

INTERNATIONAL TELECOMMUNICATION UNION

CASE STUDY OF THE CHANGING INTERNATIONAL
TELECOMMUNICATIONS ENVIRONMENT

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1 OUTLINE OF THE SOCIO-ECONOMIC SITUATION IN SENEGAL

1.1 Geographical and demographic situation

Senegal is located at the furthest western point of the African continent, on the Atlantic coast. It is bordered by Mauritania to the north, Mali to the east, Guinea-Bissau and the Republic of Guinea to the south. In addition to these neighbouring countries, Gambia is enclosed within Senegal's territory.

Figure 1.1: General map of Senegal



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The demographic and economic situation in Senegal is summarized below:

- Surface area: 196 712 km²
- Population: 8.46 million inhabitants
- Urban population: 40%
- Density: 43 inhabitants/km²
- Population under age 20: 58%
- GDP/inhabitant: \$US 550
- Exchange rate 96: \$US 1 = 533 FCFA

1.2 Senegal's economy

A look at Senegal's economic development over a long period reveals a slow decline (-1.2%¹ during the period 1985-95), especially in terms of per capita GDP. Senegal's per capita GDP is estimated at around \$US 550 for 1996.

Almost half of GDP is generated by the tertiary sector. Nevertheless, the primary sector, including in particular agriculture, occupies an important place. The primary sector accounts for some 20% of GDP and nigh on three-quarters of the active population owe their livelihood to agriculture. Table 1.1 shows the sources and use of GDP, in millions of current US dollars.

Senegal is a small country with a limited domestic market and a relatively low level of per capita income. This means that, in order to achieve high growth rates, the country has to be particularly effective in the realm of foreign trade.

A study of the make up of Senegal's trade with the outside world reveals three main characteristics:

- chronic deficits (see Table 1.1);
- little diversification of exports;
- limited flows of private capital.

Table 1.1: Evolution of foreign trade balances

In billion FCFA

	1994	1995	1996
Balance: Goods and services	-16.7	99.9	-110.3
<i>Balance: Goods</i>	<i>-61.5</i>	<i>-123.8</i>	<i>-132.9</i>
<i>Balance: Services</i>	<i>44.8</i>	<i>23.9</i>	<i>22.6</i>
– Exports	640.7	814.0	860.6
<i>Goods</i>	<i>387.8</i>	<i>483.5</i>	<i>516.6</i>
<i>Services</i>	<i>252.9</i>	<i>330.5</i>	<i>344.0</i>
– Imports	657.4	913.9	970.9
<i>Goods</i>	<i>449.3</i>	<i>607.3</i>	<i>649.5</i>
<i>Services</i>	<i>208.1</i>	<i>306.6</i>	<i>321.4</i>

Source: Forecasting and Statistics Directorate, Senegal.

1.3 The role of telecommunications in Senegal's economy

In the telecommunication sector in Senegal, there is a complete absence of any equipment manufacturing industry. Senegal merely offers telecommunication services through its national public telecommunication operator Sonatel.

¹ The World Bank's "World Table 1997", Real growth rate.

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The telecommunication sector is a relatively efficient and profitable sector. In 1996 Sonatel achieved a profit of \$US 23.6 million² for a turnover of \$US 121 million. Thus, profit represents around 20% of turnover.

In 1996, telecommunication turnover accounted for 2.6% of GDP. This high ratio (for a developing country) points to a country with a dynamic telecommunication sector which has achieved an optimal level of development in relation to the other sectors of the economy. For instance, in most industrialized or newly industrializing countries the telecommunication sector accounts for 1.7 to 2.8% of GDP on average.

The net international settlement balance in 1996 amounted to some 19 billion FCFA (\$US 35.6 million), i.e. around 84% of Senegal's trade balance in services. Net settlement payments amounted to some 0.77% of GDP in 1996.

² Source: Sonatel's financial report - Profit in FCFA: 12 605 342 865.

2 THE TELECOMMUNICATION SECTOR IN SENEGAL

2.1 Institutional framework

In 1985, the telecommunication in Senegal was completely reformed: the post and telecommunication activities of the Senegalese OPT³ were separated, and national and international telecommunication services were merged. An entirely State-owned corporation was set up: **Sonatel**.

The main missions entrusted to this single operator were to:

- develop the domestic network (1985-92);
- upgrade the international telephone network and increase network capacity in Dakar (1992-95);

In 1996, Law No. 96-03 was adopted, setting out the telecommunication code. This Law constitutes the basic regulatory text governing telecommunications in Senegal. It provides for:

- opening up Sonatel's capital to private foreign and national partners and to Sonatel's staff;
- liberalization of some segments of the telecommunication market.

At the same time, it stipulates that:

“the establishment of telecommunication networks open to the public, provision of telephone service between fixed points, telex services, the data transmission service and mobile services are the exclusive responsibility of the State, which may license them out fully or partially to one or more physical persons or legal persons constituted under public or private law.”

Following on from this law, and as part of the programme for privatization of Senegalese State-owned enterprises, in 1997 the State decided to arrange for a partial privatization of Sonatel. Under this privatization process, France Telecom acquired a 33.33% stake in Sonatel, for some \$US 122 million.

This privatization has not fundamentally altered the institutional framework of the telecommunication sector in Senegal since Sonatel still enjoys a monopoly over all telecommunication services until 31 December 2006 (at the latest). The Senegalese authorities remain cautious regarding liberalization of the whole of the telecommunication sector. This caution is reflected in Senegal's most recent declarations within the World Trade Organization⁴. The most important of these are as follows:

- Fixed telecommunication services: The authorities will consider the possibility of opening up the sector to other operators after 2003.
- Cellular services: Following an international invitation to tender, the Government will issue licences to one or two operators. At the moment, Sonatel is operating a GSM cellular network. A DCS 1800 licence should be issued to Bouygues Telecom early in 1998. For cellular services, Sonatel will retain a monopoly on international calls until 2006.
- Mobile-satellite services: Mobile satellite communication terminals can only be used by a visitor to Senegal if their stay in Senegal does not exceed seven days and if the service provider has undertaken to supply data on calls from and to such terminals within a time-frame set by the authorities. The authorities will very shortly be setting the maximum number of operating licences, including if necessary for the installation of gateways.
- Regulation of the telecommunication sector: Senegal has made commitments under World Trade Organization's basic telecommunications agreement, to introduce by 31 December 1997 at the latest a regulatory structure promoting healthy and fair competition between operators. Up to now, regulatory matters have been handled by the Directorate of Studies and Regulation of Posts and Telecommunications.

³ Office of Posts and Telecommunications.

⁴ Source: WTO website: <http://www.WTO.org>.

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At present, the basic operator for telecommunications in Senegal is Sonatel, although one may note the presence of Access Telecom in paging and SITA in data transmission. There are also several Internet service providers.

2.2 Main characteristics of the telecommunication sector

Senegal's telecommunication sector is one of the most efficient in Africa. Sonatel is very frequently cited as the reference for operators on the African continent in terms of management and productivity.

2.2.1 Main telephone lines

The number of telephone lines stood at 127'000 at the end of 1997. Between 1990 and 1996, the total number of lines was tripled, which shows how dynamically the network is developing. There is a very heavy concentration in the Dakar area, which accounts for 69% of installed lines in Senegal.

2.2.2 Telephone density

At 31 December 1996, telephone density stood at 1.11% in Senegal. Urban telephone density stood at 2.54%, as against 0.05% in rural areas. These figures, although modest in comparison with the telephone densities registered in developing countries, are nevertheless among the highest in West Africa.

2.3 Characteristics of the national network

2.3.1 Transmission equipment

Sonatel's domestic transmission network is almost entirely digitized (85%). The total length of transmission arteries in service stands at 4'791 km for around 54.5 million km/circuits, i.e. some 32'500 circuits.

Most national links start from the town of Dakar. Sonatel's transmission network is built around three major routes:

- The northern route, towards St. Louis, Podor, Matam and Kidira, on which the links are set up over optical fibres installed during the years 1991-95 and over analogue radio-relay systems installed in the 1980s.
- The southern route, towards Koalack, Nioro, Digante, Ziguinchor, Kolda and Tambacounda, on which the links are set up by digital radio-relay systems brought into service in the 1990s.
- The eastern route, towards Diourbel, Koalack, Tambacounda and Kidira, on which the links are set up by analogue radio-relay systems; a project for the implementation of an optical fibre link is under study, under which an optical fibre has already been installed between Thiès and Diourbel in 1997.

2.3.2 Switching equipment

Sonatel has 12 automatic switching exchanges with autonomous routing in addition to two international transit centres.

The installed capacity of the exchanges has risen from 105 180 lines in 1994 to 132 397 in June 1996. The filling rate of the exchanges stands at around 70.5%. The Dakar area alone accounts for 69% of installed capacity. In 1997, switching attained a 100% digitization rate and the number of installed lines increased by 10%. In July 1997, installed capacity stood at 146 000 lines.

2.3.3 Characteristics of the international network

Sonatel's international network comprises:

- two international transit centres (ITC) in Dakar. These ITCs were brought into service in 1996;
- one international network connection centre (INCC) brought into service in 1995 to manage all international circuits;
- two centres handling the transport of telecommunication signals, comprising a submarine cable operation centre (CSM) and a satellite telecommunication centre in Gandoul (CTS-GDL).

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Most international links are set up via the INTELSAT satellite system and via submarine cables, of which there are four landing in Dakar. For regional communications, Senegal also has at its disposal a network of radio-relay links including the PANAFTTEL (CIDA) and INTELCOM 1 (ECOWAS) routes.

Satellite telecommunication centre in Gandoul (CTS-GDL)

CTS-GDL is an earth station which fulfils the function of international telephone and data transmission centre and international television centre.

Submarine cable operation centre (CSM)

The CSM is a submarine telecommunication station which also serves as an international maintenance centre for transmission. Sonatel's international network includes four submarine cables landing at Dakar at the CSM, namely:

- ANTINEA, laid in 1977 between Dakar and Casablanca (Morocco), with a capacity of 640 telephone circuits, of which 395 are currently in service; 160 circuits belong to Sonatel, which uses 155 of them.
- FRATERNITE, laid in 1978 between Dakar and Abidjan (Côte d'Ivoire), with a capacity of 480 telephone circuits, of which 375 are in service; 56 belong to Sonatel, which uses 423 of them.
- ATLANTIS-1 S1, laid in 1982 between Dakar and Recife (Brazil), with a capacity of 1'380 telephone circuits, of which 998 are in service; 12 belong to Sonatel, which uses 9 of them.
- ATLANTIS-1 S2, laid in 1982 between Dakar and Burgau (Portugal), with a capacity of 2'580 telephone circuits, of which 1'261 are in service; Sonatel has 560 circuits available, 162 of which are used.

Regional radio-relay systems

Sonatel is party to the utilization of two regional radio-relay systems, namely:

- The PANAFTTEL network, which connects five countries of the subregion (Benin, Burkina Faso, Mali, Niger and Senegal) by means of radio-relay systems. It also helps in fostering national communications, by connecting a number of towns along its route, and in bringing service to some isolated regions.
- The INTELCOM network, financed by ECOWAS, was set up following a decision by the member countries in 1979 to interconnect their capital cities by means of radio-relay networks.

2.3.4 Other telephone services provided by Sonatel

Besides the basic telephone services, Sonatel offers its subscribers the following services:

- Payphones: At the end of 1995, there were 471 Sonatel payphones.
- Telecentres: Telecentres are one of the main means of access to telephone services for populations in rural areas.
- Radio telephone: Sonatel has acquired a GSM system (ALIZE) which was commissioned in September 1996. The system installed has a capacity of 10'000 subscribers. Following an initial development phase in the Dakar area, the towns of Thiès, Mbour, Koalack, MBackhe and Touba will be served, as well as the main roads between Dakar and Thiès and Dakar and Mbour. A second stage will see the service brought to other main towns. At the end of 1997, there were 7'000 GSM subscribers.
- Telex: At 31 December 1996, Sonatel had a total of 560 main lines for telex. However, the number of telex lines is declining steadily.
- Dedicated links: Sonatel has developed a service providing dedicated links to meet the needs of some of its subscribers.
- The SENPAC network: This packet-switched transmission network (X.25 standard) has been in service since 1988. It has a capacity of 521 lines.
- Internet: As part of its policy to diversify its services, Sonatel has set up for its subscribers a local network connected to Internet over a permanent dedicated 64 kbit/s link. Sonatel offers only access over

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dedicated links; the other access services are marketed by other service providers. Dedicated access to Sonatel's access port is geared to customers with high demand wishing to connect to the local network for their own needs or to resell access or Internet services. There are about a dozen dedicated link subscribers. There are 2'219 subscribers via the switched telephone network, and 14 servers.

2.4 Sonatel's medium-term objectives

Thanks to the investment efforts deployed by Sonatel over the last ten years, the national network provides a good-quality basic telephone service and offers a range of additional services (mobile telephone, data transmission, dedicated links, Internet).

Sonatel's main technical objectives for the coming years are as follows:

- to triple the total number of fixed telephone lines by the year 2000 (around 350 000 lines), giving particular attention to the development of rural telephony;
- to introduce 50 000 mobile telephone lines by the year 2006;
- to complete full digitization of its network, and in particular international links;
- to implement new submarine cables in order to increase traffic capacity with African countries;
- to improve the quality of the services offered to its subscribers;
- to optimize real-time management of its network's technical resources;

On the economic and financial side, Sonatel will strive:

- to continue controlling costs;
- to continue increasing staff productivity;

to reduce tariffs so as to be one of the least expensive telephone operators on the African continent by the year 2000.

2.5 Network development plans

In order to meet these objectives for the development and improvement of its services, Sonatel has drawn up a movable medium-term investment plan, focusing on the following main projects:

2.5.1 Local network

The main projects for the development of local networks are expansion of the distribution network in Dakar, extension and modernization of the networks in Ziguinchor and Kolda, digitization of the network in the Diourbel area and introduction of an automatic network management system for Sonatel's network.

In order to increase the number of lines in rural areas and at the same time bring service to remote localities, Sonatel has undertaken to devote a 6% share of its investment to rural telecommunications.

2.5.2 International transmission

Several projects to digitize international links are planned, so as to replace analogue submarine cables and analogue radio-relay systems used for African regional links.

Examples include establishment of the ATLANTIS 2 (Argentina, Brazil, Senegal, Spain, Portugal) and West African (Senegal, Côte d'Ivoire, Nigeria) optical fibre cables and the installation of digital radio-relay systems such as PANAFTTEL and ECOWAS.

2.5.3 Domestic transmission

The main project in the field of national transmission is synchronization of the northern route.

2.5.4 Other services

Other projects are also planned for the provision of additional services to subscribers. These include:

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- the "Telepole" project, designed to provide advice in telecommunications and service provision to businesses;
installation of an X.400 message handling system;
- the intelligent network project, to accommodate network services such as payment by credit card, virtual private network, freephone, shared-charge numbers, premium-rate telephone services, universal number, UPT.

2.6 Sonatel's tariff structure

2.6.1 Fixed telephone tariffs

Fixed charges include an installation fee of between \$US 130 and \$US 176 and a two-monthly subscription fee of around \$US 8.

National communications

The tariff for local calls during peak-rate periods is set at one basic charge unit (BCU), i.e. around 9.5 US cents, every three minutes. Long-distance tariffs are calculated according to a tariff schedule in which Senegal is divided into three areas:

Area 1: Dakar region,

Area 2: Thiès, Diourbel, Saint-Louis, Louga regions,

Area 3: Koalack, Fatick, Ziguinchor, Kolda, Tambacounda regions.

On the basis of these areas, long-distance rates are shown in Table 2.1.

A 50% off-peak rate reduction is applied to national calls from 2000 to 0800 hours on weekdays, from 1300 hours on Saturday and all day on Sundays and national holidays.

International communications

International calls are charged according to six steps in a scale of rates. However, it is difficult to establish clearly whether the different steps are founded on geographical criteria. For instance, calls to Madagascar are charged at \$US 0.6 per minute (the same price as a minute of call to Côte d'Ivoire), whereas calls to the island of Reunion (which is close to Madagascar) are charged at \$US 1.35 per minute. The scale of rates is shown in Table 2.2.

The cost of a minute of international call varies from \$US 0.6 to \$US 2.5, i.e. a factor of four between the lowest and highest tariffs. A 20% off-peak rate reduction is offered on weekdays from 20.00 to 08.00 hours, on Saturday from 13.00 hours and all day Sunday and national holidays.

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Table 2.1: Scale of long-distance rates

In FCFA per three minute call

	Dakar	Diourbel	Fatick	Kaolack	Kolda	Louga	Saint-Louis	Tambacounda	Thiès	Ziguinchor
Dakar	50	300	300	300	300	300	300	300	300	300
Diourbel		50	300	300	300	200	200	300	200	300
Fatick			50	200	200	300	300	200	300	200
Kaolack				50	200	300	300	200	300	200
Kolda					50	300	300	200	300	200
Louga						50	200	300	200	300
Saint-Louis							50	300	200	300
Tambacounda								50	300	200
Thiès									50	300
Ziguinchor										50

Source: Sonatel.

Table 2.2: Scale of rates for international calls

In US dollars per minute

	Peak	Off-peak	BCU/min	Charging rate
	<i>(in \$US)</i>	<i>(in \$US)</i>		<i>(seconds)</i>
Step 1	2.4	2.0	29	2.04
Step 2	2.2	1.8	27	2.26
Step 3	1.9	1.5	22	2.70
Step 4	1.3	1.1	16	3.75
Step 5	1.0	0.8	12	5.00
Step 6	0.6	0.5	8	8.00

Source: Sonatel \$US 1 = 600 FCFA.

Mobile telephone tariffs

Tariffs for the GSM network comprise a connection fee (including the guarantee deposit) of \$US 169.5 and the monthly subscription fee of \$US 21. Tariffs for calls are shown in Table 2.3.

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Table 2.3: Mobile telephone tariffs in Senegal

In US Dollars per minute

	Peak	Off-peak
	<i>(in \$US/min)</i>	<i>(in \$US/min)</i>
International		
	0.17	0.13
	+ call price at prevailing international rates	
National		
Fixed to mobile	0.28	0.14
Mobile to fixed	0.28	0.14
Mobile to mobile	0.33	0.17

Source: Sonatel. \$US 1 = 600 FCFA

Table 2.4: Evolution of telephone income

In thousands of US Dollars

Revenues from:	1990	1991	1992	1993	1994	1995	1996	As % of total revenues, 1996
Telephone connection	1'360	1'012	2'218	1'339	1'175	1'447	1'579	1.30%
Telephone subscription	6'129	6'439	11'962	7'674	5'256	6'759	7'187	5.91%
Telephone traffic	63'092	63'056	109'840	68'374	46'910	60'296	66'852	55.02%
– international	<i>n.a.</i>	<i>n.a.</i>	<i>n.a.</i>	39'556	19'394	19'933	30'002	24.69%
– domestic				28'818	27'516	40'364	36'850	30.33%
Net settlements - International telephone traffic	10'050	13'535	39'154	41'648	39'500	31'270	35'688	29.37%
Mobile communications	0	0	0	0	0	109	561	0.46%
Other telephone services	21'583	21'895	35'051	20'226	9'155	9'397	9'634	7.92%
TOTAL	102'214	105'937	198'225	139'261	101'996	109'279	121'501	100%

Source: Sonatel

2.7 Breakdown of income

In 1996, income from telephone services totalled \$US 121.5 million. Income from outgoing international traffic and international settlement balances represented 54% of telephone revenue. Domestic calls represented a further 30% with the rest coming from fixed charges (7%) and other services (8%: see Table 2.4).

In terms of current dollars, Sonatel's income has stagnated on account of the devaluation of the FCFA against the French franc (-50%) in January 1994. Income from outgoing international traffic (collection charges) was halved, while international settlement balances remained more or less stable.

Since 1993, international calls have accounted for between 18 and 25% of Sonatel's telecommunication revenue. The share represented by international settlement balances, on the other hand, rose briefly to 39% in 1994 before returning back to 29% in 1995 and 1996. Over the same period, the share of income from domestic traffic rose by 10%.

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Table 2.5: Evolution of the breakdown of telephone income

In percentages

	1993	1994	1995	1996
Total fixed charges	6%	6%	8%	7%
Domestic traffic	21%	27%	37%	30%
International traffic	28%	19%	18%	25%
Net settlements - International telephone traffic	30%	39%	29%	29%
Other telephone services	15%	9%	9%	8%
TOTAL	100%	100%	100%	100%

Source: Sonatel.

3 INTERNATIONAL TELECOMMUNICATIONS

3.1 General introduction

Sonatel's international telephone traffic in 1996⁶ stood at 24.2 million minutes of outgoing traffic from Senegal and 52.8 million minutes of incoming traffic from abroad. Between 1990 and 1996, outgoing traffic increased by a factor of 1.8, as against a 2.2 times increase in incoming international traffic.

Table 3.1: Evolution of international traffic (incoming and outgoing)

In minutes of international telephone traffic, and settlement balance in US\$ 000s

	1990	1991	1992	1993	1994	1995	1996
Incoming (1)	23'601'994	26'223'671	40'743'573	40'857'896	46'080'770	48'339'442	52'805'583
Outgoing (2)	13'578'178	14'234'577	15'723'583	15'737'844	17'808'591	20'154'171	24'244'000
Ratio (1)/(2)	1.7	1.8	2.6	2.6	2.6	2.4	2.2
Balance (2-1)	-10'023'816	-11'989'094	-25'019'990	-25'120'052	-28'272'179	-28'185'271	-28'561'583
International settlement balance (in thousands of \$US)							
Balance	10'050	13'535	39'154	41'648	39'500	31'270	35'688

Source: Sonatel.

Since 1990, incoming international traffic has exceeded outgoing international traffic. However, the ratio (incoming/outgoing traffic) has altered significantly over the last six years, as shown in the Table above. Incoming international traffic grew by around 50% in 1992, while at the same time outgoing traffic grew by only 12%. This date corresponds approximately to the introduction of call-back services and other forms of call-turnaround.

On account of this sharp increase in incoming international traffic in 1992, the ratio (incoming/outgoing traffic) rose to its highest level in the years 1992 and 1994, namely 2.6. Since 1994, outgoing international traffic has grown at a faster rate than incoming international traffic, thereby bringing the ratio (incoming/outgoing traffic) down to 2.2 in 1996.

At the same time, the international settlement balance increased fourfold between 1990 and 1992. However, since 1993, due to the combined effect of the rapid increase in outgoing international traffic and the reduction in the unit value of the settlement rate, the international settlement balance has declined, by 5% in 1994 and 20% between 1994 and 1995. This trend was reversed, however, in 1996, when an increase in the balance from international settlements of 15% was registered. Figure 3.1 gives a comparative analysis of the rates of the volumes and growth of international traffic and settlement balances.

3.2 Detailed analysis of international traffic

3.2.1 Incoming international traffic

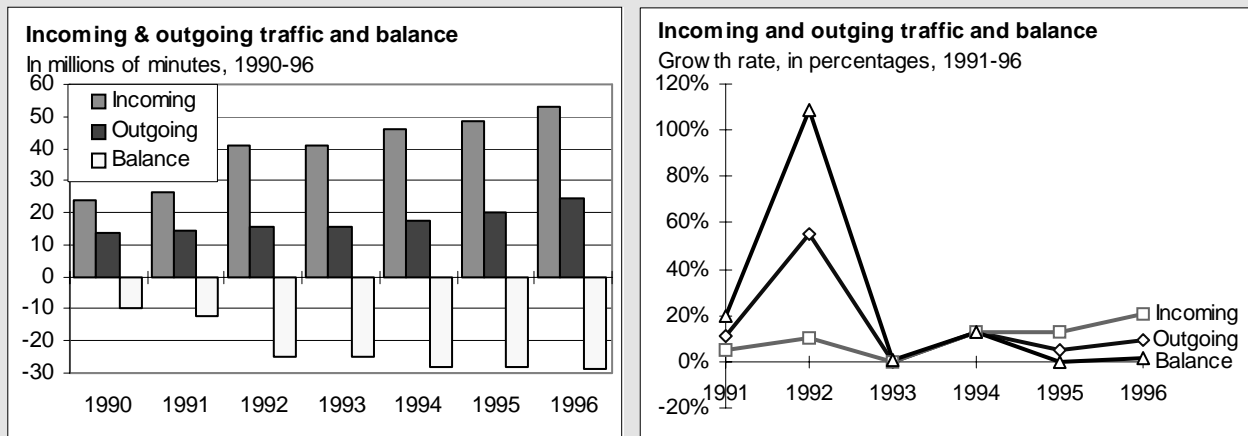
Europe accounts for the major proportion of Senegal's international traffic. Some **62% of incoming international traffic in Senegal comes from European countries**. Senegal's main European correspondent is France, which in 1996 accounted for over one-third of total incoming international traffic. The second largest geographical area in terms of generating incoming international traffic in Senegal is the Americas region (primarily North America). In 1996, international traffic from this area represented over a quarter of total incoming traffic. The breakdown of incoming international telephone traffic altered somewhat between 1990 and 1996. The proportion of calls from African countries has been cut by half, while the proportion of calls from the American continent has risen by some 7%. The proportion of incoming international traffic from Europe has remained stable, although the share of traffic from France has fallen by around 10%, mainly in favour of Italy.

⁶ Estimate.

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Figure 3.1: International traffic

Volumes of traffic in minutes, and growth rates in percentages, for incoming, outgoing and balance of international traffic, 1990/91 - 1996



Source: Sonatel.

Table 3.2: Analysis of incoming international traffic by geographical area

Area of the world	1990	1993	1996
Africa	14.06%	11.64%	7.33%
America	19.95%	21.11%	26.64%
Europe	62.02%	66.94%	61.60%
<i>of which France</i>	44.12%	32.11%	35.85%
<i>of which Italy</i>	9.45%	23.50%	15.60%
Rest of world	3.97%	0.30%	4.42%
Total	100.00%	100.00%	100.00%

Source: Sonatel.

Incoming international telephone traffic is highly concentrated, some 80% of it coming from only four countries: France, Italy, the United States and Côte d'Ivoire. Table 3.3 shows the evolution of incoming telephone traffic for Sonatel's 20 main correspondents. The most remarkable feature is the exponential increase in traffic from Italy in 1992; that traffic rose from 2.7 million minutes in 1991 to 10 million minutes in 1992, probably due to an increase in transit or refile traffic, routed via Italy.

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Table 3.3: Incoming international traffic (in minutes): Sonatel's main correspondents

Area of world	Country	1990	1991	1992	1993	1994	1995	1996 ²	Breakdown 96
France	France	10 412 163	11 293 949	12 559 420	13 117 523	14 897 573	15 606 750	18 931 994	35.85%
Europe	Italy	2 231 139	2 738 302	10 031 812	9 614 660	9 295 571	7 277 189	8 227 750	15.58%
America	USA/ATT	3 055 240	4 351 083	6 372 144	5 345 374	5 177 150	7 400 864	7 414 098	14.04%
America	USA/MCI	498 031	1 696 560	1 448 498	1 929 486	3 692 458	4 171 010	5 684 046	10.76%
Subregion	Côte d'Ivoire	1 548 311		1 300 103	1 112 145	1 457 797	1 609 958	2 247 095	4.26%
Europe	Spain	402 599	542 472	948 832	2 088 154	2 028 352	1 094 710	1 444 552	2.74%
Europe	Germany	508 399	580 522	795 384	961 104	1 032 835	1 182 834	1 337 184	2.53%
Europe	United Kingdom	317 924	353 878	447 543	414 728	466 846	786 437	1 020 648	1.93%
America	Canada	348 582	420 178	1 174 993	670 910	979 185	538 950	964 917	1.83%
Europe	Switzerland	417 226	467 471	531 424	554 780	648 598	727 859	791 904	1.50%
Europe	Belgium	239 865	287 315	353 328	426 145	537 804	480 493	610 520	1.16%
Subregion	Morocco	238 407	206 613	323 198	345 738	345 780	380 001	429 706	0.81%
Subregion	Gambia	431 185	210 331	574 520	527 697	622 258	419 378	318 613	0.60%
Subregion	Burkina Faso	218 885	186 488	227 499	198 844	222 008	241 773	250 317	0.47%
Subregion	Guinea Bissau	108 070			129 973	148 456	163 158	247 663	0.47%
Subregion	Niger	102 567			77 041	126 847	92 218	189 712	0.36%
Europe	Netherlands	109 489	129 714	155 600	174 015	184 883	205 331	166 210	0.31%
Subregion	Benin	110 726	88 794	95 662	117 357	152 512	177 658	117 298	0.22%
Subregion	Guinea/Cry	105 779	217 343	105 574	244 584	297 876	133 043	69 579	0.13%
America	USA/Sprint	805 928	566 107	331 103	679 311	201 309	10 188	5 941	0.01%
Subregion	Mauritania	64 999	274 404	524 577					0.00%
Subregion	Mali	388 606	792 439	691 043	712 782	742 168	748 878		0.00%
Africa	Gabon				1 291 296	1 267 915			0.00%
<i>Rest of world</i>	<i>Other countries</i>	937 874	819 708	1 751 316	124 249	1 554 589	4 890 762	2 335 836	4.42%
	TOTAL	23 601 994	26 223 671	40 743 573	40 857 896	46 080 770	48 339 442	52 805 583	100.00%

Notes: ¹Data for terminal + transit traffic. ²1996 provisional data

Source: Sonatel

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Table 3.4: Outgoing international traffic (in minutes): Main correspondents

Area of world	Country	1990	1991	1992	1993	1994	1995	1996 ²	Breakdown 96
France	France	7 547 233	7 923 905	7 940 163	7 727 330	8 526 480	9 537 290	10 990 947	45.33%
Subregion	Côte d'Ivoire	881 216	933 325	1 046 538	1 095 758	1 139 789	1 355 573	1 884 333	7.77%
Subregion	Gambia	431 185	513 408	623 606	698 748	729 364	763 915	977 191	4.03%
Europe	Italy	153 265	596 154	714 660	621 230	833 955	704 148	910 418	3.76%
America	USA/ATT	562 649	178 810	341 961	443 398	515 358	590 740	900 141	3.71%
Subregion	Mali	388 606	455 086	541 113	619 641	701 138	823 543	874 786	3.61%
America	USA/MCI	74 883	516 024	495 903	413 593	564 399	795 228	685 759	2.83%
Europe	United Kingdom	196 886	258 802	333 720	290 052	350 770	364 675	586 615	2.42%
Subregion	Mauritania	72 019	110 012	210 484	179 473	309 773	373 502	517 697	2.14%
Europe	Spain	251 264	292 244	310 222	298 516	340 831	454 530	500 054	2.06%
Subregion	Guinea/Cry	90 228	138 256	137 698	154 408	262 601	316 485	494 388	2.04%
Europe	Belgium	232 492	257 974	280 134	300 715	326 675	345 088	430 880	1.78%
Subregion	Morocco	182 225	200 715	259 918	295 873	328 128	340 141	417 358	1.72%
Africa	Gabon	191 975	194 747	243 970	256 131	269 796	315 797	410 809	1.69%
Europe	Germany	194 935	194 437	214 534	203 839	245 802	305 592	382 162	1.58%
Europe	Switzerland	236 921	239 204	254 009	247 315	280 010	310 941	351 028	1.45%
Subregion	Burkina Faso	81 915	109 134	132 745	165 838	197 334	256 026	342 619	1.41%
America	Canada	206 192	135 002	204 077	217 902	245 671	291 932	329 679	1.36%
Subregion	Guinea Bissau	90 228	77 190	117 220	132 329	164 182	187 893	276 219	1.14%
Subregion	Benin	110 726	133 933	154 983	155 764	206 391	214 975	272 762	1.13%
Subregion	Niger	102 587	97 167	90 495	87 567	113 195	113 291	161 239	0.67%
Europe	Netherlands	60 514	62 176	72 007	83 055	85 897	97 718	113 792	0.47%
America	USA/Sprint								0.00%
<i>Rest of world</i>	<i>Other countries</i>	<i>1 238 034</i>	<i>616 872</i>	<i>1 003 423</i>	<i>1 049 369</i>	<i>1 071 052</i>	<i>1 295 148</i>	<i>1 433 124</i>	<i>5.91%</i>
	TOTAL	13 578 178	14 234 577	15 723 583	15 737 844	17 808 591	20 154 171	24 244 000	100.00%

Source: Sonatel

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3.2.2 Outgoing international traffic

The breakdown of outgoing international traffic differs very markedly from that of incoming traffic (Table 3.4). Africa counts for a much more significant proportion of outgoing than incoming international traffic, unlike the American continent. Europe is still the main continent for international calls placed by Sonatel's subscribers, alone attracting 58.8% of outgoing calls from Senegal. Outgoing traffic is directed primarily to France, which receives 45% of outgoing calls. Italy only represents a small proportion of outgoing international traffic, with 3.7% of calls. After Europe, Sonatel subscribers call African countries, which represent 27% of outgoing calls. The three countries called most frequently are Côte d'Ivoire, Gambia and Mali. Between 1990 and 1996, the proportion of outgoing traffic from Senegal to other African countries rose from 19% to 27%. Calls to the American continent (primarily North America) account for no more than 7% of total outgoing calls. This proportion has remained stable over the last six years.

Table 3.5: Analysis of outgoing international traffic by geographical area

Area of the world	1990	1993	1996
Africa	19.32%	24.41%	27.34%
America	6.21%	6.83%	7.90%
Europe	65.35%	62.09%	58.84%
<i>of which France</i>	<i>55.58%</i>	<i>49.10%</i>	<i>45.33%</i>
Rest of world	9.12%	6.67%	5.91%
Total	100.00%	100.00%	100.00%

Source: Sonatel

Outgoing international traffic is less concentrated than incoming international traffic. The four main correspondents, namely France, Côte d'Ivoire, Gambia and Italy, account for only 61% of outgoing international traffic. If we look at the top 80% of outgoing international traffic, we see that this includes traffic to no fewer than 12 correspondents. Table 3.4 shows the evolution of outgoing international traffic over the last six years for Senegal's first 20 correspondents.

3.3 Analysis of international settlement rates and international tariffs

Between 1990 and 1996, international telephone tariffs for the public have been reduced by 55% for all destinations. Over the same period, the settlement rates have also fallen. However, their fall has not been as uniform as the reduction in tariffs. The average settlement rate for America has declined by 18%, while over the same period the settlement rate for Europe fell by 28%.

For Europe and America, the level of Senegal's settlement rates is on average slightly below half of the peak-rate international tariff. Settlement rates for Africa are very close to the price of outgoing international calls, thus leaving Senegal only a very small margin on such calls.

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International settlement rates remained stable between 1990 and 1993. The settlement rates for Europe and Africa have been declining since 1994, whereas those in respect of America have only been declining since 1996. However, settlement rates to the United States remain lower than those to Europe even though the tariff to the United States is higher. Thus the mark-up on the settlement rate is much higher for outgoing calls to the United States.

Table 3.6: Comparison of the evolution of settlement rates and international tariffs (in \$US)

Area of the world	1990	1991	1992	1993	1994	1995	1996	% 90-96
AMERICA								
Peak-rate tariffs	5.41	4.63	5.06	4.19	2.59	2.69	2.39	-56%
Off-peak rate tariffs	4.33	3.27	4.04	3.35	2.07	1.90	1.73	-60%
Settlement rate	1.30	1.30	1.30	1.30	1.30	1.30	1.30	0%
Settlement rate as % of peak-rate tariff	24%	28%	26%	31%	50%	48%	54%	
EUROPE								
Peak-rate tariffs	4.35	3.73	3.70	3.37	2.08	2.17	2.01	-54%
Off-peak rate tariffs	3.48	2.91	2.96	2.69	1.64	1.69	1.57	-55%
Settlement rate	1.54	1.53	1.58	1.60	1.51	1.63	1.46	-5%
Settlement rate as % of peak-rate tariff	35%	41%	43%	47%	72%	75%	73%	
AFRICA								
Peak-rate tariffs	1.52	1.31	1.40	1.18	0.73	0.76	0.70	-54%
Off-peak rate tariffs	1.22	1.04	1.12	0.94	0.58	0.61	0.56	-54%
Settlement rate	0.64	0.63	0.67	0.64	0.53	0.58	0.53	-17%
Settlement rate as % of peak-rate tariff	42%	48%	48%	54%	73%	77%	75%	

Source: Sonatel

The balance of international traffic (incoming/outgoing) showed a surplus of 28.5 million minutes in 1996. This balance has been stable since 1994. It is concentrated on three destinations, which account for some 93% of the balance, namely:

- United States - balance: 11.4 million minutes;
- France - balance: 7.9 million minutes;
- Italy - balance: 7.3 million minutes.

The greatest traffic imbalance is with the United States, since outgoing traffic to the United States represents only 13.7% of total traffic exchanged between the two countries. There is a small deficit on the balances of telephone traffic to other countries in Africa. Table 3.7 shows the balances of international traffic for Sonatel's first 20 correspondents.

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Table 3.7: Evolution of the balance of international traffic (in minutes) (incoming/outgoing)

Area of world	Country	1990	1991	1992	1993	1994	1995	1996 ²	Breakdown 96
France	France	2 864 930	3 370 044	4 619 257	5 390 193	6 371 093	6 069 460	7 941 047	27.80%
Europe	Italy	2 077 874	2 142 148	9 317 152	8 993 430	8 461 616	6 573 041	7 317 332	25.62%
America	USA/ATT	2 492 591	4 172 273	6 030 183	4 901 976	4 661 792	6 810 124	6 513 957	22.81%
America	USA/MCI	423 148	1 180 536	952 595	1 515 893	3 128 059	3 375 782	4 998 287	17.50%
Europe	Germany	313 464	386 085	580 850	757 265	787 033	877 242	955 022	3.34%
Europe	Spain	151 335	250 228	638 610	1 789 638	1 687 521	640 180	944 498	3.31%
America	Canada	142 390	285 176	970 916	453 008	733 514	247 018	635 238	2.22%
Europe	Switzerland	180 305	228 267	277 415	307 465	368 588	416 918	440 876	1.54%
Europe	United Kingdom	121 038	95 076	113 823	124 676	116 076	421 762	434 033	1.52%
Subregion	Côte d'Ivoire	667 095	-933 325	253 565	16 387	318 008	254 385	362 762	1.27%
Europe	Belgium	7 373	29 341	73 194	125 430	211 129	135 405	179 640	0.63%
Europe	Netherlands	48 975	67 538	83 593	90 960	98 986	107 613	52 418	0.18%
Subregion	Niger	-20	-97 167	-90 495	-10 526	13 652	-21 073	28 473	0.10%
Subregion	Morocco	56 182	5 898	63 280	49 865	17 652	39 860	12 348	0.04%
America	USA/Sprint	805 928	566 107	331 103	679 311	201 309	10 188	5 941	0.02%
Subregion	Guinea Bissau	17 842	-77 190	-117 220	-2 356	-15 726	-24 735	-28 556	-0.10%
Subregion	Burkina Faso	136 970	77 354	94 754	33 006	24 674	-14 253	-92 302	-0.32%
Subregion	Benin	0	-45 139	-59 321	-38 407	-53 879	-37 317	-155 464	-0.54%
Africa	Gabon	-191 975	-194 747	-243 970	1 035 165	998 119	-315 797	-410 809	-1.44%
Subregion	Guinea/Cry	15 551	79 087	-32 124	90 176	35 275	-183 442	-424 809	-1.49%
Subregion	Mauritania	-7 020	164 392	314 093	-179 473	-309 773	-373 502	-517 697	-1.81%
Subregion	Gambia	0	-303 077	-49 086	-171 051	-107 106	-344 537	-658 578	-2.31%
Subregion	Mali	0	337 353	149 930	93 141	41 030	-74 665	-874 786	-3.06%
Rest of world	Other countries	-300 160	202 836	747 893	-925 120	483 537	3 595 614	902 712	3.16%
	TOTAL	10 023 816	11 989 094	25 019 990	25 120 052	28 272 179	28 185 271	28 561 583	100.00%

Note: ¹Data terminal + transit. ²Provisional data.

Source: Sonatel.

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It can be seen from the evolution of the balances of accounts exchanged with Sonatel's 20 main correspondents how important this income is for the company's turnover. Total revenue from balances of accounts with its 20 main correspondents represents 27% of Sonatel's telephone income. Receipts of \$US 17.5 million are generated by the positive balances of settlement rates with the countries of Europe, and \$US 12.3 million by the positive balances with countries on the American continent.

Table 3.8: Evolution of the balance of net settlement payments for Sonatel's 20 main correspondents (in US\$)

Area of the world	1990	1991	1992	1993	1994	1995	1996	% 96
America (1)	5 023 274	8 065 320	10 770 236	9 815 244	11 342 076	13 576 046	12 343 994	42%
Europe (2)	7 547 481	8 294 384	21 841 583	27 882 098	21 776 226	19 410 735	17 591 769	60%
Africa (3)	651 260	-747 648	-161 882	78 341	149 783	-230 669	-819 834	-3%
Total (1+2+3)	13 222 015	15 612 055	32 449 936	37 775 683	33 268 085	32 756 111	29 115 930	
% Turnover (telecommunication services)				33%	36%	33%	27%	

Source: Sonatel

4 EVALUATION OF COSTS FOR INTERNATIONAL TELEPHONE SERVICES

4.1 Estimate of costs for the international telephone service

This section is closely related to the next section, the aim of which is to test scenarios for future development of the international accounting system based on settlement rates. A number of scenarios take as the future target for international settlement rates the "price cap" system proposed by the American regulator FCC in its Order No. 97-280 of 18 August 1997.

It is thus worthwhile comparing the cost levels proposed by FCC with those which we shall calculate for Senegal on the basis of Sonatel's accounts. First, we shall briefly outline the methodology used by FCC and the results which it produces. We shall then give our evaluation of costs for Senegal and some considerations on the level of cross-subsidies between the different telephone services.

4.2 FCC methodology and result

In August 1997, FCC published an order setting a price cap which American international telephone service operators should not exceed in paying foreign operators for the termination of traffic from the United States. To set this benchmark, FCC would have liked to use a calculation method based on long-range incremental costs (TSLRIC), since economic theory holds that in a "totally" competitive market prices ultimately tend towards incremental costs. However, FCC was unable to use this method to set its benchmark, for lack of detailed data on foreign operators required to calculate long-range incremental costs.

Therefore, FCC developed another model, called the tarified components price methodology (TCP), loosely based on the cost components identified in ITU-T Recommendation D.140. This Recommendation lays down guidelines concerning the cost elements to be taken into consideration in determining settlement rates applicable to the international telephone service. The TCP methodology endeavours to identify, for a given sample of countries, costs relating to the three network components used to provide the international telephone service, namely:

- 1) international transmission;
- 2) international switching;
- 3) national extension.

The amounts calculated by FCC for components 1 and 3 are based on the foreign operators' tariffs. The portion of the tariff relating to the use of international transmission infrastructures is calculated on the basis of the tariffs for leased links. The portion relating to the national extension is calculated on the basis of the foreign operators' tariffs for domestic calls. The portion relating to international switching is calculated on the basis of the principles set forth in ITU-T Recommendation D.300 R, which is based upon the degree of digitization of exchanges.

In order to take account of prevailing disparities in the level of economic development of the different countries, FCC decided to set its benchmark for four categories of country:

- 1) low income: GDP per capita < \$US 726
- 2) lower middle income: GDP per capita US\$726 - 2'895
- 3) upper middle income: GDP per capita US\$2'896 - 8'955]
- 4) high income: GDP per capita > \$US 8'955.

Taking this approach, we end up, for each category of country, with an amount for the settlement rate which American operators should pay foreign operators and the date on which the benchmark is to take effect.

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Table 4.1: FCC price cap

Category of country	High income	Upper middle	Lower middle	Low income
Price cap in \$US/min	0.15	0.19	0.19	0.23
Date of introduction	1998	1999	2000	2001/2002

Source: FCC.

On the basis of a sample of countries classified according to their income category, the FCC calculated the mean of the three cost elements (international transmission, international switching and national extension) for each category of country.

On the basis of the information available in FCC's Order No. 97-280 of 18 August 1997, we have reconstituted, for low income countries, the costs of these three components required for the provision of international telephony. The results are given in Table 4.2.

Table 4.2: FCC benchmark for a sample of low income countries

In US cents	International transmission	International switching	National extension	Total
China	8.7	4.8	4.2	17.7
Egypt	10.4	4.8	2.0	17.2
Guyana	6.6	4.8	0.6	12.0
Haiti	8.6	4.8	17.0	30.4
Honduras	3.1	4.8	8.7	16.6
Kenya	25.5	4.8	12.3	42.6
India	8.1	4.8	18.3	31.2
Nicaragua	3.8	4.8	18.3	31.2
Pakistan	14.7	4.8	7.2	26.7
Viet Nam	9.3	4.8	10.6	24.7
Mean FCC benchmark	10	5	8	23

Source: FCC Report and Order No. 97-280 dated 18 August 1997.

Table 4.2 shows that there are large variations in costs, reflecting the wide range of different situations of telephone operators.

Senegal was erroneously classed by FCC as a low income country, with a teledensity of less than 1⁷. Therefore, the benchmark which FCC wishes to see American operators apply in their telephone relations with Senegal is \$US 0.23 per minute⁸. In the section below, different approaches are used to attempt to

⁷ FCC Order No. 97-280 dated 18 August 1997, Appendix C: Classification of Economies.

⁸ In the ITU's classification, Senegal has been classed as a lower-middle income country since 1995, in line with the classification used by the World Bank. The FCC erroneously uses older World Bank data, relating to 1994. Furthermore, Senegal's true teledensity now exceeds 1. The scenarios in chapter five referring to the FCC benchmark will be based on the correct classification (US\$ 0.19) rather than those established by the FCC (US\$ 0.23).

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determine for Senegal the cost of the three components necessary for the transmission of international traffic. The costs will then be compared with those proposed by the FCC price cap.

4.3 Determination of costs for incoming international telecommunications in Senegal

4.3.1 General comments on the methodology

The main question which arises when seeking to determine tariffs for telecommunication services (local, long-distance and international) set up using infrastructure that may be shared by several services⁹ and entails fixed costs is to establish where economies of scale are achieved. Research carried out on tariff principles for telecommunications offers different solutions:

- **Tariffs may be set as a function of the utility of the service.** Since groups of users do not all display the same service usefulness functions, prices can be increased on the least elastic segments in order to cover fixed costs. This tariff method is called a Ramsey type method.
- **Tariffs may be set using the fully distributed cost method.** Under the Fully Distributed Costs (FDC) method, fixed costs are distributed among the telephone services more or less arbitrarily.
- **Tariffs may be set so as to charge for services according to the actual costs each entails** (called incremental costs) and cover fixed costs (network access) with a set fee independent of usage. This is called a "cost-based" tariff method.
- **Another system consists in basing tariffs on long-range incremental costs (TSLRIC)** to which is added a "reasonable share" of the costs common to several services. In a long-range calculation, the company's costs can be assimilated to variable costs or disregarded. The cost to be calculated is thus the additional cost which the company incurs in order to provide the service.

The following section shows the cost results obtained for the international telephone service in Senegal using, first, the fully distributed cost method and, second, the cost-based method (incremental costs).

The Ramsey tariff method is difficult to apply without adequate data on user groups' utility functions, or at least information on the price elasticity of their demand for services.

The long-range incremental cost method provides a theoretically optimum result. However, modelling in this method requires extremely precise information which is difficult to obtain. For this reason, this method has not been used in this case study.

4.3.2 Estimation of costs

The results of the two methods used (fully distributed costs and incremental costs) are presented below. As mentioned above, the fully distributed cost method allocates all the direct costs of the services plus a proportion of shared fixed costs. Conversely, the incremental cost method prices a service solely on the basis of the direct costs of that service, and fixed costs are covered by the subscription. It may therefore be considered that the fully distributed cost method tends to subsidize network access costs, which are borne by all the other services (local, long-distance, international). For small networks still under development, such a subsidy may be necessary to avoid setting absolutely prohibitive tariffs.

4.3.3 Data used

Very good information is available in Sonatel's analytical accounts for 1996. As a result, we were able to allocate the costs directly attributable to the international telephone service on the basis of the three cost elements identified in ITU-T Recommendation D.140, namely international switching, international transmission and national extension.

⁹ In Senegal, the international transit centres are also used as national transit centre in Dakar.

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For remuneration of equity capital, we decided (given Sonatel's very low level of debt, less than 10% of permanent capital) on a rate of return of 15% on fixed assets, which can easily be allocated to the various telephone services.

Indirect costs or shared costs were allocated to the different telephone services according to the respective proportion of traffic they each generate. In this connection, Sonatel supplied us with valuable traffic observation data, from which we were able to estimate¹⁰:

- the breakdown of total telephone traffic in Senegal into incoming and outgoing international traffic, local traffic and long-distance traffic;
- the distribution of incoming international traffic throughout the country;
- the mean duration of local, long-distance and outgoing international calls.

Using the data from the analytical accounts for 1996, from which the items relating to non-telephone services (telex, telegraph) were subtracted, the following results were obtained:

- under the incremental cost method, a cost per minute of 147.3 FCFA (= \$US 0.28);
- under the fully distributed cost method, a cost per minute of 178.4 FCFA (= \$US 0.33).

In order to draw a parallel with the figures given by the FCC benchmark, these costs were broken down into the three components of an international communication.

Three types of results are presented, in which the of participation by call charges in the financing of the network varies from 0% (incremental cost) to a 100% (fully distributed cost).

Table 4.3: International service costs according to level of subsidy

In US cents	International transmission	International switching	National extension	TCP	% of network access financing by other services
	<i>10</i>	<i>4</i>	<i>19</i>	<i>33</i>	<i>100%</i>
	<i>10</i>	<i>4</i>	<i>16</i>	<i>31</i>	<i>50%</i>
	<i>10</i>	<i>4</i>	<i>14</i>	<i>28</i>	<i>0%</i>
Benchmark FCC					
Low income country	10	5	8	23	

Source: Case study, FCC.

The costs of the network elements used in the provision of international telephone services vary (according to the rate of subsidy of network access costs taken) between 28 US cents and 33 US cents. In comparison with the FCC benchmark, the incremental cost (28 US cents) is at least:

- 20% higher than that calculated for low income countries (23 US cents);
- 45% higher than that calculated for middle income countries (19 US cents).

The results obtained are interesting, since the incremental cost calculated (disregarding indirect or shared costs, such as commercial, marketing and administrative expenses) is much higher than the FCC price cap. The main difference lies in the costs for the national extension. This analysis would suggest the need for Senegal to rebalance its local tariff structure. The costs of international switching and international

¹⁰ For reasons of confidentiality, these data used in the determination of costs are not disclosed, with the exception of incoming and outgoing international traffic flows (shown in the previous sections).

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transmission, on the other hand, seem to be correctly estimated by FCC. It is true that they are relatively independent of local conditions.

4.4 Estimate of cross-subsidies between the international and domestic services

A first approximation of the current level of cross-subsidies between services may be obtained by comparing a breakdown of traffic with a breakdown of telephone income.

Table 4.4: Comparison between income and traffic figures

	Income in %	Traffic in %
Connection	1.4%	
Subscription	6.5%	
Billed traffic	60.1%	90%
– local	12.0%	59.8%
– long-distance	21.0%	25.6%
– outgoing international	27.1%	4.6%
Net international settlement balance	32.1%	10%
Total	100%	100%

Source: Case study, Sonatel.

Local traffic, which accounts for nearly 60% of the traffic handled in Senegal, generates only 12% of income. International traffic accounts for barely 5% of Senegal's total traffic, yet brings in nearly 27% of Sonatel's income. Income from the balance of international accounts is also high (32%) even though incoming international traffic represents only 10% of the total traffic handled in Senegal.

Subscription fees account for only 6.5% of income, whereas Sonatel's fixed costs represent some 54% of total costs.

The results anticipated in the previous analysis are confirmed. When current tariffs are compared with the incremental costs of services, the international service¹¹ yields a surplus of \$US 0.93 per minute, which serves to assist the financing of both the local telephone service and network access costs. The current long-distance tariff is very slightly below the corresponding incremental cost.

This comparison gives us orders of magnitude for the levels of “cross subsidies”. Although it is accepted that tariffs should be cost-oriented, state-owned or partially state-owned operators in the developing countries cannot however simply reconfigure their tariffs overnight.

¹¹ This calculation takes account of the surplus generated by both outgoing and incoming international services. The surplus for the outgoing international service was calculated by taking the difference between the weighted mean tariff Sonatel bills its subscribers and the sum of the incremental cost (\$US 0.28) and the weighted mean settlement rate that Senegal pays out to its correspondents. The surplus for the incoming international service is equal to the difference between the weighted mean settlement rate received by Senegal and the incremental cost of the service (\$US 0.28).

5 FUTURE SCENARIOS FOR THE INTERNATIONAL ACCOUNTING RATE SYSTEM

5.1 Methodology and principles

The main purpose of all of the scenarios proposed here is to try to assess the impact that a significant decline in accounting rates and/or a change in the way they are set would have on operators in terms of:

- loss of income;
- rebalancing their tariff schedule;
- ability to sustain their development programme.

Modelling all the effects induced by a fall in accounting rate levels is a complex operation and requires a vast amount of data, some of which (price elasticity, etc.) are not available and have to be estimated.

In order to try to take into account the most important effects in developing scenarios with the data available, the following hypotheses have been used.

Elasticity of demand in relation to the price of international calls:

One of the objectives sought by FCC in its proposal to reform the accounting rate system is to bring the benefits of lower international tariffs to all consumers¹². In order to model the effects of lower accounting rates, therefore, information is required on the elasticity of demand for international calls between the different operators in relation to the prices they charge. This type of information is rare, and impossible to obtain for all telephone operators. However, relatively recent studies offer some useful guidance.

Bewley and Fiebig (1988) demonstrated that, overall, the number of calls is rather inelastic in relation to price, whereas call duration varies significantly as a function of price. In addition, this direct price elasticity may vary according to subscriber anticipation of price. Acton and Vogelsang (1990) showed that there exists (particularly in the United States) an interdependence between incoming calls, outgoing calls and call externality. This elasticity is called cross-price elasticity.

In the simulation of the scenarios proposed below, only direct price elasticity has been simulated. It has been taken into account both for outgoing international traffic from Senegal and for incoming international traffic to Senegal, **so as to simulate a general reduction in the price of international communications everywhere.**

In the absence of precise data on elasticity levels, various hypotheses have been tested. It is widely accepted that this type of elasticity is generally less than one. The following values of price elasticity were tested: (0.4, 0.6, 0.8).

Some studies have suggested that demand elasticity in relation to the price of international calls in the United States is between 0.9 and 0.8. In order to take account of the significant disparities in income between inhabitants of the developing countries and those of other countries and different consumer habits, a lower figure (0.6) was taken.

Since this elasticity applies for variations in tariffs, we have assumed that Senegal's correspondents would reflect any reduction in accounting rates in their international tariffs. The international tariffs of Sonatel's main correspondents were identified (France, Italy, United States) in order to assess the weight of Senegal's settlement rate in tariffs for calls to those countries.

The reduction in international tariffs for outgoing traffic from Senegal was determined according to the constraints imposed by rebalancing of Sonatel's tariff schedule and development of its network.

¹² FCC Order, § 7: Accounting rate reform will allow consumers to receive higher quality service, more service options and lower rates as accounting rates are reduced to a more cost-based value...

Tariff rebalancing

Sonatel's tariff schedule is currently unbalanced. In Chapter 4 of this study, the current level of cross-subsidies between services is estimated and indications are given on the level of incremental costs for the different telephone services. Sonatel's objective is to rebalance this tariff schedule as quickly as possible, in order to have competitive tariffs for all of its services by the time the telecommunication sector is fully liberalized in 2003. The scenarios described below take account of this objective and propose a rebalancing of Sonatel's tariff schedule by the year 2003.

This rebalancing aims to make tariffs cost-oriented. However, tariffs for telephone services in the developing countries are often set by the responsible ministry which often has to take political considerations into account. To reflect this state of affairs, we have made tariffs cost-oriented while at the same time allowing some cross-subsidies to remain. The following subsidies are maintained:

- Subscription charge subsidized by other telephone services to the tune of 60%.
- Price of local calls subsidized by the price of international calls to the tune of 20%.

With these hypotheses, the tariff rebalancing shown in Table 5.1 can be achieved:

Table 5.1: Hypotheses for rebalancing Sonatel's tariff schedule

	1996 tariff	2003 tariff
Income from subscriptions	10%	17%
Income from calls	90%	83%
– <i>National</i>	40%	70%
– <i>International</i>	50%	13%
Total subscription + calls	100%	100%

Source: Case study.

According to these hypotheses, by the year 2003:

- the price of international calls would fall by 67% in relation to current average tariffs;
- tariffs for long-distance calls would increase by only 12%;
- the price of the subscription would increase by 72%;
- the tariff for local calls would be multiplied by a factor of 1.45.

Network development plan and investment financing policy

In 1997, the number of installed telephone lines in Senegal stood at some 127'000 fixed lines and 7'200 mobile lines. In line with the network development commitments undertaken by Sonatel's reference shareholders vis-à-vis the responsible ministry, by 2006 Senegal should have some 350'000 telephone lines and around 50'000 mobile telephone lines. These figures are to be achieved through rapid growth between 1998 and 1999 (around +25% per year) followed by more moderate growth between 2000 and 2007 (around 10% per year). According to these hypotheses, telephone density in Senegal should be approaching 3.2% in 2006.

In order to cope with this extremely fast growth in its number of lines, Sonatel has planned a significant investment programme over five years. Total investment in technical facilities amounts to some 187.5 billion FCFA (\$US 312.6 million). The average price of a fixed telephone line is around \$US 1'450.

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This relatively high price is due to the programme for coverage of rural areas, investments in respect of which account for nearly 14% of the company's investments.

For many years now, investment has been almost entirely financed by internal cash generation. In 1996, Sonatel's debt ratio¹³ stood at 7%. Sonatel's financial independence is one of the priorities set by the General Directorate. Thus, in the main, the 1997-2003 investment programme will be self-financed. In discussion on the scenarios, Sonatel's rate of self-financing of investment and the level of its debt will be two key indicators of the impact of lower accounting rates.

Traffic development hypothesis

International traffic

In 1996, the volume of incoming international traffic was 2.4 times that of outgoing international traffic in Senegal. In view of this specific characteristic, the tariff hypotheses seek to reduce this factor, bringing the figure down to 1.8 in 2003. The greatest disparity is found in the balance of traffic relating to the North America area. In 1996, international traffic from this geographical area exceeded outgoing traffic from Senegal by a factor of seven. The traffic development hypotheses assume that this factor will be reduced to 5.7 by 2003.

It is more or less certain that an imbalance will persist in the medium term for the directions in question (Italy, France and the United States). The difference in purchasing power between Senegalese emigrants living in the industrialized countries and their families back home is such that, for this customer segment, international calls will always be set up in the direction foreign country - Senegal. Furthermore, even if this effect is difficult to measure, call-back and refile operators will always take advantage of the difference in tariff levels at the two ends.

Incoming international traffic has been broken down into four groups from the following geographical areas: Europe, North America, Africa and rest of the world. The evolution of incoming international traffic has been broken down into two periods, 1997-2000 and 2001-2003. In the first period, it is assumed that traffic will increase significantly with the digitization of international links. For the period 2001-2003, a lower traffic growth rate is assumed.

Under these hypotheses, incoming international traffic increases from 57.8 million minutes in 1996 to 120.1 million minutes in 2003 (Table 5.2).

Table 5.2: Growth hypotheses for incoming international traffic from different origin regions

Incoming international traffic from:	Annual growth rate (1997-2000)	Annual growth rate (2001-2003)
Europe	15%	10%
North America	15%	10%
Africa	10%	7%
Rest of the world	12%	9%

Source: Case study.

¹³ Ratio: Long-term debts/permanent capital.

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Outgoing international traffic has been broken down into four groups for the same geographical areas as incoming international traffic. The traffic growth hypotheses are as shown in Table 5.3:

Table 5.3: Growth hypotheses for outgoing international traffic from different origin regions

Outgoing international traffic to:	Annual growth rate (1997-2000)	Annual growth rate (2001-2003)
Europe	18%	13%
North America	20%	15%
Africa	20%	15%
Rest of the world	15%	10%

Source: Case study.

Under these hypotheses, outgoing international traffic would rise from 24 million minutes in 1996 to 70 million minutes in 2003.

Domestic traffic

The increase in domestic traffic follows the anticipated nominal growth in GDP, i.e. 7 to 8% per year. With this hypothesis, the operating income/GDP ratio can be kept more or less constant between 1996 and 2003. This ratio, which is already high in 1996 (2.6), rises to 2.8 in 2003. For any more optimistic domestic traffic growth hypothesis, it will no longer be possible to maintain a reasonable operating income/GDP ratio conforming to international averages.

Economic and demographic hypotheses

A medium growth hypothesis was adopted for GDP, namely a nominal growth of 7 to 8% per year. Population is assumed to grow by 2.7% per year and the FCFA/\$US exchange rate has been set at 600 FCFA/\$US 1.

Commercial management indicator

To date, Sonatel displays a healthy collection rate (around 89%) in respect of all of its customers. The model assumes that Sonatel continues its debt collection efforts and achieves a collection rate of 95% in 2003.

Controlling costs

As with its policy of financial independence, Sonatel has made cost control one of its prime objectives. In view of this, the following hypotheses have been taken:

Staffing

The growth in Sonatel's staffing levels has been calculated so that the ratio of staff per 1'000 lines tends to five by the year 2003. In 1996, this ratio was estimated at 20. Although this figure is relatively high in comparison with operators in the industrialized countries (e.g. a ratio of seven for France Telecom in 1996), Sonatel boasts one of the highest staff productivity ratios among African operators. This hypothesis, assuming a determined effort to control staffing levels, is in line with a voluntary staff reduction policy which Sonatel has been pursuing in 1996 and 1997.

Wage bill

It has been assumed that the wage bill will grow by an average of 4% per year, i.e. 1.5% above inflation.

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Purchases and supplies

Purchases and supplies represent 3% on average of total fixed assets.

Circuit lease charges

Lease charges for circuits have been increased in line with the growth rate of outgoing international traffic, less 2% to take account of improved circuit use stemming from increases in traffic and competition which is sure to intensify in the coming years on tariffs for the lease of international circuits.

Other charges

Other costs are considered to be under control, and their growth rate is set at the assumed level of inflation (2.5% per year).

5.2 Scenarios

5.2.1 Scenario A: FCC Benchmark

Presentation of the scenario

This scenario proposes an evolution of settlement rates such that the amount of accounting rates between American operators and Senegal meets the level set by the FCC Benchmark.

To comply with the benchmark, settlement rates between Senegal and the United States must be reduced to 19 US cents per minute by 2001. In view of the current level (1996) of settlement rates between the two countries (\$US 1.30 per minute), this price cap would mean an annual 32% reduction in settlement rates for five years. The simulation of the scenario therefore proposes an across-the-board 32% reduction in settlement rates for all international destinations, except in Africa. The 1996 settlement rates for these destinations are lower. The scenario thus also assumes that the settlement rates for the African region tend towards the FCC benchmark, but at a different pace.

In this scenario, the settlement rates are still divided 50/50 between the operators at both ends.

Analysis of the results

The results are presented for the period 1996-2003, in order to take account:

- of the deadline set by FCC for achieving its proposed benchmark (2001);
- the deadline by which total opening up of the telecommunication market obliges Senegal to rebalance its tariff schedule (2003).

Analysis of the evolution of settlement rates gives an idea of the impact of the price cap proposed by FCC. For the two main geographical areas (North America and Europe), the price cap imposes an 85% reduction in settlement rates over five years. The corresponding reduction in settlement rates for the Africa region over the same period is only 64%.

Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 3.3 between 1996 and 2001 and 4.8 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Senegal resulting from the reduction in the amount of settlement rates and the introduction of cost-oriented tariffs serves to generate 31.5 million additional minutes.

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Table 5.4: Scenario A - Benchmarks

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	64	83	105	130	151	166	182
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		3.1	3.6	3.7	3.6	3.3	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	2.06	2.06	2.04	1.98	1.90	1.73	1.57
Settlement rate received by Senegal (in \$US)								
Europe	1.46	0.99	0.67	0.46	0.31	0.21	0.21	0.21
Americas	1.30	0.89	0.60	0.41	0.28	0.19	0.19	0.19
Africa	0.53	0.43	0.35	0.28	0.23	0.19	0.19	0.19
Financial impact (in million FCFA)								
Turnover	64'765	71'891	77'113	84'015	88'857	94'401	103'785	114'216
Profit	12'605	14'484	10'348	7'704	11'387	16'692	22'661	29'218
International settlement balance	19'023	18'136	16'326	14'248	11'946	9'213	9'109	8'832
Liquidity	35'921	32'779	12'647	10'745	11'331	11'509	18'501	30'045
Cash flow	25'877	27'831	26'151	28'550	32'622	36'751	42'531	48'986
Long-term debt/permanent capital	7%	7%	9%	24%	29%	25%	21%	17%

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.4 between 1996 and 2001 and 3.5 between 1996 and 2003. In the period from 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate 17.4 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.2 in 1996 to 1.90 in 2001.

Financial impact: In this scenario, the balance of international settlements falls between 1996 and 2001 by 52%, resulting in a net cumulative loss of 25.2 billion FCFA (\$US 42 million). This sharp fall in income is one of the main reasons¹⁴ for the downturn in Sonatel's net profits, which decline by 44% between 1996 and 1999. In subsequent years profit starts rising again, thanks to tariff rebalancing, and in 2001 it exceeds the 1996 level. Under the combined effect of stagnation of cash flow and the magnitude of its investment programme, Sonatel's indebtedness increases fourfold between 1996 and 2001.

Conclusion

Even though outgoing international traffic grows more rapidly than incoming international traffic, this scenario, in which the proposed benchmark is far removed from Sonatel's costs¹⁵, has a significant impact on

¹⁴ The other reason is the high level of customs duties that Sonatel has to pay to import its equipment.

¹⁵ See under cost estimates in Section 4.

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income from the settlement balance for international traffic. More than this, the whole financial structure of Sonatel's balance-sheet is modified, since the reduction in settlement rates undermines Sonatel's self-financing capability and forces it to borrow in order to meet its telephone network development obligations. Only tariff rebalancing offers an alternative to cushion the impact of this reduction in settlement rates.

Postponing the introduction of this benchmark with the rebalancing of Sonatel's tariff schedule (introduction in 2003 instead of 2001) would make it possible to maintain a low level of indebtedness, but would nevertheless not prevent a halving of income from the settlement balance for international traffic, unless the effect of price elasticity for incoming traffic is higher than assumed in our hypotheses (0.6), being amplified by call-back. For example, an elasticity of 0.8 for incoming traffic resulting from call-back on 10% of outgoing international traffic would more or less offset cumulative losses on the international settlement balance, although at the cost of a loss of income from outgoing traffic.

5.2.2 Scenario B1: 6% staged reduction

Presentation of the scenario

This scenario proposes a slower reduction of 6% per year in the amount of settlement rates, which continue to be applied according to the principle currently in force.

Analysis of the results

Analysis of the evolution of settlement rates gives an idea of the impact of a staged reduction in settlement rates. For the three main geographical areas which account for nearly 95% of Senegal's telephone relations, this staged reduction imposes a reduction in settlement rates of 26% on average over five years. This staged reduction results in a settlement rate of \$US 0.95 for the relation Senegal-North America and an average settlement rate of \$US 1.07 for the relation Senegal-Europe.

Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 3.3 between 1996 and 2001 and 4.8 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Senegal resulting from the reduction in the amount of settlement rates and the introduction of cost-oriented tariffs serves to generate 31.5 million additional minutes.

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 1.9 between 1996 and 2001 and 2.3 between 1996 and 2003. In the period 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate only 4 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.2 in 1996 to 1.4 in 2001.

Financial impact: In this scenario, the balance of international settlements rises between 1996 and 2001 by 10%, resulting in a cumulative net gain of 10 billion FCFA (\$US 17 million). Sonatel's sizeable investment programme obliges it to have recourse to borrowing in order to finance part of its new fixed assets. Nevertheless, the long-term debt/permanent capital ratio peaks at only 21% in 2001, falling back to 13% as of 2003.

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Table 5.5: Scenario B1 - Staged reduction of 6% per year

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	56	66	78	91	103	113	124
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		0.7	0.7	0.8	0.9	0.9	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	1.80	1.64	1.51	1.39	1.29	1.17	1.07
Settlement rate received by Senegal (in \$US)								
Europe	1.46	1.37	1.28	1.20	1.14	1.07	1.07	1.07
Americas	1.30	1.22	1.15	1.08	1.01	0.95	0.95	0.95
Africa	0.53	0.49	0.46	0.43	0.41	0.39	0.39	0.39
Financial impact (in million FCFA)								
Turnover	64'765	73'721	81'680	91'409	98'883	105'910	113'204	120'846
Profit	12'605	15'674	13'545	12'484	18'216	24'329	28'961	33'817
International settlement balance	19'023	19'967	20'893	21'642	21'972	20'722	18'528	15'451
Liquidity	35'921	33'816	11'741	13'417	13'794	17'564	28'646	43'226
Cash flow	25'877	29'021	29'043	33'329	39'092	44'259	48'831	53'585
Long-term debt/permanent capital	7%	7%	6%	22%	25%	21%	17%	13%

5.2.3 Scenario B2: 10% staged reduction

Presentation of the scenario

This scenario proposes a slow reduction of 10% per year in the amount of settlement rates.

Analysis of the results

The results of this simulation are very similar indeed to those presented in Scenario B1. The big difference is in settlement rates, which are all less than \$US 1 by 2001.

Incoming international traffic: The larger annual reduction in the level of settlement rates should mean that the overall level of international telecommunication tariffs will fall more rapidly. Thus, incoming international traffic is multiplied by a factor of 2.1 between 1997 and 2001. The gain in traffic due to lower international tariffs is of the order of 6.8 million minutes.

In terms of financial impact, this scenario exacerbates slightly the impact of Scenario B1 as regards the settlement balance; the net cumulative gain is only 7.4 billion FCFA (\$US 12 million).

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Table 5.6: Scenario B2 - 10% staged reductions

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	58	69	82	98	112	123	135
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		1.2	1.2	1.3	1.5	1.6	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	1.84	1.71	1.60	1.50	1.41	1.28	1.16
Settlement rate received by Senegal (in \$US)								
Europe	1.46	1.31	1.18	1.06	0.95	0.86	0.86	0.86
Americas	1.30	1.17	1.05	0.95	0.85	0.77	0.77	0.77
Africa	0.53	0.47	0.42	0.38	0.34	0.31	0.31	0.31
Financial impact (in million FCFA)								
Turnover	64'765	73'513	81'175	90'722	98'165	105'436	113'522	122'164
Profit	12'605	15'538	13'213	12'026	17'652	24'042	29'181	34'691
International settlement balance	19'023	19'758	20'388	20'954	21'254	20'248	18'845	16'769
Liquidity	35'921	33'698	11'379	12'771	14'516	18'053	29'252	44'360
Cash flow	25'877	28'885	28'711	32'872	38'648	43'972	49'051	54'460
Long-term debt/permanent capital	7%	7%	6%	22%	25%	21%	17%	13%

Scenarios B1 and B2: Conclusion

With scenarios B1 and B2, income from the settlement balance for international traffic stabilizes at a level slightly higher than the 1996 level. They propose an average reduction in settlement rates of between 26% and 40% by 2001 in relation to their 1996 level. However, the level of settlement rates (North America and Europe) still remains rather high, at between \$US 0.77 and 1.07. With this high level of settlement rate, the cost to be billed (settlement rate plus incremental cost of the service) to Sonatel subscribers for an outgoing international call to Europe or North America will be between \$US 1.05 and \$US 1.35 in 2001. This is still expensive.

With an annual reduction of 19% on all settlement rates over a period of five years, the international settlement balance could be stabilized at around 19 billion FCFA (same level as in 1996). In this case, settlement rates are as follows: Europe \$US 0.51, North America \$US 0.45 and Africa \$US 0.18 per minute.

5.2.4 General presentation of Scenarios C1 and C2: Termination charge

The termination charge has been evaluated on the basis of the costs calculated in the previous section, using the three components identified in ITU-T Recommendation D.140, namely: i) international switching, ii) international transmission and iii) national extension.

In Scenario C1, a termination charge equal to the sum of the incremental costs of these three components is applied for incoming international traffic to Senegal. The amount of this flat-rate charge, applied for all relations, is set at \$US 0.28 per minute.

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As far as the charge applied by foreign operators on their incoming international traffic from Senegal is concerned, it has been decided to apply, for relations with Europe and North America, the benchmark proposed by FCC for high-income countries, namely \$US 0.15 per minute. For countries in the Africa region, it has been decided that the charge proposed by Senegal was close to their actual costs. Finally, the termination charge applied to Senegal by other countries has been based on the FCC benchmark for middle income countries, namely \$US 0.19.

This scenario proposes an asymmetric termination charge between European and North American operators.

Scenario C2 proposes a termination charge based on the incremental costs of the three components required for routing international communications, plus a factor for subsidizing other services. This charge has been estimated at \$US 0.37 per minute, i.e. an additional \$US 0.09 of subsidy, which may serve for instance as incoming traffic's contribution to Sonatel's universal service obligations. In this scenario, income from international traffic subsidizes the cost of other services to the tune of 25%.

5.2.5 Scenario C1: Termination charge

This scenario provides an idea of the impact of introducing by 2001 a termination charge based on Sonatel's actual costs (unbundled termination charge).

Table 5.7: Scenario C1 - unbundled termination charges

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	63	80	100	124	144	159	174
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		2.5	2.9	3.1	3.2	3.1	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	2.01	1.99	1.95	1.89	1.82	1.65	1.50
Settlement rate received by Senegal (in \$US)								
Europe	1.46	1.05	0.75	0.54	0.39	0.28	0.28	0.28
Americas	1.30	0.96	0.70	0.52	0.38	0.28	0.28	0.28
Africa	0.53	0.46	0.40	0.36	0.32	0.28	0.28	0.28
Financial impact (in million FCFA)								
Turnover	64'765	73'592	80'448	88'813	94'848	100'967	111'060	122'287
Profit	12'605	15'589	12'742	10'774	15'379	21'102	27'487	34'662
International settlement balance	19'023	19'837	19'661	19'046	17'937	15'780	16'384	16'893
Liquidity	35'921	33'743	10'988	11'433	13'297	14'839	25'483	41'104
Cash flow	25'877	28'937	28'240	31'620	36'495	41'032	47'357	54'430
Long-term debt/permanent capital	7%	7%	6%	22%	26%	22%	18%	14%

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Analysis of the results

Analysis of the evolution of settlement rates: The average settlement rates received for the different geographical areas evolve as follows:

- Europe: -81%
- North America: -78%
- Africa: -47%

At the same time, the average settlement rates Senegal pays its correspondents evolve as follows:

- Europe: -90%, i.e. \$US 0.15 per minute
- North America: -88%, i.e. \$US 0.15 per minute
- Africa: -47%, i.e. \$US 0.28 per minute

In terms of asymmetry, the settlement rates are divided 35%/65% with Europe and North America and 50%/50% with African countries.

Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.7 between 1996 and 2001 and 4.8 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Senegal resulting from the reduction in the amount of settlement rates and the introduction of cost-oriented tariffs serves to generate 31.5 million additional minutes.

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.7 between 1996 and 2001 and 3.3 between 1996 and 2003. In the period 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate 14.8 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.2 in 1996 to 1.8 in 2001.

Financial impact: In this scenario, the balance of international settlements falls between 1996 and 2001 by 17%, resulting in a net cumulative loss of 28 billion FCFA (\$US 15 million). Sonatel is unable to finance all of its investment programme from internally generated funds, and has to have recourse to borrowing. The long-term debt/permanent capital ratio peaks at 22% in 2001, falling back to 14% in 2003.

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Table 5.8: Scenario C2 - Cost-oriented asymmetric termination charge (termination charge + subsidy)

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	62	77	96	118	137	151	166
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		2.1	2.4	2.6	2.8	2.8	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	1.97	1.92	1.87	1.80	1.73	1.57	1.43
Settlement rate received by Senegal (in \$US)								
Europe	1.46	1.11	0.84	0.64	0.48	0.37	0.37	0.37
Americas	1.30	1.01	0.79	0.61	0.48	0.37	0.37	0.37
Africa	0.53	0.49	0.45	0.42	0.39	0.37	0.37	0.37
Financial impact (in million FCFA)								
Turnover	64'765	74'560	82'543	92'079	99'239	106'125	116'593	128'209
Profit	12'605	16'218	14'120	13'070	18'320	24'474	31'176	38'679
International settlement balance	19'023	20'805	21'755	22'312	22'328	20'938	21'917	22'814
Liquidity	35'921	34'291	12'524	11'707	13'972	17'989	31'243	49'652
Cash flow	25'877	29'566	29'618	33'718	39'315	44'404	51'046	58'447
Long-term debt/permanent capital	7%	7%	6%	21%	24%	21%	17%	13%

5.2.6 Scenario C2: Termination charge + subsidy

This scenario provides an idea of the impact of introducing by 2001 an asymmetric termination charge based on Sonatel's actual costs.

Analysis of the results

Analysis of the evolution of settlement rates: The average settlement rates received for the different geographical areas evolve as follows:

- Europe: -75%
- North America: -72%
- Africa: -30%

At the same time, the average settlement rates Senegal pays its correspondents evolve as follows:

- Europe: -90%, i.e. \$US 0.15 per minute
- North America: -88%, i.e. \$US 0.15 per minute
- Africa: -30%, i.e. \$US 0.37 per minute

In terms of asymmetry, the settlement rates are divided 30%/70% with Europe and North America and 50%/50% with African countries.

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Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 3.3 between 1996 and 2001 and 4.8 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Senegal resulting from the reduction in the amount of settlement rates and the introduction of cost-oriented tariffs serves to generate 31.5 million additional minutes.

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.58 between 1996 and 2001 and 3.3 between 1996 and 2003. In the period 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate 12.7 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.2 in 1996 to 1.7 in 2001.

Financial impact: In this scenario, the balance of international settlements rises between 1996 and 2001 by 10%, resulting in a net cumulative gain of 13 billion FCFA (\$US 22 million). The long-term debt/permanent capital ratio stands at 21% in 2001.

Scenarios C1 and C2: Conclusion

Both scenarios involve a system of asymmetric termination charges. However, scenario C1 proposes a termination charge based on Sonatel's (incremental) costs, whereas scenario C2 proposes including in the termination charge **an identified subsidy component which may serve for example to finance the cost of developing universal service in Senegal**. Scenarios C1 and C2 are in line with ITU-T Recommendation D.140, which proposes that: "accounting rates for international telephone services should be cost-oriented". However, the impact they have on the overall settlement balance for international traffic differs somewhat.

Scenario C2 results in a net gain on the settlement balance in relation to the 1996 balance, whereas scenario C1 gives a net loss of the same order of magnitude. In the light of these results, we attempted to identify a scenario which would stabilize income from traffic balances by 2001. This scenario corresponds to the following termination charges:

Termination charge for Senegal: \$US 0.30

- Termination charges set by Senegal's various correspondents:
- Europe: \$US 0.15;
- North America: \$US 0.15;
- Africa: \$US 0.30;
- Other: \$US 0.15.

This scenario thus proposes an asymmetric division 67/33 for Senegal's relations with Europe, North America and other countries and a symmetrical 50/50 division for relations with countries in Africa. The traffic settlement balance stabilizes after 2001 at around 17 billion FCFA, and the net gain is estimated at 1.31 billion FCFA.

5.2.7 Scenario D1: Very low settlement rates

Presentation of the scenario

This scenario simulates the impact of the introduction of very low settlement rates akin to interconnection charges. The simulation assumes settlement rates to be symmetrical and cut to \$US 0.08 for all destinations.

This scenario simulates the discontinuation of bilateral negotiations for determining the amounts of settlement rates. To take account of the sudden nature of the discontinuation of negotiations, it is assumed

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that the settlement rates plummet to \$US 0.08 in 1999, whereas, in previous years, the downward growth trend was around -25% per year¹⁶.

Analysis of the results

Analysis of the evolution of settlement rates: All settlement rates fall by 94% on average over three years for relations with Europe and North America. For relations with the African countries, the fall is 85% on average over three years.

Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 3.3 between 1996 and 2001 and 4.8 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Senegal resulting from the reduction in the amount of settlement rates and the introduction of cost-oriented tariffs serves to generate 31.5 million additional minutes.

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.8 between 1996 and 2001 and 3.4 between 1996 and 2003. In the period from 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate 16.1 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.14 in 1996 to 1.88 in 2001.

Financial impact: In this scenario, the international settlement balance falls between 1996 and 2001 by 81%, resulting in a cumulative net loss of 48.3 billion FCFA (\$US 81 million). The long-term debt/permanent capital ratio rises to 30% in 2001 and the net profit before distribution of dividends falls by around 12 billion FCFA in the year when the negotiations are discontinued. Sonatel's liquidates fall by nearly 25 billion FCFA in 2001.

¹⁶ The situation can easily be imagined, for example, whereby North American operators decide to break off negotiations because the proposed annual reduction (-25%) seems inadequate to them and the FCC benchmark will not be achieved in time.

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Table 5.9: Scenario D1 - Very low settlement rates

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	62	78	119	137	150	165	181
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		2.5	2.9	10.7	0.0	0.0	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	1.99	1.95	2.31	2.08	1.88	1.71	1.56
Settlement rate received by Senegal (in \$US)								
Europe	1.46	1.10	0.82	0.08	0.08	0.08	0.08	0.08
Americas	1.30	0.98	0.73	0.08	0.08	0.08	0.08	0.08
Africa	0.53	0.39	0.30	0.08	0.08	0.08	0.08	0.08
Financial impact (in million FCFA)								
Turnover	64'765	72'342	78'309	73'114	80'451	88'731	98'168	108'764
Profit	12'605	14'777	11'331	137	5'721	12'858	19'004	25'572
International settlement balance	19'023	18'587	17'522	3'347	3'540	3'543	3'491	3'370
Liquidity	35'921	33'034	9'330	9'143	10'524	11'322	15'237	23'614
Cash flow	25'877	28'124	26'829	21'574	27'196	33'110	38'874	45'340
Long-term debt/permanent capital	7%	7%	6%	26%	32%	30%	25%	20%

5.2.8 Scenario D2: Sender keeps all

Presentation of scenario

This scenario proposes an extreme situation, in which accounting rates are abolished for all telephone relations with Senegal. The results are presented in Table 5.9.

Analysis of the results

Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 3.3 between 1996 and 2001 and 4.8 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Senegal resulting from the reduction in the amount of settlement rates and the introduction of cost-oriented tariffs serves to generate 31.5 million additional minutes.

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.7 between 1996 and 2001 and 3.2 between 1996 and 2003. In the period from 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate 9.8 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.14 in 1996 to 1.78 in 2001.

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Financial impact: The international settlement balance ceases to exist, resulting in a net cumulative loss of 95.1 billion FCFA (\$US 158.5 million). The long-term debt/permanent capital ratio rises to 39% in 2001 and net profit before distribution of dividends falls by some 13 billion FCFA in 1998, and remains negative for two consecutive financial years. Sonatel's liquidates fall by nearly 27.5 billion FCFA as from 1998 and remain at a very low level (less than 13 billion FCFA) until 2001.

Table 5.9: Scenario D2 - Abolition of accounting rates (sender keeps all)

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	86	98	113	129	142	156	171
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		9.8	0.0	0.0	0.0	0.0	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	2.75	2.44	2.19	1.97	1.78	1.62	1.47
Settlement rate received by Senegal (in \$US)								
Europe	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Americas	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Africa	0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Financial impact (in million FCFA)								
Turnover	64 765	53 755	60 787	69 767	76 911	85 188	94 676	105 395
Profit	12 605	2 695	(1 161)	(2 050)	3 247	10 239	16 784	23 303
International settlement balance	19 023	0	0	0	0	0	0	0
Liquidity	35 921	22 505	8 948	8 558	9 771	12 991	12 555	16 313
Cash flow	25 877	16 043	15 560	19 388	24 961	30 943	36 654	43 071
Long-term debt/permanent capital	7%	7%	17%	34%	40%	39%	33%	27%

5.2.9 Scenario D3: 10% of international traffic routed via the Internet

Presentation of the scenario

This scenario is an alternative to scenario D2, in which a portion of international traffic, routed via the Internet, is not subject to settlement rates. This scenario requires Senegalese subscribers to be equipped with a minimum number of Internet terminals or telephones allowing access to the Internet and that international standards are defined to ensure compatibility of the hardware used. In parallel with this diversion of traffic over the Internet, it is assumed that settlement rates evolve along the same lines as in scenario C1 (cost-based termination charge).

Analysis of the results

Incoming international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity) is multiplied by a factor of 2.7 between 1996 and 2001 and 3.3 between 1996 and

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2003. In the period from 1997-2003, the decline in international tariffs resulting from the reduction in the amount of settlement rates serves to generate 14.8 million additional minutes of traffic to Senegal.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio falls from 2.14 in 1996 to 1.8 in 2001.

Financial impact: The international settlement balance falls by 17%, resulting in a net cumulative loss of 2.8 billion FCFA (\$US 5 million). The long-term debt/permanent capital ratio rises to 27% in 2001. Sonatel's liquidity fall by nearly 27 billion FCFA as from 1998 and remain at a very low level (less than 14 billion FCFA) until 2001.

Table 5.10: Scenario D3 - 10% of international traffic routed via the Internet

	1996	1997	1998	1999	2000	2001	2002	2003
Traffic (in million minutes)								
Incoming international traffic (1)	53	63	80	100	124	144	159	174
Outgoing international traffic (2)	24	31	40	51	66	80	96	116
<i>Of which additional international traffic generated by tariff reductions</i>								
<i>Incoming international traffic</i>		2.5	2.9	3.1	3.2	3.1	0.0	0.0
<i>Outgoing international traffic</i>		2.5	3.2	3.8	4.5	5.1	5.8	6.6
(1)/(2)	2.18	2.01	1.99	1.95	1.89	1.82	1.65	1.50
Settlement rate received by Senegal (in \$US)								
Europe	1.46	1.05	0.75	0.54	0.39	0.28	0.28	0.28
Americas	1.30	0.96	0.70	0.52	0.38	0.28	0.28	0.28
Africa	0.53	0.46	0.40	0.36	0.32	0.28	0.28	0.28
Financial impact (in million FCFA)								
Turnover	64 765	71 830	78 509	86 692	92 539	98 570	108 582	119 735
Profit	12 605	14 568	11 582	9 347	13 933	19 684	25 967	33 038
International settlement balance	19 023	19 837	19 661	19 046	17 937	15 780	16 384	16 893
Liquidity	35 921	32 874	9 467	11 869	14 355	14 619	23 862	38 028
Cash flow	25 877	27 916	27 081	30 390	35 169	39 613	45 837	52 806
Long-term debt/permanent capital	7%	7%	6%	23%	28%	24%	20%	15%

Scenarios D1, D2 and D3: Conclusion

Abolition (scenario D2) or very sharp reduction (scenario D1) of settlement rates has a very severe impact on Sonatel's profitability and its ability to continue developing Senegal's telephone network according to its set objectives. In scenario D3, a diversion of traffic over the Internet (10%) along with a sizeable reduction in settlement rates also affects Sonatel's financial independence.

6 CONCLUSION

6.1 Current situation

An analysis of the current situation in terms of the level of settlement rates in relation to international tariffs practised by foreign operators reveals that settlement rates may account for up to 80% of those tariffs. Thus, AT&T bills a minute of call to Senegal at \$US 1.55, when the settlement rate stands at \$US 1.30. Some call-back operators even propose tariffs of as little as \$US 1.47/minute¹⁷ (in the direction United States-Senegal). The result for countries like the United States is high dependence on their net settlement payments on the direction of traffic flows¹⁸.

The Senegalese telephone operator, for its part, displays:

- high financial dependence on income from settlement balances for international traffic. In 1996, this income accounted for 30% of operating revenue, which is extremely high;
- a tariff imbalance between it and its European and North American correspondents. By way of example, Sonatel's tariff to the United States is of the order of 1 330 FCFA/minute (\$US 2.22), whereas it is offered at \$US 1.55/minute by ATT in the other direction. This situation is thus an incentive both to organized commercial call-back and "social" call-back of the "call me back" type. A further incentive here is also the difference in purchasing power between Senegalese subscribers and their correspondents in the western world;
- an unbalanced tariff schedule, where the prices of the subscription and local calls are low, being subsidized by the international service (outgoing and incoming).

Scrutiny of the respective situations of the different players involved reveals that:

- accounting rates currently bear no relation to operators' costs;
- tariffs for international calls in the developed countries no longer follow the classical rule: "tariff = twice the settlement rate plus X" and most of the money they collect from their subscribers is paid out to Sonatel;
- the parties involved are obliged to maintain high international tariffs on account of the amount of the accounting rates, which creates an economic risk if the surpluses generated are not used effectively;
- the parties involved apparently face a vicious circle, since any cut in tariffs on the part of the operators in the western world encourages the Senegalese to resort to call-back, which in turn exacerbates still further the traffic imbalance for the foreign operators.

6.2 The concerns of the different parties involved

In the above context, foreign operators' main desire is to reduce the amount they have to pay Sonatel (which explains the approach proposed by FCC). However, Sonatel has to meet its public service obligations, and in particular continue to finance the development of its network. The associated investments are mainly in hard currency.

For Sonatel, the fact that it receives a sizeable portion of its income in hard currency enables it to secure either self-financing of this investment or to repay its loans.

In this connection, when the CFA franc was devalued by 50% in relation to the French franc in January 1994, the hard-currency international settlement balance enabled Sonatel to continue both repaying

¹⁷ Source: Kallback server Internet <http://K.Kallback.com>.

¹⁸ This behaviour on the part of American operators may be partly attributable to the fact that, in the other direction (incoming traffic from Senegal) they receive income equal to the settlement rate which far exceeds their costs. As their incoming traffic is allocated on the basis of proportionality with outgoing traffic, there is an incentive for these operators to maximize their outgoing traffic.

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its loans and self-financing its new investment. In 1996, its rate of indebtedness was only 7%. The high level of hard-currency income thus serves to offset the effects of currency fluctuations in the developing countries to a large extent.

Furthermore, Sonatel has to cope with future full liberalization of the telecommunication market in Senegal (2003). To do this, it will have to have a rebalanced and cost-oriented tariff schedule, in order to withstand the entry of new operators.

6.3 Firm simulation hypotheses

In view of Sonatel's concerns as described above, it was decided that the reduction in international tariffs should take account, first and foremost, of the need to rebalance the tariff schedule. This rebalancing will take account of social constraints and the presumed date on which the market will be liberalized. The reduction in settlement rates thus has no direct impact on the level of Sonatel's international tariffs. It is for this reason that outgoing international traffic from Senegal is constant in all the proposed scenarios.

The second firm hypothesis is constituted by the choice of the elasticity of demand in relation to the price of calls from foreign operators (0.6). This elasticity is applied to all destinations.

6.4 Summary of the simulations

All of the scenarios can be placed in one of three categories, according to the cumulative effects on the traffic settlement balance:

- **Scenarios with very adverse impact:** FCC benchmark, very low settlement rate, sender keeps all.
- **Scenarios with positive impact:** 6% and 10% gradual reduction, asymmetric termination charge plus 24% subsidy in relation to incremental cost.
- **Scenarios with little impact:** Asymmetric termination charge without subsidy, asymmetric termination charge plus 7% subsidy in relation to incremental cost.

Furthermore, it emerges from an analysis of the scenarios which have a positive or little impact on the settlement balance that, for the same settlement rate received by Senegal, an asymmetric system is more advantageous for Senegal. The two scenarios are in Table 6.2. In both cases, between 1997 and 2003 the cumulative settlement balance is more than 20% lower when symmetrical settlement rates are used.

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Table 6.1: Summary of simulations

	1996	Simulation of the situation in 2001							
	Initial situation	Benchmark	6% staged reduction	10% staged reduction	Termination charge: incremental cost	Termination charge: incremental cost + subsidy	Very low settlement rate 8 US cents	SKA	Stable income
		SC No. A	SC No. B1	SC No. B2	SC No. C1	SC No. C2	SC No. D1	SC No. D2	
Incoming international traffic (million minutes)	53	151	103	130	144	137	150	142	143
Outgoing international traffic (million minutes)	24	80	80	80	80	80	80	80	80
Settlement rate Senegal-North America									
Received by Senegal (\$US/min)	1.30	0.19	0.95	0.45	0.28	0.37	0.08	0.00	0.30
Paid by Senegal (\$US/min)	1.30	0.19	0.95	0.45	0.15	0.15	0.08	0.00	0.15
Settlement rate Senegal-Europe									
Received by Senegal (\$US/min)	1.46	0.21	1.07	0.51	0.28	0.37	0.08	0.00	0.30
Paid by Senegal (\$US/min)	1.46	0.21	1.07	0.51	0.15	0.15	0.08	0.00	0.30
Settlement rate Senegal-Africa									
Received by Senegal (\$US/min)	0.53	0.19	0.39	0.18	0.28	0.37	0.08	0.00	0.30
Paid by Senegal (\$US/min)	0.53	0.19	0.39	0.18	0.28	0.37	0.08	0.00	0.30
Cumulative effect on total traffic settlement balance (billion FCFA)		(25'247)	10'080	9'605	(2'855)	13'021	(48'577)	(95'116)	(17)
Debt rate	7%	25%	21%	22%	22%	21%	30%	39%	22%

Table 6.2: Comparison of advantages: symmetrical/asymmetric termination charge
International settlement balance (billion FCFA)

	1996	1997	1998	1999	2000	2001	2002	2003	Total
Scenario C2, settlement rates 0.37/0.15	19'023	20'805	21'755	22'312	22'328	20'938	21'917	22'814	152'868
Scenario B2, settlement rates 0.37/0.37	19'023	19'056	18'375	17'407	15'996	13'587	13'070	12'205	109'698
Scenario C2, settlement rates 0.30/0.15	19'023	19'997	20'026	19'631	18'732	16'712	17'360	17'909	130'367
Scenario B2, settlement rates 0.30/0.30	19'023	18'774	17'710	16'341	14'577	11'998	11'676	11'081	102'157

Source: Case Study.

With asymmetric settlement rates, international tariffs can be reduced more quickly than with a symmetrical system, and particularly international tariffs for the developing countries since the asymmetry works in their favour.

For operators in the developed countries, this asymmetry already exists, since most of their collection charge is paid out in the form of the settlement rate (which is not the case in Senegal). The introduction of cost-oriented asymmetric termination charges would enable them to rebalance the proportion of the settlement rate in their collection charge, while offering lower international tariffs for their subscribers. It would also avoid a situation in which the remuneration they receive for incoming traffic is disproportionate in relation to the cost they incur in routing calls, a phenomenon which distorts their traffic calculation, possibly opening the way for dumping on outgoing traffic.

The introduction of a cost-oriented termination charge including a small subsidy to meet universal service development obligations will necessarily be asymmetric, since each operator has to propose its own charge based on its own costs. This termination charge (\$US 0.28 + \$US 0.02 subsidy), introduced over five years, would in the case of Senegal enable it¹⁹ to stabilize its settlement balance.

Cost-oriented asymmetric termination charges (including a small subsidy) and minimum introduction period (five years) appear to be principles that may be generally applicable.

The level of the termination charge depends on each operator's cost structure. This study provides some ideas on the level of the termination charge which Senegal may offer. However, this charge, which is based on Sonatel's costs, cannot be extended to all countries, even ones that appear similar.

The level at which this termination charge is set will indeed depend on the costs each operator bears, and this is liable to result in a very wide range of values. It therefore seems important that, in future, ITU should be in a position to:

- help to develop one or more (for different types and levels of development of operators) methods of calculating termination rates, methods which must be as objective as possible;
- use the results of the case studies to provide reference values for termination charge levels and perhaps propose a floor level.

¹⁹ If the developed countries offer an accounting rate of \$US 0.15 and the African countries agree to apply the same termination charge as Senegal.

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