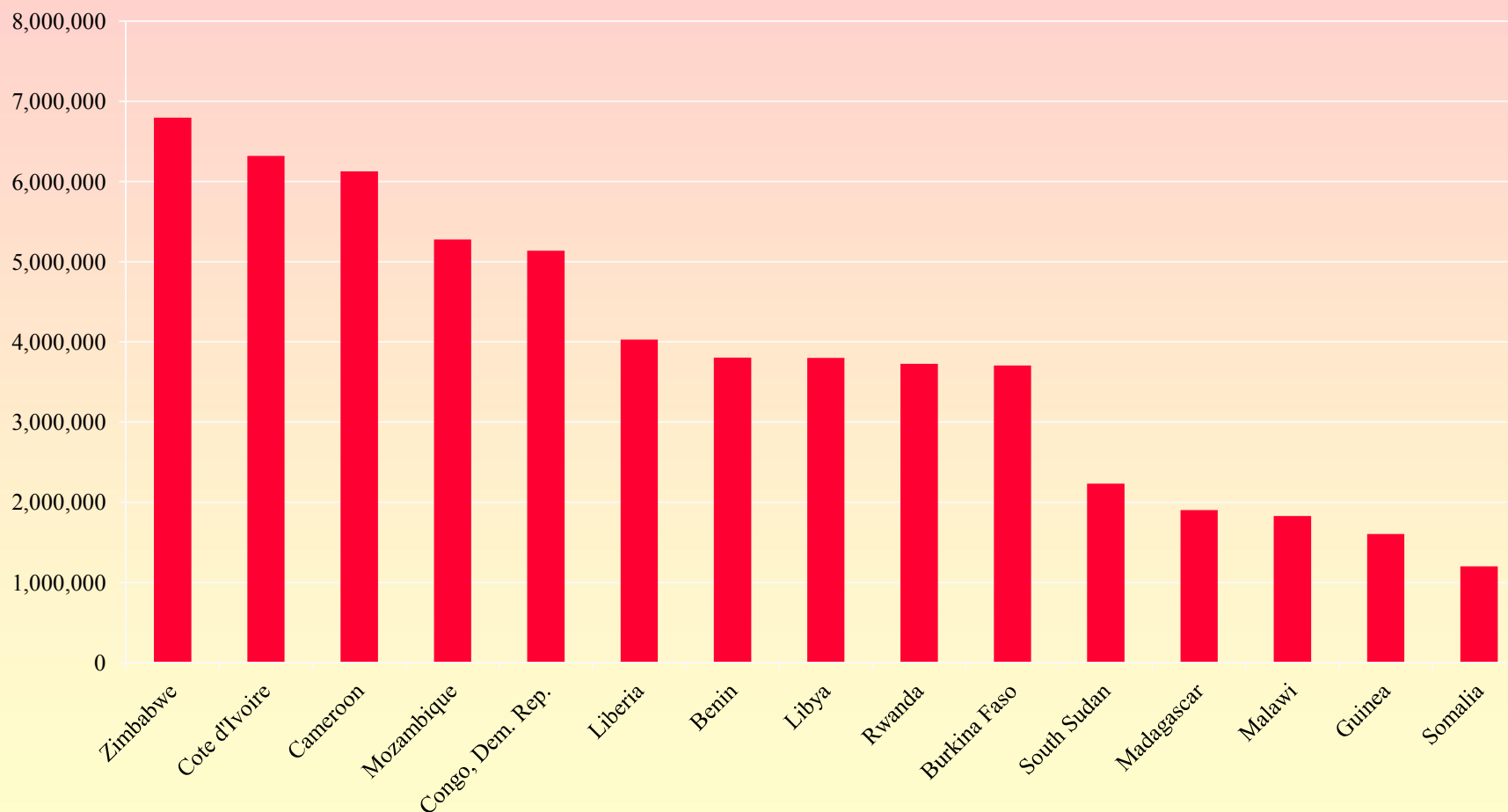


Genova, 01/07/2019

# Case studies: Internet Users, March 2019, Africa

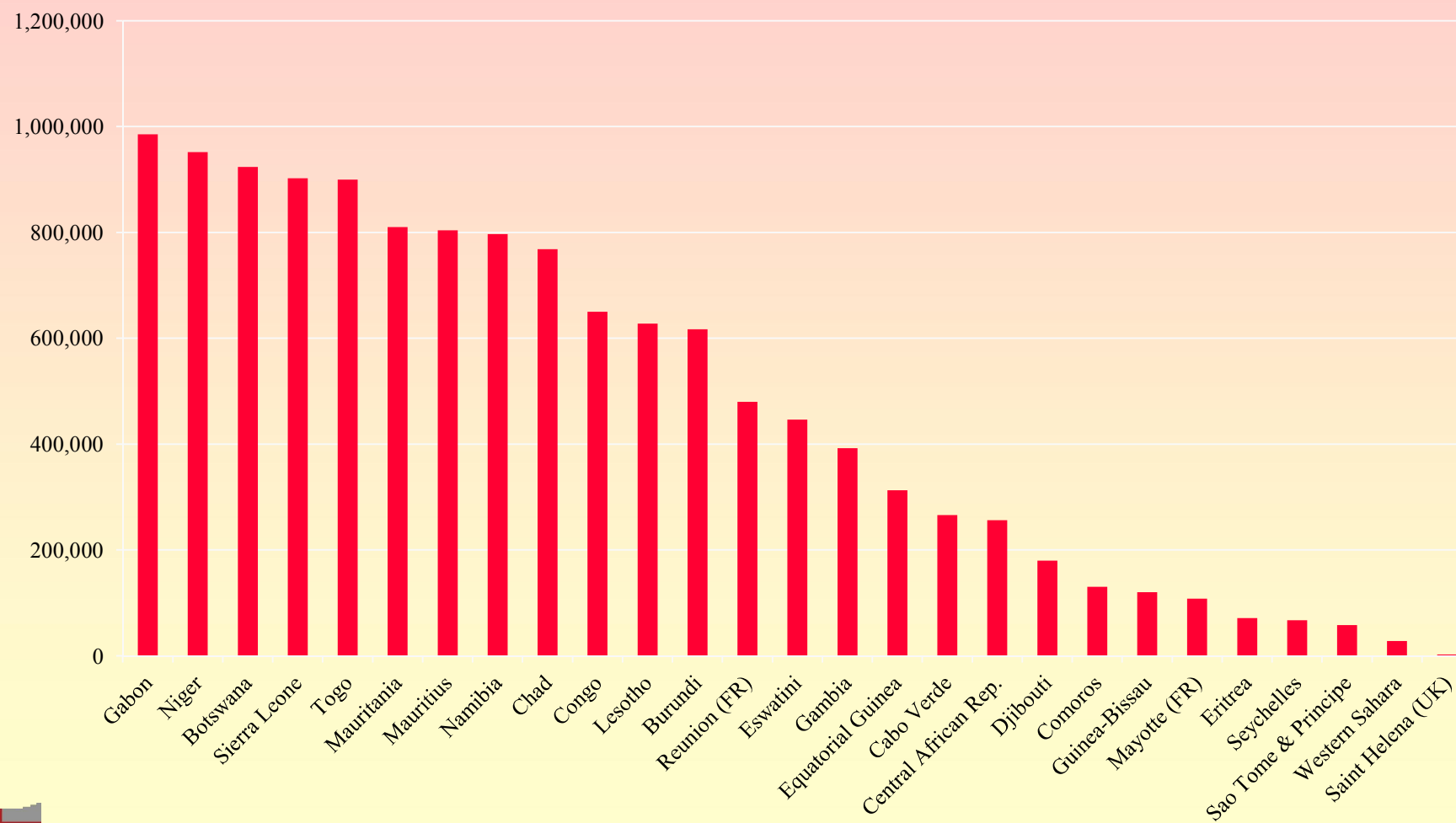


# Case studies: Internet Users, March 2019, Africa

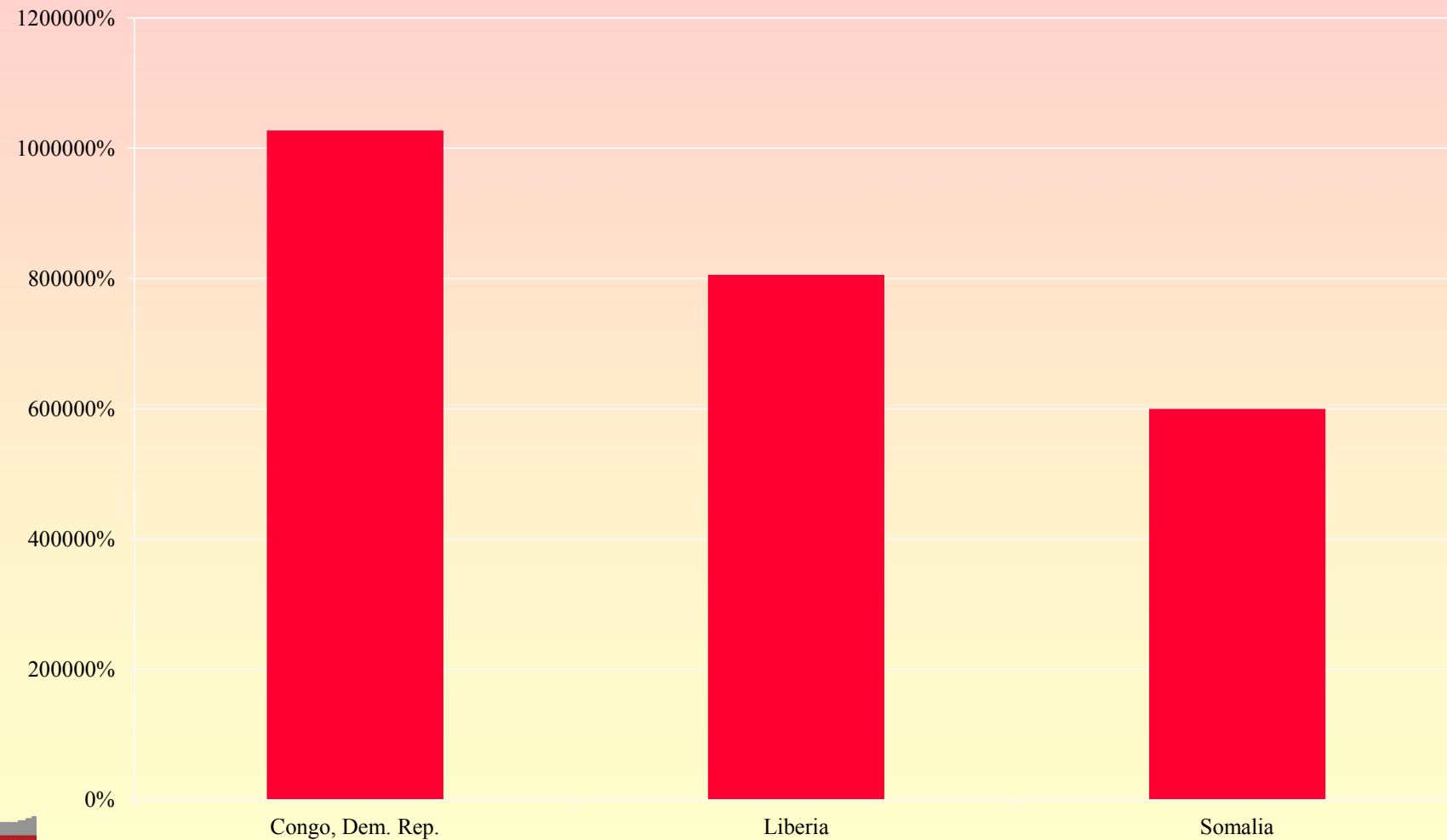




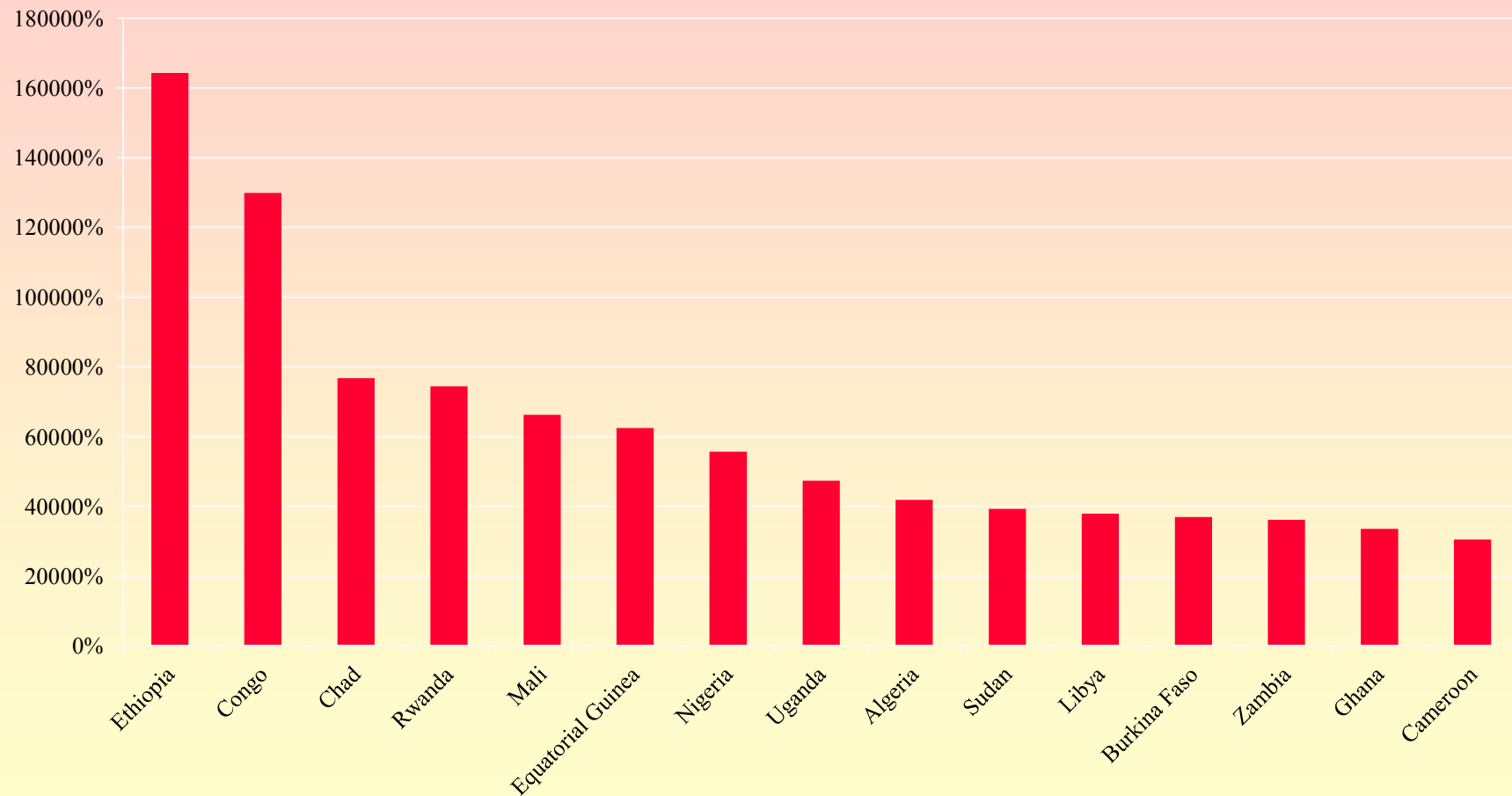
# Case studies: Internet Users, March 2019, Africa



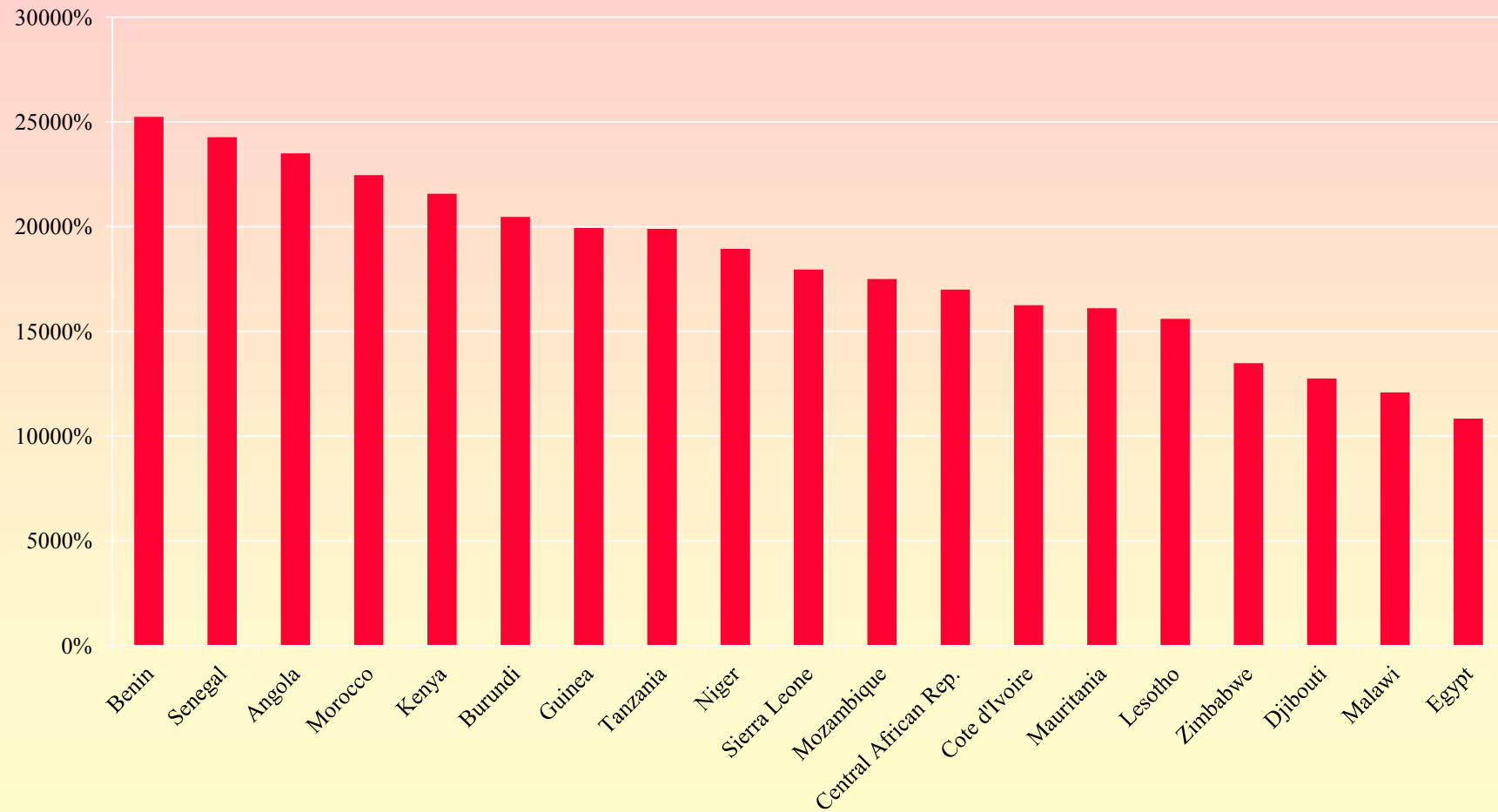
# Case Study: Internet User Growth, 2000-2019, Africa



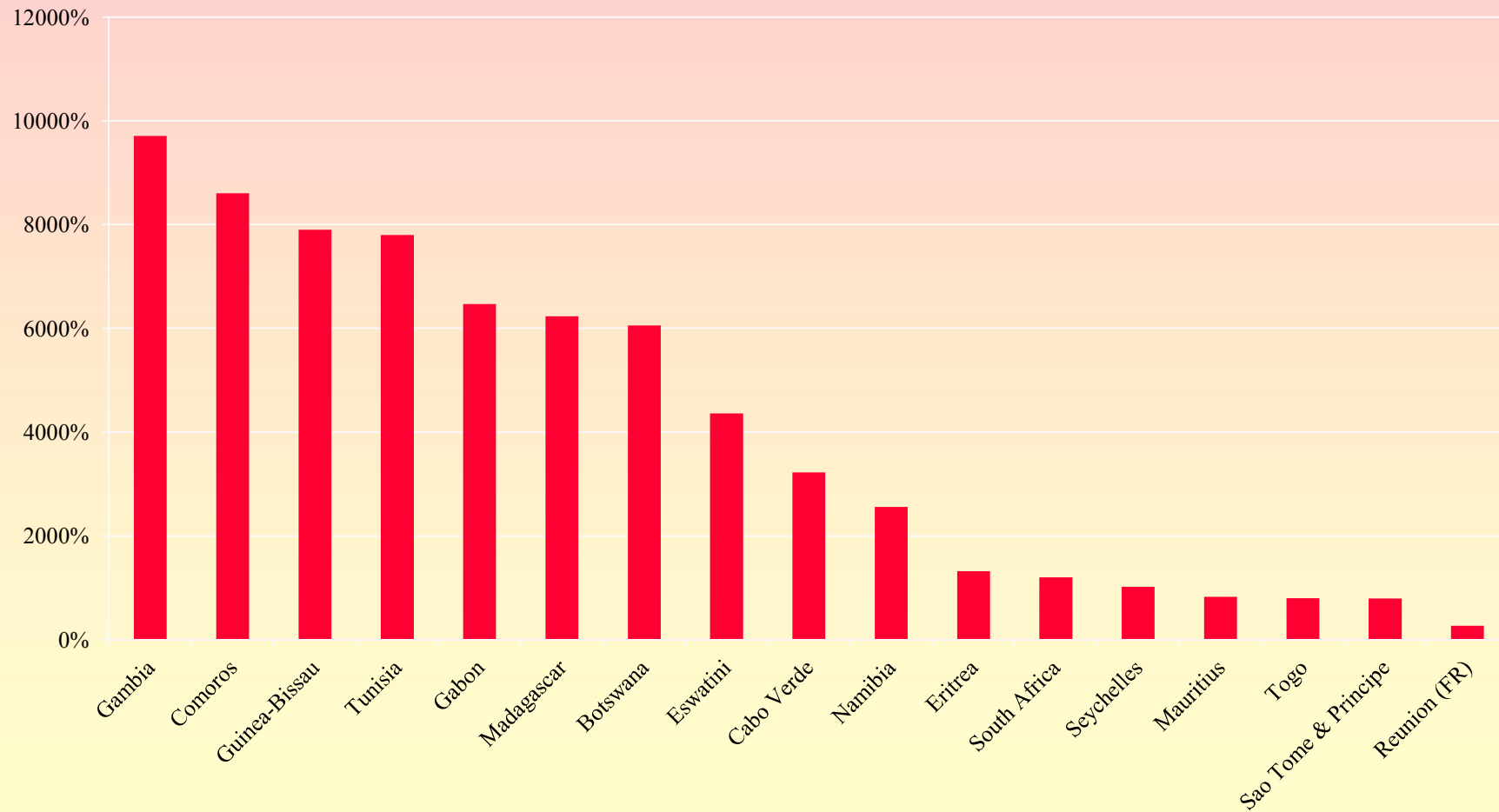
# Case Study: Internet User Growth, 2000-2019, Africa



# Case Study: Internet User Growth, 2000-2019, Africa



# Case Study: Internet User Growth, 2000-2019, Africa



# Case study: 3 African Countries

	Population (2019 Est.)	Internet Users 31-Dec-00	Internet Users 31-Mar-19	Penetration (% Population)	Internet Growth % 2000 - 2019
<u>AFRICA</u>					
<u>Ghana</u>	30,096,970	30,000	10,110,000	33.60%	33600%
<u>Nigeria</u>	200,962,417	200,000	111,632,516	55.50%	55716%
<u>Togo</u>	8,186,384	100,000	899,956	11.00%	800%
<u>TOTAL AFRICA</u>	1,320,038,716	4,514,400	492,762,185	37.30%	10815%
<u>Rest of World</u>	6,396,184,493	82.90%	3,891,048,157	60.80%	88.80%
<b>WORLD TOTAL</b>	7,716,223,209	100.00%	4,383,810,342	56.80%	100.00%



# Nigeria

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- ⇒ Since its inception a little over a century ago, Nigeria's telecommunications system has progressed through various stages of development from the primitive communications equipment in its colonial days to the enormous variety of technologies available e today. In this chapter, the processes of Nigeria's telecommunications development and its progress, problems, and prospects are examined and discussed from its emergence to the expansion and modernization efforts of the 1990s.
- ⇒ Preindependence Era
  - The development of telecommunications in Nigeria began in 1886 when a cable connection was established between Lagos and the colonial office in London. By 1893, government offices in Lagos were provided with telephone service, which was later extended to Ilorin and Jebba in the hinterland. A slow but steady process of development in the years that followed led to the gradual formation of the nucleus of a national telecommunications network.
  - In 1923, the first commercial trunk telephone service between Itu and Calabar was established. Between 1946 and 1952,



# Nigeria

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- ⇒ The main transmission medium during the preindependence era was unshielded twisted pair. This evolved later from rural carrier systems on high gauge lines to line carrier systems of twelve-channel capacity. Small- to medium-capacity systems employing VHF and UHF radio were introduced around 1955. The first serious attempt at planning telecommunications services in the country was the 1955-62 Development Programme. It provided for the expansion of the trunk using a VHF Multichannel Radio System on a nationwide basis and a short microwave link between Lagos and Ibadan.
- ⇒ In the early days, the primitive coordinate pegboard switching system was used. This progressed through manual switchboards of different sizes, shapes, and capacities until Strowger exchanges were installed into the national network at Lagos Island, Ikeja, Ebute Metta, Apapa, and Port Harcourt between 1955-60 along with 116 manual exchanges. The installation of the Strowger exchanges marked the beginning of automatic telephone switching in Nigeria. By the time of independence, automatic exchanges were established at the main centers and a subscriber trunk dialing system (STD) was introduced between Lagos and Ibadan.





# Nigeria

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⇒ With the attainment of independence in 1960, Nigeria embarked on a periodic national development plan. Telecommunications development was featured in each of these plans, which were usually of a five-year duration. It is more meaningful, however, to discuss the development of Nigeria's telecommunications since independence--its objectives, achievements, and features--on a decade-by-decade basis.



# Nigeria

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- ⇒ 60s: The focus of attention in this period was the expansion of the network to meet the needs of the fledging commercial and industrial. The specific objectives included: installation of additional 60,000 telephone lines to bring the total number of lines to 90,000 by the end of the decade; expansion of trunk dialing facilities to link the major urban centers that were then springing up; and establishment of the Nigerian External Telecommunications (NET) Limited. Unfortunately, these objectives could not be completely realized by the end of the plan period. For example, only about 26,000 lines (just over 40% of the planned target) could be added to the existing network, partly because of underfunding and partly because of the disruption caused to the economy by the Nigerian Civil War (1967-70). Nevertheless, some the decade's major achievements included the installation of a microwave radio transmission system to link the cities of Lagos, Ibadan, Enugu, Benin, and Port Harcourt, all of which are in the southern part of Nigeria's transmission system. Preparatory work toward the establishment of NET as a limited liability company started during this period as well.



# Nigeria

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- ⇒ 1970-75 Plan Period
- ⇒ Reconstruction and rehabilitation of the telephone equipment and other infrastructure damaged during the civil war.
- ⇒ Developments in five major areas were considered. In telephony, new automatic exchanges were to be constructed and existing automatic exchanges expanded.
- ⇒ The 1970-75 plan stipulated the establishment of a Nigerian Satellite Communications earth station at Lanlate in the southwestern part of Nigeria.



# Nigeria

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- ⇒ The 1975-80 Plan Period
- ⇒ The third National Development Plan period (1975-80), was the most ambitious. It aimed at increasing the telephone facilities from 50,000 lines to 750,000 lines--an increase of about 1,400%.
- ⇒ In the area of transmission, the following projects were considered: introduction of the Nigerian Domestic Satellite (DOMSAT) to provide television and sound broadcasting (later modified to accommodate telephony and teletype services between the state s); introduction of the aerostat (balloon) system, which was intended for television and sound broadcasting and telex and telephone services; provision of coaxial cable between Lagos and Kaduna; expansion of the existing microwave radio link system intend ed for telephone services as part of the contingency plan exchanges; and provision of new transmission links for the exchanges in the contingency plan not covered by existing radio links.
- ⇒ A second satellite antenna was built at Lanlate, and this increased the global coverage of the external services. An International Telephone Switching Centre (ITSC) was installed at the Nigerian External Communications (NECOM) house in Lagos. And finally, a new microwave link was provided between Lagos and Cotonou (Ben in Republic) and computerized telex, telegraph, and data switching centers were provided at NECOM House.
- ⇒ The 1975-80 plan period was not a complete success, however. The disastrous aerostat balloon project, which was abandoned, was a colossal waste of money. The proliferation of different technologies in the network made spare parts procurement difficult and complicated manpower training by limiting the number of personnel who could be switched from one part of the network to another. There was also a shortage of technical manpower to operate and maintain the additional facilities and a lack of adequate levels of finance to execute the projects.
- ⇒ The most serious problem, however, was bad planning. There was not adequate coordination between project management and implementation. Buildings were not available for the installation of purchased equipment, and vital links -- such as external line plants -- were omitted in the contract awarded.



# Nigeria

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- ⇒ The 1980s
- ⇒ The first half of the decade covered the fourth National Development Plan period (1980-85), which was essentially aimed at completing all outstanding projects from the previous plans. In addition to the primary objective, the development plan was designed to provide a total of 370,550 additional telephone lines, a terrestrial toll and trunk transmission network to link all switching centers throughout the country, and Telex/Gentex exchanges for about 9,000 telex lines with external line plant and teleprinter machines. It was envisaged that the total number of installed telephone lines in Nigeria at the end of the plan period would increase to 612,000.
- ⇒ During this period, the telecommunications arm of the Department of Posts and Telecommunications was merged with the Nigerian External Telecommunications (NET) to form, in 1985, the Nigerian Telecommunications Ltd. (NITEL), a limited liability company that today administers both internal and external telecommunications services in Nigeria.



# Nigeria

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- ⇒ Present
- ⇒ Telephone Services , Telex Services
- ⇒ Transmission Systems
  - » Microwave
  - » Coaxial
  - » Optical Fibre Cable
  - » Domsat
- ⇒ International Services
  - » International Satellite System
  - » Submarine Cable
- ⇒ Maritime Services
  - Shore-to-shore and ship-to-shore maritime communication services are provided via the High Frequency Radio System. The limitations of the present system are poor transmission quality, low reliability, and lack of automatic access to the national telecommunications network. In 1988, Nigeria joined the International Maritime Satellite Organization (INMARSAT), which operates a system of satellites to provide mobile communications for the world's shipping and off-shore industries. Through the IN MARSAT system, NITEL offers Maritime Mobile Service (MMS) as well as satellite mobile communication.



# Nigeria

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⇒ The telecommunication scenario in Nigeria is not likely to be too different from what exists in many developing countries. It is necessary to give the utmost priority to the development of telecommunications in Nigeria because of its multiplying effects on industrial and economic growth.



# Case study: 3 African Countries

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# Ghana

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## ⇒ Ghana - Convergence, Broadband and Internet Market Report

Ghana was amongst the first countries in Africa to achieve connection to the Internet. National and international public data services are provided by more than 20 companies and there are more than 50 VSAT networks operating in the country. Almost 100 new Internet Service Providers (ISPs) were licensed in 2004 alone, bringing the total to more than 140. Broadband ADSL services were introduced in 2003.



# Ghana

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- ⇒ The telecommunications industry in Ghana has been on a very progressive journey and it has covered a great distance in a very short period of time.
- ⇒ Not long ago very few people had private telephones that worked. As recently as 1996, the telephone density of Ghana was 0.26% meaning that there were 2.6 telephone lines for every 1,000 people including 35 payphones in the entire country out of which 32 were located in Accra. This was one of the lowest in Africa. Today there is one phone for every four Ghanaians!



# Ghana

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- ⇒ This tremendous increase in the tele-density has been a result of the establishment of the National Communications Authority (NCA) in 1997 and the subsequent deregulation of the telecom industry, which brought about the growth of wireless telephony as a result of significant investment by operators. For the consumer, being in touch simply means being able to purchase a mobile handset and subscribing to a wireless service.
- ⇒ Deregulation also meant opportunities for ambitious entrepreneurs and large telecom companies to establish operations in Ghana and participate in what was to become the biggest boom in Ghana's recent economic history.
- ⇒ Telecommunications is the main economic sector of Ghana according to the statistics of the World Bank due to the Ghana liberal policy around Information and Communications Technology (ICT). Among the main sectors of investments, 65% is for ICT, 8% for communications and 27% is divided for public administration.



# Ghana

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- ⇒ As of 2012 there were 285,000 fixed telephone lines in use, 120th in the world, and 25.6 million mobile cellular lines, 42nd in the world.
- ⇒ The telephone system is outdated, with an unreliable fixed-line infrastructure heavily concentrated in Accra and some wireless local loop installed, domestic trunks primarily use microwave radio relay. There are 4 Intelsat (Atlantic Ocean) satellite earth stations. Microwave radio relay links Ghana to its neighbors (2009).
- ⇒ The SAT-3/WASC, Main One, GLO-1, and ACE international fiber-optic submarine cables provide links to countries along the west coast of Africa and on to Europe and Asia.
- ⇒ In 2010 two fixed line and six mobile phone companies were authorized to operate in Ghana of which 5 were operating, 13 satellite providers were authorized of which 8 were operating, 176 VSAT providers were authorized of which 57 were operating, and 99 public and private network operators were authorized of which 25 were operating.
- ⇒ Competition among multiple mobile-cellular providers has spurred growth, with a mobile phone teledensity in 2009 of more than 80 per 100 persons and rising.
- ⇒ Official data from the National Communications Authority (NCA) published on a August, 2012 showed the country had 91 percent mobile phone penetration, and one percent fixed line penetration. Recent figures released by the regulatory authority (NCA) in August 2014, shows that the mobile phone penetration increased by 111.16% leaving 0.89% for fixed line.



# Ghana

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- ⇒ Ghana was one of the first countries in Africa to connect to the Internet to and introduce ADSL services. With an average household download speed of 5.8 Mbit/s Ghana had the third fastest speed on the African continent and the 110th fastest out of 188 countries worldwide in February 2014.
- ⇒ Presently, Ghana is served by five submarine cables: SAT-3; MainOne; Glo-1; and WACS Cables supplying about 7.16 Terabits capacity. Last year, the Africa Coast to Europe (ACE) submarine cable system was inaugurated in Accra, bringing onboard additional 5.1 Terabits, to increase the overall submarine cable capacity to 12.3 Terabits.
- ⇒ There is also, a national terrestrial optic fibre network that is being built to cover all the Districts and Constituency areas of the country. In June 2012, Ghana successfully connected its terrestrial optic fibre with those of neighboring sister countries of Burkina Faso and Togo.
- ⇒ A 780-kilometre optic fibre ICT backbone infrastructure on the Eastern Corridor of the country is being built to provide broadband infrastructure to over 120 towns and communities along the route. The project will be connected to the existing optic fibre network.
- ⇒ Other infrastructure includes ;WHO-sponsored eHealth system developments; fibre network for Eastern Corridor completed; bandwidth cost plummets to a tenth of the price in 2007; regulator's market data to May 2014; market developments into 2014



# Ghana

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- ⇒ Ghana was awarded the ITU's WSIS Project Prize 2014 Award in Rural Telephony Ghana in Geneva 10th June, 2014. The award was in recognition country's effort for bridging the communication gap in rural communities.
- ⇒ The substantial rise in telephone subscription in Ghana from 947,320 for mobile and 6,884 payphones to 28,615,445 between 2003 and 2014, coupled with pragmatic programmes by successive governments are some of the factors leading to this success.
- ⇒ Ghana remains committed to the Geneva Plan of Action and the Principles for building an inclusive Information Society. Ghana regards the Tunis Agenda for the Information Society as a valuable reaffirmation of the global commitment for bridging the digital divide, on Internet governance and related issues.



# Case study: 3 African Countries

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# Togo

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⇒ Togo's population has remained evenly spread between urban and rural communities in the past decade, with 43 per cent of its 6 million persons living in rural areas. Sixty-three per cent of urban residents live in big cities where they can access more and better infrastructure such as Internet, mobile phone services and electricity; the latter serves only 20 per cent due to production challenges. Employment for youths between the ages of 15 to 24 years dropped slightly, by one percentage point, to 44.6 per cent of total population in the past decade.





# Togo

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⇒ Fixed telephone lines remain at a low of 3 per 100 inhabitants, with mobile cellular showing a remarkable growth, from 6 to nearly 40 per 100 inhabitants from 2004 to 2010. Households with a computer and with Internet are at 3 and 1 per 100 inhabitants, respectively, making Togo one of the countries with the lowest Internet and computer penetration in Africa. Broadband remains largely unavailable.



# Togo

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⇒ Two major Internet service companies provide access: Café Informatique, the first and by far the largest, and the incumbent Togo Telecom (OstaMyy, n.d.). Others include eProcess International SA, which is a subsidiary service provider for the regional financial institution, EcoBank; and other small-scale ISPs and cyber cafes numbering close to 179 in Lome alone. As a result of the low penetration of the Internet to households, access is centralized to cyber cafes—even then, connectivity is concentrated in mostly urban areas



# Togo

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⇒ Broadband growth in Togo is evolving slowly compared to the rest of Africa and its unavailability remains a significant concern for most Togolese. An opportunity for the deployment of mobile broadband, especially to the rural areas where access is mostly scarce, is evident because of the growth of mobile cellular subscriptions but more action is needed to leverage this opportunity. Choices would have to be made that involve the government and the private sector, especially infrastructure and Internet service providers that support the deployment of mobile broadband particularly to the underserved and unserved. Broadband deployment would need much more than deployment in fixed line infrastructure.



# Togo

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- ⇒ Another opportunity exists in advancing growth in the phosphate mining, agricultural and service producing industries. Togo's large youth population could contribute to the development of a service industry that capitalizes on the positively improving provision of technology services and goods to the mining and agriculture sectors as a contribution to GDP.
- ⇒ Large percentage of those involved in a survey of public perception in Internet policy making highlighted tax issues as impeding growth of the technology services industry. There is an opportunity here to reform the tax regime in the light of the opportunities that the Internet offers, and broadband deployment can play an important role here.
- ⇒ Two sides of the broadband coin should influence its development in the country—the supply side, which concerns the deployment of international connectivity, domestic backbone, metropolitan connectivity and local connectivity infrastructures; and the demand side, which concerns the creation and use of broadband-enabled services and applications to boost local demand and encourage further deployment (Kelly & Rossotto, 2012).



# Togo

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⇒ As it concerns international connectivity, access to the Internet prior to 2007 was via satellite links, until an agreement was reached between the president of Togo and Benin to allow access to the undersea South Atlantic 3/West Africa Submarine Cable through the deployment of over 165 kilometres of fibre optic cable installed by Togo Telecom to increase the delivery of voice, video and data. This makes international bandwidth (not necessarily broadband) available to the country. Metropolitan access or the backbone infrastructure necessary for last-mile distribution and that diversifies access to the regions is still lacking, the availability of which will significantly improve broadband access to and in the country.



# Togo

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⇒ Communications cables: West Africa Cable System (WACS), a submarine cable linking countries along the west coast of Africa with each other and with Portugal and the United Kingdom; GLO-1 which links countries along the west coast of Africa to each other and to Portugal, Spain, and the United Kingdom.



# Togo

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⇒ The demand for broadband services from sectors such as education and health is yet to gain significant hold in Togo. Neither has demand been created in the private sector through firms that may be interested in exploring the local agricultural and phosphate industries. The opening up of industries in these areas could stimulate the growth of broadband and drive demand beyond the basic Internet access for which it is presently used.



# Contacts

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