

# **Seminar on pricing for frequency usage for CIS Countries Yerevan (Armenia), 21-23 March 2001**

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## **Spectrum management fees evaluation, proceeding from the fulfilment of necessary functions and resources used**

### **How much costs using of a spectrum?**

This question is sufficiently important and complex to which it is impossible get an unambiguous answer.

Expenditures of the state on the spectrum use management – is one of the important components of pricing of spectral resource fees.

There are three main approaches for financing spectrum use management :

- financing through the national budget;
- spectrum use fees;
- auctions.

The choice of the approach will be determined by that what tasks the state is intended to decide through spectrum use, its policy in the field of telecommunications.

Let's consider in brief each of these approaches.

### **Financing through the national budget**

In this case part of the annual management budget is distributed in favour of spectrum use management.

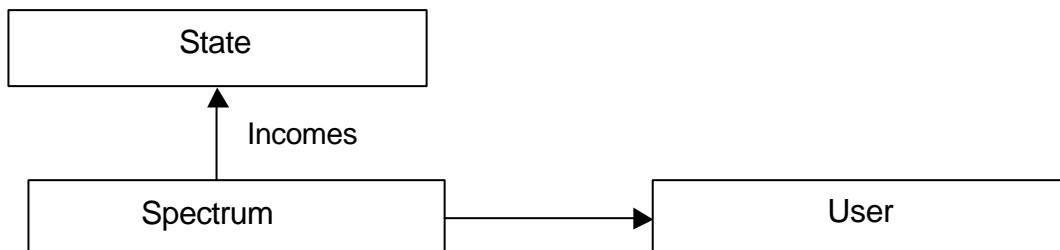
Defects:

- approach is unjust to one does not use radiotelecommunications;
- financing is limited, since budget itself is limited by limits of tax revenueses;
- spectrum management, as a rule, is not a priority problem of a government;
- in countries with the transitional economy due to problems with the budget, financing of spectrum use management is sloppy;
- efficient spectrum use is not stimulating

It is possible to consider the question of compensation the expenses of a state on spectrum management in the aggregate with approaches of spectrum use

It is possible to consider the spectral resource only as a commodity which will be sold by a state (will be rented on the certain term) to a user, moreover further relations of a user of a spectrum with the state do not enter to the task of this consideration.

### Spectral resource – Commodity

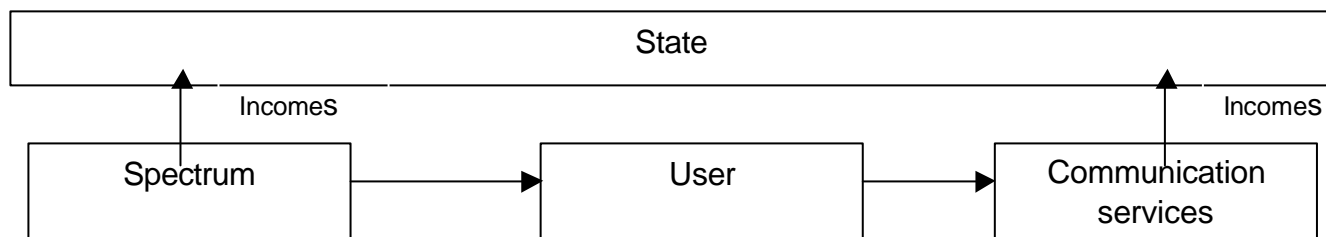


In this case relations between the administration of communications, representing the state, and user are marketable only. One will sell (more expensively), other purchases (more cheaply) commodity. Task of spectrum management body is to sell on possible maximum price.

In this case the best approach is an auction, which will give an real price to the spectral resource at the time of the auction.

Problems: protection of own producer of services in countries with the transitional economy, which, as a rule, hasn't sufficiently funds in order to participate in the auction.

### Spectrum – a resource for producing of commodity



It is possible to consider spectrum as a resource, using which telecommunication operators create communication services. Part of incomes from selling these services in the form of taxes comes directly to a budget. Here we need to optimize on two sources of incomes: incomes from selling a spectrum and tax from incomes of operators.

In forming a spectrum price it is necessary to take into account:

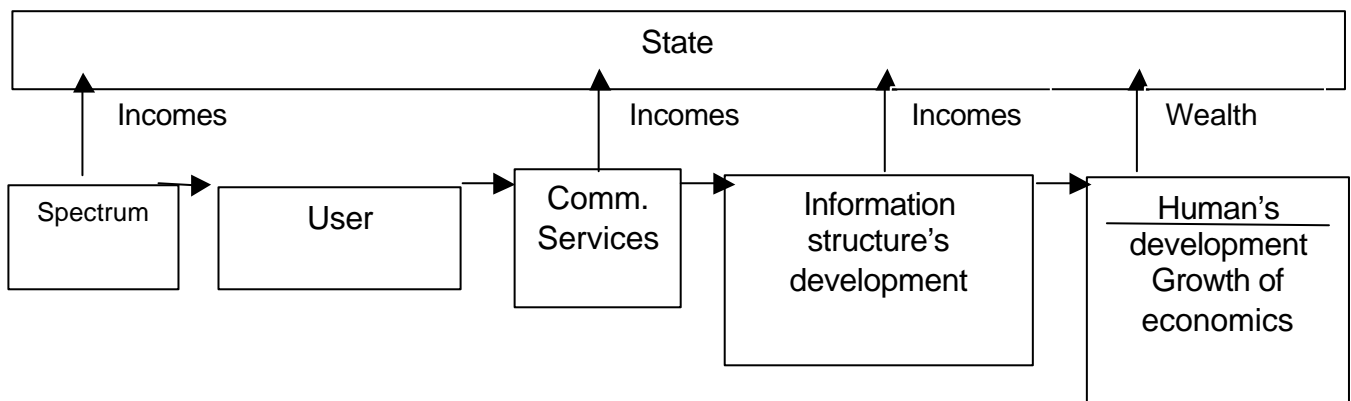
- influence of a charge per spectrum on communication services tariffs, market development;

- influence of a charge per spectrum on competitiveness of communication services, especially on international market.

Probably in this case we will find, that no necessity to try to reach greatly high prices for the spectrum.

Probably with the purpose of conducting certain policy on the development of telecommunication market, an optimum approach will turn out to be not auction, but payments for spectrum use.

### Spectrum – one of the resource components of the development of the society



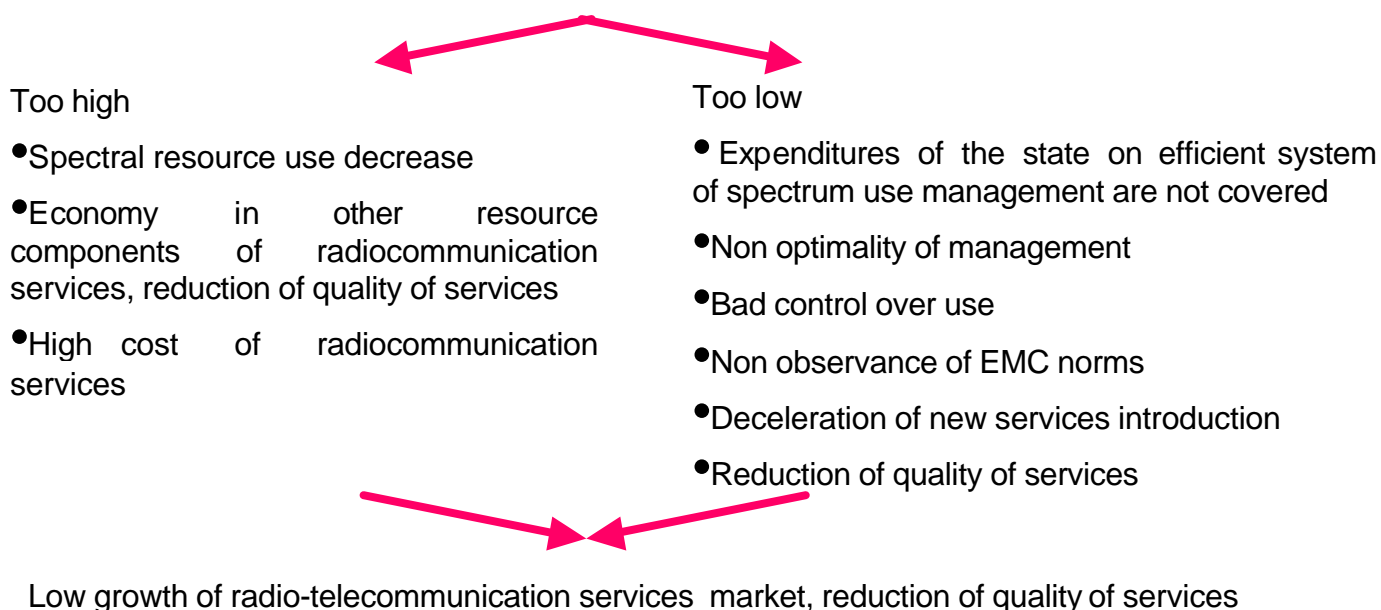
It's possible to consider the spectrum as one of the resource components of building of information society. For the state as a whole it will be better, if **the largest** number of members of society will get highly intellectual development, having gained access to information resources.

So, information services must be as cheapest as possible.

For this purpose communication services tariffs must be limited overhand.

In forming prices for the spectrum it is necessary to take into account these factors. Probably, it will be expedient not to earn from payment for the spectrum, but simply cover expenses on spectrum use management, using for this purpose the method of license fees.

## Spectral resource payment.



### Efficient spectrum use management

Before we speak about too high or too low payment for the spectrum it is necessary to determine some required level of state expenditures on spectrum management, which undoubtedly must be financed and after this we can compare a total payment for the spectrum with this level.

Evidently, this level of financing must guarantee that system of spectrum use management will be efficient, the **main functions** of management will work properly.

Thereby, for the evaluation of the level of financing it is necessary to determine what functions must be fulfilled without fail and what resources must be attracted in order these functions were **fulfilled properly**.

### Main functions of spectrum use management

- spectrum use management policy and its planning/distribution;
- frequency assignment and licensing;
- standards specification and sanctioning of an equipment;
- spectrum use monitoring (compulsory measures and radio monitoring);
- international co-operation;
- cooperation and consultations;
- engineering support of spectrum use management;

- computer support;
- administrative and legal support.

### **Performing the functions of spectrum management**

• For performing these functions **properly** usage and regulation of radio communication must be established **in legal way**.

• The National table of frequency assignment must be adopted without fail, which provides the General plan of spectrum use and basic structure for effective spectrum use and prevention radio interference between services on the national and international levels.

• The structure, responsible for spectrum use management and its role in a state management system within the country must be determined, as well as coordination and interaction of this structure with the rest infrastructure of state management must be provided.

• Procedures of decision making must be perfected and accepted. Process of decision acceptance must be ranked in order to guarantee systematic character and timeliness of process of spectrum use management.

If functions of spectrum management are determined, organizing and other measures on ensuring a performing these functions are accepted, the following stage will be an evaluation of resources, which are required for performing these functions.

Basically these facility we can split into material, information and human resources.

#### **Material resources:**

- Buildings, constructions (and their amortization);
- Transport vehicles;
- Radio monitoring stations equipment;
- Direction finders;
- Office equipment;
- Paper and other materials;
- Combustible-lubrificants
- Electrical energy, water, heat carriers;
- Others.

#### **Information resources:**

- Scientific and operational literature;
- International standards and recommendations;
- Results of scientific studies;

- Software for the spectrum management system, including for radio monitoring stations, National spectrum management database, systems of carrying out electromagnetic compatibility analysis;
- Periodic technical literature;
- Information resources on training the staff, who deal with spectrum use management.

### **Human resources:**

Effective spectrum use system must be provided by the stable staff of highly qualified specialists. They must be sufficiently provided financially. Their training and retraining must be conducted opportunely.

They actively must participate in the international cooperation to be in the course of international events in the field of spectrum use.

Having valued these resources it is possible to proceed with determination of necessary level of financing of spectrum use management system.

But first it would be better to give small information on the proposed annual payment Model, going on the expenses compensation on spectrum management and algorithm to its realization.

### **Model of determination of annual payment for spectrum use**

- ◆ Determination of cumulative annual expenditures of state on spectral resource management and determination on this base of total amount of annual payments for the whole spectral resource used in the country.
- ◆ Determination of spectral resource value really used in the republic.
- ◆ Determination of spectral resource unit price.
- ◆ Determination of the annual payment by a specific user determined from the actual value of used spectral resource and resource unit price.

### **Spectral resource payment.**

State can simultaneously use different approaches to the financing of spectrum management. If we speak of annual payments  $?_{ann}$ , these payments must be separated from other payments, and then it is possible to determine  $?_{ann}$  as following:

$$?_{ann} = ?_1 + ?_2 - I \quad (1)$$

$?_{ann}$  – total amount of annual payments of spectrum users

$?_1$  - share of the sum that is necessary for covering expenditures of the state on all national and international spectrum management activities

$\pi_2$  – net income of a state

$I$  – share of the sum that comes from spectrum users for the spectrum management activity, not in the form of annual collections. For example, Administration can use separate additional tariffs for inspection and examination activities (examination of frequency assignment application forms, inspection of radio stations after installations before entering to operation, systematic inspection of radio installations on conformity to license terms, etc.).

It is possible to subdivide the terms  $C_1$  and  $C_2$  into additional components:

$$C_1 = C_{11} + C_{12} + C_{13} + C_{14} \quad (2)$$

where:

$C_{11}$ : funds necessary for the purchase and efficient operations using spectrum management system facilities and equipment, including radio monitoring station equipment, direction finders, computers and software for monitoring stations and for a national Spectrum Management Database, equipment for inspection purposes, materials, amortisation of buildings, constructions, transport vehicles, training of specialists occupied in spectrum use management etc.

$C_{12}$ : funds necessary for carrying out supporting scientific research, purchase of the scientific and operational literature, international standards and recommendations, carrying out electromagnetic compatibility analysis for supporting frequency assignment process, etc.

$C_{13}$ : funds necessary to provide efficient activities of a national telecommunication Administration within ITU-R and to fulfil bilateral and multilateral frequency coordination obligations relating to terrestrial and satellite radio services etc.

$C_{14}$ : spectrum management staff salaries.

Taxes are not included in the amounts  $C_{11} - C_{14}$ .

In formula (1) coefficient  $C_2$  can be presented as the following components:

$$C_2 = C_{21} + C_{22}, \quad (3)$$

where:

$C_{21}$ : taxes on the incomes of a national spectrum management body and taxes included in the cost of the equipment, software, materials etc., which are bought by this body from the market

$C_{22}$ : additional payment for spectrum use coming directly to a state budget.

In essence  $C_{22}$  is some kind of advanced payment to the state for a spectrum and many telecommunication operators, especially in the developing countries, will not be immediately

be able to make such large payments and furthermore this could be an obstacle to development.

A good measure of the provision of an economic incentive is to reduce to a minimum the  $C_{22}$  component, so that a telecommunication operator begins to provide service as quickly as possible. The loss of this  $C_{22}$  component can be easily compensated by a state from taxes from the telecommunication operator's activity.

To encourage faster development of radio communication services to support economic development of a country some countries do not apply such additional charges  $\varphi_{22}$ .

Formulas (1) and (3) do not take into account any indirect income of the state from the used spectral resource in the form of taxes from the incomes of the telecommunication operators whose activity is connected with spectral resource use (for example, taxes from the incomes of the cellular communication operators). This component of the income of the state usually is collected and repeatedly exceeds reasonable values of  $C_{22}$ , if those would be collected. At the same time these taxes are also the state income from used spectral resource although an indirect one.

Counting financing systems, acting in majority of the CIS countries, coefficient  $C_1$  in formula (1) is as follows:

$$\varphi_1 = [\varphi_{sf} (1 + \varphi_{si} + \varphi_{ae}) + \varphi_{\varphi} + \varphi_m + \varphi_{el} + \varphi_{im} + \varphi_{tp} + \varphi_{oe}] \cdot \varphi_p \quad (4)$$

$\varphi_{sf}$  – salary of a personal;

$\varphi_{si}$  – coefficient, counting deductions on social insurance;

$\varphi_{ae}$  – coefficient, counting additional expenditures;

$\varphi_{\varphi}$  – expenditures on amortization of an equipment

$\varphi_m$  – expenditures on materials;

$\varphi_{el}$  – expenditures on electric power;

$\varphi_{im}$  – expenditures on international missions;

$\varphi_{tp}$  - expenditures on training of personal;

$\varphi_{oe}$  – other expenditures;

$\varphi_p$  – coefficient of profitability.

Thereby, in the given report analysis of components of expenditures of a state on spectrum use management coming from evaluations of resources is carried out, required for performing the functions of spectrum use management.



Such analysis allows to determine a minimum total payment amount, which can be claimed from all spectrum users in the country.

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