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Question 13/2: Methods to enhance the viability of public service broadcasting, particularly focusing on developing countries

STUDY GROUP 2

SOURCE: CANADA

TITLE: LONG-TERM STRATEGIES FOR THE USE OF RADIO FREQUENCY SPECTRUM¹

EXECUTIVE SUMMARY

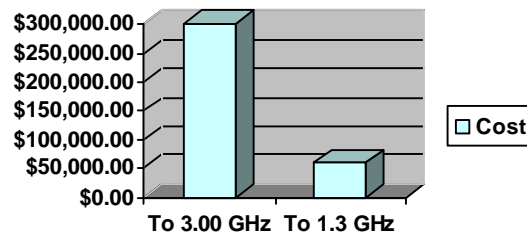
Canada is in a unique position in the area of spectrum frequency management, with a unique role to fill in the international arena. She is perfectly positioned and qualified to offer the two primary tools for spectrum management - affordable effective equipment and operator training.

In recent years many manufacturers of telecommunications equipment have propounded the idea that there is a need for sophisticated equipment capable of monitoring frequencies in the 2.05 to 3.00 GHz range. Pressure has been exerted on the International Telecommunications Union to make this requirement mandatory. The high cost of acquiring such equipment places it way beyond the reach of most developing nations.

If we examine the traffic on these frequencies, we find that much of the data contribute little to managing the spectrum. Although there is a school of thought that believes there will be a need for such data in the future, based on the contention that a country will eventually need additional new frequencies, the fact remains that most countries are not using the frequencies they have at this time.

¹ **Reference:** Resolution 9 (WTDC-98) "Participation of Countries, particularly Developing Countries, in Frequency Spectrum Management"

While there is of course a need for such sophisticated systems in the military, less elaborate systems currently available offer 85% useful data at 20% of the cost (see chart below), indicating that, at this time, military grade equipment has no place in commercial and civilian use of the spectrum.



Comparative cost: 85% effect for 20% of the price

While a greater need may indeed arise in the future, many nations - in particular the least developed nations - are examining their actual and immediate requirements; this is therefore the most important area for national and international development in telecommunications.

The success of any spectrum management system hinges on the affordable availability of its two principal elements - the equipment and properly trained operators.

Training may well be the first priority. This is a role that Canada is very qualified to perform. It is very gratifying to see the combined effort of Industry Canada, the Canadian International Development Agency, the International Development Research Centre and the private sector who have come together to examine ways to implement the objective of affordable effective spectrum management on a global scale.

Member countries of the ITU should also assist the least developed nations in two areas: examining their requirements and special studies to identify their real needs.

Self-financing spectrum management is available today. Canada has a leading role to take in its implementation and distribution.

Spectrum Management Program and Objectives

Introduction

A well-designed national spectrum management program is one that ensures high-quality, reliable radiocommunications. It also ensures that radiocommunications serve the country's economic, social and cultural development objectives. To accomplish these goals, the system must be based on the country's identified and detailed spectrum management needs, assessed in a national context as to their requirements, cost and impact relative to existing programs and operational priorities.

Three primary activities support spectrum management:

- radio station licensing
- spectrum monitoring and control
- spectrum engineering and planning.

The one essential component that ties together all of these activities and makes a successful integrated frequency management program possible is an accurate and current Radio Station Licensing Database (RSLD).

The RSLD contains all licensing, operational and technical measurement data related to licensed radio stations. It fully supports a spectrum management program designed to operate a modern and efficient Radio Frequency Management System (RFMS).

The RFMS takes into consideration all primary spectrum environmental and administrative factors in the assignment of frequencies and the issuance of radio station licences. RFMS also supplies the means to regulate and maximise use of the spectrum by creating an interference-free radio frequency environment in which to assign and operate radio systems. By controlling and ensuring the technical and operational quality of radiocommunications systems and by providing the tools required by a Spectrum Management Administration (SMA) to identify and eliminate unlicensed or illegal radio stations which are potential interference sources to licensed operations.

Another important consideration in establishing a national spectrum management program is the acquiring of training and assistance in administrative and technical areas. Spectrum management is a complex process that includes a large number of diverse administrative and technical processes and procedures, from the planning of frequency bands and the licensing of radio stations to the technical and operational analysis of illegal radiocommunication systems. To ensure a successful project, it is of the utmost importance to ensure that the spectrum management system provider has the required experience and expertise, plus a proven record, to deliver adequate training and technical assistance.

Spectrum Management Overview

Spectrum management can be described as a set of activities that enables governments to ensure reliable radiocommunications to serve national interests. Since radio waves do not recognize international boundaries, bilateral and multilateral coordination of frequency allocations and radio station licensing is necessary.

A national spectrum management program contains objectives and activities for radio frequency management and spectrum monitoring and control, including

- radio station licensing

- radio traffic supervision
- measurement of frequency occupancy (channel occupancy measurements)
- technical measurements: frequency, modulation, bandwidth, field strength, signals & systems analysis, etc.
- direction finding
- broadcast technical quality measurements
- determination of infringements
- investigation of interference
- location of illegal radio stations
- statistical data for frequency management purposes
- frequency planning

To achieve the above objectives, the principal components of a spectrum management program would involve the following activities:

- license, regulate and manage the operation of radio equipment including mobile radio systems, satellites and other users;
- co-ordinate bilaterally and multilaterally the allocation of frequencies within and external to a country's borders;
- develop standards for radio equipment and systems;
- carry out spectrum planning and engineering to provide the channelling plans and engineering basis for spectrum management;
- establish operating procedures;
- pursue and protect the country's interests in all ITU fora where international regulations, allocations and standards are developed;
- ensure radio apparatus are approved for use; and,
- conduct examinations for radio operators.

Spectrum Management Programs

As stated previously, three main spectrum management programs support the specified objectives and activities: radio station licensing; spectrum monitoring and control; and, spectrum engineering and planning.

While the full implementation of these programs is desirable, an SMA with given resources (normally not unlimited) has to prioritise the implementation of these programs to maximise the application of the available resources.

The RFMS, which provides the means of licensing radio stations and the establishment of the radio station licensing database, is of primary importance to the management of the radio frequency spectrum.

For monitoring and field operations programs, in Industry Canada's (Canada's radio frequency regulatory body, formerly known as the Department of Communications) experience, for the

effective management of the radio spectrum it is not an immediate requirement to provide fixed monitoring and direction finding capabilities above 1 GHz.

Not only is the equipment for coverage above 1 GHz very expensive, but the detection of emitters in this frequency band is impractical under most circumstances from fixed locations as shown in the following example.

Extremely low signal levels are emitted by mobile GSM cellular, PCS and other similar systems' units operating in the 900 MHz frequency band. For example:

A 3-watt ERP, mobile GSM cellular or PCS unit's signal level is reduced by approximately 80 db per km @ >900 MHz, resulting in a signal level in the micro-volt level within one kilometer.

Because of the low signal levels, interception and analysis of these transmitters is difficult, if not impossible, from a fixed site unless the portable or mobile emitter is in close proximity to the monitoring site.

In rare instances, when technical analysis by the SMA is necessary, a more cost-effective and practical method of analysis can be performed by a mobile monitoring system that can conduct the technical and operational analysis in these frequency bands in many areas, as opposed to the limited coverage area possible from fixed sites at 900 MHz and above.

Canadian experience has shown that the majority of day-to-day monitoring and direction finding requirements concentrates in the land mobile service bands within the 30 MHz to 1 GHz frequency band. The technology for deployment of programs for this frequency range is matured, cost-effective and readily available from many sources.

Radio Frequency Management System

The RFMS provides a radio station licensing function that includes the authorization of licences for land fixed, land mobile, microwave, and ships, aircraft and amateur radio applications that can involve:

- international and domestic frequency coordination and notification;
- the processing of applications and certifications;
- the technical certification of AM, FM and TV broadcast stations and CATV systems;
- the certification of ships, aircraft and amateur operators; and,
- radio equipment type approval.

The licensing process may also include the assessment of channel loading occupancy to determine

- levels of activity on a channel if vertical loading of radio station assignments is utilised or if additional spectrum is requested by single channel users;
- whether a frequency is being employed efficiently and in accordance with the terms of licence with regard to minimum channel occupancy levels being achieved within the agreed-upon time periods.

Spectrum Monitoring and Control

The spectrum monitoring and control program, which includes investigations and inspections activities, is utilized to support the management of the frequency spectrum and provides technical and operational information related to spectrum occupancy for statistical purposes. Another of its functions is to gather information for enforcement and regulatory programs deployed to ensure the compliance of individual radio communication systems and stations with government telecommunications regulations.

It should be noted that while the monitoring and technical assessment of the radio frequency environment can be accomplished through the use of a variety of systems and hardware, including those configured primarily for military applications, unless a system is designed specifically to meet the spectrum management needs of a country, undesirable compromises normally result which impact on the spectrum management system and its licensing and operational programs.

Past experience with Canadian spectrum management systems has shown that a system created and configured specifically to meet the identified needs of a national spectrum management program is the most cost-effective and efficient method of achieving the objectives of a spectrum management program. A system that is particularly effective is one that factors all of the objectives required from the management of a country's radio frequency environment.

As part of the spectrum monitoring and control program, field and monitoring investigations are carried out in response to complaints of interference to radiocommunication systems and, to a lesser degree, complaints related to interference to radio-sensitive equipment from radiocommunication stations.

Investigations normally involve the on-site or off-air technical analysis of the problem and the resolution of the complaint in accordance with radio regulations.

Inspections, both off-air (monitoring) and on-site (mobile inspection vehicle), are conducted to provide specific data for the evaluation of the condition of the radio environment and to assess whether licensees have installed and have maintained the installation in accordance with authorized radio station licence parameters. The installation and siting of a radio station as authorized by the SMA allows the orderly establishment of new stations in the radio environment and permits continued interference-free operation by existing users.
