No. 2004-09-B

OFFICE OF ECONOMICS WORKING PAPER

U.S. INTERNATIONAL TRADE COMMISSION

The Liberalization of India's Telecommunications Sector: Implications for Trade and Investment

William Greene*

U.S. International Trade Commission

September 2004

---

*The author is with the Office of Economics of the U.S. International Trade Commission. Office of Economics working papers are the result of the ongoing professional research of USITC Staff and are solely meant to represent the opinions and professional research of individual authors. These papers are not meant to represent in any way the views of the U.S. International Trade Commission or any of its individual Commissioners. Working papers are circulated to promote the active exchange of ideas between USITC Staff and recognized experts outside the USITC, and to promote professional development of Office staff by encouraging outside professional critique of staff research.

Address correspondence to:
Office of Economics
U.S. International Trade Commission
Washington, DC 20436 USA

The Liberalization of India's Telecommunications Sector: Implications for Trade and Investment

William Greene
U.S. International Trade Commission[1]

ABSTRACT

India's telecommunication sector has undergone a spectacular transformation during the last decade emerging from a highly regulated, state-owned monopoly to a moderately competitive fairly deregulated sector. Today, India possesses the world's fifth largest public sector telecommunictions network and Asia's third largest, behind only China and South Korea. India's telecommunications sector continues to grow at a rapid pace and government officials, regardless of party, acknowledge that India needs a modern telecommunications network to sustain high levels of economic growth and to create the proper environment for its IT sector to grow and prosper.

Given its size and population, India possesses one of the most under penetrated and least developed telecommunications services markets in the world. India's fixed-line service sector has suffered from decades of under investment, the abscence of competition, government protection, and monopoly. Much of the country's telecommunications infrastructure is archaic by international standards and the introduction of new technologies has rendered it obsolete. By the late 1980s, recurring fiscal deficits and negative balances of payments encouraged the Indian government to initiate an economic reform package to move the country from central planning to a market economy. The package of reforms ended the government's monopoly over telecommunications services and in the manufacture of telecommunications equipment and opened the sector to private sector participation and foreign investment.

Many of the world's leading multinational telecommunications firms have been drawn to India because of its enormous market potential. The opening of the telecommunications sector created one of the fastest growing and hottest markets for equipment and services in the world. Today vendors from the United States and other countries dominate India's $12.3 billion annual equipment market. To meet the ambitious goals set by the government in the National Telecom Policy of 1994 and 1999, India will need to install approximately 250 million telephones by 2010 at a cost of $106 billion. Most of the funds needed for the expansion are expected to come from the United States and other foreign investors.

[1]The author is with the Country and Regional Analysis Division, Office of Economics, U.S. International Trade Commission, 500 E Street, NW, Washington, DC 20436. Office of Economics Working Papers are the result of the ongoing professional research of USITC staff and are solely meant to represents the opinions and professional research of individual authors. These papers are not meant to represent the views of the U.S. International Trade Commission or any of its individual Commissioners. Working papers are circulated to promote the active exchange of ideas between USITC Staff and recognized experts outside the USITC, and to promote professional development of Office staff by encouraging outside professional critique of staff research. Please direct all correspondence to William Greene, Office of Economics, U.S. International Trade Commission, telephone: 202-205-3405, fax: 202-205-xxx, *email: greene@usitc.gov*.

CONTENTS

Page

Abbreviations and Acronyms
Overview 1
Regulatory Bodies 3
- Department of Telecommunications (DoT) 3
- Telecom Regulatory Authority of India (TRAI) 6
- Telecom Dispute Settlement and Appellate Tribunal (TDSAT) 7
- Other Government Bodies 7

Deregulation and Policy Reforms 7
- National Telecom Policy (NTP), 1994 10
- National Telecom Policy (NTP), 1999 11
- Communications Convergence Bill 2001 14
- Unified Access Licensing regime 14

Market Characteristics and Trends 17
Telecommunications Services 20
- Basic-fixed line service 22
- Cellular Telephony 24
- Wireless-in-local loop (WLL) using CDMA technology 32
- Internet 34

Profiles of Leading Companies 38
- Mahanagar Telephone Nigam Limited (MTNL) 38
- Videsh Sanchar Nigam Limited (VSNL) 41
- Bharat Sanchar Nigam Limited (BSNL) 43
- Bharti Televentures 46
- Idea Cellular 48
- Escotel Mobile Communications 49
- Shyam Telecom 50
- Himachal Futuristic Communications Infotel (HFCL) 50
- MobileFirst 51
- BPL Cellular 52
- Tata Indicom 53
- Reliance Infocomm 54
- Hutchison-Essar Telecom (HMTL) 56

Investment Trends 57
Telecommunications Equipment Market 60
- Exports 65
- Imports 66

International Trade Disputes and WTO Commitments 67
Outlook for the Indian Telecommunications Industry 69

Page

APPENDIX A:

Table A-1 Telephones per 100 population (tele-density), Dec. 31, 2002 72
Table A-2 Total Telephones in India, Dec. 31, 2002 73
Indian telecommunications Sector Time Line 74
Glossary of Terms 76

ABBREVIATIONS AND ACRONYMS

A&N	Andaman & Nicobar
AP	Andhra Pradesh
ARPU	Average revenue per user
ATM	Asynchronous transfer mode
ATM	Automatic teller machine
BPO	Business process outsourcing
BSNL	Bharat Sanchar Nigam Ltd
BSO	Basic service operator
Its	Base station transfer system
Car	Compound's annual growth rate
CDMA	Code division multiple excess technology
CAI	Cellular Operators Association of India
CSC'S	Central switching center
Dells	Direct exchange lines
DoT	Department of Telecommunications
D.L.	Digital subscriber line
Do	Department of Telecommunications Operations
DTS	Department of Telecommunications Services
FBI	Foreign direct investment
Fops	Basic fixed line service providers
Fcp.	Fixed-wiress telephone
FWT	Fixed-wireless terminals telephones (WLL-F)
GATS	General Agreement on Trade and Services
GDP	Gross Domestic Product
GSM	Global System for Mobile Communications
GOI	Government of India
HFCL	Himachal Futuristic Communications
HP	Himachal Pradesh
ILD	International long distance service
INMARST	International Marine Satellite Organization
ISDN	Integrated services digital network
ISP	Internet service provider
IT	Information Technology
ITI Ltd	Indian Telephone Industries
J&K	Jammu & Kashmir
LAN	Local area network
MP	Madhya Pradesh
MSC	Mobile switching center
MTNL	Mahanagar Telephone Nigam Ltd
NLD	National long distance service
NTP'94	National Telecom Policy 1994
NTP'99	National Telecom Policy 1999
PC	Personal computer
PCO	Public call offices
PBX	Private branch exchange
PSTN	Public switched telephone network
PSU	Public limited company

PTO	Public telecommunications operator
PTT	Post, Telecommunications, and Telegraph model
Rkm	Route kilometer
RBS	Radio base station
SDCA	Short distance calling area
SMS	Short messaging system
STD	Subscriber trunk dialing
TN	Tamil Nadu
TAX	Trunk auto exchange lines
TDSAT	Telecom Dispute Settlement and Appellate Tribunal
TRAI	Telecom Regulatory Authority of India
UP (e)	Uttar Pradesh (east)
UP (w)	Uttar Pradesh (west)
USTR	U.S. Trade Representative
VoIP	Voice over Internet Protocol
VSAT	Very small aperture terminal
VSNL	Videsh Sanchar Nigam Ltd
VTPs	Village public telephones
WAP	Wireless applications protocol
WB	West Bengal
Wi-Fi	Wireless fidelity service
WLL	Wireless-in-local loop
WLL-F	Wireless-in-local loop fixed
WLL-M	Wireless-in-local-loop limited mobility
WTO	World Trade Organization

OVERVIEW

India possesses the world's fifth largest public sector telecommunications network and Asia's third largest, behind only China and South Korea.[1] Since the late 1980s India has progressively liberalized its telecommunications services and equipment manufacturing sectors and has now opened them to private sector participation. The Indian market for telecommunication services is expected to grow from $11 billion in FY2002-2003 to between $23 billion and $25 billion in 2007, representing one of the fastest growth rates in the world.[2] The surge in basic telecommunications services has been propelled by a number of factors including: rising demand for telephone lines, growing importance of cellular telephony, the liberalization of equipment imports, declining telephone call rates, increasing competition from private sector service providers, and the demand for better and more modern services by India's internationally competitive Information Technology (IT) and business process outsourcing sectors (BPO).

India: key indicators	
Population	1.06 billion
GDP	$3.022 trillion
Percent below poverty line	25 percent
Literacy rate	59 percent
GDP per captia	$2,900
GDPreal growth	7.6 percent
GDP	$3.02 billion
Exports	$57.2 billion
Imports	$74.2 billion

India's telecommunications sector has undergone a spectacular transformation during the last decade emerging from a highly regulated, state-owned monopoly to a moderately competitive fairly deregulated sector. Realizing the importance of a modern telecommunications network and a global shift toward knowledge-based economies, the Government of India (GOI) realized that the provision of a modern, efficient, world class telecommunications infrastructure was central to accelerating the economic development and social growth of the country.[3] Similarly Mr. T.V. Ramachandra, Director General of Cellular Operators Association of India (COAI), stated that "world over, telecom is accepted to be a critical infrastructure sector. It substantially impacts the efficiency, competitiveness and growth of every other industry. In fact, international studies have shown a direct relationship between growth in tele-density and its impact on economic growth."[4] It has been established that for every 1 percent increase in tele-density, there is a 3 percent increase in the growth in GDP.

During the last decade, India's telecommunications network capacity has grown to more than 79 million working telephones (both cellular and fixed-line) and 36,628 telephone exchanges. Indian telephone service providers installed more than 1.5 times more fixed phones between 1998 and 2003 than

[1] Telecom India, Confederation of Indian Industry (CII), found at http://www.ciionline.org.

[2] India's fiscal year extends from March 31 to March 31. India Telecom News, found at http://www.indiatelecomnews.com/investmentfinance.htm, retrieved Feb. 19, 2004. "Telecom reform," BSNL, Feb. 10, 2004, found at http://www.bsnl.in/telecomguide.asp?intnewsid=29076, retrieved Feb. 11, 2004. "India's telecom revenues seen at $23-25 bn by 2007: E&Y," Hindustan Times, March 8, 2004, found at http://www.hindustantimes.com/news/181-603279.0003.htm, retrieved March 8, 2004.

[3] *History of Cellular Telephony in India*, Cellular Operators Association of India (COAI), found at http://www.coai.com/telephny.htm, retrieved March 25, 2003.

[4] Tele-density is the number of telephones per 100 people and it is believed to be an index of economic growth since there is a positive correlation between per capita income and tele-density. T.V. Ramachandra, Director General, COAI, The Process and Progress of Liberalization, CTMS Seminar, Dec. 29, 2002, found at http://www.ctms-bharat.org/121_jan02.htm, retrieved Oct. 30, 2003.

they had during the previous 40 years.[5] During 2000-2003, fixed-line installation grew by an average of 22 percent and cellular telephony subscribership grew from 339,031 subscribers in 1997 to more than 28 million in May 2004 (table 1).[6] The growth of India's telecommunications services sector has not been limited only to fixed-lines and cellular mobile telephony. India's telecommunications sector has grown to include a large network of optical fiber cables, digital microwave and satellite communications systems, and a wide range of value-added services such as radio paging, public mobile radio trunking services, high speeds Internet, video-on demand and video conferencing, global communications by satellite (GMPCS), very small aperture terminal (VSAT), video conferencing, INMARST, and intelligent networks.

Table 1: Telecommunications network status (Feb. 2004)

Number of basic telephones	43.2 million
Cellular subscribers	
GMS technology	28.6 million
WLL CDMA technology	7.7 million
Total phones	79.5 million
Tele-density	7.02 per 100
Waiting list (fixed phones)	1.9 million
Equipped switching capacity	63.4 million
Telephone exchanges (2002-03)	38,000
Village public phones (VTPs)	522,263
Rural direct exchange lines (DELs)	11.9 million
PCOs (public)	1.9 million
Trunk auto exchange lines (TAX)	4.9 million
Optical fiber cable (route kms)	579,500
UFH and microwave (route kms)	264,551
Internet service providers (ISPs) (Dec. 2002)	213
International gateways	55
Internet subscribers	4 million
Internet users	18 million
Internet cafes (dhabas)	50,000
Personal computers	9 million
Satellite stations	515

Source: Department of Telecommunications (DoT), COAI.

However, given its size and population, India possesses one of the world's most under penetrated and least developed telecommunications services markets. India's fixed-line service sector has suffered from decades of under investment, the absence of competition, government protection, and monopoly. Until very recently, Indians had to wait, on average, several years to obtain a telephone line. Also, the Indian government owned and operated telecommunications monopolies were unable to supply affordable, reliable, and modern telecommunications services to its customers. Much of India's telecommunications infrastructure is archaic by international standards and the introduction of new

[5] India - A Bird's eye view, Investindiatelecom, found at http://www.investindiatelecom.com/brochure/brochure.htm, retrieved Nov. 5, 2003.

[6] Department of Telecommunications (DoT) and Cellular Operators Associations of India (COAI).

technologies has rendered India's telecommunications network obsolete.[7]

With a population exceeding one billion people, India possesses only 72 million telephones, which translates into a tele-density, a measure of telephone penetration, of nearly 7 telephones per 100 inhabitants, one of the lowest in the world.[8] In 2002, India's average rural tele-density was 1.4 phones for every 100 citizens, whereas its urban tele-density was higher at more than 13 per 100 (Appendix A-1). Due to the high cost of supplying telephone services and the limited return on investment, India's national tele-density is well below the world average of 35 and significantly below that of the United Kingdom (85), the United States (80), China (24), and most Scandinavian countries (95). Of India's 607,491 rural villages covered under the village public telephone program only 85,228 lacked access to a village public telephone (VTPs) during 2004 and the country's cellular penetration lagged at approximately 2.1 cellular mobile telephones per 100 residents.[9] The areas with the highest tele-density rates are the cities of Mumbai (India's financial center), New Delhi (the national capital), Kolkata (India's most populous city), and Chennai. Parts of the country with the lowest telephony penetration rate include Chhattisgarh, Bhiar, Assam, and Jharkhand, which have less than 2 telephones for every 100 residents. Also, there are more than 1.9 million Indian citizens currently waiting for the installation of a basic telephone line.

However, with the impressive growth of India's software industry things have begun to change. Since 1995, India's telecommunications sector has undergone a revolutionary change with the introduction of structural and institutional reforms intended to modernize, liberalize, and open the telecommunications network to private sector and foreign participation and investment. New advanced switching equipment and transmission technologies have been installed, the manufacture of telecommunications machinery and equipment was opened to the private sector in 1992, tele-density was targeted for rapid expansion, tariffs on imported equipment have been lowered, call rates charges have declined dramatically, and India's import regime has been liberalized.

REGULATORY BODIES

In 1947 a newly independent India nationalized its telecommunications sector to form the Ministry of Post and Telegraph under the Ministry of Communications. In the mid-1980s, India's telecommunications sector was reorganized and the Department of Posts and Telegraphs was split into the Department of Telecommunications (DoT) and the Department of Posts. Until the early 1990s, all aspects of India's telecommunications sector were managed, controlled, and provided by DoT, a government monopoly that derived its monopoly status from the Indian Telegraph Act, 1885.

Department of Telecommunications (DoT): DoT was founded as a regulatory and legislative agency in 1985 to regulate and monitor India's telecommunication sector (table 2).[10] DoT served as India's exclusive telecommunications service provider, licensing authority, sole policy maker,

---

[7] *The India Infrastructure Report 2001: Issues in Regulation and Market Structure,* Sebastian Morris (ed.), India - A Bird's eye view, Investindiatelecom, found at http://www.investindiatelecom.com/brochure/brochure.htm, retrieved Nov. 5, 2003.

[8] "Teledensity Nudges 7 Per Cent Mark," The Financial Express, Dec. 5, 2003, found at http://www.financialexpress.com/print.php?content_id=47761, retrieved Dec. 11, 2003.

[10] Telecommunications system is regulated by the Indian Telegraph Act 1885, the Indian Wireless Telegraph Act 1933, and the Telecom Regulatory Authority of India Act 1997. *New Telecom Policy 1999*, Embassy of India, found at http://www.indianembassy.org/polic...econ1999/legislation_NTP_1999.html retrieved Nov. 12, 2003.

and implementation body in all matters concerning telegraphs, telephones, wireless data, facsimile, and other forms of communications services. DoT's principal duty was to provide telephones on demand to all of India's citizens and to provide the nation with a reliable state-of-the art telecommunications infrastructure. As India's monopoly provider, DoT supplied the country with basic (fixed-line), cellular, Internet, domestic, international and domestic long distance services, and other value-added services. DOT also had the authority to unilaterally set telephone toll rates. Within DoT services were subdivided between three distinct state-controlled monopolies, the Department of Telecom Services (DTS), the Department of Telecommunications, and the Department of Telecom Operations (DTO).

On February 28, 1986, the Government of India (GOI) created two new large state-owned quasi-independent public limited corporate entities, the Mahanagar Telephone Nigam Limited (MTNL) and Videsh Sanchar Nigam Limited (VSNL).[11] MTNL was established under the Indian Telegraph Act to maintain and provide telecommunications services in the cities of Mumbai (India's commercial center) and New Delhi (the national capital). These responsibilities were transferred from DoT to MTNL in 1995 when it assumed the responsibility for providing basic telephone services, national long distance telecommunications, and the maintenance and development of telecommunications infrastructure in both cities. VSNL, successor to Overseas Communication Service (OCS), was incorporated under the Indian Companies Act and licensed as India's monopoly international long distance service.[12] All incoming and outgoing international calls were routed through VSNL's gateways and similarly VSNL was India's principal Internet provider, except in the cities of New Delhi and Mumbai where MTNL was the service provider.

Table 2: DoT's principal functions and duties
• Policy formation and overall administrative control of matters related to telegraphs, telephones, wireless, data, Facsimile, and telematic services and other forms of communications. • Granting licenses to operators to provide basic and value-added services. • The allocation and management of frequency and radio communications. • Enforcing wireless regulatory measures and monitoring the wireless transmissions. • Promotion of private investment and procure equipment needed by DoT. • Promote equipment standardization and research and development (R&D). • Enforcing wireless regulatory measures and monitoring wireless transmission. • The implementation of treaties and agreements with other countries and international bodies related to telecommunications.[13]
Source: DoT

On October 1, 2000, the GOI transferred the telecommunication services functions of the Department of Telecom Services (DTS) and the Department of Telecom Operations to a newly created corporatized government entity named the Bharat Sanchar Nigam Limited (BSNL). On that date BSNL assumed a near monopoly over basic telephone services throughout the country, except in New Delhi and

[11] MTNL and VSNL were founded as corporate entities where the government retained control with 34.3 percent and 33 percent, respectively, of the companies share holdings. The remainder is owned by financial institutions and private shareholders.

[12] The Eastern Telegraph Company (1872) and the Indian Radio Telegraph Co. (1927) merged in 1932 to form the Indian Radio and Cable Communications Co (IRCC). In 1947, IRCC was taken over by the government and renamed the Overseas Communications Service (OCS).

[13] These organizations include the International telecommunication Union (ITU), its International Frequency Regulation Board (IFRB), Radio Communication Sector (ITU-R), Telecommunication Standardization Sector (ITU-T), Development Sector (ITU-D), International Telecommunication Satellite Organization (INTELSAT), International Mobile Satellite Organization (INMARSAT), Asia Public Telecommunication (APT).

Mumbai. BSNL was also authorized to venture into value-added services such as cellular and the Internet and it was hoping that BSNL could provide telephones on demand at affordable prices. The GOI initiated policies in 1994 to liberalize the telecommunications sector and put into place a license-bidding process that would end the government's monopoly on basic telephone services.[14] Consequently, India was divided into 23 telecommunications "circles" (service areas) that included the cities of Bombay (Mumbai), New Delhi, Calcutta (Kolkata), and Chennai.[15] Separate operators' licenses were required for each telecommunication service and each industry segment has its own structure, terms of entry, and licensing fees. Operators were required to apply for separate licenses for each service they provided within the circles they operated, including basic fixed-line, cellular, national long distance, international long distance, and Internet. In 1995, the government received 80 bids for basic telecommunication licenses from 16 companies valued at $82 billion. This allowed for one licensed private operator in each circle to compete with one of the government-owned providers. Licenses for cellular services were awarded to private services providers in the four metropolitan cities in 1994 and to the remaining circles in 1995. A maximum of two private sector operators could offer cellular services in each circle, while BSNL or MTNL acted as the third operators. The government subsequently issued a fourth cellular operator's licenses in each circle and these operators are now competing with each other for the provision of services that are substitutable. Although private operators are allowed to provide services under licenses in the 23 circles, BSNL and MTNL continue to control more than 90 percent of the market for fixed-lines and 86 percent of all telephone connections as of March 2002.[16]

Private sector participation in India's telecommunications sector was hindered by its inability to arrange finance, restrictions on inter-circle and international long distances service, and because actual revenues did not match projections. In August 2000, the GOI announced that it would terminate MTNL's monopoly on national long distance service and remove limits on the number of private sector operators allowed to provide end-to-end bandwidth infrastructure. The GOI also allowed up to 49 percent foreign equity ownership per license and allowed new entrants to carry traffic between India's circles and carry intra-circle long distance traffic in mutual agreement with the basic fixed-line service provider operating in the circle.[17]

To ensure a level playing field and promote competition among service providers the GOI decided to separate DoT's service functions from its regulatory and policy responsibilities by transferring DoT's regulatory duties to the newly created Telecom Regulatory Authority of India (TRAI). DoT's functions are now limited to policy formulation, licensing, wireless spectrum management, administrative monitoring of public limited companies, research and development, and setting technical standards, and the validation of equipment.[18]

---

[14] Many private operators participating in the license auction process placed astronomical bid and are now finding that their investments do not match their expectation and several subsequently defaulted on paying their license fees.

[15] The non-metro circles are roughly analogous to the boundaries of India's states. The creation of the different telecom circles was based on revenue. Circle 'A' includes relatively high revenue areas of the country; Circle 'B' includes less profitable areas; and Circle 'C' includes the least profitable areas of the country. License fees for Circle 'A' would be 12 percent, 10 percent for Circle 'B', and 8 percent for Circle 'C'.

[16] "Telecom equipment costs must be lowered," Rediff, Feb. 19, 2002, found at http://.www.rediff.com/money/2002/feb/19tele.htm, retrieved April 10, 2003.

[17] U.S. Department of State, "India's New Long Distance Telephony Policy," message reference No. 5606, prepared by U.S. Embassy, New Delhi, Aug. 14, 2000.

[18] Telecommunications, Embassy of India, http://www.india-emb.org.eg/Section12E/engl17b5.htm, retrieved April 29, 2002.

Telecom Regulatory Authority of India (TRAI): The Telecom Regulatory Authority of India was established in January 1997 under the TRAI Act, 1997 to serve as India's telecommunication sector "watch dog." The TRAI was founded as a statutory and autonomous regulatory agency to promote greater competition, improve efficiencies, and to assist in attaining the targets of the NTP '94. The new regulatory agency was founded as an autonomous independent body with quasi-judicial powers to set telephone call toll rates, act as a dispute body, and to provide "effective regulatory framework and adequate safeguards to ensure fair competition and protection of consumer interests."[19] TRAI's principal duties include the protection of consumer interest, easing the entry of private operators into the telecommunications sector, fixing the telephone rate structure to prevent predatory pricing, and arbitrating between DoT and private operators with respect to licensing issues, technical compatibility, and fixing telephone rates (table 3). It was empowered to provide recommendations on various aspects to the functioning of telecommunications service providers and to discharge certain regulatory functions. The consultation with TRAI has been made mandatory and time bound. In addition, it is now mandatory for the government to seek the opinion of TRAI on the need and timing of the new service providers although the recommendations are not binding.

Table 3: TRAI's principal functions and duties
• Protect the interests of customers and facilitate competition by preventing predatory pricing and cross subsidization; set standards for service and technologies used by service providers. • Set terms and conditions of license to service provider, responsible for the revocation of license for noncompliance of terms and conditions of license. • Ensure technical compatibility and effective interconnection between service providers and fix the terms and conditions of inter-connectivity between service providers. • Regulate arrangements between service providers of revenue sharing their revenues derived from telecommunications services and promote competition and efficiency; and regulate prices; and make recommendations on the timing and need for new service providers. • Finalize all call toll rate ceilings; set price ceilings on phone service packages, local calls, STD calls, ILD calls, fixed to cellular calls, and fixed to WLL calls (rates for telephones and rentals). • Fix the terms and conditions of inter-connectivity charges between different service providers, and maintain register of interconnect agreements. • Manage available spectrum, approve the types of equipment used by services providers and ensure the technical compatibility and effective interconnection between different service providers. • Ensure quality services by conducting periodic survey of such services. • Ensure compliance with the Universal Service Obligation.[20]
Source: DoT and FICCI.

Since the duties and responsibilities of the TRAI were thought to be somewhat vague, the GOI enacted the TRAI (Amendment) Act 2000 in January 2000 that reconstituted the TRAI and more clearly defined its role. The Act divided the TRAI into two bodies, one acting as an appellate authority and the other acting as an adjudicator. The regulatory functions of TRAI were separated from its dispute settlement (judicial) duties and was given to the newly created Telecom Dispute Settlement and Appellate Tribunal (TDSAT). Although, TDSAT was founded to handle dispute settlement and appeals against TRAI, TRAI continued to set telephone call rates, recommending the introduction of new service

[19] DoT, found at http://www.nic.in/dot/ddp/role.htm.received Feb. 4, 2004.

[20] Universal Service Obligation is part of the basic fixed-line licensing agreement that requires service operators to provide telecommunications services to India's high-cost rural and remote areas equivalent to 10 percent of their installed capacity. Basic operators failed to meet these targets.

providers, technological improvements, quality standards, setting the terms and conditions of licenses, and setting the terms and conditions under which operators can interconnect with others. The Act also required the government to seek recommendations from TRAI before new telecommunication licenses were issued to service providers. In March 2004, TRAI published a consultation paper asking for industry views on various issues including a unified license regime.

Telecom Dispute Settlement and Appellate Tribunal (TDSAT): TDSAT, another quasi-judicial body, was founded in January 2000 to handle disputes and appeals against TRAI. It was authorized to arbitrate disputes between a licensor and a licensee, between two or more service providers, between a service provider and a group of customers, and to hear and dispose of appeals against any direction, decision, or order of TRAI.[21] Because all appeals of decisions were time bound any challenge to a decision could only be appealed to the Supreme Court.

Other Government bodies: There are a number of state-owned consultant and telecommunications equipment manufacturing entities. Leading state-owned manufacturers include Indian Telephone Industries LTD (ITI) and Hindustan Teleprinters Ltd (HTL). The Telecommunications Consultants India Ltd (TCIL), another PSU was founded in 1978 to undertake consultancy services in telecom.

DEREGULATION and POLICY REFORM

After independence in 1947 India embraced the Soviet model of a dominant public sector and created a highly centralized economic system dominated by government-owned monopolies and stressed self-reliant industrialization based on import substitution.[22] Until the late 1980s, like many other countries, India's telecommunications sector was based on the Posts, Telecommunications, and Telegraph (PTT) model. The Indian Ministry of Posts and Telecommunications had a monopoly position over India's telecommunications services and infrastructure. In the late 1940s, India had only 321 urban telephone switching centers (telephone exchanges), 82,985 telephones, 23,166 public and private branch exchanges, and a national tele-density of 0.25 telephones for every 1,000 people.[23] The Indian telecommunications sector continued to be protected for the next several years by a complex import-licensing scheme, high tariffs, and government regulations that isolated and protected Indian industry from outside competition.[24]

---

[21] Annual Report 2002-2003, DoT.

[22] The Economist, fact sheet, Country Forecasts: India, The Economist Intelligence Unit (EIU), July 18, 1997.

[23] Indian Telecom Sector-Moving Ahead," Government of India, Press Information Bureau, Feb. 2000, found at http://www.pib.nic/feature/feyr2000/ffeb2000/f220220001.html, Feb. 11, 2004.

[24] India's policies according to the World Bank, successfully "throttled the private sector, discouraged production for exports, created recurrent shortages of foreign exchange, and made the balance of payments vulnerable to sudden changes in international markets." To prevent bankruptcy, India accepted loan assistance from the International Monetary Fund (IMF) and the World Bank in June 1991. The IMF and the World Bank agreed to provide India with assistance only if it opened up its economy to the world. Out of necessity, India departed from self-sufficiency and four decades of central planning by initiating a series of reforms. India also opened up portions of its economy to the private sector previously reserved for the public sector, particularly the telecommunications sector. World Bank, *India*, Country Brief, South Asia Brief, The World Bank Group, found at http://gopher.worldbank.org, retrieved Nov. 5, 2003. Greg Jones, "Indian Economy Perks Up After Government Rolls Back Socialist Policies," The Dallas Morning News, Aug. 11, 1997, retrieved Nov. 5, 2003.

Until recently, India's telecommunications sector operated in a very highly regulated business environment. Recurring fiscal deficits and negative balance of payments encouraged the Indian Government to initiate an economic reform package to move the country from central planning to a market oriented model. The package of reforms was intended to lower barriers to entry, boost competition and telephone usage, and allow for private sector participation. Reforms included privatization of some public enterprises, liberalization of rules for foreign participation and investment, lowering tariff rates, and reducing of import barriers. During this period, all aspects of India's telecommunications sector were managed and controlled by the government.[25]

Like most nations, India's telecommunications network was as a natural monopoly best operated as a state-owned monopoly because of the capital intensive nature of establishing a network characterized by high fixed and low variable costs.[26] Policy makers believed that monopoly status would guarantee universal access on demand and that the single service provider could generate an assortment of services more economically by avoiding expensive infrastructure duplication. The development of the telecommunications sector had low priority with the government because it was not deemed crucial for rapid economic expansion and modernization of the economy. Consequently the government allocated only minimal levels of investments that severely limited the quality, quantity, and range of services. The lack of investment also resulted in an antiquated telecommunications network that is profoundly inadequate for a country the size of India.[27]

Technological progress and innovation, especially in the wireless area, forced the government to rethink its view of the telecommunication sector as a natural monopoly. The introduction of new technologies has dramatically lowered the cost of telecommunication services, reduced market entry and maintenance costs, and brought pressures on the government to liberalize to achieve universal access. This process coincided with growing dissatisfaction among the urban subscriber base that objected to the poor quality service provided by government-owned monopolies. The development of new technologies in other parts of the world demonstrated that there was no single technology for providing telecommunication services. The government acknowledged that it would be virtually impossible for the public sector to provide telephone on demand without significant participation and investment by the private sector. So private participation was permitted to supplement investment of government PSUs to increase efficiencies and construct a competitive telecommunications infrastructure incorporating world class technologies.[28]

In 1985, the liberalization process began in earnest when the government de-monopolized the telecommunications equipment manufacturing sector, allowing for the private sector to produce terminal equipment. The GOI also separated the telecommunications functions of the Ministry of Posts and Telegraphs by splitting the entity into to the Department of Posts and the Department of

---

[25] In 1984, there were only 2.5 million telephones (all fixed-lines) operational in India and approximately 55 percent of those phones were in the possession of less than 7 percent of the population. There were only 12,000 public phones for nearly one billion Indians.

[26] "So any service provider needs resources to withstand a period of at least 5 years before breaking even," Telecom, Inidainfoline.com, Dec. 24, 2001, found at http://www.indiainfoline.com/sect/tesp/ch06.html, retrieved Nov. 18, 2003.

[27] The India Infrastructure Report 2001: Issues in Regulation and Market Structure, Sebastian Morris (ed.), 3iNetwork, Oxford University Press, New Delhi and New York, 2001. Chap. 8, The Telecom Sector, Rekha Jain, Ashok Jhunjhunwala, S Manikutty, Bhaskar Ramamurthi, and Dheeraj Sanghi,m found at http://www.iimahd.ernet.om/~morris/iir01/contentsSearch.htm, retrieved April 1, 2002.

[28] Srinivas S. Kaushik, *Liberalisation of Telecommunications Services and Norms Relating to Interconnection In India*, McGill University, Graduate Thesis, 1998.

Telecommunications.[29] Since the 1980s, India's telecommunications reforms have taken place in four distinct phases (table 4).

Table 4: Reform Phases	
Phase I (1980s)	Launched "Mission Better Communications" program; private manufacturers allowed to manufacturer terminal equipment (1985); proliferation of STD and ISD networks; MTNL and VSNL created out of DoT; Telecom Commission established (1989); Center for Developments of Telematics; private franchises granted for PCOs.
Phase II (early 1990s)	Liberalization of the economy and announcement of the New Economic Plan 1991; the manufacture of telecommunications equipment was de-licensed (1991), value-added services were opened to private participation (1992); radio paging, basic, and cellular services opened to competition from the private sector; NTP'94 announced; Universal Service obligations announced for service providers; TRAI established (1997); Internet services opened (1998).
Phase III (late 1990's)	NTP '99 (so called 3rd generation reforms); operators allowed to migrate from a fixed license fee system to a revenue sharing regime; duopoly discontinued; national long distance and international long distance services opened; TDSAT created; all sectors opened to unlimited competition except those limited by spectrum availability.
Phase IV (early 2000's)	Basic services opened; licenses were issued to 31 operators; 15 state capitals had access to telephones on demand; tele-density nearly doubled in a two-year period; all exchanges are now digital electronic; wireless in local loop (WLL) permitted; licenses were issued to 4 cellular service operators in 18 circles plus Mumbai, New Delhi, Chennai, and Kolkata; 46 ISP licenses issued.
Sources: Shyamal Ghosh, Chairman, Telecom Commission, Telecom Reforms in India, found at http://www.shilpabichita.com/shipal2002/ent151.html.	

In the past, India's telecommunications services were restricted primarily to its major metropolitan areas since telephone services were deemed to be luxuries by the GOI rather than requirements for economic development an efficient government.[30] Consequently, telephone usage was confined to a limited number of urban elites, government offices, the military and important business groups.[31] In the 1950s India had a tele-density of 0.03 lines per hundred and more than 55 percent of its telephones were owned by less than 7 percent of the population. Similarly, India possessed only 12,000 public phones for nearly 700 million people, more than 97 percent of India's villages did not have access to telephone service, and less than one percent of households had access to a land line telephone.

[29] The government permitted the private sector to manufacture terminal equipment and in 1991 allowed the private sector to produce all other types of telecommunications equipment. P.N.V. Nair, "Exciting things are happening in the telecom sector," Project Monitor, June 16, 2001, found at http://www.projectsmonitor.com/detailnews.asp?newsid=2205, retrieved Nov. 14, 2003.

[30] Until 1985 the government's investment in the telecommunications sector was less than three percent of GNP; it was only from 1992 onwards that government spending increased to 11.9 percent. N. Ravi, "Telecommunications in India-Past, Present, and Future," IEEE Communications Magazine, March 1992

[31] Areas of higher government priority included the food sector, water, and education. Pradipta Bagchi, Telecommunications Reforms and the State in India: The Contradiction of Private Control and Government Competition, University of Pennsylvania, Center for Advanced Study of India, Dec. 2000.

Also, there is a very pronounced gap in tele-density between India's more affluent better educated states with large urban areas such as Maharashtra, Punjab, and Kerala as apposed to poorer states like Orissa, Jammu & Kashmir, Bihar, and West Bengal (Appendix A-1 and A-2).[32] At present 65 percent of India's telecommunications revenues, 48 percent of its international long distance traffic, 56 percent of basic fixed phone lines, and 70 percent of all voice traffic are accounted for by the Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, New Delhi and Mumbai circles.[33] A digital divide also exists between India's urban and rural areas. Maharashtra and many southern states have tele-densities that exceed the national average of 4.90, whereas States in the western region, except for Gujarat and Central and North East regions have a tele-density much lower than the national average. Because most telephones are still restricted to urban areas, tele-density in rural India was less than 1.6 telephones for every 100 inhabitants in 2003-04.[34] In addition to the soaring differential in rural and urban tele-density levels and the significant differential among states, only about 28 percent of India's population lives in urban areas while the vast majority still live in rural villages.[35]

Since 1991, the Indian government has taken significant steps to liberalize its telecommunications sector by improving infrastructure and opening the sector up to private sector participation and foreign investment. The GOI has permitted private sector participation in the delivery of telecommunications services that now compete directly with BSNL and MTNL. It also acknowledged the need to develop a modern world class telecommunications infrastructure to maintain its position as a world leader in IT software development and business process outsourcing (BPO) by attracting foreign investors.

The government set a series of ambitious goals for the telecommunications sector, including a tele-density target of 7 telephones per 100 inhabitants by 2005 and 15 per 100 by 2010, 4 telephones per 100 for rural inhabitants by 2010, and Internet access to all district headquarters by 2002.[36] To accomplish this, the GOI implemented the National Telecom Policy of 1994 (NTP'94) and NTP'99 to help facilitate the creation of a modern telecommunication network by privatizing its telecommunications monopolies, reducing barriers to entry, and through measures to encourage competition.

National Telecom Policy 1994 (NTP'94): The NTP'94 was the first significant government effort to reform the Indian telecommunications sector by reducing barriers to entry, encouraging competition, accelerating modernization, and providing low-cost telephony to the largest number of Indians at affordable prices. Since government owned service operators had great difficulty providing basic services to the Indian public, the GOI acknowledged the need to allow private sector participation in both basic and value-added services. The NTP'94 charted basic policy guidelines for the future development of the telecommunication sector and smoothed the way for private sector participation. The government recognized that only private sector participation in the telecommunications sector could make up for an investment shortfall.

The NTP'94 divided the country into 21 territorial telecommunication regions called "circles"

---

[32] "Tata Teleservices Limited (TTSL) has the brand equity of the Tata Group and promise to bring you an enhanced telecommunications experience," Tata Indicom, found at http://www.tataindiacom.com/global/mainglobal.asp?chkg=4&links=35, retrieved Sept. 15, 2003.

[33] "Tata Teleservices Limited (TTSL) has the brand equity of the Tata Group and promise to bring you an enhanced telecommunications experience," Tata Indicom, found at http://www.tataindiacom.com/global/mainglobal.asp?chkg=4&links=35, retrieved Sept. 15, 2003.

[34] "India's rural teledensity grows by a meagre 4% in 2003-04," Infochange India, July 30, 2004, found at http://infochangeindia.com/itandditop.jsp?section_idv=9, retrieved Aug. 10, 2004.

[35] New Telecom Policy 1999-2000, DoT, Department of Telecom Services, found at http://www.dot.india.com/flash/new/telpo_details.htm, retrieved April 9, 2003.

[36] DoT.

that included the metropolitan cities of Mumbai, New Delhi, Chennai, and Kolkata. The 17 non-metro circles are roughly analogous to the boundaries of India's states. Competition in basic services was allowed by way of a duopoly and bids for licenses were accepted for one private sector operator in each circle that would compete with one of the government operators (MTNL or BSNL). License applications were accepted as sealed bids and auctions were held for cellular licenses in December 1994 and for basic fixed-wire line services in January 1995. The initial auction for basic fixed-line services attracted 80 bids for 40 licenses from 16 national and foreign companies. Only 6 licenses were issued to offer fixed wire line telephony in the Andhra Pradesh, Gujarat, Maharashtra, Madhya Pradesh, Punjab, and Rajasthan circles. Foreign companies participating in the bidding included AT&T, U.S. West, Bell Atlantic, NYNEX, NTT (Japan), Bell Canada, Beqez (Israel), and Shinawatra (Thailand).

The NTP'94 specified that fixed-wire line providers could invest in wireless in local loop (WLL) technologies. The NTP '94 called for an additional 100,000 village public telephones (VTPs), telephone on demand for all citizens at reasonable rates, one public call office for every 500 urban citizens, telephone service to all of India's villages by 2000, and required that all basic services providers participate in the Universal Service Obligation program (table 5).

Table 5: Goals and objectives of the NTP 1994

- Telephone on demand by 1997.
- Basic telephone services to all of India's more than 607,491 villages by 1997 at a reasonable price.
- Provide services at world standards, quick settlements of consumer complaints and all other disputes.
- Attract FDI and stimulate domestic investment.
- Protect and maintain the national security of India.
- Value-added services on demand by 1996 (e-mail, voice-mail, cellular telephony, radio paging).
- Ensure that India becomes a major manufacturer and exporter of telecommunications equipment.
- Promised one public call office (PCO) for every 500 urban residents by 1997.
- Promised value-added services (e-mail, voice-mail, radio paging, and cellular services) on demand by 1996.
- Promised tele-density of 7 per 100 residents by 2005 and 15 by 2010.
- DoT would not be converted into a government-owned corporation.
- Private sector companies will be issued licenses for state wide operations in competition with DoT for basic telephone services. This established a duopoly system for 15 years in 23 statewide service circles.
- Mobile telephone services will be offered solely by non-DoT private sector companies, at least two in each service area. Initial licenses in 10 years, extendable there after in 5 year increments.

Source: DoT; Dr. V. Sridhar, *Telecommunications Industry and Market Structure; An Overview*, Indian Institute of Management, Lucknow.

National Telecom Policy 1999: India failed to meet many of the stated objectives of NPT '94 for modernizing the telecommunications network. Although the process of awarding licenses (entry permits) to the highest bidder was successful in generating high bids, it failed to meet NTP '94's tele-density and service provision objectives. Due to a large demand-supply gap and the inability of India' state-owned companies to provide a reliable, affordable, state-of-the art telecommunications service the GOI decided to permit greater private sector participation in both basic, cellular, long distance, and value-added services.[37] The process, however, was characterized by delays, constant modification and revision of policy guidelines, accusations of wide spread corruption, very high license fees, and the lack of transparency in issuing licenses. Many companies participating in the licensing process bid

[37] *New Telecom Policy 1999-2000 Details*, found at http://www.dotindia.com/flash/newtelpo_details.htm, retrieved No. 5, 2003.

astronomical and unrealistic amounts to win bids that later became a significant financial burden. Acknowledging that the development of the telecommunications sector was both capital and technology intensive, the GOI recognized that it could not provide the investment needed for modernizing India's telecommunications infrastructure. Many operators were on the verge of bankruptcy because actual revenues failed to meet projections causing many to fear that the sector would collapse. As a result, they pleaded with the government to speed up the reform process.

In 1999-2000, only 333,965 of India's more than 607,491 villages had telephone service. India was faced with a stagnant economy and declining investment in the telecommunications sector.[38] The GOI issued a new set of policies in the form of the NTP '99 to promote modernization, promote efficiency, and bring down domestic call toll rates. It also allowed for 100 percent foreign equity ownership in certain value-added services, lowered customs duties on selected equipment items from 25 to 5 percent, privatized government telecommunications monopoly VSNL, and made the government's role as arbitrator more transparent.

The NTP '99 established more ambitious universal coverage targets and presented service providers with greater choices of technologies, new tele-density goals, and allowed telecommunication service providers to shift from a high cost fixed license fee regime to a lower cost revenue sharing scheme (table 6). It also tried to anticipate new technological developments and it transferred DoT's telecommunication services responsibilities to two newly created independent state-owned limited corporate entities (MTNL and BSNL). To eliminate the need to lay underground copper cables, DoT specified that wireless- in-local loop (WLL) based on CDMA technology as the preferred method of providing basic fixed-line services in densely populated areas.

[38] Ministry of Finance.

Table 6: Goals and objectives of NTP 1999
• Duopoly established by NTP'94 was eliminated. • Provide affordable service to all residents and telephone on demand by 2002. • Increase tele-density to 7 per 100 residents (75 million phone connections) by 2005 and 15 per 100 (175 million) phones by 2010 at an investment of $37 billion by 2005 and $69 billion by 2010. Increase rural tele- density from 0.4 per 100 in 1999 to 4 per 100 by 2010. • Allowed existing private operators to migrate from fixed license fees to a relatively lower one-time entry fee plus revenue sharing. License period to be extended to 20 years, then by a further 10 years. • Provide Internet access to all district headquarters by 2002; Open value-added services, including cellular telephony, to the private sector, provide Internet access to all villages by 2002. • Allow 100 percent foreign equity ownership for Internet ISPs; ISPs permitted to set up submarine cable landing stations for international gateways for Internet service. • Phased opening of NLD and ILD services to be opened for competition in August 2000. • Corporatize DoT's service functions and transfer to public company (BSNL) in October 2000. • VSNL's monopoly for international long distance will be ended and the company privatized and international long distance service to be opened for competition by April 2002. • Multiple operators allowed in fixed basic telephony sector and basic providers are permitted to offer limited mobility in the form of wireless-in-local loop (WLL). • Provide universal service to all uncovered areas and encourage development of telecommunications infrastructure in remote hilly and tribal areas and provide reliable media to all exchanges by 2002. • Convert PCOs, where justified, into public Teleinfo Cafes. • Two categories of infrastructure providers have been allowed to provide end-to-end bandwidth and dark fiber, right of way, and towers. • BSNL & MTNL allowed to become 3rd cellular mobile telephony provider in every state. • IP telephony to be permitted at the appropriate time. Fourth cellular operator has been permitted; one in each metro and 13 circles was permitted. • Created a Universal Service-access Fund to provide public telephones in villages and some private telephones in rural areas and upgrade VPTs into public Internet kiosks.
Source: Annual Report 2001-02, Annual Report 2002-2003, DoT.

NTP '99 eliminated the prohibition against private service providers having licenses in more than one circle and abolished restrictions on the number of companies offering basic fixed-line services participating in each circle. It provided the framework for the fastest ever expansion of India's telecommunications sector and today India has one of the world's most deregulated telecommunications sectors. Private participation is permitted in all segments of the telecommunication services and private sector investment has been able to bridge the resource gap to a significant degree. In 2004, there are no limits or restrictions on private sector participation in any segment of the services market, except in cellular telephony where spectrum restrictions are an issue. Similarly, NTP initiated the National Internet backbone, eliminated the ban on Internet telephony, and allowed for the opening national long distance and international long distance service to the private sector. India's telecommunications sector was able to meet NTP'99's tele-density target of 7 percent 2 years ahead of schedule. The growth occurred principally in the proliferation of cellular mobile telephone service in urban and semi-urban areas. However, many companies missed their universal service obligations as the industry as a whole failed to meet the government's targets for the provision of village public telephones to all of India's 607,491 villages.

Communication Convergence Bill, 2001: In August 2001, legislation was approved by the Cabinet and introduced into the Lok Sabha (House of the People) to support the convergence in technology services similar to that of the U.S. Telecommunications Act of 1996. The bill hopes to

address advances in technologies that have blurred the traditional boundary between fixed and mobile services. This bill would have effectively repealed the Indian Telegraph Act of 1885, the Indian Cordless Telegraphy Act 1933, the Telegraph Wire Unlawful Possession Act 1950, and the Cable Television Networks (Regulation) Act 1995, and the Telecom Regulatory of India Act (TRAI) 1997.[39]

The Communications Convergence Bill was designed to address, regulate, and promote the convergence of technologies and markets by creating a modern supra-Ministry that would oversee the development and the need for regulatory and licensing functions in the areas of information technology (IT), broadcasting, multimedia, telecommunications, data communications, the Internet and web casting, consumer electronics and other related technologies and services using existing telecommunications infrastructure.[40] The bill would facilitate the development of the infrastructure needed in a modern information-based society, provide a greater array of choices, and eliminate the need for multi-regulatory agencies and licenses and create a new independent commission known as the Communications Commission of India (CCI). The CCI would have a structure similar to that of the U.S. Federal Communications Commission (U.S. Telecommunications Act of 1996) and it would assume the responsibilities of the TRAI as both licensing and regulatory authority. The Communications Convergence Bill was tabled and awaits further action.

Unified Access Licensing Regime: India is one of the world's markets where there is an active contest between two different mobile telephony standards: Global System for Mobile Communications-based cellular telephony (GSM) and Code Division Multiple Access (CDMA) based wireless-in-local loop (WLL). Historically, cellular and basic fixed-line service providers have operated in isolation from each other but the introduction of new technologies and wireless in local loop (WLL) based on the CDMA format has substantially blurred the traditional distinction between the two services. Increasingly WLL limited mobility and cellular mobile have become substitutable and cellular mobile service providers argued that this puts basic fixed-line service providers in violation of their license agreement that prohibited mobility. GSM-based cellular operators alleged that basic service operators have illegally offered mobility through wireless in local loop (WLL) employing CDMA technology. They also accused WLL operators offering "limited mobility" (WLL-M) of unlicensed entry into mobile service through the "back door" by turning WLL-M services into full-fledged mobile technology. The dispute began in 1997 when MTNL offered limited mobility where subscribers were provided "limited mobile" services at the same cost per call as fixed-line services. GSM-based cellular operators quickly petitioned TRAI to intervene.

According to the Cellular Operators Association of India (COAI), "large WLL-M operators were offering full-fledged cellular mobile services with impunity and no corrective or punitive action has been taken against the violators."[41] Basic operators countered by saying that cellular operators are trying to protect their turf. They have been in operation for more than 8 years, which gives them the first mover advantage over new operations. In fact, this gives them the opportunity to expand through cheaper acquisition.[42]

---

[39] Annual Report 2002-2003, DoT.

[40] *New Telecom Policy 1999-2000 Details*, found at http://www.dotindia.com/flash/newtelpo_details.htm, retrieved Nov. 5, 2003.

[41] TV Ramachandran, Director-General, COAI - appeal of TDSAT's judgment to the Supreme Court in Oct, 2003. "COAI moves DC against TDSAT's verdict on WLL," Rediff.com, Oct. 28, 2003, found at http://www.rediff.com/money/2003/oct/28telecom.htm, retrieved Feb. 27, 2004.

[42] Thomas K Thomas, "Cellular firms may sue Trai over unified license," Business Standard, Oct. 1, 2003, found at http://www.buisness-standard .com/archives/2003/jul/50180703.034.asp, Oct. 1, 2003.

The COAI objected when DoT allowed WLL services as part of the basic license agreement and accuses basic operators offering mobile telephony while avoiding the high license fees paid by GSM mobile providers. COAI stated that WLL service providers were using multiple registration and call forwarding to contravene the conditions of their licenses.[43] The current licensing system requires separate licenses for cellular telephony and basic fixed-line services and these licenses differ in terms of license fees, performance bank guarantees, spectrum allocation, interconnection charges, and roll out obligations.[44] There is a tremendous differential in the license fees paid by cellular and basic service providers.

Cellular operators filed a complaint against basic service providers with the TRAI alleging that WLL based limited mobility was contrary to the provisions of NTP'99 and that basic operators were in violation of their licensing agreement. In August 2003, the TRAI upheld the legality of WLL-M service as a value-added extension of basic service, but recommended that WLL-M services be restricted to within a single short distance charging area (SDCA) with a fixed radius of 5 to 10 kilometers.[45] TRAI also recommended that basic service providers be prohibited from using mobile switching centers (MSC) that could enable them to offer extensive mobility and roaming beyond the SDCA. TRAI Justices Prasad and Dasgupta stated "we are conscious of the fact that allowing WLL service with limited mobility will cause disturbance in the level playing field. Hence we have suggested a number of steps which should be considered and taken for ensuring the level playing field. It is important to ensure that mobility in the case of WLL-M services remains restricted to SDCA and no hand-over from one SDCA to another under any circumstance."[46] Cellular operators appealed TRAI's decision to the TDSAT charging that basic operators were also using their national long distance services to subsidize WLL-M services that allowed them to offer a 3 minute call for 25 cents compared to 58 cents for a one minute cellular call.

Because TDSAT directed DoT to keep the two services distinct, cellular operators requested that TDSAT prohibited WLL-M providers from using MSCs and require them to use V5.2 software to prevent roaming and to restrict them to a single SDCA. TDSAT rejected COAI's petition in September 2003 stating that there was essentially no difference between WLL-M and GSM cellular. However, the TDSAT did recommend that TRAI bar roaming by WLL-M operators and limit their services within a single SDCA with no handover from one SDCA to another. Cellular operators opposed TDSAT's decision and asked DoT to restrict WLL "limited mobility" to an instrument fixed at the subscribers

---

[43] Multiple registration/subscription services allow a specific WLL- M subscriber to use the same handset for making/receiving calls in more than one SDCA.

[44] Cellular service providers are required to pay an annual license fee (called revenue sharing) of 17 percent of their adjusted gross revenues compared to between 8 to 12 percent for basic service providers. Cellular providers were required to pay a one time entry fee through the bidding route that ranging from $79,166 to $106.7 million. The auction for the mobile license for 4th cellular operator was priced at $330 million. This annual license fee is termed as 'revenue sharing' generated from the services and the percent of revenue paid as license fee for the three categories of telecom circles equals 12 percent for A, 10 percent for B, and 8 percent for C. The entry fee for basic operators depends on the service area. The fee varied from approximately $7.5 to $24 million for Category A circle, $2.1million to $5.2 million for B, and $280,000 to $2.1 million for C. Basic operators offering WLL- M pay a one time entry fee of about $103 million.

[45] Cellular operators claim that since 97 percent of their revenues are derived within the local loop and WLL-M operators can offer both fixed-line and mobile at a fraction of the cost would be very harmful to their business interest.

[46] "TDSAT allows WLL services by majority judgment," OutlookIndia.com, (DATE), found at http://www.outlookindia.com/pti_print.asp?id=158926, retrieved June 2, 2004. "WLL may lose roaming facility," The Economic Times, Aug. 16, 2003, found at http://economictimes.indiatimes.comarticleshow/msid-135833,prtpage-1.cms, retrieved June 7, 2004.

residence or require basic service providers to pay for a cellular license.[47] Cellular operators challenged TDSAT's decision and the unified licensing regime to the Supreme Court.

To end the protracted litigation, TRAI recommended the unification of basic and cellular services under a single licensing system (Unified Access Licensing regime) in October 2003. It would replace the current system that requires separate licenses for cellular and basic service with one that allowed an operator to provide both services without formally applying for separate licenses. The new regime will allow operators to offer any type of telecommunications service employing any type of technology under the one license and the new regime would allow market forces to dictate the best technology instead of the government.[48] COAI opposed the unified licensing regime stating that "the entire plan seems to be to legalize the limited mobility into full mobility and do away with the differentiation between the two kinds of services and favor certain operators."[49]The differential in licensing fees would be eliminated and WLL-M operators wanting to offer full mobile service would be required to pay a one time entry fee for migration equivalent to the difference between the fourth cellular operator's license fee and the basic operator's license fee.[50]

Reliance Infocomm is the largest WLL-M service provider and offered "virtual roaming" by way of multiple registration of the same subscriber in multiple SDCA's under different telephone numbers and call forwarding from one number to another to achieve full mobility.[51] Reliance and other basic fixed-line companies offering "virtual roaming" were required to pay a penalty plus an entry fee in order to migrate to full mobility. Reliance Infocomm paid a penalty of approximately $100.9 million for offering "virtual roaming" plus the entry fee of $341.9 million to migrate. Tata Teleservices and Bharti Teleservices were both required to pay approximately $28.7 million to migrate. Migration is strictly voluntary and those WLL-M operators that do not wish to migrate to full mobility will not be required to and can continue to offer "limited mobility" within the limits of the SDCA.

Industry sources indicate that Reliance Infocomm and Tata Teleservices would be the chief beneficiaries of a unified license regime since they could offer full-fledged mobile services. Reliance Infocomm, a subsidiary of one of India's leading business houses received significant amounts of money for investments from its parent company. Unlike smaller operators, Reliance can access tremendous amounts of capital that allows it to make huge infrastructure investments. Smaller cellular service providers with limited revenue bases are at a disadvantage since they do not benefit from economies of scale or have the capability to raise the funds necessary to prevent their networks from becoming technologically obsolete.[52]

---

[47] The fixed handset at the operators home or office is identical in technological terms to the mobile handset.

[48] "Govt issues norms for unified license," The Times of India, Jan. 12, 2003, found at http://www.timesofindia.indiatimes.com/cms.dll/xml/uncomp/articleshow?msid=278341&prtpage, retrieved Nov. 11, 2003.

[49] "Divided house on entry fee, unified license," Convergence Plus, Aug. 23, 2003, found at http://www.convergenceplus.comsept03%20india%20telecom%2001.htm, retrieved Feb. 27, 2004.

[50] Ibid.

[51] Reliance will be required to pay $228 million to migrate and an additional $100 million in penalty. "Reliance rapped for license breach," NDTV.com, Oct. 27, 2003, found at http://www.ndtv.com/addons/printpage.asp?id=15718&callid=5&caption=unified, retrieved Oct. 27, 2003. "Cellular firms move SC against WLL-M" The Times of India, Oct. 28, 2003, found at http://timesofindia.indiatimes.com/articleshow/msid-255651, prtpage-1.cms, retrieved Feb. 27, 2004.

[52] "Single license: WLL firms pay Rs 2,000 cr," rediff, Nov. 11, 2003, found at http://www.rediff.com/money/2003/nov/14telecom3.htm, retrieved May 4, 2004.

On January 6, 2004, COAI Cellular operators filed an application to withdraw its challenge before the Supreme Court against WLL-M and the unified access licensing regime.[53] This came after the government agreed to provide cellular operators with concessions of greater than $212.8 million annually to compensate them for high license fees and revenues lost to CDMA based WLL-M service providers.[54] The government lowered the cellular license fee by 2 percentage points and gave them an additional 2 percentage point reduction in revenue shared to the first and second licensee in each circle for four years. Subsequently, Reliance Infocomm, Tata Teleservices, the Bharti Group, HFCL Infotel, Spice Communications, Shyam Telelink, Hutchison Essar South, and DishnetDSL have all applied for a unified license.

MARKET CHARACTERISTICS AND TRENDS

The Indian telecommunications industry can be divided into two basic sectors namely services and equipment. The services sector can be further subdivided into basic-fixed wire line services and cellular services. The Indian market for telecommunications services is one of the fastest growing in the world with demand for fixed-line services growing at an annual average of 22 percent and the demand for cellular and Internet services growing by more than 100 percent per annum.[55]

The Indian telecommunications services market has been growing at an incredible rate due to the country's sustained annual economic growth of 8 percent and the growing importance of IT outsourcing.[56] This sector grew in value by 20 percent from $10.24 billion in 2002-03 to $12.3 billion during 2003-04.[57] The sector is expected to continue expanding until it reaches $25 billion in 2012. The growth in revenues and in the number of subscribers has been fueled by low call rates and an introduction of the 'calling party pays regime.' Service providers will continue to use declining call rates as the principal means for attracting customers, but subscribers are beginning to place greater emphasis on quality of service and customer support. The Indian market for telecommunications equipment declined by 34 percent during 2003-04 to $2.1 billion from $3.2 billion in 2002-03.[58] The market for data services is expected to reach $5.6 billion by 2007, accounting for 17 percent of industry revenues.[59]

---

[53] "License fee cut in telecom package- cellular operators assured help to overcome financial problems," Business Line, Dec. 24, 2003, found at http://www.blonnet.com/2003/12/25/stories/2003122502610100.htm, received June 16, 2004.

[54] "Rs 9.68 billion relief for cellular operators," India Bandwidth, Dec. 25, 2003, found at http://www.indiabandwidth.com/dir1/bandwidth78.html, retrieved March 26, 2004.

[55] Dr. Sowri Rajan Komandur, The Telecom Policy of India Globalization and Global Information Society, XII Biennial Conference of the International Telecommunications Society, March 10, 2000, found at http://www.ficci.com/ficci/India-profile/ch5-pg1.htm, retrieved Sept. 15, 2003.

[56] Although India's per capita annual income is comparatively low, India's middle class of 300 million is larger than the population of the United States and possess sufficient disposable income to participate in India's telecommunications revolution. However, three quarters of India's population resides in villages and 91 percent of those villages have a population of less than 2,000 inhabitants. Investment, India Telecom News, found at http://www.indiatelecomnews.com/investment.htms, retrieved Aug. 22, 2003. "Telecom user base at 203 mn by 07: E&Y," The Economic Times, March 8, 2003, found at http://www.economictimes.indiatimes.com/articleshow/msid-545288, retrieved March 8, 2004.

[57] "Indian telecom industry grows 20% in FY04," found at http://www.indiatelephone.com/news/20040715_1.htm, retrieved July 20, 2004.

[58] "Telecom equipment market drops by 34%," Indiatimes Infotech, July 3, 2004, found at http://infotech.indiatimes.com/articleshow/763690.cms, retrieved July 13, 2004.

[59] "Cellular revenue to touch Rs 36,600 cr by 2007: Gartner," The Economic times, July 7, 2003, found at http://economictimes.indiatimes.com/cms.dll/articleshew?artid=80938, retrieved July 17, 2004.

In 2001-02, state-owned incumbents BSNL, MTNL, and VSNL accounted for nearly 97 percent of the telecommunications industry's profits derived from basic fixed-line, national long distance (NLD), and international long distance services (ILD). India is expected to mirror other parts of the world as growth rates and customer demand will be driven by mobile telephony rather than fixed-line services. Private sector companies have progressively increased their share of the telecommunications market over the last 10 years. Although they have concentrated their efforts mainly in the cellular and value-added segments, the private sector currently accounts for more than 40 percent of all telephony subscribers in India.

Private sector service providers are expected to satisfy most of the demand for new telecommunications services and the GOI expects that there will more than 203 million telephone subscribers by 2007. Other less optimistic sources estimate that the total fixed-line based will grow to a compound annual growth rate (CAGR) of 21 percent to 87 million lines and the cellular subscriber base will only increase to nearly 75 million by 2010.[60] The number of telephone subscribers grew by 40 percent from 54.62 million connections in 2002-03 to 76.54 million in 2003-04 (table 7). Most of the growth can be attributed to a number of factors including: competitive pressures that continue to push telephone call rates down, the introduction of new technologies and value-added services, the proliferation of cellular telephony, declining import duties on cellular phones and telecommunications equipment, and the introduction of new technologies, especially in the digital wireless arena.

Much of the growth in India's telecommunications sector will take place in semi-rural and rural areas where the tele-density is below the national average. Although India has one of the world's lowest average revenue per user (ARPU), Indians spend a far greater share of their incomes on telecom services than do subscribers in most other countries. According to industry estimates, the average Indian spends approximately 19 to 21 percent of their disposable income on telecommunications services, whereas subscribers in developed countries spend between 2 to 4 percent. Indian service providers will attempt to make a profit from an ARPU of $7 per month compared to $12 per month in China, $35 in Western Europe, and $55 in the United States.[61]

Table 7: Overall telephone connections 2002-03 to 2003-04

Connections (2002-03)	**Public**	**Private**	**Overall**
Mobile	2.64	10.36	13.00
Fixed	40.53	1.09	41.62
Overall	43.17	11.45	54.62
Connections (2003-04)			
Mobile	6.00	27.7	33.7
Fixed	40.48	2.36	42.84
Overall	46.48	30.06	76.54
Percent growth			
Mobile	127.27	167.37	159.2
Fixed	-0.12	116.51	2.93
Overall	7.67	162.53	40.10
Source: DoT.			

[60] Gaurav Das, "Direct Connection," Business Standard, Dec. 23, 2002, found at http://www.business-standard.com/archives/2002/dec/50231202.071.asp, retrieved May 28, 2003.

[61] "Lehman Says India's Hot Stuff," Boardwatch, March 24, 2004, found at http://www.boardwatch.com/document.asp?doc_id=49924&print=true, received July 15, 2004.

Intense competition among service providers has driven call toll rates down to the point where India has some of the lowest telephone rates in the world. It is estimated that basic fixed-line services account for nearly 57 percent of the total services, cellular for 16 percent, national long distance for 12 percent, international long distance for 11 percent, and Internet service for much of the remainder. Tele-density rates are expected to pass the 10 telephones per 100 residents by 2012.[62] The growth in demand for basic fixed-line telephone service has grown from 100,000 telephones in 1947 to more than 72 million telephones (fixed and cellular) in 2003.[63]

Since 1991, India has added more than 28 million mobile cellular telephones and 6.7 million fixed and mobile wireless-in local loop (WLL) telephones. Liberalization has also brought tremendous changes to India's domestic long distance (NLD) and international long distance (ILD) markets. Eventually, demand for these services is expected to grow at a significant rate with India's emergence as an IT and Business Processing Outsourcing superpower. Although NLD and ILD rates have declined dramatically since 2001, India's service providers continue to lag behind those in the developed world in terms of quality of service and price. BSNL dominates the NLD market with 88 percent market share and VSNL dominates the ILD segment with 63 percent of total revenues.

Revenues generated by the long distance market declined by 20 percent in 2002-03 and by 14 percent in 2003-04 to $2.1 billion.[64] India's long distance call rates continue to be significantly higher than in other markets, consumer choices continue to be limited, and service providers have not kept pace with the needs of their large commercial subscribers in the provision of data services (leased lines, frame relay, ATM, IP-VPN, and IP transit). During 2003-03, approximately 2 of every 3 new telephone subscribers were mobile users, either GSM-based cellular or WLL-M. Presently wireless applications account for approximately 40 percent of all telephone subscribers and the number of GSM-based cellular and WLL-M limited mobility subscribers is expected to account for 70 percent of the total telephone subscriber base by 2007. The subscriber base is expected to grow further to 203 million by 2007 with the wireless segment accounting for nearly 142 million subscribers. Tele-density rates are also expected to reach 20 per 100 by 2007. Also, the implementation of Interconnect Usage charges is expected to significantly lower the call rate differential between GSM and CDMA until they converge in the near future. Nevertheless, a significant proportion of the growth in telecommunications services was limited to India's large metropolitan cities and to a limited number of 'A' circles. At least 13 circles have a tele-density rate less than 2 telephones for every 100 residents that is significantly below the country's average of 7.02 percent.

Telecommunications Services

Telecommunications sector reforms promoted the introduction and development of a variety of new services. India's telecommunications services sector can be divided into three primary segments: basic fixed-line, cellular, and value-added services (including Internet, radio paging, PMRTS, GMPCS, and VSAT). There are four basic types of companies providing telecommunications services in India: the large state-owned incumbent operators, large integrated private sector operators, small private sector

[62] "Telecom sector bucks global trend, poised for record growth," India Times Infotech, found at http://infotech.indiatimes.com/cms.dll/xml/uncomp/articleshow?msid=33670579, retrieved May 28, 2003.

[63] V. Rishi Kumar, "Telecom Sector set for $13 billion revenues by 2007," Business Line, Oct. 21, 2002, found at http://thehindubusinessline.com/bline/2002/10/22/stories/2002102200640700.htm, retrieved Oct. 13, 2003.

[64] India's NLD network infrastructure covers 572,675 Rkm and demand for data services have grown by 66 percent and international voice minutes have grown by 22 percent. Long distance service providers are not concentrating on the introduction of MPLS networks. "Indian telecom industry grows 20% in FY04," found at http://www.indiatelephone.com/news/20040715_1.htm, retrieved July 20, 2004.

operators offering one or more value-added services, and telecommunications equipment producers. The integrated companies enjoy a captive consumer base and economies of scale that enable them to leverage volumes when purchasing equipment and leverage labor and infrastructure over several different business segments.

There are 7 basic fixed-line operators, 12 national long distance operators, 6 international long distance operators, 13 cellular service providers, 14 radio paging operators, 12 VSAT operators, and 213 Internet providers. In 2004, fewer than 12 service providers accounted for most of the revenues, service coverage, and customer base (table 8). The remaining providers are small regional niche players specializing in one or two services.

Table 8: India's Principal Telecommunications Service Providers

Service Providers	Status	Basic Service	Cellular Service	WLL Service	Internet Service	NLD	ILD
Mahanagar Telephone Nigam Ltd	Public	X	X	X	X	X	
Videsh Sanchar Nigam Ltd	Public				X	X	X
Bharat Sanchar Nigam Ltd	Public	X	X	X	X	X	X
Bharti Televentures	Private	X	X		X	X	X
Idea Cellular	Private		X			X	X
Shyam Telecom	Private	X	X		X	X	
Himachal Futuristic (HFCL)	Private	X		X		X	
MobileFirst	Private		X		X	X	
BPL Communications	Private		X		X	X	
Tata Teleservices	Private	X		X	X	X	X
Reliance Infocomm	Private	X	X	X	X	X	X
Hutchison-Essar	Private		X			X	

Source: DoT.

Incumbent state-owned service providers BSNL, MTNL, and VSNL continue to dominate basic fixed-line telephony and long distance service in India. Private sector operators dominate the cellular and value-added services markets and they have recently moved into basic, national long distance, and international long distance service. Foreign companies and their Indian subsidiaries are the technology providers and also dominate the equipment manufacturing segment. The two state-owned companies control more than 90 percent of all telephones in India and their dominance over the basic-fixed-line infrastructure have permitted them to wield tremendous control over pricing and services in the other segments of the market.

However, in quality of local access lines, BSNL and MTNL rates were among the worst in Asia and in "last mile" they were also rated the lowest among 20 of Asia's leading telecommunications

carriers.[65] A recent TAI survey also reported that services offered by BSNL and MTNL were substandard beyond the large metropolitan areas and A circles in terms of faults per 100 subscribers and time required to change connections. GSM and WLL based, mobile service providers have also failed to meet TRAILS standard for quality and user satisfaction.

When private sector providers were allowed to participate in the basic and cellular services market in 1996, entry permits (licenses) were awarded by public auction that produced incredibly high bids to acquire what was perceived as a guaranteed captive audience. The cellular service sector was also complicated by the government's insistence that only GSM protocols are permitted for the provision of cellular mobile telephony.[66] The high license fees acted as barriers to entry and private companies were also deprived of the benefits of economies of scale since licenses were issued on a statewide or circle basis and not on a countrywide basis.

Historically telecommunications providers in other countries have divided their services into separate companies to compete in niche markets. India's three largest private sector providers (Tata, Bharti, and Reliance) have elected to combine as many services as possible less than one company segment ranging from basic fixed-line too cellularly to national and international long distance services. According to these companies, this technique is the only viable means to grow in the Indian market. Government regulations and polices also play an important part since service providers faced interconnection problems and the universal license regime will result in a significant restructuring of the market. These companies stress that customer acquisition is the key to success and insist that stand alone niche focused companies (Hutchison, Essar, and BPL) will find it increasingly more difficult to compete. Companies in this sector will continue to boost their subscriber base by reducing call toll rates that will make it increasingly more difficult for companies to focus solely on one service segment to survive. India's niche focused companies have primarily been cellular telephony service providers because of the limited competition they faced from state-owned incumbents who have only recently entered the cellular service market. Today there are at least 4 local telephone service providers in each circle. There has also been a wave of mergers and acquisitions driven by declining cellular toll rates that have significantly squeezed margins.

When TRAI adopted a technology neutral stance many telecommunications providers had to reconsider their future plans. Until 2000, there was an obvious delineation between wireless services (cellular), fixed wire-line (basic and fixed-lines), national and international long distance services, with explicit limitations on technology and rates. The introduction of the Unified Access Licensing Regime in October 2003 will now allow basic fixed-line operators to offer CDMA-based wireless-in-local loop services with full mobility to compete head-to-head with cellular operators. The distinction between wire-line and wireless services has been blurred significantly and even in the long distance service the DoT now permits the use of voice over Internet protocol (VoIP) technologies that allow Internet service providers (ISPs) to offer Internet telephony and compete with both cellular and basic fixed-line service providers. The differential in toll costs between CDMA wireless-in-local loop (WLL) and GSM cellular mobile is expected to converge by the end of 2004, with prepaid subscriber services accounting for 68 percent of the market. Presently, GSM call toll costs are higher than those for CDMA WLL services, but the implementation of the interconnect charge regime is expected to drive GSM call prices downward.

---

[65] "TRAI for imposing quality of basic telecom services," The Economic Times, April 21. 2004, found at http://economictimes.com.indiatimes.com/articleshow/msid-630934, prtpage-1.cms, retrieved April 21, 2004.

[66] Vickram Crishna, Telecommunications in India -Thin Bones, washed Flesh. Workshop on Internet: South Asian Realities and Opportunities, Dhaka, Apr. 5-8, 1999, found at http://216.152.71.16/indiatelecom.html, retrieved Nov. 28, 2003.

Basic fixed-line service: India has one of the largest basic fixed-line telecommunications infrastructures in with high demand and a large waiting list for basic telephone connections.[67] Until the introduction of mobile telephones, basic fixed-line service was the principal vehicle for the growth in the telecommunications sector. Basic services were opened to the private sector in 1998 and consist principally of local services (mainly voice), national long distance service, international long distance service, and data services. India possesses the world's sixth largest basic telecommunications network with approximately 42.8 million telephone lines.

Until 1994, DoT was India's sole provider of fixed-line basic telecommunications services. Subsequently the corporatized elements of DoT (MTNL and BSNL) inherited an antiquated infrastructure but they still accounted for more than 90 percent of fixed-line calls. India's telecommunications infrastructure was modeled after those of developed countries where voice telephone service dominated its fixed-line telephone infrastructure. In the past telephone services were concentrated primarily in India's urban areas and less so in the rural and inaccessible areas where fixed-line services were very expensive to provide.

Basic telephony was treated as "natural monopoly" due to the extremely high fixed costs associated with building a world class infrastructure. The country's exchanges are mostly electronic, its local loop is copper-based, and its long-haul backbone network is primarily digital using optical fiber, microwave, and satellite link communications. Basic services can be divided into domestic and international voice and data services. Domestic calls, both local and long-distance are routed through cables/wireless links and international calls are routed overseas, mainly through satellite links.[68] In accordance with NTP'94, basic telephony services were opened for private sector participation and bids were invited for basic telecom licenses in 21 telecom circles that the country had divided for licensing purposes. NTP'99 ended the existing duopoly and introduced unlimited competition in basic fixed-line, national long distance, and international long distance service. It permitted operators to hold licenses in multiple circles and eliminated caps on the number of companies participating in each circle. The government also allowed fixed service providers (FSPs) to offer limited mobility via CDMA based wireless-in-local loop (WLL) technology in order to roll out services at a faster rate. FSP services licenses were issued on a nonexclusive basis for a period of 20 years (extendable by 10 years) and the NTP'94 set a domestic equity floor of 51 percent, required operators to pay a non-refundable one time license fee of $22 million and a bank guarantee of $88 million.[69]

India's basic service market is expected to grow from $6.7 billion in 2000-01 to more than $16 billion in 2004-05.[70] The number of fixed-lines is expected to exceed 47 million in 2005 and is expected to grow at a CAGR of 8 percent to 58 million in 2007 and 86 million in 2012.[71] Although the growth in fixed-lines declined by 25 percent during the first 9 months of 2002-03, the sector added 1,951,169 new

---

[67] Basic service is local telephone service and it as also known as public switched telephone network (PSTN) and normally referred to the "last mile" connection over very short distances. The subscriber's connection to the telecom network is called a direct exchange line (DEL) and people use it for talking.

[68] Telecom, IndiaInfoline Sector Reports, IndiaInfoline, Dec. 24, 2001, found at http://www.indiainfoline.com/sect/tesp/ch03.html, retrieved Nov. 18, 2003.

[69] It also required operators to participate in a revenue sharing regime based on service area profitability ("A" circles at 12 percent, "B" circles at 10 percent, and "C" circles at 8 percent), obligated them to pay a revenue share of 2 percent for spectrum charges, permitted basic service operators to carry their own long distance traffic within their service area, and allowed state owned service providers to establish 'last mile.'

[70] "India: basic services market to grow by 18.5 pc," Business Line, Dec. 18, 2001, found at http://www.proquest.umi.com, retrieved Jan. 18, 2004.

[71] Telecom Industry, CII, found at http://www.ciionline.org. "Indian telecom industry grows 20% in FY04," found at http://www.indiatelephone.com/news/20040715_1.htm, retrieved July 20, 2004.

lines during the quarter ending March 31, 2004 and the subscriber base grew by 4.1 percent.[72] The number of cellular mobile subscribers is expected to surpass the number of basic fixed-lines in India for the first time by the end of 2004.

In January 2001, DoT received 52 applications from private companies for providing basic services and after several rounds of bidding licenses to provide basic telecommunications services were rewarded to 5 companies: Bharti Telenet, Tata Tele Services Reliance Telecom, Essar Comvission, Hughes Telenet, and Shyam Telelink (table 9).[73] In 2004, MTNL and BSLN continue to dominate this sector accounting for more than 91 percent of all fixed-lines (84 percent for BSNL and 10 percent for MTNL) and 90 percent of revenues from basic services, whereas private sector operators dominate wireless-in-local loop services (WLL), both fixed and limited mobile. Bharti Telenet is the only basic fixed-line provider that does not offer "limited mobility" service.

Table 9: Basic Telephone Services: fixed-line and WLL-F (June 2003)

Providers	Status	Fixed	Circles-cities covered
BSNL	Public	36,112,093	All India (except New Delhi and Mumbai)
MTNL	Public	4,367,264	New Delhi and Mumbai.
Bharti Telenet	Private	636,725	Madhya Pradesh, New Delhi, Haryana, Karnataka, Tamil Nadu.
Shyam Telecom	Private	92,392	Rajasthan
Tata Tele Services	Private	1,003,585	Gujarat, Maharashtra, TN, New Delhi, AP, Karnataka.
Reliance Telecom	Private	503,353	New Delhi, Haryana, Himachal Pradesh, Kerala, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh (E & W), West Bengal
HFCL Infotel	Private	125,331	Punjab
Total		42,840,743	

Source: DoT, Business Standard.

Despite the growth in demand for basic telephone service the waiting list for new connections remains high. Fixed service providers (FSPs) hoped that the introduction of limited mobility WLL technologies would lead to a significant increase in the number of subscribers.[74] Although the fixed-line network is expected to grow to more than 47 million lines by 2006, India only has a basic line penetration rate of 4 percent as apposed to 40 to 60 subscribers per 100 percent for most developed countries.[75] National long distance services account for approximately 45 percent of all voice revenues and are expected to grow by 20 percent over the next few years. Private sector operators have concentrated their efforts on providing basic fixed-line services to business-corporate communities by offering reliable high-end services such as leased lines, ISDN, closed user groups, and video conferencing.

Since MTNL and BSNL are required to provide services to both urban and rural customers the average revenue per user of private service providers is more than twice that of the state owned service providers. Accordingly, average revenue per user (ARPU) for private FSPs is more than twice that of state-owned FSPs. India's basic service penetration rate has increased from 1.2 percent in 1995 to 3.8 percent in 2002 but it remains well below much of Asia and the world where the average penetration rate is about four times the Indian average.

---

[72] "Indian telecom industry grows 20% in FY04," found at http://www.indiatelephone.com/news/20040715_1.htm, retrieved July 20, 2004.

[73] Bharti is the only basic operator which does not offer limited mobility WLL based services.

[74] Telecom Industry, CII, found at http://www.ciionline.org.

[75] Mamuni Das, "Capital crossover to mobile telephony," Financial Express, July 25, 2003, found at http://www.financialexpress.com/fe_full_story.php?content_id=36959, retrieved June 26, 2004.

In the third quarter of FY2004, TRAI reported that most of the basic fixed-line service providers failed to meet its quality standards for the provision of new telephone connections within 7 days after registration. Public sector providers BSNL and MTNL failed to meet TRAI's limit of 3 faults per 100 subscribers per month and MTNL failed to meet the standard that more than 90 percent of all faults be repaired by the next day.[76]

Cellular telephony: India has one of the world's fastest growing cellular telephone service markets and cellular telephones have become common place in India's urban areas. As has happened in other developing countries, the cellular telephone service segment is expected to be the key growth sector in India's telecommunications services sector. The structural usage by economic class has also changed dramatically in recent years since cellular telephones are no longer strictly status symbols limited to the rich and upwardly mobile professional classes. Today cellular telephones are tools for doing everyday commerce, especially because GSM call toll rates have dropped by more than 95 percent since March 1998 from Rs 14.5 per minute (31 cents) to Rs 0.77 per minute (2 cents) in March 2004.[77]

According to Pankaj Mohindroo, the President of the Indian Cellular Association of India (COAI), "a mobile is now a poor man's tool and not a rich man's toy" since they are now being used by small urban businessmen, taxi drivers, fishermen, and traders since many have switched from using pagers.[78] Mobile cellular telephones have changed the manner in which many Indians conduct their business dealings even in areas of the country where less than 20 years ago fixed land line phones were a luxury. Cell phone subscription rates continue to rise significantly, especially in the major metropolitan areas, but continue to be beyond the reach of the majority of India's rural residents.[79]

The GOI opened the cellular telephony services market to the private sector in 1994 in two phases. In the first phase, cellular telephony services were offered in India's largest metropolitan areas and in the second phase to the rest of the country.[80] To facilitate the dissemination of services, India was divided into telecommunications circles or service areas that included the country's four largest metropolitan areas (Kolkata, New Delhi, Chennia, and Mumbai) and 19 other circles covering the rest of the country. A maximum of 4 licensed cellular operators were allowed in each service area and operators were required to obtain a separate license for each circle in which they offered services. The licenses also permitted them to carry their own domestic long distance traffic within their service area without applying for an additional license.[81] Currently 25 companies hold 78 licenses to offer cellular services and the GOI

---

[76] "Basic operators fail to meet Trai quality benchmark," The Economic Times, June 9, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-728404,prtpage-1.cms, retrieved June 9, 2004.

[77] Cellular telephony allows for two-way mobile, wireless communication via a portable handset. India Infoline, Ltd, found at http://www.indiainfoline.com/sect/tesp/ch15.htm, retrieved Jan. 18, 2004.

[78] Shailendra Bhatnagar, "Mobile handset sales in India to double in 2003," The Economic Times, May 28, 2003, found at http://economictimes.indiatimes.com/cms.dll/articleshow?msid=47777933, retrieved May 29, 2003.

[79] "Cellular industry: B & C circles more into the high growth path," The Financial Express, March 28, 2002, found at http://www.financialexpress.com/fe_full_story_.php?content_id=5472, retrieved May 28, 2003

[80] According to the COAI, "in a cellular system, the geographical area is divided into adjacent, non-overlapping hexagonal shaped cells." The 19 non-metro circles were divided into 5 "A" service areas, 8 "B" service areas, and 5 "C" service areas, depending on the profitability of the circle. For more detail see Appendix A.

[81] More than 60 percent of all national long distance cellular calls are intra-circle. U.S. Department of State, "India's Government's Communications Breakthrough," message reference No. 4973, prepared by U.S. Embassy, New Delhi, July 19, 2000.

mandated that all cellular telephony service providers adopt the Global System for Mobile Communications (GSM) protocol.[82]

Initially licenses were granted to two private operators in each circle to compete with one of the state owned operators as the third service provider (MTNL and BSNL were issued licenses in 2001 and 2002, respectively).[83] Companies applying for cellular licenses were required to pay approximately $340 million as an up-front entry fee and the industry estimates that under the fixed licensing regime companies paid between 35 and 42 percent of their gross revenues in license fees, spectrum charges, service taxes, and interconnect charges.[84] DoT subsequently issued licenses in 2001 for a fourth private operator in each circle.

Many companies pledged license fees under the fixed-license regime that were extraordinarily high and due to the competitive nature of the industry most have not been profitable despite declining call toll rates and soaring subscribership. High license fees have acted as a barrier to entry for both domestic and foreign companies. Cellular phone tele-density in India is approximately 7 phones per 100 residents compared to 80 in the United Kingdom and 95 in various parts of Scandinavia, but its penetration rate is expected to grown to nearly 5.2 percent by the end of 2004.[85] India continues to trail countries like Taiwan (88.3), Hong Kong (80.4), South Korea (76.7), and China (20.6) where cellular telephone penetration rates are much higher.[86] In 2004, less than 4 Indians in 100 own a cellular mobile telephone compared to more than 21 per 100 in China.

India's first cellular network was started in Kolkata (Calcutta) in 1995 and in 2003-04 cellular operators added between 2 million and 3 million new subscribers per month and services were provided by 42 networks (table 10). The country's cellular subscriber base has grown from 3.1 million in December 2000 to 24.6 million in February 2004 and is expected to reach 56 million by the end of the year. Between January 2000 and February 2004 the number of cellular subscribers grew by more than 6 fold in the Metro circles, by more than 9 fold in Circle A, by more than 8 fold in Circle B, and by more than 11 fold in Circle C.[87] The four metros dominated subscribership until 2003 when they were surpassed by Circle A. Nevertheless, Mumbai and New Delhi remain the two largest single markets for cellular telephones with 3.2 million and 2.8 million subscribers, respectively, as of February 2004.

---

[82] The GSM protocol is a European time division, multiple access (TDMA) radio technology that dominates most of the globe. "Cellular technology," COAI, found at http://coai.com/tech.htm, retrieved July 21, 2003. "History of Cellular Telephony in India," COAI, found at http://coai.com/telephony.htm, retrieved May 28, 2003. For more detail description see Appendix A.

[83] *History of Cellular Telephony in India*, COAI.

[84] License fees in form of revenue sharing was set at 8 percent of adjusted gross revenues for circle C, 10 percent for circle B, and 12 percent for Metros and Circle A. Cellular providers were also required to pay an additional revenue share of 2 percent for spectrum charges up to 4.4 MHz + 4.4 MHz, 3 percent for spectrum to 6.2 MHz + 6.2 MHz , or 4 percent beyond 6.2MHz. Annual Report 2002-2003, DoT.

[85] Pallavi Rao, "Telecom: changing gears," Business Standard, March 1, 2004, found at http://www.bsstrategist.com/today/storyr.asp?menu=35372&story=35372, retrieved May 4, 2004.

[86] The number of cell phone users in India is a fraction of China's 226 million. COAI.
Some have suggested that the number of cellular subscribers may be overstated since the different companies have elected various cut-off dates for purging pre-paid card holders from the system. G.R. Rambabu, "Cellular subscriber base figures over estimated?" Business Line, Feb. 2, 2004, found at http://blonnet.com/2004/01/03/stories/2004010302710100.htm, retrieved June 16, 2004.

[87] "Cell users cross 10m in Dec 2002," Business Standard, Jan. 10, 2003, found at http://www.business-standard.com/archives/2003/jan/50100103.031.asp, retrieved May 28, 2003.

Table 10: Cellular subscribers by circle					
Circles	**2000**	**2001**	**2002**	**2003**	**Feb. 2004**
Metro Circles	1,194,992	2,161,114	4,054,434	6,994,327	7,670,429
Circle A	982,511	1,871,736	3,515,333	8,047,660	9,013,481
Circle B	838,413	1,252,765	2,550,223	6,052,692	6,942,389
Circle C	91,533	193,317	360,440	897,064	1,002,301
Total	3,107,449	5,478,932	10,480,430	21,991,743	24,648,600
Source: Cellular Operators Association of India (COAI).					

India's cellular market is highly price elastic and more than 60 percent of all Indian subscribers belong to the prepaid calling card segment that tends to be very price sensitive and erratic. Price is the principal acquisition tool for operators acquiring and retaining customers and the largest percentage of prepaid subscribers are in Circle A, Metros, and Circle B (table 11). Companies have concentrated on prepaid subscribers because this segment is the easiest to increase their subscriber base, however they have begun to process of converting prepaid subscribers into post-paid because prepaid bills tend to be low compared to the higher revenue earning post-paid segment.[88]

According to the COAI, nearly 50 percent of prepaid subscribers pay less than $10 per month and the ratio of incoming to outgoing calls has traditionally been 65:35. Between 65 to 70 percent of all cellular telephone calls are cellular to fixed-line and the rest are primarily cell to cell or cell to wireless in local loop traffic.[89] Nearly 60 percent of cellular mobile subscribers pay a monthly bill in the low average revenue per user (ARPU) range of $31 less, 35 percent pay a mid-ARPU rate of $31 to $105, and 5 percent pay a high ARPU rate of $105 or more. The number of subscribers with an ARPU of less than $11.08 has grown from 28 percent of the total in 2002 to 46 percent in 2003. The rate that subscribers change from one service provider to another on a monthly basis ranges between 30 to 35 percent, where it should range between 20 to 25 percent.

Table 11: Number subscribers by payment type (March 2004)			
Sector	**Post Paid (percent)**	**Prepaid (percent)**	**Percent prepaid**
Circle A	2,720,634	6,631,645	
Circle B	1,633,171	5,737,577	
Circle C	249,373	813,107	
Metros	1,739,723	6,202,288	
All India	6,342,901	19,384,617	
Source: TRAI			

Indian's cellular market is projected to grow at a rate 4 times that of China and is expected to grow at a CAGR of 20 percent with revenues growing from $1.4 billion in 2002-03 to $1.8 billion in

[88] "Cell companies aim to trun pre-paid consumers to post-paid," The Economic Times, June 16, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-741415,prtpage-1.cms, retrieved June 16, 2004.

[89] Cell calls to cost more, BSNL users unaffected," The Financial Express, Feb. 1 200x, found at http://www.financialexpress.com/print.php?content_id=51662, retrieved Feb. 27, 2004.

2003-04. The sector is expected to grow further to $7.8 billion in 2007.[90] The number of cellular subscribers is expected to grow from 56 million in 2004 to between 100 million and 150 million by the end of 2005. Data services, which currently account for 17 percent of total revenues, are expected to grow from $7.5 billion to $137.5 billion by 2007. The average revenue per user for private service providers fell from $11.58 to $9.57, or by 17 percent, during 2003-04 despite falling rates and a 30 percent increase in industry revenues.[91] This would make the Indian cellular market one of the world's hottest markets, especially as Western firms confront shrinking home markets.[92] Growth in the cellular subscriber base occurred mostly among low-usage customers and despite this growth the ARPU declined because service providers operated on very thin margins that limited their ability to provide services in rural and remote areas or to build new networks or expand existing ones. One of the industry's most successful value-added services has been short message service (SMS). In 2003, SMS services generated more than 7.39 billion

Table 10: Cellular subscribers by circle

Circles	2000	2001	2002	2003	Feb. 2004
Metro Circles	1,194,992	2,161,114	4,054,434	6,994,327	7,670,429
Circle A	982,511	1,871,736	3,515,333	8,047,660	9,013,481
Circle B	838,413	1,252,765	2,550,223	6,052,692	6,942,389
Circle C	91,533	193,317	360,440	897,064	1,002,301
Total	3,107,449	5,478,932	10,480,430	21,991,743	24,648,600

Source: Cellular Operators Association of India (COAI).

India's cellular market is highly price elastic and more than 60 percent of all Indian subscribers belong to the prepaid calling card segment that tends to be very price sensitive and erratic. Price is the principal acquisition tool for operators acquiring and retaining customers and the largest percentage of prepaid subscribers are in Circle A, Metros, and Circle B (table 11). Companies have concentrated on prepaid subscribers because this segment is the easiest to increase their subscriber base, however they have begun to process of converting prepaid subscribers into post-paid because prepaid bills tend to be low compared to the higher revenue earning post-paid segment.[93]

According to the COAI, nearly 50 percent of prepaid subscribers pay less than $10 per month and the ratio of incoming to outgoing calls has traditionally been 65:35. Between 65 to 70 percent of all cellular telephone calls are cellular to fixed-line and the rest are primarily cell to cell or cell to wireless in

[90] "Cellular revenues to touch Rs 36,600 cr by 2007: Gartner," The Economic Times, July 17, 2003, found at http://www.economictimes.indiatimes.com/cms.dll/articleshow?artid=80938, retrieved July 17, 2003. "India's GSM mobile phone growth slows in April 2004," Reuters, May 7, 2004, found at http://www.hindustantimes.com/onlinecda/pfversion.jsp?article=http://10.81.141.122/ne..., retrieved May 7, 2004.

[91] "India: Telecoms set for explosive growth," ebusineesforum, March 25, 2003, found at http://www.ebusinessforum.com/index.asp?doc.id=7036&layout=nch_story, retrieved April 29, 2004.

[92] By September 2004, the number of cellular connections is expected to exceed million fixed-line connections." "New IUC regime for telecom services," The Economic Times, Jan. 31, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-467489,prtpage-1.cms, retrieved April 1, 2004.

[93] "Cell companies aim to trun pre-paid consumers to post-paid," The Economic Times, June 16, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-741415,prtpage-1.cms, retrieved June 16, 2004.

local loop traffic.[94] Nearly 60 percent of cellular mobile subscribers pay a monthly bill in the low average revenue per user (ARPU) range of $31 less, 35 percent pay a mid-ARPU rate of $31 to $105, and 5 percent pay a high ARPU rate of $105 or more. The number of subscribers with an ARPU of less than $11.08 has grown from 28 percent of the total in 2002 to 46 percent in 2003. The rate that subscribers change from one service provider to another on a monthly basis ranges between 30 to 35 percent, where it should range between 20 to 25 percent.

Table 11: Number subscribers by payment type (March 2004)

Sector	Post Paid (percent)	Prepaid (percent)	Percent prepaid
Circle A	2,720,634	6,631,645	
Circle B	1,633,171	5,737,577	
Circle C	249,373	813,107	
Metros	1,739,723	6,202,288	
All India	6,342,901	19,384,617	
Source: TRAI			

Indian's cellular market is projected to grow at a rate 4 times that of China and is expected to grow at a CAGR of 20 percent with revenues growing from $1.4 billion in 2002-03 to $1.8 billion in 2003-04. The sector is expected to grow further to $7.8 billion in 2007.[95] The number of cellular subscribers is expected to grow from 56 million in 2004 to between 100 million and 150 million by the end of 2005. Data services, which currently account for 17 percent of total revenues, are expected to grow from $7.5 billion to $137.5 billion by 2007. The average revenue per user for private service providers fell from $11.58 to $9.57, or by 17 percent, during 2003-04 despite falling rates and a 30 percent increase in industry revenues.[96] This would make the Indian cellular market one of the world's hottest markets, especially as Western firms confront shrinking home markets.[97] Growth in the cellular subscriber base occurred mostly among low-usage customers and despite this growth the ARPU declined because service providers operated on very thin margins that limited their ability to provide services in rural and remote areas or to build new networks or expand existing ones. One of the industry's most successful value-added services has been short message service (SMS). In 2003, SMS services generated more than 7.39 billion messages and the principal driver was the cost differential between voice calls and less expensive SMS.[98]

The explosive growth in India's cellular telecommunications sector was produced by the overall economic expansion driven by the reforms of the 1990s, aggressive pricing policies and rock bottom call rates have created affordability by lowering call toll rates by 80 percent, declining handsets prices (especially for the lower-end market), making incoming calls free, and providing bundling schemes. The

---

[94] Cell calls to cost more, BSNL users unaffected," The Financial Express, Feb. 1 200x, found at http://www.financialexpress.com/print.php?content_id=51662, retrieved Feb. 27, 2004.

[95] "Cellular revenues to touch Rs 36,600 cr by 2007: Gartner," The Economic Times, July 17, 2003, found at http://www.economictimes.indiatimes.com/cms.dll/articleshow?artid=80938, retrieved July 17, 2003. "India's GSM mobile phone growth slows in April 2004," Reuters, May 7, 2004, found at http://www.hindustantimes.com/onlinecda/pfversion.jsp?article=http://10.81.141.122/ne..., retrieved May 7, 2004.

[96] "India: Telecoms set for explosive growth," ebusineesforum, March 25, 2003, found at http://www.ebusinessforum.com/index.asp?doc.id=7036&layout=nch_story, retrieved April 29, 2004.

[97] By September 2004, the number of cellular connections is expected to exceed million fixed-line connections." "New IUC regime for telecom services," The Economic Times, Jan. 31, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-467489,prtpage-1.cms, retrieved April 1, 2004.

[98] "India: Telecoms set for explosive growth," ebusinessforum, March 25, 2003, found at http://www.ebusinessforum.com/index.asp?doc.id=7036&layout=nch_story, retrieved April 29, 2004.

introduction of wireless-in-local loop services precipitated a price war that has forced the industry to lower its call rates. Industry experts now speculate that demand for cellular services in major cities and towns is leveling off and that future growth will take place among lower income groups and in the under-penetrated under served rural and remote regions of the country. The NTP'99 allowed existing operators to migrate from the fixed licensing regime to a less expensive revenue sharing regime (August 1, 1999). To meet the NTP'99 tele-density targets would require investments of $20 billion during 2004-06 and an additional $30 billion by 2012. To accomplish this goal the government has been asked to raise the foreign equity cap from 49 percent to 74 percent to attract cheap foreign capital. Cellular operators have also used non-price strategies to attract subscribers such as prepaid calling card schemes, discounted roaming rates, and variable installation fees.

A significant digital divide exists between states and regions of the country. Those states with large urban areas and better educated and more affluent populations tend to have subscriber and tele-density rates much higher than the national average. Conversely, those states with higher rural to urban populations tend to have subscriber and tele-density rates that are much lower than the national average (Appendix A-1). Maharashtra and southern states like Andhra Pradesh, Tamil Nadu, and Kerala accounted for 23 percent of total cellular subscribership in February 2004 (table 12) and they registered an average tele-density much lower than the national average of nearly 7 percent. The Western region of India, besides Gujarat and the Central and Northeast regions, have a tele-density much lower than the national average.

Table 12: Cellular subscribers by circle, 2001-Feb. 2004

City/state market	Circle	2001	2002	2003	Feb. 2004
New Delhi	M	873,499	1,672,712	2,934,409	3,161,496
Mumbai	M	832,995	1,512,296	2,507,229	2,745,907
Chennai	M	229,015	418,865	759,789	892,752
Maharashtra	A	423,807	827,737	1,969,716	2,219,088
Gujarat	A	416,173	798,742	1,804,897	1,984,368
AP	A	430,793	740,253	1,545,508	1,739,776
Karnataka	A	329,346	649,584	1,493,119	1,680,672
Tamil Nadu	A	271,617	499,017	1,236,420	1,389,580
Kerala	B	348,861	531,464	1,023,086	1,169,142
Punjab	B	236,369	195,374	1,779,836	1,996,502
UP (E)	B	180,046	322,856	859,677	743,606
UP (W)	B	101,556	171,293	602,662	947,052
Rajasthan	B	95,574	179,644	437,576	558,631
MP	B	168,646	334,185	692,662	766,699
West Bengal	B	35,151	88,648	0	0
HP	C	19,655	44,872	136,974	157,810
Bihar	C	102,665	189,062	449,676	516,075
Orissa	C	42,431	15,353	228,907	247,903
Assam	C	24,809	40,728	42,160	54,236
NE	C	3,747	7,433	10,606	1,669
WB & A&N	B	0	0	243,083	268,764
Haryana	B	195,374	264,488	414,512	441,993
Jammu & Kashmir	C	0	0	28,741	35,563
Kolkata	M	225,605	450,561	792,789	892,752

Source: Cellular Operators Association of India (COAI)

India opened its cellular telephony sector to private sector participation in 1992 and there were more than 20 companies offering cellular services. Since 1995, there have been a number of mergers and acquisitions and now the industry is dominated by 7 large groups that control almost 90 percent of all cellular subscribers (table 13). In February 2004, Bharti accounted for 24.3 percent of the total subscriber base, BSNL for 18.1 percent, Idea for 8.8 percent, and Hutchison for 13.6 percent. The remaining 35.2 percent split between BPL Cellular, Spice Communications, Fascel, and Aircel Digilink. India has 42 cellular telephony networks covering more than 1,400 towns and cities and thousands of rural villages requiring an investment of more than $4 billion.

Table 13: Cellular subscribers by Service Provider (2002-Feb. 2004)

Service Provider	Circles	2002	2003	Feb. 2004	Service area (Cells)
Bharti Tele Services (Cellular, Telenet, Mobinet, Mobitel, Mobile)	M,A, B, C	2,023,718	4,869,868	6,006,032	New Delhi, Mumbai, Chennai, Kolkata, Maharashtra, Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Punjab, Haryana, Uttar Pradesh (w), Madhya Pradesh, Himachal Pradesh
Hutchison (Essar, Max, Telecom)	M,A	1,604,007	2,953,159	3,357,323	New Delhi , Mumbai, Chennai, Kolkata, Andhra Pradesh, Karnataka
MTNL	M	240,088	324,933	348,507	New Delhi and Mumbai
Idea Cellular	M,A,B	1,204,343	2,241,427	2,180,867	New Delhi, Maharashtra, Gujarat, Andhra Pradesh, Madhya Pradesh
BPL Cellular	M,A,B	1,079,313	1,541,464	1,764,725	Mumbai, Maharashtra, Tamil Nadu, Kerala
RPG Cellular	M	166,305	226,082	254,993	Chennai
BSNL	M,A,B, C	860,205	4,283,778	4,472,878	Kolkata, Chennai, Maharashtra, Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Punjab, Haryana, Uttar Pradesh (west and east), Rajasthan, Madhya Pradesh, West Bengal and A & N, Himachal Pradesh, Bihar, Orissa, Jammu & Kashmir
Fascel	A	420,255	817,778	902,725	Gujarat
Hexacom	B,C	111,556	203,377	244,006	Rajasthan, North East
Reliance Infocomm	B,C	500,607	583,636	756,415	West Bengal, Kolkata, Bihar, Orissa, HP, North East, Assam, MP
Spice Comm	A,B	456,246	1,052,708	1,184,358	Rajasthan, North East
Aircel Digilink	A,B	375,548	593,570	1,153,963	Haryana, Uttar Pradesh (east), Rajasthan, Tamil Nadu
Escotel	B	566,710	461,117	940,165	Kerala, Haryana, Uttar Pradesh (west)
Total					
All India total		10,480,430	21,991,743	24,648,600	

Circles: Metros (M), most lucrative (A circle), less profitable (B circle), and least profitable (C circle).
Source: Cellular Operators Association of India.

The spectacular growth in the number of Indian cellular telephony subscribers masks the incipient sickness of an industry that has an accumulated loss exceeding $1.5 billion.[99] To gain market share and

[99] "Cellular industry finance - cautious optimism," India Telecom News, July 23, 2003, found at http://www.indiatelecomnews.com/detail.asp?newsid=284, retrieved Aug. 22, 2003.

obtain economies of scale, cellular operators have made sweeping changes to their call rates, reducing them by as much as 40 to 50 percent at the expense of their own economic and financial health. Today, India has some of the world's lowest call rates and one of the world's highest cost structures as companies pass between 35 to 42 percent of their revenues to government for various licenses and fees. Intense competition and aggressive pricing continue to push call rates down and many believe that this situation is unsustainable over the long term.[100] Private operators have also accused BSNL of anti-competitive behavior and predatory pricing by using its long distance service to subsidize its local call rates. Call rates have also been forced down by the success of wireless-in-local loop services offered by Reliance Infocomm and Tata Teleservices and the institution of a "calling party pays" arrangement. The price war between cellular operators has resulted in an 80 percent reduction in local call rates, a 59 percent reduction for post-paid subscribers, and a 25 percent decline in domestic long distance rates.[101] On average, India's mobile call charges have declined by 87 percent from 35 cents per minute to approximately 4 cents per minute. Additionally national long distance charges have dropped from 53 cents per minute to 7 cents per minute and international long distance rates have fallen from 93 cents per minute to 16 cents per minute.[98]

India's cellular operators have had significant difficulty making a profit outside the major metropolitan areas and the ARPU is expected to fall by nearly 15 percent from $125 million from $146 million.[99] This industry has been plagued by high cellular call rates, deteriorating service, high churn rates, cut throat competition, and inadequate spectrum allocation. Subscribers in the metros have complained of erratic connectivity, bad voice quality, busy signals, slow connections, dropped calls, and the need to repeat dial. Although the industry has invested more than $5 billion in its networks, it has accumulated a loss in excess of $2 billion.

During 2003, call traffic in New Delhi alone increased by 30 to 40 percent clogging the networks and exhausting bandwidth. In many areas cellular operators have added subscribers without a corresponding increase in network capacity. Inadequate spectrum has also been cited as a major reason for poor quality. Cellular service in the metros as subscribers experience poor sound transmission and frequent call drops.

The Indian cellular telephony industry also has one of Asia's highest churn rates, or the average number of subscribers that cancel or modify their services in search of better call rates, lower subscription fees, and cheaper handsets. India's monthly churn rate ranges from 3.5 percent to 6 percent, meaning that between 3.5 to 6 percent of cellular subscribers cancel their services with one operator and switch to another each month. India's churn rate is higher than those of Indonesia, Japan, Malaysia, Singapore, China, Taiwan, and South Korea.[100]

India's cellular industry is one of the fastest growing in the world has begun to consolidate and the number of service providers is expected to decline. Because this market is extremely capital intensive, it cannot support 12 operators. The market is expected to consolidate and the larger integrated service

---

[100] COAI.

[101] "Market strategy - Mobile telecoms under pressure," Emerging Markets Online, Jan. 16, 2003, found at http://www.businessmonitor.com/cgi-bin/dispatcher.pl?article=037128&myemo=true&ses..., retrieved May 29, 2003.

[98] Thomas K Thomas, "Villagers miss telecom wave," Business Standard, April 9, 2004, found at http://www.business-standard.com/common/storypage.php?storyflag=y, retrieved April 12, 2004.

[99] "BPL and BTAL telecom merger-can it fly?" EIU Viewswire, found at http://www.viewswire...layout=display_print&doc_id=155415, retrieved Jan. 18, 2004.

[100] "India Tops Cellular Churn Rates in Apac: Gartner," The Financial Express, Feb. 18, 2004, found at http://www.financialexpress.com/fe_full_story.php?content_id=52924, retrieved Feb. 18, 2004.

providers are likely to acquire many of the smaller companies to cut their costs and increase their share of the market. The number of acquisitions increased after the GOI allowed unlimited competition in 2003 doing away with policies that limited the number of providers to 4 in each circle. Mergers and acquisitions are expected to increase when the GOI raises FDI limits on cellular and fixed-line services from 49 to 74 percent. Key mergers and acquisitions include: (1) Bharti's purchase of an equity stake in JT Mobile, Skycell, Spice Cell, and Hexacom; (2) the merger of Birla- AT&T Tata (Batata) and BPL to form Idea Cellular, which later purchased RPG Cellular; (3) the merger of BPL, Escotel, RPG Cellular, and Spice Telecom to form MobileFirst; (4) the purchase of Escotel by Idea Cellular; and (5) Hutchison Telecom acquiring a major interest in Sterling Cellular and paid $360 million for Aircel; (6) AT&T Wireless sold its 33 percent stake in Idea Cellular to Singapore Technology Telemedia and Telekom Malaysia consortium for $220 million and AT&T sold its 49 percent stake in BPL to its Indian partner; (7) Idea purchased Escort's mobile business for $266 million.[101]

TRAI favors continued consolidation of the cellular market into a limited number of large corporate groups capable of undertaking large investments. The smaller service providers will find it increasingly more difficult to operate. Eventually these large corporate groups will have a pan-India footprint and some have called for a merger of MTNL and BSNL in response to intense competition from integrated private sector operators. Private sector cellular operators expected to survive the consolidation phase includes Tata Tele Services, Idea Cellular, Reliance Infocomm, Bharti Teleservices, and Hutchison-Essar.[102] These companies are expected to fund their acquisitions and expansion plans via private equity floatation. The BPL Group and Spice Telecom are among the remaining six firms that could be targets for a takeover.

Wireless-in-local loop (WLL) using CDMA technology:[103] Developing countries with limited telecommunications infrastructure began using wireless-in-local loop in the early 1990s to expand their telecommunications networks using wireless technologies rather than more expensive conventional copper wire or optical fiber.[104] WLL, based on the code division multiple access (CDMA) technology, can bypass fixed networks and is a reliable and high quality substitute for wire line technology since it replaces copper wires with a wireless system-in-local loop. It permitted developing countries like India to offer greater coverage at a fraction of the cost and was touted as the fastest and most-efficient way to upgrade the nation's telecommunications infrastructure and increase tele-density over the shortest period of time. WLL has the unique capacity to provide both fixed location as well as "limited mobile" services and can be installed quickly and cheaply in both densely populated urban areas as well as remote and sparsely populated rural areas of the country where laying copper cable is prohibitively expensive.

Wireless-in-local loop systems are also less fault prone and less capital intensive and they offer lower operating and upgrading costs, ease of deployment, and can seamlessly migrate to 3rd generation technologies.CDMA WLL offers better voice clarity, supports a higher number of subscribers, more efficient hand-off between cells, requires fewer cell sites than GSM, it is more spectrum efficient, provides enhanced privacy, offers the lost level of radiation, and offers significant advantages over GSM

---

[101] "Merger buzz gets louder," The Telegraph, March 8, 2004, found at http://www.telegraphindia.com/1040308/asp/other/print.html, retrieved July 1, 2004.

[102] Surajeet Das Gupta, "2007: a mobile services odyssey," Business Standard, April 9, 2003, found at http://business-standard.com/archieves/2003/apr/50090403.asp, retrieved May 28, 2003.

[103] WLL based CDMA is a more recent technology than GSM and is a standard used by many U.S. companies. For more detail see Appendix A. *Wireless in local loop*, ITI Ltd, found at http://www.itiltd-india.com/wll.htm, retrieved Jan. 18, 2004.

[104] Satish Pandya, "Telephone on demand: commitment fulfilled," GOI, Press Information Bureau, found at http://www.pid.nic.in/feature/fevr2002/f080220021.htm, retrieved Jan. 18, 2004.

in its support of data services.[105]

WLL has been called the "poor man's" or the "common man's" mobile telephone service since many Indians still cannot afford cellular telephones due to its high cost. The introduction of CDMA created significant competition with cellular mobility operators and offered mobile communication to many citizens for the first time. Basic service operators have offered WLL calls at the cheaper fixed-line rate, made incoming calls free, priced outgoing calls at less than one cent per minute, and set the price for a monthly subscription of $5.56.[106] WLL-M operators offer a wide range of value-added services that have reduced the distinction between WLL and GSM substantially. These services include color display, embedded cameras, Internet, and short message services (SMS). DoT hoped that the introduction of WLL based mobile services would slash customer charges by at least 50 percent. The first WLL based CDMA system was setup by MTNL in New Delhi in May 1997 followed by BSNL and Reliance in 2001.

Fixed location WLL eliminates the need for wires connecting the subscriber's residence or office to a telephone pole and to the central switching station. A small box with a 6-inch antenna is attached to the outside of the subscribers' premises and radio waves, instead of wires, to transmit voice and data to the central switching station. WLL terminals can be easily installed and connected to an existing telephone instrument, PBX, or PC for Internet access (speeds up to 115 kbps). Fixed location systems offer all the services associated with traditional copper wire systems (within the conventional local public switched telephone network) including local calls, domestic and international long distance service, Internet, fax transmission, and videoconferencing.[107]

In January 2001, DoT classified WLL as a basic service and allowed fixed-line operators to offer a "limited mobility" service that allows subscribers with mobile handsets to move around like cellular subscribers. Although CDMA is capable of full mobility like cellular systems, to maintain a distinction between cellular and WLL the TRAI maintained that WLL-M be limited to an operational area or short distance charging area (SDCA) to a fixed radius of 20 to 30 kilometers with three or four antenna sites.[108] This system prevents long distance roaming and reception is restricted to inside city limits and handsets cannot be used outside the subscriber's SDCA, which renders WLL unsuitable for many business applications. Basic service providers are also prohibited from using mobile switching centers that enable calls to be transferred from one SDCA to another simulating roaming, a service reserved for cellular telephone service providers. To compensate WLL service providers for banning roaming and limiting their services to within an SDCA, the government allowed WLL service providers to offer CDMA calls of the same rate applicable to less expensive fixed-line calls.

---

[105] CDMA, a U.S. technology, was designed to serve the lower end of the market for mobile telephones. Range and quality of these systems is not comparable with cellular systems, but CDMA is said to be at least five to six times more spectrum efficient than GSM and it enables many more people to share the airwaves at the same time without static, cross-talk, or interference.

[106] In contrast, GSM operators charged a minimum of one cent per minute for incoming calls, a minimum of 3.5 cents per for outgoing calls, and a monthly subscription rate of $8. Incoming cellular calls became free in April 2004 as part of the new inter-connect usage regime that also required basic fixed-line subscribers in urban areas to pay a higher rate.

[107] Government regulations required that WLL services be provided on the 5 + 5 MHz 824-845 and 869-890 MHz frequency band and can support voice, group 3 fax, and data up to speeds of 14.4 kbps. Service providers have recently employed a system based on CDMA 2000 IX technology that can transmit voice and data at a speed of 9.6 kbps. CorDECT, indigenous WLL-based technology, is being used to connect far-flung rural PC kiosks.CorDECT was developed jointly by Indian Institute of Technology, Chennai, Midas Communications, and Analog Devices, Inc.

[108] The same area covered by GSM, according to basic service providers, would require at least 200 coverage points.

DoT received 147 applications from private sector companies to provide basic fixed-line services to compete with BSNL and MTNL. Basic operators were required to pay a one time entry fee of approximately $109 million to offer both basic fixed-line and limited mobility services, which is significantly lower than the entry fee paid by GSM cellular operators. According to DoT's projections, the WLL-M subscriber base will increase nine fold from 4.6 million in 2002 to 40 million by 2007. Competition from WLL-M operators is expected to cut into GSM cellular market share that is expected to decline from 80 percent to 60 percent by 2006.[109] As of January 13, 2003, DoT had issued more than 125 licenses to offer WLL services to companies like Reliance with 18 licenses, Tata with 8 licenses, and Bharti with 6 licenses.

There are currently 6 companies providing "limited mobility" WLL-M services in India. CDMA By 2003-04, the subscriber base for WLL-M services is projected to grow from 7.5 million to 33.6 million and the number of WLL-F subscribers is expected to reach 42.6 million (Table 14).[110] Revenues are also expected to rise from $351.65 million to $681.32 million in 2004-05 and the ARPU is expected to grow from $47 to $49.[111] Competition is expected to grow dramatically as Reliance and Tata compete for subscribers based the lowest available call rates, subsidized handsets, and the introduction of prepaid cash cards. Of the 7.7 million subscribers, approximately 1.2 million are wire line, 1.4 million are WLL fixed, and the remainder are WLL-M limited mobile.

Table 14: CDMA WLL providers by Service Provider (March 2004)

Operator	Fixed wire-line & WLL-F	WLL-M	Brand Name	Circle
Reliance Infocomm	503,353	6,474,349	India Mobile	20 circles including AP, Delhi, MD, TN, Gujarat, Maharashtra
Tata Teleservices	1,003,585	625,267	Tata Indicom	Maharashtra
BSNL	36,112,093	202,198	Tarang	All India
MTNL	4,367,264	102,739	Garuda	Delhi and Mumbai
HCFL	125,331	29,908		Punjab
Bharti	636,725	0	IndiaOne	Delhi, Haryana, Karnataka, MP, TN
Shyam Telelink	92,392	27,632		Rajasthan
Total	42,840,743	7,462,095		
Source: TRAI				

Reliance Infocomm is India's largest WLL-M service provider accounting for nearly 6.5 million subscribers or more than 90 percent of the market. Reliance began service in 2003 and within 7 months had accumulated more than 600,000 subscribers. Reliance, Tata and other WLL-M operators are expected to migrate to the new unified access service license where they can offer true mobility.

With the implementation of the Interconnect Usage Charge regime in January 2004 the price differential between WLL-M and GSM cellular changed. The measure differentiated WLL-M from basic fixed-line services and added an interconnect toll for terminating calls that increased the cost of WLL-M calls in relation to fixed-line and nearly merged them with GSM cellular fees. Like cellular companies, WLL-M

[109] Surajeet Das Gupta, "Cell firms may lose a third of market share," rediff.com, Oct. 27, 2003, found at http://www.rediff.com/cms/print.jsp?docpath=/money/2003/oct/27cell.htm, retrieved Oct. 27, 2003.

[110] "Telecom FDI Set To Cross Rs 10,000-Cr Mark Shortly," The Financial Express, April 15, 2004, found at http://www.financialexpress.com/fe_full_story.php?content_id=57096, retrieved July 12, 2004.

[111] "WLL subscriber base to hit 14 mn in FY-05," The Economic Times, June 9, 2004, found at http://economictimes.indiatimes.com/articleshow/727816.cms, retrieved June 9, 2004.

service providers will be required to pay their competitors Rs 0.3 per minute (0.006 cents) for terminating calls on the each other's network.

In October 2003, the GOI introduced a unified telecommunications service licensing scheme that combined basic (fixed-line) and mobile services. This permitted Reliance Infocomm, Tata Teleservices and others to offer fully mobile cellular services beyond the SDACAs through their WLL-M systems. Reliance, Tata, and Bharti have been gained new licenses under the new unified regime.

Internet: DoT granted VSNL the license to offer Internet services in the 4 metros and in August 1995 it launched India's first Internet services and for the next four years served as India's sole monopoly provider. In November 1998, VSNL lost its monopoly when private sector operators were allowed to offer Internet services. At that time approximately 150 companies including multinationals like British Telecom, MCI, Motorola, and CompuServe announced plans to enter India's Internet market. Since that time approximately 587 Internet service operators' licenses have been issued.[112] Satyam Infoway was the first private sector company to offer Internet service in India. DoT issued three types of Internet services providers licenses (according to the area of coverage): Category 'A' licenses were for operations covering all of India; category 'B' covered the metros and state level circles; and Category 'C' for medium and small cities. Dot issued 94 category 'A' licenses, 230 category 'B' licenses, and 263 category 'C' circles. Of these, 189 are operational and 166 have surrendered their licenses back to the government (tables 15).[113]

Table 15: Internet services (Dec. 2003)	
Internet subscribers	4.1 million
ISP licenses issued	587
ISP licenses surrendered	166
Operational ISPs	189
Cyber cafes	12,300
Cities and towns covered	130
Operational gateways	145
Source: TRAI, DoT	

In contrast to the basic and cellular licensing process, the Internet service provider (ISP) licensing process was much more transparent, licenses were not auctioned to the highest bidder, licensing fees were nominal (Rs 1), and unlimited competition was immediately allowed. This process allowed the dimensions of the industry to be shaped by market forces rather than government rules and regulations.[114] India's

[112] Some of the companies obtaining Internet providers licenses never actually offered services. Many surrendered their licenses after depositing 5 percent of their bank guarantees.

[113] Internet Services Industry – An Overview, Internet Service Providers Association of India (ISPAT), found at http://www.ispai.com/overview.html, retrieved Feb. 12, 2004.

[114] The NTP '99 amended existing provisions and regulations by setting a number of new goals: The NTP '99 required Internet service at the District headquarters level by 2002. Made no restrictions on the number of service providers. Permitted ISPs to establish international gateways with foreign satellite and submarine cable companies. Allowed ISPs to set up submarine landing stations either alone or in partnership with international undersea bandwidth carriers. ISPs permitted to carry last mile service using fiber optic or radio, set their own fees, and permitted to offer Internet service via Cable TV. Set foreign direct investment in ISPs at 100 percent, but limited foreign equity to 49 percent for those ISPs that owned their own international gateways. In 2002, the GOI amended this to allow ISPs to set foreign equity limits at 74 percent for ISPs with international gateways and 100 percent for ISPs without international gateways providing end-to-end bandwidth. ISPs without submarine or satellite landing stations were required to offer cable networks, electronics,

Internet services are dominated by three public sector service providers and 7 private sector providers that account for more than 97 percent of the total subscriber base (table 16). However, more than 69 percent of the country's Internet subscribers are now controlled by MTNL, VSNL, BSNL, and Satyam Infoway (Sify). The three public sector providers currently operate 292 Internet access nodes and are using their large telephone subscriber base to draw from for their Internet services. Most ISPs have continued to use VSNL's level 1 gateway through a backbone connection to the United States and a Level 2 connection through the United Kingdom. Leading private ISPs include Sify, HCL Infinet, DishnetDSL, and Tata ISL.[115] More than 90 percent of India's Internet subscribers use dial-up services, but other services such as cable, DSL, and wireless are gaining acceptance.[116] The typical subscriber uses approximately 400 minutes a month and the average value per user per month was approximately $6.31.[117] While Internet penetration in India is 0.02 per 100 residents, while broadband penetration stands at 2 for every 10,000 residents the TRAI wants the Internet penetration rate to increase to 0.6 for Internet and 0.3 for broadband by 2005.[118]

Table 16: India's leading Internet service providers (Oct. 2003)

Company	Coverage area	Subscribers	Band name
BSNL	All India, except Mumbai and New Delhi	1,128,172	Sanchar Net
MTNL (Millennium)	All India	769,434	Bol Anmol
Sify Ltd	All India	658,192	Sify
VSNL	All India	600,509	Tata Indicom
Dishnet DSL	All India	264,631	DishnetDSL
Tata Internet Services	All Inida	179,224	Tata Nova
Relaince	All India	174,038	Relaince
HCL Infinet	All India	55,872	HCL Infinet
Bharti (Broadband & Telesonic)	All India	73,872	Bharti BT Internet (Mantra on Line)
Data Access	All India	40,769	Data Access
Total		4,549,618	

Source: The Indian Telecom Service Performance Indicators July-Sept'03, TRAI, Nov. 2003.

While VSNL held a monopoly position over the Internet, the subscriber base grew very slowly despite high demand and there were only 200,000 subscribers at the end of 1998. Since then, Internet subscribership has grown by more 15 times and now stands at approximately 4.5 million subscribers. Initially, prices were high and access was limited to a small number of providers through dial-up access. Service was plagued by network congestion, frequent disconnections, and poor connect speed. In 2003-04

voice mail, and had to promise to offer 26 percent of their equity to the public within five years of their licensing.

[115] "VSNL leads ISPs in India," India Telecom News, Sept. 3, 2003, found at http://www.indiatelecomnews.com/newdetails.asp?newsid=311, retrieved Sept. 9, 2003.

[116] N Vidyasagar, "Internet on demand: when will this be a reality?" The Times of India, Dec. 11, 2003, found at http://timesofindia.com/articleshow/msid=353309,prtpage-1.cms, retrieved Dec. 11, 2003.

[117] BSNL is biggest internet operator," Indiatimes Infotech, Dec. 4, 2003, found at http://www.infotech.indiatimes.com/articleshow/346277.cms, retrieved March 26, 2004.

[118] "Broadband goes boom: Prices crash," India Times Infotech, March 26, 2004, found at http://infotech.indiatimes.com/articleshow/583233.cms, retrieved March 26, 2004.

more than 90 percent of subscribers still rely on dial-up access.

The Indian Internet market is estimated at $54 million and the largest user segment has been the corporate and business sector. The corporate sector accounts for approximately 44 percent of active users and households account for the remainder. The most commonly used method of accessing the Internet continues to be dial-up although the use of dial-up has declined among corporate customers from 71 percent of total in March 2003 to 60 percent in March 2004. The number of customers accessing the Internet through cable link has grown from 12 percent to 16 percent while ISDN has increased from 11 percent to 17 percent and leased lines from 8 percent to 9 percent.[119]

Declining PC prices, unlimited competition, and the demand for local content accounted for the 5 percent increase in the Internet subscriber base in 2003. The National Association of Software Services Companies (NASSCOM) predicted that India's Internet subscriber base would have grown to 10 million by the beginning of 2004 because of growing demand for electronic-commerce applications and leased lines, ISDN, and VPN services. Although the Indian Internet sector has experienced significant growth in the number of Internet users and the accessibility of PCs, and the number of Internet users per capita remains very low, only a fraction of the total population.

However, more than 200 ISPs have ceased operations and closed down their operations since 1999 despite India having some of the highest Internet usage charges in the world. Theses ISPs were casualties of the very slow growth of the Internet subscriber base, low bandwidth and PC penetration, and a growing gray market. Nearly 30 percent of India's ISPs reported a significant decline in their subscriber base during 2002-03.[120] Companies like Bharti Broadband and Reliance Infocomm have seen their subscriber base decline by 53 percent and 43 percent, respectively, during 2002-03. Nonetheless, MTNL's subscriber base expanded by 208 percent during the same period as it bundled its Internet with its other telephone services.

The Internet Service Providers Association of India (ISPAI) predicted that ISPs would lose approximately 2,000 subscribers during the first few months of 2003 and predict that it will be difficult for the industry to reach the 10th Five Year Plan of 23 million subscribers. In 2003-04, Internet access rates have fallen even further due to growing competition from cable service providers offering 24 hour access at $6.25 per month. Cable service providers have cut their rates by 50 percent in anticipation of Reliance Infocomm's launch of Internet Cable TV and local telephone services on the same platform at $10.42 per month during 2002-03. However during FY2003-04, the industry registered 24 percent increase in the number of subscribers and revenues increased by 22 percent to $340.1 million.[121]

Other sources predict that the number of Internet subscribers will to grow to 8.2 million by 2006 and revenues will reach $740 million due to growing PC penetration rates, declining bandwidth rates, and growing access to Internet via cable TV.[122] Service providers have also accused the government of not doing enough to prevent gray market providers from illegally competing for their small revenue base. According to industry sources, none of the operational ISPs report a profit based solely on the strength of their dial-up services. Existing IPSs have been desperately trying to improve their profitability and viability by increasing the number of value-added services they provide. Most have resisted raising access

---

[119] "Internet subscriber base grows 64 pc," The Hindu, July 7, 2004, found at http://www.hinduonnnet.com/holnus/006200407070358.htm, retrieved July 7, 2004.

[120] Thomas K Thomas, "Telecom firms grab 60% of Net user base," Rediff.com. Sept. 1, 2003, found at http://www.rediff.com/money/2003/sep/01net.htm, retrieved Feb. 18, 2004.

[121] "Indian telecom industry grows 20% in FY04," found at http://www.indiatelephone.com/news/20040715_1.htm, retrieved July 20, 2004.

[122] Vipin V. Nair, "Net effect: Few takers," Business Line, Jan. 14, 2004, found at http://www.blonnet.com/ew/2004/01/14/stories/2004011400010100.htm, retrieved April 2, 2004.

rates fearing the customers would abandon services, especially because of existing high telephone charges at 50 cents per hour.

The Dotcom explosion, 100 percent foreign equity, unlimited entry, and government policies designed to promote competition and proliferation all combined to drive Internet access prices to very low levels. Internet cyber cafes (cyber dhabas) have assumed an important place in expanding accessibility because most Internet users find it less expensive to use the local cyber café than to use dial-p access from their own homes.[123] Internet access has become easily accessible at the cyber bhabas and they have been growing in number, not only in the large metropolitan areas but also in smaller towns and cities. Cyber bhabas can offer lower prices because they use a single telephone connection, which represents a significant portion of access cost, to connect several computers. In December 2003, TRAI also lowered the toll on leased lines used by ISPs that could lower infrastructure costs by nearly 40 percent.

On April 2, 2002, DoT announced that the prohibition against Internet telephony would be lifted. Approximately 121 ISPs were granted permission by DoT to offer Internet telephony and 43 have initiated services. The number of minutes used by subscribers increased by 30 percent to 25.2 million in the quarter ending March 31, 2004 quarter from 20.1 million during the corresponding period of 2003.
TRAI guidelines limit the provision of services to ISPs and interconnectivity between ISPs was permitted only if both had licenses to offer Internet telephony. In order to protect national long distance providers like BSNL, Bharti, and Reliance, TRAI's final guidelines barred PC to telephone calls within India and on April 1, 2002 internet subscribers could place and receive PC-to-PC and PC-to-telephone calls from abroad. For Internet based telephone-to-telephone calls, ISPs will be required to set up a separate Voice-over-Internet protocol network (VoIP).[124] Nearly 20,000 Internet telephony devices are expected to be sold annually at prices ranging between $208 and $520.

As of March 203, the estimated market for Internet telephony was approximately $54 million. The market is very price sensitive and most calls are placed to the United States, Canada, and the United Kingdom. Despite the poor quality of voice, the prices for Internet telephony average of 9 cents per minute compared to BSNL's land line rates of 16 cents per minutes for calls to the UK, 20 cents per minute for calls to the U.S. and Europe, and 26 cents per minute for calls to countries of South East Asia.[125]

PROFILES OF LEADING COMPANIES

Mahanagar Telephone Nigam Limited (MTNL): MTNL was incorporated on April 1, 1986 as a Public Limited Company (PSU) to manage, control, and operate DoT's fixed-line telecommunications network in India's largest and most lucrative markets of New Delhi and Mumbai.

---

[123] For surfing the Internet at home for one hour during the day, it will cost a subscriber will about 50 cents (Rs 24) plus ISP charges. This can total 67 cents per hour (Rs 32), whereas one hour at a Cyber Café can range from 31 cents to 42 cents per hour (Rs 15-20).. Vipin V. Nair, "Net effect: Few takers," Business Line, Jan. 14, 2004, found at http://www.blonnet.com/ew/2004/01/14/stories/2004011400010100.htm, retrieved April 2, 2004. "Internet Subscribers Down By Two Lakh in Two Months, says ISPAI," Internet Service Providers Association of India (ISPAI), March 12, 2003, found at http://www.ispai.com/financialexpress12mar2002.html, retrieved April 2, 2004. "Internet Subscribers To Grow at 27% Between 2001-06; IDC," Internet Service Providers Association of India (ISPAI), Feb. 7, 2003, found at http://www.ispai.com/2ndeconomictimes07feb2003.html, retrieved April 2, 2004.

[124] "TRAI: No license for ILD net telephony," India Bandwidth, Feb. 21, 2002, found at http://www.indiabandwidth.com/dir1/longdist28.html, retrieved Feb. 9, 2004.

[125] G. Rambabu, "Calling abroad & net telephony the best bet," Business Line, March 17, 2004, found at http://www.hindubusinessline.com/2004/03/08/stories/2004030801520100.htm, retrieved June 16, 2004.

These two cities account for nearly 28 percent of the basic fixed-line subscriber base, 30 percent of domestic long
distance calls, and 12 percent of the cellular subscriber base. The PSU has an authorized capital of $174 million and a paid-up share capital of $137 million.

DoT granted MTNL a licensed to provide basic, cellular, and other telecommunications services in Mumbai and New Delhi until March 31, 2013. MTNL has an equipped capacity of 5.9 million fixed-lines, 4.7 million direct exchange lines, and more than 761,000 mobile subscribers (table 17). MTNL is listed on the New York Stock Exchange and in 1992 the GOI divested 20 percent of MTNL's equity and in 1994 it divested another 13 percent of MTNL's equity holdings leaving the government with a 56.2 percent stake in the company.

Table 17: MTNL Infrastructure (March 2004)

Equipped capacity	5.9 million lines
Direct exchange lines (DELs)	4.7 million
Public call offices (PCO)	204,433
Public Phone booths	20,753
Number of stations (long distance)	238
Number of countries connected overseas	492
Optical fiber cable	4,351 route km

Source: MTNL

For 2002-03, MTNL posted a net profit of approximately $194 million in 2002-03 as compared to $287 million in FY2001-02 and the company's turnover declined from $1.4 billion to $1.3 billion during the same time period. During the quarter ending March 31, 2004, MTNL's sales turnover grew to $3.2 billion, its total income rose to $3.4 billion, and its operating profit grew to $126.9 million.[126] Approximately 97 percent of MTNL's income is derived from fixed-line service supplied especially to its high-end customers. Fixed-line service accounts for only 12 percent of MTNL's total subscriber base but account for nearly 50 percent of its revenues.[127]

While no longer the sole monopoly provider of basic fixed-line services in Mumbai and New Delhi, MTNL still enjoys significant economies of scale and has extensive infrastructure being India's second largest telecommunications service provider. MTNL controls more than 13 percent of India's telecommunications network, 90 percent of its fixed-lines, and less than 50 percent the telephones in New Delhi and Mumbai.[128] MTNL's share of the WLL-F and WLL-M markets in the two cities stood at 24 percent and 7 percent, respectively in 2003-04.

MTNL has faltered in the face significant competition from the private sector and in FY2004 its market share fell below 50 percent in both Mumbai and New Delhi and its share of the market is expected to decline further in the future. Between 2000 and 2002 the number of new fixed-line telephones installed by MTNL dropped from 237,238 to 25,000 and the company lost approximately 100,000 customers due to poor quality of service. During the January-September period of 2003 only 65,000 subscribers were added compared to 70,000 that terminated service and returned their telephones. As the telephony market shifted from a seller's market to a buyer's market, MTNL faced stiff competition from private sector operators in

[126] "Private Cos stifle MTNL's ring," The Economic Times, Dec. 7, 2003, found at http://economictimes.indiatimes.com/articleshow/msid-346004,prtpage-1.cms, retrieved July 20, 2004.

[127] "MTNL: will it ring a bell?" Business Standard, June 24, 2004, found at http://www.businessstandard.com/bsonline/storypage.php?autono=159018, retrieved June 23, 2004.

[128] Mahanagar Telephone Nigam Ltd, indiainfoline, found at http://www.indiainfoline.com/comp/mtnl/mtnl.html, retrieved June 10, 2004.

both Mumbai and New Delhi. To meet this challenge MTNL has begun modernizing its infrastructure including the installation of digital switches and optical fiber, increasing the number of cell sites to 300 by the end of 2004, introduced ADSL-based broadband in Mumbai, and $265 million in 2003-04 for the expansion its mobile networks in both metros.[129]

MTNL offers a wide rage of services such as basic wire-line telephony (voice and data), GSM cellular, wireless and satellite Internet, leased circuits, long distance, SMS, ISDN, and ATM services. In Feb 2001, MTNL became the 3rd cellular service provider in both Delhi and Mumbai and in February 2001 MTNL launched its post-paid GSM cellular mobile service with a capacity of 50,000 subscribers in each metro under the brand name of "Dolphin" (table 18). MTNL was the third cellular mobile service provider in Mumbai using GSM 9000 band technology supporting intelligent services such as prepaid cash cards, roaming, national long distance, and international long distance.

Although MTNL was a late entrant into the cellular mobile market and its bid to gain market share has been limited, it plans to double its cellular capacity in Mumbai to 200,000 subscribers by adding new cell sites and setting up an additional 95 base stations to take the total to 270. MTNL's cellular subscriber base has grown from 118,656 in December 2001 to 348,507 in February 2004, or by 194 percent. MTNL launched its prepaid GSM cellular scheme in January 2002 under the brand name "Trump." However, expansion of its networks has been limited by capacity constraints.

Table 18: MTNL telephony services (Dec. 2003)

Technology	Number of subscribers	Brand names	Circles	Services
GSM	324,933	Dolphin (postpaid) Trump (prepaid)	New Delhi and Mumbai	Basic wireline (voice and data), leased lines, ISDN, VPN, ATM, voice mail, paging and short message services, Centrex services, DSL services, mobile services (CDMA and GSM), international trunk services, Internet and Internet telephony, and video conferencing, prepaid calling cards
WLL	421,104	Garuda		
Internet	250,000	Bol Anmol, Milennium Telecom		

MTNL launched its WLL service based on CDMA technology in Delhi and Mumbai circles in 1997 with an equipped capacity of 50,000 lines in each city. MTNL's CDMA service is provided under the brand name of "Garuda 1X" that enables subscribers to access data at speeds of up to 144 kbps. MTNL offers WLL service via a hand held terminal (mobile handset) and by way of a fixed wireless terminal (FWT). Both services provide CLIP facility, call waiting, call hunting, call forwarding, three party conference, abbreviated dialing, STD/ISD lock, Internet access from FWT, and data. The network was subsequently upgraded to a 3rd generation CDMA 2000 1X technology with a capacity of 28,000 lines (based on indigenously developed CorDect technology) in the two cities.[130]

To gain market share MTNL has dramatically lowered call rates on its CDMA mobile phone service in Delhi and plans to lower rates for data access by 50 percent and call rates on voice telephony by up to 15 percent. The growth of both Garuda and Dolphin has been restricted by capacity constraints, equipment and handset procurement problems, and by MTNL's failure to anticipate the growth in demand

[129] "Rs 1,200 cr MTNL outlay for telecom infrastructure," The Times of India, May 23, 2003, found at http://www.timesof India.indiatimes.com/articheshow/msid-47268833, prtpage-1.cms, retrieved March 10, 2004

[130] MTNL.

for both services that exceeded capacity forcing the company to turn away potential subscribers.[131]

MTNL is the largest Internet service provider (ISP) in Delhi and Mumbai and has become the third largest ISP in India. The company launched prepaid and post-paid Internet services in Delhi in 1999 and offers high speed data services that permit subscribers to access data at speeds up to 144 kbps. It also began offering international long distance service with the launch of its Internet telephone facilities in July 2002 (PC to phone).[132] Under the brand name "Bol Anmol" it is possible for MTNL subscribers to call 168 countries, including the United States and the United Kingdom, for approximately 11 cents per minute as compared to 53 cents per minute for international telephone calls.[133] Subsequently MTNL applied for a license to provide Internet telephony to the entire country through its 100 percent subsidiary Millennium Telecom, a category "A" Internet service.

With the introduction of the unified access license regime in September 2003, MTNL has begun to restructure its operations by merging its GSM division with its basic telephone operations thereby using the existing basic services marketing infrastructure also for its GSM services. MTNL also operates telecommunications equipment factories in Kolkata, Mumbai, Jabalpur, Richhai, Bhilai, Gopalpur, and Kharagur. These facilities produce a variety of telecommunications equipment including line transmitter equipment, telephone poles, microwave towers, hand and coin-box telephones, C.T. and D.P. boxes, main distribution frames, modems, single fiber patch cords and pigtails, and tool kits for the installation and assembly of optical fiber cables.

Because MTNL is limited to offering fixed and mobile services solely in Mumbai and New Delhi, it is looking to expand its operations outside of India. Currently MTNL has obtained licenses to operate telecommunications services in Mauritius and Nepal and is bidding on CDMA –based mobile licenses in Rwanda and basic fixed-line license in Kenya. MTNL Telephone (Mauritius), a 100 percent subsidiary of MTNL, now offers fixed, mobile and international long distance services in Mauritius.[134] MTNL-Mauritius will initially offer 15,000 lines and in Kenya MTNL will enter a joint venture with Telecom Consultants of India (TCIL) and a local company with MTNL having a 40 percent equity stake in the new venture. The company is also exploring possible ventures into the Gulf States and the CIS countries.

Videsh Sanchar Nigam Limited (VSNL): VSNL was incorporated as a Public Limited Company (PSU) in April 1986 under the Indian Companies Act to serve as India's monopoly carrier of international long distance services until March 31, 2004. It also served as the country's monopoly provider of international data transmission and Internet service, except in Mumbai and New Delhi. The newly created company assumed the responsibilities of the government-owned Overseas Communications Service, a department of the Ministry of communications. VSNL connects more than 10,909 Indian cities and towns to more than 236 overseas destinations.

VSNL carries more than 1 billion minutes of outgoing and incoming international traffic and nearly 80 percent of its $1.1 billion in revenues (FY2002-03) were derived from overseas calls. VSNL was the first Indian public sector company to be listed on the New York Stock Exchange and all international calls were routed through its gateways and it maintains bilateral relations with international

---

[131] "MTNL restores mobile to landline link," The Statesman, Jan. 20, 2003, found at http://www.thestatesman.net/page.archiview.php?clid=12&id=38491&usersess=1, retrieved June 2, 2003.

[132] MTNL.

[133] "MTNL launches Internet telephony at Rs 4.80," rediff.com, July 24, 2002, found at http://www.rediff.com/money/2002/jul/24mtnk.html, retrieved June 10, 2004.

[134] Manoj Gairola, "Telecom majors hit pay dirt abroad," The Economic Times, Feb. 27, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-522160,prtpage-1.cms, retrieved July 15, 2004.

traffic carriers in more than 75 countries. VSNL is also India's signatory to the International Telecommunications Satellite Organization (INTELSAT) and the International Maritime Satellite Organization (INMARSAT). VSNL was also granted 'Navaratna' standing by the GOI until February 13, 2002 giving it greater managerial and operational independence than other state-owned companies. VSNL's basic services include telephony, telex, and telegraph and value-added services include high-speed digital leased lines, GMPCS, Internet access, ISDN, gateway data packet switching, television and video uplinking, electronic data exchange, frame relay services, and video conferencing (table 19). VSNL maintains a network of 37 earth satellite stations, two analogue cable systems (IOCOM and Gulf Cables), switching capabilities in 9 cities, and optical fiber submarine cable systems (Flag, SEA-ME-WE-2, and SEA-ME-WE-3). It provides international service through 32,000 electronic exchanges and 326 digital trunk automatic exchanges (TAX) to 236 countries via Intelsat and Inmarsat. VSNL has 22 Internet "points-of-presence" and also controls over 1 ghps of international bandwidth and its centers for international gateway connectivity located in New Delhi, Mumbai, Kolkata, Chennai, Jallandhar, Gandhinagar, and Ernakulam.

Table 19: VSNL

Service Type	Number of subscribers	Brand names	Circles	Service
International long distance (ILD)		VSNL	All India	ILD, NLD, Internet, GMPCS, INMARSAT, Internet, Internet telephony.
Internet	700,000	Tata Indicom Total Internet		

VSNL was able to earn huge profits because all international long distance (ILD) calls were routed through VSNL were subject to extremely high call rates. VSNL profited by having sole access to BSNL and MTNL fixed-line subscribers and more than 90 percent of VSNL's earnings were derived from ILD calls. In April 1, 2002, the GOI terminated VSNL's monopoly on international telephony and within in 6 months call rates fell by 50 percent and the trend has continued. VSNL's incoming international traffic grew by an average rate of 24 percent annually between 1990 and 1999 and in 1999-2000 incoming calls grew by 72 percent per annum. Although VSNL handled more than 3 million minutes during the 2002-03, most of the growth in volume has gone to private sector competitors. The call ratio for incoming and outgoing international calls was 3.7:1 due to VSNL's high call charges placed on outgoing international calls. VSNL's revenues can easily be compared to leading telecommunications companies in smaller countries like Chile, Pakistan, and Malaysia.

With the introduction of competition, VSNL's revenues per call dropped from 22 cents to 10 cents in FY2002. During 2003-04, VSNL's net sales declined by 30 percent from $1.4 billion to $989.3 million from the previous fiscal year. VSNL reported that its revenues fell by 35 percent to $732 million from $1 billion during 2003-04 and its net profit declined by 51 percent to $169 million from $82 million. Because of competitive pressures from the private sector, industry experts expect VSNL to lose at least 45 to 50 percent of its ILD market share by the end of 2005.[135] In 2002 alone, VSNL's subscriber base dropped by more than 100,000 to between 580,000 and 590,000 customers. The entry of private competition allowed BSNL and MTNL to route their ILD calls through pipelines owned by The Bharti Group and other private sector providers.

[135] "VSNL set to lose 45-50 pc market share: study," Business Line, Jan. 24, 2002, found at http://www.blonnet.com/2002/01/25/stories/2002012500780500.htm, retrieved Nov. 18, 2003.

VSNL's monopoly on Internet services ended in November 1998 and in February 2000 it lost its monopoly over international gateways when the GOI permitted private operators to become ISPs, establish their own gateways, and connect to foreign satellites.[136] VSNL's monopoly on international voice and data services ended two years ahead of schedule under intense international pressure as part of India's commitments to the WTO Basic Telecommunications Agreement. The GOI had been under considerable pressure since 1995 to review VSNL's monopoly status. To compensate VSNL for losing its monopoly status two years earlier than planned the GOI gave VSNL $153 million, and all-India Internet Service Provider (ISP) license, a NLD license, and a 5-year exemption from paying license fees. The company stated that a portion of the funds would be used in the construction of infrastructure to support its national long distance services (NLD) by 2005. In 2003, VSNL was rated as the third best ISP in Asia and the 29th best in the world. It also maintains a series of Internet hubs in countries like the U.S., U.K., UAE, Singapore, and Japan.[137]

VSNL and Dishnet DSL reached an agreement for VSNL to purchase of its Internet service provider division (Sterling Infotech) for $57.8 million. This will give VSNL access to Dishnet's more than 600 owned and franchised CyberCafes and Dishnet's broadband assets that can serve more than 50,000 cities.[138] VSNL also announced the formation of VSNL American, Inc. on July 30, 2003 to facilitate end-to-end Internet bandwidth between India and the United States. It has also commenced operations in Nepal and Sri Lanka.[139] VSNL also received 4 STM-1s on i2i cable network from DishnetDSL that will give the company an additional 555 MBPs bandwidth capacity.

In 2004, most of the outgoing international calls continued to be routed through VSNL and the company still dominated India's international fiber bandwidth market in with more than 80 percent market share.[140] VSNL launched prepaid calling cards under the brand name of "Hello Duniya" to enable subscribers to make national and international long distance calls from any Tata Indicom telephone network. Cellular telephony providers such as Hutchison-Essar, Idea, BPL Mobile, MobileFirst, Escotel, and Spice Telecom have signed agreements with VSNL to route their ILD traffic through VSNL.

In 2002, the GOI opened bids for the privatization of VSNL as part of its divestment plans. The GOI offered to sell a controlling portion of its 54.02 percent share holdings in the company. On February 13, 2002, Panatone Finvest, a subsidiary of the Tata Group, signed a shareholder's agreement with the GOI for the acquisition of a 25 percent equity share in VSNL worth $300 million.[141] Since its privatization the Tata Group has acquired 45 percent of the company with most of rest being held by banks, international equity holders, Indian institutions, and the Indian public.

---

[136] "Telecoms sector is magnet for investment," EIU Viewswire, Jan. 10, 2002, found at http://www.viewswire...layout=display_print&doc_id=174041, retrieved Nov. 18, 2003.

[137] VSNL ranked 3rd among ISPs in Asia, 29th in world," The Economic Times, Sept. 28, 2003, found at http://economictimes.indiatimes.com/cms.dll/xml/uncomp/articleshow?msid=205962, retrieved Oct. 1, 2003.

[138] "VSNL acquires Dishnet's net biz for Rs 270 cr," Business Line, March 19, 2004, found at http://www.thehindubusinessline.com/2004/03/02/stories/2004032002590100.htm, retrieved July 2, 2004.

[139] "VSNL coming to America," India Telecom News, July 30, 2003, found at http://www.indiatelecomnews.com/newdetails.asp?newsid=295, retrieved June 17, 2004.

[140] "VSNL vs. the rest," Business Standard, Dec. 6, 2003, found at http://www.business-standard.com/weekend/printpage.asp?story=29159, retrieved Dec. 9, 2003.

[141] Business Asia, EIU, Feb. 28, 2002, found at http://db.eiu.com/reports.asp?titl...+asia&valname=BAC211&doc_id=978195, retrieved Nov. 18, 2003.

Bharat Sanchar Nigam Limited (BSNL): BSNL is India's largest telecommunications operator and its largest state-run company. BSNL was founded on October 1, 2000 as a Public Limited Company when DoT transferred the telecommunications functions of the Department of Telecom Services (DTS) and the Department of Telecommunications Operations to this newly corporatized government entity. BSNL assumed a near monopoly over basic telephone services throughout the country, except in Mumbai and New Delhi. When BSNL was founded the GOI contributed $1.16 billion as equity capital and the company has an authorized capital of $2.2 billion, a paid up capital of $1.1 billion, a net worth of $13.6 billion, and annual revenues greater than $4.8 billion.

During 2003-04, BSNL expected to have a net profit of $1.3 billion and revenues of $6.5 billion. During the last two years, growth in BSNL's basic fixed-line market has slowed tremendously and cellular subscribers are expected to outnumber fixed-line customers for the first time by the end of 2004. The number of basic subscribers is expected to reach 40 million by 2005 and the number of its GSM cellular telephony subscriptions is projected to be between 17 million to 20 million by 2005. BSNL is expected to invest approximately $3.2 billion during 2004-05 to expand it cellular and WLL based mobile networks.

BSNL was licensed to provide basic fixed-wireline services, cellular mobile telephony, fixed and mobile wireless-in-local loop (WLL) employing CDMA technology, long distance, Internet, and a variety of value-added services. It has an equipped capacity of 45 million lines covering 5,000 towns and cities, 35 million telephone connections, and more than 4.4 million cellular GSM subscribers (table 20). As a government-owned corporation, BSNL was expected to provider services "where they are not profitable and is expected to bear most of the cost of increasingly unprofitable rural telephony and it provides telecommunications services to more than 460,000 of India's 607,491 villages.

Table 20: BSNL Infrastructure (2003)

Equipped capacity Direct	45 million lines
exchange lines (DELs)Public call offices	35 million lines
(PCO)Electronic exchanges	204,433
Digital trunk automatic exchanges (TAX)	32,000
Optical fiber cable	326
	355,632 kilometers

Source: BSNL.

Although it is no longer the sole provider of basic fixed-line telephone services, BSNL still accounts for 85 percent of the nation's basic telecommunications subscribers and earns over 90 percent share in terms of revenues. It enjoys significant economies of scale with its huge infrastructure capacity and is horizontally and vertically integrated and more than 90 percent of its revenues are generated by basic fixed-line telephony. Value-added services offered by BSNL include cellular GSM mobile telephony, national long distance, fixed and mobile WLL CDMA services, satellite services (INSAT and INMARSAT), data services (broadband, DSL, and leased lines), and pagers (table 21). MTNL has petitioned the GOI for 'Maharatna' status to gain greater managerial and operational independence than other state-owned companies. BSNL announced plans to added approximately 10,000,000 telephone connections in FY2004-05 including 750,000 land lines, 2,250,000 CDMA based WLL connections, and 7 million GSM-based cellular connections.

Table 21: BSNL

Technology	Number of subscribers	Brand Names	Circles	Services
GSM	4,434,043	CellOne (prepaid) Excel (postpaid)	All circles except New Delhi and Mumbai	NLD, ILD, telex, telegraph, satellite services, WLL-CDMA, GSM cellular, data services, broadband, Internet, broadband pagers, GRPS services.
WLL/basic service	543,000	Bfone(basic) Tarang (WLL)		
Internet/Internet telephony, broadband	750,000	Sanchar Net, Webfone, Data One broadband		

Source: COAI, BSNL.

BSNL launched its nationwide GSM cellular services in 350 towns and cities in October 2002 under the brand names of "CellOne" for post-paid card scheme and "Ex-cel" for its prepaid card scheme. BSNL invested more than $600 million to develop its cellular infrastructure and has attracted approximately $1.2 billion in foreign direct investment. CellOne offers some of the world's lowest cellular telephony call rates and prepaid accounts for 66 percent of BSNL's subscriber base. BSNL expected its cellular operation to generate $216 million by 2004 by capturing 50 percent of the market through aggressive pricing and by servicing unprofitable rural and remote regions of the country where private operators were absent. BSNL's pricing policies designed to attract customers have been characterized as anti-competitive and designed to kill competition by its private sector competitors. It plans to invest approximately $2.8 billion on infrastructure projects during 2004-05, including the installation of 70,000 to 80,000 GSM connections. In June 2004, BSNL submitted a petition to the Government for permission to enter the New Delhi and Mumbai markets.

BSNL offers both fixed wireless and 'limited mobility' wireless-in-local loop using CDMA technology in 80 cities and as the last mile in rural areas under the brand name of "Tarang."[143] Tarang connects fixed and mobile customers to BSNL's PSTN network that has a network capacity of 100,000 lines and nearly 27,000 subscribers. As of July 2003, BSNL's WLL subscriber base of 543,000 with 78 percent in rural areas and the reminder in urban areas. BSNL has invested more than $173.2 million on the installation of WLL-CDMA Infrastructure and in its latest 5-year plan (2002-07), BSNL plans to add 8.1 million landline telephones, 21 million mobile telephones, and 6.8 million WLL telephones.[144]

BSNL is one of India's largest Internet service providers with more than 950,000 subscribers.[145] This service is offered throughout the country (except in Mumbai and New Delhi) under the brand name 'Sancharnet.' Sancharnet provides free nationwide roaming and offers Internet Dhabas in all block headquarters. BSNL projected that its subscriber base would reach 2 million by the end of 2004 owning to its ability to offer direct Internet access to its fixed line subscribers. It has more than 590,000 Internet

[143] Thomas K Thomas, "BSNL to offer 3G services on CDMA platform," Business Standard, Nov. 4, 2003, found at http://www.business –standard.com/today/printpage.asp?story=26545, retrieved Nov. 4, 2003.

[144] "BSNL to add more mobile phones than fixed/WLL phones," Indian Telephone, found at http://www.indiantelephones.com/news/20030523_39.htm, retrieved July 1, 2003.

[145] "BSNL become largest Internet service provider," rediff.com, Oct. 1, 2003, found at http://www.rediff.com/money/2003/oct/01bsnl.htm, retrieved June 22, 2004.

connections and is adding nearly 6,000 subscribers per month in the metros and nearly 1,000 per day in the remainder of the country. BSNL is also its subscriber base by offering service in small towns and rural and remote areas of the country. Growth is mostly coming from dial-up service. Internet telephony is being offered under the brand name 'Webfone." Webfone was launched in September 2002 to offer BSNL's customers a cost-effective means of making international telephone calls via the Internet.

BSNL announced plans in July 2004 to invest $261.5 million to improve its infrastructure and improve its capacity in the AP circle.[146] The funds will be split evenly between improving CellOne and improving direct internet access and its fixed line phones. BSNL also operates telecommunications equipment manufacturing factories in the cities of Kolkata, Gopalpur, Kharagpur, Japalpur, Bhilai, Richhai, and Mumbai. BSNL also petitioned the GOI for permission to offer telecommunications services in Mumbai and New Delhi and in July 2004 the GOI rejected BSNL's request.

Bharti Televentures: Bharti Televentures is a subsidiary of the Bharti Group, one of India's leading corporate families. Bharti is the single largest cellular mobile operator accounting for 24.3 percent of all subscribers and it offers a range of telecommunications services including: cellular telephony services, basic fixed line services, domestic long distance, international long distance, Internet, broadband services, VSAT, Short Messaging services (SMS), and data services. It also manufacturers and exports a line of telephone terminals and cordless phones.[147] Bharti has a number of joint ventures and partnerships with international telecommunications companies such as Singtel (Singapore Telecom), British Telecom, Telecom Italia, Warburg Pincus (U.S.), and Telia (Sweden).

Until May 2003, Bharti consisted of four wholly-owned subsidiaries: Bharti Cellular (cellular services), Bharti Telenet (Internet access), Bharti Telesonic (long distance), and Bharti Broadband (broadband services). Bharti serves approximately 6.2 million cellular subscribers, 422 fixed-line basic customers, and (164,000) Internet subscribers in 15 circles (table 22). Bharti merged Bharti Telenet, Bharti Telesonic, and Bharti Broadband into a new company to form Bharti Infotel. Bharti Infotel is a wholly owned subsidiary of Bharti Televentures.

Table 22: Bharti (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
GSM	6,199,434	AirTel, AirTel Magic, India One	New Delhi, Mumbai, Chennai, Kolkata, Rajasthan, Maharashtra, Gujarat, AP, Karnataka, Tamil Nadu, Kerala, Punjab, Haryana, UP (W), MP, HP	NLD, ILD, GMS, Wi-Fi, DLS, fixed-line, SMS, data services, VSAT, Internet
Basic Service	422,000	TouchTel	Karnataka, Haryana, New Delhi, Tamil Nadu, MP, Chhattisgrah	
Internet	1,004,246			

Source: COAI, Bharti Televentures

[146] Phalguna Jandhyala, "BSNL plans to invest Rs 1,200 cr in Andhra," Business Standard, July 13, 2004, found at http://www.business-standard.com/iceworld/storypage_link.php?chklogm=n&autono=162, retrieved July 13, 2004.

[147] Bharti

Bharti was the first private company to offer GMS cellular service in New Delhi and was India's first private sector basic fixed-line basic operator (Bharti Telenet) when it initiated services in 1998 and now provides service under the brand name of 'TouchTel.'[148] It was India's first private sector operator to offer international long distance services and presently offers basic fixed-line and WLL services to 400,000 subscribers in 6 circles. Bhart is the only telecommunications provider offering CDMA WLL services that does not to offer 'limited mobility' services. Bharti offers GMS cellular service in Kolkata under the 'AirTel Magic' brand name and its national long distance service for data transmission services are offered under the 'IndiaOne' brand name. The company launched India's first private international long distance service in July 2002 and it has completed the construction of a 3,648 Rkm fiber optic backbone linking 29 cities in MP and Chhattisgarh.

Bharti is India's largest cellular mobile telephony service provider and cellular services make up the largest percentage of its business, in revenue terms. As of February 2004, Bharti accounted for 25 percent of India's cellular subscribers with plans to eventually acquire a 30 percent market share.[149] Bharti launched its first cellular services under the brand name of 'AirTel' in November 1995 in New Delhi and now offers services in 15 of the 22 circles. In 2002, Bharti became the first private telecommunications service provider to launch international long distance service. (179) Bharti has installed more than 1,600 base stations and has increased the number of exchange switches from 10 to 19.

To expand its footprint Bharti acquired JT Mobile (AP and Karnataka) and Skycell (Chennai) in 2001 and Spice Cell (Kolkata) for $100 million, formerly a JV between Modi Corp. and Distacom (Hong Kong). In December 2003, Bharti entered into an agreement to buy 67.5 percent equity stake in Hexacom, the largest cellular service provider in Rajasthan, for $98 million from Shyam Telecom. It also entered into an agreement with Telesystem (Mauritius), a subsidiary of TIW (Canada), for its equity in Hexacom for $22.5 million.[150] In conjunction with British Telecom, Bharti Enterprises launched the company's Internet service in March 1999 under the brand name 'mantra online Internet service.' The company maintains points of presence in Bangalore, New Delhi, and Mumbai.

Bharti is also a joint venture partner with Singapore Telecommunications (SingTel) in a $650 million submarine cable project (Network i2i) that will link Singapore with Chennai by high speed undersea cable. The 3,200 km cable will be the world's highest capacity of 8.4 terabytes per second and it is also laying cable between Chennai and Mumbai to act as a carrier for its SingTel-Bharti submarine cable project. It is also laying cable between Chennai and Mumbai to act as a carrier for its SingTel-Bharti submarine cable project. In 2001, SingTel invested $200 million in Bharti Tele-Ventures raising its stake in Bharti to nearly 30 percent. Network i2i cable was completed in April 2002 and is carrying commercial traffic offering international long distance service and in June 2003, Bharti Group announced the launch of its international data and Internet services using Network i2i submarine cable.[151] The 8.4 terabyte cable system will be able to carry 130m Internet dial-up connections simultaneously.[152] The company has already signed up 25 to 30 customers including Oracle, Microsoft, Citibank, Visa, and JP Morgan for the new service.

---

[148] "Bharti rolls out new fixed-line service," The Economic Times, April 3, 2002, found at http://economictimes.indiatimes.com/articleshow.asp?art_id=5785940@prtpage=1, retrieved Nov. 18, 2003.

[149] COAI. "Bharti submarine cable project by March," Business Line, Jan. 25, 2002, found at http://www.blonnet.com/2002/01/25/stories/2002012500810500.htm, retrieved March 25, 2003.

[150] "TCIL likely to hike stake in JV Hexacom," The Financial Express, Jan. 11, 2004, found at http://www.financialexpress.com/pring.php?content_id=50300, retrieved Jan. 12, 2004.

[151] "Bharti launches global data service," Business Standard, June 13, 2003, found at http://wwwrediff.com/money/2003/Jan/13bharti.htm, retrieved Sept. 12, 2003.

[152] "Bharti and SingTel celebrate completion of i2i cable network," Indian Television, April 12, 2002, found at http://www.indiantelevision.com/headlines/y2k2/apr/arp4.htm, retrieved Jan. 29, 2004.

Bharti petitioned the GOI in July 2003 for an additional 5 MHz spectrum to reduce congestion and raise the quality of its service and operations to international levels. The additional 5 MHz would bring Bharti to 10 MHz of spectrum in New Delhi. DoT released 2 MHz of additional spectrum that enabled cellphone users to converse to Airtel that will increase Airtel's traffic handling capacity by 40 percent. Bharti paid the GOI approximately $106 million to migrate to the unified regime from the existing licensing scheme.

Idea Cellular: In June 2001, BPL Communications along with Aditya Birla Group- AT&T, and the Tata Group (Batata) merged certain portions of their cellular operations to form Idea Cellular. According to the agreement BPL would hold 25 percent of the new company's equity, AT&T 24 percent, Birla and Tatas 17 percent each and the remainder will be held by financial investors such as the AIG Group and Trance Telecom. The new company, valued at $2 billion, would provide seamless GMS coverage in 23 districts in Andhra Pradesh, 53 cities across Madhya Pradesh, the entirety of Gujarat, and along 400 kilometers of highways.[153] The Idea brand name replaced AT&T in Maharashtra, Goa, and Gujarat; Tata Cellular in AP, and RPG Cellular in MD and Chhatissgarh. As of February 2004, Idea Cellular was India's fourth largest GSM cellular operator and accounted for10 percent of country's cellular base with more than 2.5 million subscribers (table 23).

To further expand its national footprint Idea acquired RPG Cellular in February 2001 renaming it BTA Cellular. The company also purchased Escotel Mobile Communications for approximately $238 million to gain access to the Kerala, Haryana, and UP (W) circles. The Idea brand will replace AT&T in Maharashtra, Goa and Gujarat; Tata Cellular in AP; and RPG Cellular in MD and Chhattisgarh.

Table 23: Idea Cellular (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
GMS	2,584,577	Idea Chitchat (prepaid)	New Delhi, Maharashtra, Gujarat, AP, MP, Kerala, Haryana	NLD, ILD, GSM cellular

Source: COAI, Idea Celluar

The new company provides cellular telephony services in 7 telecommunications circles and its FY2003-04 revenues were expected to grow by 40 percent and the industry expects Idea to make a profit within the next two years. Idea posted gross revenues of nearly approximately $194,800 in 2002-03.[155] It also plans to invest approximately $65 million by installing 100 new cell sites in Maharashtra, a new gateway in Pune, 700 new transceivers in Nagpur and Goa, 137 base stations, and upgrade its switches in Pune. The expansion will permit Idea to triple its prepaid subscriber base to 30,000 customers.[156]

Idea announced plans to make significant new investments in Kerala and UP (W) including $22.7 million in Kerala for the installation of several new base stations and a new mobile switching center. It also plans to invest approximately $21.7 million in UP(W) to extend its coverage to 60 new towns,

---

[153] "Batata-BPL Communications to float new firm," The Hindu, June 29, 2001, found at http://www.hinduonnet.com/2001/06/29/stories/012900d.htm, retrieved Jan. 14, 2004.

[155] "Idea cellular foresees 40% hike in revenue," CIOL.com, Aug. 6, 2003, found at http://www.ciol.com/content/news/2003/103080602.asp, retrieved Jan. 14, 2004.

[156] "Idea to invest Rs 104 cr in Kerala," Business Standard, July 7, 2004, found at http://www.business.standard.com/iceworld/storypage-link.php?chklogin=n&autono=1606, retrieved July 7, 2004.

increase its highway coverage from 400 km to 600 km, install 100 new cell sites and a mobile switching center in Meerut.[157] Idea also announced plans to invest $32.5 million to expand its network in Gujarat and it is migrating Escotel subscribers in the UP (W), Haryana, and Kerala to the Idea brand name.

On June 2004, AT&T sold its 33 percent share in Idea to the Singapore Technologies TeleMedia-Telekom Malaysia consortium for approximately $220 million. The consortium subsequently increased its holdings in Idea to 49 percent and indicated that it would invest nearly $43 million in debt ridden Escotel Mobile.[158]

Escotel Mobile Communications: Escotel Mobile is a joint venture of Escorts Limited and First Pacific Company Ltd. (Hong Kong). Escorts has 51 percent equity share in the joint venture and First Pacific has the remaining 49 percent. The company began offering GSM900 cellular services to three circles in December 1996 – January 1997. In March 2003, Escotel, RPG Cellular, and Spice Telecom jointed to form the 'Mobile First' alliance so that they could offer common services packages, joint call rates, and gain a larger pan-Indian footprint. Escotel Mobile was purchased by Idea Cellular in 2004. Escotel predicted that its 2003-04 revenues to grow by at least 10 percent and its subscriber base to exceed one million. It expected that its revenues would increase by 10 percent during 2003-04 to nearly $77.6 million and the company announced that its revenues reached $71.2 million in 2002-03.[159] In February 2004, Escotel had a subscriber base of 940,165 and provides service in 180 towns, highway coverage in 77 towns, and more than 3,000 villages in Kerala, Haryana, and Uttar Pradesh (W). Escotel has introduced prepaid card scheme under the brand name 'Let's talk' in Kerala and 'V-Tel' in Uttar Pradesh (W) and Haryana (table 24). Escotel also offers Internet service, SMS, and international roaming services to 56 countries across 100 networks. Escotel announced its intentions to invest $238 million to initiate new operations in the Punjab, UP (east), Rajasthan, and HP circles where it will be targeting non-urban subscribers. The new circles would serve as greenfield operations for Escotel. Idea Cellular acquired 100 percent equity in Escotel in January 2004 for approximately $238 million. As part of the agreement Idea agreed to assume Escort's debt that totaled $174.3 million.

Table 24: Escotel Mobile Communications (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
GSM	940,165	Escotel, Let's Talk (prepaid), V-Tel (prepaid)	Kerala, Haryan, UP (w)	GSM celllar, SMS, Internet

Source: COAI, Escotel

Shyam Telecom: The Shyam Group consists of 5 subsidiaries including Shyam Telecom (equipment manufacturer), Hexacom India (cellular service), Shyam Telelink (basic services), Essel Shyam (VSAT provider), and Shyam ACeS (GMPCS service). Shyam Telecom, incorporated in 1992, provides telecommunications services through its subsidiaries Hexacom (cellular), Shyam Telelink (basic fixed service), Essel Shyam Communications (VSAT), and Shyam AceS India (GMPCS).Shyam offers

[157] "Idea to invest Rs 100 cr in UP (West)," The Economic Times, July 6, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-766943,prtpage-1.cms, retrieved July 7, 2004.

[158] "Singapore Tech-Telekom Malaysia pick up AT&T's 33% of Idea," India Infotel, June 1, 2004, found at http://www.indiainfotel.com/news/news.asp?dat=40583, retrieved June 17, 2004.

[159] "Escotel expects 10% growth in revenues," The Economic Times, Aug. 25, 2003, found at http://economictimes.indiatimes.com/articleshow/145741.cms, retrieved June 30, 2004.

GSM cellular, basic fixed-line, and WLL-M services to 366,006 subscribers (table 25). Hexacom, Shyam's principal GSM cellular mobile service provider is a consortium of three companies: Shyam Telecom, Telecommunication Consultants of India, and Telesystems International of Canada. Hexacom's primary focus is on voice but it also offers value-added services such as prepaid cards, post-paid services, and cricket scores to obtain additional revenues. It provides GSM services under the brand name of 'Oasis' and has a paid up equity of $27 million.

Table 25: Shyam Telecom (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
GSM	244,006	Oasis Cellular	Rajasthan	Basic fixed-line, WLL, GSM cellular, paging, Internet, GMPS, VSAT
WLL/fixed-line	122,000	Citimobile and Rainbow (WLL)		

Source: COAI, Shyam Telecom

Shyam offers basic telephone service through, Shyam Telelink under the brand names of 'Rainbow' and 'Citimobile' (prepaid) and GSM cellular service under the 'Oasis' brand through 4,000 kilometers of optic fiber cable in the Rajasthan circle. Shyam plans to diversify and expand on several fronts to consolidate operations. Hexacom 'Oasis Cellular' the cellular service and it enjoys a 90 percent market share in Rajasthan.

During quarter ending March 31, 2003, Shyam reported a net profit of $325,330 on income totaling $818,628. Shyam has take lead among Indian service providers in implementing the CoreDect technology which enabled simultaneous use of the telephone and the internet over a wireless network, prompting BSNL to follow suit with a nationwide launch. Shyam Telecom, the fixed line and mobile in Rajasthan, has implemented the CoreDect technology as part of its fixed line network.

Shyam Telelink will invest $214 million to expand its operations into rural areas and underserved areas of Rajasthan through both fixed and wireless service. Shyam has already invested $108 million in the Rajasthan operations and the company is attempting to attract lower middle class consumers, traders, dealers, and students. It has also announced plans to invest $20 million on expansion of which $15 million will go toward the development of new products such as digital-multi-access radios, wireless in local loop, and various VSAT and DAMA systems. Shyam has taken the lead in the implementation of indigenous CoreDect technology which permits concurrent use of the telephone and the Internet over a wireless network.[161] It implemented the CoreDect technology as part of its fixed line network.

Shyam Telecom is one of India's leading manufacturers of telecommunications equipment that includes village telephones, digital microwave radio systems, multiplexers, UFH/VHF radio telephone systems, VSAT, and DAMA systems, optical line terminals, transceivers, fixed wireless terminals, and single channel radio systems.

In December 2003, Shyam agreed to sell 67.5 percent of its holdings in Hexacom to Bharti Televentures for $98 million indicating a desire to concentrate its efforts on its fixed line services offered under the 'Rainbow' brand name. In March 2004, Hexacom had over 257,000 subscribers and it

[161] CoreDect is an indigenous Indian technology offers an Internet speed of 70 megabytes per second and works in the 1800 megahertz 10 1900 megahertz spectrum.

controlled nearly 44 percent of the GSM market in Rajasthan.[162] Shyam paid the GOI approximately $645, 020 in November 2003 to migrate to the Unified License Regime. It has also applied for 7 additional Unified Access Licenses.

Himachal Futuristic Communications Infotel (HFCL): HFCL Infotel (formerly Essar Commvission) is a subsidiary of Himachal Futuristic Communications that holds approximately 85 percent of equity with the remainder divided between the Indian public (10 percent) and banks and commercial groups (5 percent). HFCL was incorporated in March 1995 and offers a range of services including CDMA mobile, wireline, and fixed wireless over its broadband network called "connect' to approximately 165,000 subscribers (table 26). In January 2004, HFCL average revenue per user equaled $26 that exceeded the industry average of $9. HFCL placed a bid for licenses to provide services in New Delhi, Haryana, Karnataka, Tamil Nadu, Maharashtra, and UP (W) in 2001. It expanded its footprint by purchasing Essar Comvision that provided services in Punjab. HFCL has also migrated to the Unified Access License regime.

Table 26: HFCL (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
Basic and WLL	165,000	HFCL	Punjab	Basic fixed-line, WLL-M, data services, Internet, leased lines, ISDN, Video

Source: COAI, HFCL

For the quarter ending March 31, 2003, HFCL reported a net profit of $434,546 as compared to a net profit of $143,400 reported during the corresponding quarter of 2002.[163] HFCL reported that its total income declined from $41 million during the quarter ending March 31, 2002 to $39.8 million during the corresponding period of 2003. HFCL acquired 60 percent equity in Page Point Services in 2000 that had provided paging services under the brand name 'Page Point' in Mumbai, Pune, Bangalore, and Hyderabad. It also acquired 74 percent equity in Hindustan Teleprinters in October 2001 for $12 million. In October 2001, the GOI sold 74 percent of telecommunications equipment manufacturer Hindustan Teleprinters (HTL) to HFCL for $11.9 million. HTL specialized in the production of switching, transmission, and data equipment for DoT, BSNL, and MTNL.[164]

MobileFirst: MobileFirst is an alliance of mobile operators in India among BPL Mobile, Escotel, RPG Cellular and Spice Telecom in March 2003. The alliance has a subscriber base of more than 3 million (table 27) located in more than 700 towns and cities. MobileFirst was created to enable these smaller companies to achieve economies and offer joint roaming and long distance call toll rates.[165] The

---

[162] "Shyam enters into an agreement to sell 67.5% of Hexacom for approximately US$98 million," Shyam, Press Release, April 5, 2004.

[163] Moneypore, found at http://www.moneypore.com/lrtelecom.htm, retrieved Sept. 10, 2003.

[164] "No plan to cut manpower in HTL," Business Line, Oct. 7, 2001, found at http://www.thehindubusinessline.com/businessline/2001/10/07/stories/14074602.htm, retrieved July 15, 2004.

[165] "BPL, Escotel, RPG Cellular and Spice forge Mobile First Alliance," Domain-b.com, htm, retrieved Jan. 29, 2004.

alliance covers approximately 10,000 kilometers and combines the circles held by Spice (Punjab and Karnataka), BPL (Mumbai, Maharashtra, TN, Kerala), Escotel (Haryana, Kerala, UP (W), UP (E), Rajasthan, and HP), and RPG Cellular (Chennai). Each of the partners covers a different area of the country.

Table 27: MobileFirst (Feb. 2004)

Technology	**Number of subscribers**	**Brand names**	**Circles**	**Services**
GSM	3,895,635	MobileFirst	Kerala, Tamil Nadu, Maharashtra, Mumbai, Haryana, UP (E), Rajasthan, HP, Chennai, Punjab, Karnataka	GSM cellular, NLD, SMS, MMS, Internet, gaming

Source: COAI, MobileFirst

BPL Cellular: BPL Cellular was founded in 1995 and launched services in 1997 in Pune, Maharashtra. BPL offers telecommunications services in 3 circles spanning 207 cities. BPL is licensed to provide mobile cellular services in Maharashtra (except Mumbai but including Goa), Tamil Nadu (including Pondicherry but not Chennai), and Kerala. BPL Cellular is a joint venture between BPL and AT&T Broadband (U.S.) and provides GSM900 mobile cellular telephony to more than 1.7 million subscribers under the 'BPL Mobile' brand name (table 28).

Table 28: BPL (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
GSM cellular	1,764,725	BPL Mobile, MOTS	Mumbai, Maharashtra & Goa, Tamil Nadu & Pondicherry, Kerala	GSM cellular, SMS, GPRS, broadband, Internet, MMS
Internet	70,000	Blpnet.com	Mumbai, Chennai, New Delhi, Bangalore	

Source: COAI, BPL

In 2002, AT&T sold its interest in BPL Cellular to the BPL Group. BPL Mobile is the Groups holding company for BPL's cellular services. BPL Mobile is owned by the BPL Group (60.5 percent), France Telecom (26 percent) and by LCC. BPL also offers broadband and Internet to more than 70,000 subscribers in New Delhi, Chennia, Mumbai, and Bangalore under the brand name "bplnet.com' and it offers prepaid cellular GSM900 service under the brand name 'BPL Mobile on the Spot (MOTS).

In June 2001, BPL, the Aditya Birla Group, AT&T, and Tata Cellular merged to form Batata alliance. [166] The alliance had an initial subscriber base of 1.5 million in 192 cities. BPL has the largest

[166] Birla AT&T is a joint venture between AT&T (U.S.) And Grasim Industries Ltd, a member of the Aditya Birla Group. In 1995, DoT granted Birla AT&T a license to provide cellular services in Gujarat, Maharashtra (except Mumbai), and Goa. Service began in 1997 under the AT&T brand name and in 2001 Birla-AT&T served more than 675,000 subscribers in the Maharshtra, Gujarat, Andhra Pradesh, and Madhya Pradesh circles.

share holding in the new company at 25 percent, AT&T with 24 percent, and the Tata and Birla Groups with 17 percent each. (BPL's Maharashtra operations were excluded from the merger).[167] Much of the remainder is held by financial investors. The $2 billion merger was the largest private sector merger at the time and it gave Batata a 24 percent share of India's cellular phone market with 1,345,000 subscribers.[168] The new alliance has presence Mumbai, Maharashtra, Tamil Nadu, MP, Chhattisgarh, Goa, and Kerala circles.

As of December 2003, BPL was the second largest cellular telephony provider in Mumbai with 854,823 subscribers and a 34 percent market share. In May 2004, BPL announced that it would invest approximately $218 million by May 2005. It plans to install 550 additional base stations to upgrade its networks. BPL currently maintains more than 1,293 cell sites across its circles.[169] BPL plans to invest additional funds in its network rollout of $347.9 million across its circles.[170] Approximately $116 million will be devoted to the upgradation of its network in Goa and Maharashtra and with the remainder invest in projects such as the installation of 150 new cell sites.

Tata Indicom: Tata Indicomm was founded in 1992 as a subsidiary of one of India's largest conglomerates, the Tata Group. Tata was initially launched as a joint venture between the Tata Group and Bell Canada. Tata is India's second leading private sector provider of basic fixed-line and CDMA 3G1X based WLL services offering services to more than 1.8 million subscribers (table 29). It also offers a range of value-added services such as Internet, voice mail, short messaging services (SMS), and national long distance services (NLD), broadband.

Table 29: Tata Teleservices (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
Basic service and WLL	1,633,585	Tata Indicom	Maharashtra, New Delhi, AP, Karnataka, TN, Gujarat, Chennai, Mumbai	WLL, NLD, SMS, WAP, Internet, broadband, push-to-talk, Wi-Fi, phone booths
Internet	600,000	Tata Vova		

Source: Tata

Currently, Tata Teleservices provides basic fixed line and WLL services in 6 circles with an investment of more than $1.6 billion. Tata was one of the first Indian companies to offer WLL services and by May 2004 had 1.6 million basic and WLL subscribers. Of those subscribers, 1,003,585 were either basic fixed-line or WLL-fixed and the remaining 630,000 were WLL-M customers. The company indicated that approximately 85 percent of its subscribers were prepaid and that Tata was operating at 90 percent capacity. Tata paid $118 million to DoT in November 2003 to migrate to the newly instituted

[167] CT Mahabharat, "India: cellular Giant Formed by Merger of BPL, Birla, AT&T-Tatas," Yahoo News, July 3, 2001, found at http://www.in.tech.yahoo.com/010703/11/10fwd.html, retrieved Nov. 18, 2003.

[168] "BPL and BTAL telecoms merger-can it fly?" EIU Viewswire, Aug. 3, 2001, found at http://www.viewswire...layout=display_print@doc_id=155415, retrieved Nov. 18, 2003.

[169] "BPL Mobile to invest Rs 1,000 cr, widen base," The Economic Times, May 17, 2004, found at http://economictimes.indiatimes.com/articleshow/679305.cms, retrieved June 30, 2004.

[170] "BPL to Inject Rs 1,600 crore To Speed Up Network Rollout," The Financial Times, July 1, 2003, found at http://www.financialexpress.com/print.php?content_id=62598, retrieved July 1, 2004.

unified licensing regime.

Tata announced in May 2004 that it planned to increase its subscriber base to 15 million by the end of 2005. To accomplish this it will set up networks in 12 new circles and increased the number of cities it services from 50 to 500 by the end of 2004 and to 1,000 by the 2005.[171] To achieve this Tata projects that it will cost nearly $2 billion in addition to the $1.3 billion it has already invested. Tata will be the sixth service provider in many of its new circles and it will face well-established competition. It also plans to put more emphasis on the provision of data services and move toward being a leader in broadband wireless rather than simply a telephone company.

Tata posted a net profit of $980,430 of the quarter ending June 30, 2003 as compared to $3461,62 for the corresponding quarter of 2002. Total income increased from $12.7 million in the June quarter of 2002 to $16.1 million in the quarter ending June 30, 2003. The company reported a 76 percent growth in it profits after taxed at the end of 2003-04 of $7 million and a turnover of $95.7 million.[172] Tata Teleservices reported a loss of $21.4 million in the quarter ending June 2004. [173]

On December 2, 2002, Tata Indicom purchased 50.83 percent paid up equity in Hughes Tele.com (U.S.) for $1 million. Hughes provided services to more than 200,000 lines offering commercial and residential services to subscribers in 10 cities in Maharashtra and Goa. The transaction gave Tata access to the lucrative Maharashtra and Mumbai circles that account for 48 percent of all long-distance traffic, 56 percent of India's basic fixed lines, and 69 percent of the country's cellular subscribers. Cellular and Birla-AT&T Communications merged with B.L. in June 2001 to form one of the largest cellular providers in India.

Tata's own national ISP, Tata Nova, which launched service in 2001 and was a rather late participant in Internet service and has yet to make a significant impression in the market. Tata recently brought VSNL's ISP operations under the 'Tata Nova' brand name. VSNL controls more than 1 gbps of international bandwidth coming into India, has 37 earth stations and switching capacity in 9 cities. It currently has 40,000 broadband customers and plans to offer 7,300 hot spots for broadband across the country. Tata was also the first Indian company to offer WAP (wireless application protocol) and the first to introduce e-mail services via cell phones in Andhra Pradesh. It has introduced its wireless-fidelity (Wi-Fi) services in 5 cities at Barista Coffee Outlets. Tata plans to offer Wi-Fi at 150 to 200 locations before it is introduced nationally. Tata-VSNL also reached an agreement with DishnetDSL to purchase Sterling Infotech's Internet business for $57.8 million. This will give VSNL access to Dishnet's more than 600 CyberCafes and Dishnet's broadband assets that can serve more than 50,000 cities.

On February 13, 2002, Panatone Finvest, a subsidiary of Tata, signed a shareholders agreement with the GOI for the acquisition of 25 percent equity share in state-owned VSNL valued at $300 million. Tata subsequently acquired additional shares in VSNL bringing its interest to 45 percent of the total. Tata assumed control over VSNL's Internet service and renamed it Tata Indicom Total Internet.

Tata Tele Services acquired for 11 new licenses to expand its national footprint for $90.6 million under the unified service operator regime. The new licenses couple with 6 circles where it already offers service will allow Tata to serve over 1,000 new towns and cities by March 2005. The new circles include:

---

[171] "TTSL to rollout services in 1,000 towns by March 2005," The Economic Times, Feb. 29, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-526850,prtpage-1cms, June 30, 2004.

[172] "Unified licenses issued to Reliance Info, Tata Tele-SC to take up cellular plea on Monday," Business Line, Nov. 15, 2003, found at http://www.blonnet.com/bline/2003/11/15/stories/2003111502500100.htm, retrieved May 10, 2004.

[173] "Tata Teleservices Q1 loss doubles," The Economic Times, July 19, 2004, found at http://economictimes.indiatimes.com/articleshow/784054.cms, retrieved July 20, 2004.

Bihar, Haryana, HP, Kerala, Kolkata, Orissa, Punjab, Rajasthan, UP (E), UP (W), and West Bengal.[174] Tata plans to begin operations in these circles in August 2004. Tata has paid the GOI $120 million to migrate to the unified license regime.

Reliance Infocomm: Reliance Infocomm, launched in December 2002, is a subsidiary of India's largest private sector enterprises and one of it's principal petrochemical and refining companies. Reliance is an integrated telecommunications provider and India's largest WLL based service provider with more than 1.8 million subscribers in 20 circles that are linked by a 60,000 km terabit capacity optic fiber network (table 30).[175] The company has a pan-India presence and offers CDMA 1X based mobile and fixed line telephony including broadband, national and international long distance, Internet, e-commerce, data and video services, a range of value-added services such as SMS, gaming, and camera phones. In December 2002, Reliance launched its nationwide optic fiber network covering 116,000 km with the ability to seamlessly link 640,491 villages and 2,500 towns and cities. As of March 2004, Reliance Infocomm had a total subscriber base in excess of 7.7 million customers.

Table 30: Reliance (Feb. 2004)

Technology	Number of subscribers	Brand names	Circles	Services
Basic service	503,353	Reliance	AP, Bihar, Gujarat, Haryana, HP, Karnataka, Kerala, MP, Maharashtra, Orissa, Punjab, Rajasthan, TN, UP (E), UP (W), West Bengal	Internet, fixed-line services, WLL, GSM mobile, NLD, ILD, SMS
WLL	6,474,349	IndiaMobile IndiaPhone		
GSM cellular	736,901	Reliance Mobile	MP, West Bengal, HP, Bihar, Orissa, Assam, North East	
Internet	174,0387	Reliance	AP, Bihar, Gujarat, Haryana, HP, Karnataka, Kerala, MP, Maharashtra, Orissa, Punjab, Rajasthan, TN, UP (E), UP (W), West Bengal	

Source: COAI, Reliance

Reliance offers CDMA based WLL under the brand names of 'Indiaphone' and 'Indiamobile'. Indiamobile is the Reliance's WLL-M "limited mobility" service that began service in May 2003. The service covers 92 cities and more than 90 percent of the company's subscriber base. To create a 50 percent differential in its call rates compared to GSM operators, Reliance decided not to apply roaming charges on incoming and outgoing calls.[176] This countered a price hike by GSM service providers in May 2004 GSM that raised roaming rates by Rs 1.50 (0.03 cents). The service currently has a subscriber base of more than 6.4 million subscribers and it offers prepaid cards, post-paid services, voice mail, roaming, and inter-city cellular services. Reliance Indiamobile has also established points of presence in New York City and Los

[174] Chitti Pantulu, "Tata Tele pays Rs 417 cr for 11 new licenses," The Economic Times, Feb. 5, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-475831,prtpage-1.cms, retrieved Feb. 9, 2004.

[175] "Reliance Infocomm unveils mega plan," The Hindu, Dec. 28, 2002, found at http://www.thehindu.com/2002/12/28/stories/2002122801491600.htm, retrieved Jan. 21, 2004.

[176] "Reliance Infocomm will be cheaper by 50 pc," The Times of India, May 9, 2004, http://www.timesofindia.indiatimes.com/articleshow/msid-666167,prtpage-1.cms, retrieved May 10, 2004.

Angeles and it has signed agreements with 50 international carriers to offer ILD services. Indiamobile's prepaid scheme is called RIM was launched in March 2004 to customers in 111 cities. Almost half of the RIM's prepaid subscribers have been individuals who did not own a landline telephone and the remainder were young professionals and students.[177]

Reliance offers WLL based fixed-line service under the brand name 'IndiaPhone.' Indiaphone offers basic voice, data services and Internet access to its residential, corporate, and institutional customers. Reliance's WLL-fixed (F) services are concentrated in the eastern region of the country where it can link with existing fixed line networks. It offers all the value-added services of a wireline phone including SMS, caller line identification, speaker phone, voice mail, and three-way conferencing calls. The company's wireline services offer fixed telephony and data/Internet applications for various segments of users including individuals and corporate clients. Reliance also offers GSM cellular telephony services in 7 circles under the brand name "Reliance Mobile." Reliance Mobile offers post-paid service, prepaid cards, voice-mail, and roaming.

The company's latest explanation plan calls for investment of $1.1 billion that includes the installation of an additional 60,000 km of optical fiber. This investment will take Reliance's total investment in the telecommunications wireless sector to between $2.6 billion and $4.3 billion. Reliance now plans to shift its focus to providing broadband services over its optical fiber network to more than 1,000 new towns and cities. Targeted cities include Mumbai, New Delhi, Chennai, and Kolkata and several category 'A' cities such as Bangalore and Hyderabad. Reliance plans to cover category 'B' and 'C' towns and cities by 2007.[178]

Reliance Infocomm is the largest WLL-M service provider and offered "virtual roaming" by way of multiple registration of the same subscriber in multiple SDCA's under different telephone numbers and call forwarding from one number to another to achieve full mobility.[179] Reliance and other basic fixed line companies offering "virtual roaming" were required to pay a penalty plus an entry fee in order to migrate to full mobility.[51] Reliance Infocomm paid approximately $344 million to migrate to the new unified licensing regime plus a penalty of $105.7 million for offering "virtual roaming." In June 2004, Reliance was accused by its competitors of predatory pricing when it lowered Reliance India Mobile - to - Reliance India Mobile calls from Rs 2.99 per minute (6 cents) to Rs 1.79 (4 cents) per minute. It also lowered the cost of Reliance India Mobile to GSM or land line connections to Rs 3.99 (8 cents) per minute to Rs 2.99 (6 cents) per minute.[180]

Hutchison-Essar Telecom, Ltd (HMTL): Hutchison launched its presence in India through a joint venture with Max India Ltd in 1994. Hutchison Max Telecom, subsidiary of Hutchison Whampoa (Hong Kong), became the first private Indian operator to launch GSM-based cellular services in Mumbai 1995 under the brand name 'Max Touch.' In 2000 Hutch migrated Max Touch customers to its international brand 'Orange'. It has acquired a number of smaller cellular operators in order to enlarge its pan-Indian footprint. In May 2000, it bought a controlling interest in Sterling Cellular (49 percent) for

---

[177] "RIM's prepaid service targets the individual," The Economic Times, March 3, 2004, found at http://economictimes.indiatimes.com/articleshow/msid-533435,prtpage-1.cms, retrieved June 30, 2004.

[178] "Reliance Info to invest Rs 5000 cr in '04-'05," The Economic Times, June 20, 2004, found at http://economictimes.indiatimes.com/articleshow/746958.cms, retrieved July 20, 2004.

[179] "Reliance will be required to pay $228 million to migrate and an additional $100 million in penalty. Others will be charged: $99.1 million for Tata, $617,000 for Shyam Telelink, and $69.4 million for Bharti Telenet. "Reliance rapped for license breach," NDTV.com, Oct. 27, 2003, found at http://www.ndtv.com/addons/printpage.asp?id=15718&callid=5&caption=unified, retrieved Oct. 27, 2003.

[180] "Cellular operators accuse Reliance of predatory tariffs," Hindustan Times, Aug. 3, 2004, found at http://www.hindustantimes.com/onlinecda/prversion.jsp?article=http://10.81.141.122/ne.., retrieved Aug. 4, 2004.

$125 million to enter the New Delhi market; acquired Usha Martin (Kolkata), Fascel (Gujarat), and HFCL Bezeq; and entered into a joint venture with the Essar Group to acquire a larger footprint. Hutchison has a 49 percent stake in the joint venture worth approximately $1.5 billion in 2004 and the remainder will be divided between Essar (26 percent), and the public (10 to 20 percent).

Hutchison is one of India's leading cellular mobile telephony service provider and its affiliates include: Hutchison Essar Telecom, Hutchison Telecom East, Hutchison Essar South, Fascel, and Aircel. With its business valued at $3.5 billion and a combined subscriber base of 5.6 million, Hutchison provides a variety of value-added services including personal communications networks, radio paging, trunk mobile radio, fixed-line services, VSAT, satellite systems, and radio broadcasting to subscribers in 10 circles (table 31). In 2004, Hutchison filed an application with the Foreign Investment Promotion Board to combine it's affiliated into a single entity Hutchison-Essar Telecom.[181] The pan-Indian consolidated entity will replace all other brand names with Hutch, except in Mumbai where customers will continue to use Orange. Hutchison-Essar acquired Aircel a GSM based cellular telephony service provider in Tamil Nadu for $262 million.

Table 31: Hutchison-Essar Telecom (May 2004)

Affiliates	Number of subscribers	Brand names	Cirlces	Services
Hutchison Essar South Hutchison Essar Telecom Hutchison Telecom East Hutchison Max	3,846,572	Hutch, Orange	New Delhi, Chennai, AP, Karnataka, Punjab, Mumbai, Koklata	GSM cellular, WAP, SMS, Fax, data
Fascel	1,022,195	Hutch	Gujarat	
Aircel Ltd	779,475	Aircel	Tamil Nadu, (except Chennai and including Pondicherry)	
Aircel Digilink	828,468	Essar	UP (E), Rajasthan, Haryana	
Aircel Cellular	343,839		Chennai, Tamil Nadu	

Source: COAI, Hutch

In June 2004, Hutchison-Essar purchased the Chennai and Tamil Nadu operations of Aircel formerly of the Sterling Infotech Group for approximately $362 million. Both Hutchison-Essar and Aircel have GSM-based cellular operations in Chennai and the merger will give the company a 49 percent market share.[182] The acquisition will provide Hutchison-Essar with Aircel's 1.9 million subscribers in the two circles.

[181] "Hutch to consolidate all group companies," Press Trust of India, June 14, 2004, found at http://www.hindustantimes.com/onlineCDA/pfversion.jsp?article=http://10.81.141.122/20, retrieved July 6, 2004.

[182] "Hutchison-Essar Acquires Aircel in India," Telecom Direct News, June 28, 2004, found at http://www.telecomdirectnews.com/do.php/1208310, retrieved July 22, 2004.

INVESTMENT TRENDS

Many of the world's leading multinational telecommunications firms have been drawn to India because to huge population of greater than 1 billion people that implies the potential for enormous market for telecommunications services and equipment. Much of India's telecommunication's infrastructure is archaic by international standards and the introduction of new technologies throughout the world has rendered the nation's network obsolete. According an official of the GOI, "modern telecommunications is an essential infrastructure for facilitating good and efficient government, for the competitive conduct of trade and commerce and for drawing rural peoples into regional and national economic exchanges. The main constraint was investment is telecoms. Government had never been able to invest an adequate amount from its budgetary resources."[183]

Mr. Amit Mitra, General Secretary of the Federation of Indian Chambers of Commerce and Industry stated, "we need about $20 billion from now up all kinds of telecom services and then we need $50 billion cumulatively by 2012."[184] However, Mr. Nripendra Misra, Chairman, Telecom Commission and Secretary, DoT offered another view in saying, "in the past one-and-a half-years, the private sector has added almost 25 million lines even though the FDI has been negligible. Till the year 2002, 5 million lines were added with an FDI of about Rs 9000 cr ($1.9 billion). The determination of FDI in the telecom sector has also something to do with the investment decision of the foreign firms including their own countries."[185]

The government continues to limit investment by controlling FDI through equity limits on foreign participation in important segments of the sector. The GOI allows 100 percent foreign equity participation in manufacturing of telecommunications equipment and value-added services like e-mail, voice-mail, Internet provision (without gateways); 74 percent participation in radio paging services, Internet (with gateways), and end-to-end bandwidth providers. In the case of basic, cellular, NLD, ILD, and value-added services like VSAT and GMPS foreign participation has been limited to 49 percent due to national security concerns about the transfer of management control over the nations telecommunications services into foreign hands.[186] There are proposals to raise the foreign investment limit from 49 percent to 74 percent for all services to attract much needed foreign capital.

The opening of the telecommunications sector in the early 1990s to private and foreign participation created one of the fastest growing markets for equipment and services in the world. The industry expects that the consumption of mobile telephones will increase by 77 percent between 2002 and 2008 making India one of the hottest markets in the world. This is especially true since investment opportunities in telecommunications markets in developed countries have been limited due to low demand. India's cellular telephony subscriber base is projected to exceed 49 million in 2004 and grow to more than 120 million by 2010. Likewise, the number of fixed-line subscribers is projected to grow from 49 million in 2004 at an average revenue per user (CAGR) of 8 percent to 58 million in 2007 and to 86

---

[183] Dr. Kodela Siva Prasada Rao, Minister for Food, Civil Supplies, Legal Metrology and Consumer Affairs, Government of A.P., Decennial Issue of the Journal of the CTMS and Inaugurating the seminar "Telecom Liberalization-Customer Gains and Concerns, Dec. 29, 2001, found at http://www.ctms-bharat.org/121_jan02.htm, retrieved Oct. 30, 2003.

[184] "India needs $50b to connect the masses," CyberIndia Online, found at http://www.coil.com/cgi-bin/printer.asp?id=56724, retrieved July 20, 2004.

[185] "FDI, no limiting factor in telecom," Sify, March 22, 2004, found at http://sify.com/printer-friendly.php?id=13435981&cid=2&lid+1, retrieved July 20, 2004.

[186] P. Vardy Anathan Lyer & Bipin Chandran, "Telecom foreign equity may be raised via FII," Business Standard, July 21, 2004, found at http://www.business-standard.com/iceworld/storypage_link.php?chklogin=n&autono=161, retrieved July 22, 2004.

million in 2012.

Since the GOI's policies on investment have become progressively more transparent, simpler, and more liberal, its telecommunications sector has attracted more than $2.1 billion in FDI (table 32) since 2002. India's nascent telecommunications sector has received a large percentage of the country's total FDI, seconds only to petrochemicals. Investors have been attracted by India's low tele-density, high latent demand, the implications associated with a vast middle class, and the country's highly skilled, low cost, workforce.

Table 32: FDI Inflows by year (1993 – Aug. 2003)

Year	Value (Rs million)	Value ($million)
1993	21	0.453
1994	140	3.020
1995	2,067	44.595
1996	7,648	165.005
1997	12,452	268.651
1998	17,756	383.085
1999	2,127	45.889
2000	2,886	62.265
2001	39,709	856.720
2002	10,815	233.333
2003	331	7.141
Total	95,952	2,070.161

Source: DoT (Rs = $0.021)

To meet TRAI's tele-density targets, India will need an additional $20 billion in investments during 2004-06 and another $30 billion by 2012. The country has an investment potential of $37 billion by 2005 and $69 billion by 2010.[187] Most of India's investment needs will come from abroad because "money will not from within the system, private sector operators will continue to remain as money guzzlers at least for the next few years, while there is a severe pressure on profitability of the incumbent operators like BSNL and MTNL. Domestic institutions also do not seem to be too keen to take such a rge exposure to any single industry. Hence, a major chunk of resources will clearly have to be contributed by foreign institutions and investors."[188]

Total revenues derived from telecommunications services is expected to grow from $8.5 billion in 2001 to more than $12 billion in 2006 and $18.5 billion in 2010. As of February 2003, cellular telephony service attracted more than 24 percent of India's telecommunications FDI (table 33). Most of FDI inflow has gone to investment holding companies, followed by cellular service, manufacturing, and consultancy. In February 2003, investment in holding companies accounted for 50.3 percent of the total. During the first 3 months of 2004 the rate of actual FDI inflow declined significantly to $19 million from $65.6 million during corresponding period of 2003.[189] This was due in part do concerns over the recent mergers and consolidations in the cellular services sector. Nonetheless, FDI is expected to exceed $2.2 billion

[187] Found at http://www.meadev.nic.in/indiareliable/telecommunications.htm, retrieved Sept. 15, 2003.

[188] Gaurav Das, "Direct Connection," Business Standard, Dec. 23, 2002, found at http://www.business-standard.com/archieves/2002/dec/50231202.071.asp, retrieved May 28, 2003.

[189] P Vinod Kumar, "Telecom Sector Dials Wrong FDI Numbers In 2004," The Financial Express, found at http://www.financialexpress.com/print.php?content_id=62964, retrieved July 7, 2004.

during the first quarter of FY2004-05 due to the expected exponential growth in the number of fixed-line, WLL, and GSM based cellular subscribers.[190]

Table 33: Actual FDI inflows by sector (Aug. 1991 – Feb. 2003)

Service	FDI (Rs millions)	FDI ($ million)	Percent share
Basic fixed-line service	3,937	85.032	4.1
Cellular service	23,328	503.844	24.4
Radio paging	910	19.654	1
E-mail service	688	14.859	1
VSAT	281	6.069	0.3
Cable TV/Internet	1,704	36.803	1.8
Satellite phone service	481	10.378	1
Radio trunking	71	1.532	0.1
Manufacturing-consulting	15,784	340.518	16.5
Holding companies	48,133	1,038.405	50.3
Other value-added	137	2.955	0.1
Automatic route	355	7.659	0.4
Total:	95,952	2,069.958	

Source: DoT, Annual Report 2002-2003. (Rs = $0.021)

Multinational equipment suppliers and service companies participating in the Indian market since the late 1990s include: British Telecom, Telecom Italia, Telstra, Swiss Telecom, Hughes, Alltell Corp, Bell Atlantic, Bell Canada, Shinwatra Bezeq, Telekom Malaysia, Vodafone (U.K.), and Guangdon Lintech (China). Huge losses, conflicting policy statements, and confusion over the liberalization process caused many of these companies to leave India. Those remaining include: SingTel (Hong Kong), Hutchinson (Hong Kong), First Pacific (Escotel), Distacom (Spice Communications), AT&T (Idea Cellular), TWI Canada, France Telecom (BPL Cellular), and CellNet.

Mauritius, a tax haven, dominates FDI inflows into the Indian telecommunications market (table 34). It is believed that much of this money comes from foreign holding and investment companies that are channeling their FDI through companies registered in Mauritius in order to take advantage of various tax breaks offered by the GOI.[191] The island accounts for 72 percent of cumulative FDI inflows during the August 1991- August 2003 period.

[190] "Telecom FDI set to Cross Rs 10,000 –Cr Mark Shortly," The Financial Express, April 15, 2004, found at http://www.financialexpress.com/fe_full_story.php?content_id=57096, retrieved July 12, 2004.

[191] P Vinod Kumar, "Telecom Sector Dials Wrong FDI Numbers In 2004," The Financial Express, (date), found at http://www.financialexpress.com/print.php?content_id=62964, retrieved July 7, 2004.

Table 34: FDI inflows by country (Aug. 1991 – Aug. 2003)

Country	FDI (Rs million)	FDI ($million)
Mauritius	68,701.6	1,482.235
United Kingdom	8,875.9	191.497
United States	4,903.8	105.799
Netherlands	3,060.0	66.019
Thailand	2,211	47.702
Sweden	1,531.9	33.050
France	1,009.4	21.778
Israel	800	17.259
Hong Kong	741	88.871

Source: DoT (Rs = $0.021)

Telecommunications Equipment Market

India's telecommunication equipment market has undergone dramatic changes in the last decade and the process began in earnest in 1985 when the GOI de-monopolized the manufacture of telecommunications terminal equipment. At that time private sector producers were allowed to compete with state-owned equipment manufacturers such as BSNL, Indian Telephone Industries (ITI), and Hindustan Teleprinters. In 2003-04, the Indian market for telecommunications equipment grew at a tremendous rate presenting significant opportunities for both domestic and international telecommunications equipment suppliers.

Since 1991, the Indian government has taken significant steps to deregulate and liberalize the equipment sector and by opening it to imports and foreign investment. One of the goals of the NTP'99 was to promote domestic production of telecommunications equipment in order to transform India into a major equipment producer and exporter.[192] According to Shri Tapan Sikdar, Minister of State for Communications and IT, "the telecom sector have created conductive investment opportunities in telecom services and service applications sectors. The telecom sector was growing at the rate of 22 to 23 percent during the last few years. It had also facilitated in positioning the brand image of India as a 'Telecom Hub,' for investment in South Asia regions in the manufacturing sector." To meet the objectives of NTP '99, Indian telecommunication service providers will need to install approximately 75 million telephones by 2005 and an additional 175 million by 2010. This will require an investment of $37 billion by 2005 and $69 billion by 2010.

India produces a complete range of telecommunications equipment including medium and small size switches, transmission and terminal equipment, radio transmission equipment, satellite systems, high bit rate digital subscriber lines, telecom cable, VSAT terminals, frame relay, optical fiber equipment, asynchronous transfer mode (ATM), wireless-in-local loop equipment. Many of these products are manufactured in collaboration or as part of joint ventures with multinational firms. ITI is India's largest manufacturer of telecommunication equipment and it produces telephones, switches, WLL, digital loop carriers, digital microwave carriers, ISDN products, VSAT equipment, optical fiber terminating equipment for fiber optics, and digital microwave radio systems. Bharti TeleTech is the dominant Indian producer of telephones and BSNL operates factories in 7 cities that produce last mile equipment such as microwave towers, cable distribution cabinets, cable transmission boxes, and public payphones (table 35).

[192] Telecom Equipment Manufacturing Sector, Telecom Equipment Manufacturers Association of India (TEMA), found at http://www.tematelecom.org/industrialprofile.asp, retrieved Feb. 11, 2004.

Table 35: Equipment suppliers

Foreign suppliers	Country	Products
Alcatel	France	GSM headsets
Siemens	Germany	GSM handsets, routers, switches
Lucent	U.S.	CDMA networks, tower stations
Sony-Ericsson	Japan-Sweden	GSM handsets, routers
Cisco	U.S.	Routers, switches
Nortel	Canada	Switches, routers, IP phones
Nokia	Finland	Handsets (GSM,CDMA), GPRS
LG Electronics	S. Korea	Handsets (GSM,CDMA)
ZTE	China	CDMA handsets
Fujitsu	Japan	CDMA handsets
Crompton Greaves	U.K.	Transmission equipment
Samsung	S. Korea	CDMA handsets
Motorola	U.S.	Infrastructure equipment, handsets
NEC	Japan	GSM equipment, switching systems
BenQ		
Nungbo Bird	Taiwan	GSM, CDMA handsets
Philips	China	GSM handsets
UTStar Com	Netherlands	GSM headsets
DbTel	U.S.	CDMA equipment
Hyundai Curitel	Taiwan	Handsets
Kyocera	S. Korea	Handsets
DBL	Japan	Handsets
Ezze	China	Handsets
Huawei Technologies	S. Korea	Handsets
Qualcomm	China	Optical fiber network
	U.S.	CDMA equipment

Domestic suppliers	
ITI, Ltd	Telephones, switches, WLL, digital loop carriers, digital microwave carrier, SDN products, VSAT equipment, optical fiber termination fiber optic equipment, microwave radio systems, terminal equipment
BSNL	Microwave towers, cable transmission boxes, public payphones
Hindustan Cables	Cable products
Hindustan Teleprinters	Switching, terminal, telex machines, modems, CDMA equipment
Tata Telecom	Switching equipment, telephone and transmission equipment.
Bharti Electronics & Teletech	Switching equipment, telephones, fixed line, handsets
Punjab Communications	Transmission equipment
Punjab Wireless Systems	Transmission and terminal equipment
HFCL	Transmission equipment, optic fiber cables, CorDEX equipment, cable Modems
Shyam Telecom	Transmission and terminal equipment, CorDEX equipment
Tata Lucent	Transmission and terminal equipment, EPBX systems
BPL Telecom	Terminal equipment
Himachal Exicom	Terminal equipment

The market for telecommunications equipment is expected to grow by 14 percent from $5.8 billion in 2002-03 to $6.6 billion in 2003-04.[193] Domestic telecommunications service providers are expected to spend $4.39 billion as capital expenditures (CAPEX) during 2003-04 and subscribers are expected spend $1.69 billion on new and replacement handsets. Of this approximately $460 million will be spent on wireless infrastructure, $1.71 billion on GSM based wireless infrastructure, $1.45 billion on CDMA based infrastructure, and remaining $770 million on broadband equipment.[194] During 2005, the CAPEX for wireline is estimated to be $68.2 million, whereas the wireless and broadband CPEX is expected to decline.[195]

Domestic production grew by 45 percent from $2.2 billion in 1997-98 to $3.2 billion in 2002-03 despite a decline in 2002-03 compared to 2001-02 (table 36). India's exports telecommunications equipment grew to $89.3 million in 2002-03 despite a significant decline in 2001-02 compared to the previous year. India's principal exports include ADPM, rural exchanges, telephones, spare cards for E-10B exchanges, single channel VHF radio, multiaccess rural radios. The primary export markets for these products in 2003 were the United States (15 percent), Singapore (9 percent), the United Kingdom (9 percent), Germany (11 percent), and the UAE (6 percent).

Table 36: Domestic production and exports (1997-2003)

Year	Production ($million)
1997-98	2,213
1998-99	2,222
1999-00	2,931
2000-01	2,727
2001-02	3,430
2002-03	3,200

Source: TRAI.

Although the market for telecommunications equipment is growing dramatically, a significant portion of domestic producers are not benefitting, especially because most cellular service providers prefer to import their equipment and handsets. Many domestic manufacturers have not adapted to the introduction of new technologies or transitioned from fixed wire-line to wireless technologies. Indian companies have not had sufficient time or financial resources to adapt and make the necessary investments to be competitive.[196] Several of the largest Indian equipment manufacturers have either been privatized or closed including state-owned Hindustan Printers that was privatized by the GOI in October 2001 when 74 percent of its equity was sold to Himachal Futuristic Communications (HFCL) for $11.9 million. Several foreign manufacturers, including Fujitsu (Japan), have ceased producing telecommunications equipment

[193] "Telecom gear markers want level field with importers," Business Line, June 22, 2004, found at http://www.thehindubusinessline.com/2004/06/22/stories/2004062201960700.htm, retrieved July 15, 2004.

[194] "Telecom capex seem at $4.4 bn in FY2004," The Financial Express, Jan. 21, 2004, found at http://www.financialexpress.com/print.php?content_id=50977, retrieved Jan. 22, 2004.

[195] CAPEX: "money spent to acquire or upgrade physical assets such as buildings and machinery. This tends to be a very large expense for companies with significant manufacturing facilities, and usually much less of an expense in the services sector. Also called capital spending or capital expanse." Investor Words.com, found at http://www.investorwords.com/5437/capex.html, retrieved July 19, 2004.

[196] "Rapidly changing telecom tech poses challenge to cos," The Economic Times, July 14, 2003, found at http://economictimes.indiatimes.com/cms.dll/xml/uncomp/articleshow?msid=74202, retrieved July 13, 2004.

in India.

To counter this trend, several multinational corporations have announced plans to begin manufacturing handsets and equipment in India. ZTE (China) earmarked $50 million in 2004 to establish a network equipment manufacturing facility.[197] Other foreign vendors announcing plans to manufacture handsets in India include Alcatel (France), Flexitron (Singapore), and Elcotecq. With the rapid growth of wireless access (GSM and CDMA) most of the demand for telecommunications equipment is being met through imports. Because India has such a low APU, carriers are looking for the best prices and venders can expect very low margins on their equipment sales. In fact most vendors are either losing money on their contracts or breaking even hoping to make a profit in the future.[198] Service suppliers also procure equipment based on funding mechanism with long-term low interest credits offered by foreign suppliers. The government has allowed trading of telecom equipment to foreign companies under the cash and carry wholesale trading.' Institutional sales are considered wholesale.

The Indian mobile handset market is booming and is the world's second largest market after China. Three prime reasons for this explosive growth have been some of the world's lowest call toll rates and a subscriber base that are expected to triple exceeding 100 million by 2005, and an apparently unmet demand for mobile handsets (CDMA and GSM). According to the Indian Cellular Association, Indian consumers spent $3.3 billion on mobile handsets in 2003 with $1.8 billion going for GSM-based handsets and the remaining $1.5 billion going for CDMA-based handsets. Approximately 28.7 million mobile handsets are expected to be sold in 2004 (16.9 million based on the GSM platform and 11.8 million based on the CDMA platform) compared to 12 million in 2003. In 2003-04, most major vendors have introduced new handset models to keep pace with demand that offer new technology features and obsolescence and the introduction of new technologies and features is expected to generate a significant replacement market into the future.

Mobile handset vendors are selling more than 2 million new and handsets per month competition has driving price down to where voice revenues have started to stagnate. The price of a CDMA-based handset has declined from $324 to $119. Initially price determined the choice of handsets, but today vendors are using new value-added features such as: local languages, multimedia (integrated digital cameras, speaker phones, color screens, voice recorders, MJPEG video clips, FM radios, multimedia messaging), Bluetooth, and wireless Internet to gain market share and increase revenues. On the other hand, the market for basic fixed-line handsets declined in both revenue and units sold during 2002-03. The number of basic fixed-line handsets sold during 2002-03 declined by 6 percent to 6.6 million units and the revenues declined by less than one percent to $58.1 million. [199]

The Indian mobile handset market is dominated by LG Electronics and Nokia, which together, command 63 percent of the market (table 37). LG only recently supplanted Nokia as India's leading handset vendor. In GSM handsets, LG Electronics is the market leader followed by Nokia, Samsung, Motorola, and Ericsson and in the CDMA handset market Samsung and LG are the dominant suppliers.[200] LG Electronics supplies the Indian handset market with 2 models aimed at the premium segment of the market that is priced from $292 to $410 and comes with a 65K color display with LMS, MMS, and GPRS

---

[197] Thomas K Thomas, "New callers from the east," rediff.com, March 27, 2004, found at http://www.rediff.com/money/2004/mar/27spec2.htm, retrieved July 26, 2004.

[198] "Lehman Says India's Hot Stuff," boardwatch, March 24, 2004, found at http://www.boardwatch.com/document.asp?doc_id=49924&print=true, retrieved July 15, 2004.

[199] "Telecom equipment market marked down 34%," IndiaInfoline.com, June 29, 2004, found at http://www.indiainfoline.com/news/news.asp?dat=42229, retrieved July 13, 2004.

[200] Mamuni Das, "Telecom Capex Seen At $4.4 Bn In FY2004," The Financial Express, Jan. 21, 2004, found at http://www.financialexpress.com/print.php?content_id=50977, retrieved Jan. 22, 2004.

capabilities. Samsung and LG Electronics have been able to capatabilize on the tremendous expansion of the CDMA market led by Reliance Infocomm, India's largest mobile service provider. Samsung, unlike LG, has decided to concentrate on the mid to high-end cellular handset markets.

Table 37: Leading handset vendors

Company (nation)	**Sales ($million)**	**Percent of market**	**Entry level phone** ($)
LG Electronics (S. Korea)	604.103	33.5	291
Nokia (Finland	535.853	29.7	82
Samsumg (S. Korea)	231.965	12.9	97
Motorola (US)	136.717	7.6	81
Hyundai Curitel (S. Korea)	64.146	3.6	---
Siemens (Sweden)	52.483	2.9	81
Sony-Ericcson	45.356	2.5	91
Kyocera (Japan)	12.958	0.7	---

Source: Mid-day.com

At least 80 percent of the mobile handsets sold in the Indian market during 2004 were less expensive entry level models. Mobile Handsets are now available in India for as little as $50, but at least 35 percent of all the cellular phones in sold in 2003-04 range between $40 and $60 in price. These handsets are targeted at the middle and lower income segments of the market where most of the growth is taking place.[201] Intense competition is constantly pushing handset prices downward and is putting tremendous pressure on vendors cutting into their already slim margins (3 percent to 5 percent). Even at these prices, handsets are still quite expensive for the average upper class Indian family with an annual income ranging between $10,000 and $12,000 per year.[202]

When the duty levels were high the gray market (illegal market) dominated the sale of cellular mobile handsets. In 2001, nearly 90 percent of the cellular handsets sold in India were from the gray market. It is estimated that the gray market deprives the government and legitimate vendors of nearly $378 million per annum. As import duty rates, countervailing duties and other fees declined the price differential between gray market headsets and gray market headsets began to close to less than 10 percent.

In January 2004, the GOI lowered the duty rate on mobile handsets from 10 percent to 5 percent and abolished the Special Additional Duty of 4 percent. This is expected to push tele-density rates upwards by making mobile telephones more affordable and reduce the price differential between legitimately imported handsets and gray market handsets. The current differential ranges between 10 percent and 25 percent and the reduction in duty rates is expected to lower the price of legitimate handsets by 5 to 10 percent, depending on the model. With this, the gray market is expected to shrink to less than

[201] Kiran Pandya, "Low handset prices boost cell phone market," Mid-day, Jan.16, 2004, found at http://ww1.mid-day.com/news/business/2004/january/74048.htm, retrieved July 23, 2004.

[202] Sue Marek, "Wanted: Cheap Indian Headsets," Wireless Week, Nov. 1, 2003, found at http://www.wirelessweek.com/index.asp?layout=articleprint&articleID=CA333043, retrieved July 23, 2004.

20 percent of the total market and gray market vendors will be consigned to selling second hand and reconditioned handsets.[203]

Exports: One of the goals of the NTP '99 was to transform India into a world class exporter of telecommunications equipment. India's exports of telecommunications equipment increased by 121 percent from $51.9 million in 2000 to $114.8 million in 2003 (table 38). India's exports included ADPM, rural exchanges, telephones, spare cards for E-10B exchanges, single channel VHF radio, multiaccess rural radio. The United States has been India's leading export market for these products, but the United States is becoming a less important export market as India shifts its attention to markets in Asia and Africa. Indian exports to the United States declined by 34 percent in 2003 compared to 2002 and its trade deficit in these products increased from $355 million 2000 to $1.8 billion in 2003.

Table 38: India's exports by country ($million)

Country	2000	2001	2002	2003	Percent Change (2000-03)
United States	9.3	13.3	25.5	16.9	15
Singapore	3.1	5.2	7.1	10.5	9
U.K.	4.7	6.1	8.3	10.5	9
Germany	3.1	3.2	4.0	12.9	11
UAE	2.9	6.2	7.9	6.4	6
Canada	2.1	2.5	2.2	2.3	2
Russia	0.1	1.4	4.8	0.8	1
Italy	2.9	0.5	1.6	1.9	2
Japan	2.8	0.5	1.6	1.9	2
Malaysia	0.5	0.4	1.8	4.3	3
Total	51.9	66.9	88.8	114.8	229

Source: Ministry of Commerce.

Imports: Nearly all private sector telecommunications service providers buy their equipment from multinational companies that provide long-term vendor financing. Until recently because domestic vendors were unable to offer long-term financing foreign vendors enjoyed a distinct advantage. Even state-owned service providers prefer to purchase equipment on a deferred payment basis. Also, the quality of local Indian manufacturing is not always at equivalent to products imported from abroad. The GOI lowered import duties on cellular handsets from 10 percent to 5 percent; exempted infrastructure equipment from duties, and reduced duties on raw materials used in the production of optic fiber and cable in January 2004.[204] Indian importers have benefitted because there is a surplus of telecommunications equipment on the international market that has tended to drive prices down.

India's imports of telecommunications equipment increased by 333 percent during the 2000-03 period (table 39). Until 2003, the United States is India's leading source for imported telecommunications

[203] Vinod Mahanta, "It's good news for cellphone manufacturers," The Economic Times, March 17, 2004, found at http://economictimes.indiatimes.com/articleshow/maid-564472prtpage-1.cms, retrieved March 19, 2004.

[204] "Cellphone importers upbeat over duty cut," Business Line, Jan. 9, 2004, found at http://www.thehindubusinessline.com/2004/01/10/stories/200401101720700.htm, retrieved July 23, 2004.

machinery and equipment. In 2003, the United States was supplanted by China as the leading source of imported telecommunications equipment. Nonetheless, import from the United States increased by 298 percent during the period. Other nations supplying equipment to the Indian market include Germany, South Korea, France, Sweden, Hong Kong, Canada, and Australia.[205]

Nearly all the cellular mobile headsets sold in India and most of the critical parts and components needed to produce switching and transmission equipment is imported (table 37). The most important providers of imported wireline network equipment to the Indian market are Siemens, Alcatel, Ericsson, and Lucent and handset imports are dominated by LG Electronics, Samsung, Nokia, and Motorola.

Alcatel (France) is India's leading supplier of digital switches and Ericsson Telecommunications accounts for 40 percent of the mobile phone market. Foreign companies supply cellular switches, cellular phones, VSAT terminals, ATM switches, frame relay, WLL technology, optical fiber equipment, card pay phones, ISDN terminals, and data terminals. Foreign companies also supply cellular switches, VSAT terminals, ATM switches, frame relay, WLL technology, routers, IP phones, digital switching systems, transmission and generation equipment, optical fiber equipment, card pay phones, ISDN terminals, and data terminals.

In 2004, cellular handset vendors from China, S. Korea, Singapore, and Taiwan launched telecommunications products in India, especially cellular handsets. The most prominent include Nungbo Bird (China's largest telecom handset manufacturer), Kejian (China), DBTel (Taiwan), Ezze (S. Korea), and BenQ (Taiwan). Other companies such as Korea Telecom and Singapore Technologies are set to compete in India's thriving wireless and broadband markets. Whereas Korea Telecom has signed an understanding with BSNL to offer broadband services and Singapore Technologies is exploring potential joint ventures. [206]

Table 39: Imports by country ($million)

Country	2000	2001	2002	2003	Percent
U.S.	104.1	157.3	116.4	414.1	24
China	46.2	39.1	103.2	443.7	25
S. Korea	20.1	33.6	113.6	316.3	18
Sweden	56.8	56.4	115.4	176.1	4
Germany	29.6	35.6	63.1	94.5	5
U.K.	23.6	40.0	55.8	90.7	5
Singapore	36.5	45.3	37.0	73.4	4
Japan	33.1	32.3	51.4	34.9	2
Israel	17.5	22.5	18.5	87.2	5
Malaysia	39.7	41.0	29.8	31.5	2
Grand total	407.1	503.1	703.7	1,762.0	

Source: Ministry of Commerce.

[205] U.S. Department of Commerce, India: Country Commercial Guide FY 2002, found at http://www.usatrade.gov/website/cc...cgurl/ccg-india2002-ch-5:006c4dcb, retrieved Nov. 18, 2003.

[206] "India's new telecom callers," United Press International, June 25, 2004, found at http://www.washingtontimes.com/upi-breaking/20040624-010347-8465r.htm, retrieved July 15, 2004.

International Trade Disputes and WTO Commitments

India was the one of 69 countries to sign the WTO Basic Telecommunications Agreement in February 1997. Countries signing the agreement pledged to liberalize their telecommunications service market and make commitments to establish regulatory mechanisms an assure market access. India committed itself to opening up the basic (local) voice service, cellular mobile service, and data services (including Internet), and private leased line services. It also pledged to review its guidelines and procedures governing domestic and international long distance services. In 2002, India de-monopolized its ILD market and opened it to private sector competition two years ahead of its WTO commitment. It also established the TRAI and TDSAT to meet its commitment to establish regulatory mechanisms. However, the CompTel ASCENT, alliance of U.S. communications companies, submitted a formal complaint with the U.S. Trade Representative in January 2004 alleging that India was one of several countries in violation of their commitments in the WTO Basic Telecommunications Agreement and the GATS Telecommunications Index.[207] CompTel ASCENT asserted that the GOI failed to meet its commitments if four long-standing problem areas (table 39).

[207] CompTel ASCENT letter dated Jan. 7, 2004 to Gloria Blue, Executive Secretary, Trade Policy Committee, USTR.

Table 39: CompTel ASCENT Allegations

The GOI refused to ensure reasonable and nondiscriminatory interconnection and access to VSNL's submarine cable station. VSNL allegedly limited access to its submarine cable station and refused to allow interconnection or access at reasonable rates and discriminated in favor or itself on the rates, terms, and conditions offered to access the limited amount of capacity that it does make available. These actions create an artificial shortage of capacity that prevented competitive operators from meeting the full bandwidth demands of their customers and keeps bandwidth prices for the capacity that is available at much higher levels than the prices for the similar capacity on routes where the market is more competitive. The Alliance wanted the GOI to enact pro-competitive safeguards and enforce its competition polices and international trade commitments to bring to an end such anti- competitive and discriminatory practices.[208]

The second area of contentions concerns competitive safeguards and the Alliance alleges that since state-owned BSNL provides NLD, ILD, and local basic services there no rules in place to prevent it from engaging in anti-competitive practices.

The third area concerns barriers to market access where the alliance claimed that the GOI imposes barriers on foreign companies seeking to apply for telecommunications licenses because of exorbitant license fees, built-out obligations, and other financial conditions applicable to ILD operators. [209]

The fourth area deals with interconnection usage charge-access deficit charges. TRAI instituted an Access Deficit Charge in connection with the Interconnection Usage Charge Regime in January 2003. Although TRAI committed to implement a Universal service regime that is transparent and nondiscriminatory, "the higher ADC charge international calls is inherently discriminatory against international operators because the must pay a higher rate than domestic operators, and one that is above costs."

VSNL responded by stating that the Alliance misstated India's obligations under the agreements since it adopted only limited sections of the Reference Paper. It also stated that India made no "substantive commitments regarding interconnection nor did it make any commitments regarding pricing."[210] TRAI subsequently intervened to help ensure that access to submarine cable capacity was provided by VSNL. According to U.S. Trade Representative Robert Zoellick, "this intervention was a short-term solution to a chronic problem of reasonable and nondiscriminatory access to such capacity; without a long-term solution, service suppliers may experience further constraints on their ability to access such capacity to provide their services."[211] Subsequently, VSNL agreed to activate some of the circuits under dispute thereby freeing up capacity to meet some of the demand.

---

[208] Letter from Carol Ann Bischoff, Chief Legal Officer CompTel/ASCENY, to the Honerable Lalit Mansingh, Ambassador to the USA, Embassy of India, Nov. 24, 2003.

[209] According to ComTel ASCENT, foreign license applicants are required to pay a license fee of $5.21 million in addition to posting a performance bond of $5.21 million and an annual fee of 15 percent of revenues. Additionally, applicants are required to establish a international gateway switch plus a minimum of four regional points of presence nationwide.

[210] Letter from Arun Gupta, Vice President, Wholesale Business, VSNL, Jan. 28, 2004 to USTR.

[211] "Zoelloick Sees Telecom Barriers In India," The Financial Express, April 9, 2004, found at http://www.financialexpress.com/print.php?content_id=56744, retrieved July 26, 2004.

Outlook for the Indian Telecommunications Industry

By opening its telecommunication sector to private sector competition and foreign participation India created one of the world's fastest growing markets for telecommunications equipment and services. India's telecommunication subscribers benefit from some of the world's cheapest call rates due to intense competition between service providers.[212] According to Pradip Baijal, TRAI Chairman, "the sector has shown unprecedented growth during 2003-04 mainly driven by competition and aggressive pricing."[213] India's huge population, low telephone penetration rate, and high levels of economic growth imply tremendous potential market.

However, the consumption of telecommunications services is still restricted to a small minority within India. India continues to have one of the world's most under penetrated and least developed telecommunications services markets. High illiteracy rates, low levels of urbanization, and low per capita income will continue to limit telecommunications penetration. Its fixed-line service suffers from decades of under investment, the absence of competition, government protection, and monopoly. Until recently, Indians had to wait, on average, several years to obtain a telephone line. The government owned and operated telecommunications monopolies were also unable to supply affordable, reliable, and modern telecommunications services to their customers.

The cellular telephony services segment will be India's key to growth in the telecommunications sector as it has been in other developing countries. The role of the private sector has grown over then years and as of June 2004 it accounted for approximately 81 percent of India's cellular subscribers. The explosive growth in the mobile cellular sector has been driven by a number of factors including India's rapid economic expansion driven by the reforms of the 1990s, aggressive pricing, and by rock bottom call rates. Thanks to these reforms, India's tele-density has increased by nearly 4 times so that more than 7 in every 100 Indians now have access to a telephone.

Cellular services remain prohibitively expensive and subscription rates are far below what should be expected in large metropolitan areas. The sector has been plagued by low margins, deteriorating service, high churn rates, unfavorable regulatory measures, infrastructure limitations, cut throat competition, and inadequate spectrum allocation. Since the early 1990s, a large number of service providers have exited the industry unable to secure the large volumes of investment needed to upgrade their networks to international standards. Also, to gain market share, cellular operators have consistently slashed their call rates at the expense of their own economic and financial well being. Likewise, most equipment vendors are either losing money or simply breaking even hoping that they will become profitable in the future.

Nonetheless, the GOI continues to take significant steps to further liberalize and modernize the telecommunications. Some of those steps include: (1) lowering of import duty rates on handsets and other telecommunications equipment enabling many vendors to lower their prices to consumers; (2) introduced a single licensing scheme (Unified Access Licensing Regime) that permits telecommunications operators to offer integrated services to their subscribers; (3) permitting mergers and the consolidation of the cellular sector to gain efficiencies and economies of scale; (4) proposing the merger of MTNL and BSNL; (5) TRAI recommending a reduction in the annual license fee from 15 percent to 6 percent to encourage competition; and allowing the cap on foreign investment to be raised from 49 percent to 74 percent. In August, the GOI announced its intention to revamp the NTP '99 due to the unparalleled growth in tele-density, changes in technology, and the continuing digital divide between the urban areas and the country

[212]Indrajut Basu, "India's new telecom callers," UPI, June 25, 2004, found at http://washingtontimes.com/upi-breaking/20040624-010347-8465r.htm, retrieved Aug. 20, 2004.

[213]TRAI.

side. It is expected that these new policies will tackle issues such as spectrum usage, broadband access, and the implementation of carrier access codes.

APPENDIX: A

Table A-1: Telephones per 100 population (tele-density) as of Dec. 31, 2002

Circles/State	Urban	Rural	Total
Andman & Nicobar	13.62	7.66	9.65
Andhra Pradesh	14.86	1.94	5.44
Assam	11.43	0.47	1.89
Bihar	8.07	0.45	1.25
Chhattisgarh	5.23	0.36	1.35
Gujarat	15.30	2.30	7.19
Haryana	14.48	2.16	5.80
Himachal Pradesh	34.28	5.24	8.12
Jummu & Kashmir	8.16	0.49	2.41
Jharkhand	5.53	0.36	1.52
Karnataka	13.96	2.33	6.32
Kerala	19.58	7.43	10.58
Madhya Pradesh	9.11	0.54	2.84
Maharashtra	13.97	2.02	5.77
North-East I & II	9.13	0.82	2.64
Orissa	9.27	0.83	2.11
Punjab	22.68	4.43	11.08
Rajasthan	10.02	1.23	3.29
Tamil Nadu	12.26	1.90	5.96
Uttarachal	11.48	1.23	3.88
Uttar Pradesh	7.64	0.54	2.02
West Bengal	7.11	0.83	1.70
Kolkata	11.77	0	13.22
Chennai	19.72	0	22.75
New Delhi	28.84	0	26.92
Mumbai	23.52	0	23.52
All India	13.71	1.41	4.89

Source: Annual Report 2002-03, DoT.

Table A-2: Total Telephones in India, as of Dec. 31, 2002.

Circles/States	Urban	Rural	Total
Andman & Nicobar	16,614	18,658	35,272
Andhra Pradesh	3,091,205	1,085,225	4,176,430
Assam	400,331	112,121	512,452
Bihar	720,343	344,071	1,064,414
Chhattisgarh	225,624	59,870	285,494
Gujarat	2,997,336	748,620	3,745,956
Haryana	924,973	330,352	1,255,325
Himachal Pradesh	210,141	291,803	501,944
Jummu & Kashmir	211,328	37,954	249,282
Jharkhand	340,308	77,313	417,621
Karnataka	2,570,254	821,767	3,392,021
Kerala	1,637,237	1,771,795	3,409,032
Madhya Pradesh	1,509,616	243,618	1,753,234
Maharashtra	3,659,735	1,155,920	4,815,655
North-East I & II	243,773	78,503	322,276
Orissa	524,136	261,590	785,726
Punjab	2,125,392	723,018	2,848,410
Rajasthan	1,361,708	547,562	1,909,270
Tamil Nadu	2,193,912	652,627	2,846,539
Uttarachal	256,469	71,743	328,212
Uttar Pradesh (E)	1,156,784	502,405	1,659,189
Uttar Pradesh (W)	1,054,867	139,834	1,194,701
West Bengal	587,785	473,442	1,061,227
Kolkata	1,320,821	0	1,320,821
Chennai	1,059,750	0	1,059,750
New Delhi	2,119,252	0	2,119,252
Mumbai	2,404,746	0	2,404,746
All India	38,974,895	28,646,486	67,621,381

Source: BSNL.

History of the Indian telecommunications sector: A Time Line

1850 First experimental electric telegraph line between Calcutta (Kolkata) and Diamond Harbor
(1854) Indian Telegraphy Department (ITD) established.
1855 Electric telegraph opened to public traffic
1858 First Indo-Ceylon cable laid
1865 First Indo-European telegraph communications via the India-Ceylon cable.
1867 A new cable laid between India and Ceylon
1873 Duplex telegraphy introduced between Bombay (Mumbai) and Calcutta (Kolkata)
1875 First telephone line and first telephone poles between Srinagar and Gilgit
1881 Licenses granted to private companies to operate telephone systems in Madras (Chennai), Bombay and Calcutta.
1882 First telephone exchange opened in Bombay.
1885 Introduction of quadraplex telegraphy and provision of copper wire (instead of iron wire) for transmission between Bombay and Madras. Phonograms introduced for the first time in Bombay and Calcutta.
1886 Copper wire for transmission between Bombay and Madras used instead of iron wire.
1888 Indo-European Telegraph Department merged with ITD
1905 Telegraph Department transferred to the Commence & Industry Department.
1914 The Postal and Telegraph Departments were "amalgamated under a single Director-General at the same time the control of the P&T Department was reverted to the PWD.
1920 Madras- Port Blair route was opened for wireless telegraphy.
1921 Continuous wave transmitters for wireless telegraphy replaces spark transmitters.
1927 Radio-telegraph working between the U.K. and India.
1933 Radio telephone communications between England and India were opened
1937 Deluxe telegrams with foreign countries were introduced.
1944 Bombay-New York wireless telegraph service was commissioned.
1950 Telegraph Wires (unlawful possession) of 1950, Act was passed.
1951 Wireless link to Thailand, Moscow, Egypt, and Iceland.
1952 Wireless link to Iran and Japan.
1953 First automatic exchange in Calcutta, Telex service started in Bombay.
1960s First microwave route between Calcutta and Asansol
1970 Installation of th SPC gateway telex exchange introducing international subscriber dialed telex services.
1980s First satellite earth station for domestic communications set up at Secundrabad
1984 Private sector manufacture of telephone subscriber terminal equipment permitted.
1985 Telecom was constituted into a separate department, first mobile telephone service introduced in Delhi, first radio paging service introduced in Delhi.
1987 Subscriber trunk dialing (STD) booths introduced.
1986 MTNL and VSNL were created as corporations.
1989 Telecom Commission formed.
1990s Introduction of the I-Net Exchange - introduction of voice mail service in Delhi.
1991 Private sector manufacture of all telecommunications equipment permitted and 51 percent foreign equity allowed.
1992 Value-added services (including cellular services) opened to private sector participation; bids invited for cellular mobile service in 4 cities and radio paging services in 27 cities.
1993 Private networks allowed in industrial areas.

1994	National Telecom Policy 1994 announced; radio paging, VSAT data services, e-mail and voice-mail, and video text services opened to private providers; DoT issues guidelines for private participation in basic-fixed line services; cellular mobile telephony service started in Caluctta, and New Delhi; licenses for cellular mobile for 4 metros issued; ISDN service started commercially, Internet service provided by VSNL.
1995	Cellular services started in Calcutta; Wireless-in-local loop (WLL) telephone system was introduced by MTNL in New Delhi; basic telecom services opened for private competition.
1996	Internet services began.
1997	Telecom Regulatory Authority of India (TRAI) established.
1998	GMPC licenses granted; new ISP policy announced.
1999	National Telecom Policy 1999 announced; international long distance service opened to private sector participation; DoT separated into two organizations: DTS and DTO.
2000	TRAI (Amendment) Ordinance passed; Telecom Dispute Settlement and Appellate Tribunal (TDSAT) established; international and domestic long distance (NLD)opened to the private sector; DTS was "corporatized" into BSNL.
2001	WLL allowed by basic operators; 'guidelines for fourth cellular operator announced; basic service tenders floated, tenders for 4th cellular operator floated; Convergence Bill introduced in Parliament.
2002	International long distance opened to the private sector; VoIP permitted in India; VSNL comes under private management (Tata Group); Internet telephony permitted.
2003	Unified Access Licensing regime introduced.

Sources: TRAI, DoT, BSNL, VSNL, MTNL, B.S. Padmanabhan, "The telecom journey," Frontline, Sept. 27 - Oct. 10, 2003, found at http://www.frontline.com/fl2020/stories/20031010051118 00.htm, retrieved Nov. 14, 2003.

GLOSSARY OF TERMS

Backbone: is a transmission link or network that carriers concentrated traffic; in the LAN/WAN context, a line or set of lines for interconnecting local area networks; in the Internet connector other wide area network, a backbone is a network that interconnects local or regional networks; in the ISP context, the local network to which the ISP's servers, switches and routers are connected.

Band: In communications, the frequency spectrum between two defined limits. A group of tracks on a magnetic drum or on one side of a magnetic disc. A set of frequencies authorized for use in a geographical area defined for common carriers for purposes of communications system management.

Bandwidth: of a channel is the range of frequencies at which the channel transmits a signal without unacceptable attenuation. Relating to a signal, the bandwidth is the range of frequencies over which Fourier components of the signal exist. Also used loosely to mean the bits per second transmitted or the available bits per second.

Base station: a land station in the land mobile service. In personal communication service, the common name fro all the radio equipment located at one fixed location and that is used for serving one or several cells.

Base Transceiver Station (BTS): a component of mobile communication network or a fixed wireless access network which includes the radio and signaling resources needed to handle traffic generated by users within the cell.

Base Station System (BSS): the wireless access network in a (GSM) mobile telecommunications network or a (DECT) wireless local loop system. The BSS consists of a Base Station Controller and one or more Base Transceiver Stations.

Basic telephone service: means of collection, carriage, transmission and delivery of voice or non-voice messages over the public switched telephone network (PSTN). This also includes WLL (M).

Bit: abbreviation for binary digit.

Broadband: describes a telecommunications service (or Internet access) in which the data relating to multiple services can be transmitted at a "high" rate: high is not quantified but is taken in various contexts to be higher than 56 kbit/s as in voice band modems, or 64 or 128 kbit/s as in ISDN, or in the digital subscriber loop context rates to signify transmission rates in excess of 1.5 or 2 Mbit/s.

Broadband Integrated Services Digital Network (N-ISDN): an integrated servcies digital network intended to provide multimedia services at high bit rates, involving broadband access and switching based on asynchronous transfer mode (ATM).

Call: a unit of traffic measurement. A point-to-point communication between two endpoints involving call set-up, a connection during which information is streamed and a termination process; a temporary relationship during which a continuous stream of information maby be transmitted.

Cellular circles: India was divided into circles or adjacent, non-overlapping hexagonal shaped cells. The 19 non-metro circles were divided into 5 "A" service areas, 8 "B" service areas, and 5 "C" service areas, depending on the profitability of the cell. Each cell has its own transmitter and receiver (called a base station) to communicate with the mobile units in that cell; a mobile switching station coordinates and hands off mobile units across boundaries. Cellular systems are based on the concept of frequency re-usage: the same frequency is used by several sites which are far enough from one another, resulting in a tremendous gain in system capacity.

Cellular mobile telecommunications service: a mobile communications system that uses a combination of radio transmission and conventional telephone switching to permit telephone communication to and from mobile users within a specified area. In cellular mobile systems, large geographical areas are segmented into many smaller areas called cells, each of which has its own radio transmitters and receivers and a single controller interconnected with the public switched telephone network.

Code-division multiple access (CDMA): a method of multiplexing allocating a unique coding method to each connection in such a way that all can be transmitted simultaneously on a single channel. CDMA is a spread spectrum technique used with Ku-band satellites to provide mobile data to truckers, for example.

Digital subscriber line (DSL): in integrated services digital networks (ISDN), equipment that provides full-duplex service on a single twisted metallic pair at a rate sufficient to support ISDN basic access and additional framing timing recovery and operational functions.

Fixed land line: a colloquial name for conventional telephone facilities. Land lines include conventional twisted-pair lines, carrier facilities, and microwave radio facilities for supporting a conventional telephone channel; excluding satellite links and mobile telephone links using radio transmission.

Fixed network: a telecommunications network, using wire-line or wireless access, not supporting terminal mobility.

Fixed wireless: a method of accessing a telecommunications network using wireless local loop in which the wireless terminal is in a fixed location.

General Packet Radio System (GPRS): a data service provided using GSM mobile telephony infrastructure giving the user always on access to to data services such as the Internet.

Global System for Mobile Communication (GSM): a second generation digital mobile telephony standard originally developed in Europe but now deployed in many countries. It is a European time division, multiple access (TDMA) radio technology. It consists of three elements: a switching system, a base station and a subsystem, and a mobile handset. The switching part makes the connection between the two users, the base station part controls the communication across the radio interface, and the mobile act as the transmitter-receiver for the user.

Interconnector: the commercial and technical arrangement under which service providers connect their equipment, networks, and services to enable their customers to have access to the customers service and networks of another service provider.

Interconnect charge: the charge for interconnection by an interconnection provider to an interconnection seeker.

Interconnection provider: the service provider to whose network and interconnection is sought for providing telecommunications services.

Interconnection seeker: the service provider who seeks interconnection to the network of the interconnection provider.

International subscriber dialing (ISD): direct interconnection between an end user in India with another end user in another country by means of direct dialing through public networks.

Internet: a world-wide interconnection of networks operating to Internet standards functioning as a single, large virtual network, providing characteristic services including e-mail, file transfer, remote login, Web browsing and electronic commerce.

Internet Dhabas: internet cafes.

Internet service: services characteristically offered over the Internet, including but not restricted to Telnet, file transfer, electronic mail, Web browsing, news, and electronic commerce.

Internet service provider (ISP): a company that provides individuals and enterprises with access to the Internet and, possibly, services such as Web site hosting. The ISP must either own or have use of a Point of Presence.

Integrated services digital network (ISDN): is a network that can provide a variety of bearer services, teleservices, and supplementary services over a single access point to the network.

Kbps: kilobyts per second.

Last mile connectivity: expensive copper wire is used to connect fixed lines to residences and offices (the last mile) with the main exchange or junction box.

Leased circuit: telecommunications facilities leased to subscribers or service providers to provide for technology transparent transmission capacity between network termination points which the user can control as part of the leased circuit provision.

Long distance charging areas: one fo the several areas into which the areas of the country is divided and declared as such for the purpose of charging for trunk calls which generally in co-terminus with secondary switching area.

Mbps: megabits per second.

Mobile switching center (MSC): the backbone of a fully mobile service, MCS allow service providers to offer roaming and virtually unlimited mobility. All fully mobile services have 3 elements: the mobile

telephone/handset (at the subscruber end), a tower and the MCS at the exchange. When a subscriber makes a call, it is transmitted to the nearest tower (a city has several towers) and from there to the exchange. An MCS carries calls, tracks the movements of subscribers from one part of the city to another city or even overseas, seamlessly handling over calls when subscribers are on the move and storing billing information.

Mobility: a general capacity which allows use of a telecommunications network without being bound to a terminal at a fixed location.

National long distance service: refers to the carriage of switched bearer telecommunication services over a long distance network.

Points of presence (PoP): the physical location at which the long distance or inter-exchange carrier interconnects with the local exchange; in the Internet context - is an access point to the Internet serving aa geographic area usually defined by a telcos local access area, consisting of a number of elements: analogue or ISDN modem bank, authentication servers, router and optionally mail and web servers.

Prepaid charging: a mode of charging for services in which the user purchases services to a specified value in advance and the credit balance is decremented with each service usage.

Roaming: In cellular technology (mobile telephone technology), the use of a wireless telephone outside a specified tariffed geographic area defined by the service provider (which area is usually called the "home" area); outside of the home area, additional charges usually apply.

Short distance charging areas (SDCA): one of the several areas into which a long distance charging area is divided and declared as such for the purpose of charging for trunk calls.

Short Message Service (SMS): a service in GSM mobile networks allowing the transmission of short text messages (<160 characters) between mobile stations using a store-and-forward principle.

Subscriber: a party having a contract with a service provider or telecommunications company involving a defined business arrangement.

Tele-density: a measure of availability and use of telephone services, usually expressed as the number of telephones per one hundred of population in a defined area.

V5.2: a software-com-hardware interface that restricts mobility to a short distance charging area.

Value-added network services (VANS): telecommunications services provided by a (licensed) provider using the facilities of a (licensed) operator.

Value-added services: a service involving processing information which enhances the value of the service beyond that of the basic telecommunications bearer function.

Voice over Internet Protocol (VoIP): the transmission of voice over circuits employing Internet protocol. It denotes the type of IP telephony technique where transmission is primary over private managed networks.

Wireless terminal: any mobile terminal, mobile station, personal station, or personal terminal using non-fixed access to the network.

Wireline: a term associated with a network or terminal that uses metallic wire conductors (and/or optical fibers) for telecommunications.

Wireless-in-local loop (WLL): WLL comes in two forms: fixed location and mobile wireless. Fixed location wireless incorporates a system where wires are not needed between the subscriber's premises to a telephone pole on the street to the central switching office. Technology replaces the copper wires in the local loop. A small box with an antenne is attached to the outside of the subscriber's premises and a normal phone instrument is connected to the box. Being wireless, WLL uses radio frequencies (electromagnetic waves) instead of traditional copper wires or optical fiber cable to connect the last mile between the local telephone exchange and the caller. Wireless mobility WLL incorporates a small hand held terminal similar to a cellular telephone except it relies of CDMA technology instead of GSM technology.

Wireless terminal: any mobile terminal, mobile station, or personal terminal using non-fixed access to the network.

Wireline: a term associated with a network or terminal that uses metallic wire conductors (and/or optical fibers) for communications.

Sources: U.S. Department of Commerce, TRAI, ATIS.org, Rediff.