

Kingdom of Morocco



Directorate of Studies and Financial Forecasts



**Deployment of the 4th generation of mobile phones (4G) in Morocco:
Opportunities and challenges**

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Introduction

The telecommunications sector constitutes a dynamic sector constantly developing worldwide. Such dynamism, resulting from the far-reaching technological changes, is characterized by accelerated processes of liberalization of the market. In fact, the unprecedented technological expansion characterizing the last two decades has shifted the institutional borders towards a progressive and quasi universal liberalization adapted to the characteristics of the market. Hence, the constant technological progress, combined with regulatory support measures, enhanced the emergence of new technologies, especially the deployment of several successive generations of telecommunication networks, including 2G mainly devoted to telephony, then 3G and 4G, destined more towards multi-media and data.

Following global trends, the telecommunications sector in Morocco has witnessed two far-reaching changes. An institutional change, putting an end to State monopoly and opening the sector to competition, and a technological change resulting in a true expansion of new communication and information systems.

The multitude of ICT in Morocco will mark a new turning point, with the advent of the fourth generation of mobile telephony planned for 2015 by ANRT¹, illustrating the key turning point that the telecommunications sector has reached. This stage will be characterized by major developments, particularly technological renewal, marked by moving from high to very high bandwidth on the mobile, development of business models, between high bandwidth access services (3G, ADSL) which reached a certain degree of technological maturity and the emergence of new related services to very high bandwidth facilitating the development of daily-life and professional uses.

Admittedly, 4G involves major challenges for both consumers and operators, especially in a context marked by a fall of the turnover and profit of the sector due to the recrudescence of competition. However, the use of this new technology, fostering the increase of connectivity and the emergence of new services, would, probably, revitalize the growth and competitiveness of the sector and offer new opportunities to other economic sectors.

In this respect, to better specify the impact of the 4G deployment, this piece of work describes the various trends of the mobile sector in general and 4G in particular worldwide and outlines the attested experiences of countries having deployed this technology. The experience feedbacks arising from this benchmark allow us to learn useful lessons for 4G deployment mobile networks. The study thereafter approaches the case of Morocco, drawing up, initially, an assessment of the development of the national telecommunications market by analyzing, subsequently, the challenges and opportunities of the 4G deployment. Based on the examination of the characteristics of

¹ L'agence nationale de réglementation des télécommunications (National Communications Regulation Agency)

the national telecommunications market and review of foreign experiences, this work proposes recommendations that would ensure the development of the national sector of telecommunications.

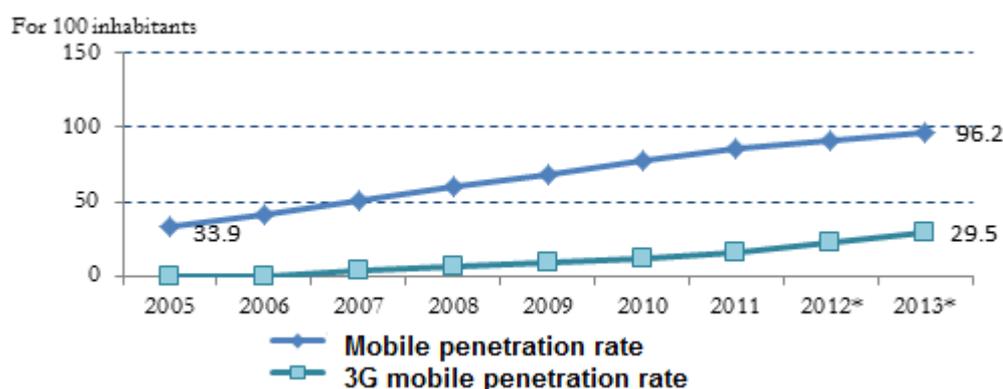
1. Global overview of mobile telephony: focus on 4G

1.1. Development of mobile telephony

The penetration of cellular mobile telephony in the world population witnessed a significant development, increasing from almost 23% in 2003 to 91,2% in 2012; that is nearly 6,34 billion mobile subscribers. This increase in the penetration of mobile telephony is explained by consumers' growing use of multiple mobile terminals and several SIM cards to access the best communications tariffs, as well as the use by companies, in many sectors of industry, of M2M² applications with a view to upgrading their own productivity and exploiting new markets. This penetration would have reached 96,2% in 2013, according to the estimate of UIT; that is 6,8 billion mobile subscriptions.

The forecasts of the development of mobile subscribers by area by 2018 show that growth continues in all the areas of the world but with a prevalence of the "Central Asia and Pacific Asia" region, which will witness a growth of 7% per annum between 2012 and 2017. In addition, Africa was a significant source of growth of mobile subscribers, accounting for 8% per annum between 2008 and 2012. This growth is ascribed mainly to the subscription of new mobile subscribers, unlike the countries of Europe, where the growth of 9% is due mainly to the acquisition of several SIM cards by only one subscriber. In terms of growth forecasts, Africa and Latin America would witness a combined growth rate of 7% to 8% per annum over the next five years.

Graph 1: Trend of mobile penetration rate in the world



* Estimates

Source: UIT

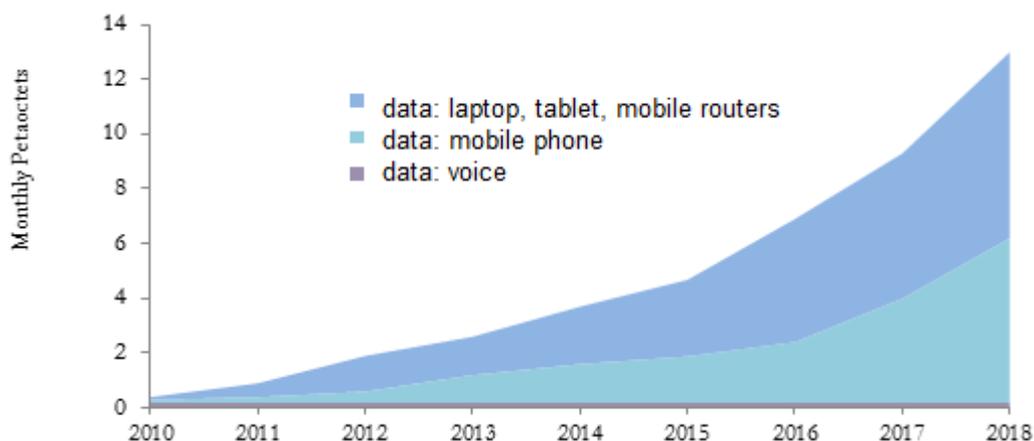
² Refers to the concept of "machine to machine" using telecommunications and computing to allow communications between machines without human intervention.

On the whole, 3G connections have quadrupled since approximately 2007, rising from 268 million to a total of 1,7 billion connections in 2012; that is a global penetration rate of 22,1% at the end of 2012. This rate is 66% in Europe as against 8%³ in Africa, indicating a strong regional disparity in terms of 3G use.

Moreover, the 3G segment is the one that has witnessed the fastest growth in recent years, not only in developed countries, but in developing countries as well, since it recorded an average annual growth rate (AAGR) of 40% since 2007.

This 3G growth should continue to reach 4,2 billion connections in 2017, which represents an average growth rate per annum of 20% compared with 40% over the period 2007-2012. This fall of 3G global growth would be explained by 4G deployment technology, which in 2012 accounted for only 1% of global connections and should account for 10% of global connections by 2017⁴. Likewise, the advent of smartphone, combined with the large deployment of high bandwidth mobile networks, led to an explosion in the use of the mobile data, hence indicating a far-reaching change in the practices of consumers who increasingly get connected to the Internet via mobile phones and tablets.

Graph 2: Global mobile traffic: voice and data (2010-2018)



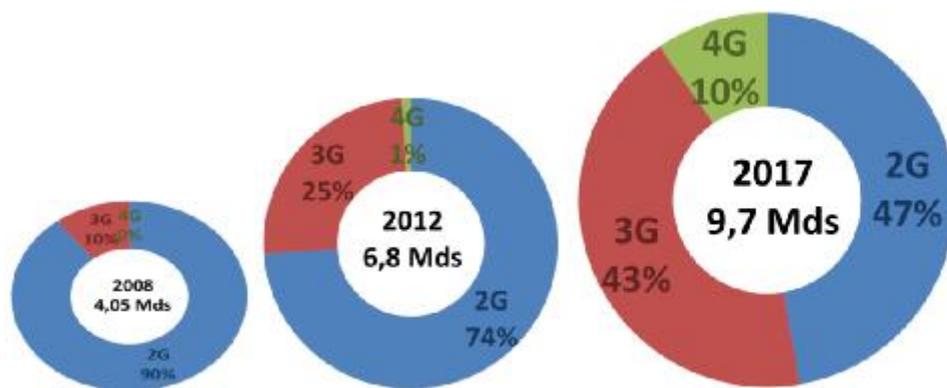
The year 2012 alone witnessed a data traffic volume of amounting to 0,9 Exabyte⁵ per month; that is a volume higher than the cumulative volume of the three previous years. This traffic is expected to grow by 66% per annum until 2018, which shows that mobile data constitutes an important niche of growth for operators.

³ "The Mobile Economy 2013". GSMA, 2013

⁴ "Mobile The Economy 2013", GSMA, 2013

⁵ Exabyte = 10¹⁸ octets and 1 petabyte = 10¹⁵ bytes.

Graph 3: Distribution of the global mobile connection by type of technology



Source: GSMA

The global growth of the number of connections conceals a significant change relating to the types of connections. In terms of the number of connections, 2G technology still represents the majority of global connections in 2012 (74%), or 5 billion out of the total of 6,8 billion connections. However, world connections growth will be driven by the increase of 3G and 4G segments, whose cumulative shares should increase by 26% to 53%⁶ of global connections over the period 2012-2017. In spite of the decline of 2G, this generation will still account for a significant share of global connections in 2017 (47%) taking into account the slow cycle of renewal of terminals in the poorest countries besides its significant satisfaction of needs in terms of voice only.

1.2. Development of 4G mobile telephony

The first 4G network was launched in December 2009 by the Swedish operator “TeliaSonera” with a very limited geographic coverage. This operator was followed, in 2010, by “MetroPCS” and “Verizon Wireless” in the United States, as well as “NTT DoCoMo” in Japan and a few other small networks. The first massive 4G deployment was carried out by Verizon Wireless in the United States as of 2010, and it is the operator that covers today nearly 90% of the population of the country subscribed to 4G, with more than 13 million subscriptions at the end of 2012.

The total number of subscribers to 4G worldwide would have reached 65 million at the end of 2012⁷, for 85 operators providing 4G services⁸. Thus, the countries with

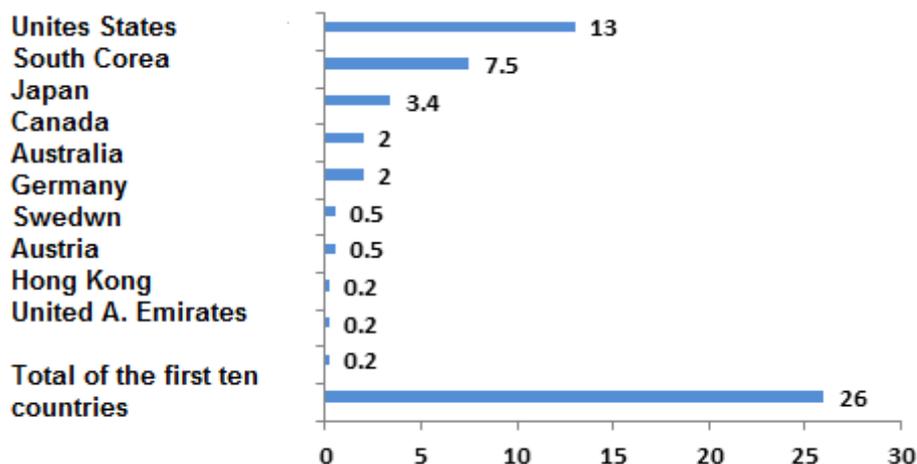
⁶ “The Mobile Economy 2013”, Association of Mobile Operators (GSMA), 2013

⁷ “LTE Market & trend”, Institute of audio-visual and telecommunications (Idate), 2013.

⁸ According to an updating in December 2013 of the IDATE, the world has, at the end of the first six-month period 2013, 130 million 4G/LTE subscriptions in the world for 200 operators.

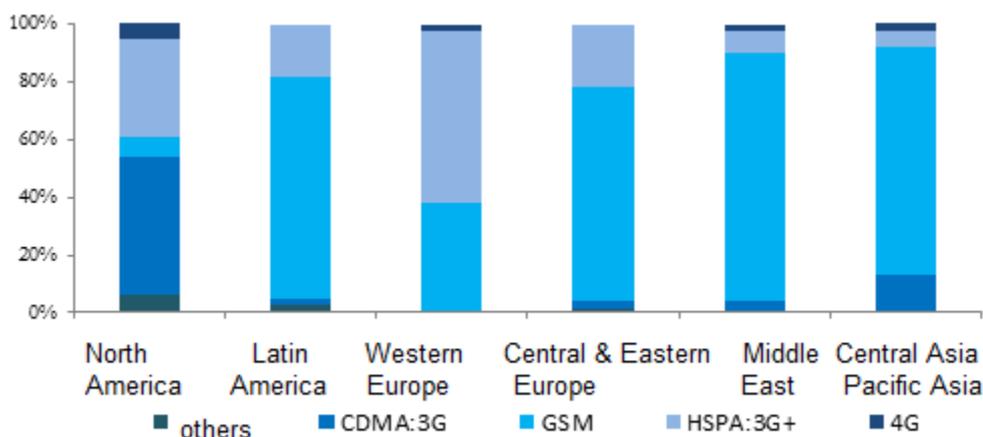
the highest number of subscribers to 4G are the United States (13 million), followed by South Korea (7,5 million) and Japan (3,4 million).

Graph 4: The first ten countries using 4G in 2012 (in million subscribers)



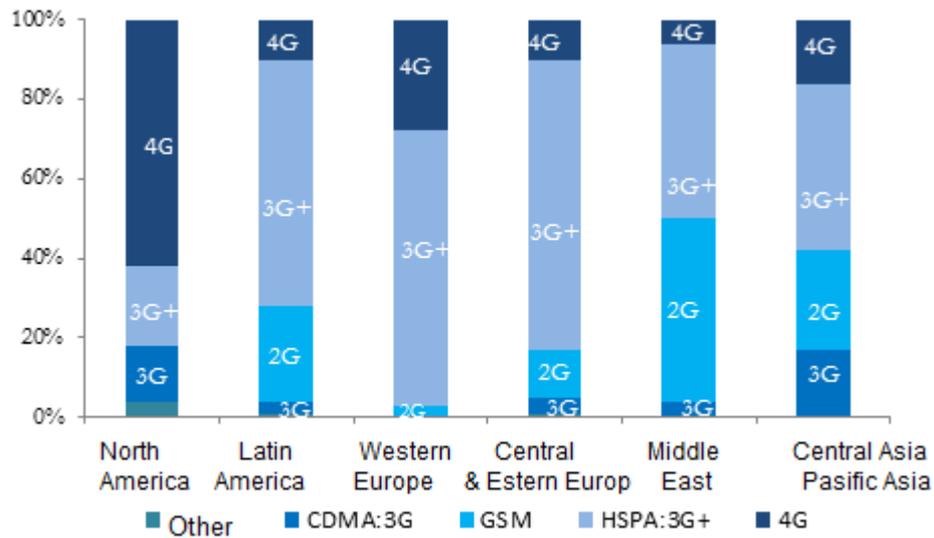
The cumulative subscriptions of pioneering countries, particularly the United States, South Korea, Japan, Canada and Australia, account for 93% of the total of the first ten countries using 4G. In these countries, 80% of the population on average is covered by these 4G networks and most smartphones compatible with this new technology.

Graph 5: Shares of mobile subscriptions by technology and area in 2012



The regional difference in terms of technological level of maturity is reflected by the predominant use of GSM in the least mature areas, while the most mature areas such as Western Europe are dominated by the 3G+ (HSPA) network. 4G, in turn, is used especially in North America.

Graph 6: Developmental prospects of mobile technologies by area in 2018



Source: IDATE, 2013

Even if 4G worldwide market is still at its beginnings, there are 163 operational 4G networks⁹ in 70 countries, and nearly 305 mobile operators, in 104 countries, are in the course of investing in this technology, thus indicating future predominance of 4G at the global level. These networks are deployed throughout the world in 12 different frequency ranges, 80% of which deployed in one of the four following frequency bands: 700 MHz, 800 MHz, 1800 MHz or 2600 MHz.

4G growth forecasts count on more than 915 million LTE subscriptions in the world by 2016¹⁰, in which the area of Africa and the Middle East would represent 7,5%, indicating the potential of expansion of this new technology. Asia-Pacific should keep its supremacy with a major share reaching 41,6%, followed by North America (21,6%), Western Europe (15,8%) and Eastern Europe (4,9%).

4G in Europe: Germany and Sweden are the most advanced

While the European operators have been very innovating and precursory in the supply of 2G and 3G mobile services, as well as mobile services high bandwidth, Europe is currently lagging behind countries such as the United States, Japan and South Korea as regards 4G deployment. These three countries are currently operating almost 93% of 4G connections in the world. On the other hand, only 6% of these connections are ascribed to Europe.

The first users of 4G in Europe are Germany and Sweden, with only 300.000 subscribers for each, followed by Austria, with 180.000 subscribers in 2012. These

⁹ Data of the Mobile world live, dating back to May 2013.

¹⁰ LTE (Long Term Development) is the most recent development of the standards of mobile telephony GSM/EDGE, CDMA2000, TD-SCDMA and UMTS.

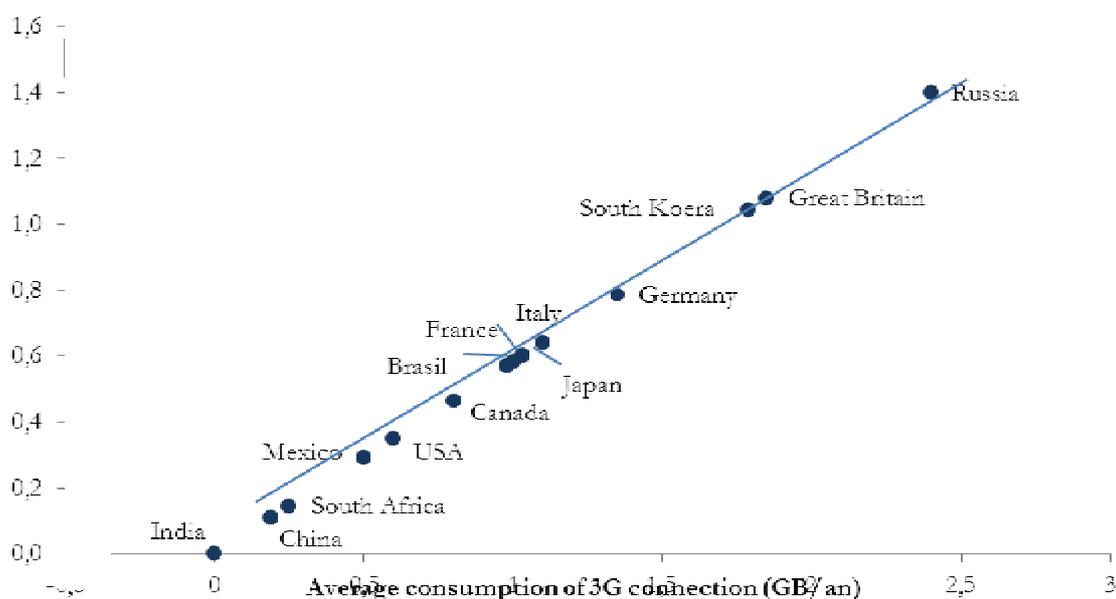
figures testify to the fact that Europe is lagging behind Asia and North America in the 4G deployment. France stands at the same standard as the majority of its European counterparts, with a slower adoption compared with other continents and Scandinavia, the pioneering digital region where several operators very early launched new generation 4G technologies. The latter being strong by its companies, especially Nokia and Ericsson, which, though disengaged of the marketing of terminals, remain among the first suppliers of equipment of telecommunication network deployment.

The difference between the United States and Europe as to 4G is significant with 19% of 4G connections recorded in the United States as against less than 6% in Europe¹¹. And even in terms of 4G development perspectives in Europe, the equipment supplier, Ericsson, estimates that 4G will relate to only 35% of subscribers in Western Europe in 2018, as against a penetration rate of 70% expected in North America. Ericsson does not envision Europe catching up with America which has already initiated the deployment the high bandwidth mobile networks.

This gap and lag incurred by Europe explain the concerns of the European Commission in this regard, especially since the penetration of the mobile high bandwidth is a direct factor of improvement of the GNP of a country and constitutes an essential tool of recovery and economic growth. Indeed, doubling the use of mobile data leads to an increase of 0,5%¹² of growth rate of GDP per capita.

Graph 7: Effect of doubling the use of mobile data by 3G connection on the growth of GDP per capita

Growth rate of GDP in (%)



¹¹ According to an update in December 2013 of IDATE, this number should reach 1,3 billion at the end of 2017.

¹² "What is the impact of mobile telephony on economic growth?" GSMA, November 2012.

Moreover, the objective set by the European Union is to cover 50% of the population by very high bandwidth by 2020. Thus, and in order to fill this gap and maintain their competitiveness with markets worldwide, the European commission encourages the operators in Europe to continue investing in 4G technologies by promoting the re-use of 2G frequencies already deployed.

Reasons of the European slow pace as regards the 4G deployment

The slow pace of 4G deployment at the European level would impact the accomplishment of the objective to ensure for 50% of the population of Europe a high bandwidth connection by 2020. The adoption of 4G was slow in Europe because of the delay in assigning new bands of frequencies for 4G and late availability of 4G smartphones and tablets. This delay is due also to the difficult European macro-economic context and the fierce competition in the sector which impacted operators' cash flow.

In conclusion, it is noted that 4G worldwide market is at a tipping point. On the "digital pioneering" markets such as the United States, South Korea and Japan, migration towards 4G networks is making headway and consequently the operators monitor the rising engagement of subscribers and average revenue by subscriber. In addition, other emerging markets in 4G with two-digit annual growth forecast between 2013 and 2017; that is a new wave of consumers in the world of high bandwidth¹³.

2. Foreign experiences as regards 4G deployment

The experiences of the world leaders as regards 4G deployment, particularly the United States, Japan and South Korea, will be examined in order to draw the relevant lesson for Morocco. The case of Europe as to 4G deployment is also analyzed through the British and French cases.

2.1. Experiences of USA: world leader of 4G

The first 4G network was deployed in the United States in 2010 by the American operator Verizon Wireless. This network, the most extensive in the United States and even in the world, covers 13 million subscribers at the end of 2012 over 486 coverage areas, or 90% of the American population. The American telecommunications operators invested more than 1200 billion dollars in their high bandwidth networks since 1996¹⁴. They continue investing in the new very high bandwidth networks, particularly 4G networks.

Some of the factors that have driven the ecosystem of 4G and its fast adoption in the United States are the availability of wavebands, especially 700 MHz, the fragmentation of 3G ecosystem in the country with several standards, more limited investments in 3G than in Europe and the massive 4G deployment by several

¹³"Global LTE network forecasts and assumptions, 2013-2017", GSMA, 2013.

¹⁴ www.ustelecom.org/broadband-industry/broadband-industry-stats/investment

operators. The availability of Smartphones, with faster processors and big size screens, is also behind the success of 4G. These pieces of equipment encourage users to consume more data on 4G networks¹⁵. Currently, 90% of the American population is covered by at least an operator, and nearly 55% by at least two.

2.2. Experience of South Korea: deployment and fast adoption of 4G

The case of South Korea is characterized by the fastest 4G deployment in the world since its launching in July 2011, reaching 20 million subscribers in March 2013. The coverage of 100% of the population was reached in June 2012 with the entry of third operator, KT Telecom.

The appropriation of 4G by the Koreans was so strong that 3G technology receded in Korea with a reduction in the number of its subscribers, falling from 35,3 million in January 2012 to 26 in January 2013 million, on a saturated market with a penetration rate of the mobile exceeding 100% (107,2% in January 2013).

The remarkable increase in the number of subscribers shows that 4G currently witnesses encouragement in South Korea. No other network technology has ever witnessed such a great success on the Korean market. Indeed, by way of comparison, the ownership of 3G in Korea required a period of three years and six months to reach 20 million subscribers.

The mode of initial marketing of 4G related to a limited volume of data, to avoid the overload of networks, then of new fixed prices for unlimited data were launched, in January 2013, but conditioned by a bandwidth reduction in the event of exceeding a basic volume ranging between 14 and 25 Go of downloading. The tariff of these unlimited fixed prices is more expensive than those of 3G and varies between 66 and 91 euros, according to the periods of time offered for the voice as against 38 and 66 euros for the 3G.

The optimization of the quality of 4G networks was conducted, inter alia, by a new technology of virtualization of base stations. This technology allows managing currently 252 base stations in Korea as if it were a matter of only one station (virtualization by unit).

One the key factors of the success of 4G technology is the availability of a broad range of terminals compatible with 4G standard, especially Galaxy Note and Galaxy-S series of Samsung or Optimus 4G series of LG. Such success is explained, also, by fierce competition between the operators, which increased the marketing expenditure of operators up to 70% between 2011 and 2012.

The development of services devoted to technology explains also the appropriation of this technology by the Koreans, in particular the services of data-

¹⁵ Nearly 50% of the mobile data of the operator Verizon Wireless are conveyed in 4G.

consuming contents, such as HD video, multi-player network games, music and streaming videos¹⁶ and the services of cloud computing¹⁷.

Notwithstanding the success of South Korea in 4G deployment, Korean operators face financial problems due to fierce competition. Indeed, in spite of the increase in the number of subscribers and the marketing expenditure of the three operators, the actual profit did not increase and ARPU¹⁸ even slightly decreased.

2.3. Japan: suspension of 2G, reinforcement of 3G and dynamism of 4G

With a share of 9,7% in GDP in 2009, CIT sector in Japan contributes to the third of growth. Japan, a precursor in mobile Internet since 1999 thanks to “I-mode”, is endowed with powerful industrial actors, such as “NEC” and “Mitsubishi Electric”, which dominate the domestic market in the field of network equipment. As for the mobile terminals of the fourth generation, they are mainly manufactured by Japanese suppliers such as Sharp and Panasonic, respectively 1st and 3rd of the Japanese mobile phone market (respectively 26,2% and 15,1% of market shares).

The market of mobile high bandwidth, especially that of 4G, is dynamic in Japan and is the object of real competition among the four national operators: NTT Docomo, Softbank, KDDI, and eMobile. The first launching of 4G was conducted in 2009, by E-mobile, which launched the first service in July with “Pocket Wifi” applications. Historic operator “NTT Docomo”, launched 4G in December 2010, aiming at providing the services of this technology to 50% of the population by 2014 using 20.000 base stations. Its competitors, KDDI and Softbank, launched their 4G services at the beginning of 2012.

The Japanese operators diversify their infrastructures, putting an end to 2G network and multiplying 3G and 4G networks with massive deployment of Wifi, to discharge congested cells, to absorb the strong increase in the exchanges of information on mobile networks and to prevent the risks of the saturation of networks.

The operators envisage ambitious investments of almost 10 billion euros at the end of 2014 to deploy very high bandwidth mobile, LTE especially technology.

2.4. 4G experience in France: ambitious coverage of the territory

¹⁶ Mode of transmission of audio and video data. These are transmitted in continuous flow as soon as the Net surfer requests the file rather than after the complete remote downloading of the video and extracting sound.

¹⁷ 4G services of Cloud computing concern, inter alia, of the applications dedicated in Cloud. The applications are downloaded in Cloud of the operator (and not in the smartphone) and the users can use them directly from Cloud in streaming.

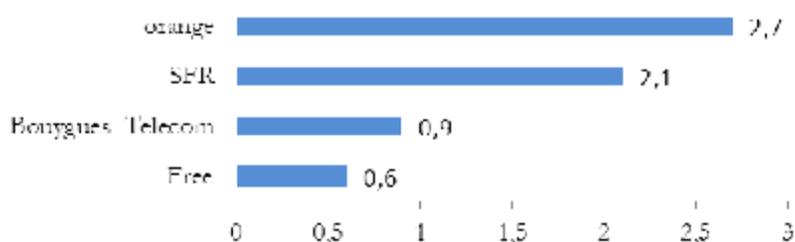
¹⁸ Average Revenue Per Links or Average Revenue Per User or ARPU is the average monthly turnover achieved by a company with a customer. It is a financial datum used by the operators of telecommunication.

The regulatory agency of the electronic communications and stations (ARCEP) has granted, since the end of 2011, authorizations for the deployment of 4G technology to four operators, namely Bouygues Telecom, Orange France, SFR and Free.

The characteristic of the French experience lies in its concern of meeting the priority requirement of digital development of the territory working out an adapted terminal. Thus, the coverage rate of the metropolitan population, to reach in fifteen years (2026), is fixed at 99,6%. This is supplemented, for the first time with regard to mobile networks, by coverage rates of the population for each department, of at least 90%, aiming at guaranteeing territorial homogeneity in deployments.

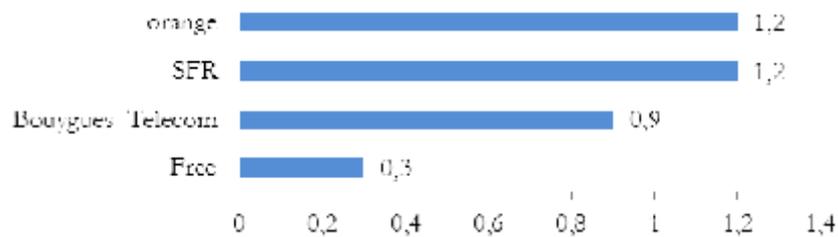
The priority coverage areas, defined in not very dense zones, were also identified by ARCEP. These account for approximately 18% of the French population and 63% of the area of the metropolitan territory, whose coverage is not easily accomplished by high frequencies. Specific obligations of deployment are attached to these zones aiming at the coverage of 40% of the population of these zones by 2017 and 90% of this zone by 2022.

Graph 8: Operators' investments for 4G deployment, except licenses, in 2012 (in billion euros)



The acquisition cost of 4G licenses in France in 2011 amounted to 3,6 billion euros and the investments for the deployment of operated network (except licenses) in 2012 amounted to nearly 6,3 billion euros. The analysis of the expenditure by operator shows that Orange invested the largest sum of 3,9 billion euros, which enabled it to top the coverage competition. In the second position appears SFR operator, which invested 3,3 billion euros for 4G deployment, including 2,1 billion euros in 2012 for the construction of a 4G network up to the standard of competing with Orange.

Graph 9: Cost of the acquisition of licenses in 2011 (in billion euros)



The third operator, Bouygues Telecom, optimized its investments with a deployment cost of 1,8 billion, including less than one billion for the construction of the network. The saving as to expenditure in infrastructures was ensured by the conversion of 2G network into 4G network. Bouygues could significantly extend, thus, coverage with less expenditure (50 million euros per annum, in addition to its royalties). Free Mobile ranks forth as it spent 300 million euros for the acquisition of 2,6 GHz frequencies whose range is small, hence requiring more antennas to cover a zone than need with 800 MHz frequencies. This is a strategic choice for Free to acquire these wavebands spending less in terms of license purchase.

In terms of market 4G development in France, the number of subscriber still did not reach one million subscribers at the end of 2012, standing at 916.000 customers 65% of which subscribed with Bouygues Telecom. the French delay is explained by the quality of the fixed high bandwidth which makes it possible to offer ADSL triple play services, which consequently limits 4G development. It is also explained by the lack of availability of terminals compatible with 4G, and by the gradual coverage of the population by 4G, currently confined with a few agglomerations. The advent of Free, in January 2012, considerably reduced the benefit of operators which had to reorganize to face the massive fall of package prices and made the choice of making 3G infrastructure profitable.

2.5. Experiences of the United Kingdom: Offer centered on large metropolises

The United Kingdom, whose 4G was introduced in November 2012 by a joint-venture of Orange and Deutsche Telekom¹⁹, witnesses accelerated competition since 29 August 2013, following the introduction of two new operators: O2 and Vodafone. The latter operate in only three cities, namely Leeds and Bradford for O2 and London for Vodafone. The United Kingdom should then have 2,3 million 4G customers at the end of 2013, according to Analysys – Mason Consultants.

In parallel, operators invest heavily on the deployment of infrastructures. Vodafone increased by 50% its expenditure on 4G infrastructures in the United Kingdom to reach 500 million euros in 2013. Orange and Deutsche Telekom²⁰ are conducting an investment plan of 1,5 billion books over three years. Finally, the

²⁰ Giving rise to the establishment of the British subsidiary company EE “Everything Everywhere”

operators have also bought transmission frequencies at a cost of 2,4 billion pounds at the biddings organized by the British authorities.

2.6. Lesson learnt from 4G deployment

The examination of foreign experiences shows that the countries having succeeded 4G deployment ensured a total coverage of the territory by technology, set up an ecosystem of services dedicated to 4G, ensured the availability of terminals compatible with high bandwidth technology and carried out the regrouping between operators and the pooling of networks. The main lesson learnt from the analysis of these international experiences can be detailed as follows:

- The possibility of offering a total national coverage appears, first of all, as a crucial factor. The difficulties of French and British operators in conquering customers by 4G are partly explained by a still limited coverage of the territory. Thus the commercial objectives²¹ of British operators (Orange and Deutsche Telekom) strongly contrast with those of South Korean operators whose services offered in less than one year on the entire territory attracted millions of customers. Hence, generalized deployment requires substantial investments, particularly for countries with large area in regions with low densities, which does not constitute an incentive for the engagement of operators (France is more than six times larger than South Korea, while the latter is nearly five times denser than France).
- The availability of a full range of terminals constitutes a second precondition to the success of 4G. In Europe, in 2009 and at the beginning of 2010, the absence of smartphones compatible with 4G limited this technology to the niche market of data mobile, intended for professional customers. Conversely, South Korean operators proposed, as of its launching, a rich range of more than 30 terminals, guaranteeing a very fast business success to it. This opening is unquestionably due to the supremacy of the South Korean manufacturers on the market of mobile phones, in general, and that of smartphones in particular. Thus, during the third quarter of 2013²², two South Korean companies, namely Samsung and LG Electronics, appeared among the first five manufacturers in the world with a cumulative share of 36,9% (respectively 32,1% and 4,8%) as to the world sales of smartphones.
- The existence of an ecosystem of complete and diversified services to stimulate uses constitutes a third precondition for the development of 4G. The operators in South Korea invested their efforts in the development of data-consuming content services, such as HD video, multi-player network games, streaming music and

²¹ To reach 4% of their mobile base at the end of 2013.

²² "Market Share Analysis: Mobile Phones, Worldwide, 3Q13", Gartner, November 2013.

videos²³ and cloud computing services. In the same vein, though the commercial opening of 3G dated from the beginning of 2000, it was necessary to await for the launching of iPhone and App Store in 2008, to ensure the takeoff of this technology through the consumption of mobile data and the development to innovating and attractive mobile services²⁴.

- Some marketing policies can also inhibit the development of 4G. As shown by the British case, the operator “Everything Everywhere”, indeed, had to face the very aggressive strategy of one of its competitors which diverted part of the customers of 4G towards the launching of an unlimited 3G fixed price with mobile Internet for 15 euros a month. The takeoff of very high bandwidth mobile, along with the creation of value on the British telecommunications market, was thereby delayed.
- The clustering of operators and the pooling of networks prove to be important for the success of 4G deployment. To try to limit expenditure, the British operators, in particular Orange and Deutsche Telekom, gathered and carried out their joint-venture in 2010 with a view to preparing 4G. The two other operators, O2 and Vodafone, in turn, pooled the investments in their network to reduce the costs of 4G deployment.
- The subsidies on compounds contributed considerably to the increase of the penetration of 4G the last two years in the United States. The average retail price (before reduction and subsidies) of 4G smartphones in developed markets such as the United States remained stable around 450 \$ US in recent years.
- Change in the economic models of invoicing data by putting an end to the offers of unlimited data. Tariffing according to bandwidth is important to manage to monetize 4G, especially since this technology encourages the consumption of mobile data exceeding that of 3G. 4G users consume on average 1,5 Go of data per month; that is nearly twice the average quantity consumed by 3G users.
- 4G networks in the entire world were deployed in 12 different wavebands, chief of which are deployed in one of the four bands: 700MHz, 800MHz, 1800MHz or 2600MHz.

3. Analysis of telecommunications market in Morocco

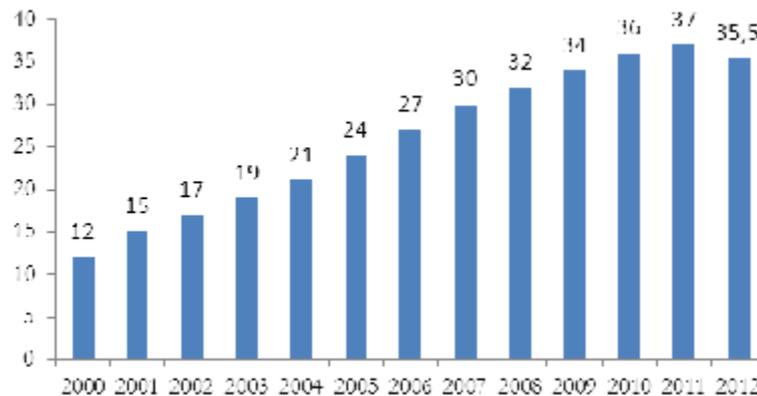
3.1. Turnover of the sector

Since its opening to competition, the telecommunications market has witnessed a sustained high growth of its turnover with a rate of 3,9%/year between 2008 and 2011 standing at 36,9 MMDH. However, the year 2012 witnessed a decrease of 4,1% following the fall of the prices inherent in the competitive momentum which was established among the actors of the sector.

²³ Mode of transmission of audio and video data. These are transmitted in continuous flow as soon as the Net surfer requests the file rather than after the complete remote downloading of the video and sound extraction.

²⁴ Services of geolocalization, social networks, streaming of audio-visual contents.

Graph 10: Trend of the turnover of the telecommunications sector (in billion MAD)

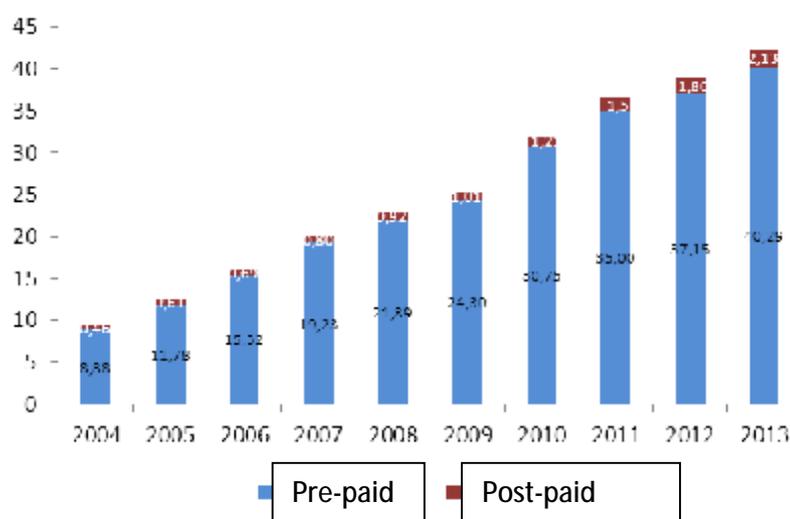


This performance of the sector is the result of the reform conducted by Morocco, marked in particular by the liberalization of the segments of mobile and land phones, the opening of the capital of the historic operator, the launching of 3G and establishing the guidelines for the sector, regarded as roadmaps to maintain the growth of the market and act against the digital divide.

3.2. Market of mobile telephony

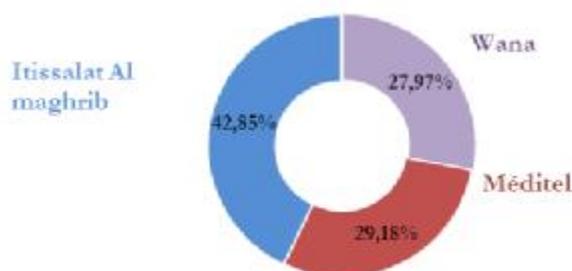
The mobile market witnessed strong growth in terms of subscribers between 2000 and 2013, up from 2,52 million to 42,4 million. The prepaid option monopolizes the largest market share of the mobile segment with more than 95% of prepaid subscribers and around 5% of postpaid subscribers in 2013.

Graph 11: Growth of the number of mobile subscribers by deal (In million)



In terms of the penetration rate of mobile telephony in the population (130% in 2013), Morocco moved from the 56th to the 52nd position out of 144 countries²⁵. This rise occurred thanks to the numerous offers of the three operators giving access to mobile telephony for the entire population.

Graph 12: Structure of the mobile base by operator in 2013

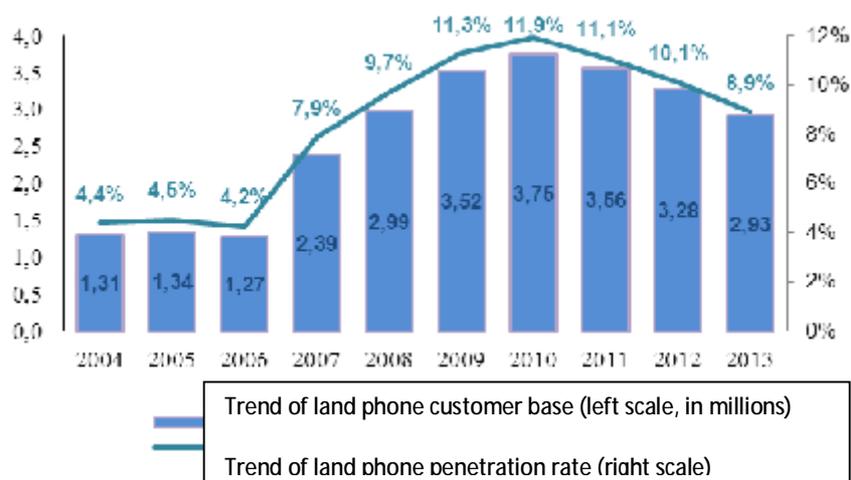


At the end of 2013, the operator Itissalat Al Maghrib held the greatest share of the mobile customer base with 42,85% of the market, as against 29,18% for Meditel and 27,97% for Wana.

3.3. Land phone market

Since the introduction of competition, the number of subscribers to land phone has witnessed an average annual growth of 22,85% between 2005 and 2010. However, this customer base witnessed a decline of 9,3%, between 2011 and 2013, down from 3,6 million to 2,9 million subscribers.

Graph 13: Trend of the number of subscribers and the penetration rate of land phone



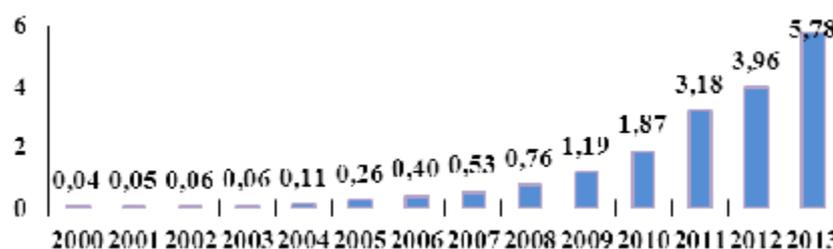
²⁵ "Report 2013-2014 on world competitiveness", World economic forum (WEF), September 2013.

The penetration rate of fixed in the population remains weak and accounts for 8,9% at the end of 2013. This situation reflects the downgrade of Morocco by 6 positions in the classification of WEF of 2013 which places Morocco at the 93rd place out of 142 countries.

3.4. Internet market

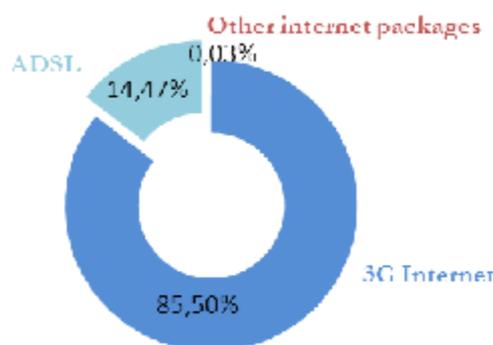
Total Internet customer base reached almost 5,8 million subscribers at the end of 2013, achieving an average annual growth of 47% over the period 2005-2013. This tendency was reflected positively on the penetration rate of the Internet which reached 17,6% at the end of 2013. In terms of Internet users, Morocco is ranked 57th out of 141 in WEF of 2013. On the other hand, the classification of Morocco as to the number of subscribers in high bandwidth land and mobile Internet remains weak, since it occupies respectively the 99th and the 85th positions.

Graph 14: Trend of the number of Internet subscribers (in million)



The 3G mobile Internet subscribers dominate the Internet market with a share of 85,5% of the total customer base at the end of 2013, as against 82,73% in 2012. The customer base of subscribers 3G is passed of 2,59 million subscribers in 2011 to 4,94 million in 2013, that is an average annual growth of 38,1%.

Graph15: Distribution of Internet customer base by access type in 2013

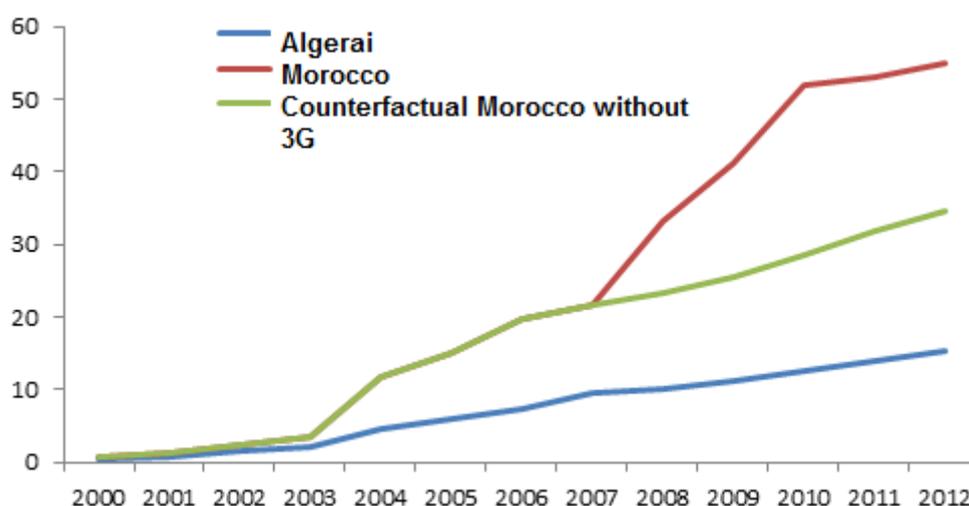


The democratization of 3G Mobile Internet benefits from the advent of tactile tablets, 3G flash drives and the falling prices of telephones. The subscriptions to 3G Internet service “Data Only” amount to about 1,58 million (32%) whereas the subscriptions combining “Voice + Data” are about 3,36 million (68%).

Thus, the move to 3G made it possible for the Internet sector to rise with a sustained two-digit growth, especially after the introduction of real competition with

increasingly attractive prices and offers combining data with voice. In addition, the introduction of 3G constituted a strong call to increase the use of the Internet. On a purely comparative basis, Algeria which just introduced 3G in December 2013 and which represents a counterfactual representative of Morocco, considering the socio-economic similarities of the two countries, posts only an individual use ratio of the Internet of 15,2% compared with 55% for Morocco.

Graph 16: Trend of individual use ratio of Internet in Morocco, Algeria and the counterfactual of Morocco without 3G



Thus, it turns out that the telecommunications market in Morocco has witnessed a remarkable expansion, especially in its aspect relating to the Internet. This development is partly due to the adoption in 2006 of 3G, which opened technological and commercial new prospects for operators. The users also benefited from this base which showed significant level of Internet use opening up numerous prospects.

In addition, several analyses agree on the role of new technologies, in general, and the Internet, in particular, in the social growth development and integration in the

knowledge economy. Indeed, the economic value²⁶ generated annually by Internet amounts to 119 US dollars per capita in emerging countries, as against 1.488 US dollars per capita in developed countries. Moreover, the economic impact on the sector of SME was also positive as regards job creation. For each employment loss in emerging countries, Internet created 3,2 jobs. This rate is higher than that of developed countries, which is 1,6 jobs created for a lost job. The surplus value for the Net surfer in emerging countries is significant, since it ranges between 9 US dollars per month and Net surfer in Nigeria and 26 US dollars per month and Net surfer in Taiwan.

Thus, the migration towards new technology, especially 4G, stimulating the use of Internet, appears an opportunity which Morocco should seize while the turnover of the sector of telecommunication shows faltering signs, and Morocco seeks to consolidate its comparative edge.

4. National policies for the development of telecommunications

The performance which the telecommunications sector witnessed are the result of the development model adopted by Morocco, particularly through various General Guidelines (GG) of the sector established since 2004 as well as the implementation of the Digital Plan of Morocco 2013, which is dedicated to the development of new technologies.

GG for the development of the telecommunications sector

To maintain the growth of the sector and react against the digital divide, three GG for the development of the telecommunications sector were worked out by ANRT. They constitute true roadmaps for all stakeholders as well as private and public operators. The assessment of these GG proves to be conclusive since it largely exceeded the objective of the sector (a land and mobile customer base of 34 million subscribers and 2 million subscribers in the Internet). However, it should be noted that the telecommunications sector reached its limits in terms of reducing the digital and territorial gap requiring to move on to a new development model, which will enable this sector to reach a new even more ambitious development cycle, while following the fast technological changes and benefitting the most from the possibilities offered in terms of opportunities of social and economic development.

It is in this new ambition that lie the new GG covering the period 2014-2018, being prepared by the National Agency for the Regulation of Telecommunications (ANRT), whose main objective is to grant more visibility for the actors of the market and maintain the development of the sector, which today contributes by approximately 5% to the national GDP.

²⁶ "Impact of Internet on emerging economies", McKinsey & Company, March 2012.

This new orientation for the sector will hinge on 5 lines, namely the expansion of the universal service of high bandwidth Internet, based on mobile technologies, optical fibers and satellite technologies, the introduction of the fourth generation of mobile networks (4G) in view of the pressure currently exerted on 3G (ANRT plans the commissioning at the end of 2014 or the beginning of 2015) and the development by the operators of the sector of monetized contents, which constitutes a growth lever of the telecommunications sector in the years to come. It is also a matter of launching the project of fiber optic in the new constructions, which requires the adoption of the new bill of the Code of Town Planning as well as the installation of outdoor Wifi²⁷ allowing the opening in public the Wifi networks of the three operators for the benefit of their 3G subscribers.

Digital Plan of Morocco 2013

The Digital Plan of Morocco 2013, launched in October 2009, aims at making of Morocco a technological hub generating wealth. This strategy aimed to create by 2013 more than 26.000 jobs and to allow the achievement of a direct additional GDP of 7 billion dirhams, to which would be added 20 billion in an indirect way.

The Digital Plan of Morocco 2013 hinged around four lines: to support access to the Internet and knowledge, to develop E-government program, to improve the computerization intended for small and medium-size companies in order to increase their productivity, and to support IT actors both locally and offshore.

Through its first line, digital Morocco accessible aimed at providing citizens with access to high bandwidth Internet and supporting access to exchanges and knowledge by connecting one home out of 3 to the Internet and by ensuring the integration of ICT in education: Injaz, Genie, Nafida.

In spite of the fulgurating growth of the adoption of Internet stimulated by the implementation of Digital Morocco 2013 and the various GG, a digital divide separates the city populations from rural populations and the richer and poorer. The urban populations, which account for 58% of the total population, are the driving force of the use of the Internet thanks to an access largely available via high bandwidth land or mobile connections and public access points such as cybercafés.

On the other hand, a saturation of 3G frequencies is noted with high latency following the massive data exchange: social networks, mini-blog and VoIP²⁸. This gives rise to the need for resorting to powerful technologies, especially 4G, offering access to very high bandwidth in mobility and making it possible to eliminate the

²⁷ Inwi launched outdoor Wifi in July 2013 in the pilot city of El Jadida.

²⁸ It is a technique which makes it possible to communicate by voice on compatible IP networks, whether on private networks or Internet, telegraphic (cable/ADSL/optic) or otherwise (satellite, wifi, GSM).

constraints on the capacity of 3G networks. In order to remedy these constraints, Morocco plans, within the framework of GG 2014-2018, 4G deployment during 2015.

Box 1: Achievements of the programs of the line on social transformation

Morocco Digital Plan 2013

Génie Program is the operational dimension of the national strategy of generalizing ICT in Education, adopted in 2005. It hinges on four major components: infrastructure, teacher training, digital resources and the development of uses. Launched at the beginning of 2006 and reviewed in 2009, this program allowed the equipment of almost 87% of schools with basic multi-media environment, which corresponds to 2.957 establishments. With regard to training, 70% of the roadmap of the program was carried out; that is nearly 150.000 people were trained out of 209.702 planned at the beginning and 148 GENIE training centers were created in all academies, delegations and initial training centers. The development of the computing infrastructure and training was accompanied, in parallel, with a reinforcement of the capacities of uses through proximity workshops (200 workshops), distribution of ICT information cases (200.000 cases) and creation of a national observatory for ICT uses. In terms of steering and operationalization of the program, a team dedicated was set up at the central level tasked with deploying the

4.1. Stakes and challenges of 4G deployment in Morocco

Morocco approaches a new stage of development of the telecommunications sector through the access to mobile technologies of the fourth generation, which constitutes a technological necessity supposed to offer Moroccan users access to high bandwidth on the mobile.

Concretely, 4G makes it possible to have a bandwidth largely more significant than that of 3G. This high bandwidth technology gives access, from the mobile, to services which require a great transport capacity of data such as high-definition streaming, video calls, etc....

Economic challenges

4G would constitute a genuine lever of performance for companies, enabling them to benefit from more innovating products and solutions, hence reconfiguring the

way of using communication services. The activities of Moroccan companies²⁹, especially access to markets, the sale and purchase of products will be facilitated by 4G technology.

This technology will conduct change in the economic activity, promoting innovation in the services provided to companies via the use of collaborative solutions, especially *machine to machine* (M2M), allowing them to be more powerful and more productive.

In addition, the development towards 4G is likely to stimulate the growth of private consumption³⁰ in Morocco, particularly through the development and use of the supply of goods and services related to m-commerce whose active number of application amounted to 22 in 2011. These applications are distributed in the sectors of education, tourism, deals, invoicing and taxes, as well as catering. 4 G would hence constitute a powerful channel for m-commerce. The growth of private consumption should drive the contribution of Internet to GDP which was 1,2% in 2011.

The rapid growth of the number of Moroccan Internet users, stimulated by 4G, would boost the domestic market for Net businesses, which emerged in the last three years. Some of these businesses are Mydeal, Marocannonces, Soukaffaires, Clicoo, Hmizat,...

Social challenges

The adoption of 4G would increase the usefulness which private individuals gain from the use of services on the Internet, through the use of search engines with regard to e-shopping and the e-gov, as well as the consumption of the media and access to information. The benefit of 4G for the private individuals also relates to the access to a broad range of research tools in fields such as m-education and m-health.

Challenges around the development of new services

The performances related to 4G technology would serve as a driving force for the development of several differentiated activities and services around video-telephony and cloud telephony. A multitude of new mobile services become possible, especially in the field of teleworking or mobile administration (m-government).

Challenges in the reduction of the digital divide

4G has also a significant potential of reducing the digital divide in Morocco by allowing the reduction of the inequalities between territories as regards digital

²⁹ 48% of the Moroccan companies are operating on the Internet, 91% have a domain name.

³⁰ In which the Internet contributes at a total value of 55%.

communication, especially since a digital divide separates city populations from rural populations as well as the richer and poorer. The urban populations, accounting for 58% of the total population, are the driving force of the use of the Internet in Morocco. 4G could constitute an alternative to curb the digital divide. It is the option explored by Orange in France on three zones called “digital villages”. It will address subscribers located too far from the connection nodes of land network. This offer will offer a box making it possible to connect to the Internet and make phone calls.

Challenges of 4G

The deployment of 4G networks constitutes the major technological stake for the next years but their installation involves challenges to take up. The obstacles which can slow down the development of 4G in Morocco would not be of a technological nature since it is already deployed throughout the world. The networks and equipment are with maturity and the approach of pooling developed by foreign operators could be exploited in Morocco as solution to address the problems of the cost of networks. The inhibitors of 4G deployment may relate to the following:

- Appetite of the market with respect to technology: the market can be at the beginning undecided about the uses of high bandwidth mobile related to the new services offered by technology. The operators should, on the one hand, integrate a latency time between the provision of services on high bandwidth mobile and , on the other hand, even anticipate an effort of popularization and training of customers on such uses.
- The price of network equipment: since Morocco does not produce the equipment of networks, and considering their high prices on the international market, their import will involve an increase in the resources devoted to the acquisition of foreign technologies and will impact the balance of payments deficit.
- The price of 4G terminals may be very expensive, especially in Morocco where the prepaid option dominates, which makes their dissemination more difficult among the population. Likewise, the mode of subsidizing terminals associated with contracts of the post-paid types cannot be exploited fully in Morocco because of significant share of the prepaid type.
- The division of value among the various actors of the value chain of 4G ecosystem, especially operators, equipment suppliers and producers of contents. A share of the value will go to the creators of contents (up to 90% according to nature of contents and author) and another share will benefit the new levels of intermediation which will be created and which can be numerous (aggregation of contents, packaging, hosting, telephone micro payment). To develop these various actors, not only one new chain of value will be constituted but also new business models around the acquisition of contents should be set up: subscription, fee for service, renting... the definition of these business models could well be difficult with the prevalence of the prepaid type.

0Box 2: Factors of building 4G ecosystem in Morocco

The first stage of the constitution of a solid 4G ecosystem is the coverage of the territory by a quality network infrastructure. It is necessary to strive to ensure the availability of the required wavebands, to provide them to the operators in convenient timeframes and to use those resulting from the digital dividend (the entire set of frequencies released following the move to terrestrial digital television and the stopping of analog television). This is not merely a question of providing good quantity frequencies, but ensuring harmonized bands at the global level.

Beyond infrastructure, a mature 4G ecosystem is defined by the intensity of the use of technology by the entire set of actors, mainly private individuals, companies and governments. In order to increase the number of private individuals using 4G, it is necessary to ensure the availability of terminals compatible with 4G, to reduce the costs of access to devices through subsidies, to develop new applications and services adapted to the Moroccan contexts, especially with regard to the contents in the national language and to develop good quality subscription packages. The companies, also, benefit from the considerable merits of the use of 4G, but should invest in this

4.2. Opportunities of 4G deployment in Morocco

In view of the world development of the telecommunications sector and the current situation of this sector at the national level, opportunities related to 4G deployment are offered to Morocco including the following:

- Need for boosting the turnover of the sector after the fall of 4,1% recorded between 2011 and 2012, which testifies to the beginning of the downturn of the current model. 4G deployment in Morocco would make it possible to ensure the recovery of the benefit of the sector thanks to the income of mobile data which would be better monetized than that of 3G. In developing economies, the operators noted that 4G users can generate an ARPU³¹ 7 to 20 times higher than 3G.
- Reinforcement of the growth and competitiveness of the Moroccan economy through a better implementation of the mobile economy, which should be placed in the center of the growth strategy of the country. Recent studies show, indeed, that with each doubling of the volume of mobile data used, GDP grows by 0,5%. The digital

³¹ Average Revenue Per Unit or Average Revenue Per User or ARPU is the average monthly turnover achieved by a company with a customer. It is a financial datum used by the operators of telecommunication.

economy currently accounts for 21% of the growth of GDP of the most advanced economies.

- The existence of an industrial fabric dominated by SME whose use of 4G constitutes an opportunity to benefit the most from the potential offered by this technology in terms of information exchange and developed applications. These uses would be capable of reinforcing the competitiveness of companies and increasing their productivity, especially machine to machine (M2M) and cloud telephony. The companies consequently have their turnover increased and their costs reduced. Compared with other emerging countries, Moroccan SME connected to the Internet post productivity gains resulting from Web technologies of 5,3%, as against 11,4% in other studied emerging countries³².
- The reinforcement of the benefits gained by Internet users from the use of mobile data in Morocco. The surplus value, in 2011, is 2 billion dollars US per annum³³ for the entire connected Moroccan population. The introduction of 4G would ineluctably induce the increase in the penetration rate of Internet and an increase in the use of online services; hence Moroccan Internet users will derive even more value in the years to come.
- The existence of a young population which constitutes the driving force of the use of mobile data, online services offered (m-banking, m-payment, TV channel on mobile...) and the services of geolocalization. This youth is involved actively in the activities of social networks and the search for online contents using smartphones and tablets. Consequently, 4G with the advantages which it offers in terms of high bandwidth and low latency time, would meet the new uses of consumers and allow the creation of a significant surplus of value for internet users.
- The development of services related to m-government. The latter would make it possible to provide practical and transparent services, to make savings for the benefit of administrations and to reduce expenditure for citizens and companies.
- The explosion of the use of mobile data envisaged at the global scale in the next five years, which should grow at the rate of 78%. In Morocco, the customer bases of Internet 3G data only and voices + data, covering respectively 1,63 million subscribers and 1,64 million in 2012, should to follow this global momentum.
- Growth in Morocco of the equipment in smartphone by 30%³⁴ between 2011 and 2012, with plans to equip 20% in 2013.

³² "Impact of Internet on emerging economies", McKinsey & Company, March 2012.

³³ "Impact of Internet on emerging economies", McKinsey & Company, March 2012

³⁴ "Use of ICT in Morocco. Access and use of households and private individuals for the year 2012", ANRT, 2013.

- Expected increase of acquisition of tablets and personal computers. Almost one Moroccan household out of five (20%)³⁵ intends to acquire or replace a computer and 5% of households express their wish to acquire a tablet.
- The maturity of the ecosystem which develops around 4G worldwide. The operators in Morocco can launch their 4G services under good conditions. With regard to terminals, the offer of smartphones and tablets is quite rich; as to networks, technology is already deployed at large scales without encumbers in many countries (the United States, Japan, South Korea, Scandinavia).
- The development of e-gov services for the benefit of citizens and companies (request for administrative documents, payment of taxes, applications for establishing companies...) in which the use of high bandwidth mobile constitutes for the users a powerful and fast channel to communicate with the administration. The latter will benefit from productivity gains and a greater transparency and celerity with respect to citizens.

³⁵ "Use of ICT in Morocco. Access and use of households and private individuals for the year 2012", ANRT, 2013.

Conclusions and development prospects of the telecommunications sector

After 2G and 3G technologies, 4G constitutes the next technological turn awaited in mobile telephony. For this reason, the relevant challenges are serious for the national economy. Allowing high bandwidths with low latency time, this technology benefits companies, by improving their productivity and reinforcing the mobility and virtualization of their workspace. Companies would more easily access services in cloud telephony and the applications developed by exploiting the capacities of 4G network. Such technology would allow significant use of mobile data and would also open access to new digital uses, particularly the remote downloading of high-definition multimedia, video-telephony, and so on, in a smooth fashion and in a situation of mobility.

4G networks are already deployed in North America and certain Asian and Scandinavian countries which, for the latter, made the choice to move directly to 4G standard. Thus, the global market of 4G is at a tipping point. On the “precursory digital” markets such as the United States, South Korea and Japan, the migration towards 4G networks is well advanced and the operators monitor the rising engagement of subscribers and the related average revenue by subscriber. Today, other emerging markets opt for 4G in greater numbers, and the forecast of a two-digit annual growth of 4G connections in the world will be materialized between 2013 and 2017, by new consumers throughout the world adopting the networks of the 4th generation.

In Morocco, the recourse to powerful technologies, particularly 4G, offering access to very high bandwidth in mobility, becomes a necessity which allows overcoming the constraints of capacity of 3G networks. The congestion of 3G networks is noted with a high latency time following the massive exchange of data, especially on social networks, mini-blogs and VoIP³⁶. To remedy these constraints, ANRT plans, within the framework of GG 2014-2018, 4G deployment during 2015.

The explosion of the use of mobile data on 4G, envisaged worldwide during the next five years, which should grow at the rate of 78%, constitutes an opportunity to seize that would make it possible for Morocco to increase the consumption of mobile data, while forming part of this global momentum. The customer base of 3G mobile data in Morocco in 2012 is 1,63 million subscribers 3G data only, and 1,64 million subscribers 3G voice + data.

The increase in the use of mobile data would be stimulated in Morocco by youth in the Moroccan population that consume such technology. This youth is involved

³⁶ It is a technique which makes it possible to communicate by voice on compatible networks IP, whether on private networks or Internet, telegraphic (cable/ADSL/optic) or otherwise (satellite, wifi, GSM).

actively in mobile activities and applications, especially online mobile services (m-banking, m-payment, multi-media...), services of geolocalization and activities of social networks and the search for online contents.

4G would ineluctably induce the reinforcement of the benefit derived by Internet users from the use of mobile data in Morocco. The surplus value, in 2011, is 2 billion dollars US³⁷ per annum for the entire Moroccan connected population. Consequently, 4G deployment in Morocco would constitute a source of considerable growth. This growth would result from the income generated from mobile data which would be monetized better than that of 3G. Recent studies show, indeed, that with each doubling of the volume of mobile data used, GDP grows by 0,5%³⁸. The digital economy currently accounts for 21% of the growth of GDP of the most advanced economies.

In addition, these 4th generation networks will benefit from the existence of a fabric of companies dominated by SME, for which the use of 4G constitutes an opportunity to benefit the most from the potential offered by this technology in terms of the exchange of information and developed applications. These uses would be capable of reinforcing the competitiveness of companies and increasing their productivity through, inter alia, machine to machine (M2M) and cloud telephony. Consequently, the companies will have their turnover increase and their costs decrease.

The construction of 4G ecosystem in Morocco would benefit also from the envisaged increasing acquisition of tablets and personal computers in Morocco. Almost one Moroccan household out of five (20%) intend to acquire or replace a computer, and 5% of households express their wish to acquire a tablet. The same holds for the equipment in smartphone, as growth of 30% of equipment was recorded between 2011 and 2012, with intentions to ensure equipment by 20% at the end of 2013³⁹.

On the basis of analysis carried out within the framework of this report and in order to support the development by the sector, especially 4G deployment, many lines of progress could be explored, hinging in particular on the following points:

Ensure the availability of wavebands

³⁷ "Impact of Internet on emerging economies", McKinsey & Company, March 2012.

³⁸ "Use of ICT in Morocco: Access and use of households and private individuals for the year 2012", ANRT, 2013.

³⁹ "Impact of Internet on emerging economies", McKinsey & Company, March 2012.

Among the factors identified for the installation of a strong 4G ecosystem is, first and foremost, the availability of wavebands. The move to digital television allows substantial gains in effectiveness of use of the spectrum of radioelectric frequencies. Hence, analog television should be exceeded to allow the release of frequencies. These spectral resources, called digital dividends, made available can be reallocated for 4G deployment.

Guarantee a good 4G coverage in Morocco

For mobile telephony, after having undertaken efforts of coverage of blank zones, it appears necessary to ensure that the deployment of the networks of 4th generation is conducted concomitantly in the urban and rural areas by identifying the priority areas where criteria such as demographic density, economic activity and degree of profitability will be taken into account. In this vein, it would be particularly important to ensure the coverage by high bandwidth mobile the zones of tourist and economic interests, which would enable them to improve their attractiveness and confer a real added value upon them and to exert a positive impact on their socio-economic development.

Ensure the pooling of high bandwidth mobile networks

Following the example of countries where the pooling of 4G networks was integrated under the conditions of granting licenses, Morocco should encourage operators in a more concrete way to engage in the pooling of the networks or even frequencies. This pooling would be beneficial in terms of both capital cost for the deployment of technology and the improvement of service quality.

Ensure the digital development of territories

Morocco, following the example other economies having deployed 4G, has real assets to generate from this project. This new stage of digital development, however, can only come to fruition if the sharing of the generated value respects the principles of equity and equal access. Indeed, 4G deployment, if it is not accompanied by terminals guaranteeing an equal access can still worsen the digital divide and the territorial inequalities are likely to worsen.

It would be convenient to accelerate the implementation of the vision of the digital development of territories prepared by the Ministry of Town Planning to support the vision deployed by ANRT for the connection of Moroccan citizens to ICT on equal footing, particularly in rural environment and remote zones.

This vision will reinforce the pressing need for coordination and synergy between the entire set of actors of digital development of territories, especially since the future challenges of the sector concern, first and foremost, the coverage of the citizens in ICT infrastructure and the adequate development of digital contents. At the territorial

level, access to telecommunication services at a competitive cost constitutes a factor of attractiveness and territorial cohesion crucial for the development of the country.

Accelerate the development and use of e-gov services via m-GOV

M-government is a new system in full swing, but already highly developed in certain countries, especially South Korea, which deployed an SMS alarm system to inform the public about seism, or India which developed an Internet portal offering services in the field of health, agriculture, education and energy.

In this direction and the special case of Morocco, it would be judicious to develop other citizen-centered services, supporting this process by applications for mobile phones. M-government represents a considerable advantage for the government by allowing dematerialization of public service and reaching a greater number of citizens, who have access to the Internet by mobile phone. That will make it possible for the country to persevere on the path of progress and to consolidate the first positive results of e-GOV, where Morocco improved its ranking in the index of maturity of the countries established by UNO in 2012, where it occupies the 56th position for the sub-indicator on administrative services on line⁴⁰. This testifies to the invested efforts making it possible for Morocco to outperform India and many other technologically more advanced countries.

Step up the development of new m-commerce services

To support the rise that E-commerce and online payment witnessed by Morocco, on the one hand, and the appropriation by Moroccan consumers of the 4th generation technology, on the other hand, the development of new services of m-commerce seems necessary. In this direction, Morocco offers a potential for the development of m-commerce and m-payment activities, particularly a customer base of mobile subscribers amounting to 42,4 million, a penetration rate of 130% and 9,6 million bank cards.

Ensure transactions' security for the development of the use of ICT services

Political measures often favor the improvement of infrastructures and access of the populations to ICT. It is necessary, also, to step up and coordinate public efforts as regards the use of ICT in the priority fields of action for the development of electronic transactions, especially for m-commerce and m-payment. With a view to removing the obstacles facing m-commerce, it will be necessary to ensure the development of the security of transactions and the development of holding bank cards, allowing online payment.

⁴⁰ Morocco is ranked 92nd for the infrastructures of telecommunication and 168th for the human capacities to include and use these services. Source: "E-Government Survey 2012", The United Nations, March 2012.

All in all, taking account of the strategic stakes of 4G deployment, Morocco is called, in line with the diversity of the fields of modernization in progress or underway, to grant a special place to 4G. Admittedly, efforts remain to undertake in terms of infrastructures and frequencies to meet the appropriate conditions so as to fully benefit from this technological turning point. Crucial challenges for the upgrade of its productive system, particularly that of SME, the reduction of the digital divide, the development of business environment and in favor of the transparency and the consolidation of democracy through equal access to services, to knowledge... loom on the horizon and constitute significant objectives to meet the challenge of 4G successfully.

It is in this direction that the standards of good regulation of the sector are deemed important to support digital development of territories, the compliance to the rules of competition, a better valorization of the terrestrial public domain to successfully cater for the strong growth of the traffic which will be generated by the very high bandwidth mobility.

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List of acronyms

ADSL: Asymmetric Digital Subscriber Line
ANRT : Agence Nationale de Réglementation des Télécommunications
ARCEP : Autorité de Régulation des Communications Electroniques et des Postes
ARPU : Average Revenue Per Unit ou Average Revenue Per User
EO : Exa-octets
GSM : Groupe Spécial Mobile
GSMA: Association of mobile operators
GO : Giga-octets
HSPA : High-Speed Packet Access
IAM : Itissalat Al Maghrib
IDATE : Institut de l'Audiovisuel et des Télécommunications en Europe
LTE : Long Term Development
M2M : Machine to machine
GG : General Guidelines
UNO : United Nations Organization
PO : Péta-octets
GDP : Gross Domestic Product
GNI : Gross National Income
SIM : Subscriber Identity Module
SMS : Short Message Service
ICT : Information and Communication Technologies
AAGR : average annual growth rate
UIT : Union Internationale des Télécommunications.
WEF : World Economic Forum
WIFI : Wireless Fidelity

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