13.4 Tariff Model for Telecommunication Services in Syria

In order to develop a tariff structure for telecommunications services in Syria, a decision model was developed in which the principles of a cost and demand oriented tariff policy are incorporated. Before presenting the results of the applied model, the methodological background will be explained in detail.

13.4.1 Principles of the Tariff Study

Optimal telecommunication tariffs should serve several purposes. The most importance of these are:

- cover the economic costs of providing the various services, including a reasonable return on the invested capital,
- be in line with the users' valuation of the various services; and
- be in line with the Government's social objectives.

These arguments are explained hereafter.

13.4.1.1 The Cost Argument

As for any other good sold in the market, telecommunications tariffs should cover all the corresponding costs and generate a reasonable profit. If this is not the case then a privately owned company could not survive very long.

State-owned telecommunication operators can for some time with impunity charge less for a service than it actually costs, by either charging much more for other services than is warranted by costs, or by accumulating losses which will later on be taken over by the Government i.e. the tax-payers. In any case, this pricing policy will generate a waste of scarce resources for the Syrian economy, as users will consume more of the undercharged services than they would if they had to pay for the service according to its cost, and vice versa for the overcharged services. It is a well received result of economic reasoning that the satisfaction of consumers is at a maximum if they consume quantities at prices that are set in correspondence with the costs of the products.

13.4.1.2 The Argument Regarding the Users' Valuation

The argument that the users' valuation of different services must be responded to is particularly important for a telecommunications operator, as the total cost includes a large share of overheads (common cost) that cannot be allocated to specific services. If prices are to be found which are in line with the costs of a certain service, a way has to be found to distribute the overheads between the services.

It can be shown that it is not optimal to distribute the overheads using a simple common percentage mark-up on the directly attributable costs. This is due to the fact that a higher or lower valuation of a service by the customer can be recognized by their reaction to price changes. If the reaction in terms of volume is relatively small to a given percentage price change the demand for that service is said to be "inelastic", indicating that consumers regard the service as more valuable than others. If, in contrast, the reaction is relatively "elastic" the consumers need for the service is low.

It is a result of economic reasoning that more of the overheads (non-attributable common costs) should be included in the prices for "inelastic" services and less in the prices for "elastic" services. This will determine prices that will lead to quantities being consumed that maximize users' satisfaction.

13.4.1.3 The Argument Regarding the Government's Social Objectives

The effect of consumers' valuation on prices may be supplemented by the Government's valuation. This usually leads to particular services being priced lower than would be justified by the aggregate of the costs and consumers' valuation, in order to enable a particular user group to avail themselves of the services for which they would otherwise not have the means. A general example is the provision of telephone services in rural areas at rates much below those justified by the cost of providing these services (Universal Service Obligation).

13.4.2 The Price Rules Derived from the above Tariff Policy Principles

The price rule that obeys the outlined principles is known as the Ramsey Price Rule. Prices determined by this rule can be calculated using a formula, which is derived as follows:
In general, Ramsey prices are defined by the solution to the following problem:

$$\text{Maximize} \sum_{i=1}^{n} \int_{x_1}^{x_i} p_i(X'_i)dx'_i - c_i x_i$$

under the constraint that

$$\sum_{i=1} \{p_i(x_i)-c_i\}x_i - C_f - p = 0$$

This holds where the maximum represents social benefit and the constraint guarantees that receipts of the company cover all costs and the required profit, and where

n	number of services offered
x_i	quantity of service i
p_i	price of service i
$p_i(x_i)$	inverse of demand function for service i
c_i	marginal cost of service i
C_f	fixed costs
p	given profit goal

If prices obey the solution to this maximization problem they are optimal in the sense that they maximize the benefit that society draws from the supply of telecommunications services.*)

If m is the Lagrange multiplier associated with the budget constraint, the solution to the preceding problem is

$$(p_i-c_i) + m\{(p_i-c_i) + (dp_i/dx_i)x_i\} = 0 \qquad i = 1,2,...,n$$

The present study is based on linear demand functions. This means that the following functional relationship between quantity x_i and price p_i for service i is used:

$$x_i = B_i - b_i p_i$$

where B_i and b_i are parameters. The inverse demand function is then

$$p_i = B_i/b_i - x_i/b_i$$

and the derivative of p_i with respect to x_i is

$$dp_i/dx_i = -1/b_i .$$

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*) For a discussion of this result see S.C. Littlechild, Elements of Telecommunications Economics, London 1979, pp. 128-129

The solution to the maximization problem given above is then in successive steps:

$$(p_i-c_i) + m[(p_i-c_i) - (1/b_i)x_i] = 0$$

$$(p_i - c_i)(1+m) = mx_i/b_i$$

$$P_i = c_i + (m/(1+m))(B_i-b_iP_i)/b_i$$

$$p_i = c_i + aB_i/b_i - ap_i \qquad \text{where } a = m/(1+m)$$

$$p_i(1+a) = c_i + aB_i/b_i$$

$$p_i = (c_i + aB_i/b_i)/(1+a)$$

The last equation represents the general formula by which prices will be determined in the model. Optimal prices, therefore, depend on the marginal cost of a service, the price elasticity of demand, and the profit constraint of the corporation.

It should be noted that the above pricing rule can easily be compared to the one a profit maximizing company would use. In fact, the latter would use the same rule with the parameter "a" set equal to unity. The profit maximizing price would then be:

$$p_i = 0.5(c_i + B_i/b_i)$$

Thus Ramsey Pricing is compatible with pricing by a privately owned profit maximizing company. The difference is that Ramsey Pricing restricts the profits to a reasonable amount instead of allowing full exploitation.

13.4.3 The Tariff Model Based on the Ramsey Price Rule

Before starting to define the corresponding equations, a couple of basic decisions have to be taken with respect to factors defining the different services. These concern the optimal number of charging zones and the periods during which low telephone call charges should apply.

With respect to the existing tariff structure, the number of charging zones for long distance telephone traffic has been decreased from seven to three. This is based on the fact that the importance of distance in the costs of telecommunication services is declining due to cheaper new transmission technology. Experience in other countries shows that the cost relevance of the distance for calculating tariffs of long distance calls in Syria can be expected to decrease in the future. In that case a further reduction in the number of charging zones should be considered.

Since the cost of a telephone network is virtually 100 percent covered by the volume of traffic during the busy day-time hours (peak periods) the idle capacity could at other times (off-peak periods) be used at little additional cost. This is the primary reason for offering lower charges

during evening and night hours. Additionally the use of the network during nonbusiness days is as shown by traffic estimates in other countries far below the capacity of the network, it is wholly justified to offer lower charges at these times as well.

The model for telephone tariffs comprises the following 24 services:

- installation charge,
- annual rent (for the customer instead of business/ residential),
- local peak,
- local off peak,
- long distance new zones 1 - 3 peak,
- long distance new zones 1 - 3 off peak,
- international Zones1 - 7 peak,
- international zones 1 - 7 off peak,

The used tariff model is based upon Excel 4.0 and MS-DOS software and shown completely in S1-13-5 in the Supporting Report. Given these services to be modeled, and the price rule derived in the previous section, the following system of equations is obtained:

$$p_i = (c_i + aB_i/b_i)/(1+a) \qquad i=1,2,\ldots,17;$$

$$x_i = B_i - b_i p_i \qquad i=1,2,\ldots,17;$$

$$p = \sum_{i=1}^{n} [(p_i - c_i)X_i - C_F]$$

where i is one of the above named services. In addition, the following figures have also been calculated:

the theoretical price maximum, where demand becomes 0
$p^{max} = B_i/b_i$

the profit maximizing (monopoly) price
$p^M = 0.5(c_i + B_i/b_i)$

the Ramsey optimal price:
$p^{ram} = (c_i + aB_i/b_i)/(1+a)$

Within the framework of this study, and in the absence of a detailed service related cost accounting system, no information about the specific cost component C_f, i.e. fixed costs, could be assessed. However, as the model is used to generate tariffs and corresponding revenues sufficient to cover projected total costs and a profit goal, this variable is not strictly speaking necessary for the application of the model.

13.4.4 Implementation of the Model

In order to implement the model it was necessary to specify the numerical values of:

- the structural parameters of the equations,
- the initial conditions from which the model could be started, and
- the marginal and total costs entering the model as exogenous variables.

As regards the initial conditions, they are important as they determine the starting point of the model and they are used to fix the parameters of the linear demand equations. There are basically two categories of variables representing the initial conditions: initial prices and initial quantities (demand and capacity).

These initial conditions were determined by taking present prices, the demand forecast and the investment plan. Based on these initial conditions and on assumptions about price elasticity, the parameters of the model were derived and then the latter implemented. It has already been mentioned that the parameters of the demand functions depend on price elasticity. As regards their values, figures based on estimates obtained for a number of other countries that can be considered as being similar to Syria have been used.

Using the assumed price elasticity and the currently prevailing prices and volumes (the initial conditions), the calculations by which the parameter values were obtained are generally as follows.

The price elasticity is defined as (leaving out the index i for the service in question):

$$= (dx/dp)(p/x)$$

where dx/dp corresponds to the parameter -b of the linear demand functions.
The choice of the price elasticity is of great importance for the validity of the entire tariff setting process. The used elasticity should reflect the macro-economical reaction of the demand in Syria.

Therefore the elasticity taken from macro-economical studies worldwide were carefully adjusted to the tariff model. In detail, Table 13.4.4-1 shows the used elasticity:

Table 13.4.4-1 Elasticity Parameters

Tariff	Elasticity E
Installation	0.05
Annual rent	0.05
Local peak	0.05
Local off	0.15
Long distance peak 1	0.1
Long distance off peak1	0.3
Long distance peak 2	0.2
Long distance off peak2	0.3
Long distance peak 3	0.3
Long distance off peak3	0.5
International peak 1	0.6
International peak 2	0.7
International peak 3	0.8
International peak 4	0.9
International peak 5	1.0
International peak 6	1.1
International peak 7	1.2
International off peak 1	0.8
International off peak 2	0.9
International off peak 3	1.0
International off peak 4	1.1
International off peak 5	1.0
International off peak 6	1.1
International off peak 7	1.2

To obtain the value of b for a particular service, one replaces e, p and x in above definition by the corresponding given value of the price elasticity and the initial values of the price (p^I) and of the volume of demand (x^I) respectively, and then solves for the unknown b. The value B of the corresponding demand curve is then calculated as

$$B = x^i + bp$$

The consumer surplus is a measure of the benefits that an economy as a whole can gain through price reductions for services and products. In other words the consumer surplus represents the total benefit gained by all consumers who can buy a product or services for a reduced unit-price, even if they would be willing to pay more.

Therefore, the consumer surplus is calculated using the following formula:

$$CS = 0.5*x(B/b - p)$$

where

CS = Consumer Surplus of the specific service

x = demand for the service

p = price of the service

B = Parameter of the demand function, indicating maximum demand at p = 0

b = Parameter of the demand function.

In order to put the model to use a computer program has been developed which incorporates all the equations and relations that define it. The program is written in the language of MS-DOS and runs in the software package "Microsoft Excel 4.0". The entire tariff model (ramsey model) accompanied by all assumptions is shown in S1-13-5 in the Supporting Report.

13.4.5 Summary of the Results

A comparison of the existing tariff structure and the calculated tariff structure according to the Ramsey principle yields the following results (see Table 13.4.5-2):

Table 13.4.5-1 12 Main Recommendations

- The installation charges (residences) and the annual rent should be increased heavily.
- Instead of residential/ business pricing should be used only one customer tariff.
- A peak/ off peak tariff should be introduced for local calls.
- Importance should be laid to the increase of the local call tariff at peak time.
- Free local call units should be decreased from 350 to 30 quarterly.
- The existing seven long distance zones should be concentrated into three zones
- Peak call charges of long distance national calls should be increased substantially.
- Off-peak call charges of long distance national calls could be reduced slightly paying attention to social aspects.
- International calls off peak should be canceled (marginal costs are equal to peak calls)
- International call charges peak should be decreased slightly.
- International call charges off peak should be increased in order to cover the cost.
- Facsimile should be regarded as a part of the PSTN and not additionally charged.

Table 13.4.5-2 Current Tariffs and Ramsey Tariffs

	Current Tariffs (US$)	Ramsey Tariffs (US$)	Change (%)
Installation (Normal Access)	95.24	122.51	29%
Installation (Priority Access)	1,785.71	122.51	- 93%
Annual Rent (Residential)	9.52	22.54	136%
Annual Rent (Business)	19.05	22.54	18%
Local peak/ min.	0.002381	0.006	152%
Local off peak/ min.	0.002381	0.0004	- 84%
Long Distance 1 peak/min. *	0.024	0.286	19%
Long Distance 1 off peak /min. *	0.012	0.0011	- 91%
Long Distance 2 peak /min. *	0.045	0.0551	22%
Long Distance 2 off peak /min. *	0.023	0.0020	- 91%
Long Distance 3 peak /min. *	0.089	0.1416	59%
Long Distance 3 off peak /min. *	0.045	0.0028	- 94%
International Zone 1/ Peak /min.	0.833	0.6444	- 23%
International Zone 1 /Off Peak /min.	0.417	0.6176	48%
International Zone 2/ Peak /min.	1.19	0.9521	- 20%
International Zone 2 /Off Peak /min.	0.595	0.918	54%
International Zone 3/ Peak /min.	1.548	1.0624	- 31%
International Zone 3 /Off Peak /min.	0.774	1.022	32%
International Zone 4/ Peak /min.	2.381	1.4765	-38%
International Zone 4/Off Peak /min.	1.191	1.4190	19%
International Zone 5/ Peak /min.	2.738	1.6817	- 39%
International Zone 5/Off Peak /min.	1.369	1.6245	19%
International Zone 6/ Peak	2.976	2.0678	- 31%
International Zone 6/Off Peak /min.	1.488	2.0085	35%
International Zone 7/ Peak /min.	4.762	2.7189	- 43%
International Zone 7/Off Peak /min.	2.381	2.6278	10%

* (Current long distance tariffs zone 0 - 6 are compared on a traffic basis accordingly to the new subdivision of long distance zones 1 - 3)

The implementation of the Ramsey tariffs (Table 13.4.5-2) will increase slightly the consumer surplus in Syria by 2.1 %. Importance should be laid to the self-financing character of these tariffs

for the modernization and necessary expansion of the Syrian telephone network. These tariffs are an appropriate means for setting free all market forces of demand and supply in the Syrian telecommunication sector. The application of the recommended tariffs will support STE's ambitious expansion policy for the next years.

As an approach in the model the profit per main line of 5176 S.P: (123 US$) from year 1994 (STE estimation) has been taken as average profit per main line for 1996. This leads to a target profit in 1996 of 91.2 million US$ (3,830 million SP).

Table 13.4.5-3 Calculation of STE's Profit Target in 1996

	in million S.P.	in million US$
STE's Profits total in 1994 (estimated)	3,756	89
Profit in the telephone sector (94.4 %)	3,546	84
Profit per Main Line in 1994 (685,000)	0.005176	0.000123
Profit per Main Line in 1996 (740,000)	0.005176	0.000123
Assumed Total Profit in telephone sector 1996	**3,830**	**91.20**

(Source: STE, Dept. of Accounting and Finance 1995)

Assuming the a.m. profit and calculating approximately 225 US$ cost per each employee including all administration and overheads at STE, there are non-accountable cost of total 45,763,062 US$ assumed in 1994. Regarding the new 55,000 main lines in 1996 with calculated additional non-accountable cost of 30 US$ per main line. Due to this calculation the total telephone revenues will increase 4.6%, the variable cost increases only 2.3%, the subscribers basis (total main lines plus 55,000) will increase 8% and the profit from the telephone increases 8.6%. The following table shows the complete calculation.

Table 13.4.5-4 Summary of Results

Summary of Results	Ramsey Tariffs	Current Tariffs **
Total Revenues R'(in US$)	266,860,435	255,089,291
Total Variable Cost Cv'(in US$)	128,247,373	125,326,229
Non-Accountable Cost Assumption (in US$)	47,413,062	45,763,062
STE's Profit Target G (In US$)	**91,200,000**	84,000,000
New Consumer surplus CS (in US$)	312,214,763	
Current Consumer surplus CSi (in US$)	305,729,175	
Change in Consumer surplus	6,485,588 **(2.1%)**	

* * (Revenues are not including connection fees for priority direct / second lines and facsimile services.)

13.4.6 Organizational Recommendations

Nowadays the current tariff affairs are handled by the Department of Exploitation and Traffic. It is recommended to install a Tariff Department within STE's organization. The task of this department should be to make a market oriented tariff policy by monitoring the changes of telecommunications demand. Especially for the new upgrading telecommunication services like mobile communications (GSM, paging data transmission, (X.25), leased lines, ISDN, broad band, videotex and other many possible value added services in Syria it is necessary to use the tariff system as a marketing tool.

An example of a surely not market oriented tariff policy in Syria could considered by the pricing of facsimile services. The high fees prevent from the penetration of the service and limit the progress of the overall communication situation. For small businesses it is not possible to afford it.

13.5 Developing an Incentive Tariff System

13.5.1 Tariff Regulation in Markets with Dominant Suppliers

Due to the shortages of insufficient provision of telephone main lines to the Syrian people it is the foremost priority to expand the telephone network rapidly and efficiently. According to the political policies and responsibilities this task has to pay attention to the public financial situation and the welfare of the nation.

STE is the monopolistic supplier of the total telecommunications market in the S.A.R. Abuse of such a dominant position should be prevented to protect the consumers from the ability of the monopolist to demand tariffs which lead to excessive profits.

For monopolistic services or services where one competitor has a dominant market share, some sort of tariff or profit regulation should be executed. This is in order to protect the customers from unfair and inefficient monopolistic pricing. As tariff autonomy in general is one of the key parameters for a commercially oriented company, the regulation should refrain from interference into individual price elements. Prices in competitive markets play a major role in guiding investment into the most efficient areas. The regulator should therefore adopt a general tariff adaptation mechanism, ensuring that abuse of market power is prevented through control of tariff levels, but allowing STE to adjust their tariff structures according to changing costs and demand.

This is especially important in Syria where there has been a tendency for the Ministry of Communication to keep a very tight control on individual tariffs for socio-political reasons. This has led to a tariff structure that is not linked to the costs of providing the services. For satisfying Syria's future challenges of telecommunications' needs huge capital requirements will be necessary. A market and demand oriented terrifying is depending on a qualified cost accounting and decision linked information system.

In particular predatory pricing behavior has to be monitored by the Ministry of Communications. This is common where the monopolist is able to cross subsidize competitive services with monopolistic ones. Monitoring of internal subsidies requires obligations for information flow from the monopolist to the regulator. The monopolist has to present a service specific cost accounting calculation, which will require improvements in the present accounting system of the STE.

13.5.2 Tariff Regulation

The experience in other countries has shown that the requirement for regulation of the telecommunications monopoly has tended to develop to a long term solution until the sector has been fully privatized. One area in which symmetrical regulation can be useful is to ensure the fulfillment of political objectives.

Customer protection from excessive tariffs of dominant telecommunications suppliers can be carried out using one of the two basic methods:

- 'Rate of Return' regulation,
- 'Price Cap' regulation.

13.5.2.1 Rate of Return Regulation

Rate of Return regulation is an indirect control of monopoly prices. The mathematical formula for this is :

$$R = O+(V-D)s,$$

where: O= Operating Costs,
V = Gross Assets of the Operator,
D = Accrued Depreciation and Value Adjustments of the Operator's Assets,
R = Income,
s = allowed Rate of Return in a particular period.

The rate of return formula can be applied separately to different services, or can be applied to all services of the operator as an entity. Due to the detailed information necessary for the separate calculation for each service, it tends to be applied to the operator's total business. This does not prevent of cross-subsidies and does not impose restrictions on individual prices, but does limit the profit potential of the operator. For practical and theoretical reasons however, this regulatory approach has been criticized. The information requirements of the regulator are very high. Extensive control capacities at high cost had to be established in the regulatory body (e.g. in USA the FCC), with a large number of specialists in accounting and controlling, to execute the rate of return regulation of AT&T. This required type of human resources, however, are very scarce in Syria.

In addition it can be shown that this type of regulation creates incentives for inefficient behavior of the regulated company[1]. As the allowed profit is related to the value of the gross assets (see formula above), the company has incentives to inefficiently increase its capital base (gold plating).

Return regulation has a major disadvantage in that it requires extremely detailed information to be implemented. This is the major reason why the FCC in the United States switched from rate of return to price cap regulation. Rate of return regulation not only requires detailed inputs, it also requires high staff expertise to carry out the calculations of allowed rates of return, it is believed that this type of expertise is not available in Syria. For these reasons it is recommended that Syria should follow international trends and introduce price caps to regulate the tariffs of the STE.

13.5.2.2 Price Cap Regulation

The price cap approach is a more direct control of monopoly prices. The basic mathematical formula is:

$$P = RPI - X$$

where: P= Percentage price increase over a preset period for a regulated bundle of STE services

RPI= Retail Price Index or a specific price index for the telecommunications industry. This variable should reflect the expected development of the monopolist's costs.

X= The expected efficiency gain of the operator over the time period, or the assumed difference between the increase in the chosen price index and the increase in the costs of the monopolist. The definition of X is extremely difficult and normally the subject of lengthy negotiations between the monopolist and the regulator.

A price cap tends to be valid over a period of several years. It encourages increased efficiency of the monopolist, as if the true value of X is greater than the value negotiated with or set by the regulator, then the operator can - by increasing his prices by the maximum allowed by the price cap - increase profits. The major problem connected with price capping is the fact that cost reductions of the regulated operator can be reached either by productivity gains or by quality of service reductions, which also results in lower costs. Therefore quality of service has to be controlled in

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1 Averch, H., Jonson, L. L.: Behaviour of the Firm under Regulatory Constraints, American Economic Review, 52, 1962, p. 1052-1069

parallel. This can be done by introducing a quality index into the price cap formula, or by other quality control measures.

The overall objective of the price cap approach is to limit tariff increases up to the level preset by the so-called "Price Cap Index" (PCI), an index reflecting the expected costs minus a variable "X". This variable reflects the expected efficiency gain of the operator or the assumed difference between the increase in the chosen price index and the increase in the operators costs. The estimation of X is extremely difficult and normally the subject of negotiations between the monopolist and the regulatory body.

The monopolist normally provides a service with different service categories, as in the case of telephone service the installation, the monthly rental or the provision of local, trunk and international calls. Therefore, the PCI can be calculated as a revenue-weighted average change in the rates of service elements. Accordingly, the price cap condition to be fulfilled can be defined in detail as follows:

$$(1) \quad \Delta P_t = \sum_{i=1}^{k} P_{it} * w_{it-1} = RPI - X$$

and

$$(2) \quad = \sum_{i=1}^{k} P_{it} * w_{it-1} + X = RPI$$

where

ΔP_t is the revenue weighted average change in tariff rates set for the individual service categories i=1...k between the year t and t-1.

ΔP_{it} is the ratio between a particular tariff, P_{it}, in force at some time in year t for services provided in service category i, and the tariff for those services, at the end of year t-1

w_{it-1} is a weight that is calculated as $R_{it-1} / \sum_{i=1}^{k} R_{it-1}$

where R_{it-1} is the total revenue from the service provided in service i in the year t-1.

X is the expected efficiency gain or the assumed price difference between the increase in the price index and the costs of the monopolist over the time period t.

RPI is a specific price index reflecting the expected development of the costs of the monopolist.

Normally the monopolist, as in the case of the STE, provides a bundle of services. Assuming that the development of productivity will be different between them it might also be reasonable to define different single price caps for the different services.
In case the price cap approach is to be applied to more than one service (j= 1.... n) the previous formula has to be changed as follows:

$$(3) \quad \Delta P^*_t = \sum_{j=1}^{n} \sum_{i=1}^{k} ((P_{it} * w_{it-1}) + X_j) * w_{jt-1} = RPI$$

with

$$(4) \quad \Delta P_{jt} = \sum_{i=1}^{k} P_{it} * w_{it-1} + X_j = RPI$$

where

ΔP^*_t is the revenue weighted average change in tariff rates set for all services j = 1...n and the individual service categories i=1...k between the year t and t-1 .

ΔP_{jt} is the revenue weighted average change in tariff rates set for service j and its individual service categories i=1...k between the year t and t-1 .

X_j is, for the service j, the expected efficiency gain or the assumed price difference between the increase in the price index and the costs of the monopolist over the time period t.

Price caps could be calculated for all services provided by STE. Even for the new cellular mobile telephony, which will be established in Syria in the near future, service categories can be defined accordingly.

Due to the past tendency to set the tariffs of the STE more for political reasons than according to economic rationality the given tariff study with its cost oriented tariffs enables the regulatory body to formulate price caps. Even for newly introduced services just entering the Syrian telecommunications market, initial tariff structures and levels have to be set by the regulator.

The values of the X variable reflecting the expected efficiency gains also have to be negotiated. Determination of the X variable should be based upon information about the present situation and future development of the service costs in Syria In most of the liberalized western telecommunications markets the most successful approach, which has already been introduced is the price cap method, as it

- increases the flexibility of the regulated firms to adapt the price structure;
- gives more incentives to increase efficiency or reduce costs of service provision;

- reduces the costs of regulation at least in the medium and long term;
- ensures that the average prices will be reduced according to purchasing power, based on a productivity growth in the telecommunications sector.

Where tariff regulation has already been introduced, the following price caps have been negotiated:

United Kingdom:
From 1989 to 1990 a general price cap of the Retail Price Index (RPI) minus 3 percent existed for all national calls, the monthly rental fee for private customers was not allowed to increase more than RPI + 2 percent. In 1990 the general price cap amounted to RPI minus 4.5 percent, from 1991 to 1993 to RPI minus 6.25 percent, whereby international call tariffs had to be reduced by 10 percent annually. Since the beginning of 1994 the price cap is RPI minus 7.5 percent.

France:
From 1991 to 1994 the prices for monopolized services may not be raised by more than the increase in the Gross Domestic Product minus 3 percent.

The Netherlands:
Until 1993 the initial tariffs, dated 1986, may not be increased by more than the increase of the retail price index not taking into account any productivity gains.

Hungary:
Starting in 1994 the revenue-weighted average increase in the tariff level for the telephone service, including all subcategorize, cannot exceed the increase in the domestic industrial price index (DPI), showing the price level of the previous period. Considering this price limit additionally for the period from 1994 to 1999 the maximum divergence of the subscription fee from the DPI may be 5 percent, for tariff calls and long distance calls (Zone I) 7 percent. For domestic trunk calls (all other than Zone I) as well as international calls the price cap is DPI minus 4 percent per year for the same period. In the case that the average exchange rate weighted by a basket of selected currencies decreases by more than 5 percent within one year the overall price cap shall be increased by two thirds of the percentage points by which such decrease exceeds the DPI.

Germany:
Based on the existing tariff level the tariffs for cellular mobile telephony provided by the competing networks of the German DBP Telekom and the private Mannesmann Consortium must not increase by more than the Retail Price Index (RPI) minus 4 percent for the period from 1993 to 1995. Within this reference period of three years the price limits have to be kept over the whole year, not for a particular day. Furthermore, it is not allowed to exceed the price limit in one year and to

balance this out by falling short of the limit in the next year. Any tariff increases allowed by the regulator but not implemented by the licensee will not have any influence on the price cap in the following reference period.

In the case of Syria as basis for a price cap regulation it is recommended to use an Consumers Price Index which should be researched from an independent statistical organization at least yearly. At the introduction of the tariff regulation a reference period of 3 years is reasonable, with the factors determined in advance. After this period the regulator will have gathered his first general experience in tariff regulation, but especially in estimating the efficiency growth in the telecommunications sector. Then the presetting of the X values may become easier and the reference period for the price cap regulation can be extended accordingly.

The major problem of price cap regulation is the fact that the regulated firm can reduce its costs not only by improving productivity but also by reducing the quality of service. Therefore the service performance of the regulated firms has to be controlled by the regulator in parallel with the control of the tariffs.

The first step is to identify quality criteria and their dimensions, depending on the kind of service provided by the regulated firm. The performance of terrestrial and mobile telephone services for example can be evaluated according to a variety of criteria, including the following:

- Telephone installation, measured as waiting time for connecting new subscribers;
- Repair service, measured as the number of repair requests, or the time for clearance of a repair request;
- Local and long distance service, measured as completion or blocking rates; their transmission quality measured through distortions, background noise etc.;
- billing process, measured as the regularity and accuracy of bills.

To identify qualitative efficiencies or inefficiencies information is required on the quality levels currently available, customer preferences and production possibilities. The ways of obtaining the relevant information are manifold: reports from the regulated firms, international comparisons as prepared by institutions such as the Organization for Economic Cooperation and Development (OECD)[2], customer surveys or other market research, partly undertaken by the regulatory body itself.

In the case of the regulated firms, and maybe even for the regulatory body in Syria it seems to be worth designing and establishing a reporting methodology that determines the appropriate set of indicators, reporting cycles and applicable methodology of quality measurement. The reason is to avoid problems regarding the value of information and the trustworthiness of the information gathered by the regulated firms.

To guarantee that the quality standards will be kept depends on the incentives given to the regulated firms. One approach is compensation schemes which means obligations to the suppliers to pay a penalty if they do not meet a specified quality standard.[3]

When price cap regulation is introduced as recommended for Syria, it is also applicable to implement an index for quality service into the formula.[4]
Based on user interviews and expert surveys a set of weights l_f should be established reflecting the importance of each of various quality performance criteria f = 1.... m. After having weighted the variables so that their sum equals 1.0 an average quality as the sum of the relative quality performances Q_f (present performance T_f to standards S_f , multiplied by the weights l_f) Quality performance Q * is then defined as

$$Q^* = \sum_{f=1}^{m} Q_f * l_f,$$

where $Q_f = (T_f - S_f)/S_f$

Where all standards are met exactly T_f is equal to S_f, and also Q_f and Q^* are zero. In case of any over- or under performance the values for Q will be positive or negative, respectively.

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2 OECD, Performance Indicators for Public Telecommunications Operators, Paris 1990
3 The pros and cons of this approach are discussed in detail in Bauer (1991), pp.10. See also chapter 7.5.5.2.
4 see Bauer (1991), pp.12

Linking the quality performance indicator to the tariff regulation the price cap formula is as follows:

$$(5) \quad \Delta P_t = \sum_{i=1}^{k} \Delta P_{it} * w_{it-1} = RPI - X + a * Q^*$$

and

$$(6) \quad = \sum_{i=1}^{k} \Delta P_{it} * w_{it-1} + X - a * Q^* = RPI$$

where

a is a "qualitative incentive factor" 0.

Where aggregate performance Q * ≥0 there will be added rewards, while there will be penalties for under performance, in other words: in case of over-performance the tariffs can be increased more than indicated by the "pure" price cap formula, while the prices may be raised less than determined by the "pure" price cap when the performance is worse than negotiated.

Even if for each of the criteria the price cap formula could be reformulated, the aggregate performance index might be better for practical reasons. First of all it reduces the control costs of the regulator as it prevents the need to gather too much information on the performance criteria. Secondly, it guarantees the flexibility of the regulated firms because any failures within one standard may be compensated for by over performance in other standards.

As already mentioned above the introduction of quality indices into the tariff regulation is a very complex instrument which not only demands a lot of information and competence in the regulatory body, but also offers many risks of regulatory arbitrariness. Facing the situation in Syria where a regulatory body still has to be formed, it seems to be reasonable in the first step to introduce the price cap regulation without any quality indices. Dependent on the experience made in the first three years with this form of tariff regulation and the introduction of a methodology for measuring service performance the quality indices should be introduced later.

13.5.3 Regulation of Non-Economic Obligations

13.5.3.1 Universal Service Obligation

There is a need to distinguish two different approaches to the concept of "universal service"; one politico-philosophical, and the other economic. Each can lead to a different set of policy prescriptions and in fact these are often confused in policy debate. Also there is a need to distinguish between the goal of universal service and the means for achieving it.

The first approach conceives universal services, as a basic right of all citizens, essential for full membership of the social community, and as a basic element of the right to freedom of expression and communication: thus, as with health and education provision, it should be provided centrally out of what is, in effect, tax revenue. In this approach, the goal of the provision of universal service overrides questions of pure economic efficiency and the provision should be raised directly by taxation or indirectly via the telecommunication tariff structure and what services should be included within the universal service mandate.

The second approach regards access to telecommunications as an economic good to be consumed in a market like any other good and thus questions of efficiency and the distribution of economic welfare become paramount.

From a perspective internal to the telecommunication sector itself it can be argued that universal service provision, in so far as it has been realized, stems ultimately from the nature of the telecommunications network and the positive consumption externality, common costs and economies of scale and scope involve. Here the policy questions are both more pragmatic and more empirically based. From the economic perspective universal service can be seen as a question of infrastructural provision, that is an investment decision undertaken not on the basis of either telecommunication revenue or direct demand for telecommunication services, but on the basis of general economic benefits. In most of the countries surveyed universal service is an implicit rather than explicit goal of telecommunication policy in the sense that individual citizens possess no legal right to telephone service on demand, or conversely telecommunications administrations are under no legal obligation to provide service.

At present Syria's sector policy only specifies one class of political obligations, namely regional expansion targets for the STE. Other political objectives, for example universal service obligations, are not yet explicitly fixed. At present such obligations are internally fulfilled due to the close relationship with, and full ownership by the Ministry of Communication. Typical examples for objectives in other countries are:

- obligation to offer all services in all regions of the country,
- obligation to serve all reasonable demand,
- obligation to offer preferential services to certain institutions, like police, hospitals, etc.,
- obligation to offer cost free emergency calls,
- obligation not to discriminate unduly between different groups of subscribers,
- obligation to serve preferential services to disabled.

The major problem of such political obligations is the question of financing. If such obligations are to be financed by cross subsidies from monopoly areas only the customers of these services have to finance socially desirable obligations, while financing by direct state subsidies would distribute the burden amongst all tax-payers.

The tariff study has integrated the universal service obligation by calculating average cost per main line as a base for all tariffs. Due to this approach of mutual cost covering implemented into the entire network planning, implicitly an automatically cross-subsidizing between rural and metropolitan areas is done by the tariff plan.

13.5.3.2 Mechanisms to Enforce Regulation

Mechanisms for the enforcement of regulation are of specific importance and have to be clearly defined among the powers of the regulatory body. Among these mechanisms the following must be clarified

- the rights of the regulatory body to receive information from STE necessary for the execution of the regulatory functions (type, volume and frequency of the information flow),

procedures for the settlement of disputes between the regulator and the regulated sector,

- penalties for non-fulfillment of obligations

methods and procedures for the financing of political obligations.

Methods for financing of political obligations with different distributional effects are

- direct subsidies from the state,
- tax exemptions,
- infrastructural taxes.

CHAPTER 14 REVIEW OF STE'S EIGHTH FIVE-YEAR PLAN

14.1 Objectives of STE's Eighth Five-Year Plan Preparation

From both political and national standpoints, STE's Eighth Five-Year Plan was prepared with the following objectives:

- The demand of the growing number of waiting applicants for 1995 should be met within the Eighth National Five-Year Plan (1996-2000).

- New automatic telephone services to rural areas (more than 4,000 thousand population) should be established in order to foster the social and economic development of rural areas.

In addition, since STE's funds are insufficient, this plan will help STE seek funding from foreign countries.

14.2 Comparison of the Master Plan with STE's Eighth Five-Year Plan

(1) The Master Plan

- A long-term plan until the year 2010.

- Covers all telecommunications development plans ranging from basic telephone networks to new services, such as Mobile Telephone services, Packet Switched Data Network and ISDN.

- The GDP per capita method, which takes into account both the past and actual records in Syria and the correlation between the telephone demand density and economic indices of various countries, was employed in making the demand forecast.

The goals:

a. Public Switched Telephone Network

- To increase the number of subscribers to 1.85 million by the year (2000 - 2002) (including the replacements of manual telephone exchanges with automatic telephone exchanges in some rural areas).

- To increase the telephone density to 11 percent by the year (2000 - 2002).

- To replace and digitalize some of the out-dated exchanges, such as EMD.

b. Mobile Services

- To accommodate 50,000 subscribers for mobile telephone services and 10,000 subscribers for paging services by the year 1998.

c. New Services

- To introduce new services such as Packet Switched Data Network and ISDN.

d. Total Investment

It is estimated that it will cost approximately US $ 600 million to carry out the eighth five-year plan (1996-2000) according to the Master Plan.

(2) STE's Five-Year Plan

- This medium-term plan mainly focuses on basic telephone demand fulfillment which is calculated according to the demand of each telephone office, and on necessary facilities plans to fulfill this demand. (No long-term demand forecast was conducted.)

- The number of new lines to be installed annually under this plan is more than twice that prescribed by the Master Plan.

- The cost estimate is based on past contracts.

- This plan was almost completed by November, 1995.

The goals:

a. To meet the demand of the approximately 2 million waiting applicants accumulated as of 1995 and to accommodate the estimated 2.54 million subscribers in the year 2000. (There is the possibility that this plan can be fulfilled by the year 2002.)

b. To provide new automatic telephone services to some rural areas as well as to expand the telephone network in urban areas

c. To increase the telephone density by the year 2000 to approximately 14 percent, as a result of the completion of this plan.

d. To replace and digitalize some of the out-dated exchanges, such as EMD.

e. The total investment cost for the Eighth National Five-Year Plan (1996 to 2000) is estimated at approximately US $ 900 million.

See "Volume 3," the Action Plan, for details regarding the development of facilities plans etc.

14.3 Review of the STE's Eighth Five-Year Plan and Preparation of the Action Plan.

(1) Preparation of the Action Plan

Since STE's Eighth Five-Year Plan only concentrates on the accumulated number of waiting applicants and the number of exchange line units, it was necessary to develop this plan further (i.e. to forecast demand, to make facilities plans, to estimate costs and to evaluate its feasibility) with regard to its actual implementation.
Therefore, the Action Plan was drafted after the Master Plan was completed, in order to determine whether or not STE's Eighth Five-Year Plan is practical. It will also serve as a future reference plan for the Syrian side.

(2) Review of STE's Eighth Five-Year Plan

As mentioned above, the Action Plan has been prepared to review the STE's Eighth Five-Year Plan. The results of the review are outlined below:

The demand forecast and the plan for its fulfillment in STE's Eighth Five-Year Plan, although based on various social, political and economic conditions in Syria, assumes a growth rate for telephone density that seems to be high when compared with the growth rates based on similar conditions in other countries.
However, in some countries there have been cases in which strong economic growth has contributed to sharp increases in growth rates. Therefore, if STE adheres to the following guidelines, it may be possible to realize the goals set forth in its plan.

a. Periodical review of the demand and the facilities plans

STE has just decided to provide facilities for about 1.5 million new exchange line units, the largest number provided ever before in Syria, in order to meet the demand of the approximately 2 million accumulated waiting applicants within seven years.
It is important to assess the number of waiting applicants on an annual basis and to review and check the facilities plans.

b. Financing programs and prioritization of the projects

In order to accomplish all the planned projects, a huge investment of approximately US $ 900 million, from foreign funding, is necessary. This financing frame is so large that STE may not be able to obtain the required amount from foreign countries all at once.
Thus, it is important for STE to determine which projects deserve greatest priority during the planning stage and then to execute the projects in accordance with their priority and/or urgency.

c. Measures for dealing with the double number of new installations

Although 40,000 to 150,000 lines were installed annually over the past several years before 1994 and it reached 330,000 in1995, STE is now expected to install approximately 300,000 new lines every year under the Eighth National Five Year Plan.

To double the implementation capacity of outside plant facilities, the following measures should be considered:

- To re-assign the present manpower to the planning, designing and implementation departments to accommodate the work volume.

- To improve and simplify the designing of works by employing when necessary, assistant(s) who have expert knowledge.

- To upgrade and develop the designing skills of the present staff and train supervisors for the implementation department.

- To carry out the projects in a systematic manner.

- To distribute manpower to each section effectively.

- To develop local contractors' and suppliers' capacities.

- To maintain customer services, it is necessary for the customer relations staff at windows to improve their overall efficiency by upgrading their clerical skills in the areas of subscriber connections, the management of waiting applicants and the management of bill collecting.

d. Strengthening of Project Management

The projects for the Eighth National Five-Year Plan are large-scale and medium-term. To realize the projects successfully, it is recommended that a project team be established within STE and that the team should uniformly plan, manage and control the whole project, including:

- Financing programs
- Tendering management
- Contract management
- Installation planning
- Installation management
- Operation and maintenance plans

CHAPTER 15 RECOMMENDATION

This Master Plan describes a long-term development plan for telecommunications in Syria, up to the year 2010. The telecommunications in the Plan consist of telephone networks, mobile service networks, data communication networks and computerization. The Syrian telecommunications network would improve remarkably if the Master Plan is carried out in accordance with its scope and schedule. However, it is important that STE restructure and improve its business management, in order to successfully realize the Plan.

The following recommendations for STE are based on the findings of the study for the Master Plan:

15.1 Review of Organization and Business Management

As mentioned in Chapter 9, to keep abreast of the rapid progress of the telecommunications network, STE will need to revise its organization and business management.

There are 17 Directorates in STE's headquarters at present, but it is observed the some of the Directorates' duties and responsibilities overlap. For example, the duties of the Directorate of Rural Service and the Directorate of Operation and Maintenance overlap in terms of area and function. Consequently, the work of both Directorates will become inefficient. In order to resolve such problems, the following recommendations are proposed:

(1) To review in detail the management inventories of each Directorate and to discover where an overlapping of duties or responsibilities occurs.

(2) To study the organization, systems and structures of representative telecommunication operation companies around the world

(3) After (1) and (2) have been completed and discussed, to restructure STE's organization and systems. All top executives, i.e. General Director, Vice General Directors and Directors should participate in this discussion.

15.2 Authorization of the General Director

It seems that a considerable amount of authorization power is distributed to the vice general directors and directors. However, for more quick decision - making and action, the following steps are recommended:

(1) To establish a few Vice General Directors who are responsible for authorization on behalf of the General Director.

(2) To review and redefine the duties and authorization power of the General Director, the Vice General Director and the Directors when the above 15.1 (3) is discussed.

15.3 Creation of Cost Consciousness

Lack of a cost consciousness, which is more common in the public sector than in the private sector, is sometimes observed in STE. One cause may be that expenditure and its control are not clearly incorporated in the duties and responsibilities of the executives. In order to create a cost consciousness, the following measures are recommended:

(1) STE's top executives should study the accounting systems of private companies, including foreign companies, and, if necessary, experts should be invited to make a work shop and delegations should be sent abroad to study these systems in depth.

(2) Introduction of a management accounting system
The introduction of a management accounting system will, make each Director more aware of his section's expenditures. It is important for STE to establish a management accounting system together with accounting experts.

(3) Control of project accounting
Expenditure for a project should be itemized, accounted for and controlled. Thus, the control of project accounting can be achieved and, at the same time, a cost consciousness can be achieved.

15.4 Enhancement of Incentives for Employees

STE's current salary system which is similar to those of other governmental organizations, provides salaries which are lower than those for the equivalent positions in private companies.

This could lead to a deterioration in the morale of employees. Also, when the need for computer engineers increases in the future, private companies may recruit STEs' computer engineers with offers of higher salaries. To retain its good engineers, STE should consider enhancing incentives, rather than raising the salaries. Two possible ways to create incentives are:

(1) To establish new programs for study abroad, or training in foreign companies, for periods of 2 - 3 years.

(2) To introduce an awards system
If STE sets achievement goals for its management (such as improvements in routine work and bill-collecting) and STE rewards both excellent telephone centers and individual employees for achieving these goals, company morale will be effectively promoted.

15.5 Review and Enhancement of Outside Plant Works

The fault rate of the subscriber's network in Syria is approximately 5.20 fault per month per 100 subscribers, which is high in comparison with other countries' rates. In Japan, the national average fault rate is approximately 0.12. It can be inferred that the quality of service for the subscriber network facilities in Syria is considerably low. Also construction vehicles, measuring equipment, maintenance tools and well-trained workers are not enough to recover faults in quick time. The quality of service depends not only on rapidly recovering faults but also on decreasing the number of faults. In order to improve the quality of service and the reliability of the subscriber network facilities in Syria, the following measures should be adopted by various departments:

(1) Planning Department
- Establishment of a Planning Standard of Guidelines for Short, Medium and Long-Term Plans.
- Establishment of a Demand Forecasting Standard.
- Arrangements of carrying out consistent, well-balanced Facilities Plans on an annual on an annual basis.

(2) Designing Department
- Establishment of a Design Standard.
- Establishment of Short Term Facilities Plans.

(3) Executing Department

- Establishment of a Construction/Installation Standard.
- Establishment of a Project Implementation Standard.
- Standardization of Material Specifications.

(4) Operation and Maintenance Department

- Management of inferior facilities and planning for replacements and rehabilitation.
- Periodical testing of subscriber cables as preventive maintenance
- Establishment of a Repair Manual.
- Preparation and Revision of Outside Plant Records.
- Establishment of Maintenance Centers equipped with:
  - Vehicles, measuring equipment and tools.
  - Facilities for receiving complaints, distributing repair orders and overseeing fault clearance.
  - A service order engineering system.

In order to realize the above-mentioned measures, the following should also be considered when restructuring STE's organization:

- Review of the duties and responsibilities of all the departments concerned.
- Systematized work flow according to the review of work flow.
- Introduction of computer systems to improve routine work.
- Training key persons who can manage and control work in each department.
- Establishment of a Work Improvement Project to control the preparation of Task Manuals,
  Designing Standards, Installation and Construction Standards etc.

In addition, the following steps are also recommended to support the Project:

- To invite advisers, specialists and/or experts, who have extensive experience in the telecommunications field.
- To study technology transfer and to train under telecommunication service carriers in foreign countries.

15.6 Arrangement of Design and Installation Volumes on an Annual basis

Through the field survey performed for the study, it was noted that the provision of network systems is not well-balanced. In some exchange centers, the capacities of local exchanges are much greater than the capacities of subscriber cables. As a result, although there are a lot of vacant line units of exchange, new subscriptions can not be installed

since subscriber cables are fully occupied. This problem results from the following features of each system:

(1) Switching and Transmission System

- The terms required for design and installation are relatively short.
- The capacity of system is not affected by demand deviation of directions in telephone centers, unlike subscriber cable capacity.
- Equipment and its installation are determined by manufacturers.
- The worldwide technical level is almost uniform.
- The work force required for installation is relatively small compared with outside plant installation work.

(2) Subscriber Cable Network System

- A systematic and comprehensive design technique is required.
- The terms required for design and installation are respectively long.
- In order to forecast and distribute demand to each direction in an exchange service area, microscopic demand management is strongly required.
- A large work force is required for installation.
- There are only a few domestic contractors who can install all outside plant facilities and they do not have a continuous work volume.

In order to implement the balanced expansion of a telecommunications network, which consists of switching, transmission, subscriber cables and other supporting systems, the following points should be considered:

- The Network Planning Department should make detailed implementation plans for network expansion, considering the length of time required for design and construction and also the actual work volume.
- Appropriate construction and installation cost estimates for each individual system, estimated cost allocations for all related departments and management of comprehensive project implementation.
- Introduction of a design standard for outside plants.
- Arrangements for annual construction work volume and training of engineers and managers.

15.7 Reservation of the Radio Frequency Band for New Mobile Services

STE plans to introduce a GSM mobile telephone system and a paging service system in a few years. It is imperative that the respective radio frequency bands are reserved.

The radio frequency band for GSM systems has been agreed upon for world wide use. Therefore, if the system introduced does not employ this frequency band, the international roaming function, which is a major benefit of GSM, will not work.
GSM systems have been introduced in many countries, especially in European. Its greatest merit is that mobile terminals in Syria will be able to be utilized in any countries where GSM has been introduced and business people and tourists from foreign countries will be able to use their terminals in Syria.

Radio equipment is produced for special frequency bands which are different from the commonly used band. Purchase of such equipment would not be cost effective.

It is also important to reserve a specific radio frequency assigned to each paging system. Radio equipment is produced for special frequency bands which are different from the commonly used band. Purchase of such equipment for paging service is not be cost effective.

Considering the above points, it is necessary that the frequency assignment of both the GSM system and the paging system should be discussed at the government level (through the establishment of a Radio Frequency Committee and a Co-ordinative Committee, for example) to avoid interference with other radio frequencies, and, if necessary , to change the frequencies of other systems in order to reserve the following GSM frequency bands.

Radio frequency band for GSM system

Base Transceiver Station Transmission	:	935---960 MHz
Mobile Station Transmission	:	890---915 MHz

If ERMES system for the paging service will be employed:

Frequency	:	169.425---169.800 MHz

The above frequency bands should be reserved throughout Syria.