INTERNATIONAL TELECOMMUNICATION UNION

**CASE STUDY OF THE CHANGING INTERNATIONAL
TELECOMMUNICATIONS ENVIRONMENT**

MAURITANIA

FINAL REPORT

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MAURITANIA

TABLE OF CONTENTS

MAURITANIA

LIST OF ILLUSTRATIONS

Tables

MAURITANIA

MAURITANIA

1 OUTLINE OF THE SOCIO-ECONOMIC SITUATION IN MAURITANIA

On account of Mauritania's exceptional geographical characteristics, both in terms of climate and demographic conditions, and its economic development characteristics (per capita income estimated at $US 470 in 1996), establishment of the necessary infrastructures for the country's economic development is a major problem.

The telecommunication sector, as an essential component in freeing the country from isolation, therefore constitutes a major challenge.

1.1 Geographical and demographic situation

With just under 2.4 million inhabitants[1], Mauritania has a population density of 2.3 inhabitants/km^2. The growth rate of the population stands at 2.9%, and the age pyramid illustrates the importance of the young layers of the population (nearly 55% of the population aged 20 or below).

Table 1.1: Population/Main Lines (ML) in 1997

	Main town	**Population[2]**	**Number of lines**	**Lines/inh.**
Nouakchott	Nouakchott	608'228	9'237	1.5%
Dakhlet Nouadhibou	Nouadhibou	97'639	1'494	1.5%
Hodh El Gharbi	Néma	261'203	115	0.0%
Hodh El Chargui	Aioun	194'103	140	0.1%
Assaba	Kiffa	200'840	198	0.1%
Gorgol	Kaédi	211'866	197	0.1%
Brakna	Aleg	225'531	91	0.0%
Trarza	Rosso	206'801	297	0.1%
Adrar	Atar	69'425	232	0.3%
Tagant	Tidjikja	73'629	150	0.2%
Guidimakha	Sélibaby	141'350	119	0.1%
Inchiri	Akjoujt	13'518	180	1.3%
Tiris Zemour	Zouerat	42'617	145	0.3%
TOTAL		2'346'750	12'595	0.5%

Source: Commercial Directorate, OPT

Two economic centres, Nouakchott and Nouadhibou, together with the eleven regional capitals, have over 1.3 million inhabitants, i.e. nearly 56% of the population. More than 95% of the population is concentrated in 40 towns.

Urban areas have developed extremely rapidly. Nouakchott, for instance, has grown in size from 500 to over 600 000 inhabitants in the space of 35 years. As a result of this spectacular development, inhabited areas

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[1] World Bank estimate, 1997

[2] Estimate: private census 1997

5

have sprung up all around towns which are difficult to equip with telecommunications and various infrastructures.

1.2   Mauritania's economy

At an estimated $US 470, Mauritania's per capita GDP is one of the lowest in the world. The telecommunication sector accounts for around 2.3% of GDP.

More than the country's vast size and extremely concentrated population distribution, the main feature of Mauritania's economy is the lack of any strong driving force to stimulate growth. The breakdown of GDP in 1997 is as follows: primary sector (27%), secondary sector (24%), tertiary sector (49%)[3].

Table 1.2: Evolution of GDP
In Million UM (current)

	1993	**1994**	**1995**
Primary sector	27'885	29'883	31'113
Secondary sector	26'027	26'819	33'981
Tertiary sector	34'375	39'160	46'461
Non-merchantable services	13'373	14'887	14'621
GDP at factor cost	101'660	110'749	126'175
Indirect taxes	12'237	13'029	14'961
GDP at market price	113'897	123'778	141'136
GDP in $US	944	1'027	1 068
Exchange rate $US/UM	120.8	123.6	129.8

Source: Mauritania Statistics Office, World Bank Atlas

As far as traditional natural resources are concerned, agriculture and animal rearing account for 20% of GDP. This input is far too dependent on climatic conditions to provide a constant stimulus (country not self-sufficient: only 40% of the population's needs are covered). Fishing, despite considerable external funding and regular government support, represents less than 10%.

The mining sector (in particular iron ore), accounts for 12% of GDP, but exports fluctuate according to the world market. Income from the mining sector is thus extremely variable.

The main component of GDP is the service economy (more than 48% of GDP). Hence the importance of developing communication infrastructure, as a formidable catalyst to boost the service economy.

Finally, it should not be forgotten that Mauritania receives the equivalent of 35% of its GNP in the form of development aid, which is thus by far the country's main resource. This quite exceptional state of affairs makes Mauritania an extreme case among the developing countries.

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[3]   World Bank Atlas, 1997

1.3   Communications infrastructures

To understand the need for the development of the telecommunication sector, it is vital to have an idea of the current status of communications infrastructures. These comprise the following main components:

Railway: One main line (Nouadhibou/Zerouate/Mhaoudat), which is used to carry iron ore to the port of Nouadhibou.

Port: Commercial port (Nouakchott), fishing port (Nouadhibou), river ports on the Senegal river.

Air transport: Two airports (Nouakchott, Nouadhibou).

Road: 8 000 km of roads, of which 2 000 km are tarmacked. The main roads are Rosso - Nouakchott, Nouakchott - Nema, Nouakchott - Akjoujt.

There is no tarmacked road between Nouakchott and Nouadhibou, the country's administrative and economic capitals. Similarly, five main towns (Akjoujt, Sélibaby, Kaédi, Atar and Fdérik) are only accessible by tracks.

In this context, the telecommunication network becomes a major factor in opening up the country and developing services. The country's large surface area and long distances to population centres entail significant costs for development and maintenance of the telephone network.

2 THE TELECOMMUNICATION SECTOR

2.1 Institutional framework

2.1.1 Status of OPT

Given the strategic role the Office of Posts and Telecommunications (OPT) plays in Mauritania's economic life, a vast rehabilitation programme has been under way since 1987. Under this programme, the status of OPT was changed on 4 April 1997 from EPIC[4] to National Company. This status gives the company greater management autonomy, although the state remains the sole shareholder.

2.1.2 Posts and telecommunication code

Two main missions are entrusted to OPT: (1) provide as many users as possible with telecommunication, financial and postal services under the best possible conditions of cost and quality, and (2) modernize the telephone network.

OPT enjoys a monopoly on postal and telecommunication service in Mauritania (Law No. 93-39 of 20 July 1993).

Article 34 defines telecommunications and monopoly:

- *Any transmission, emission or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.*

- *No telecommunication installation may be set up or used for the transmission of correspondence except by the public post and telecommunication operator or with its authorization.*

Thus, OPT has a monopoly over fixed voice/data telephony and all mobile services under development.

OPT is the sole telecommunication operator in Mauritania.

2.1.3 State/OPT programme contract

Relations between the State and OPT are governed by a programme contract[5]. The main objectives under the contract for 1994-1996 are:

- *Investment programme (develop domestic network, rehabilitate earth stations).*

- *Human resources programme (improve staff productivity).*

- *Management programme (introduction of a more efficient information system).*

- *Structural division programme (organization of the post and telecommunication sectors).*

2.2 Main characteristics of the telecommunication sector

The telecommunication sector has long been rationed by supply. Recent installations under the DOMSAT project (linking centres by means of a domestic satellite telecommunication network) and digitization of the network have made it possible to extend the potential coverage area. Despite some still significant holes, the network is covering an increasing portion of the population and, probably, a very large majority of the solvent population.

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[4]   Public industrial and commercial establishment

[5]   The programme contract is based on the measures for restructuring public enterprises introduced in agreement with IMF in 1991 under the consolidation and relaunch programme. It sets out the State's and OPT's respective commitments.

2.2.1   Key figures

• **Telecommunications in GDP**

Table 2.1: Evolution of telecommunication turnover in GDP
In Millions $US

	1994	**1995**	**1996**
Telecom turnover	25	25.8	27.5
Total GDP	1'027	1'068	1'094
% of GDP	2.4%	2.4%	2.5%

Source: ITU World Telecommunication Indicator Database, World Bank Atlas 1997

The share of telecommunications in GDP in Mauritania is high compared with data for other countries with the same level of development, which is a consequence of the geographical isolation described earlier.

• **Main telephone lines**

The latest figures for 1997 show a subscriber coverage of 12 600 main lines. This figure rose by only 10% per year between 1993 and 1996, on account of the saturation of equipment and the difficulty of installing additional equipment. Still today, the dimensions of the network are determined by how much additional infrastructure capacity can be installed. People living on the fringes of towns are having to wait to be connected to the telephone network.

The sharp improvement in 1997 is attributable to introduction of the DOMSAT national network, through which outstanding demand in provincial capitals has been met.

The number of public phones has remained constant for three years (200 lines). There has been a regular decline in the number of telex subscribers since 1985.

Table 2.2: Evolution of the number of subscribers

Year	Main Lines	% growth	Telex lines	% growth
1985	3'957		231	
1986	4'255	8%	242	4.8%
1987	4'413	4%	262	8.3%
1988	4'673	6%	261	-0.4%
1989	4'581	-2%	243	-6.9%
1990	5'353	17%	252	3.7%
1991	6'283	17%	219	-13.1%
1992	6'731	7%	190	-13.2%
1993	7'567	12%	191	0.5%
1994	8'430	11%	190	-0.5%
1995	9'281	10%	155	-18.4%
1996	10'200	10%		
1997	12'600	24%		

Source: OPT Directorate (estimate 1997)

2.2.2 History of the network

The development of Mauritania's telephone network can be divided into three phases: development of the telegraph, development of the telephone (1960-1994) and the DOMSAT project (1994).

- **Telegraph (1891-1960)**

The first telecommunication equipment was set up in 1891 (telegraph lines). These lines were only accessible from 11 offices in the country.

- **Telephone (1974-1985: an embryonic network)**

It was not until 1974 that the telephone network began to develop (post-colonial era).

Links:

– the towns of Nouakchott, Nouadhibou, Atar, Tidjikja, Boghé, Néma, Aïoune, Kiffa, Sélibaby and Kaédi are connected by 12 long-distance telephone links;

– a 2-channel link between Nouadhibou and Zouérate, a single 12-channel coaxial cable link between Nouakchott and Akjoujt, a 30-channel link between Nouakchott and Rosso;

– 4-channel HF radio links for France, two channels for Spain, one channel for Algeria, one channel for Morocco. A radio-relay network connects Senegal and Mauritania (PANAFTEL network).

Exchanges:

– the switching network comprises 11 telephone exchanges: Nouakchott, Atar, Tidjikja, Akjoujt, Néma, Rosso, Aïoune, Kiffa, Kaédi, Zérouate;

–   telex exchanges are installed at Nouakchott and Nouadhibou. A maritime radio transmission station is installed at Nouadhibou.

The network stagnated for many years with less than 3 000 subscribers, for lack of sufficient investment to finance growth.

•   **Telephone (1985-1999: digitization)**

In order to cater for growing demand, investment programmes were carried out to develop the international network, primarily through the INTELSAT and ARABSAT projects.

Links:

INTELSAT project (1985): One high-capacity earth station at Nouakchott for traffic with France and Spain.

ARABSAT project (1986): Earth station installed at Nouakchott used for traffic with the United Arab Emirates, Saudi Arabia, Kuwait, Algeria and Tunisia.

Exchanges:

One 450-circuit ITC/NTC at Nouakchott relieving the old exchange.

Networks:

Digitization of the network in Nouakchott.

Digital telephone exchange for telephony (1989), digital telex exchange (ELTEX V at Nouakchott and TG 20 and Nouadhibou).

Maritime radio station at Nouakchott (1994) and Nouadhibou (1994).

•   **DOMSAT project**

Given the size of its territory and the need to improve service to the 11 provincial capitals (Wilayas), satellite emerged as an ideal solution for Mauritania.

Under the funding agreement AFESD No. 227/89 (Arab Fund for Economic and Social Development), 16 million dollars were allocated for implementation of the project (50% for telecommunications, 50% for radio and television). This project is one of the largest in Mauritanian history (along with mining projects).

Under this project, the provincial capitals (Aïoune, Akjoujt, Aleg, Atar, Kaédi, Kiffa, Néma, Rosso, Sélibaby, Tidjikja, Zouétate) were equipped with satellite transmitting/receiving stations, supplemented with domestic exchanges.

2.2.3   The telephone network today

Mauritania's telecommunication network has a relatively simple star configuration.

•   **Transmission**

The transmission infrastructure comprises:

–   one INTELSAT station at Nouakchott, which handles international links. The antenna is equipped with two 2 Mb/s IDR/DCME carriers for France and Spain, one 512 kb/s IDR carrier for the United States, one FDM carrier for Senegal and Côte d'Ivoire;

–   an ARABSAT station at Nouakchott, which handles international links (to Arab countries) and national links;

–   a national station at Nouadhibou (ARABSAT)

MAURITANIA

–   12 DOMSAT earth stations installed in the provincial capitals and at Nouadhibou.

• **Switching**

The switching infrastructures comprise:

–   a national and international transit centre at Nouakchott (ALCATEL E10 MT 20)

–   a national transit centre at Nouakchott (ALCATEL E10 MT 25)

–   a national transit centre at Nouadhibou (ALCATEL E10 MT 25)

–   11 digital telephone exchanges in the provincial capitals (HARRIS EE900).

• **Other services**

The main installations for other services are a telex exchange (installed in Nouakchott), two maritime radio stations with a mobile radio system and an Internet node set up at Nouakchott.

Table 2.3 : Technical characteristics of switching

Switching	Model	Make	Installed capacity	Utilized	Maximum	Filling rate
ITC Nouakchott	E10-MT20	Alcatel	2'048	2'000	20'000	97%
NTC Nouakchott	E10-MT25	Alcatel	10'048	10'000	64'000	98%
NTC Nouadhibou	E10-MT25	Alcatel	2'048	1'500	64'000	73%
NTC provincial capitals	EE900	Harris	192-312	140-180	900	57-72%

Source: OPT Directorate

The switching equipment is completely saturated in Mauritania's two major cities, Nouakchott and Nouadhibou.

For the exchange at Nouakchott, a 3 500 subscriber extension will be installed in early 1998. For Nouadhibou (3 500 subscribers), funding is still being sought for a 3 500 subscriber extension.

12

Table 2.4: Characteristics of transmission by INTELSAT

Destination	Installed capacity	Utilized	Maximum
France	120	60	360
Spain	120	45	240
United States	16	8	16

Source: Intelsat

2.2.4   Planned extensions

•   **Domestic services**

Intelligent network services (voice server, ITC) have been installed.

Development of the GSM network in Nouakchott and Nouadhibou (7 000 subscribers) by the year 2000 is OPT's next major project. The economic feasibility study and technical specifications have been completed, and financing is being sought.

Extension of the capacities of the Nouakchott and Nouadhibou exchanges, to 33 000 and 15 000 subscribes respectively. This extension should enable demand to be met.

Serving rural areas is a key challenge. Wireless systems are under study.

•   **International outlets**

OPT is involved in the Africa One submarine cable programme. Agreement of principle on the cable has been reached by all the signatory countries. Financing problems are liable to delay implementation of the project. Satellite links should also be expanded (INTELSAT, ARABSAT, etc....).

2.3   OPT - Key figures

OPT's telecommunication turnover is increasing regularly.

Table 2.5: Evolution of turnover
(in millions of UM)

Telecommunication Income	1995	1996	Variation 95/96
Domestic income	53%	45%	- 5%
Net international income	47%	55%	+ 30%
Net turnover	100%	100%	+ 12%

Source: OPT Directorate

The domestic segment declined between 1995 and 1996 from 53% to 45% of turnover, while the international segment increased from 47% to 55%. The proportion of turnover represented by international

income is increasing significantly, despite changes to the tariff grid (regular reduction in the price of international calls).

Most of the turnover is attributable to traffic-related components.

Table 2.6: Components of turnover

	1994	1995	1996
Domestic traffic	50%	49%	73%
Subscription/connection	9%	11%	13%
Other	41%	40%	14%
Domestic turnover	100%	100%	100%

	1994	1995	1996
Billed international traffic	N/A	84.1%	90.9%
International settlement balance	N/A	10.9%	5.6%
Other	N/A	4%	4.5%
Net international turnover	100%	100%	100%

N/A = Not available

The sharp increase in domestic traffic in 1996 is due to the breakdown of income from public phones into the different components (domestic traffic, international traffic, rental ...). The subscription and connection charge is tending to increase gradually (by 2% per year). Income from connection and subscription charges has increased with the extension of telephone service coverage since the introduction of the DOMSAT network.

Turning to international traffic, the income generated by outgoing international traffic exceeds income from the international settlement balance, which accounts for around 3.1% of total telecommunication turnover.

3 INTERNATIONAL ENVIRONMENT

3.1 Importance of international telecommunications

Income and expenditure for the international segment is an important component of OPT's profit and loss account: gross international income (billed income + terminal settlement rates for incoming traffic) represent over half of telecommunication turnover, while direct international expenditure (including settlement outpayments to correspondents) represent around a third of total expenditure in the sector.

Table 3.1: International income and expenditure 1994-1996

Income (millions UM)	1994	1995	1996	Average
International income	1'667	1'835	2'321	57%
Total income	3'090	3'356	3'772	

Expenditure	1994	1995	1996	Average
International operation	662	712	802	34%
Total expenditure	1'891	1'957	2'600	

Source: OPT Financial Directorate

International settlement rates received account for 17% of total income on average, while settlement outpayments account for 23.5% of expenditure on average.

3.2 Analysis of traffic

3.2.1 International traffic

Table 3.2: Evolution of traffic

Traffic (min)	1990	1991	1992	1993	1994	1995	1996
Outgoing	2'573'334	2'961'543	4'357'334	4'277'511	4'503'822	4'127'943	4'889'159
Incoming	1'782'288	1'967'814	2'448'587	2'554'938	3'021'502	3'032'341	3'861'047

Source: OPT Directorate

Traffic volumes have risen by 90% over the period studied, although unevenly: a sharp increase was recorded in 1992, while the trend was momentarily reversed by two falls in 1993 and 1995. Data for incoming traffic take into account only the three main carriers (France, Spain, United States).

3.2.2 Outgoing traffic

The four main destinations from Mauritania are France, Spain, Senegal and the Arab countries. The three international transit countries are France, Spain and the United States.

Table 3.3: Evolution of outgoing traffic (terminal + transit)

Outgoing (mins)	1990	%	1993	%	1996	%
France	1'276'404	49.6%	1'626'908	38.0%	2'120'212	43.4%
Spain	463'933	18.0%	822'798	19.2%	900'853	18.4%
United States	77'196	3.0%	224'641	5.3%	180'298	3.7%
Senegal	385'471	15.0%	466'705	10.9%	805'103	16.5%
Côte d'Ivoire	136'401	5.3%	139'098	3.3%	133'159	2.7%
Arab countries	233'929	9.1%	997'361	23.3%	749'534	15.3%
Total	2'573'334	100%	4'277'511	100%	4'889'159	100%

Source: OPT Directorate

Traffic grew in volume terms over the period studied for virtually all countries.

- **France**

France remains the leading country for outgoing calls. Transit accounts for 35% of traffic on average (this proportion increased significantly in 1996).

- **Spain**

This is the second destination for outgoing calls, a large amount of traffic between the two countries (to Spain's advantage) being generated by the fishing industry. Transit traffic accounts for over 47% of the total on average, with two particularly peak years, 1992 and 1994 (over 65% of traffic transit-related).

- **United States**

International traffic stagnated until 1991 and has been steadily increasing since then. A peak was recorded in 1993, with 224 641 outgoing minutes.

- **Senegal**

Senegal is a neighbouring country with which economic exchanges are significant. Consumption fell in 1991 (fall connected with the political events between the two countries), but has since resumed. Exchanges with Senegal are growing significantly.

- **Côte d'Ivoire**

Traffic to Côte d'Ivoire has stagnated over the period studied, which explains the decline in that country's share of the market from 5.3 to 2.7%.

- **Arab countries**

Traffic rose sharply in 1991 (on account of the political events associated with the Gulf War). Although the trend is downward, the level of traffic is still very high (three peaks in consumption in 1992, 1993 and 1995).

The table below gives a breakdown of traffic for the main countries.

Table 3.4: Evolution of outgoing terminal traffic (in minutes)

Country	1994	%	1995	%
France	1'085'320	29%	1'243'988	25%
Senegal	599'525	16%	622'899	13%
Morocco	354'813	9%	325'504	7%
Spain	329'386	9%	571'743	12%
Saudi Arabia	303'453	8%	312'426	6%
United Arab Emirates	236'391	6%	233'056	5%
Côte d'Ivoire	133'191	4%	135'375	3%
United States	120'089	3%	143'566	3%
Tunisia	95'872	3%	121'721	2%
Algeria	62'858	2%	23'911	0%
Germany	48'602	1%	80'313	2%
Italy	47'678	1%	71'245	1%
Mali	35'128	1%	85'329	2%
Belgium	35'075	1%	73'608	2%
Canada	25'782	1%	31'236	1%
Netherlands	19'065	1%	27'328	1%
Brazil	15'916	0%	21'576	0%

Source: Statistics Directorate

The first countries' rankings are more or less stable, a notable exception however being the top three, since Spain moves up from fourth place (with 329 386 minutes) to third place (with 571 743 minutes).

3.2.3 Incoming traffic from transit countries

Table 3.5: Evolution of incoming traffic (in minutes)

Incoming	1990	%	1993	%	1996	%
France	1'433'416	80.4%	1'845'482	72%	2'620'475	67.9%
Spain	261'807	14.7%	484'815	19%	766'429	19.9%
United States	87'065	4.9%	224'641	9%	474'143	12.3%
Total	**1'782'288**	**100%**	**2'554'938**	**100%**	**3'861'047**	**100%**

Source: OPT Directorate

France is still the leading country for incoming traffic, even though its share has declined from 80% in 1990 to 68% today. Spain accounts for 20% of incoming traffic.

We have not yet received data on incoming traffic from other countries.

3.2.4 Accounting balance with the three main carriers

Mauritania displays a structural surplus with France (incoming traffic greater than outgoing traffic), and this generates significant resources. Similarly, traffic with the United States produces a positive balance.

With Spain, however, there is a deficit (except in 1995, when there was a marked reversal in the trend). The overall evolution of the balance with the three countries is in Mauritania's favour: the balance with France has doubled in six years, the balance with the United States has grown by a factor of 30, and the negative balance with Spain has tended to shrink little by little.

Overall, the trend in Mauritania's situation in respect of its foreign partners is improving. The imbalance with Spain and resulting expenditure are more than offset by the surplus with France and the United States.

Table 3.6: Balance with transit countries (in minutes)

Balance in minutes Incoming - outgoing	**1990**	**1993**	**1996**
France	157'012	218'574	500'263
Spain	-202'126	-337'983	-134'424
United States	9'869	0	293'845

Source: OPT Directorate

3.3 Tariff analysis

OPT introduced a new tariff grid in 1997 which, broadly speaking, charges for local calls by duration and groups foreign countries into six tariff areas. The last major change had taken place in 1994. Meanwhile, the fiscal administration had subjected telephone services to taxes (value added tax and tax on income and services).

3.3.1 Fixed charges

Table 3.7: Evolution of fixed charges 1990-1996

In UM	**1990**	**1992**	**1994**	**1995**
Guarantee deposits:				
– residential	26'000	26'000	28'000	28'000
– business	52'000	52'000	56'000	56'000
Connection fee:				
– fixed	10'400	14'000	16'000	16'000
– variable[6]	13'000	14'000		
Annual subscription:				
– NTC (+2 000 lines)	5'850	5'850	8'832	9'024
– NTC (-2 000 lines)	3'900	3'900	6'528	6'720
Exchange rate UM/$US	80.6	87.0	123.6	129.8

Source : OPT Directorate

The guarantee deposit has changed little in six years. From 1990 to 1993, the connection fee comprised a fixed portion and a variable portion: since the changes implemented in 1994, only the fixed portion remains.

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[6] Distance is calculated between the subscriber connection point and the concentration point (CP). In 1990, a charge was made for distances greater than 500 m. In 1992, this minimum distance was increased to 2 000 m.

The price of the annual subscription depends on the size of the connecting exchange. If the exchange has over 2 000 lines, the connection is more expensive. From 1992 to 1994 the price rose by 51% for subscribers connected to an NTC with more than 2 000 lines and 67% for subscribers connected to an NTC of less than 2 000 lines. The subscription has barely increased at all since.

3.3.2   Call charges

The table below shows how the price of calls has evolved.

Table 3.8: Evolution of the tariff grid 1990-1997

In UM	**1990**	**1992**	**1994**	**1995**	**1997**
Price basic charge unit (BCU)	13	14	16	16	16
Local call	1 BCU	1 BCU	1 BCU	1 BCU	1 BCU
Local call duration	Unlimited	Unlimited	Unlimited	Unlimited	7 mins
CU long-distance call	1 BCU	1 BCU	1 BCU	1 BCU	1 BCU
Duration up to 100 km	40 s	36 s	36 s	36 s	36 s
101-250	25 s	18 s	18 s	18 s	18 s
251-400	15 s	12 s	12 s	12 s	12 s
401-600	10 s	10 s	10 s	10 s	10 s
more than 600 km	9 s	9 s	9 s	9 s	9 s
International call	1 BCU	1 BCU	1 BCU	1 BCU	1 BCU
Duration France	4.7 s		1.8 s	2.6 s	3 s
Spain	4.7 s		2.6 s	2.6 s	3 s
United Kingdom	3.3 s		2.8 s	2.8 s	3 s
United States	2 s		3.6 s	3.6 s	4 s
Senegal	9 s		3.7 s	3.7 s	4 s
Côte d'Ivoire	4.7 s		3.4 s	3.4 s	4 s
Saudi Arabia	2.6 s		3.9 s	3.9 s	4.5 s

Source: OPT Directorate

• **Basic charge unit**

The basic charge unit has increased little in six years (+ 23%), i.e. less than the effect of inflation and currency draft. Increases in tariffs have thus been made by reducing the call duration covered by a basic charge unit.

• **Local calls**

The main development was the changeover in 1997 from an unlimited call duration to a duration of seven minutes for a basic charge unit.

- **Long-distance calls**

The price of long-distance calls is determined according to distance and duration. The distance is divided into a scale of five areas: five tiers around the point of origin of the call. Within these areas, the duration for a basic charge unit varies between 9 and 36 seconds. The major development in 1994 was the changeover from charging by indivisible segments of three minutes[7], to staged charging (the basic charge unit serving as a reference). In 1997, the introduction of time segments helped to optimize network utilization by distributing calls more effectively between peak and off-peak periods.

- **International calls**

The previous international grid (more or less a different tariff for each country) has been replaced by a clearer six-area scheme of international tariffs: OPT has placed countries in six tariff groups (group 1: Arab countries, group 2: West Africa plus United States, Group 3: Northern Europe plus Red Sea...).

The same tariff is applied more or less for all European countries, a single tariff is adopted for neighbouring African countries, and similarly for the Arab countries. The United States enjoys a more favourable tariff than European correspondents.

3.3.3   Comparison with the tariffs of certain operators

The table below provides a simple and quick comparison of the tariff grids of certain operators, in particular in Africa.

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[7]   For the links Nouakchott/Akjoujt, Nouakchott/Nouadhibou and Nouakchott/Rosso, which are equipped with automatic exchanges, charging is carried out on the basis of the basic charge unit (1 BCU every 12 to 20 seconds). For the other links, which are equipped with mechanical exchanges, charging is carried out in indivisible 3-minute segments.

Table 3.9: Comparison of the tariffs of number of operators

Country	Madagascar	Mauritius	France	Senegal	Mauritania
Operator	TELMA	Telecom Mauritius	France Telecom	Sonatel	OPT
Currency	FMG	RS	FRF	FCFA	MU
Exchange rate	5'251	21	6	590	165
VAT	25%		20.6%	20%	14%
FIXED CHARGES (in $US)					
Installation					
– residential or mixed	39.4	95.2	43.6	129.7	315.2
– business		142.9		176.3	484.8
Subscription/month					
– residential or mixed	4.8	2.9	9.7	3.9	4.6
– business		4.8			
VARIABLE CHARGES (IN $US)					
Basic charge unit (BCU)	0.10	0.05	0.10	0.08	0.10
Average cost local call (3 min)	0.10	0.05	0.10	0.08	0.10
Long-distance calls					
– less than 25 km	**0.19**	0.05	0.13	0.11	0.16
– 25-30	**0.19**	0.05	0.13	0.11	0.16
– 30-50	**0.19**	0.05	0.16	0.11	0.16
– 50-100	**0.19**	0.05	0.19	0.11	0.16
– 100-150	0.19		0.19	0.11	**0.32**
– 150-200	0.32		0.19	0.17	**0.32**
– 200-300	0.32		0.19	0.17	**0.48**
– 300-400	0.32		0.19	0.17	**0.48**
– greater than 400 km	0.32		0.19	0.17	**0.58**
Off-peak rate reduction	none	none	50%	50%	none
International					
Madagascar		1.9	1.0	0.6	**2.9**
Mauritius	1.9		1.1	**2.3**	1.9
France	**2.4**	1.4		1.4	1.9
Senegal	**3.6**	1.9	1.0		1.5
Mauritania	**3.6**	1.9	1.0	0.6	
United Kingdom	**3.6**	1.4	0.3	1.9	1.9
United States	**3.6**	1.7	0.3	2.3	1.5
South Africa	2.4	1.4	1.0	2.3	**3.9**
Average	**3.0**	**1.7**	**0.8**	**1.6**	**2.2**

The network connection charge is extremely high in Mauritania, more than double the charge in the next most expensive country (on account of the very high guarantee deposit).

The price of local calls is similar to the price in other countries.

The price of long-distance calls is high, particularly for the longest distances. This is explained to a large extent by the costs associated with national networks (ARABSAT and investment in DOMSAT). However, the introduction of time segments (peak/off-peak rates) brings down the price of calls somewhat.

The price of international calls is in the high portion of the sample. Mauritania's tariff grid is far higher than the mean price for France Telecom. It is also more expensive, on average, than the tariff grids of the operators in Senegal and Mauritius.

It is interesting to compare average price of OPT's international minute with that of Telma, the operator in Madagascar, which faces the same constraints in terms of national coverage and maintenance of the national network. Like OPT, Telma utilizes a DOMSAT system to cover its territory. Despite a price reduction in mid-1997, Telma's average price is still far higher than OPT's.

It is interesting to note that the tariff for calling the United States is the same as the tariff for calling Senegal. The tariff to the United States is attractive.

A comparison of countries' tariffs and accounting rates for the corresponding regions for the three main correspondents gives the following results.

Table 3.10: Accounting rate/consumer price 1997
(in $US)

Region	Country	Consumer tariff	Accounting rate	Tariff/A.R.
America	United States	1.5	1.70	90%
Europe	France	1.9	1.10	173%
Africa	Senegal	1.5	1.16	147%

It may be seen that the tariff for calls to the United States does not fully cover the accounting rate on that relation. In the other direction, the consumer tariff changed in the United States for calls to Mauritania ($US 1.67[8]) is very close to the accounting rate. However, this tariff is only $US 1.10 for some callback operators.

The situation described above stems partly from changes in the Ouguiya/Dollar exchange rate ($US 1 = 140 UM in 1996, $US 1 = 165 UM in 1997).

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[8]   Source ITU

4   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 for international exchanges of traffic. 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 settlement levels proposed by FCC with those which we shall calculate for Mauritania 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 Mauritania and some considerations on the level of cross-subsidies between the different telephone services.

4.1   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 method of estimating international settlement rates for a sample of countries, called the tariffed components price methodology (TCP), based on 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   [726 - 2 895]

3)   upper middle income: GDP/per capita   [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.

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

On the basis of a sample of countries classified according to their income category, 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 the table below.

Table 4.2: Benchmark for 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	**10**	**5**	**8**	**2.3**

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

Mauritania is not referenced by FCC. Nevertheless, given the country's development criteria, it should undeniably be classified in the "low income" category[9].

In the section below, different approaches are used to attempt to determine for Mauritania the cost of the three components of international traffic. These costs will then be compared with those proposed by FCC.

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[9]   Refer to Appendix C: Classification of Economies, FCC Order No. 97-280 of 18 August 1997.

4.2 Determination of costs for incoming international telecommunications in Mauritania

4.2.1 General comments on the methodology

When seeking to determine tariffs for telecommunication services (local, long-distance and international) set up using infrastructure that may be shared by several services[10] and entails fixed costs, the problem is to identify economies of scale.

Research carried out on tariff principles for telecommunications offers different types of solutions.

- **Tariffs may be set as a function of utility of the service**. Since groups of users do not all display the same service utility 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 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 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 is apparently the most suitable for dynamic and competitive markets. In its Order, FCC states that: "*Most economists generally agree that competitive markets over the long run tend to force prices towards incremental costs. In dynamic, competitive markets, firms take action based not on embedded costs, but on relationship between market determined prices and forward-looking costs. If market prices exceed forward-looking economist costs, new competitors will enter the market. As new competitors enter the market, prices will be driven toward forward-looking incremental cost level.*" This method requires a sound forecasting model. Without precise data on which to base traffic and cost forecasts, however, it is extremely difficult to apply, and has therefore not been adopted in this study.

The following section shows the cost results obtained for the international telephone service in Mauritania, using the fully distributed cost method and the method based on incremental costs.

4.2.2 Estimation of costs

The fully distributed cost method allocates all the direct costs of the services, plus a proportion of shared fixed costs.

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).

We present two sets of results in which the level at which the other services subsidize network access varies from 0% (incremental cost) to 100% (fully distributed cost).

4.2.3 Data used

On account of the lack of cost accounting and the fact that OPT continues to perform two functions (telecommunication operator and post office), there is no simple way of determining the costs directly

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[10]   In Mauritania, the international transit centres are used as national transit centre.

attributable to international telephone services (international switching, international transmission and national extension).

The problem is that the final accounts for the telecommunication function bears a significant share of the costs of structures common to posts and telecommunications. Nevertheless, since the telecommunication function is OPT's main activity, this share is probably close to the costs that would be incurred by an autonomous enterprise. The deficit on posts has therefore been disregarded for the purposes of the cost study.

Costs associated with the telecommunication sector were allocated directly to the services concerned, when such direct allocation was possible.

Costs common to both sectors were evaluated and then attributed according to a distribution determined by the degree of utilization by the sector concerned (working unit). Similarly, appropriations for depreciation and common provisions were recalculated and allocated to the services concerned. In the absence of more precise analytical data (in particular for contributions to non-telecom depreciation), this distribution remains somewhat theoretical. For remuneration of equity capital, we decided on a rate of return of 10% on fixed assets, which can easily be allocated to the various telephone services.

From the information in our possession, we were able to determine the structure and volumes of incoming and outgoing international traffic. Through an analysis of some national traffic observations and comparisons with countries with similar consumption behaviours, we were able to evaluate:

•   distribution of incoming international traffic throughout the country

•   mean duration of local, long-distance and outgoing international calls.

These data were used to determine the cost of international services, which are set out in the table below.

Table 4.3: Cost of international services (per minute)

Components	Incremental cost		Distributed cost		Benchmark
	UM	$US	UM	$US	$US
International transmission	25	0.18	33	0.24	0.10
International switching	6	0.04	8	0.06	0.05
National extension	31	0.22	41	0.30	0.08
Cost per minute (in $US)	**64**	**0.45**	**82**	**0.59**	**0.23**

It should be noted that common post and telecommunication costs borne by the telecommunication sector augment the cost per international minute by $US 0.03, which is incremental in comparison with other costs.

The costs of the network components used in the provision of international telephone services lie (according to the network access cost subsidy rate used) between $US 0.45 and $US 0.59. This cost is far higher than that determined under the benchmark advocated by FCC for countries in the low-income category.

The difference between the costs calculated above and the FCC benchmark stem from both the transmission component (+80%) and the national extension (+175%). This difference is explained, for the first component, by the lack of economies of scale (two international earth stations for 113 circuits in service), while the high cost of the national extension is explained by the fact that subscribers are scattered far and wide throughout the territory and by the magnitude of national transmission investment (DOMSAT).

The cost of international transmission is similar to that of a country such as Kenya (cf. FCC benchmark); the cost of the national extension is similar to that of a country like Madagascar (small number of subscribers, extensive areas to be covered, DOMSAT national transmission system).

4.3   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 telephone income and traffic figures

	% of total income	% of total traffic
Connection	**2.1%**	
Subscription	**4.2%**	
Traffic	**89.7%**	
– *local*	7.5%	63%
– *long-distance*	29%	14%
– *outgoing international*	53.2%	10%
International balance	**3.8%**	**12%**
Total	**100%**	**100%**

Local traffic, which accounts for nearly 63% of the traffic handled, generates barely 7.5% of income (on account of the low price of local calls, recently set at 12 cents per 7 minute period). International traffic accounts for over 57% of OPT's income, while representing around 22% of Mauritania's total traffic.

The table below shows, on the basis of the costs estimated above, that the international service generates a surplus of the order of 46% of the income it generates. It is this surplus that constitutes the service's subsidy for other OPT products (local and long-distance service, network access).

Table 4.5: Subsidy from international service

	Net international income		Transfer to other services
100%	SURPLUS		SUBSIDY
54%	INTERNATIONAL COST		

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 grid;

•   ability to sustain their development programme.

Modelling all the effects induced by a fall in accounting rate levels is a complex operation and requires many items of data, some of which (cross-price elasticity, callback, refile...) are not available and have to be estimated. The first measurements of callback have only just started.

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 consumers[11]. 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 offer. 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, a 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 (call duration varies as a function of price). It has been taken into account both for outgoing international traffic from Mauritania and incoming international traffic to Mauritania, so as to simulate a general reduction in the price of international communications everywhere.

Some studies have shown 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 as well as different consumer habits, an average figure (0.6) was taken, which constitutes a rather conservative hypotheses (0.5 for Mauritania; 0.7 for its correspondent countries).

Since this elasticity applies for variations in tariffs, we have assumed that Mauritania's correspondents would reflect any reduction in accounting rates in their international tariffs. This hypothesis obviously has a significant impact on projections of incoming traffic, in particular four years in which the accounting rate declines sharply.

A reduction in international tariffs for outgoing traffic from Mauritania was determined according to the constraints imposed by rebalancing of the tariff grid and maintaining and developing the national network (including notably investments in GSM).

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[11]   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

OPT's tariff grid is currently unbalanced. In the previous section of this study, the current level of cross-subsidies between services is estimated. The subscription fee and the cost of a minute of local call are subsidized to a large extent by the minute of national and international call.

To reflect this state of affairs, we have made tariffs progressively cost-oriented, while at the same time allowing some cross-subsidies to remain. Given the very high cost of the national extension and the current acute imbalance in the tariff grid, it will be necessary, for several years to come, for international calls to finance part of the national network[12].

An international tariff grid was thus elaborated with this in mind. The following subsidies are maintained:

•   Subscription charge subsidized by the other telephone services to the tune of 40%.

•   Price of local calls subsidized by the price of international calls to the tune of 20%.

The target is, under these conditions, to balance the tariff grid by 2003.

Table 5.1: International tariff hypothesis

(in $US)	Average tariff 1996	Average tariff 2003	Annual change
MU/$US	140	140	
Tariff/minute	334	160	-7%

With these hypotheses, the following tariff rebalancing is achieved:

Table 5.2: Hypotheses for rebalancing income

	1996	2003
Income from subscriptions	7%	19%
Income from calls	93%	81%
– *National*	37%	52%
– *International*	54%	29%
Total subscription + calls	100%	100%

(The above subscription income includes connection fees.)

Slower rebalancing of the tariff grid, for example by 2007, would result in international calls accounting for a larger proportion of total income from calls (over 32%).

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12   Such an obligation could apply to any future competitor as an obligation to contribute to universal service development.

Network development plan and investment financing policy

In 1997, there were just over 12 500 subscribers in Mauritania. The number of subscribers grew considerably in 1997, with the opening of the domestic market and the final commercial and technical implementation of the DOMSAT system, absorbing the waiting list. Smaller growth should however be anticipated from now on.

Under the projection hypotheses taken, telephone density rises from 0.5% to 1% in 2003 (as a result of lower costs and lower tariffs).

Account was taken of the programme for development of the GSM network and extension of the Nouakchott and Nouadhibou exchanges.

Traffic development hypothesis

International traffic

In 1996, the volume of incoming international traffic was greater than that of outgoing traffic (only 70% of incoming traffic is known in detail; traffic from correspondents other than the top three is estimated).

The small imbalance must not be allowed to obscure the fact that no international accounts are exchanged among the majority of countries in the subregion. Thus, countries in the CFA area (including among others Senegal[13] and Côte d'Ivoire) and most of the Arab countries (except United Arab Emirates) do not exchange international accounts (as if, in a way, the "sender keeps all" method is already applied). No provision was made for any exchanges of accounts between these countries in the simulation. If accounts were exchanged, this would increase the surplus balance in Mauritania's favour.

International traffic evolves according to natural growth, added to an elasticity effect of lower international tariffs. Traffic with countries of the subregion should grow more than traffic with other countries of the world.

No major imbalances are observed, except with the United States which carries 2.6 times more incoming traffic than outgoing. France sends more traffic than it receives, unlike Spain, which has a positive balance with Mauritania. In the traffic projection hypotheses, the directions of these imbalances are retained.

Outgoing and incoming international traffic was divided up into four areas (Europe, North America, Africa and rest of the world), in order to take into account the unequal growth rates with the different countries. Incoming international traffic is increasing on average by 10% a year for Europe, 12% for the United States and the countries of the subregion. The evolution of incoming international traffic is identified in two periods, 1997-2000 and 2001-2003, in order to take account of more significant growth (elasticity apart) during the first period than in the second (when the growth rate falls by 2%).

Price elasticity effects have been added to natural traffic trends: elasticity effects are less marked in Mauritania than for its correspondents (0.5 as against 0.7).

Domestic traffic

The increase in domestic traffic follows real growth in GDP. Long-distance traffic benefits from a price elasticity effect, with the gradual rebalancing of the tariff grid.

It was assumed that traffic grows by 4-5% per year. At that rate, the telecommunication operating income/GDP ratio is kept more or less constant (rising from 2.4 to 2.7% over six years).

Economic and demographic hypotheses

A medium growth hypothesis was adopted for GDP, assuming a real growth rate of 3.5% per year on average over the period 1997-2003.

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[13]   Some of the traffic with Senegal is however subject to exchanges of accounts.

Controlling costs

Staffing and wage bill

The growth in OPT's staffing levels has been calculated so that the lines/staff ratio is multiplied by a factor of four over ten years (increase in productivity). The ratio currently stands at eighteen lines per staff member. This hypothesis is necessary in order to keep the wage bill under control. It has been assumed that the wage bill will grow on average by 1.5% more than inflation.

Purchases and supplies

Purchases and supplies represent 4% on average of total fixed costs.

Costs for use of the space segment

These costs are proportional to the rate of growth of the sum of outgoing and incoming international traffic, less 2% to take account of improved circuit use stemming from increases in traffic and competition.

The operating cost of the DOMSAT system and possible additional investment to cope with the increase in domestic traffic are proportional to national traffic growth.

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).

Shared costs with the postal network

It is necessary to highlight the magnitude of the share of general services common to both posts and telecommunications. This share has been incorporated in the projection hypotheses, with the presumption that possible separation of telecommunications and posts would improve the cost situation.

Subsidies for the postal sector

A possible subsidy to be paid by telecommunications to the new postal entity in the years following separation has been included in the simulation in the form of a fixed outlay payable to the post office ($US 1 million per year). Such a subsidy is normal consideration when balance-sheets are separated, in order to facilitate the gradual adjustment of postal operations during the first few financial years. Since the separation process is currently being envisaged, this cost needs to be taken into account in the simulation.

5.2   Scenarios

5.2.1   Scenario A: FCC Benchmark

•   **Presentation of Scenario A**

This scenario proposes an evolution of settlement rates such that the amount of accounting rates between American operators and Mauritania meets the level set by the FCC benchmark (23 US cents per minute in 2003).

The 1996 level of settlement rates between the two countries stands at 85 cents per minute, which is low in comparison with other countries of the same type. The difference in the two figures means that a 73% reduction in settlement rates will be required over the projection period (17% per year).

The simulation of this scenario therefore proposes an across-the-board reduction of 17% per year for all international destinations (no country should however go below $US 0.23). The settlement rates remain symmetrical.

Table 5.3: FCC benchmark scenario

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	5.9	6.5	7.3	8.2	9.1	10.1
Incoming international traffic	10^6 min	6.1	6.8	7.6	8.5	9.6	11.0	12.3	13.7
Ratio incoming/outgoing		1.24	1.26	1.28	1.30	1.32	1.34	1.35	1.35
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	0.85	0.71	0.59	0.49	0.40	0.34	0.28
Settlement Rate United States	$US/min	0.85	0.71	0.59	0.49	0.40	0.33	0.28	0.23
Settlement Rate Africa	$US/min	1.16	0.96	0.80	0.66	0.55	0.45	0.39	0.32
Settlement Rate rest of the world	$US/min	1.49	1.24	1.03	0.85	0.71	0.59	0.49	0.40
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	25.1	26.7	28.8	31.5	34.4	37.7	41.9
Net profit	10^6 $US	6.5	7.5	8.2	7.3	8.2	5.4	7.1	10.2
International settlement balance	10^6 $US	**0.7**	**0.77**	**0.77**	**0.75**	**0.74**	**0.71**	**0.67**	**0.63**
% of net profit	%	10.8 %	10.3 %	9.3%	10.3 %	9.0%	13.2 %	9.5%	6.1%
Cash flow	10^6 $US	12.7	11.9	12.9	12.9	14.5	14.4	16.3	19.4
Long-term debt/permanent capital	%	69%	57%	48%	45%	41%	47%	42%	36%

- **Analysis of the results**

Analysis of the evolution of settlement rates gives an idea of the impact of the reduction in the settlement rate proposed by FCC. For the three main geographical areas accounting for nearly 80% of Mauritania's telephone relations, the reduction sought imposes a 73% reduction in settlement rates over five years. This decline in all settlement rates results for some destinations in a situation close to the costs suggested by FCC.

Outgoing international traffic, owing to the combined effect of natural traffic growth and lower international tariffs (price elasticity), is multiplied by a factor of 2.1 between 1996 and 2003. In the period 1997-2003, the decline in outgoing international tariffs from Mauritania resulting from the introduction of cost-oriented tariffs serves to generate 8.1 million additional minutes. This evolution is identical for all the scenarios and will not be repeated in the remainder of this study.

Incoming international traffic is multiplied by a factor of 2.3 between 1996 and 2003, attaining 13.7 million minutes. The incoming/outgoing traffic ratio increases from 1.24 to 1.32.

Financial impact: In this scenario, the balance of international settlements falls progressively (cumulative decline of 11%). However, price elasticity offsets considerably the decline in settlement rates (increased difference between incoming and outgoing traffic).

One of the firm hypotheses adopted for the simulation is higher elasticity for incoming traffic (coefficient 0.7) than outgoing traffic (0.5). If incoming traffic evolved with lower elasticity (for example 0.6), the international settlement balance would drop by 32%, representing a cumulative loss of 600 000 dollars (equivalent to the surplus on the international settlement balance in 1996).

Conversely, it may be anticipated that when foreign operators reflect the lower accounting rates in their tariffs, this will increase the difference between their tariffs and OPT's. More traffic should then be attracted to callback, thereby redressing the international settlement balance to the detriment of locally collected income.

Indebtedness rises by nearly 70% to 36% of permanent capital, which is an acceptable level given the current situation.

• **Conclusions**

The faster growth of incoming international traffic as compared with outgoing international traffic almost offsets the gradual reduction in settlement rates. The settlement rates nevertheless appear to be far removed from real costs, as calculated above, leading to fears that OPT might end up subsidizing its incoming traffic. The gap should however close gradually on account of gains in productivity.

In order to offset the loss of income on the settlement balance, one could think in terms of a lesser rebalancing of the tariff grid. However, since this would increase the difference between OPT's tariffs and those of its correspondents, a considerable incentive to callback would result.

5.2.2 Scenario B1: 6% staged reduction

• **Presentation of the scenario**

This scenario proposes a straight-line annual 6% reduction in the amount of settlement rates.

Table 5.4: Scenario B1: 6% staged reduction

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	5.9	6.5	7.3	8.2	9.1	10.1
Incoming international traffic	10^6 min	6.1	6.6	7.1	7.7	8.6	9.5	10.4	11.4
Radio incoming/outgoing		**1.24**	**1.22**	**1.21**	**1.19**	**1.17**	**1.16**	**1.15**	**1.13**
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	0.97	0.91	0.85	0.80	0.76	0.71	0.67
Settlement Rate United States	$US/min	0.85	0.80	0.75	0.71	0.66	0.62	0.59	0.55
Settlement Rate Africa	$US/min	1.16	1.09	1.02	0.96	0.90	0.85	0.80	0.75
Settlement Rate rest of the world	$US/min	1.49	1.40	1.31	1.23	1.16	1.09	1.03	0.96
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	25.1	26.7	28.8	31.5	34.5	37.8	42.1
Net profit	10^6 $US	6.5	7.5	8.2	7.3	8.2	9.3	7.7	10.2
International settlement balance	10^6 $US	**0.7**	**0.71**	**0.67**	**0.61**	**0.56**	**0.50**	**0.43**	**0.34**
% of net profit	%	10.8%	9.6%	8.1%	8.4%	6.9%	5.4%	5.6%	3.3%
Cash flow	10^6 $US	12.7	11.9	12.9	12.9	14.5	16.3	16.8	19.5
Long-term debt/permanent capital	%	69%	57%	48%	45%	41%	38%	40%	35%

- **Analysis of results**

<u>Analysis of the evolution of settlement rates</u> gives an idea of the impact of a staged reduction in settlement rates. For the three main geographical areas which account for nearly 80% of Mauritania's telephone relations, this staged reduction imposes a 35% reduction in settlement rates over seven years.

With this gradual reduction, an settlement rate of $US 0.55 is obtained for the relation Mauritania - United States and an average settlement rate of $US 0.67 for the relation Mauritania - Europe.

<u>Incoming international traffic</u>, 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 2003. The incoming/outgoing traffic ratio falls from 1.24 to 1.1. This situation, in which traffic tends to even out, necessarily results in a fall in the surplus on the international settlement balance.

<u>Financial impact</u>: In this scenario, the balance of international settlements falls by 51%, from 0.7 to 0.34 million dollars.

With price elasticity, the incoming/outgoing traffic ratio cannot be maintained at a sufficiently high level to keep income stable. The necessary rebalancing of Mauritania's tariff grid results in a greater increase in outgoing traffic than the increase generated by the much lower fall in settlement rates.

At the end of the simulation, the international settlement balance accounts for less than 1% of turnover. The net loss on the settlement balance totals over 1 million dollars. Nevertheless, in comparison with the previous scenario, the overall telecommunication accounts for Mauritania are slightly improved.

5.2.3 Scenario B2: 10% staged reduction

- **Presentation of the scenario**

This scenario proposes a straight-line annual 10% reduction in the amount of settlement rates. The 10% reduction is applied to all the OPT's international relations. In this scenario, operators remunerate each other on the basis of the number of traffic units carried and settlement rates are symmetrical according to the destinations.

Table 5.5: Scenario B2: 10% staged reduction

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	5.9	6.5	7.3	8.2	9.1	10.1
Incoming international traffic	10^6 min	6.1	6.6	7.3	8.0	9.0	10.0	11.1	12.2
Ratio incoming/outgoing		**1.24**	**1.24**	**1.23**	**1.23**	**1.23**	**1.22**	**1.22**	**1.21**
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	0.93	0.83	0.75	0.68	0.61	0.55	0.49
Settlement Rate United States	$US/min	0.85	0.77	0.69	0.62	0.56	0.50	0.45	0.41
Settlement Rate Africa	$US/min	1.16	1.04	0.94	0.84	0.76	0.68	0.62	0.55
Settlement Rate rest of the world	$US/min	1.49	1.34	1.20	1.08	0.98	0.88	0.79	0.71
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	25.1	26.7	28.8	31.5	34.5	37.8	42.1
Net profit	10^6 $US	6.5	7.5	8.2	7.3	8.2	9.3	7.7	10.3
International settlement balance	10^6 $US	**0.7**	**0.74**	**0.72**	**0.69**	**0.67**	**0.65**	**0.61**	**0.56**
% of net profit	%	10.8 %	9.9%	8.7%	9.4%	8.1%	6.9%	7.9%	5.5%
Cash flow	10^6 $US	12.7	11.9	12.9	12.9	14.5	16.4	16.8	19.6
Long-term debt/permanent capital	%	69%	57%	48%	45%	41%	38%	40%	35%

- **Analysis of the results**

Analysis of settlement rates: the settlement rate for relations with the European area ends up at $US 0.49, and that for relations with the United States at $US 0.41.

Incoming international traffic is doubled between 1997 and 2003, attaining 12.2 million minutes.

In terms of financial impact, the fall in the international surplus is less acute than for the 6% scenario, since incoming traffic benefits from the elasticity effect. The international settlement balance falls by 7%, representing a cumulative loss of $US 300 000. The financial result is only slightly worse than in scenario B1.

- **Conclusion for scenarios B1 and B2**

Given the quasi-equilibrium of incoming and outgoing traffic in 1996 (ratio of 1.3), the scenario involving a staged reduction of settlement rates would result in a decline in the international settlement balance for the Mauritanian operator. Nevertheless, total turnover and net profit are less severely affected than in scenario A, on account of the smaller decline in settlement rates.

The very similar financial result in both scenarios clearly reflects the relatively small proportion that the international settlement balance represents in OPT's net turnover.

5.2.4   Scenario C: Termination charge

• **Presentation of the scenarios**

The terminal share 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 (international switching, international transmission, national extension). The scenarios which follow illustrate the application of an asymmetrical accounting rate based on the costs of the different operators.

The amount of the terminal share, determined by the incremental cost method, is $US 0.49 per minute for Mauritania. The scenarios which follow show two possible formulae for the termination charge scenario:

1)   Application of the cost-based settlement rate from the first year, followed by a straight-line 2% reduction to follow gains in productivity.

2)   Regular reduction of terminal shares down to $US 0.49 in 2003 for Mauritania and the respective benchmarks for its correspondents.

With respect to the rate applied by foreign operators on international traffic from Mauritania, it has been assumed that countries in the high-income category should set the rate for incoming traffic at the FCC benchmark ($US 0.15/minute). The rate for countries in the African area would be set on the same cost basis as for Mauritania, and for countries in between the rate should be $US 0.19 (FCC benchmark for middle income countries).

These settlement rates are introduced as from the first year in scenario C1 and then reduced by 2% per year for the remainder of the projection; in scenario C2, they are applied at the end of the period, by staged reduction.

• **Scenario C1: Termination charge from year 1**

Table 5.6: Termination charge scenario C1

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	5.9	6.5	7.3	8.2	9.1	10.1
Incoming international traffic	10^6 min	6.1	7.5	8.0	8.6	9.5	10.4	11.3	12.2
Ratio incoming/outgoing		1.24	1.40	1.36	1.33	1.30	1.27	1.24	1.21
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	0.49	0.48	0.46	0.45	0.43	0.42	0.41
Settlement Rate United States	$US/min	0.85	0.49	0.48	0.46	0.45	0.43	0.42	0.41
Settlement Rate Africa	$US/min	1.16	0.49	0.48	0.46	0.45	0.43	0.42	0.41
Settlement Rate rest of the world	$US/min	1.49	0.49	0.48	0.46	0.45	0.43	0.42	0.41
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	25.9	27.6	29.8	32.7	35.8	39.3	43.7
Net profit	10^6 $US	6.5	8.3	9.1	8.2	9.3	10.6	9.1	11.8
International settlement balance	10^6 $US	0.7	1.55	1.58	1.61	1.69	1.77	1.82	1.88
% of net profit	%	10.8 %	18.7 %	17.4 %	19.6 %	18.2 %	16.8 %	20.1 %	15.9 %
Cash flow	10^6 $US	12.7	12.7	13.8	13.8	15.6	17.6	18.2	21.1
Long-term debt/permanent capital	%	69%	56%	47%	43%	39%	36%	38%	33%

- **Analysis of the results**

Analysis of settlement rates: the incoming terminal share for Mauritania falls from $US 0.49 to $US 0.41 over the period. For its correspondents, it falls from $US 0.15 to $US 0.12 in the developed countries, $US 0.19 to $US 0.15 in the intermediate countries, and $US 0.49 to $US 0.41 in African countries.

Analysis of incoming traffic: incoming traffic is multiplied by a factor of 1.9 over the period, totalling 12.2 million minutes in 2003.

Financial impact: the introduction of an asymmetrical accounting rate automatically increases the operator's revenue (on account of the incoming/outgoing traffic balance).

The international settlement balance is multiplied by a factor of 2.7, representing a cumulative gain of $US 7 million (the share of the international settlement balance in OPT's turnover increases from 3.5% to over 6% of turnover in the year 2000).

This evolution of settlement rates increases the surplus on the international settlement balance by creating a sharply asymmetric situation from the first year of projection (with a 75/25 ratio in Mauritania's favour).

This result needs to be tempered, however: if foreign operators were to offset the loss in income resulting from the decline in their incoming termination charges by a smaller reduction in their tariffs, the international settlement balance would be reduced. We note however that the gross margin (tariff minus Mauritania's settlement rate) which they currently receive far exceeds the cost estimated by FCC. There is thus significant latitude for a reduction in their tariffs.

• **Scenario C2: Termination charge in year 7**

Table 5.7: Termination charge scenario C2

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	5.9	6.5	7.3	8.2	9.1	10.1
Incoming international traffic	10^6 min	6.1	6.6	7.2	7.9	8.8	10.0	11.1	12.4
Ratio incoming/outgoing		1.24	1.23	1.22	1.21	1.21	1.22	1.22	1.23
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	0.95	0.88	0.80	0.72	0.64	0.57	0.49
Settlement Rate United States	$US/min	0.85	0.80	0.75	0.70	0.64	0.59	0.54	0.49
Settlement Rate Africa	$US/min	1.16	1.06	0.97	0.87	0.78	0.68	0.59	0.49
Settlement Rate rest of the world	$US/min	1.49	1.34	1.20	1.06	0.92	0.77	0.63	0.49
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	25.3	27.2	29.5	32.5	35.9	39.5	44.3
Net profit	10^6 $US	6.5	7.7	8.6	8.0	9.1	10.6	9.3	12.3
International settlement balance	10^6 $US	0.7	0.86	0.99	1.15	1.37	1.64	1.94	2.31
% of net profit		10.8%	11.3%	11.5%	14.4%	15.0%	15.5%	20.9%	18.7%
Cash flow	10^6 $US	12.7	12.1	13.3	13.5	15.5	17.6	18.4	21.6
Long-term debt/permanent capital		69%	57%	48%	44%	40%	36%	38%	33%

• **Analysis of the results**

<u>Analysis of the evolution of settlement rates</u>: the cost-orientation of settlement rates is gradual and spread over the whole simulation period. The amount of average settlement rates evolves as follows.

Table 5.8: Average Settlement Rates

	Settlement rates paid out by Mauritania	Settlement rates paid out by correspondents
Europe	-82%	-52%
United States	-82%	-32%
Africa	-47%	-47%
Other countries	-87%	-67%

The gradual cost-orientation of settlement rates results in a staged asymmetry, from a ratio of 52/48 to 75/25 in Mauritania's favour with respect to its corespondents in the developed countries.

Incoming international traffic

Incoming international traffic should double between 1997 and 2003.

Financial impact

Lower elasticity for incoming traffic is offset to a very large extent by the measured reduction in accounting rates. Income from the international settlement balance is tripled. The international settlement balance accounts for over 5% of turnover at the end of the period. In these circumstances, an additional cumulative sum of over $US 5 million would be generated (which, after all, represents an extra year of net profit).

- **Conclusion for scenarios C1 and C2**

Moving accounting rates towards the Mauritanian operator's real costs would generate a significant surplus on the international settlement balance (if the accounting rate were set at $US 0.49 per minute). This imbalance is an ideal situation for the operator, maximizing international settlement income. According to the scenario, the cumulative gain would be between 5 and 7 million dollars.

Overall, OPT's turnover and profit resulting from these scenarios are better than before, since incoming traffic flows are increased thanks to a significant reduction in Mauritania's settlement rate while Mauritania's outpayments are also reduced.

5.2.5 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 between the United States and Mauritania to be symmetrical and cut to $US 0.08.

It provides a simulation of 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 that the settlement rates between North America and Mauritania plummet to $US 0.08 in 1999.

The hypothesis of discontinuation of bilateral negotiations has been extended to all international relations.

Table 5.9: Very low rates scenario

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	6.0	6.6	7.4	8.4	9.3	10.1
Incoming international traffic	10^6 min	6.1	7.0	8.4	10.7	11.7	12.7	13.6	14.6
Ratio incoming/outgoing		1.24	1.31	1.41	1.63	1.57	1.52	1.46	1.41
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	0.72	0.41	0.08	0.08	0.08	0.08	0.08
Settlement Rate United States	$US/min	0.85	0.59	0.34	0.08	0.08	0.08	0.08	0.08
Settlement Rate Africa	$US/min	1.16	0.81	0.46	0.08	0.08	0.08	0.08	0.08
Settlement Rate rest of the world	$US/min	1.49	1.04	0.59	0.08	0.08	0.08	0.08	0.08
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	25.1	26.6	28.2	30.8	33.8	37.0	41.3
Net profit	10^6 $US	6.5	7.5	8.1	6.7	3.1	4.3	6.6	9.8
International settlement balance	10^6 $US	0.7	0.79	0.70	0.23	0.23	0.23	0.22	0.22
% of net profit		10.8 %	10.5 %	8.6%	3.3%	7.4%	5.4%	3.4%	2.2%
Cash flow	10^6 $US	12.7	11.9	12.8	12.3	11.5	13.3	15.7	18.9
Long-term debt/permanent capital		69%%	57%	48%	45%	52%	50%	44%	38%

- **Analysis of the results**

Analysis of the evolution of accounting rates: all settlement rates fall by 91 - 95% in three years, down to $US 0.08.

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 2003, rising to 14.6 million minutes.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio rises from 1.24 in 1996 to 1.42 in 2003.

Financial impact: in this scenario, the international settlement balance falls between 1996 and 2003 by 70%, resulting in a cumulative net loss of $US 2.4 million (representing 3.5 times income on the 1996 balance). The Mauritanian operator could withstand this level of loss. The long-term debt/permanent capital ratio stands at around 40% at the end of the period, which is still a high level of indebtedness.

- **Conclusion for scenario D1**

The big risk in this scenario is probable proliferation of call-back. Since the Mauritanian operator cannot reduce its tariffs significantly over such a short period, there would probably be a substantial increase in the difference between the OPT's tariff grid and that of its correspondents. In these circumstances, an increase in call-back is inevitable (it is unlikely that OPT would be able to prevent all call-back, just as it is unlikely

that Mauritanian users will refrain from taking advantage of this practice if the difference in price is sufficiently big).

The table below gives an estimate of losses on cumulative net profit in the case of diversion of traffic through call-back.

Table 5.10: Effect of call-back on income ($US millions)

% of traffic through call-back	1996	1997	1998	1999	2000	2001	2002	2003	Cumulative loss
0%	6.5	7.5	8.1	6.7	3.1	4.3	6.6	9.8	
10%	6.5	7.2	7.7	6.0	2.4	3.6	5.9	9.1	4.1
20%	6.5	7.0	7.2	5.3	1.7	2.9	5.2	8.4	8.3
30%	6.5	6.7	6.8	4.6	0.9	2.2	4.5	7.8	12.6

5.2.6 Scenario D2: Sender keeps all

• **Presentation of the scenario**

This scenario proposes an extreme situation, in which there is no longer any exchange of international accounts (as is currently the case for some traffic with Senegal, Côte d'Ivoire and a number of Arab countries).

Table 5.11: Sender keeps all scenario

	Unit	1996	1997	1998	1999	2000	2001	2002	2003
TRAFFIC IN MINUTES									
Outgoing international traffic	10^6 min	4.9	5.4	6.0	6.6	7.4	8.4	9.3	10.1
Incoming international traffic	10^6 min	6.1	8.4	8.9	9.5	10.3	11.3	12.1	13.0
Ratio incoming/outgoing		1.24	1.56	1.50	1.44	1.39	1.35	1.30	1.25
SETTLEMENT RATE									
Settlement Rate Europe	$US/min	1.03	-	-	-	-	-	-	-
Settlement Rate United States	$US/min	0.85	-	-	-	-	-	-	-
Settlement Rate Africa	$US/min	1.16	-	-	-	-	-	-	-
Settlement Rate rest of the world	$US/min	1.49	-	-	-	-	-	-	-
FINANCIAL ACCOUNTS									
Turnover	10^6 $US	23.1	24.3	25.9	27.9	30.6	33.5	36.7	41.0
Net profit	10^6 $US	6.5	6.7	7.5	6.5	7.4	4.5	6.2	9.4
International settlement balance	10^6 $US	0.7							
% of net profit	%	10.8 %							
Cash flow	10^6 $US	12.7	11.2	12.2	12.1	13.7	13.5	15.4	18.6
Long-term debt/permanent capital	%	69%	58%	49%	46%	43%	49%	44%	38%

- **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 2.1 between 1996 and 2003.

In terms of traffic rebalancing, the incoming/outgoing international traffic ratio rises from 1.24 in 1996 to 1.25 in 2003, after a traffic peak in 1997 caused by the effect of price elasticity (over 50% increase in traffic).

Financial impact: in this scenario, there is no longer any international settlement income.

The conclusions are the same as for the previous scenario. Given the relative importance of the international settlement balance for OPT's income, there is little effect on net profit. In such circumstances, the overriding problem is how much traffic will be diverted through call-back.

- **Conclusions for scenarios D1 and D2**

Abolishing exchanges of international accounts or maintaining a practically zero settlement rate has in practice little direct impact on the Mauritanian operator's net profit (the settlement balance surplus currently accounts for only around 3.2% of net turnover).

The indirect effects of the diversion of outgoing traffic through call-back are much more of a problem. National development constraints are such that the national network has to be financed by the international network, which therefore has to be subsidized. We have seen that the cost of a minute of international call is extremely high in Mauritania. It is not possible for the Mauritanian operator to reduce the price of a minute of international call in the same proportions as its correspondents.

The big difference in tariffs which results would lead to a net decline in the operator's income on account of the phenomenon of call-back.

The impact of this would be exacerbated by the fact that OPT would be obliged to make investments to route this incoming traffic, without any compensation since it would be insufficiently remunerated or even not at all. That would in a way be tantamount to OPT having to subsidize the routing of traffic from third countries, including traffic "stolen" from it by call-back operators.

6 CONCLUSIONS

6.1 The traditional mechanism for setting tariffs no longer works

The above study highlights two types of distortions:

- The actual costs of routing incoming traffic are much lower than settlement rates. It should be noted that in the current symmetrical system, the difference is greater in the developed countries than in the developing countries.

- Public tariffs practised by operators in the developed countries, in particular where competition is at play, do not follow the classical rule:

Collection charge = K* (total settlement rates).

In fact, such tariffs are calculated more on the basis of:

Collection charge = cost of the outgoing section + accounting rate of other operators.

It is possible that these tariffs also implicitly include the surplus generated on settlement rates received for incoming traffic to these operators (which are higher than routing costs).

The resulting asymmetry of tariffs contribute to exacerbating the imbalance in the amounts of international settlements and encouraging callback. While it is logical for developed country operators to try and reduce this imbalance, in order to cut down their outpayments, it would seem that the reduction in payments to correspondence tends to be largely offset by the growth in traffic which results from lower tariffs.

6.2 Case of Mauritania: Low dependence on international settlement balances, high routing costs

In the case of Mauritania, we see that the result of the simulation is highly sensitive to elasticity levels. This is due to the present small difference between incoming and outgoing traffic (ratio currently 1.2). This means that Mauritania's OPT is not very dependent on international settlement balances, which generate only 3.2 % of its net turnover (1996 data). Nevertheless, the difference between outgoing and incoming traffic is tending to grow as the years go by.

According to the calculation method used, the cost of routing international calls stands at between 45 and 60 cents per minute, on account of the high cost of the national extension. Mauritania would thus be particularly hard hit by the introduction of settlement rates calculated on the basis of the performances of countries with much more dense networks.

Moreover, there are great imbalances in the tariffs applied in Mauritania: international income covers the deficit on local and long-distance services. Accordingly, the introduction of new rules has to be done on the basis of a gradual rebalancing of tariffs.

This gradual introduction is necessary on account of the prevailing local economic and social context. Mauritania would not be in a position to reduce its tariffs as quickly as its correspondents in the event of a reduction in settlement rates.

Finally, even if Mauritania only makes a small profit on international settlements, the balance is labelled in hard currency, which is important in a country whose currency is not convertible.

Thus, the contribution from international income will remain valuable for OPT, which has to continue the costly exercise of establishing its national network and repay a debt in hard currency (exchange rate fluctuations can cause significant exchange rate loses).

6.3 Summary of the simulations

Table 6.1: Summary of results, for 2003

	1996	FCC Benchmark	Staged reduction 6%	Staged reduction 10%	Termination charge	Very low rates	Sender keeps all
TRAFFIC (millions of minutes							
Outgoing traffic	4.9	10.1	10.1	10.1	10.1	10.1	10.1
Incoming traffic	6.1	13.7	11.4	12.2	12.2	14.2	13
Settlement Rate - United States ($US)							
Received by Mauritania	0.85	0.23	0.55	0.41	0.49	0.08	0
Paid by Mauritania	0.85	0.23	0.55	0.41	0.15	0.08	0
Settlement Rate - Europe ($US)							
Received by Mauritania	1.03	0.28	0.67	0.49	0.49	0.08	0
Paid by Mauritania	1.03	0.28	0.67	0.49	0.15	0.08	0
Settlement Rate - Africa ($US)							
Received by Mauritania	1.16	0.32	0.75	0.55	0.49	0.08	0
Paid by Mauritania	1.16	0.32	0.75	0.55	0.49	0.08	0
CUMULATIVE BALANCE							
Millions $US	5.6(*)	5.2 - 5.9(**)	5	5.7	11	3.4	0
CUMULATIVE TURNOVER							
Millions $US		249	249	249	257	247	244

(*) projection as for 1996 profit
(**) according to elasticity for incoming traffic

The above simulations show that a fast decline in accounting rates (subject to the effect of elasticity) does not necessarily result in a proportional reduction in the operator's income. The perverse effect of this decline in fact resides in the increased risk of call-back which, on the contrary, would result in a sharp loss of income for Mauritania (the Mauritanian operator's income depends very strongly on income from billed international traffic). Given its rigid income structure, any adjustment of OPT's international tariffs will have to be gradual.

In these circumstances, there will be an increased danger of call-back if foreign correspondents' tariffs fell very rapidly. The radical sender keeps all and very low termination charge scenarios illustrate this situation.

A more gradual reduction in accounting great shares would help to maintain the Mauritanian's operator's income at a high level and facilitate its transition towards to a rebalanced tariff grid.

Nevertheless, symmetrical settlement rates are not justified by the cost structure, as developed country and developing country operators' costs are asymmetrical.

For this reason, scenarios C1 and C2 seem to be more consistent with economic reality and more likely to provide a lasting framework for future international exchanges.

6.4   Proposal

Determining a termination charge for each country is a complex task requiring the elaboration of a methodology acceptable to all the countries involved.

Beyond a simple cost evaluation, it is necessary to determine the proportion of national network development costs that should be borne by incoming international traffic. To our mind, it is fully justifiable that correspondent operators should contribute to network development, since this development constitutes not only the priority mission but also the main financial liability of developing country operators.

It would be desirable for this task to be carried out under the auspices of ITU, in order to guarantee that all the operators participate. The aim should be to develop an objective method that can be applied by all the operators and which takes account of changes in the various factors through time, in order to avoid establishing another rigid system.