2.1 Introduction

With the advancement of human knowledge and invention of new technologies, the communication sector is growing faster and thereby making the world smaller; dramatically changing the way human beings communicate. For instance, when we row-up to our history of communication, there is an evidence of using pigeon, runner messenger and herald using trumpet or drum for communication. During those days communication takes place by means of physical presence, not by technology. Today with the introduction of new communication technologies such as mobile phone and internet had dramatically changed the landscape of communication. Moreover, studies have shown the positive correlation of mobile phone and internet with socio-economic development. The expansion of telecommunication service is integral to development in today's technology oriented society. It becomes a critical component like electricity, road and transportation in the path of development. Telecommunication is the sending of messages by means of an electrical signal from one place to another. According to Constitution and Convention of the International Telecommunication Union (ITU), "telecommunication is any transmission, emission or reception of signs, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems". Telegraph, telephone, fax, pager, mobile phone, internet, etc., is the example of telecommunication.

The journey of telecommunication started in 1790's, when a French inventor, Claude Chappe built the first visual telegraph or in another term 'semaphore'. The invention of an electrical telegraph by Samuel F.B. Morse in1839 had changed the dimension of telecommunication. A major change in the telecommunication sector was made by Alexander Graham on March 10, 1876 with the invention of the telephone. In 1895, Guglielmo Marconi further developed the electrical telegraph of Morse by introducing wireless telegraphy i.e., radio telegraphy. India had its first experience of telegraph during colonial period. Telegraph line was laid in India in 1839, the year in which Samuel Morse laid the first telegraph line. On 28th January, 1882 the first formal telephone service was established in India (G.G, 2014). At the time of independence India had 84,000 telephone lines for its 350 million populations (Singhal and Rogers, 2001).Mobile phone service was started on 15 August, 1995 on non-commercial basis in New Delhi. India is now the second largest mobile phone user in the world after China with over 973.35 million as of April 2015.

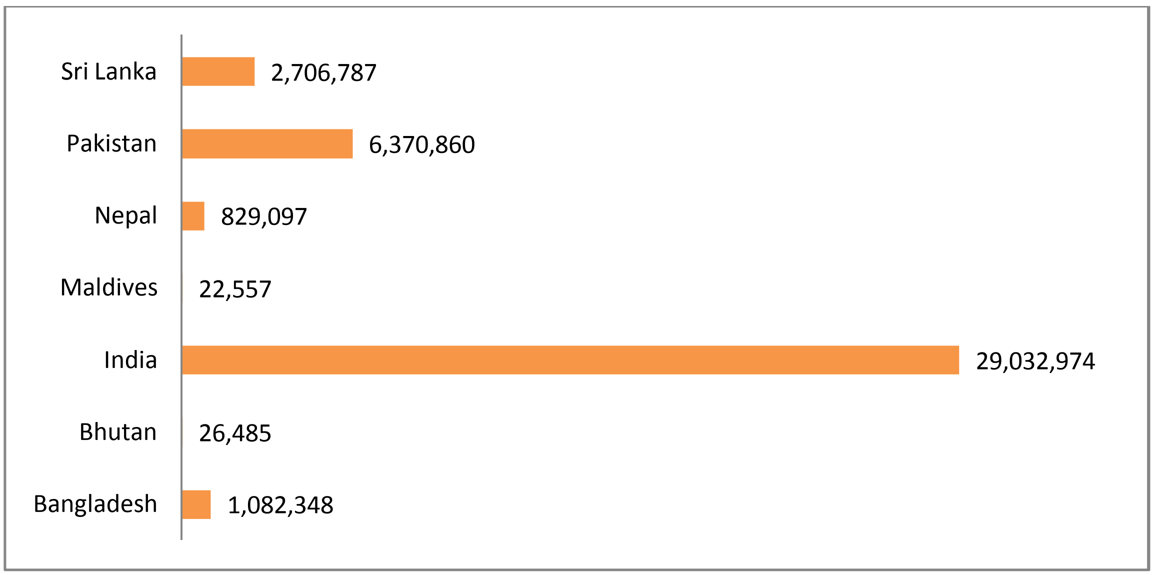
Indian telecommunication revolution was lighted-up in the mid-1980s under the leadership of Prime Minister Rajiv Gandhi, India's "high-tech" national leader, and Satyen ("Sam") Pitroda, a U.S.-returned expatriate Indian. In 1984, Centre for Development of Telematics (C-DOT) was established as an autonomous body with an objective of developing new technologies and promoting research in the field of telecom (DOT annual report, 2006-07). In 1985 the Department of Telecommunication (DOT) was created after separation from Posts and Telegraphs Department. In 1989 the Telecom Commission was established by the Government of India to deal with various aspects of telecommunications and to implement the government's policy in matters concerning telecommunications. Initially, Indian telecommunication network was worse; changes have been brought with the reformation of telecommunication sector in 1990s. After the reformation of telecommunication sector several domestic private firms have started manufacturing telephone equipment, including those designed by Siemens & Ericssion. Tata Telecom & Bharat Telecom soon appeared as a leader in the field.

De-monopolization in the telecommunication sector and the announcement of NTP-1994 had encouraged competition between the newly emerged private telecom operator and government telecom operator, both in the basic as well as cellular services. Such changing scenario in the telecom sector, demand for a regulator and hence Telecom Regulatory Authority of India (TRAI) was established in 1997, as an independent regulatory agency for the telecom sector. To make up the loop hole of the NTP-1994, New Telecom Policy 1999 was approved on 26th March 1999. With the changing landscape of telecom sector of India wireless telephony surpass wireline telephony. As of March 2014, wireless subscription has reached 904.51 million and that of wireline has 28.5 million. Subscription rates of wireline are declining dramatically with the development of wireless telecom sector. Rural telecommunication sector of India has witness a remarkable growth in the recent years. Rural telephone connection including both wireless and wireline at the end of December 2010, was 259.83 million the number was increased to 377.78 million by the end of March 2014. The internet subscriptions rate of India for both wireless and wireline as on 31st March, 2014 was 251.59 million. Besides, India is the second country after Bangladesh which has the lowest mobile tariffs in the world (TRAI). This is a contributing factor in the growth of cellular service. Telecom sector is contributing significantly to the revenues of the Government. The total revenue of telecom sector went up from Rs 2,12,592 crore in 2012-13 to Rs 2,33,815 crore in 2013-14 indicating a growth of 9.98% (TRAI Annual report, 2013-14). The Government of India has also increased the Foreign Direct Investment (FDI) for telecom sector from 74% to 100% on August 2013, to attract the inflow of FDI (DOT Annual report, 2013-14). The telecom sector is the third largest recipient of FDI with more than 7% of total FDI received by the country since 2000. Growth in the Indian telecommunication sector is the fruit of the reformation and de-monopolization of telecommunication in the end of the 20th century. Long term telecom policy and sound regulation are also a contributing factor in the growth of telecommunication in India. Globally, at present there are 6.8 billion mobile subscribers and the demand is increasing day by day. The modern day mobile phones incorporated all the multimedia and there is the witness of rapidly upgrading a system from a simple mobile phone to smart phone. In the near future the demand for mobile telephony will further escalate.

2.2 Telecommunication in South Asian region and India

South Asian is a region comprised of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. In this region the history of telecommunication can be traced back during the colonial period. Initially, telecommunication sector in this region was poor. In 1981, South Asia had a fixed line teledensity of 0.31, which increased to 0.65 in 1991. By 2001, South Asia accounted for 4 percent of the world's fixed lines with 43.7 million fixed lines in operation and less than 1 percent of cellular subscribers with 8.5 million subscribers (Minges & Simkhada).

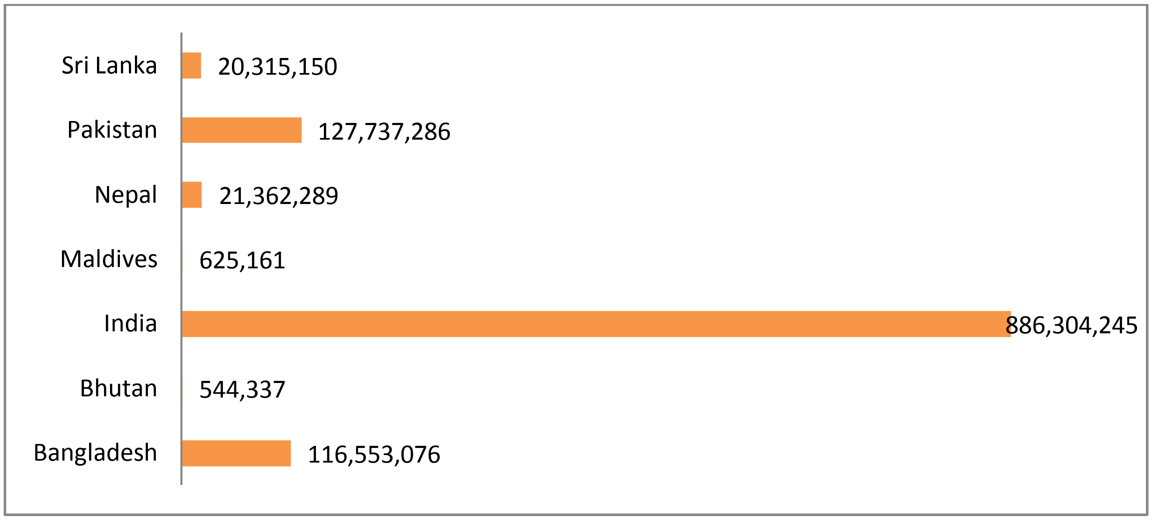
Today South Asian telecommunication sector is growing at a faster pace, this is happening because of the significant transformation of the telecommunication sector and infrastructure development. Allowing the participation of private operators in the sector increased competition and enhanced the quality of services which in turn lead to the development of the sector. Mobile tariffs are the lowest in the South Asian countries as compared to other regions. Bangladesh is the South Asian country which has the lowest mobile tariffs in the world followed by India (TRAI). In terms of cellular mobile subscription India is the second largest cellular mobile subscription in the world after China. Figure 2.2.1, 2.2.2, and 2.2.3 indicate the graphical representation of the fixed line telephones subscriptions, mobile cellular subscriptions and broadband subscriptions of the South Asian countries as on 2013 respectively.



Source: ITU

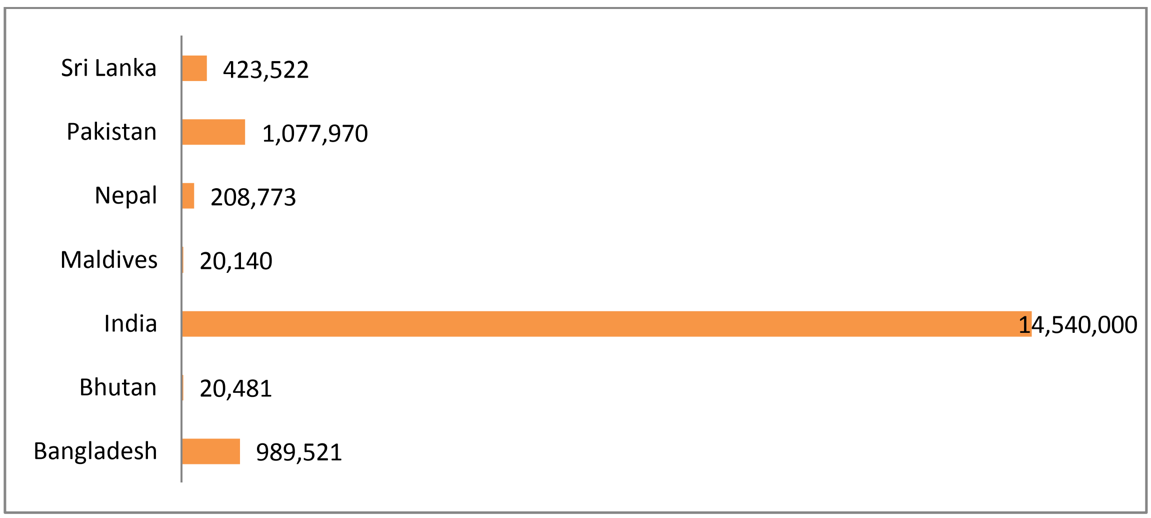
Fig.2.2.1: Graphical representation of the fixed line telephone subscriptions of South Asian countries as on 2013.

The above figure indicate that among the South Asian countries India has the highest number of fixed line telephone subscriber with 29,032,974 subscribers, followed by Pakistan with 6,370,860 subscribers, Sri Lanka with 2,706,787 subscribers, Bangladesh with 1,082,348 subscribers, Nepal with 829,097 subscribers. Bhutan and Maldives is at the lowest subscriber rate with 26,485 subscribers and 22,557 subscribers respectively. In terms of mobile cellular subscription and fixed wire broadband subscription India stood on the top among the south Asian countries. The mobile cellular subscriber of India as on 2013 stood at 886,304,245 subscribers and the fixed wire broadband subscriber of India stood at 14,540,000 subscribers as on 2013.



Source: ITU

Fig.2.2.2: Graphical representation of the mobile cellular subscriptions of the South Asian countries as on 2013.

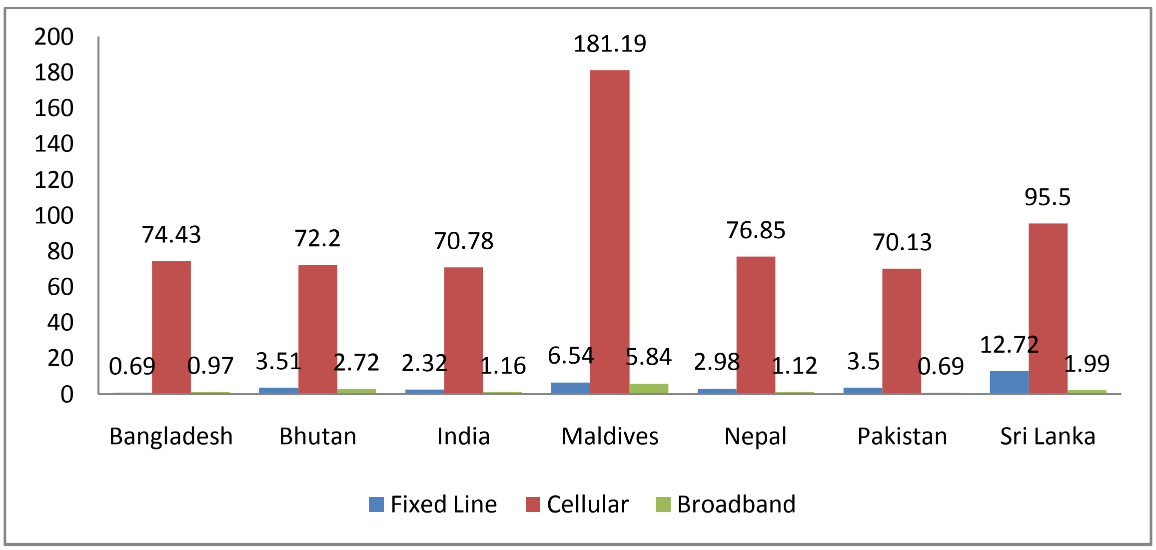


Source: ITU

Fig.2.2.3: Graphical representation of the fixed wired broadband subscriptions of the South Asian countries as on 2013.

Among the South Asian countries, India is the largest country, in terms of population, economy, and telecommunication network. From the above figures it is clearly visible that in all the three sectors of telecommunication i.e., fixed line telephone, mobile cellular phone and broadband connections, India dominates all the South Asian countries in terms of subscriptions. Next to India, lies Pakistan, dominating all the said three sectors of telecommunication in terms of subscriptions.

However, in terms of fixed telephone subscriptions per 100 inhabitants among South Asian countries Sri Lanka stood on top with 12.72 percent. In terms of mobile subscription and broadband subscription per 100 inhabitants Maldives stood at the top position with 181.19 percent and 5.84 percent respectively. Fig.2.2.4 indicates the graphical representation of fixed telephone, cellular telephone and broadband subscription per 100 inhabitants of South Asian countries.



Source: ITU

Fig.2.2.4: Graphical representation of fixed telephone, cellular telephone and broadband subscription per 100 inhabitants as on 2013 of South Asian countries.

Apparent to above figure it is evidence that in fixed line telephone subscription per 100 inhabitants Sri Lanka is on the top with 12.72 percent, followed by Maldives (6.54 percent), Bhutan (3.51 percent), Pakistan (3.50 percent), Nepal (2.98 percent), India (2.32 percent), and Bangladesh (0.69 percent) (ITU). In mobile subscription per 100 inhabitants Maldives stood on the top position with 181.19 percent, followed by Sri Lanka (95.50 percent), Nepal (76.85 percent), Bangladesh (74.43 percent), Bhutan (72.20 percent), India (70.78 percent), and Pakistan (70.13 percent) (ITU). Regarding broadband subscriptions per 100 inhabitants Maldives is again on the top position with 5.84 percent, followed by Bhutan with 2.72 percent, Sri Lanka with 1.99 percent, India with 1.16 percent, Nepal with 1.12 percent, Bangladesh with 0.97 percent, and Pakistan with 0.61 percent.

2.3 Telecommunication in India during colonial period

The foundation of telecommunications was laid in India during the colonial period as a political tool by the colonial government to maintain law and order. The telegraph was introduced by the colonial government in 1839, the year in which Samuel Morse laid the first telegraph line. Soon after, the first operational land line was laid by the government in 1851 near Calcutta (Mody, 1997). During the colonial period telegraph system set up in India was controlled by the government in contrast to the system set up in its mother country which was operated by the private firms. Within 20 years of its introduction every major town of the Indian colony had telegraph office. In 1854, Dr. William O' Shaughnessy, pioneered the telegraph and telephone in India. He belonged to the Public Works Department and worked for the development of telecom (G.G, 2014).

Only five years after its invention, in 1881, Oriental Telephone Company Limited of England a private firm opened a telephone exchange in Calcutta, Bombay, Madras and Ahmedabad. On 28th January 1882 the first formal telephone service was established (G.G, 2014). In 1883 the colonial government combined the telegraph services with postal services. From the year 1902 India adopted wireless telegraph, radio telephone and trunk dialing from cable telegraph. During the colonial period India has 321 city centered telephone exchanges, 86,000 working lines, and 338 long-distance public call offices and teledensity was 0.25 per 100 people (Mody, 1997).

2.4 Telecommunication in India after Independence

After Independence India's telecommunication sector still remained under the government monopoly. All the foreign telecommunication companies were nationalized and form Post, Telephone and Telegraph, a monopoly run by the Government of India. In the year of independence India had only 84,000 telephone lines for its 350 million populations (Singhal and Rogers, 2001). Post independence telecommunication sector of India was very poor due to lack of engineers or bureaucrats who had experienced in developing new technologies in their own labs. On the other hand the new nations face the problems of illiterate, poverty, unemployment and other social issues. In such critical situation the Department of Post, Telephone and Telegraph was used as tools to provide job opportunity to reduce poverty and unemployment. As a result half of the Post, Telephone and Telegraph staffs were illiterate (Mody, 1997). Some intellectual claims that major change in the telecom sector of India after independence is the increase in the staff size and decline in the staff efficiency. The staffing level after independence is approximately 104 employees for every 1000 lines, in comparison to 7-12 per 1000 in industrialized countries, 20-40 in middle income countries, and 60-90 in comparison to developing countries (Bernt cited in Mody, 1997). In postcolonial India the concentration of telecom service continues in urban areas, however, the quality of the service provided was poor. The average number of complaints per month was 43 for every 100 telephones (Bernt and Weiss, cited in Mody, 1997).

Reformation in the telecommunications sector was witnessed in the 1980s under the leadership of the then Prime Minister Rajiv Gandhi and Satyen Pitroda, a U.S.-returned expatriate Indian (Singhal and Rogers, 2001). In 1984, Centre for Development of Telematics (C-DOT) was established as an autonomous body with an objective of developing new technologies and promoting research in the field of telecom (DOT annual report, 2006-07). In 1985 the Department of Telecommunication (DOT) was created after separation from Posts and Telegraphs Department. During those days DOT is the exclusive service provider of domestic local and long-distance call. Business users, several government departments, and urban residents were not satisfied about the quality of service provided by DOT. This dissatisfied nature from users led to the creation of two separate corporations with a little more autonomy from government. The Mahanagar Telephone Nigam Limited (MTNL) was established in 1986 to provide telex and telephone service under a non-exclusive license in the two largest metropolitan cities of Delhi and Mumbai. In the same year Videsh Sanchar Nigam Limited (VSNL) was created to run international long distance services. Later on VSNL was privatized in February 2002. DOT is entrusted with the task of formulating policies, awarding license, spectrum management, frequency allocation and radio communication management in close coordination with international bodies. In addition to these DOT is responsible for enforcing wireless regulatory measures and monitoring the wireless transmission of all users in the country.

In 1989 the Telecom Commission was established as an executive body under the ministry of communications with administrative and financial powers of the Government of India. It deals with various aspects of telecommunications and to implement the government's policy in matters concerning telecommunications. The major functions of the Telecom Commission include policy formulation, review of performance, licensing, wireless spectrum management, administration, monitoring of Public Service Undertaking (PSU), research and development, standardization/validation of equipment and International Relations (DOT Annual report, 2006-2007). Later on, the service portion of the DOT was detached from the Telecom Commission in October 1999, and brought under a new Department of Telecommunications Services (DTS). One year later in October 2000, DTS was corporatized to form BSNL as a new body for providing telecommunications services in the entire country except Delhi and Mumbai.

2.5 Demonopolization of Telecommunication Sector

Demonopolization in the telecommunications sector was initiated with the announcement of new economic policy in 1984 and new industrial policy 1991 (Mody, 1997). After these initiatives telecom equipment manufacturing was de-licensed in 1991 and value added services were open to private sector in 1992 (TRAI, 2012). With the de-monopolization of telecom sector the door of telecom was opened to several domestic private farms and started manufacturing telecom equipment in the country. Major transformation had been observed in the sector with significant policy reforms. At the beginning National Telecom Policy (NTP) opened the account of India's telecom policy, this policy was announced by the government in 1994. The policy lay down certain objectives, including ensuring the availability of telephone on demand, covering all the village, providing certain basic telecom services at affordable and reasonable prices, providing world standard telecom service, improving India's competitiveness in global market and promoting exports, attractive FDI and stimulating domestic investment, and ensuring India's emergence as major manufacturing/export base of telecom equipment and universal availability of basic telecom services to all villages (DOT, Telecom at a Glance). NTP 1994 also allowed the participation of private companies in the field of telecom except National Long Distance (NLD) and International Long Distance (ILD) services.

The formulation of the National Telecom Policy (NTP) in 1994 was followed by the launched of mobile telephony in 1995 on non-commercial basis on the eve of the 48th Independence Day at country's capital Delhi. However, growth rate in the initial years was very slow due to high tariff structure of service providers and high mobile handset prices. Slowly the subscriber rate of mobile telephone increased. De-monopolization in the telecommunication sector and the announcement of NTP-1994 had encouraged competition between the newly emerged private telecom operator and government telecom operator, both in the basic as well as cellular services. Such changing scenario in the telecom sector, required to separate telecom regulatory functions from service providing functions and hence Telecom Regulatory Authority of India (TRAI) was established in 1997, as an independent regulatory agency for the telecom sector. The functions of the TRAI include fixing tariffs, ensuring compliance with the terms and conditions of licenses, formulating the terms and conditions of interconnection arrangement between service providers, and establishing and ensuring standards of quality of service to be provided by service providers (TRAI, 2012). Apart from these TRAI was also provided with certain quasi-judicial authority to pass judgment and settle disputes. In 2000, the TRAI was amended by the TRAI amendment Act, 2000. Under this amended Act, a clear distinction is made between recommendatory and regulatory functions of TRAI as envisaged under sub-section (I) of section 11 of the Act. The amended Act has also been made mandatory for the central government to seek the recommendations of the Authority in respect of matters specified in sub-clauses (i) and (ii) of section 11 (I) (a) of the Act, especially with respect to the need and timing for the introduction of new service providers, and terms and conditions of license to a service provider. TRAI is formed to nurture India's Telecommunication sector so that India can play a leading role in emerging global information society.

Further in the year 2000 Telecom Disputes Settlement and Appellate Tribunal (TDSAT) was created by the government under the TRAI Act, 1997 to settle and abdicate disputes involving licensor, licensee, and a group of consumers. In January, 2004 the jurisdiction of TDSAT was extended to include broadcasting and cable services besides telecommunication services (Annual report DOT, 2013-

14). TDSAT also hears and disposes off appeals against any directions, decision or order of TRAI.

To make up the loop hole of the NTP-1994, New Telecom Policy 1999 (NTP- 1999) was approved on 26th March 1999, and became effective from 1st April 1999. NTP-99 is the most important milestone and instrument of telecom reforms in India. The policy clearly acknowledged the need for strengthening the regulatory regime as well as reorganizing the departmental telecom services to separate the licensing and policy functions of the Government. Direct interconnectivity and sharing of network with other telecom service providers within the service area was permitted under the policy. NTP -1999 pave the way for future reforms of India's telecom sector on matterssuch as opening up all the segments of the telecom for private participation including NLD and ILD services,providing licenses to private operators on a revenue sharing basis, plus a one-time entry fees, providing universal service to all uncovered areas, encourage development of telecommunication facilities in remote, hilly and tribal areas of the country, creating a modern and efficient telecommunications infrastructure taking into account the convergence of IT, media, telecom and consumer electronics and thereby propelling India into becoming an IT superpower, creating public teleinfo centers having multimedia capability like ISDN service, remote database access, government and community information system etc, strengthen research and development efforts in manufacturing telecom equipment, achieve efficiency and transparency in spectrum management, protect defense and security interest of the country.

NTP 1999 made the specific targets to achieve the objectives, made telephone available on demand by the year 2002 and sustain it thereafter so as to achieve a teledensity of 7 by the year 2005 and 15 by the year 2010, achieve telecom coverage of all villages in the country and provide reliable media to all exchanges by the year 2002, provide internet access to all district head quarter by the year 2000, provide high speed data and multimedia capability using technologies including ISDN to all towers with a population greater than 2 lakh by the year 2002 (DOT). In November 2003, NTP-99 was amended which permitted the licensee to make available wireline and wireless services using any technology in a pre-determined license area after conversion of the license to a Universal Access Service License (UASL).

2.6 Mobile Phone / Cellular phone service in India

Liberalization of telecommunication sector in 1990s paved the way for introduction of mobile phone services in India. The government of India initiated the process to introduce mobile phone service in 1992. In this year the government invited competitive bids for two non-exclusive cellular mobile licenses for a ten year period, extendable by five years, for the four metropolitan cities of Delhi, Mumbai, Kolkata and Chennai. For providing Cellular Mobile Telecom Service (CMTS), the country is divided into 23 service areas consisting of 19 Telecom Service Areas and 4 Metro Service Areas. In the beginning in November 1994, eight licenses were issued to private companies of four metro cities of Delhi, Mumbai, Kolkata and Chennai. Among the cities, Kolkata made the history of India's first cellular mobile service provider. In August 1995, the then Chief Minister of Kolkata Jyoti Bashu made the historic call to Union Telecom Minister Sukhram through Modi Telstra Mobile. Later on, 34 licenses for 18 Territorial Telecom Circles were also issued to 14 private companies during 1995-1998. During this period, for providing CMTS a maximum of two licenses were granted in each service area and these licenses were called first and second cellular licenses. As a third operator for CMTS, MTNL and BSNL were issued licenses. Thereafter, as a fourth operator 17 fresh licenses were issued to private companies, one each in four metro cities and 13 Telecom Circles in September/October 2001.

On November 11, 2003 some CMTS operators were migrated to Unified Access Service License (UASL). This service license allows to provide wireline as well as wireless service in a service area. Wireless services include Full Mobile, Limited Mobile and Fixed Wireless services. The service providers migrating to UASL can continue to provide wireless services in already allocated/contracted spectrum. No additional spectrum will be allotted for migration to UASL. The licensee can also provide various value added services.

In early stage the subscriber rate of cellular mobile service was very poor in comparison to wireline service. In the beginning the users of the mobile phone were primarily urban elites, corporate leaders, businessmen, professionals, and upper income families (Singhal and Rogers, 2001). The reason for delayed in diffusion of mobile phone was the high price of mobile phone and tariffs, and moreover negative attitude of consumer on mobile phone. In completion of five years of its introduction the subscriber rate marked only 1.2 million in comparing to 21.59 million wireline subscriber, growing at the growth rate of 0.86%. Soon changed has been observed in the sector. The growth rate of cellular mobile services increased tremendously. On completion of ten years of its introduction, the subscriber rate of cellular mobile service surpassed the subscriber rate of wireline service. In 2005, the subscriber rate of mobile phone was 52.22 million compared to 41.43 million wireline subscriber. The contributing factor of such changed in the cellular mobile service is reduced in mobile phone, price and tariffs, encouraging regulatory environment, increasing income levels and changed of perception of public upon mobile phone. Setting up of renowned telecom equipment manufacturing companies like Nokia, Motorola, Sony Ericsson, Samsung, Flextronic and LG etc. also encouraged in the growth of mobile telephony. The subscriber base of Fixed line and Mobile phone from 1997-2014 is given below in Table 2.6.1 and the same is depicted graphically in figure 2.6.1.

Table 2.6.1: Subscriber base of fixed line and mobile phone from 1997-2014

Year	Fixed Line	Mobile Phone	Year	Fixed Line	Mobile phone
1997	14.54	0.34	2006	41.54	98.77
1998	17.6	0.88	2007	40.75	165.11
1999	21.59	1.2	2008	39.42	261.07
2000	26.65	1.88	2009	37.96	391.76
2001	32.65	3.58	2010	36.96	584.32
2002	38.33	6.68	2011	34.73	811.59
2003	40.91	13	2012	32.17	919.17
2004	40.92	33.69	2013	30.21	867.8
2005	41.43	52.22	2014	28.5	904.51

From the above table it is observed that the growth rate of mobile phone in the beginning was very low. It started gaining momentum from 2005 and surpassed wireline connections. The subscriber rate of mobile phone in 2005 was 52.22 million and that of wireline was 41.43 million. It is also observed that from 2007 the subscriber rate of wireline was decreasing. In 2007, the subscriber rate of wireline was 40.75 million and it decreased to 28.5 million in 2014. Graphical representation of the subscriber base of wireline and mobile phone from 1997-2014 is given in the fig.2.6.1.

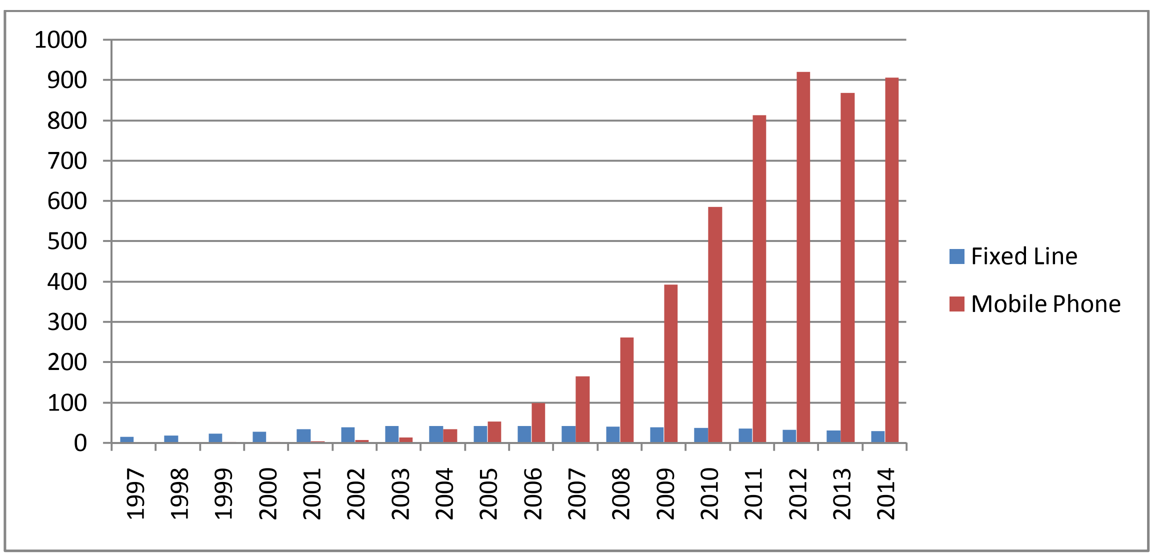


Fig. 2.6.1: Subscriber base of Fixed Line and Mobile Phone from 1997-2014

Source: TRAI

It is visible from the above graph that there is a huge gap in the growth of wireline and mobile phone. Growth rate of mobile phone gained momentum from 2005 and surpassed the wireline. In 2005, there were 52.22 million mobile subscribers and 41.43 million fixed line subscribers. By the year 2014 mobile subscriber reached 904.51 million and that of wireline was 28.50 million. According to the ITU report India had 8 mobile phone subscribers per 100 inhabitants in 2005. By 2013 subscription rate was increased to 70.78 per 100 inhabitants. Subscriptions of fixed line and mobile phone per 100 inhabitants from 2000-2013 is given in the table 2.6.2. and the same is depicted graphically in figure 2.6.2.

Table 2.6.2: Subscription of fixed line and mobile phone per 100 inhabitants from 2000-2013.

Year	Fixed Line	Mobile Phone	Year	Fixed Line	Mobile phone
2000	3.11	0.34	2007	3.39	20.16
2001	3.64	0.62	2008	3.23	29.53
2002	3.85	1.21	2009	3.11	44.12
2003	3.84	3.08	2010	2.91	62.39
2004	4.16	4.7	2011	2.69	73.39
2005	4.45	8	2012	2.5	69.92
2006	3.57	14.52	2013	2.32	70.78

Source: ITU

Pertaining to above table it is observed that the growth rate of mobile phone is very fast while comparing to fixed line connections, by 2000 there was only 0.34 mobile phone subscriptions per 100 inhabitants and that of fixed line in the same year was 3.11 per 100 inhabitants. In 2005 mobile phone surpassed the fixed line and there were 8 mobile phone subscriptions per 100 inhabitants and for fixed line in the same were 4.45 per 100 inhabitants. In 2013 fixed line and mobile phone subscriptions per 100 inhabitants was 2.32 and 70.78 respectively. Below given is the graphical representation of fixed line and mobile phone subscriptions per 100 inhabitants from 2000-2013.

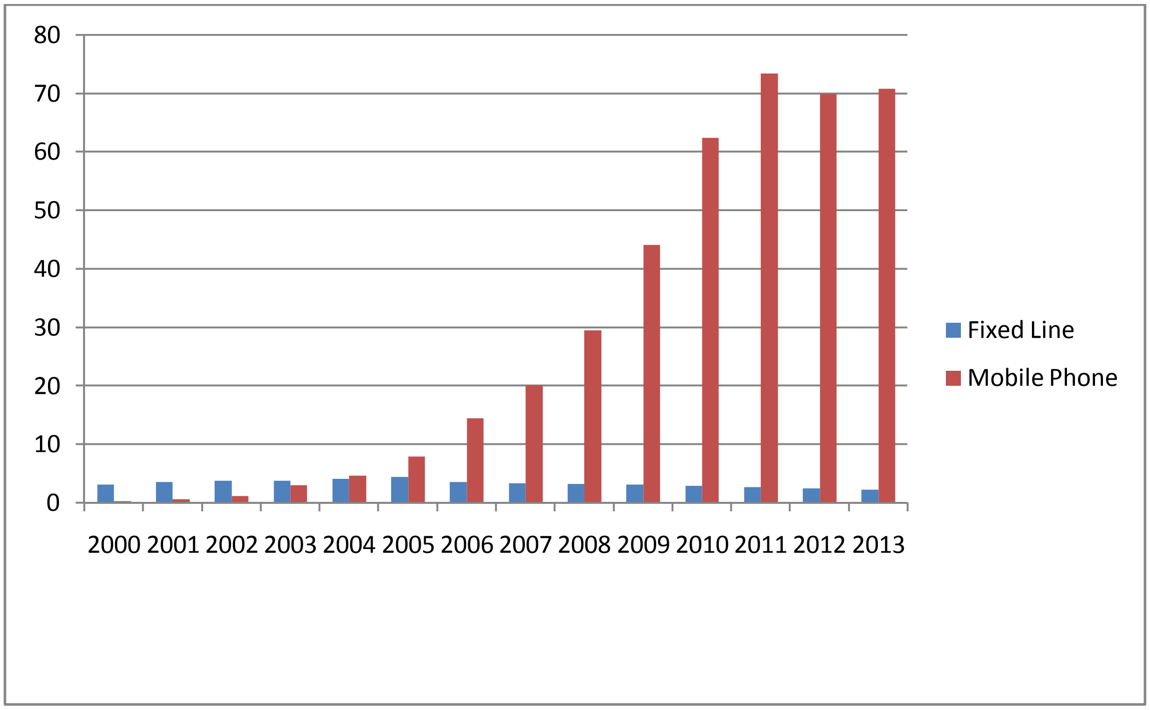


Fig. 2.6.2: Fixed line and mobile phone subscription per 100 inhabitants from 2000-2013

Source: ITU

From the above graph the difference is apparent in the growth rate between the fixed line and mobile phone. A huge gap has been observed in the growth rate of fixed line and mobile phone, from 2005 to 2011. By 2012 decline in the growth rate of mobile phone has been observed and again it is increased in 2013.

2.7 Expansion of Telecommunication Network

The expansion of telecommunication network can be classified into three stages. Stage 1: refers to the period before 1990 where the sector was under government monopoly. Stage 2: refers to the period 1991-2000, where de-monopolization and reformation was taking place. Stage 3: refers to post 2001, which is the era of wireless. In the first stage the growth of telecommunication was very slow, corresponding to the period 1981-1990 the sector witnessed a Compound Annual Growth Rate of 10 per cent only. During this stage growth in telecom sector services was primarily driven by the public sector, showing very marginal growth. Second stage marked the turning point in the growth of telecommunication. In this stage the foundation of growth of Indian telecommunication was laid. Demonopolization and reformation of telecommunication sector were taking place in this stage. During this stage telecommunication sector was opened up for private participation, which in turn increased competition among the operators. Telecommunication equipment manufacture began in the country during this stage. The two national telecom policy announced in 1994 and 1999 contribute a remarkable change in the sector. Such development in the sector, result CAGR of 20 per cent during 1991-2000. The third stage is the era of wireless, after the introduction of wireless phone in mid-90s Indian telecommunication network witnessed a significant growth. In 2005, the subscriber rate of wireless phone surpassed the wireline phone. During the period 2001-11 telecommunication sector has witnessed a CAGR of 35.3 per cent.

Today, Indian telecommunication network is the second largest network in the world after China. The overall telecom subscriber base, including both wireline and wireless increased from 28.53 million in March 2000 to 951.34 million in March 2012. In March 2013, the overall telecom subscriber base decreased to 898.01 million. The overall telecom subscriber base again increased to 933.01 million in March 2014. Figure 2.7.1 indicates the graphical representation of overall teledensity since March 2000 to 2014.

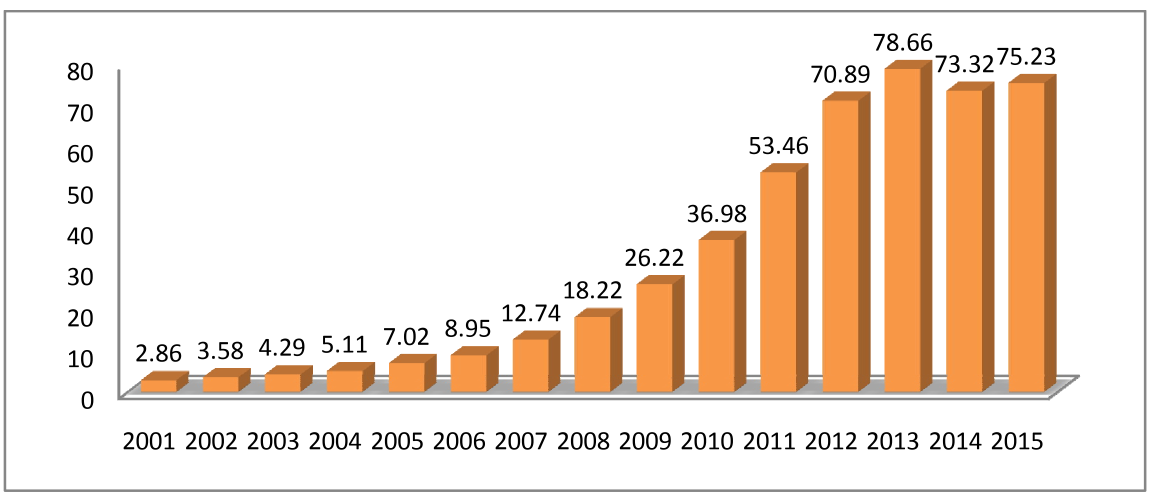


Fig. 2.7.1: Graphical representation of overall teledensity since March 2000 to March 2014

Source: DOT

NOTE: Wireless phones were not included in rural teledensity before March 2007

Pertaining to the above graph it is evidenced that the overall teledensity as on March 2000 was 2.86 percent and it increased to 8.95 percent in March 2005. In March 2010 the overall teledensity of India has reached 53.46 percent and it is increased to 78.66 percent in March 2012. After March 2012 declining in overall teledensity is witnessed. In March 2013, the teledensity was declining to 73.32 percent and again it is increased to 75.23 percent in March 2014.

The growth of the wireline sector registers a negative growth rate with the increase in the growth rate of the wireless sector. In 1981, wireline subscriptions marked 2.3 million and it was increased to 32.44 million in 2000. In 2006, the subscription rate stood at 50.18 million. Thereafter, the growth rate of wireline started declining. By the end of December 2014, wireline subscriptions marked 28.5 million. On the other hand, wireless sector grew at a faster pace. In March 2000, the subscriber base of the wireless sector stood at 1.88 million and the number escalates to 919.17 million in March 2012. However, the subscriber base of wireless decreased to 867.8 million in March 2013. In March 2014, the subscriber base of wireless again increased to 904.51 million, but was unable to exceed the subscriber base of March 2012.

The expansion of telecommunication network has narrow down the rural and the urban digital divide up to some extent. The overall teledensity of rural areas in March 2000 stood at 0.68 percent only. After ten years, i.e., in March 2010, the overall teledensity of rural area escalates to 24.56 percent. In March 2014, the overall rural teledensity marked 44.01 percent. From March 2000 to March 2014, the overall teledensity of rural area is growing at 14.84 percent. Zooming into urban area the overall teledensity in March 2000 stood at 8.23 percent. In March 2010, the overall teledensity of urban area escalates to 122.00 percent. In March 2014, the overall teledensity of urban area stood at 145.46 percent. The overall teledensity of urban area is growing at 71.71 percent from March 2000 to March 2014. The graphical representation of urban and rural teledensity from March 2000 to March 2014 is depicted in fig. 2.8.2.

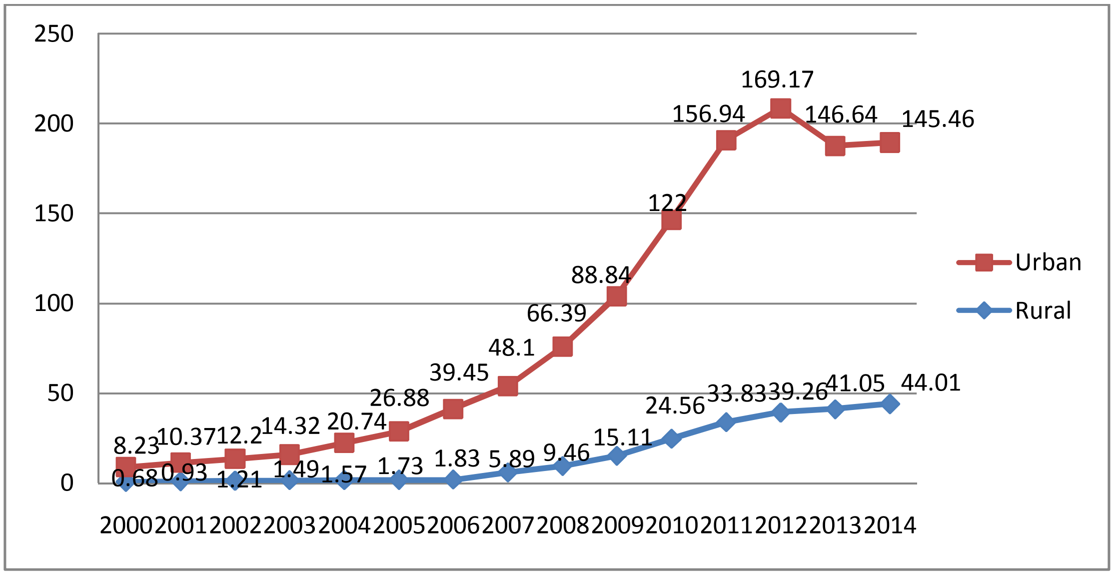


Fig. 2.7.2: Graphical representation of urban and rural teledensity from March 2000 to March 2014.

Source: DOT

NOTE: Wireless phones were not included in rural teledensity before March 2007.

Expansion of the telecommunications network has narrowed down the rural and the urban digital divide and also able to bridge up the gap between the two areas to some extent which used to be unconnected. Initially, the telecommunications services were mainly confined to urban areas. Recognizing the importance of expansion of telecommunication services in rural areas for sizeable growth in the telecom sector and for developing rural areas TRAI issued a recommendation on "Growth of Telecom Services in Rural India" in 3rd October, 2005. Thereafter, the growth of telecommunication services in rural areas has gained momentum. In March 2010, the overall telephone subscriber base of rural areas stood at 200.68 million as against 420.6 million of urban areas in the same period. From March 2010 to March 2014, the overall telephone subscriber base of rural areas has witnessed a continuous growth rate. During the same period the overall telephone subscriber base of rural areas registered an increase of 177.06 million. On the other hand the overall telephone subscriber base of urban areas during the same period has declined in March 2013 and registered an increase of 134.66 million since March 2010 to March 2014. Fig. 2.7.3 depicted the overall telephone subscriber base of urban and rural areas from March 2010 to March 2014.

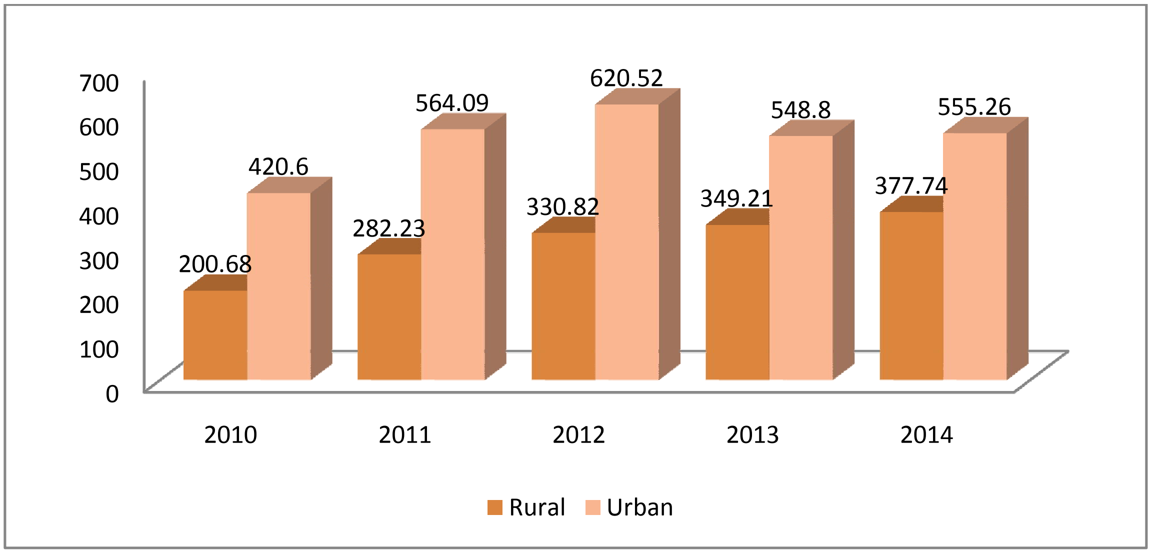


Fig. 2.7.3: Graphical representation of rural and urban overall telephone subscriber base since March 2010-March 2014 in million

In India's telecom scenario the wireline sector is declining both in urban and rural areas. In March 2010, the subscriber base of rural wireline stood at 9.80 million and the same is reduced to 5.96 million in March 2014. During this period rural wireline registered 3.84 million downfalls. Similarly, the subscriber base of urban wireline reduced from 27.16 million in March 2010 to 22.53 million in March 2014. During the same period the subscriber base of urban wireline 4.63 million downfalls.

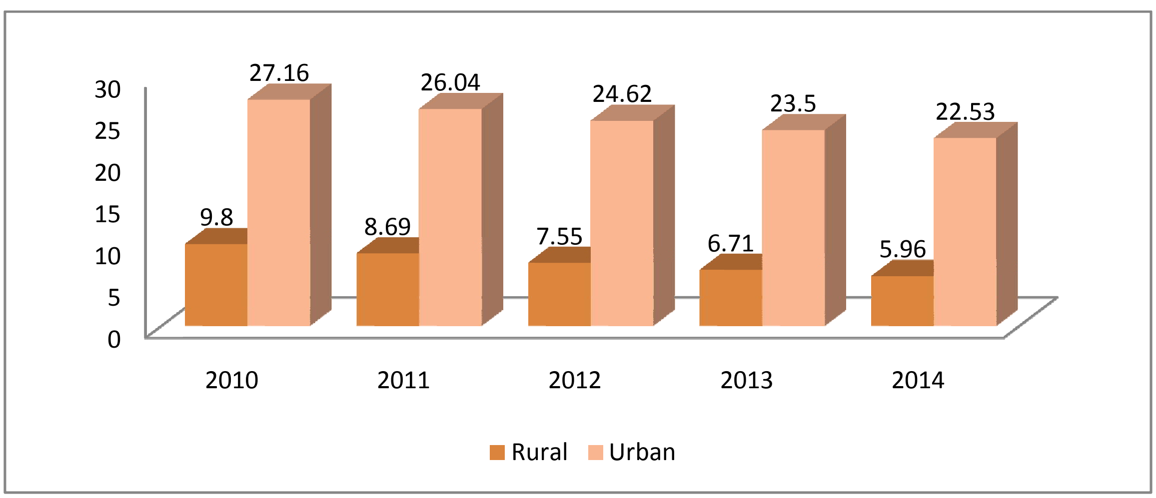


Fig. 2.7.4: Graphical representation of rural and urban wireline subscriber base from March 2010-March 2014 in million

The wireless sector of Indian telecom shows a significant growth both in rural and urban areas. Presently, India stood at second position in terms of cellular network subscriber with 999.71 million as on April 2015, next only to China. The wireless subscriber base of rural areas increased from 190.88 million as of March 2010 to 371.78 million in March 2014. During the same period rural wireless shows continuous growth and registered an increase of 180.9 million. While that of counterpart urban areas marked 393.44 million subscribers as on March 2010. Unlike rural areas the subscriber base of urban wireless telephone declined in March 2013 with 525.3 million as against 595.9 million of March 2012. From March 2010 to March 2014, the urban wireless sector marked an increase of 139.29 million. Fig. 2.7.5 shows the graphical representation of rural and urban wireless subscriber base in between March 2010 to March 2014.

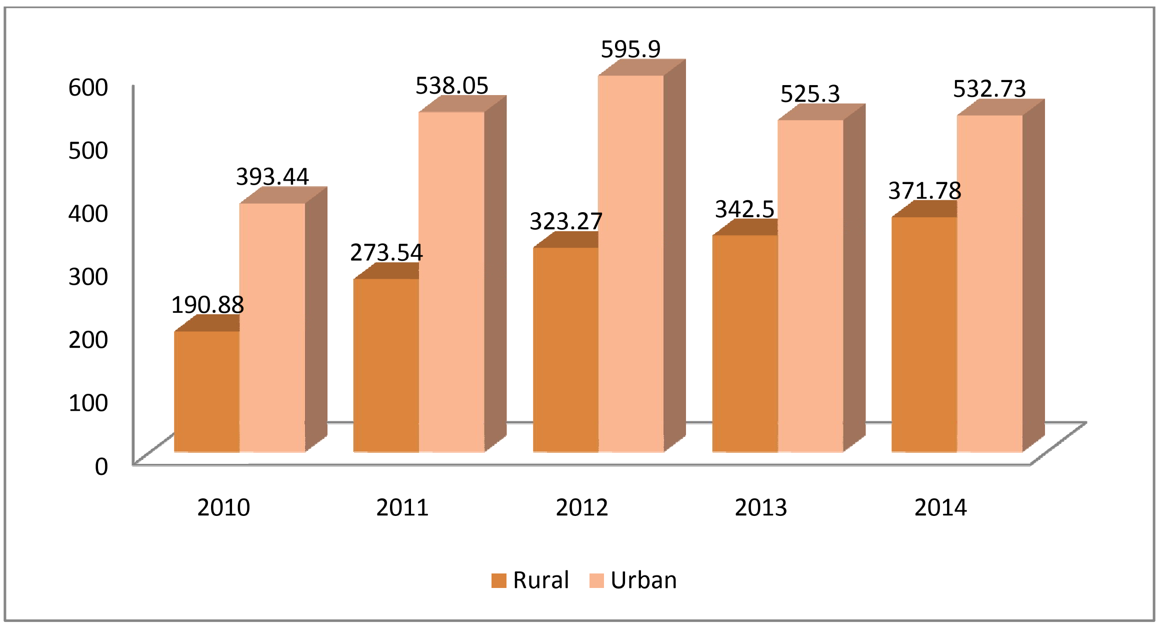
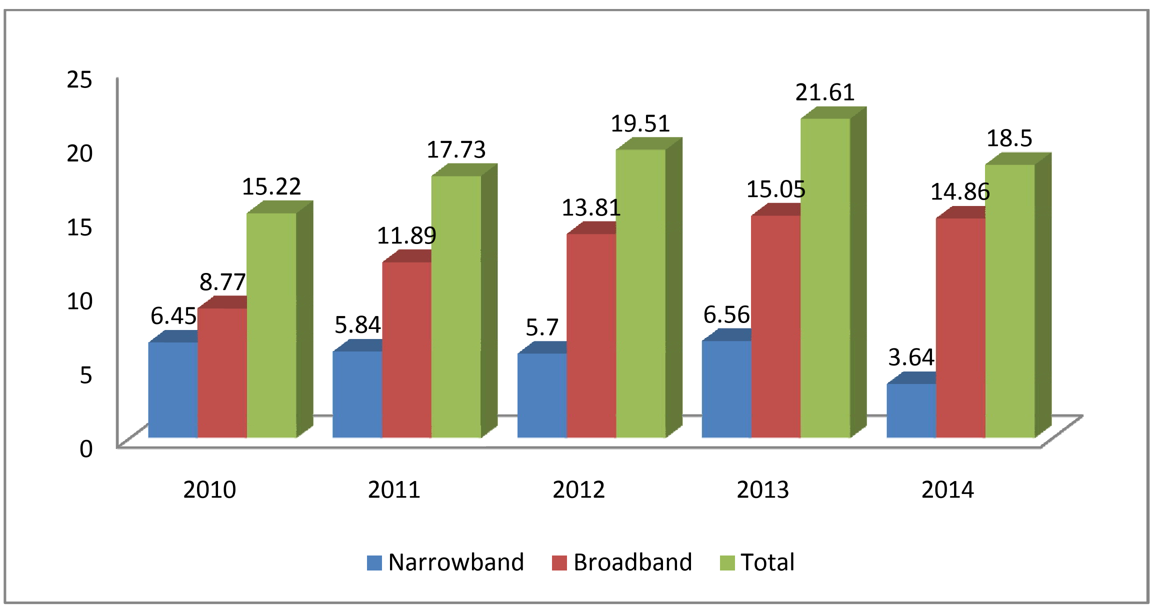


Fig. 2.7.5: Graphical representation of rural and urban wireless subscriber base from March 2010 to March 2014 in terms of million

Internet service in India was initiated in 1995 by VSNL. It was opened for private participation in 1998 with a view to encourage its growth and penetration. In its initial stages the penetration of internet service in India was very slow. In March 1997, India's internet subscribers, including both wireline and wireless stood at 0.09 million only. The subscribers rate of internet service in India gain momentum in March 2007, with 40.47 million subscribers as against 6.94 million subscribers of March 2006. The access of internet service in the country is driven by wireless sector. In March 2013, the wireless internet subscribers stood at 143.2 million as compared to 21.61 million wireline internet subscribers. In March 2014, the wireless internet subscriber escalates to 233.09 million as compared to 18.50 million wireline internet subscribers. Regarding the broadband services, the broadband subscribers in the country stood at 0.18 million in March 2005 and the same escalates to 13.81 million in March 2012. On 18th July 2013, the department of telecommunication had revised the definition of broadband. As per revised definition, the minimum download speed for the broadband services was increased from 256 kbps to 512 kbps and the wireless data services were also included in the revised definition of broadband service. As per revised definition the subscriber base of broadband in March 2013, it increased from 15.05 million to 60.87 million in March 2014. Fig. 2.7.6 depicted the wireline internet subscribers (in million) from March 2010 – March 2014.

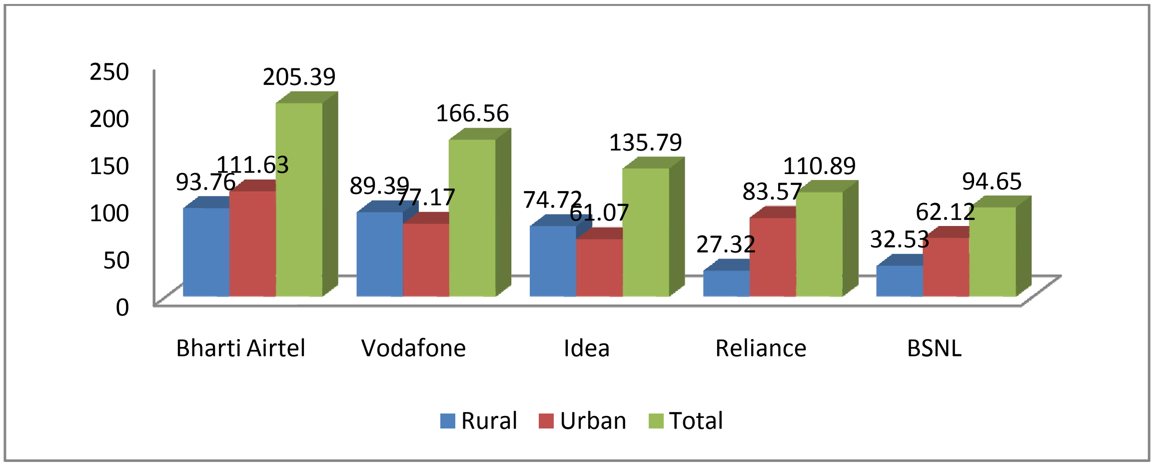


SOURCE: TRAI

Fig.2.7.6: Graphical representation of wireline internet subscribers (in million) from March 2010 - March 2014

2.8 Present scenario of telecommunication

Presently, India with its 23 telecom circles and 973.35 million wireless subscribers as on 30th April, 2015 is the second largest cellular network in the world after China. Such achievement is the fruit of significant reformation of telecommunication policy of the country. The country's total telephone subscriber base, including both wireline and wireless at the end of March 2104, stood at 933.02 million and it is increased to 996.49 million in March 2015 and the same is increased to 999.71 million in April 2015. Regarding the subscriber base of wireless sector, the wireless subscribers of the nation at the end of March 2015 stood at 969.89 million as compared to 26.60 million wireline subscribers. At the end of March 2015, rural telephone subscriber base, including wireline and wireless marked 419.31 million as compared to 577.18 million urban subscribers. During the same period the wireless subscriber base of rural areas stood at 414.18 million as against 555.71 million urban subscribers. With the expansion of wireless network, the wireline network decreases. In March 2015, wireline subscriber base of rural areas stood at 5.13 million as compared to 21.47 million urban subscribers. Among the service providers Bharti Airtel occupying the top position in terms of rural wireless subscriber is followed by Vodafone. In March 2010, rural wireless subscriber of Bharti Airtel stood at 48.09 million as against 36.79 million of Vodafone in the same period. In March 2013, rural wireless subscriber base of Vodafone surpasses the rural wireless subscriber base of Bharti Airtel. In this year rural wireless subscriber base of Vodafone stood at 82.29 million as against 82.16 million of Bharti Airtel. In the context of urban wireless subscriber Reliance stood in the top position from March 2010 to March 2012. In March 2013, Bharti Airtel outdid Reliance and holds the top position in the wireless subscriber base of urban areas. The top five service providers-wise urban and rural wireless subscriber base (in million) since March 2010 to March 2014 is illustrated in the figure 2.8.1.

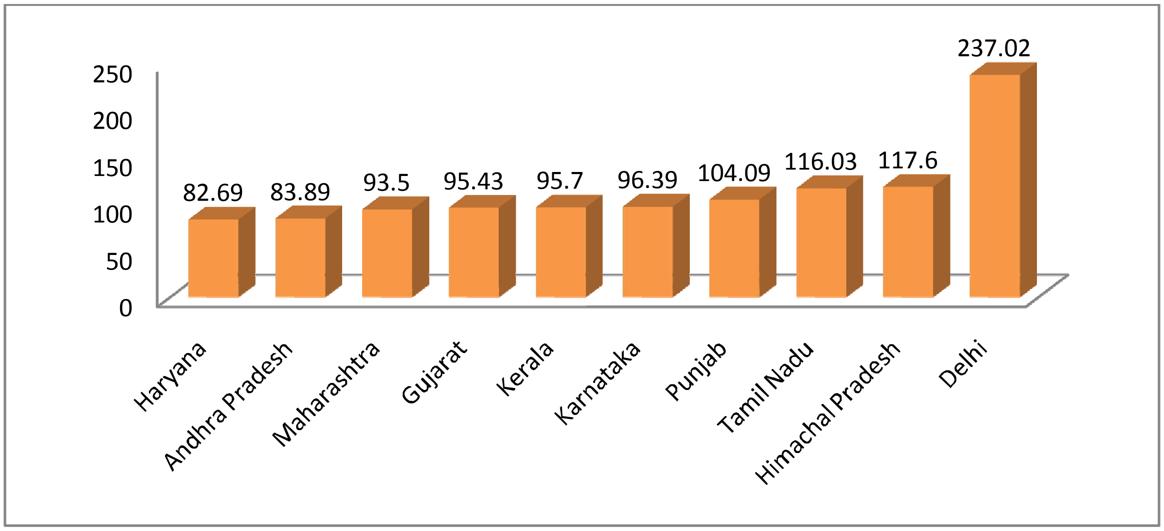


Source: TRAI

Fig. 2.8.1: Graphical representation of top five service provider wise urban and rural wireless subscribers base (in million) as on 2014 March.

Pertaining to above fig. 2.8.1 it is evidenced that for the service provider Vodafone and Idea rural subscriber is more than urban subscriber. Bharti Airtel stood at top wireless service provider in terms of both urban and rural subscriber base. Reliance stood at second position in terms of urban subscriber base with 83.57 million next to Bharti Airtel followed by Vodafone (77.17 million), BSNL (62.12 million), and Idea (61.07 million) respectively. In terms of rural subscriber base Vodafone hold the position of second with 89.39 million subscribers followed by Idea (74.72 million), BSNL (32.53 million), and Reliance (27.32 million) respectively.

The overall teledensity of the country as on March 2015 stood at 79.38 percent of which rural teledensity marked at 48.37 percent as against 148.61 percent urban teledensity. The wireless teledensity of the country increased from 72.94% at the end of March, 2014 to 77.46% as on 30th April, 2015. During the same period urban and rural wireless teledensity was increased from 139.86% to 143.64% and 43.27% to 47.79% respectively. Figure 2.8.2 indicates the top 10 Indian states in terms of overall teledensity as on April 2015.



Source: TRAI

Fig.2.8.2: Graphical representation of top Ten Indian states in terms of teledensity as on 2015 April.

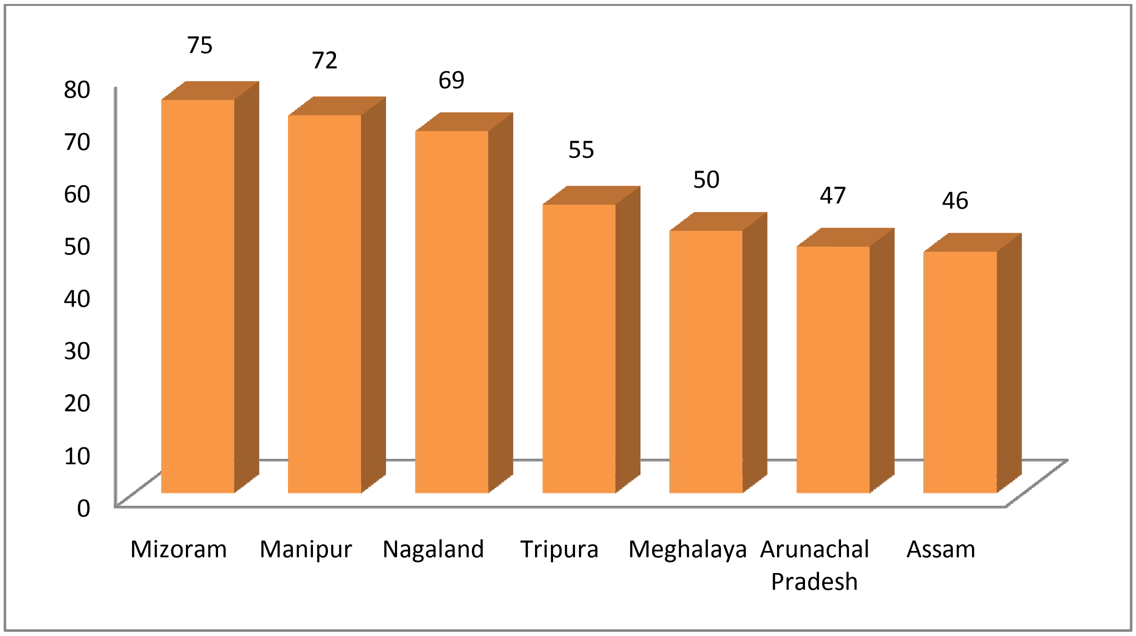
2.9 National Telecom Policy 2011 and 2012

National Telecom Policy 2011 was released on 10th October 2011 with a vision to empower the people of India by providing secure, reliable, affordable and high quality converged telecommunication services anytime, anywhere. The objectives of the NTP 2011 includes to provide affordable voice telephony and high speed broadband services to every citizen in India with special focus on rural and remote areas, to make India a global hub of manufacturing electronic products including telecom equipment, to achieve One Nation-Full Mobile Number Portability, to enable free roaming throughout the country and to utilizing full potential of mobile phones for education, health, employment, agriculture, entertainment, banking & insurance services, skill up-gradation, vocational training etc (DOT, 2011-12).

On 31st May 2012, another National Telecom Policy 2012 was approved by the Government. The important objectives of NTP 2012, includes to create One Nation-One License across services and service areas, to increase rural teledensity, to recognize telecom, including broadband connectivity as a basic need like education and health and work towards 'Right to Broadband', to provide affordable and reliable broadband-on-demand by the year 2015 and to achieve 175 million broadband connections by 2017 and 600 million by the year 2020 at minimum 2 Mbps download speed and making available higher speeds of at least 100 Mbps on demand, and to provide higher speed and high quality broadband access to all village Panchayats through a combinations of technologies by the year 2014 and progressively to all villages and habitations by 2020 (DOT, 2012-13).

2.10 Telecommunication in Northeast

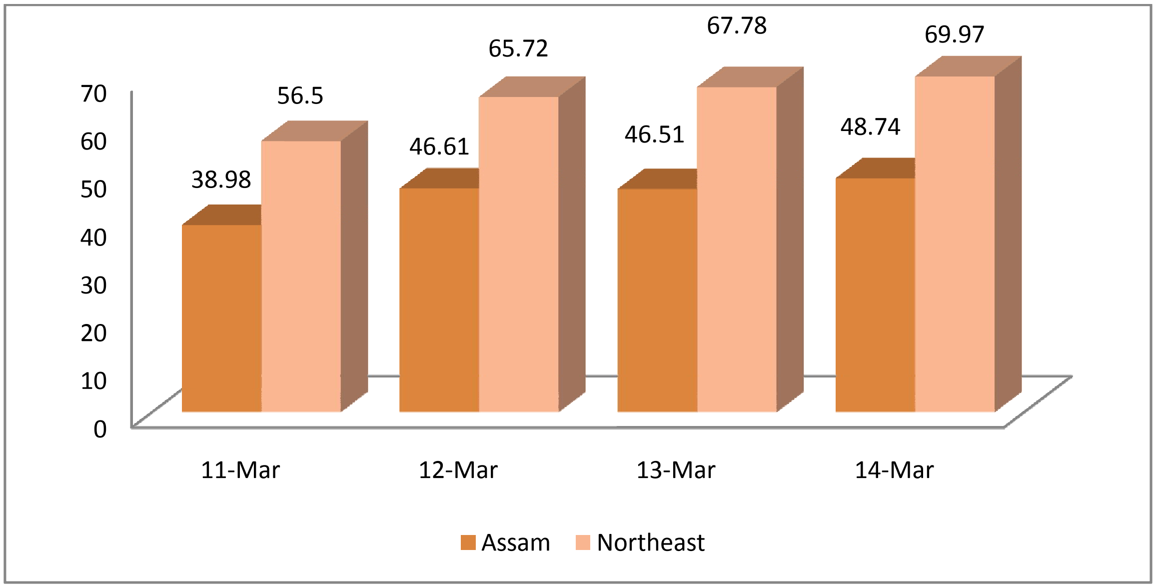
The Northeast region of India is split into three telecom Licensed Service Areas (LSAs). Namely, they are Assam telecom LSA, Northeast telecom LSA and West Bengal telecom LSA. The Assam telecom LSA covers only the state of Assam. The Northeast LSAs covers six states viz. Tripura, Meghalaya, Mizoram, Arunachal Pradesh, Nagaland, and Manipur. Sikkim is in the West Bengal telecom LSA. For the operational purposes BSNL has further split up the Northeast telecom LSA into Northeast-I (Meghalaya, Tripura, and Mizoram) and Northeast-II (Arunachal Pradesh, Nagaland, and Manipur) Telecom circles (TRAI, 2013). Services provider operates in the Northeast region are BSNL as public sector undertaking and in private sector, Airtel, Aircel, Vodafone, Reliance, Idea, and Dishnet Wireless Ltd (TRAI, 2013-2014). Among the service provider operate in NER, BSNL is the only service provider which operates in both GSM and CDMA. In terms of providing both wireline and wireless services, BSNL and Vodafone is the only service provider in NER (TRAI, 2013-2014). Wireless teledensity of Northeast region (excluding Sikkim) as on May 2013 is indicated on figure 2.10.1.



Source: TRAI

Fig. 2.10.1: Graphical representation of state-wise wireless teledensity of NER as on May 2013.

The overall teledensity of Assam telecom circle as on 31st December, 2011 stood at 45.84% as compared to 64.02% of Northeast telecom circle in the same period. In March 2014, the overall teledensity of Assam telecom circle escalates to 48.74% as against 69.97% of Northeast telecom circle in the same period. As of 30th April, 2015 the overall teledensity of Assam telecom circle has reached 54.36% and that of Northeast has reached 76.63%. The overall teledensity of rural and urban areas of Assam telecom circle as on 31st December, 2011 was marked 28.21% and 144.72% respectively. Regarding the wireline teledensity of Assam telecom circle as on 31st December, 2011marked at 0.75% of which 0.19% and 3.87% are of rural and urban teledensity respectively. The wireless teledensity of Assam telecom circle's stood at 45.10% as on 31st December, 2011 of which 28.01% and 140.85% are of rural and urban respectively. In case of Northeast telecom circle's rural and urban overall teledensity as on December 2011 stood at 37.91% and 145.51% respectively. Regarding the wireline teledensity of Northeast telecom circle as on December 2011 has marked 1.90% of which rural and urban stood at 0.63% and 5.89% respectively. The wireless teledensity of Northeast telecom circle as on December 2011 hold at 62.12% of which rural and urban stood at 37.29% and 139.63% respectively. Fig. 2.10.2 indicates the graphical representation of overall teledensity of Assam and Northeast telecom circle from March 2011 to March 2014.



Source: TRAI

Fig.2.10.2: Graphical representation of overall teledensity of Assam and Northeast telecom circle from March 2011 to March 2014.

Among the Northeast states Assam has the highest wireless subscriber base with 1,45,48,912 as on May 2013 followed by Tripura (20,82,530) and Manipur (20,49,004). Among the wireless service provider Bharti Airtel holds the top position with 8693632 subscribers as on April 2015 followed by Aircel (7350424) and Vodafone (4505298). State-wise wireless subscriber base of Northeast region as on May 2013 is predicted in fig. 2.10.3 and fig. 2.10.4 indicates the graphical representation of wireless service provider wise subscriber base of Assam and Northeast LSA as on April 2015.

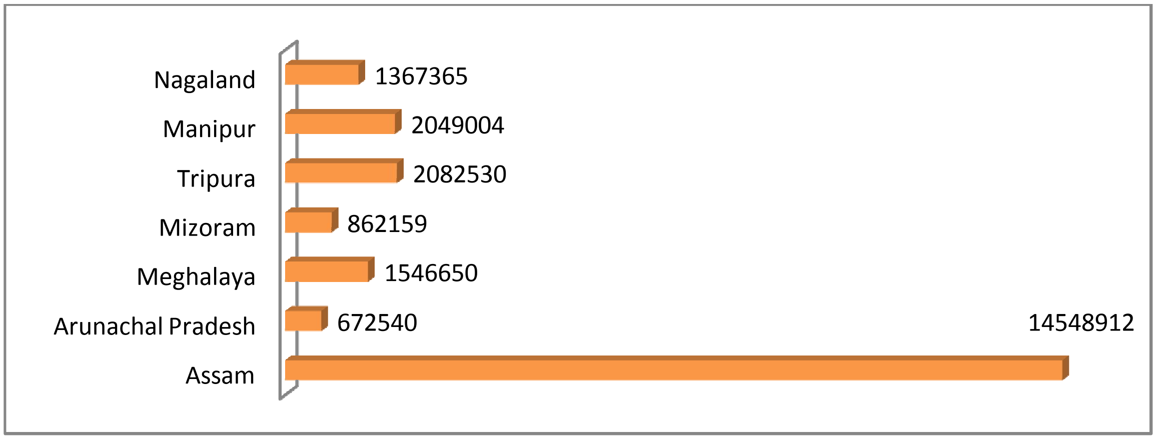
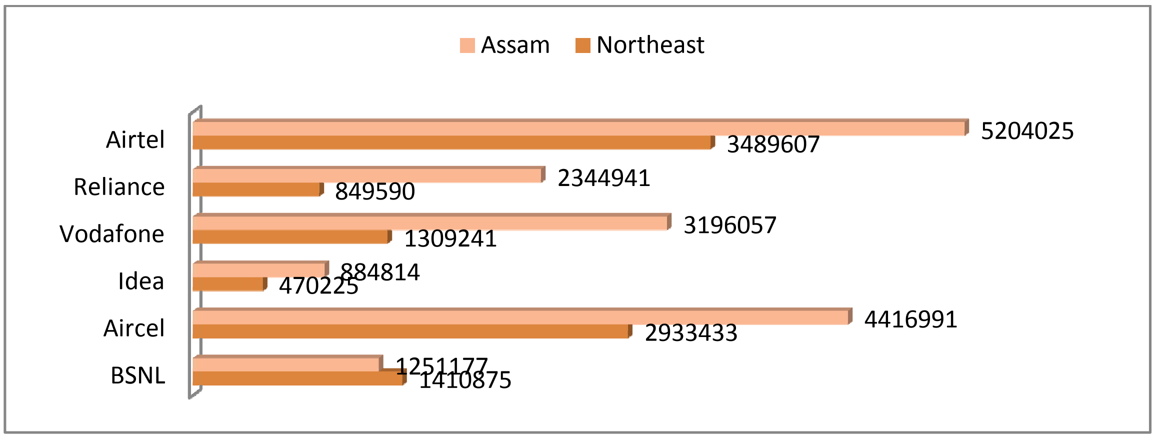


Fig. 2.10.3: State wise wireless subscribers base of Northeast region excluding Sikkim as on May 2013.



Source: TRAI

Fig. 2.10.4: Graphical representation of wireless service provider wise subscriber base of Assam and Northeast telecom circle

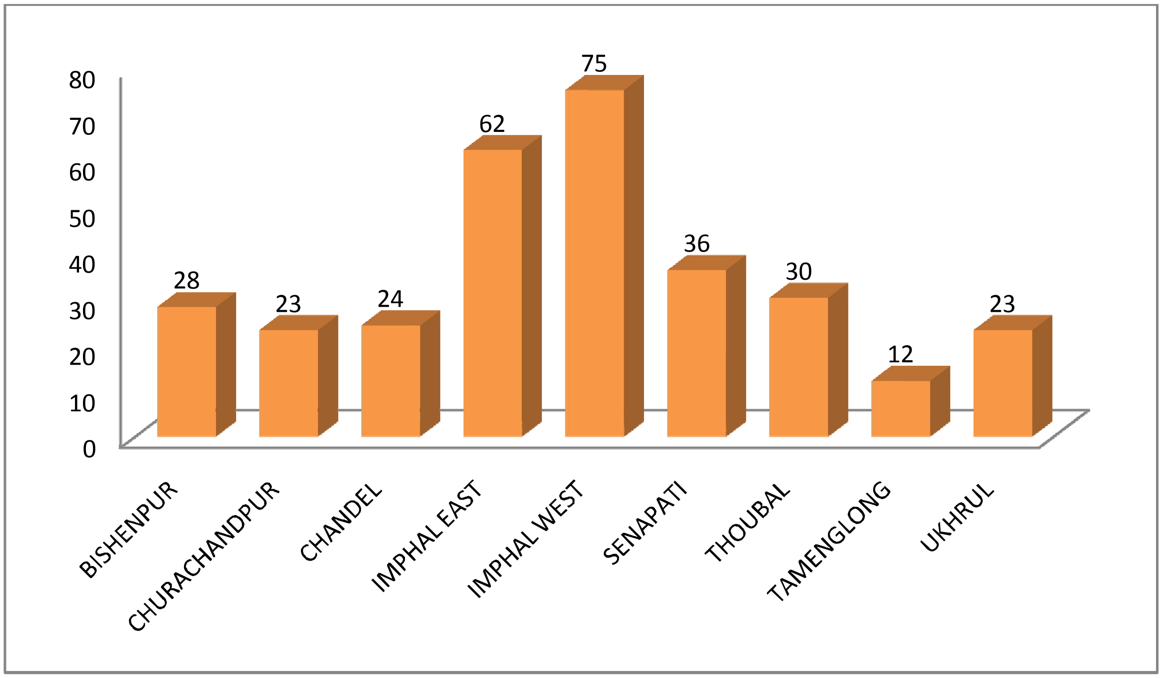
2G services in the Northeast region are yet to be improved. According to the 2011 census, there are 44,769 villages in the northeast region excluding Sikkim of which 33,607 villages had 2G coverage. All the District Headquarters in this region is connected by 2G services. In case of 3G services the District Headquarters of Assam, Manipur and Tripura are covered by the services and the rest of the state is yet to be covered. Out of the total 44,769 villages only 1733 villages are covered by the 3G services. Table indicates the 2G and 3G coverage of the Northeast states excluding Sikkim.

Table 2.10.1: 2G and 3G coverage of the Northeast states excluding Sikkim as on May 2013

State	No. of District	District HQ covered by 2G	District HQ covered by 3G	No. of villages	Village covered by 2G	Village covere d by 3G	Total No. of Population	Total Population on 3G coverage (rural+urban)
Arunachal Pradesh	16	16	4	5590	2374	103	1383727	266675
Assam	27	27	27	26550	22611	1162	31205576	5224373
Manipur	9	9	9	2612	1937	290	2570390	1050538
Meghalaya	11	11	4	6851	4082	46	2966889	542727
Mizoram	8	8	6	830	446	17	1097206	460801
Nagaland	11	11	6	1435	1270	83	1978502	503843
Tripura	8	8	8	901	887	32	3673917	709579
Total	90	90	64	44769	33607	1733	44876207	8758536

2.11 Telecommunication in Manipur

Mobile phone service was initiated in Manipur on 2004 by BSNL with two BTS installed each at Imphal West's Babupara and Imphal East's KhumanLampak. However, the steps for installation of BTS for providing mobile phone service in Manipur were started from December 2003. In the first phase of providing mobile service, BSNL provides service to 1600 customers. As on May 2013, the subscriber base of BSNL in Manipur had reached 1,70,755. On August 2010, 3G service was launched in Manipur under the Phase-V program of BSNL for expansion of telecommunications services. As on December 2015, there are 313 BTS of BSNL installed in Manipur of which 75 BTS are installed at Imphal West District. Among the districts highest numbers of BTS are installed at Imphal West. Fig. 2.11.1 indicates the number of BSNL's BTS installed in Manipur district wise. In rural areas of Imphal West there are 28 BTS. Village wise installation of BTS in rural areas of Imphal West District is provided in table 2.11.1.



SOURCE: BSNL MANIPUR

Fig. 2.11.1: Number of BSNL's BTS installed in Manipur District-wise as on December 2015.

Table 2.11.1: Village wise installation of BTS at rural areas of Imphal West District as on December 2015

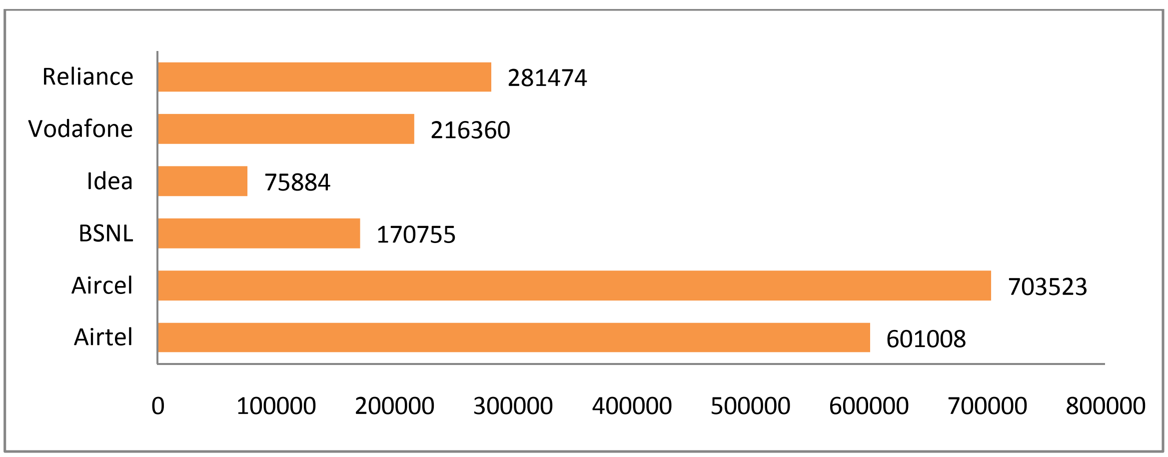
Name of Village	No. of BTS	Site ID	Name of Village	No. of BTS	Site ID
Toubungkhok	2	GSM041	Khonghampat	2	GSM067
Malom Tuliyaima (Airport)	2	GSM048	Yurembam	2	GSM165
Khumbong	2	GSM053	Langjing	2	GSM179
Heirangoithong Maibam Leikai	2	GSM056	Langol (Shija Hospital)	2	GSM196
Sangaiprou	2	GSM088	Iroishemba	2	GSM201
Haorang Sabal	2	GSM141	Sekmai	2	GSM208
Hiyangthang	2	GSM162	Singda	2	GSM215

Source: BSNL MANIPUR

According to the Census of India 2011, out of the total 609,964 households 57.5% have telephone or mobile phone facilities with 74.4% in urban areas and 48.9% in rural areas. Out of this total household 52.3% have only mobile phone facilities with 44.7% in rural & 67.2% in urban. Out of total 6,09,964 household of Manipur 10,886 households have internet connection facilities with 3,733 households in rural areas and 7,153 households in urban areas. The telecommunication facilities, access by the backward classes of Manipur is very unsatisfactory in accordance with the 2011 census report. In Manipur total household of schedule caste is 27,890 out of this household14,181 households has access to mobile phone facilities, 1,589 have only landline connections provided by BSNL and 733 households have access to an internet connection. There are 13,438 households of schedule caste in rural areas of Manipur; out of this total household 6,276 households have mobile phone facilities, 725 households have only landline connections provided by BSNL and 193 households have access to internet connection facilities. While in urban areas of Manipur there are 14,452 households of schedule cast, out of this total household 7,905 households have mobile phone facilities, 864 households have only landline connections provided by BSNL and 540 households have access to internet connection facilities. In the Imphal West district of Manipur there are 5,075 households of schedule caste in total. Out of this 5,075 households 2,974 households have mobile phone facilities, 309 households have only landline connections provided by BSNL and 396 households have access to internet facilities. In rural areas of Imphal West there are 3,128 households of schedule caste and from the total households 1,813 have access to mobile phone facilities, 199 households have only landline connections provided by BSNL and 67 households have access to internet facilities. While that in urban areas of Imphal West there is 1,947 households in total and out of this total household 1,161 have mobile phone facilities, 110 households have landline connections provided by BSNL and 329 households have access to an internet connection facility.

Regarding schedule tribe of Manipur there are 1,73,757 households in total and out of this total household only 65,222 households have mobile phone facilities, 3,041 households have only landline connections and 2,310 households have access to internet facilities. In rural areas of Manipur there are 1,52,848 households in total and out of these households 51,857 households have access to mobile phone facilities, 2,103 households have access to landline connections only and 1,266 households have internet connection facilities. While in urban areas of Manipur there are total 20,909 households of schedule tribe and out of this total household 13,365 have access to mobile phone facilities, 938 households have only landline connections and 1,044 households have internet connection facilities. In the Imphal West district of Manipur there are 4,772 households of schedule tribe in total and out of these total households 3,602 households have mobile phone facilities, 365 households have only landline connections and 423 households have access to internet connection facilities. In the context of rural areas there are 853 households of schedule tribe in total and out of these households 559 households have mobile phone facilities, 27 households have only landline connection and 36 households have access to internet facilities. While that in urban areas there are total 3,919 households of schedule tribe and out of this total households 3,043 households have mobile phone, 338 households have only landline connections and 387 households have access to internet connections facilities.

BSNL is the first mobile service provider in Manipur and is the only operator providing wireline services in the state. After BSNL, Aircel, Reliance, Airtel, Vodafone, Idea start providing mobile communication service. Figure 2.11.2 indicates the service provider wise subscriber base of wireless in Manipur as on May 2013.



Source: TRAI

Fig. 2.11.2: Graphical representation of service provider wise subscriber base of wireless service in Manipur as on May 2013.

Pertaining to above figure it is evidenced that Aircel has the highest subscriber base in Manipur as on May 2013 with 703523 subscribers followed by Airtel with 601008 subscribers, Reliance with 281474 subscribers, Vodafone with 216360 subscribers, BSNL with 170755 subscribers and Idea with 75884 subscribers.

Table 2.11.2: Distribution of ST and SC access to telecommunication service of rural and urban areas of Imphal West District

Area	THH SC	THH SC Access to			THH SC in Imphal West	THH SC in Imphal West Access to			THH ST	THH ST Access to			THH ST in Imphal West	THH ST in Imphal West Access to		
		Mobile	**Wireline**	**Internet**		**Mobile**	**Wireline**	**Internet**		**Mobile**	**Wireline**	**Internet**		**Mobile**	**Wireline**	**Internet**
Rural	13438	6276	725	193	3128	1813	199	67	1,52,848	51857	2103	1266	853	559	27	36
Urban	14452	7905	864	540	1947	1161	110	329	20909	13365	938	1044	3919	3043	338	387
Total	27890	14181	1589	733	5075	2974	309	396	1,73,757	65222	3041	2310	4772	3602	365	423

Source: Census of India 2011

Note: THH-Total House Hold; SC-Schedule Cast; ST-Schedule Tribes

As on May 2013, wireless subscriber base of Manipur is 20,49,004 and wireless teledensity is 72.3%. According to the annual report of DOT 2013-14, Manipur has a broadband connection of 7,547. Regarding mobile coverage of Manipur, out of total 2547 inhabited village based on 2011 census 1937 villages are covered by 2G mobile services. There are 610 inhabited villages which do not have 2G mobile coverage (TRAI).

Table 2.11.3: Districts wise 2G mobile coverage of villages in Manipur as on May 2013.

District	Total no. of village	Total no. of un-inhabited village	No. of village having mobile coverage	Uncovered village
Bishnupur	49	1	48	0
Imphal West	134	17	115	2
Imphal East	209	4	201	4
Thoubal	103	16	86	1
Ukhrul	214	0	86	128
Tamenglong	176	1	99	76
Senapati	687	15	524	148
Churanchandpur	603	4	410	189
Chandel	437	7	368	62
Total	2612	65	1937	610

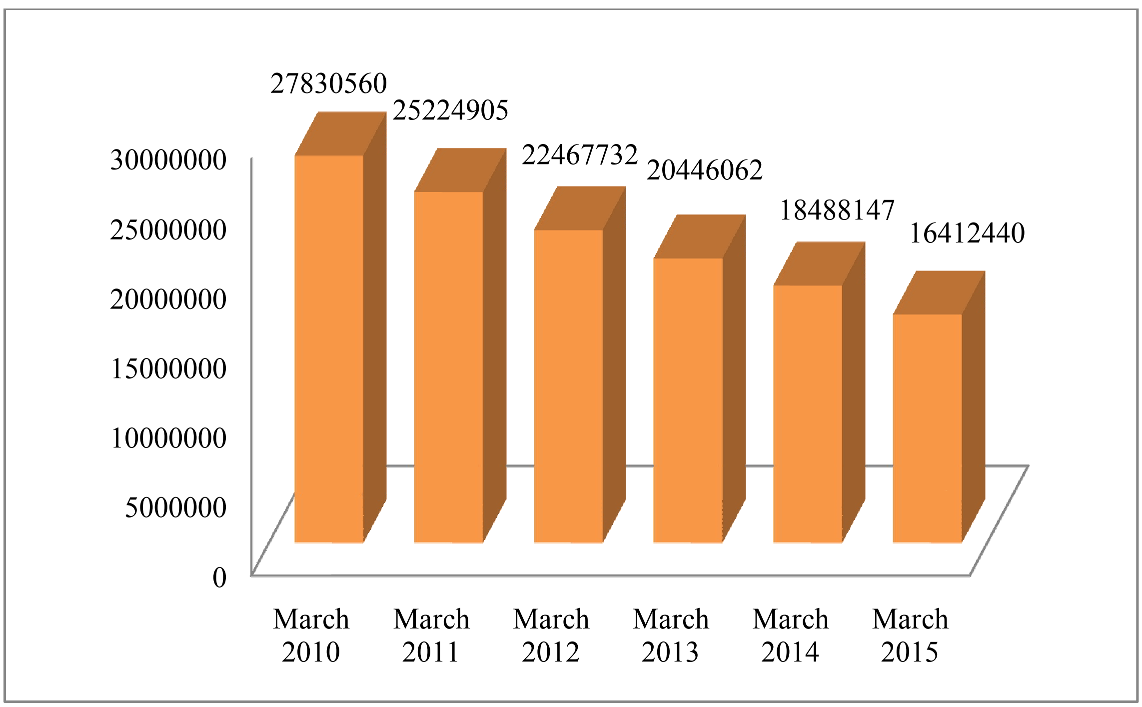
Source: TRAI

3G services in Manipur is very poor, all the District Headquarters have not been fully covered by 3G services. Out of 2547 inhabited villages of Manipur base on 2011 census only 209 villages are covered by 3G and 2257 villages have no 3G coverage. At present Aircel, Reliance, BSNL and Airtel have 3G spectrum in Manipur. 83.3% of the urban population is covered by 3G services and there are total 51 towns, of which 19 are yet to get 3G coverage (TRAI).

2.12 Public Sector Undertaking Mobile Service Provider

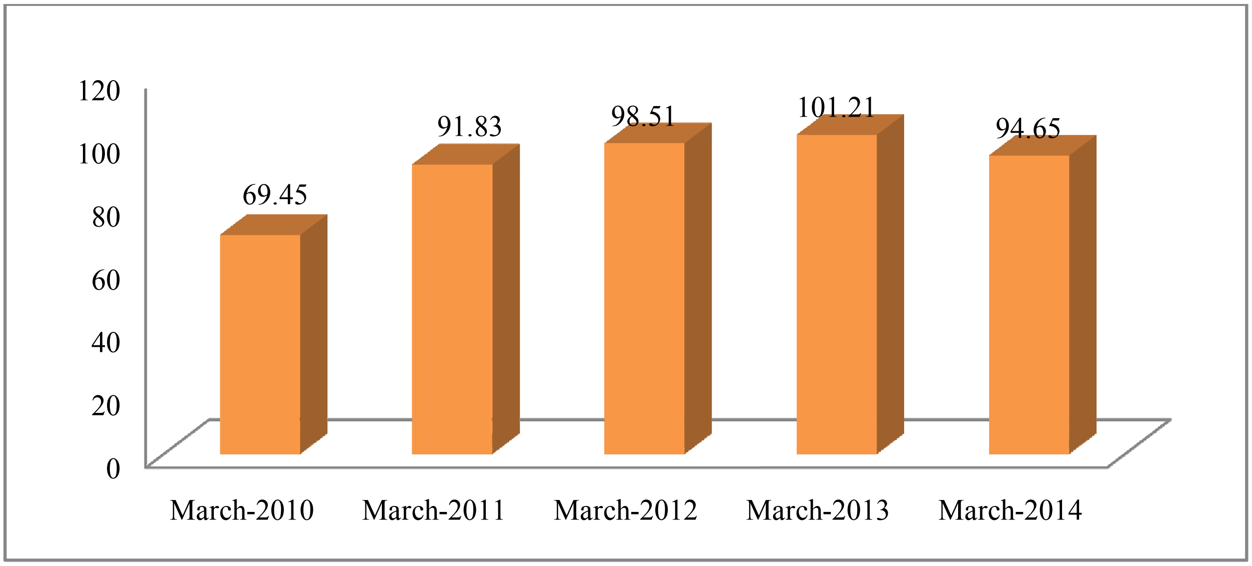
2.12.1 Bharat Sanchar Nigam Limited (BSNL)

BSNL is one of the Public Sector Undertaking telecom service providers formed on 1st October, 2000 by the corporatization of the former Department of Telecom Service. It provides telecom service in the entire telecom circle, excluding Mumbai and Delhi. The technologies used by BSNL for providing telecom service are GSM, EDGE, HSDPA, $HSPA^+$, CDMA2000, EVDO and WiMAX. BSNL provides services such as wireline and wireless, WLL, broadband, internet, leased circuits and long distance telecom service. In 2011 BSNL offer 3G service to its customer and in January 2016 BSNL launched 4G service in Chandigarh on non-commercial basis at the speed of 100 Mbps. The subscriber of BSNL including wireline and wireless as on April 2015 stood at 93985848 of which wireline marked 16175388 and wireless marked 77810460 subscribers. In March 2010, rural wireless subscriber of BSNL marked 25.26 million and the same is increased to 32.53 million in March 2014. The wireline subscriber base of BSNL from March 2010 to March 2015 is depicted in the fig. 2.13.1.1. The wireless subscriber base of BSNL from March 2010 to March 2014 is highlighted in fig 2.13.1.2 and fig.2.13.1.3 highlighted the rural wireless subscriber of BSNL from March 2010 to March 2014.



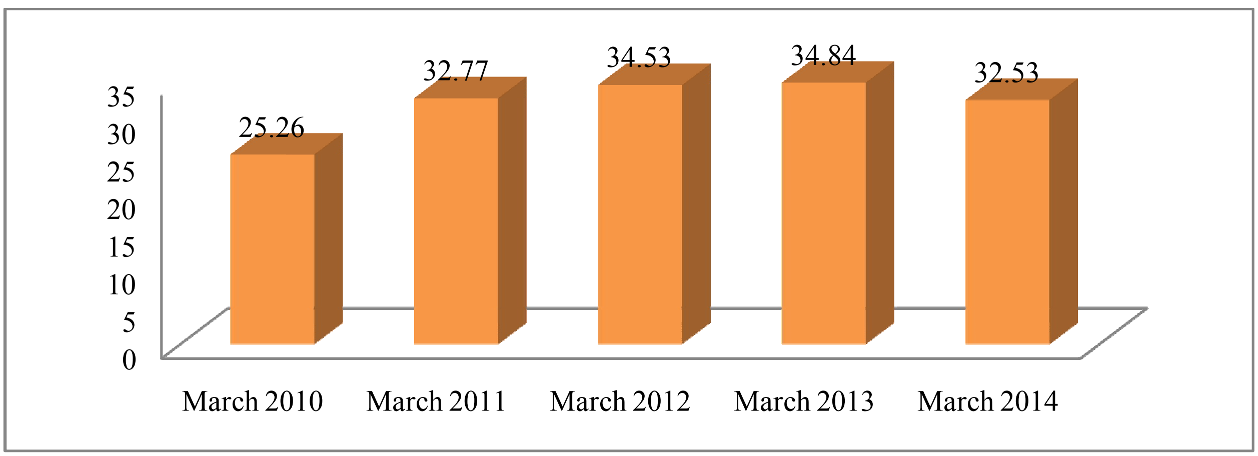
Source: TRAI

Fig. 2.12.1.1: Graphical representation of wireline subscriber base of BSNL from March 2010 to March 2015



Source: TRAI

Fig.2.12.1.2: Wireless subscriber base of BSNL from March 2010 to March 2014.

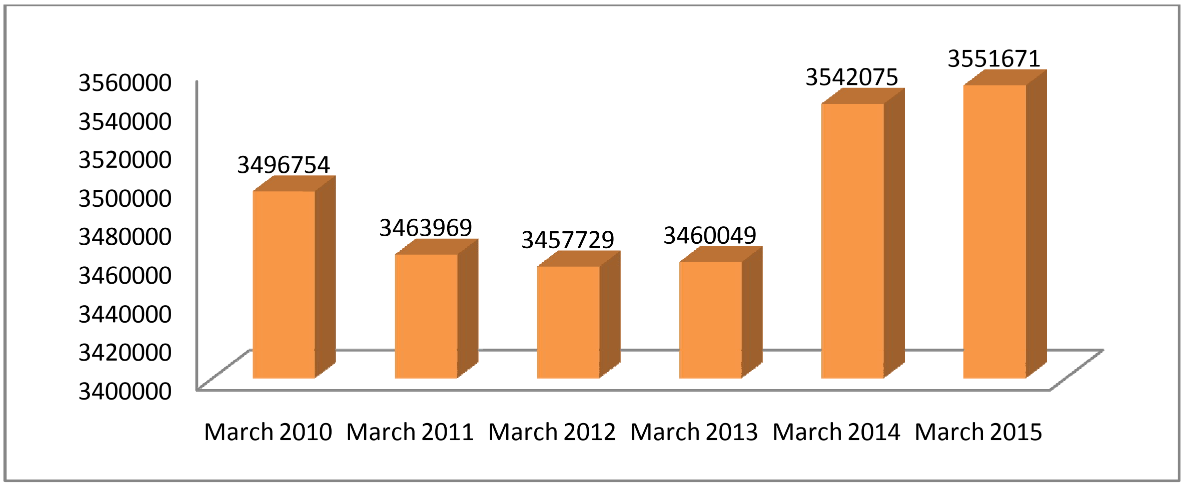


Source: TRAI

Fig.2.12.1.3: Rural wireless subscriber base of BSNL from March 2010 to March 2014.

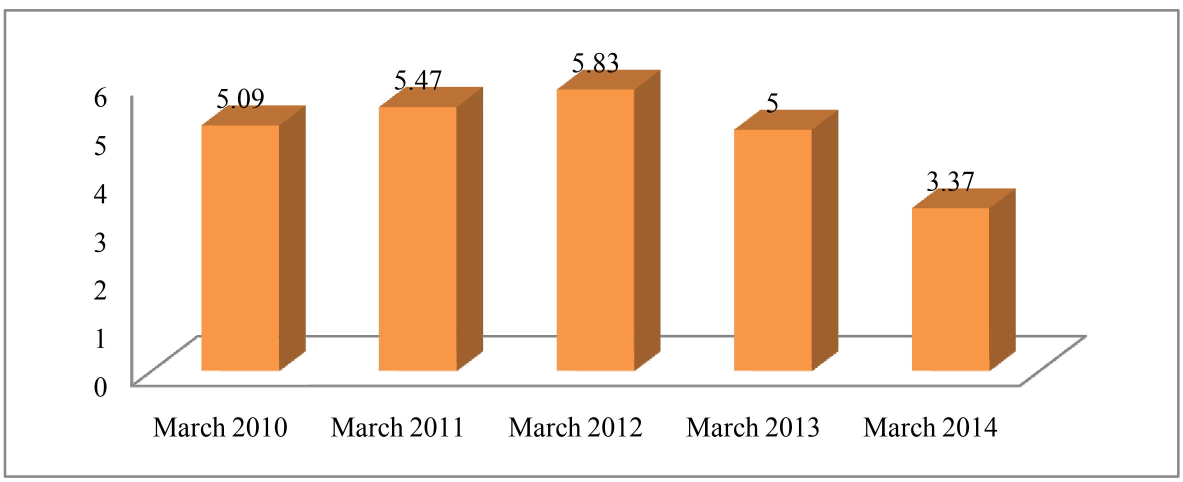
2.12.2 Mahanagar Telephone Nigam Limited (MTNL)

MTNL as a PSU company was formed on April 1, 1986 with a vision to provide telecom service at Mumbai and Delhi only. MTNL provides fixed line telecommunication service and GSM mobile service in these two metropolitan cities. It also provides dial up internet services in Delhi &Mumbai under separate non-exclusive license agreement. MTNL launched Broadband service in the year 2005 and 3G services on 11th December, 2008. To make the 3G services popular among its subscribers, MTNL has allowed all its GSM mobile subscriber access to 3G services. MTNL operates by using GSM, CDMA2000 and HSDPA technologies. It offers wireline and wireless telecom service to its customer and in addition internet and broadband service. As on April 2015, the subscriber base of MTNL marked at 7028400 of which wireless subscriber base stood at 3482209 and wireline subscriber base stood at 3546191. As on March 2014, MTNL has 11.72 lakh broadband connections. Fig. 2.12.2.1 highlights the graphical representation wireline subscriber of MTNL from March 2010 to March 2015 and fig.2.12.2.2 highlights the wireless subscriber base of MTNL from March 2010 to March 2014.



Source: TRAI

Fig.2.12.2.1: Graphical representation of wireline subscriber of MTNL from March 2010 to March 2015.



Source: TRAI

Fig. 2.12.2.2: Graphical representation of wireless subscriber base of MTNL from March 2010 to March 2014.

2.13 Private sector undertaking mobile service provider

2.13.1 Vodafone

Vodafone India Limited headquarter in Mumbai, is the 2nd largest mobile network operator serving over 184 million customers as on April 2015, with a presence in all 22 telecom circles. Vodafone offers voice telephony, including wireless and wireline, mobile internet, wireless broadband services, My Vodafone apps, music, videos and more in India. Vodafone also supports the government's objective to improve rural penetration of telephony services and for this Vodafone has worked continuously in the last few years to establish a strong rural presence. Vodafone marked a growth of over 21% in rural subscriber base in the financial year 2011-2012 to become the second largest rural wireless operator in the country. Vodafone has 143.0 million prepaid subscribers and 7.5 million postpaid subscribers as on 31st March 2012. In April 2015, the wireless subscriber base of Vodafone stood at 184562590 as against 81240 wireline subscriber in the same period. The wireless subscriber base of Vodafone since March 2010 to March 2014 is given in the fig. 2.13.1.1 and rural wireless subscriber base of Vodafone from March 2010 to March 2014 is predicted in the fig 2.13.1.2.

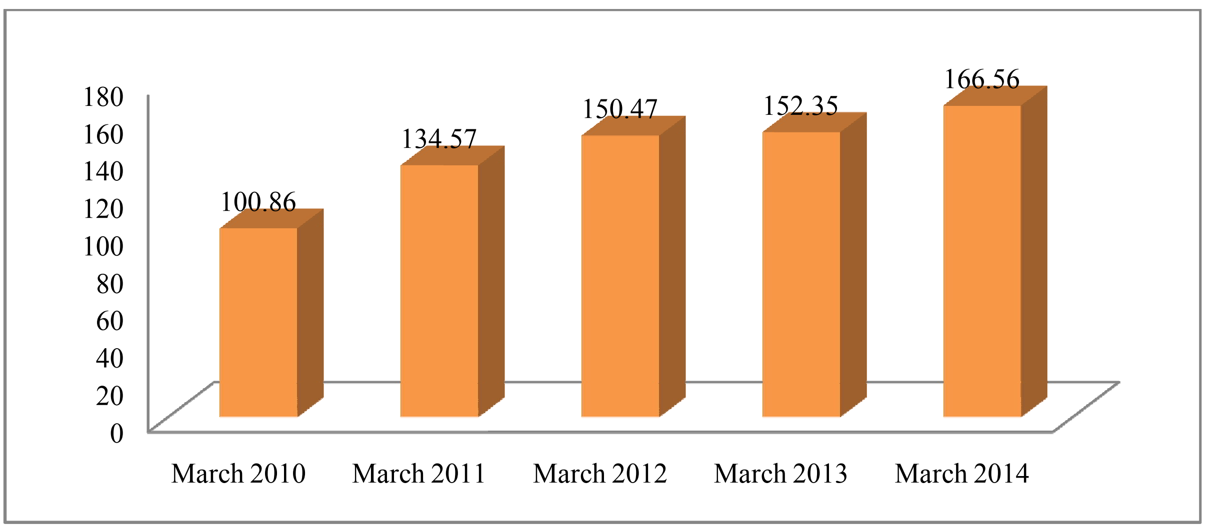


Fig. 2.13.1.1: Wireless subscriber base of Vodafone (in million) from March 2010-March 2014.

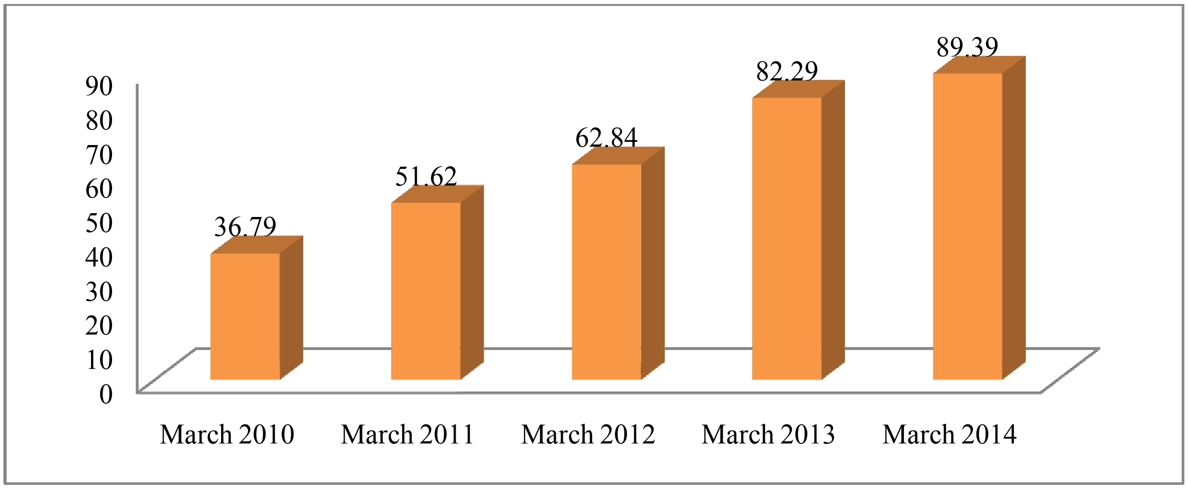


Fig.2.13.1.2: Rural wireless subscriber base of Vodafone (in million) from March 2010-March 2014.

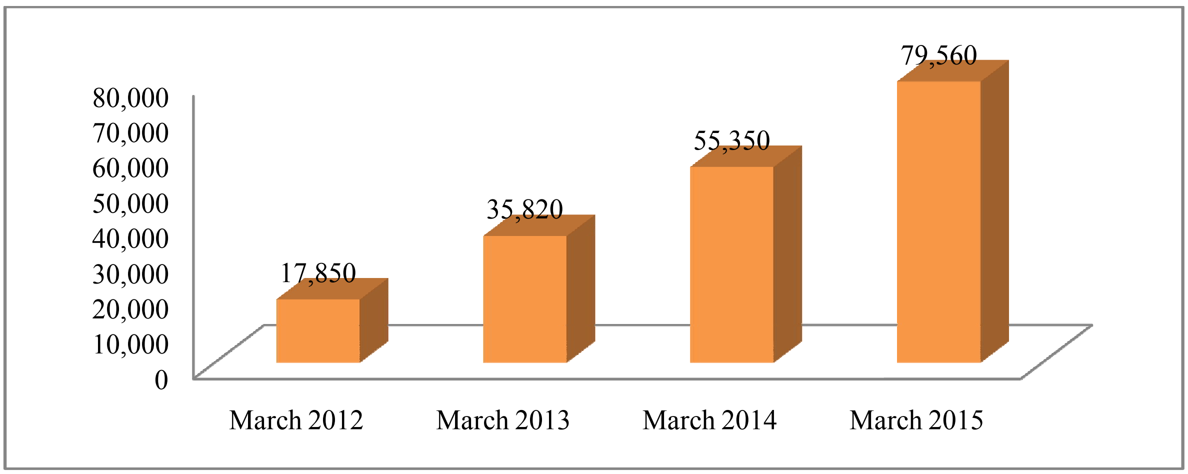


Fig. 2.13.1.3: Wireline subscriber base of Vodafone since March 2012-March 2015.

2.13.2 Bharti Airtel

Bharti Airtel was established on 7th July 1995, it is the largest mobile network operator in India and the third largest in the World. Headquarter in New Delhi, Bharti Airtel operates in 20 countries across South Asia, Africa and the Channel Islands. In India, Airtel provides 2G, 3G and 4G wireless services, mobile commerce, fixed line service, high speed DSL broadband, IPTV, DTH, enterprise services including national & international long distance services to carriers. In 2011, Airtel launched 3G service in Mumbai and in 2014 Airtel and Apple launched India's first 4G on mobile. In terms of subscriber Bharti Airtel is the largest mobile service provider and second largest wireline service provider in India. As on April 2015, Bharti Airtel has 22,60,17,413 wireless subscriber and 34,18,492 wireline subscriber. The wireless subscriber base of the company from March 2010 to March 2014 is depicted in the fig. 2.13.2.1 and rural wireless subscriber base is depicted in the fig. 2.13.2.2.

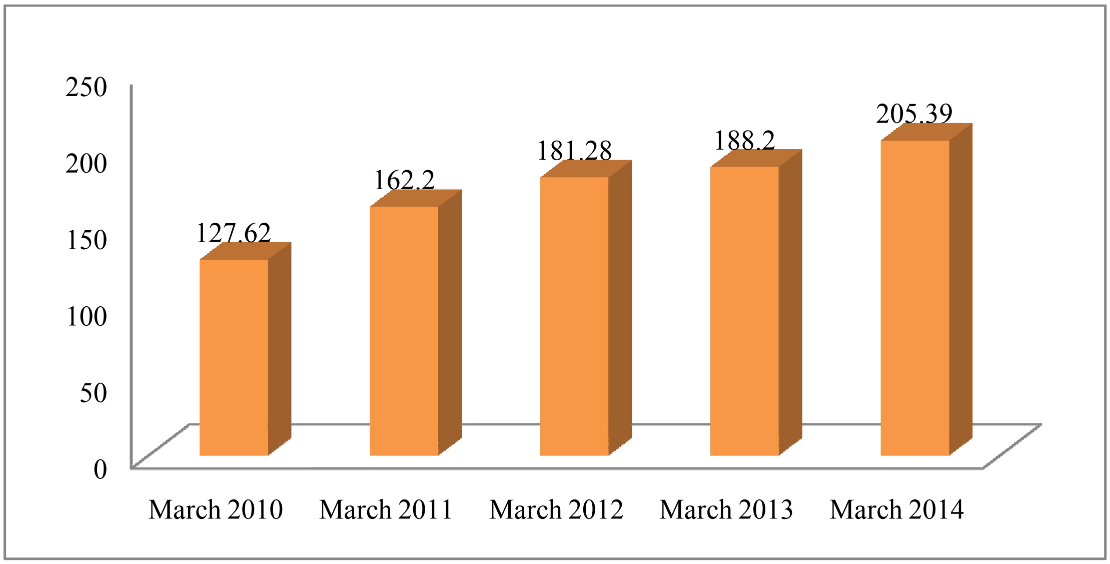


Fig. 2.13.2.1: Wireless subscriber base of Airtel (in million) from March 2010 to March 2014.

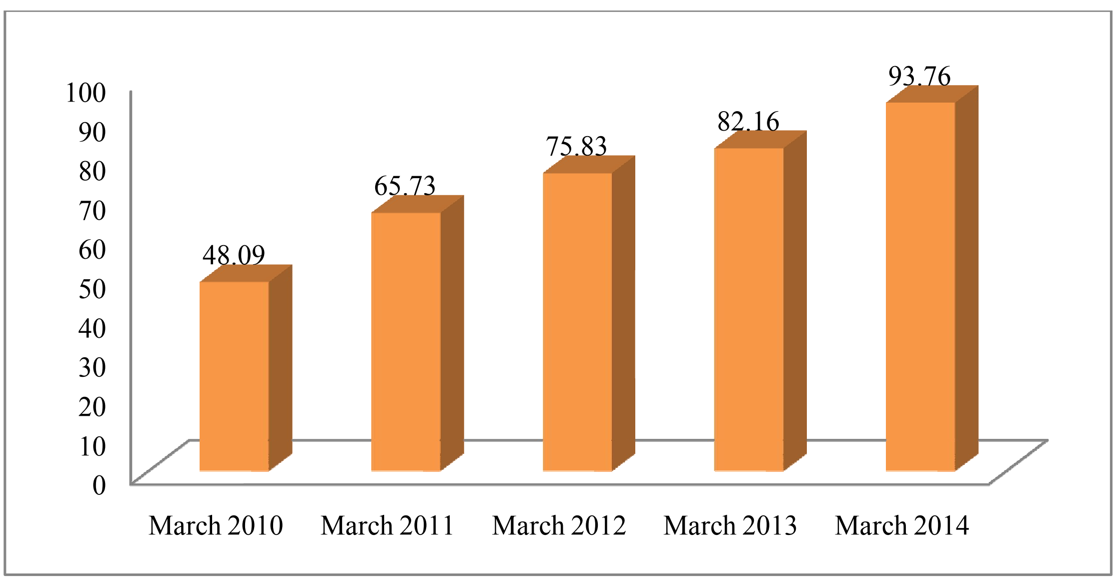


Fig.2.13.2.2: Rural wireless subscriber base of Airtel (in Million) from March 2010-March 2014.

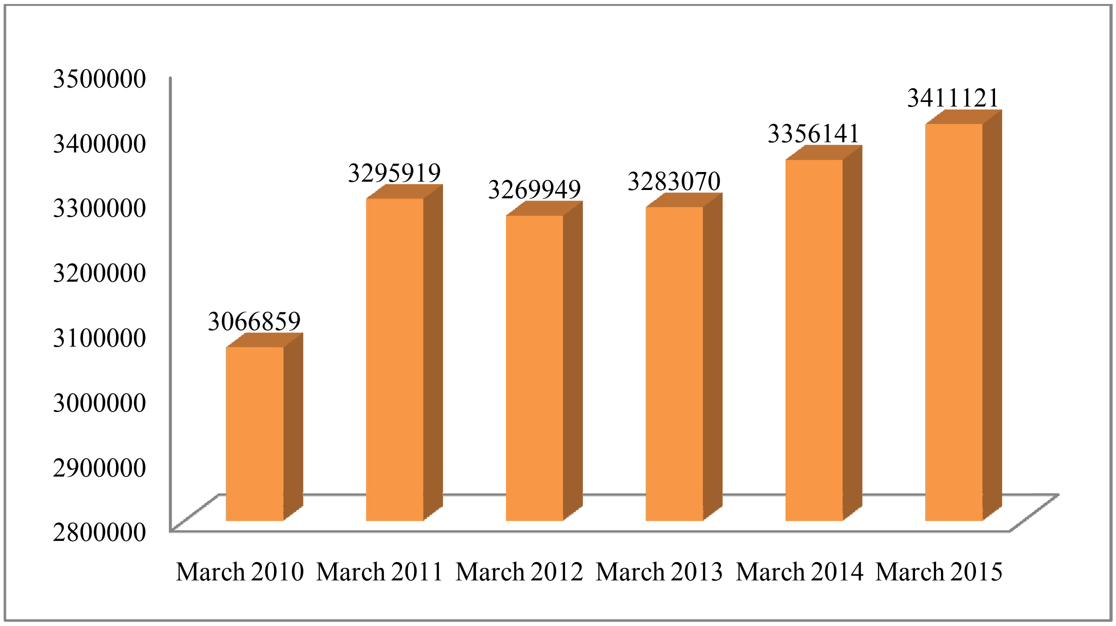


Fig.2.13.2.3: Wireline subscriber base of Airtel from March 2010-March 2015

2.13.3 Idea

In 1997, Idea commenced its operations in Gujarat and Maharashtra under the company name Birla AT&T Communications Limited. Former to this the company name is Birla Communications Limited. In 2001, the company name was again changed to Birla Tata AT&T Limited. In 2002, again changed name to Idea Cellular Limited and launched "Idea" brand name. In 2011, Idea launched its 3G service in ten telecom circles. Idea won 4G LTE telecom spectrum for eight telecom service areas in 2014. In 2013, Idea emerged as the third largest mobile service provider with 128,685,043 subscribers at the end of December 2013. The wireless subscriber base of Idea as on April 2015 stood at 159,200,069. As on March 2014, the rural wireless subscriber base of Idea stood at 74.72 million. Fig 2.13.3.1 indicates the wireless subscriber base of Idea from March 2010 to March 2014 and fig. 2.13.3.2 indicates the rural wireless subscriber base of Idea from March 2010 to March 2014.

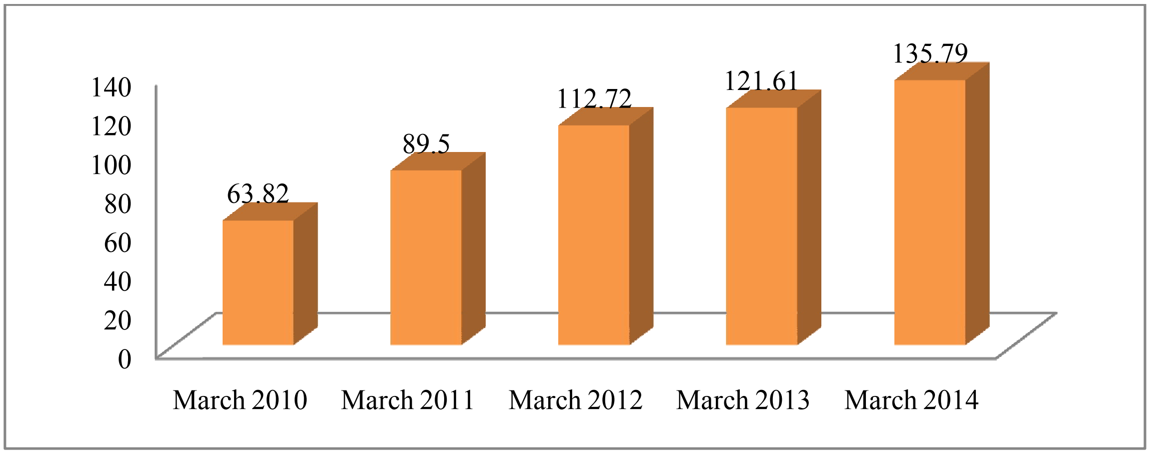


Fig.2.13.3.1: Wireless subscribers (in million) of Idea from March 2010-March 2014.

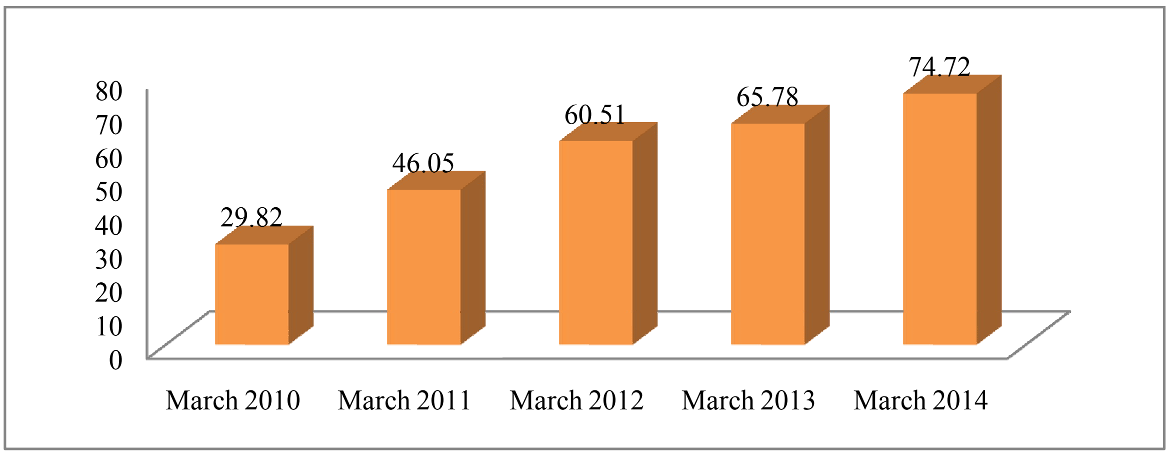
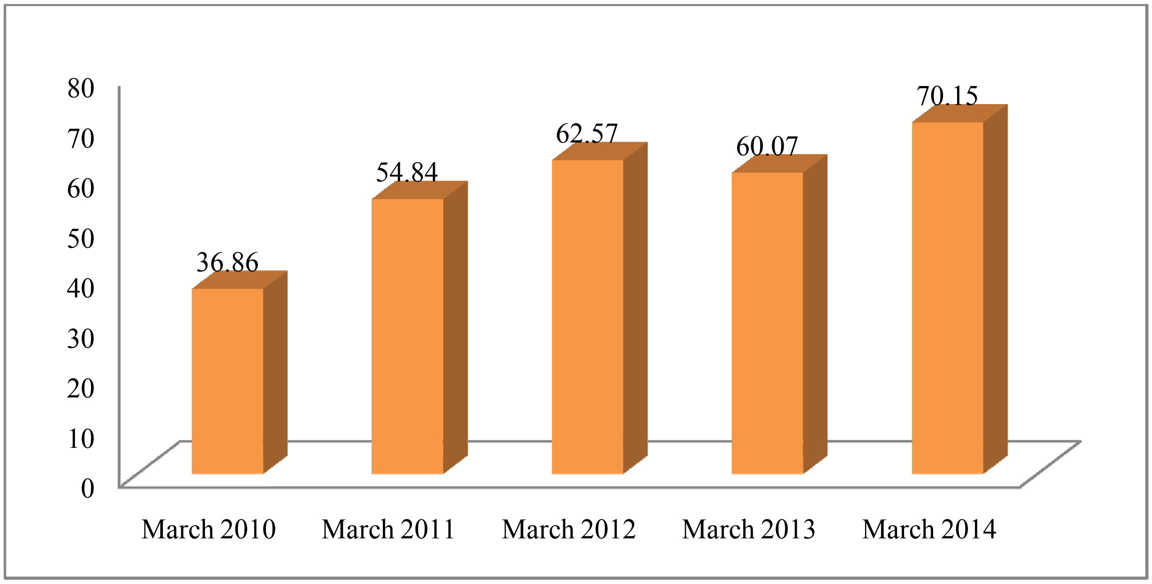


Fig. 2.13.3.2: Rural wireless subscribers (in million) of Idea from March 2010-March 2014.

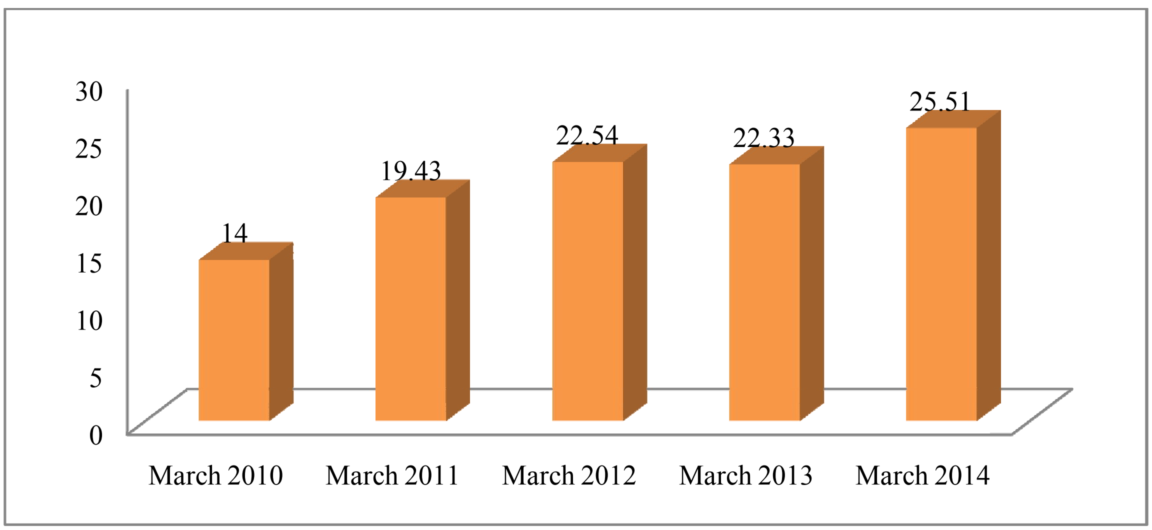
2.13.4 Aircel

Aircel headquarter in Chennai is an Indian Mobile Network operator with a presence in all 22 Telecom Circle. It commenced its service in Tamil Nadu in 1999. Aircel is the fifth largest mobile service provider in the country with a subscriber base of 82015141 as of April 2015. Aircel offers 2G, 3G, 4G services, wireless broadband services and mobile entertainment apps to its customers. Aircel operates in GSM, EDGE, HSDPA, TD-LTE technology. Aircel rolls out 3G services in 2014 at Delhi, Rajasthan and Mumbai and presently it has 3G spectrum in 13 Telecom Circle. In 2014 Aircel roll out 4G LTE services in Andhra Pradesh, Assam, Bihar and Odisha and then to Tamil Nadu and J&K. As on March 2014, the wireless subscriber base of Aircel stood at 70.15 million of which rural wireless subscriber base marked 25.51 million in the same period. Wireless subscriber base of Aircel from March 2010-March 2014 is highlighted in the fig 2.13.4.1 and fig 2.13.4.2 indicates rural wireless subscriber of Aircel from March 2010 to March 2014.



Source: TRAI

Fig.2.13.4.1: Wireless subscriber of Aircel (in million) from March 2010-March 2014.

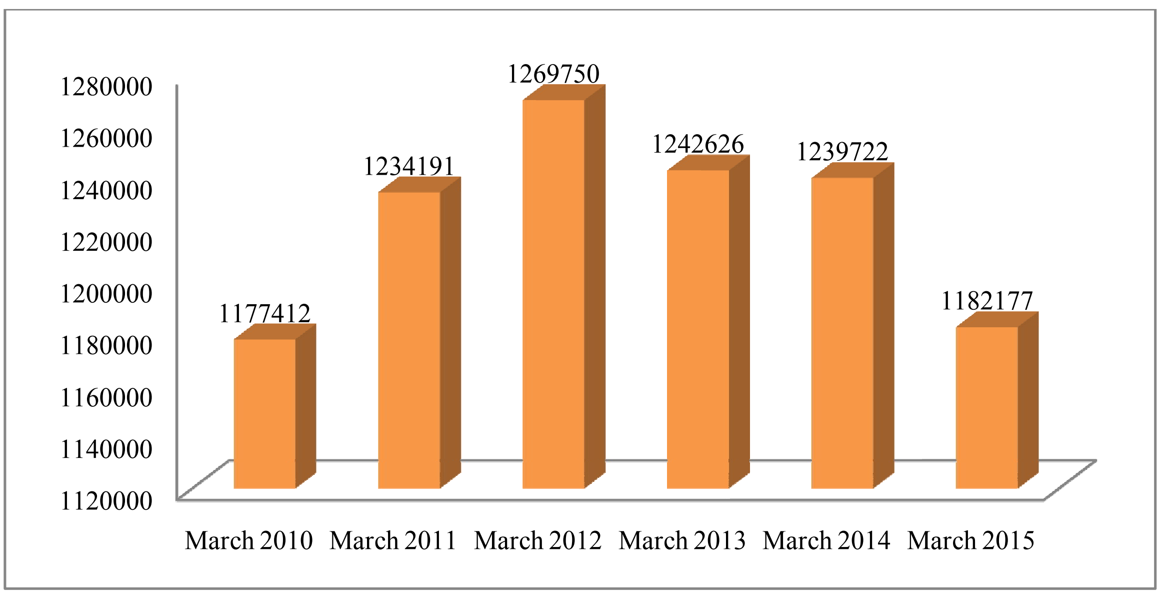


Source: TRAI

Fig.2.13.4.2: Rural wireless subscriber of Aircel (in million) from March 2010-March 2014.

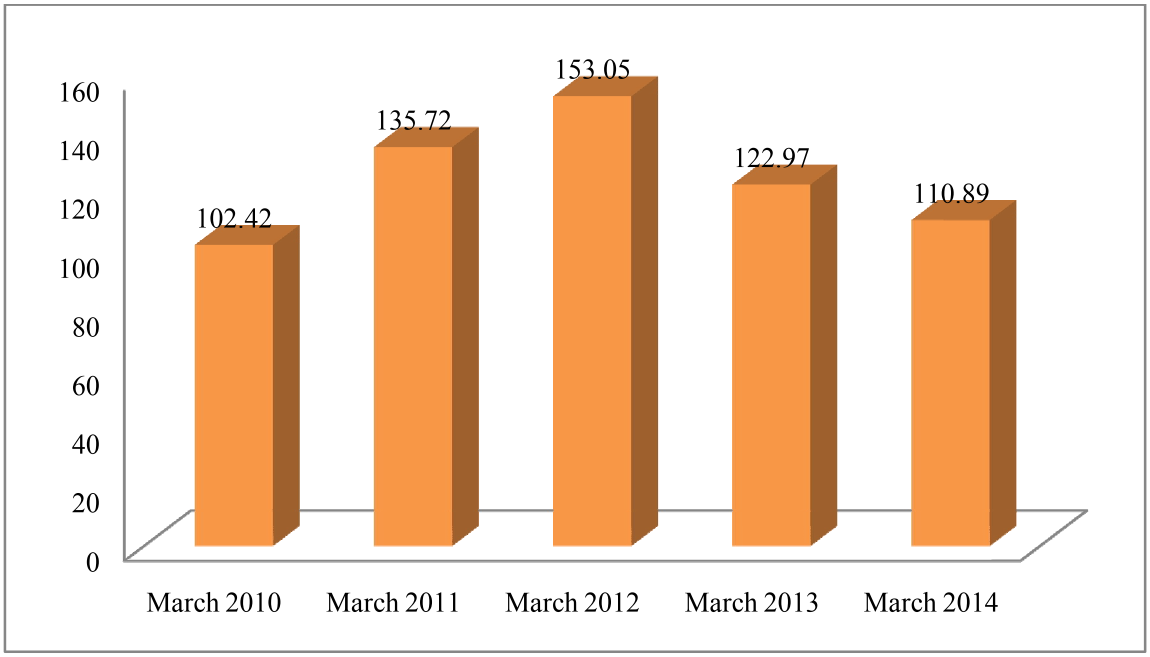
2.13.5 Reliance

Reliance Communication Ltd. Headquarter in Mumbai is an Indian telecommunication service operator which offers wireline and wireless telecommunication services such as internet, wireline and wireless broadband, voice service and mobile entertainment. Reliance operates in GSM, CDMA2000, EVDO, EDGE, HSPA+, and WiMAX technology. Reliance is India's first telecom service provider offering nationwide CDMA and GSM services with digital voice clarity. In December 13th, 2010 Reliance roll out its first 3G service in Delhi, Mumbai, Kolkata and Chandigarh. It provides services in all the 22 Telecom Circle with 110,985,293 subscribers, including wireline and wireless as on April 2015. In this period the subscriber base of wireline stood at 11,82,177 as against 10,98,02,978 wireless subscriber. The rural wireless subscriber of Reliance increased from 21.25 million in March 2010 to 27.32 million in March 2014. The wireline subscriber of Reliance from March 2010 to March 2015 is highlighted in the fig 2.13.5.1. The wireless subscriber of Reliance from March 2010 to March 2014 is highlighted in the fig 2.13.5.2 and fig 2.13.5.3 depicted the rural wireless subscriber of Reliance from March 2010 to March 2014.



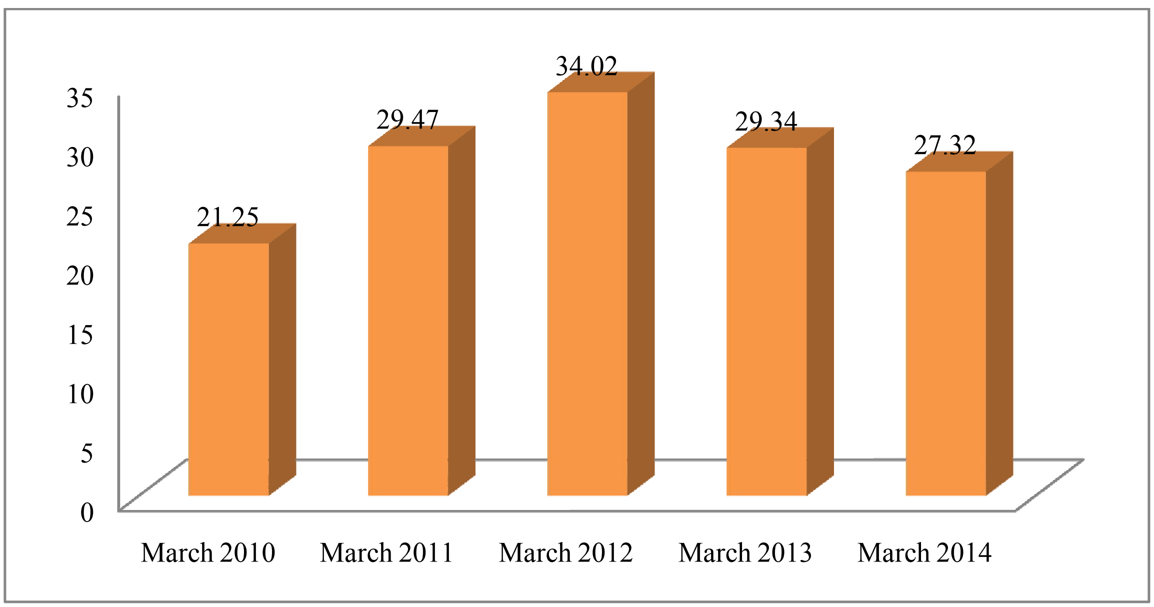
Source: TRAI

Fig. 2.13.5.1: Wireline subscriber base of Reliance from March 2010 to March 2015



Source: TRAI

Fig.2.13.5.2: Wireless subscriber base of Reliance from March 2010 to March 2014



Source: TRAI

Fig.2.13.5.3: Rural wireless subscriber base of Reliance from March 2010 to March 2014