

**Access to Microfinance & Improved Implementation of Policy Reform
(AMIR Program)**

Funded By U.S. Agency for International Development

Assessment of Spectrum Management Issues in Jordan

Final Report

**Deliverable for Policy Component, Task No. 4.6.16
Contract No. 278-C-00-98-00029-00**

January 2001

This report was prepared by Dr. Charles Rush, in collaboration with Chemonics International Inc., prime contractor to the U.S. Agency for International Development for the AMIR Program in Jordan.

**ASSESSMENT OF SPECTRUM MANAGEMENT
ISSUES IN JORDAN**

Table of Contents

	Executive Summary.....	1
I.	Introduction.....	2
II.	Current Spectrum Management in Jordan.....	3
III.	Development of a National Frequency Allocation Table and a National Register of Frequencies.....	6
IV.	Strengthening the Frequency Coordination of Government and Private Sector Spectrum Use.....	8
V.	Develop Clearly Defined Responsibilities for the Military and Civilian Sectors in Frequency Monitoring.....	10
VI.	Establish Clearly Defined Licensing Rules for All Radio Services.....	12
VII.	Development of a Spectrum Fee Structure Consistent with Jordan’s Telecommunications Market.....	12
VIII.	Role of the Ministry and the TRC in International Telecommunications Negotiations.....	14
IX.	Enhance Level Of Staff Capabilities.....	16
X.	Increasing Public Participation in the Frequency Management Process.....	17
XI.	Conclusion.....	19
	ANNEX 1: List of Officials Interviewed in Jordan.....	20

EXECUTIVE SUMMARY

A study of the radio spectrum management environment in the Hashemite Kingdom of Jordan has been undertaken by the U.S. Agency for International Development's AMIR project. This study was designed to assist the Minister of Post and Communications in improving the management of the radio spectrum within Jordan and enabling greater commercial use of the radio frequency to support overall economic development. The project involved identifying challenges for Jordan to implement an efficient and effective spectrum management process, including defining the respective roles of civilian and military authorities in the usage of the spectrum in Jordan. The result of the effort is a series of recommendations for improving the spectrum management process in Jordan and for assisting the Minister of Post and Communications, His Excellency, Dr. Fawaz Hatim Zu'bi, and the TRC to best plan for advancing commercial use of the spectrum.

The consultant visited the Kingdom of Jordan from November 11-17, 2000, and met with the Minister of Post and Communications, government personnel involved in the management of the radio spectrum in Jordan, and representatives of the private sector. The options and recommendations in this report are based on those meetings, materials provided to the consultant, and international best practices.

These recommendations are that the following objectives should be high priorities for the Kingdom of Jordan:

- Developing a national frequency allocation table and a national register of frequencies for Jordan
- Establishing a consultative process for government agencies regarding frequency use
- Clearly defining the role of the military and civilian sectors in frequency monitoring
- Establishing open and transparent licensing rules
- Establishing a realistic spectrum fee structure
- Defining the respective roles of the Ministry and the TRC in international telecommunications negotiations
- Increasing the spectrum management staff and providing them with sufficient resources
- Increasing public participation in the frequency management process.

I. INTRODUCTION

Telecommunications development is recognized globally as a core component of a thriving economy. Telecommunications and information technologies are an integral part of financial services, commodities markets, media, transportation and the travel industry and they provide vital links among manufactures, wholesalers and retailers. Many of these sectors of the economy are increasingly being served by wireless services, both mobile and fixed applications. Not only do radio-based systems allow for ease in portability and mobility of services, but these systems also often enable telecommunications infrastructures to be upgraded and improved in a time-frame and on an economic scale that is far less than that for corresponding wire-line infrastructure upgrades and build-out. Key to improving the telecommunications infrastructure by use of radio-based systems and services is an efficiently managed, modern spectrum management system.

Within the Kingdom of Jordan the regulation of radio frequencies used for telecommunications purposes falls under the purview of the Telecommunications Regulatory Commission (TRC). Although the Telecommunications Law of 1995 makes the TRC responsible for spectrum management, the details of the use of spectrum in Jordan is currently unclear, with information about military use generally unavailable to the civilian (TRC) authorities. In addition, insufficient attention has been paid to viewing the radio frequency spectrum as a national asset and to obtaining the best possible commercial use of that asset. Jordan currently finds itself in the challenging position where the demands placed on the spectrum management process have not kept pace with the demands of radio-based service providers wishing to offer telecommunications services.

In order to remedy these deficiencies, the Minister of Post and Communications, His Excellency, Dr. Fawaz Hatim Zu'bi (hereafter referred to simply as the Minister) has convened a task force made up of representatives of the Ministry, the TRC, the Army, and the General Intelligence Department (GID) to examine the entire range of spectrum usage issues. Working under the direction of the Minister, the consultant assisted this group in developing recommendations for the effective management of the spectrum, including defining the roles of civilian authorities and the military in the usage of the spectrum. Specifically, the role of the consultant is to assist the Ministry and the TRC to prepare the latter to assume its full range of responsibilities for spectrum management. The end product of the consultant's work is recommendations for improving the spectrum management process in Jordan and for assisting the Minister and the TRC to best plan for commercial use of the spectrum.

The consultant visited the Kingdom of Jordan from November 11-17, 2000, for the purpose of meeting with the Minister and other personnel involved in the management of the radio spectrum in Jordan. This report, based on materials provided by the Ministry and the TRC, as well as interviews with representatives from the TRC and the

Jordanian telecommunications private sector, provides the recommendations for the Minister.

The individuals interviewed as part of this effort provided insights and comments that were invaluable aids in developing the recommendations contained in this report. A list of these individuals can be found in Annex 1. In addition to the individuals listed in Annex 1, discussions were held with the members of the Board of Directors of the TRC who represent the Royal Signal Corps and the general intelligence community. These discussions also were extremely informative and provided assistance in arriving at the recommendations given in this report.

The current spectrum management situation in Jordan is briefly described in Section II of this report, followed by subsequent sections that focus on the “how to” aspects of bringing the Jordanian spectrum management process into concert with a more transparent and liberalized regulatory regime. Where it is reasonable and logical to do so, options are given for different approaches to address the specific spectrum management issue with justification provided for the recommended approach. The discussion focuses on the following spectrum management issues:

- Developing a national frequency allocation table and a national register of frequencies for Jordan
- Establishing a consultative process for government agencies regarding frequency use
- Clearly defining the role of the military and civilian sectors in frequency monitoring
- Establishing open and transparent licensing rules
- Establishing a realistic spectrum fee structure
- Defining the respective roles of the Ministry and the TRC in international telecommunications negotiations
- Increasing the spectrum management staff and providing them with sufficient resources
- Increasing public participation in the frequency management process.

II. CURRENT SPECTRUM MANAGEMENT IN JORDAN

Article 30 of the Telecommunications Law of 1995 establishes that frequency spectrum is a national resource to be regulated by the TRC. While the existing regulatory framework provides the TRC with significant authority in managing Jordan’s radio spectrum, the current situation does not reflect the legal framework in place. The TRC does not have sufficient information on the current use of the spectrum and does not have the necessary personnel and equipment to carry out its legal authority. Also, the TRC does not have sufficient information from other government agencies that operate radio systems to effectively manage the overall radio spectrum in the Kingdom of Jordan. The following points highlight the current problems that severely limit the TRC in carrying out many of its regulatory responsibilities with regards to spectrum management.

1. Lack of Information on Existing Radio Allocations – A significant amount of information regarding operation of radio systems resides within the military and security agencies, which is a result of when these organizations were responsible for managing the radio spectrum in the pre-liberalized market era. The current lack of information on the state of the radio spectrum and the capabilities of existing radio systems undermines the TRC’s overall authority. The following items illustrate how the current lack of spectrum information impedes the TRC from carrying out its responsibilities.

- a. Until the TRC is advised of the breadth and depth of frequency use by the military and national security community, it will be very difficult for the TRC to develop a national register of frequencies, an essential spectrum management regulatory tool.
- b. Before the TRC can issue a license, the Royal Signal Corps must review the frequencies requested and determine the frequencies that can be used by the applicant. This process results in licensing delays and decisions that are non-transparent to the public.
- c. The TRC has incomplete information necessary to develop licensing and technical rules for new radio systems that will ensure that these systems can operate without interference and require no further coordination with other government systems.
- d. The TRC faces difficulty in developing reasonable equipment performance standards to protect current users because it lacks any information on existing systems. Furthermore, the TRC cannot be assured that equipment approved to operate in the Kingdom of Jordan will not interfere or be interfered with by existing radio operations.

2. Lack of a National Frequency Allocation Table – The TRC and the public do not have access to a comprehensive national table of existing frequency allocations. Without a national frequency allocation table, the TRC, other government agencies, and industry are limited in their ability to recommend future planning of the radio spectrum and offer comprehensive strategic advice with regard to the wireless market. This limited ability can result in an adverse impact on both the availability of services and the opportunities for economic prospects. Recognizing that there are many competing requirements for spectrum consuming services within the borders of the Kingdom and within the territory of its neighbors, Jordan could find itself with limited frequency options to provide basic and advanced wireless telecommunications services.

3. Lack of Technical Resources – The TRC has limited ability to review wireless license applications and has no capability to monitor the use of the radio spectrum. The TRC relies upon the military to review the frequencies requested and determine the frequencies that can be used for wireless systems. The TRC also requires the assistance of the military to help resolve other regulatory and technical issues that require spectrum monitoring support. By being reliant on the military, the TRC’s authority is weakened and its decisions are viewed by the private sector as non-transparent and overly influenced by the military.

4. Lack of Clarity Regarding Authority over Broadcasting Frequencies – Until a recent court decision, the TRC had not managed the spectrum that is used by the broadcasting community in Jordan. Although broadcast spectrum allocation and assignments should be made by the TRC, it is the Jordan Radio and Television Company that grants the broadcasting operating licenses in Jordan. Despite the fact that this situation apparently is an effective means of conducting current operations, the management of the broadcasting spectrum should be clearly placed under the purview of the TRC, particularly in light of the liberalization of the mass media sector. An entity competing with others in its sector should not be controlling the spectrum to be used by its competitors. Furthermore, given that the current demands placed on communications and information requirements, computer applications and broadcast capabilities and the merging of technologies underpinning these sectors of the economy, it becomes even more important to maintain all spectrum allocation within one agency. The proposed law amending the Telecommunications Law of 1995 clarifies the TRC’s authority to regulate broadcast spectrum.

5. Lack of Coordination within the Government – The lack of coordination within the government on spectrum management precludes the TRC from effectively managing the radio spectrum. The TRC must have the authority to maintain proper coordination among relevant government agencies. The TRC should be responsible for developing and maintaining a coordinated national frequency allocation table that is accessible to the public (see paragraph 2 above). By establishing a permanent coordination mechanism, the Kingdom of Jordan can also effectively develop long-term plans to assist in regional and international negotiations.

Effective spectrum management requires the establishment of processes based on principles that are consistent with the country’s social, economic, and national security objectives. The first principle is that the implementation of spectrum-based telecommunications systems will increase access to telecommunications services, thus providing enhanced means of delivery of social services and improving the overall standard of living in Jordan. The second principle recognizes that the use of radio-based systems will continue to be an essential element of the national defense and public security of the Kingdom. The third principle is that the efficient and effective management of radio spectrum resources is fundamental to ensuring that traditional and advanced wireless services will continue to contribute to improving the economy of the Kingdom of Jordan.

The spectrum management process must be understood by operators and manufacturers alike, and by users themselves to the extent that it impacts their ability to receive the services demanded or expected. The regulations guiding the management of the spectrum must be transparent, impartial, and available publicly for review. The spectrum management regulations should be consistent with basic physical principles, sound engineering practices, and, when not at variance with the laws and security of the Kingdom, with those practices adopted internationally that provide the most efficient use of the spectrum at the least cost, in terms of both price and bandwidth.

In discussions and interviews held during the initial visit of the consultant to Jordan in November 2000, all parties seemed aware of what had to be done to bring about an effective spectrum management environment within the Kingdom. The issue here is not **what** has to be done but rather **how** to get it done. As is typical of telecommunications environments undergoing liberalization around the world, many of the individuals who played significant management and/or technical roles under the monopolistic regulatory scheme in Jordan are involved in comparable roles in the new environment. That this is the case is easy to understand because telecommunications as a service is dependent on numerous complex interdependencies such as technology advances, availability of capital, economic and investment trends, and enlightened regulatory policies. It is difficult, if not impossible, to maintain an acceptable degree of quality of service while at the same time building upon the embedded telecommunications infrastructure without relying on the experience and expertise available in Jordan that was engendered under the monopolistic regime.

Jordan is in a very good position to move forward into the more liberalized telecommunications, and spectrum management, environment. There is a cadre of highly dedicated, capable and experienced people, willing to serve for the good of the Kingdom. There is a genuine feeling of acceptance of change as a necessary part of bringing about improved social order. Within the telecommunications sector, there is a pervasive aura of willingness to work for improvements in services that will logically result in enhanced economic status and social well-being in the Kingdom.

III. DEVELOPMENT OF A NATIONAL FREQUENCY ALLOCATION TABLE AND A NATIONAL REGISTER OF FREQUENCIES

One of the major limitations in the management of the spectrum in Jordan today is the absence of a publicly available national frequency allocation table and a national register of frequencies, which are critical spectrum management resources for the regulator. The National Frequency Allocation Table should show the division of the frequency spectrum into bands in accordance with the International Telecommunication Union's (ITU) Table of Frequency Allocations to the extent consistent with the laws and national security objectives of the Kingdom. The National Register of Frequencies should be a special file that contains information regarding the allocation and assignment of frequencies or bands of frequencies for military, security and commercial uses, specifying the nature of their application.

The lack of a frequency allocation table and a register of frequencies leads to the perception that the spectrum management environment is less than optimally structured and those who fall under its regulatory framework view the environment as being less than totally effective. This is of particular concern because Article 30 of the Telecommunications Law of 1995 specifically calls for the establishment of the National Register of Frequencies to record all information related to radio waves, their applications and assignments. Without a table of frequency allocations and a national register of frequencies that represent the current use of the radio spectrum in Jordan, it is difficult to develop a plan that will serve as the basis for future telecommunications

operations and telecommunications infrastructure investment. This could lead not only to inadequate services being designed and offered to the public, but could also have the far reaching effects of stifling competition in the provision of telecommunications services, as well as limiting investment improvements by both local and foreign sources in infrastructure development.

OPTIONS AVAILABLE TO ADDRESS DEVELOPMENT OF THE NATIONAL FREQUENCY ALLOCATION TABLE AND THE NATIONAL REGISTER OF FREQUENCIES:

Option 1: The TRC produces the National Frequency Allocation Table and the National Register of Frequencies without input from the military

Option 2: The TRC, working jointly with the military, produces the National Frequency Allocation Table and the National Register of Frequencies

Recommendation: Option 2

The TRC should immediately undertake the preparation and publication of a national frequency allocation table that is publicly available. Because the details of the use of the radio spectrum throughout Jordan -- band occupancy, usage statistics -- currently reside within the military, the TRC must work jointly with the military spectrum managers to develop a meaningful and useful national frequency allocation table and national register of frequencies. This will require that the military provide information that can be released to the public in the National Frequency Allocation Table indicating which bands of frequencies are used by the government, which are used by the private sector, and which are unused. The information in the National Frequency Allocation Table will not compromise security interests because it will be relatively generic. Many other countries publish their national frequency allocation tables clearly delineating the commercial usage from government uses, as well as the shared spectrum. For the development of the National Register of Frequencies, only those entries that pertain to licensed spectrum operations in Jordan need to be made publicly available, therefore ensuring protection of national security interests.

For ease in understanding and usefulness, the national frequency allocation table should follow the format of the ITU's Table of Frequency Allocations for Region 1, which includes the Middle East, Africa, and Europe. Because radio waves can travel over large distances and do not respect political borders, it is generally the practice to allocate domestic services in a manner that is consistent with international agreements. This helps, but by no means guarantees that domestic operations will not suffer interference from international operations and *vice versa*. For every frequency band indicated in the ITU Table of Frequency Allocations, there should be a corresponding indication of how that band is used in Jordan. In addition, the National Frequency Allocation Table of Jordan should contain, or make reference to, specific rules, or footnotes, that clarify the use of the band for the services indicated. It is not necessary that the details of the

government spectrum operations be made public, but those frequencies and bands that support government operations need to be clearly identified.

Because the ITU Table of Frequency Allocations often indicates service allocations for the same band that are incompatible with each other, it will be necessary for the TRC to determine the most appropriate allocation for a particular frequency band given national priorities and goals for the provision of telecommunications services. Once goals and priorities have been established, options available to the TRC spectrum managers include limiting the number of services that can be allocated and authorized to operate within a given band or sub-dividing the band among different services.

The TRC's Department of Frequency Management has already initiated the development of the National Frequency Allocation Table, which is consistent with the suggestions made above using information currently available to it, for the frequencies and/or bands currently occupied by non-government licensees and users known to the TRC. They are to be commended for recognizing the need to assemble this National Frequency Allocation Table and initiating the effort to date. In order to expeditiously proceed with the development of the National Frequency Allocation Table and the National Register of Frequencies, it is recommended that the spectrum management resources – both manpower and data records – available in the military be co-located with the Department of Frequency Management personnel in the TRC assigned to the task of producing these national spectrum management resources. This will likely require the establishment of a secure facility to house the entire set of records that will need to be accessed to produce the National Register of Frequencies, as well as granting access to the records to selected TRC personnel. The co-location of operationally-oriented spectrum management personnel will have the additional advantage of helping to facilitate an ongoing coordination process between spectrum managers for government and non-government frequency users.

IV. STRENGTHENING THE FREQUENCY COORDINATION OF GOVERNMENT AND PRIVATE SECTOR SPECTRUM USE

After the development and publication of a national frequency allocation table, questions are likely to remain regarding how the radio spectrum is used by the government and what frequencies – where in the spectrum and how much – can be made available to the private sector. Pressures to allocate more spectrum for commercial uses will increase and the importance of coordinating government and private sector use of the spectrum will become more important.

OPTIONS AVAILABLE TO STRENGTHEN THE FREQUENCY COORDINATION OF GOVERNMENT AND PRIVATE SECTOR USE OF THE SPECTRUM:

Option 1: Maintain the current consultative committee

Option 2: Modify the consultative committee to take a more pro-active role

Recommendation: Option 2

Article 33 of the 1995 Telecommunications Law established the Consultative Committee for Frequencies. This inter-agency committee could be strengthened to serve as the mechanism to coordinate spectrum issues between the government and private sector interests. Input from the Consultative Committee should be used by the TRC to draw up plans for the allocation and assignment of spectrum.

For the Consultative Committee to be most effective, it should be chaired by the TRC and one of the military or security representatives should be its vice chair. The proposed law to amend the 1995 Telecommunications Law provides for such leadership of the Consultative Committee, however, the current law is flexible enough to permit this leadership arrangement. To assist in the effective planning of the spectrum resource within the regulator, the Chairman of the Commission should appoint the TRC's Director of the Frequency Management Department, or one of his staff, to act as secretary to the Consultative Committee. In addition to preparing the agenda of its meetings, taking minutes, and keeping its documents and business files, the secretary could use his substantive expertise to act as a conduit of information back to the spectrum management implementation level of the TRC.

In determining the amount of spectrum needed to support government users, particularly military and security forces, the Consultative Committee may have to consider special circumstances regarding particular spectrum requirements. For example, the fact that military and security forces do not normally use all the frequencies assigned to them is not necessarily an indication of bad frequency management. Such apparent under-utilization often results from the necessity of keeping the frequencies in reserve for use during times of national crises or emergencies. In coordinating the use of spectrum for government and private sector users, consideration should be given to developing a priority order for the government services that will be assigned spectrum. For example, government spectrum could be assigned along the following priorities:

- Frequencies used primarily and directly for national security and defense purposes which are vital to the safety of the nation.
- Frequencies used primarily and directly to safeguard life and property in conditions of national emergency.
- Frequencies used primarily and directly to safeguard life and property where other means of communication are not available.
- Frequencies used in scientific research, when such use is considered to be necessary or desirable in the national interest.
- Frequencies used for all other purposes, the assignment of which must be judged upon the merits of the intended use.

In arriving at decisions as to how spectrum is to be ultimately used, the Consultative Committee would also have to assess the relative importance of each of these items listed above compared to the need to provide spectrum for private sector and commercial operations.

Finally, the Consultative Committee should develop guidelines for the reimbursement to the military and other government users for having to vacate spectrum in favor of private sector operations. It is certainly reasonable for the military to be reimbursed by the direct beneficiary of the vacated spectrum (the new private sector entrant) for costs associated with relocating to different spectrum. These costs include acquiring real estate, constructing new facilities, and replacing equipment that will permit operations at least at the level achieved prior to relocation. The cost basis for the relocation fees developed by the military must be made public and be subject to good-faith negotiation between the affected military user and the new entrant.

Reimbursement of the military for vacating spectrum should be based solely on the principle of ensuring that government operations are not harmed as the result of vacating spectrum. There should be no reimbursement of the military for spectrum that is unoccupied or unused. The spectrum resource is a national resource and its use should be judged in terms of the common good of the Kingdom.

V. DEVELOP CLEARLY DEFINED RESPONSIBILITIES FOR THE MILITARY AND CIVILIAN SECTORS IN FREQUENCY MONITORING

It was pointed out in Section II that the TRC does not have the capability at present to monitor how the spectrum is being used. Military resources must be relied upon to resolve issues of interference or to determine if an operator is using his equipment in conformity with the terms of his license. Clearly defined responsibilities for the military and civilian sectors in frequency monitoring should be established. The proposed amending law to the Telecommunications Law of 1995 clearly delineates monitoring as one of the TRC's responsibilities.

OPTIONS AVAILABLE TO ESTABLISH CLEARLY DEFINED RESPONSIBILITIES FOR THE MILITARY AND CIVILIAN SECTORS IN FREQUENCY MONITORING:

Option 1: Continue with the military performing all the monitoring of spectrum use in Jordan

Option 2: Empower the TRC to perform all the monitoring functions within Jordan

Option 3: Separate the monitoring role for military purposes from that of the private sector

Recommendation: Option 3

Option 3 allows the oversight and monitoring for the military to remain as it is but gives the TRC authority to monitor the uses of the spectrum it regulates. Although there may be more resources required under this option, it is the best long-term solution for the TRC and Jordan. The lack of capability on the part of the TRC to perform monitoring

on its own is both impractical and hinders its effectiveness by undermining its authority in the eyes of the public. Furthermore, any current limitations that the military may have with its own monitoring capabilities, e.g., upper frequency limits, modulation types, results in limitations on the TRC's ability to effectively use monitoring information in the spectrum management process. It is likewise impractical for the TRC to assume the monitoring responsibility for both the military and non-military spectrum users.

While the military is responsive to current TRC monitoring needs, it is not realistic to assume that monitoring of private sector operations will always be accomplished in the time frame needed by the TRC. Military operations would naturally be priority objectives for military services. The demands placed upon the military in terms of vigilance and responsiveness associated with real-time tactical operations involving communications precludes all options but that of a dedicated spectrum management and monitoring team supporting the military missions in this arena.

All things taken into consideration, it is recommended that the TRC develop its own monitoring capability to support the spectrum monitoring requirements of the private sector. This places the resolution and enforcement of private sector spectrum matters squarely in hands of the regulator – the TRC – where it rightfully belongs. A logical fallout of this recommendation is that the military will continue with its primary mission of supporting military, security and other government spectrum monitoring requirements.

There are no clearly defined, publicly established mechanisms for monitoring private sector spectrum-related activities by the TRC. It will be necessary for enforcement regulations and policies relating to spectrum monitoring to be issued and made publicly available. The enforcement and monitoring authority of the TRC must be clearly defined under the regulations so that there is little room for misunderstandings regarding its authority to enforce the laws and relevant regulations.

At present there are no resources assigned to monitoring functions at the TRC, apart from those associated with acting on interference complaints and passing requests for monitoring exercises to the military. The TRC must hire personnel that will be specifically assigned to spectrum monitoring functions. Furthermore, the TRC needs to procure the necessary equipment to monitor the private sector spectrum use in Jordan. Spectrum monitoring equipment is expensive and financing options will have to be considered to ensure its acquisition. Co-location of TRC and military spectrum managers as discussed in Section III would allow for sharing of some equipment and could assist in phasing in some of the expenses associated with the TRC's new monitoring responsibilities. It may also be necessary to conduct a public relations campaign to change the image of spectrum monitoring from that of the government listening in on the private lives of its citizens to the government undertaking actions to preserve the integrity of a limited, critical national resource.

VI. ESTABLISH CLEARLY DEFINED LICENSING RULES FOR ALL RADIO SERVICES

The rules and regulations pertaining to the granting of licenses for use of the radio spectrum must be issued in a transparent and open process, one in which the private sector can participate. These rules must be impartial, consistently applied, and publicly available. The TRC should establish and publish procedures for accepting applications for spectrum licenses, the conditions for award of spectrum licenses, the responsibilities of the licensee once award of a spectrum license has been granted, and penalties for failure to comply with license terms and conditions. The licensing process and oversight of adherence to regulations and licensing conditions must be prompt, fair and strictly enforced. The TRC must undertake to ensure that this is accomplished in short order. There are no other options. Although regulators in some countries may benefit from taking a conciliatory approach to enforcement of the terms and conditions of licenses, the TRC may want to exercise its enforcement authority since regulatory inaction will result in further interference and congestion of Jordan's spectrum.

VII. DEVELOPMENT OF A SPECTRUM FEE STRUCTURE CONSISTENT WITH JORDAN'S TELECOMMUNICATIONS MARKET

One of the most pervasive complaints made by the telecommunications private sector representatives that were interviewed during the consultant's visit to Jordan was the apparent lack of marketplace reality and logic in the structure of the spectrum fees now used in Jordan. They pointed to the particularly onerous current fee structure for the VHF/UHF fixed service and the wide-area paging service.

The primary purpose of regulatory fees should be as a tool for financing the activities of the regulator, including the spectrum management activities of the regulator. Regulatory fees must be seen as practical and fair, thus establishing and reviewing the regulator's fee structure should be done in an open and transparent process and take into account all the functions of the regulator. In addition, any review of the spectrum fees by the TRC should consider the overall regulatory fee structure of the TRC.

If spectrum fees are to be used to support the administrative costs of the TRC's spectrum management activities, information about the operation of existing and future services and functions must be known. The current spectrum fee system covers VHF and UHF fixed and mobile operations, fixed microwave links, very small aperture antennas (VSATs), and receive-only satellite stations. In order for the spectrum management activity to be an effective arm for implementing the telecommunications policies of the Kingdom of Jordan, the TRC must have the authority to impose fees for the use of spectrum and be able to enforce its rules to ensure that payments related to spectrum utilization are actually made. To address some of these issues, the following options are available to implement a spectrum fee structure. This section covers spectrum fees for licensed users of the radio spectrum. It does not consider, however, the approaches that the TRC uses in assigning licenses.

OPTIONS AVAILABLE TO DEVELOP A SPECTRUM FEE STRUCTURE THAT IS CONSISTENT WITH THE JORDANIAN TELECOMMUNICATIONS MARKET:

Option 1: Maintain the current spectrum fee structure

Option 2: Develop a new fee structure without comment from the private sector

Option 3: Develop a new fee structure after consultation with private sector telecommunications operators

Recommendation: Option 3

It is recommended that Option 3 be adopted for determining a more marketplace-sensitive spectrum fee schedule for use in Jordan. Soliciting the input from those who will be most directly affected by the spectrum fee structure – the operators – will increase the likelihood that the fees will be viewed as fair and that the fees will be paid with minimal problems to the TRC. As part of the decision-making process, the TRC should examine and consider various fee structures, including those used by Jordan's neighboring countries. These models could be used to frame the government and industry discussion and assist the TRC in its final decision-making.

The following principles should be considered as the TRC reviews the spectrum fee structure.

- Spectrum user fees should cover the total costs of spectrum management. These costs should include all direct and indirect costs, including those related to the necessary research and development work, monitoring and enforcement costs. This principle will require the TRC to consider its overall fee structure to account for the direct cost for each of its regulatory functions and to determine other costs that cannot be associated with a particular regulatory function.
- Spectrum fees should not be treated as a means of making money or a general source of revenues for the government. A fee structure should cover the administrative costs of the regulatory agency and serve as a catalyst for promoting efficient use of the spectrum.
- Spectrum fees should reflect the economic value of the scarce resource to introduce efficiencies in using the spectrum.
- Most users of the spectrum should be charged a fee.
- Fees should be as equitable as practical (e.g., users assigned equal amounts of spectrum for comparable use should be charged the same fee).
- Fees should not be an impediment to spectrum access and market entry.

- The fees should reflect the amount of spectrum assigned to the licensee.
- Fees should be structured to encourage the installation of spectrally efficient equipment, particularly in congested areas.
- Fee changes should be made in consultation with the users and the industry.

The TRC faces many options in reforming its spectrum fee structure, such as methodologies using fee formulas, based on administrative costs, or based on licensee revenues. Most methodologies contain factors proportional to the population or area served by the radio station, the attributed bandwidth, etc. In developing a spectrum fee structure, the TRC must consider various parameters when implementing a methodology. The TRC must also consider the effects the fee structure will have on introducing efficiencies into the marketplace, enabling competition, and accounting for social goals. If a formula approach to fee setting is adopted, the TRC would have to determine the parameters of the formula, the way they influence the level of the fee, and the economic value of the spectrum. To conduct this reform, the TRC should consider best practices in and outside of the region and undertake a review that is transparent and open to the public.

VIII. ROLE OF THE MINISTRY AND THE TRC IN INTERNATIONAL TELECOMMUNICATIONS NEGOTIATIONS

Because of the international character of telecommunications, it is important that the Kingdom of Jordan be represented in international telecommunications negotiations and conferences. Most of the conferences of importance are held under the auspices of the International Telecommunication Union (ITU) and many of them deal with technical issues. The ITU Radiocommunication Sector (ITU-R) and the Telecommunication Standardization Sector (ITU-T) are the primary entities providing a forum for dealing with radio and telecommunications network technical issues. There are other regional groups that address telecommunications issues that require representation by the Kingdom of Jordan. In addition, pan-Arab groups form to develop common positions in preparation for global meetings and conferences. Numerous negotiations with other countries will also be required to coordinate transborder radio spectrum issues. It will be important to resolve in the near term who represents the Kingdom of Jordan at these meetings.

OPTIONS AVAILABLE FOR REPRESENTING JORDAN AT INTERNATIONAL TELECOMMUNICATIONS CONFERENCES AND NEGOTIATIONS:

Option 1: All representation is undertaken by the Ministry of Post and Communications

Option 2: All representation is undertaken by the TRC

Option 3: Maintain a shared international representation approach with the Ministry taking the lead on policy and administrative issues and the TRC taking the lead on technical and regulatory issues

Recommendation: Option 3

It is recommended that Option 3 be adopted as the approach to be followed in representing Jordan at international telecommunications conferences and negotiations. The rationale for this recommendation at its simplest is that international representation should be the purview of the organization able to act in the best interests of Jordan. This approach is being adopted by more and more countries as they liberalize the telecommunications sector and have separate regulatory and policy-making bodies.

Bilateral and multilateral meetings focusing on policy and administrative issues should be the purview of the Ministry of Post and Communications. The Ministry, in its role as the telecommunications policy maker for the Kingdom of Jordan, is best suited to lead the representation for Jordan at meetings of the ITU Plenipotentiary Conference, the ITU Council and ITU World Telecommunication Development Conferences. It should also take the lead in representing the views of the Kingdom of Jordan in telecommunications activities conducted under the auspices of the World Trade Organization.

The TRC, with its regulatory and technical expertise, should be the lead entity in preparing for and participating in ITU World Radiocommunication Conferences, meetings of the ITU-R and ITU-T study groups and working parties, and regional groups that address the development of positions for international meetings bearing on technical issues. In addition, the TRC should be the lead Jordanian agency participating in standards development organizations and other telecommunications technology-based organizations. Bilateral and multilateral negotiations involving frequency coordination issues should likewise fall under the leadership of the TRC.

In undertaking their respective leadership roles in international telecommunications representation, it will be necessary that the Ministry and the TRC work in close coordination between themselves and with other elements of the Jordanian telecommunications market – the military, the national security interests and the private sector. It is further recommended that on-going coordination between the Ministry and the TRC on international telecommunications issues be undertaken. Regular meetings, perhaps on a monthly basis, between the principals involved from both the Ministry and the TRC should be considered as a mechanism to foster this coordination, at least initially. In addition, periodic public meetings could be held to discuss issues of interest.

There are also instances where other organizations within the telecommunications sector are best able to represent the interests of the Kingdom of Jordan in international deliberations. For example, representation at international satellite organizations such as Intelsat, Inmarsat and Arabsat, is best left to the company with a financial interest in the international entity.

IX. ENHANCE LEVEL OF STAFF CAPABILITIES

There is no lack of dedication among the individuals involved in the spectrum management process in Jordan. Similarly, the personnel currently assigned to spectrum management activities are characterized by high levels of expertise and technical sophistication. The problem is there are not enough experts to do all that is expected to be accomplished in establishing and maintaining a technically sound, transparent, and efficient spectrum management process. Nor do the current experts have all the tools necessary to do the job. The resources available to the TRC in the conduct of its spectrum management functions must be enhanced. There are no alternatives and must be undertaken expeditiously. The source of funds needed to undertake this is not addressed here.

The Department of Frequency Management of the TRC is organized into the following divisions:

- Frequency Licensing and Assignment
- Frequency Planning and International Affairs
- Inspection
- Monitoring

This division of responsibility for the most part is both functional and logical.

The Inspection Division focuses on equipment type-approval and tracking licensee compliance with the terms of the license. The Monitoring Division presently exists only on paper. The Frequency Planning and International Affairs Division focuses on the ITU-R aspects of international affairs because of the limited resources (information and personnel) available to undertake effective domestic frequency planning. Under the terms of a recent Jordanian court decision and under the proposed amending law for telecommunications, managing broadcast spectrum will be under the TRC, a new area of responsibility. Because of the lack of legal clarity, information or human resource capabilities, some of the functions performed in the divisions have been limited.

In order for the TRC to be able to function as an effective national spectrum manager, the number of staff with spectrum management expertise and the resources available to the staff must be increased. Additional human resources will have to be made available to the TRC to expand its role in frequency planning, monitoring, and inspection. The source of this additional staff can be either direct hiring from outside the TRC or transferring experienced personnel from the military and national security community to work at the TRC, perhaps while still retaining their affiliation with the military. At least one, possibly two, staff members should be brought into the TRC to take responsibility for the frequency management functions related to broadcasting. In addition, many regulators use consultants to assist them by undertaking technical assistance projects, drafting regulatory text, and preparing for international telecommunications conferences.

Training programs should be implemented for all spectrum management staff, civilian and military alike, taking into account the training needs at various levels of professional development and responsibility. New TRC personnel and spectrum managers will need training in a range of basic engineering and management skills. Selected TRC personnel should be trained to better use computers, word processors, spreadsheets, databases and dedicated software to speed-up and facilitate many of the more repetitive spectrum management and administrative functions of the TRC. For the TRC to become an effective arm of the telecommunications regulatory environment in Jordan it must undertake detailed technical studies and analyses to support frequency allocations and licensing decisions. Computer-aided spectrum management tools should be procured and personnel trained in their use. The use of widely available databases and computer-based telecommunications system simulation models can be of immeasurable help in planning spectrum use, allocating it to specific services, and analyzing potential sources of interference before systems are designed and made operational.

Moreover, other resources – measurement equipment and appropriate computers – must be made available to TRC staff to enable them to perform their tasks efficiently and effectively. Consideration should be given to establishing a research laboratory to study some of the more basic elements of the technologies currently driving telecommunications today – signal processing, digital coding schemes, advanced modulation techniques and their application to evolving fixed and wireless high data rate services. There also need to be clearly defined messages regarding the mission and objectives of the agency so that staff can meet the requirements of their new responsibilities by effectively serving the private sector. Many of the current personnel assigned to spectrum management functions at the TRC, and at the Ministry for that matter, spent substantial parts of their careers in the JTC in the pre-liberalized era. These individuals have been subjected to a major cultural shift in terms of responsiveness and expectation on the part of those that they now serve. Human resource training focusing on job performance in an era of changing social and economic priorities could prove to be very beneficial in increasing staff responsiveness to private sector calls for advice or assistance.

X. INCREASING PUBLIC PARTICIPATION IN THE FREQUENCY MANAGEMENT PROCESS

A key component of an effective spectrum management process is the degree to which the regulator and the licensee understand the respective roles of each other in the process and how well they cooperate under various conditions. A logical and effective way to accomplish this is for the regulator to involve the public in a variety of spectrum-related activities through a public outreach process.

OPTIONS AVAILABLE FOR INCREASING PUBLIC PARTICIPATION IN THE FREQUENCY MANAGEMENT PROCESS:

Option 1: Information primarily limited to government officials only

Option 2: The TRC decides what information to make available to the public and establishes mechanisms for its release

Option 3: The TRC initiates public processes for the private sector to work together to decide frequency management issues confronting Jordan

Recommendation: Option 3

It is recommended that Option 3 be adopted as the approach to be followed in establishing a process to make information available to the public and soliciting public involvement in implementing sound spectrum management principles. There is considerable expertise and resources available in the private sector in Jordan that can be brought into spectrum management discussions. The TRC should consider forming advisory committees with industry for those services that have a high priority for Jordan in the near-term such as mobile cellular, third generation mobile, and wireless local loop. These committees can assist the TRC in the formulation of enforceable regulations for their service sector, provide technical and engineering assistance, and coordinate frequency selection. Involving affected industry participants in preparations for international telecommunications and spectrum meetings, such as ITU World Radiocommunication Conferences, and other bilateral and multilateral meetings provides an effective means to formulate a comprehensive Jordanian position at little direct cost to the government. Official representation at these conferences would still be provided by the Ministry and the TRC, but the development of Jordanian positions presented at such conferences should involve all parties – government and private sector alike – who are affected by the results of such meetings.

All pertinent information -- legal, technical, and regulatory -- relative to the operation of private radio-based telecommunications services and management of the spectrum in the Kingdom of Jordan should be made available to current and prospective licensees. To the extent that the information is not proprietary in nature, the information should be available to the public at large. Likewise, to the degree that it does not violate national security or impede the public welfare, information concerning government spectrum use should also be available to the public. This information should be published in readily available documents, and announcements describing how to obtain these documents should be distributed widely, including electronically.

In addition to the more formal pronouncements in such publications as the Official Gazette, the TRC should consider direct contact with advisory committees, trade associations, and professional organizations having a direct interest in the spectrum activities. Members of these groups often have detailed knowledge of the technical capabilities of various telecommunications systems and equipment. They have a good understanding of practical concerns associated with system operations and manufacturing. Due to the benefit that they derive from their involvement in standards development, frequency coordination, engineering capacity building and research, members of these groups often are willing to participate in spectrum management related activities, frequently at no cost to the government.

XI. CONCLUSION

This report provides a list of recommendations that should be undertaken by the Ministry of Post and Communications, the TRC and other relevant government agencies to implement effective and efficient spectrum management practices in the Kingdom of Jordan. These recommendations include :

- Developing a national frequency allocation table and a national register of frequencies for Jordan
- Establishing a consultative process for government agencies regarding frequency use
- Clearly defining the role of the military and civilian sectors in frequency monitoring
- Establishing open and transparent licensing rules
- Establishing a realistic spectrum fee structure
- Defining the respective roles of the Ministry and the TRC in international telecommunications negotiations
- Increasing the spectrum management staff and providing them with sufficient resources
- Increasing public participation in the frequency management process.

These recommendations are consistent with the general provisions of the 1995 Telecommunications Law. However, the proposed law to amend the 1995 Law will more clearly define the responsibilities and duties of the TRC to facilitate the implementation of these recommendations. The focus of this report has been on how best to implement the actions that have been proposed. It is assumed that the cost to implement the recommendations, while certainly a consideration, will not be a major deterrent to their successful completion.

Much of what has to be done to improve the management of the frequency spectrum is well known within the spectrum management environment in Jordan. There appears to be consensus among all the proponents – the Ministry, the regulator, operators, users, military and security interests - that the best interests of the Kingdom will be served by the implementation of a sound and efficient spectrum management scheme. The path to success is a commitment on the part of Jordanians at the highest levels of government and at the policy implementation level to exert their influence and initiative to make sure that it is accomplished.

ANNEX 1

His Excellency, Dr. Fawaz Hatim Zu'bi, Minister of Post and Communications

Mr. Mamoun Balqar, Director General, Telecommunications Regulatory Commission, Jordan

Eng. Moh'd Alwathiq Shaqrah, Director, Spectrum Management, Telecommunications Regulatory Commission, Jordan

Ms. Huda H. Izziddin, Director, Legal Affairs, Telecommunications Regulatory Commission, Jordan

Ms. Muna Hakooz, Director, Management Development and Training, Telecommunications Regulatory Commission, Jordan

Mr. Al- Tayeb Joma, Chief, Frequency Licensing and Assignment Division, Spectrum Management Department, Telecommunications Regulatory Commission, Jordan

Eng. Ahmad M. Al-Khawalden, Director, Telecommunications Policy Department, Ministry of Post and Communications

Mr. Yousef H. Murad, Deputy General Manager, Haider Murad and Sons Investment Group

Mr. Majid Al Shami, Marketing and Development Manager, Haider Murad and Sons Investment Group

Mr. Khamis Wadi, Strategy and Corporate Relation Officer, MobileCom

Mr. Samir Narmouq, Senior Systems Engineer, Communications Development Co.

Mr. Yazan Al-Mufti, Chairman, Jordan Radio Paging

Mr. Munther Z. Borgan, Manager, Regulatory Affairs Department, Jordan Telecom

Mr. Majed Saleh, Manager, RF Planning and Optimization, Fastlink

Mr. Haytham Fatayer, Manager, Systems Engineering, Fastlink

Mr. Roger Guichard, Telecommunications Project Manager, AMIR

Mr. Emile Cubeisy, AMIR Consultant to the Ministry