



Republic of Lebanon
Telecommunications
Regulatory Authority

EMERGENCY COMMUNICATIONS FRAMEWORK

Document for Consultation

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The Telecommunications Regulatory Authority, during its meeting held on ...

Pursuant to law No 431 dated 22/07/2002 (Telecommunications Law), in particular Part X, article 47

Pursuant to Decree No 14264 dated 4/03/2005 (Financial and administrative management of the Telecommunications Regulatory Authority),

Issued the following guidelines

1 Background and Legal Basis

Pursuant to Article 47 of the Telecommunications Law 431, stating that “upon the occurrence of events that affect national security, the Council of Ministers may instruct Service Providers to give full priority to the telecommunications needs of the security forces and the civil organizations operating under their control” and pursuant to the TRA mandate to issue the proper rules and regulations corresponding to the implementation of the Law (article 5-1 b), the TRA is consulting with the relevant stakeholder and the public at large on the framework that the telecom stakeholders should adopt in order to establish a clear strategy and a robust process for the use of emergency communications services during national disasters.

2 Role of Telecommunications Systems during National Emergencies

Telecommunications services are facilities that play a primordial role in the preparedness and the management of national disasters, they provide a platform of communications for the public and the authorities in charge of crisis management to be used in the rescue and relief operations. As natural and man-made disasters often occur without prior warning, preparedness as well as effective and timely response of all possible communication means during those emergencies are crucial to ensure the safety of the public.

Effective disaster and emergency management depends on the informed participation of all stakeholders. Of particular importance is the real time exchange of information and coordination during the response and relief operations. Telecommunications and broadcasting systems provide a platform of communications for both the public and the authorities and play a crucial role in the warning and relief phases of emergencies. There are several phases of disaster management, telecommunications systems are considered critical resources at all of these phases namely prevention, preparedness, response and recovery (Figure 1).

- **Prevention:** prevention is the avoidance of threats and the early monitoring and preparedness for an eventual disaster. Telecommunications and broadcasting play a role in the distribution of respective knowledge and the creation of early awareness for disaster prevention.

- **Preparedness:** preparedness is the alert state and the corresponding measures that both the public and the authorities should take at the wake of an impending disaster. Knowledge and awareness have proved to be one of the biggest mitigating factors of the devastating impact of small and big scale disasters. Telecommunications and broadcasting are the key means of communicating such alert to the public and the authorities, thus putting all national resources under a state of emergency. The role and the readiness of telecommunications at this stage should not be undermined, all stakeholders should coordinate and plan the use telecommunications means for alert and warning.
- **Response:** response is the set of operations undertaken by the relevant entities during the disaster. When disaster eventually strikes, coordination of relief work by relevant entities, as well as the international community is made easier, more efficient and timely due to the availability of communications links. The increasing complexity of administrative structures and the allocation of responsibilities among response operations and the increased panic calling among citizens require the availability of a variety of emergency communications services (mobile base stations, priority calling, etc...) and the robustness of those services.
- **Recovery:** recovery is the work undertaken by relief personnel, government authorities and citizens after the disaster has stricken. At this stage little restoration of damaged infrastructure has been achieved, and Emergency communications services still play a critical role in providing reliable communications to the government as well as the citizens, these may include alternative communications channels, priority calling etc... National and International coordination and the management of emergency services at this stage guarantee the limitation of the damages already incurred and a faster recovery of normal life.

Figure 1: Role of telecommunications during the different phases of national disaster management

Prevention	<p>Early Awareness Telecommunications as a tool to communicate awareness</p>
Preparedness	<p>Alert for impending disaster Telecommunications and information systems as a critical tool to disseminate warning and alert</p>
Response	<p>Response operation Telecommunications and information systems as a critical communication platform for government authorities, relief officers and citizens</p>
Recovery	<p>Post Disaster Telecommunications as a tool for restoring life back to normal</p>

3 Emergency Communications Framework

Real time communication is the backbone of all operations in emergency management whether at the prevention, preparedness or response phases. Telecommunications, especially in this era of convergence and next generation networks, open new possibilities and innovations in dealing with disasters. They can however, not fulfil their task properly if they are not fully integrated throughout the development and the implementation of the disaster and emergency management. And although telecommunications are organizational tools for the different phases of disaster management, they also need their own organization and readiness.

Thus arises the need for an overarching emergency communications strategy that would bring together both the telecommunications stakeholders and the emergency management stakeholders. The availability and applicability of the most appropriate means of communications in emergency situations is a result of close cooperation between those involved in the decision making such as humanitarian relief officers and NGOs, governmental agencies and the providers of telecommunications means. This framework consists of a committee, the Emergency Communications Committee (ECC) and an Emergency Communications Plan (ECP) which is the set of rules and regulations governing the management of telecommunications means prior to, during and post national emergency situations.

3.1 Emergency Communications Plan (ECP)

The Emergency Communications Plan (ECP) is a strategic plan with the corresponding set of rules and regulations that establishes a national and overarching vision for the utilization of telecommunications systems for emergency purposes and guide stakeholders on their specific roles and responsibilities. The TRA proposes having three main axes in the development of the ECP:

a) Readiness of telecommunications systems for emergencies:

- Technical plan for the use of telecommunications systems and services for alerting public prior to occurrence of disasters;
- Detailed recommendations to enhance the robustness and reliability of telecommunications networks and services (backup power and network element supplies, redundancies, proper protection of equipment, etc...) with corresponding timeframes and responsibilities allocation; and
- Best practice guidelines for maintaining network security and integrity.

b) Emergency Communications Services:

- Description of the different emergency communications services needed during emergency situations
- Description of the role of each telecom provider in case of disaster;

- Description of the different damage levels that could occur and mapping of an action plan for each level, including the reallocation of resources and responsibilities;
- Description of the recovery procedures with allocation of responsibilities and action plan; and
- Description of the telecommunications means that will be used by each telecommunications user.

c) Recovery of Emergency Communications Systems:

- Procedures and guidelines for the restoration of the telecommunications infrastructure and services
- Review and assessment procedures for the performance of the emergency services.
- Recommendation for future enhancement of emergency management procedures and technical plans.

3.2 Emergency Communications Committee (ECC)

The Emergency Communications Committee provides a platform of communications between the entities who need to use the communications means for response/relief and the entities that provide those communications means (whether for their own use or for the use of other entities). Exchange of requirements, specifications and expertise on the required emergency services is critical for the readiness of the telecommunications systems prior to any disaster or emergency situation. This exchange and platform will also lay the ground for the processes, responsibility allocation and the plan of action that should be adopted during emergencies. Emergency communications management thus require the coordination of all stakeholders for preparing the telecommunications systems and for coordination during national emergencies.

The objective of the Emergency Communications Committee is to:

- Improve the ability of emergency relief and government entities to maintain reliable communication during national disaster.
- Ensure interoperable nationwide emergency communication systems
- Ensure the continuity of essential functions in any national security emergency
- Ensure that the appropriate resources and human expertise are deployed effectively and efficiently during national disasters
- Improve the ability of service providers and stakeholders to provide the necessary early warning systems.
- Restore services and infrastructure at the earliest possible

3.3 Role of Different Stakeholders

3.3.1 Role of the ECC

The ECC will aim at drafting an Emergency Communications Plan (ECP) that would address the procedural and technical issues of managing communications under emergencies. It should ensure the development of all needed regulations and documents of the ECP and its implementation by all stakeholders. Along and prior to the drafting of the ECP, the Committee should fulfil the following responsibilities:

- Assess the different disaster scenarios and match the communications needs with the available resources.
- Assess the needs and capabilities of the response personnel, relief officers, NGOs and other critical users of communications means during national emergencies.
- Conduct due diligence on the available human and capital resources, to be used by Communications Users and Operators and prepare for their readiness during emergencies.
- Ensure that telecommunications operators (private and public) invest in preventive measures that will ensure maximum robustness and preparedness of the telecom networks during emergencies.
- Ensure that telecommunications operators (private and public) develop detailed emergency plans for management of resources under their responsibility.
- Develop a common and easily accessible database of available human resources and network equipment with harmonized formats. Conduct annual reviews of the ECP
- Simulate and train relief officers and representatives on the agreed processes.
- Organize annual symposium on telecommunications availability during emergency.
- Coordinate with international organizations and experts.
- Update the communications plan according to development and innovations in emergency telecommunications systems.
- Disseminate information among the Public and the Governmental Authorities on the availability of telecom services and equipments for use during emergencies.
- Organize and conduct awareness campaigns on the use of communications systems during disasters.
- Make use of the ITU starring effort in disaster management, especially the Tampere convention which facilitates the rapid deployment and effective use of telecommunications resources during emergencies.
- Review the international agreements with the neighboring countries for coordination of information, equipment and expertise for disaster management and mitigation
- Decrease custom duties and restrictions in order to allow humanitarian assistance and equipment from other countries during times of disasters.

- Define entities eligible for priority calling on both mobile and fixed networks, these might include: different government agencies, civil defense, ISF, Red Cross, Army, financial institutions, etc...
- Encourage sharing of infrastructure among relief officers from different government administrations and agencies

3.3.2 Role of the TRA

The TRA is the Telecommunications Regulator, it strives through its issued regulations, decisions and licenses to maintain and ensure continuity of communications for the Public. To that end the TRA ensures the safety and business continuity of the national communications infrastructure, it mitigates the impact of disasters and ensures the recovery of telecommunications networks. As a statutory controller and regulator of the telecom sector, the TRA will work on developing the required guidelines and regulations for the appropriate preparedness and response of the telecom operators. In addition, the TRA and as part of the ECC, will ensure that telecom operators abide by the rules and regulations of the ECC and ensure that regulations are issued and amended according to the requirement of the emergency communications plan. In more details the TRA will take on the following actions with regard to emergency communications:

- Develop and Issue Business Continuity Guidelines for Telecom operators
- Amend regulations and issue regulatory tool to ensure that regulatory barriers that are a hurdle for the utilization of national resources are removed under emergency situation
- Revise regulations and licenses for compliance with the emergency communications plan rules and regulations.
- Ensure that all telecom operators abide by the rules and regulations of the ECC through TRA regulation, guidelines and Decisions.
- Ensure the restoration of the telecommunications network to their normal operations after the end of the emergency situation.
- Encourage the development of broadband services, in a way that networks and online services play an important role in facilitating communications among citizens and help relief operations.
- Follow up ITU-R activities and try to benefit from the ITU's assistance
- Develop technical rules to promote reliable, interoperable public safety radio communications

3.3.3 Role of the Telecommunications Operators

Public Telecommunications operators are the biggest providers of telecommunications services during normal or emergency situations. Therefore it lays upon the responsibility of those public or private operators to develop in accordance with the guidelines of the ECC, a plan of action for managing emergency situations. Therefore telecom operators should undertake the following actions:

- Develop a well documented emergency action plan for all business and IT functions. This action plan should be reviewed by the TRA and comply with its recommendations as highlighted in the second part of this document.
- Develop preventive measures to protect essential infrastructure.
- Perform periodic, well documented and effective tests on the procedures and equipments used during emergencies to be audited by the ECC, monitored by the TRA.
- Develop a clear management structure of the emergency action plan.
- Assign a representative from each operator before the ECC, expected to be responsible for, or involved in, the management of the operator's emergency and business continuity.
- Ensure the implementation of the failure notification procedures as detailed in the quality of service regulation issued by the TRA.
- Sign Memoranda of Understanding between each other (under the supervision of the TRA) for the mutual coordination during emergencies.

Annex –Technical Note on Emergency Communications Services

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1 Introduction

This second part of the consultation covers the technical use of the different telecommunications technologies and services during or prior to an emergency situation. We believe that advances in technologies have made networks and services an essential part of people's daily life. However, and most importantly, it is more and more serving as a primary tool during life threatening situations. We believe that stakeholders should ensure that all means of communications are utilized to the maximum possible during emergencies. There is therefore a need for prior planning in terms of increasing the robustness of the current networks and exploring the potential needs for additional services, networks and equipments.

The technical note presented hereby is only a snapshot of the potential use of telecommunications for emergency purposes; the ECC should issue the required regulations, guidelines or decisions governing the preparedness, response and relief procedures required from telecommunications stakeholders and control the implementation of these regulatory tools. Public and Private Telecommunications operators should collaborate in order to come up with an extensive and detailed plan for using each network type and service.

2 Preparedness of Telecommunications systems for emergencies

Robustness and preparedness of the telecommunications systems are keys for their effective utilization during disaster. In many instances the mobile, fixed or Internet networks failures and congestions can be prevented with prior planning, investment and testing. Public and private telecommunications operators should implement the following measures in order to increase the robustness and prevent failures of their networks during emergencies.

2.1 Physical Infrastructure Safety Requirements

Telecom operators whether private or public should follow certain norms and standards in building their physical infrastructure. The following standards help increase the robustness and flexibility of the networks and maintain the safety of the primary network elements and infrastructure:

- Towers and equipments should be installed at adequate heights in areas prone to high waves and floods.
- Wherever reasonable, essential equipment should not be concentrated in one building.
- All buildings, towers and equipment sites should be equipped with adequate fire detection and extinguishing systems.
- All buildings, towers and equipment sites should follow the anti earthquake Standards.
- As practical as possible, communication cables should be buried underground in ducts to reduce their vulnerability; (it is also advisable to have all disaster management centers connected through underground cables).

2.2 Redundancy Requirements

Experience in Lebanon and worldwide proved that redundancy in traffic management is essential to the integrity and robustness of the networks. Sufficient redundancy prevents total network failure due to a single point of failure. The following requirements are high level recommendations for mobile, fixed and data operators. An in depth study and redundancy customization should be planned for each specific network.

Mobile operators should ensure that transmission links between main Network Elements and switching equipment are redundant through two distinct geographical paths. As for fixed and data networks, the operators should provide for the following:

- Alternative telecommunications links (such as SDH ring on optical fiber) between primary switches
- Connection of main switches and Network Elements through mesh and ring transmission networks
- Redundant microwave links, aerial or underground, switches, etc... should be secured in alternative locations.
- Alternative and secure International gateways and International Paths

2.3 Backup Requirements

Planning for backups of network elements, batteries and fuel can prevent total failures from minor equipment damage. Mobile, fixed and data operators should ensure that there is sufficient fuel, power and essential equipment backups as follows:

- Provide an uninterruptible power supply (UPS) along with sufficient External Batteries to ensure service is not interrupted to all key equipment in the event of a main power supply failure
- Ensure supply of fuel for back-up generators
- Consider alternate means of power like Solar power systems
- Analyze the needs in spare parts and ensure availability of spares on site for emergency
- Ensure enough spares in air conditioning equipment to serve the peak hours load
- Store backup spares and fuel storage in an accessible but secure area

2.4 Overload Prevention Measures

Emergency situation often triggers overload of the network due to high traffic, anxiety calls and repeated call attempts. For instance a fixed PSTN network allows maximum 10% of the subscribers to call and receive calls at the same time. However during emergencies more than 10% of the subscribers tend to make simultaneous calls resulting in blockage or congestion of the network.

Therefore operators should work on avoiding congestion and providing an effective solution to prevent the crash of the network due to anxiety calls and develop clear congestion management process reviewed, tested and approved by the TRA. Mobile and Fixed operators can implement stringent traffic management measures to prevent congestion, such as:

- Develop an effective management plan to ensure connectivity between public and users of telecommunications during emergencies (Red cross, civil defense and police states)
- Traffic on main switches should be constantly monitored through an effective network management system which should cover fault, configuration, performance, security and traffic management.
- Traffic should be promptly switched from overloaded switches to backup switches or to different routes through the Call Gaping and Traffic management and Policing systems
- Operators should plan for extra capacity on their network in order to cater for high traffic generated during emergencies
- An integrated plan between fixed and mobile operators to allow connectivity for the maximum number of subscribers in case of disasters

3 Emergency Services

3.1 Warning and Alert

The ECC should work on the establishment of a resilient and efficient system for disaster early warning and dissemination of information to the Public. Early warning systems may use in parallel more than one of the many available communications means, which may be either media like FM broadcasting, satellite, cable operators and terrestrial television, or telecommunications means like SMS, cell broadcasting and the internet through social networking sites.

Special consideration should be given to people with disabilities who have special needs in terms of both reception and generation of emergency messages. The ECC should leverage the advancement in technologies and innovations in order to devise solutions for the emergency communication for people with disabilities.

3.2 Mobile Communications

3.2.1 Emergency Switching and Broadcasting Equipment

In case of damage to mobile networks, mobile operators should ensure according to the level of the damage, alternative communications means to the public or to the relief personnel. There are two types of alternative mobile systems that should be planned for:

- a. Standalone Outdoor Mobile base stations
- b. Emergency MSC/BSC/HLR

The utilization of one or all systems depends on the level of damage to the mobile network and should be used according to a prioritization plan developed by the ECC.

a. Standalone Outdoor Mobile Base Station

Mobile base stations are a fast response to damaged mobile networks; they are deployed in areas where existing base stations are damaged. Mobile operators should ensure the availability of a few mobile base stations and plan for a prioritized deployment in case the network is damaged in several areas.

Mobile Operators should purchase and equip several vans or trucks hosting each one a mobile base station and test them periodically in order to be ready for use in case of emergency. Moreover operators should ensure the proper training of several technicians able to install and run the mobile base stations. Enough mobile base stations should be provisioned for in order to reach the damaged based stations within 3 hours. TRA proposes the following recommendation for the mobile base station:

- The van should accommodate for a mobile base station equipped with a number of TRX (8, 12).
- The van should be equipped with both microwave and VSAT transmission links equipment, telescopic masts. Transmission equipment will connect the Base Station to the main or to the compact emergency MSC/BSC/HLR. VSAT transmission should be used whenever microwave point-to-point connection is unpractical due to physical or technical constraints.
- A redundant portable ready to assemble microwave tower could also be used for transmission if feasible
- The van/truck could have fax, voice, and telephone etc...
- The van/truck could have provision for carrying logistics such as food, water, shelter and fuel inside the van/truck
- The van/truck should have power supply such as external batteries racks and a mobile Electrical Generator
- The van/truck should be air conditioned

b. Emergency MSC/ BSC/HLR

Damages to the Main MSCs or BSCs or HLRs could result in total failures of the mobile network, in which case a mobile base station is useless. Therefore operators should plan for a back up of at least one compact emergency MSC/BSC/HLR. This emergency equipment should be stored in safe and secure bunkers (resistant to earthquakes, floods and tsunamis) and deployed in case of emergencies. These tools should also be equipped with VSAT and microwave transmission links in order to ensure backhaul connectivity with the mobile base stations.

3.2.2 SMS and Cell Broadcasting

Mobile networks are still the most reliable and efficient means of relaying alert messages to the public. Several platforms can be used for informing the public about impending emergencies, the most common ones are SMS and cell broadcasting.

Sending bulk SMS to the public has many disadvantages among which:

- uses extensive network resources,
- is vulnerable to failure due to traffic overload,

- can be delayed significantly,
- can cause network and Radio Interface congestion and block voice calls,
- can be easily spoofed, and
- can't target only limited geographical area.

In contrast, cell Broadcast is an efficient mobile technology used to broadcast messages to all mobile handsets and similar devices within a designated geographical area (from a single cell to the entire network); it offers the capability of reaching network subscribers on time and without using extra network capacity. In addition, cell broadcasting technology is cheaper than SMS and includes some inherent features required during emergencies such as location based capabilities. VAS operators should be required to stop all SMS bulk messages during emergencies as this might cause additional congestion and blockage of the network.

Commercial Mobile Alert System (CMAS) is warning and alert system used by the US government for officials to send alert messages to mobile subscribers within a specific area. The CMAS is based on cell broadcasting and the Public Warning System and is applicable to all generations of mobile technologies (GSM, UMTS, and LTE).¹

We recommend that the ECC with the mobile operators develop a plan for warning and alerting people in case of disasters that is based on cell broadcasting technology, while keeping up with new solutions and innovation in emergency warning systems (such as solutions for people with disabilities, smart phones applications, alert messages over internet, etc...).

3.2.3 Mobile Emergency Services

Emergency numbers are often considered reliable means for the public to inform the Police or the Internal Security Forces whenever emergency assistance is required. In Lebanon, 999 and 119 are the two three digit numbers available for the public to contact the operation room of the Internal Security Forces. Several measures should be taken by relevant stakeholders in order to improve the effectiveness of dealing with emergency calls:

- The TRA should ensure that the support of emergency services is implemented by wireless operators for mobile devices for voice communications on GSM, UMTS/HSPA+ or LTE networks.
- Mobile operators should coordinate with the Internal Security Forces for the seamless provision of the caller ID and the location of the cell sites or base station transmitting the call. From the Government side, more awareness on the availability and use of these numbers is needed. More importantly, the Internal Security Forces should devise effective procedures for responding to these emergency calls.
- On another note, advances in technologies and standardization are always a key driver for the development of new, more effective mobile emergency services. The ECC should always monitor such advancement and update its recommendations and requirements accordingly. For instance the 3GPP is currently working on a wireless

¹ The Cell Broadcast Service (CBS) capabilities are defined in 3GPP TS 23.041 and the Public Warning System (PWS) are defined in 3GPP TS 22.268.

device standard which would accommodate an end to end emergency non-voice communications from citizens to authority called NOVES².

3.2.4 Mobile Call Prioritization

Often, in times of crisis, key authorities fail to communicate with each other or with relief officers due to damage, congestion or failure of the fixed and mobile network. This problem can be solved by providing those people with priority calling capabilities and configuring the network to recognize priority traffic³.

Mobile call prioritization only provides a higher probability of call completion, it does not pre-empt calls in progress and the calls have to be queued and wait for bandwidth availability. The queuing priority of the priority call user should be defined by the ECC and the mobile operators. Mobile priority calls do not automatically get priority on landline networks; the user must have access to priority calls on both the mobile and fixed networks. Mobile priority calling can be programmed on a user basis or group basis.

The priority aspect should be applicable to the different phases of mobile calls such as signaling, routing and control⁴. The priority mechanism should include protocols on network interconnection and emergency signals transmitted across networks (between a circuit-switched network and an NGN, etc.).

3.3 Public Switch Telephone Network (PSTN)

3.3.1 Handsets

Fixed telephone handsets at the users' premises are powered from local Exchange batteries. If power at the user's premises is lost, the Fixed phone will still work as long as the copper lines are not damaged. However, this does not apply to cordless phones, which will have a home base station powered by the domestic power supply. Therefore it is recommended that all emergency relief centres and every home be equipped with at least one non cordless handset to be used under emergencies.

² 3GPP has conducted a recent study on non-voice emergency services and is targeting the standardization of NOVES to be completed for 3GPP Rel-11, also The 3GPP technical specification TS 22.101 defines the requirements for voice based emergency services and 3GPP technical specification TS 23.167 defines the support of emergency calls in the LTE environment (via the IP Multimedia Subsystem (IMS)).

³ The 3GPP Technical Specification 22.06732 defines the mobile prioritization service requirements and 3GPP Technical Specification 23.06733 defines the mobile prioritization architecture. Although prioritization of IP based multimedia services is not widely used, the 3GPP has developed the technical specification 22.153 defining the requirement for the support of multimedia priority services in 3GPP networks.

⁴ as per ITU-T Recommendation E.107

3.3.2 Fixed Call prioritization

As with the mobile networks, congested fixed networks can often impede critical communications between key authorities or relief officers. Therefore call prioritization in fixed networks is also an important aspect of emergency communications management; however call prioritization in fixed network is more efficient than prioritization on mobile networks. Unlike prioritization in mobile networks, a dedicated end to end communications link can be provided for priority calls in fixed networks.

Priority traffic can be identified by the signalling protocol which is different from the normal traffic. The PSTN network design does not support ubiquitous signalling request for priority access, the dial tone comes on a demand basis from a limited selection of priority ports with predefined location and number. Once traffic is identified, telecommunications network policy rules or methods should be applied to provide an enhanced priority treatment to emergency traffic. The essential network features for the successful call prioritizations are:

- priority dial tone;
- priority call setup, including priority queuing schemes; and
- Exemption from restrictive management controls, such as call gapping.

The ECC should at first decide on the key people/ centres having the need for priority calling, and then in coordination with the fixed and mobile operators devise a technical and operational plan for the recognition and implementation of call prioritization.

3.4 Amateur Radio Services

Amateur Radio Service presents a unique asset for communications under the extreme conditions encountered in emergencies. The platform has a widely spread radio station network and provides a network which is independent from any other. Radio Amateurs are also an important human resource during relief operations, whether as volunteers or as emergency professionals.

There are three types of radio networks that can be used during emergencies:

- **Short range:** provides communications at the site of a disaster and with the surrounding areas. They can include fixed, mobile and portable equipment. They use frequencies in the VHF and UHF spectrum.
- **Medium Range:** provides communication from the site of an event to the centre of operations outside the affected area within the distance of 10-500 km.
- **Long Range:** provides communications beyond 500 km, it can link remote areas with main cities. It also serves as backup connectivity between different countries.

The Radio amateur association of Lebanon should develop in coordination with the ECC a plan for the utilization of the human and capital resources of radio amateurs during emergencies including the needed type of network and the process of coordination.

3.5 Broadcasting

Often Broadcasting (FM Radio Broadcasting and TV) is underestimated in time of emergencies although it can reach a large section of the public with information and advice. Dissemination of information, alert or advice can be achieved in a very effective and efficient manner through TV and Radio broadcasting. Such dissemination of information is best done through TV in cases where electricity is available most of the time and people have access to TV stations. Radio broadcasting is even more powerful especially in times of serious disaster since radios can be operated with only small portable batteries and held in any position and place.

For this reason, emergency kits for households and individuals often include a handheld radio powered by batteries. The ECC along with radio broadcasters should work on an awareness campaign for the mass ownership and use of battery operated radios during emergencies.

3.6 Satellite Terminals and Satellite Phones

Satellite phones are often a very reliable means of communications in time of crisis. Given that satellite phones do not rely on national networks that could be damaged by disaster, they should be considered as essential facilities used by key people responsible for relief and rescue operations.

3.6.1 Inmarsat:

Satellite systems differ in the size of equipment and coverage required. Inmarsat is the most widely used system; it consists of geostationary satellites, Land Earth Stations (LES) and Mobile terminals. The communication links consist of a connection between the user's terminal and one satellite, a link from the satellite to a LES, and the connections from there into a terrestrial public network. All Inmarsat terminals need to have a line of sight with the satellite and cannot be used while in motion. For the use of emergency telecommunications, various types of Inmarsat standards are available; the most common ones are Standard M and mini-M, GAN and BGAN. The choice between these standards depends on the size of the equipment, the coverage area and the data speed required.

3.6.2 Satellite Phones:

Services of the Global Mobile Personal Communication Systems (GMPCS) allow the use of equipment that is very similar to terrestrial cellular telephones. They are particularly suitable for situations where a high degree of mobility is required, and while they still need a line-of-sight connection to the satellite or satellites, their mostly Omni-directional antennas need not be aligned accurately. Different systems offer specific advantages but also have specific restrictions in respect to their applications in emergency telecommunications.

- Thuraya
- Iridium
- Globalstar

Thuraya and other satellite terminals are not yet licensed to operate and serve customers in Lebanon. However key authorities should own a satellite phone for backup purposes to be used during emergencies, therefore appropriate regulations should be developed to remove barriers on using those services in case of disasters.

3.7 Very Small Aperture Terminal (VSAT) Networks

VSAT systems are used for data transfer and Internet access by companies, individual and Government authorities. In case landline international communications or transmissions between major centres of relief are down, VSAT can be used as an alternative means of communications. This will make essential communications independent of the terrestrial infrastructure and congestion of the PSTN.

VSAT are mostly designed for fixed installation, they are available for disaster recovery purposes; however they have their own safety requirements such as:

- The terminal equipment needs to be protected from physical damage
- The dish in particular should be protected during disasters, while still maintaining its directivity to the satellite.
- VSAT systems should have an independent source of power

3.8 The Internet

Access to the Internet permits continuous access to and generation of updates on disaster information. The integration of wireless (including satellite-based) technologies and high speed wired connections will provide disaster managers with the needed infrastructure to exchange information and effectively manage the crisis. The Internet can contribute in disaster relief by:

- Sending and receiving email and using web based directories to communicate with parties that provide assistance
- Tracking news from a variety of sources (government, academic, commercial)
- Find up-to-date geopolitical info, geographical maps, travel warnings, bulletins etc...
- Accessing medical database to gather info
- Maintain an awareness of the large picture and how different viewpoints are portraying the disaster
- Social communication networks that keep people connected during disasters
- Voice communications in case of congestion or failures in the public mobile and fixed networks

3.9 Private Networks

3.9.1 Land Mobile Radio Networks

During a disaster the LMR system can offer:

- Group calls allowing communication between a calling party and one or several called parties belonging to the same group
- Emergency calls with automatic call set-up and pre-emptive calls

- Very short set up times
- Simultaneous voice and data usage
- Mobility
- High robustness and ease of use in harsh urban, wide areas, mountainous environments
- Different sizes of coverage from one cell of a few meters to large countrywide areas
- Quick set up of the network

It is very important to take into consideration measures to enable interconnection and interoperability between land mobile systems such as public safety, local government and private mobile units likely to be used in disasters. In order to optimize such inter-operability, the following measures should be taken:

- Use the same technology in the same frequency band
- Use of the same equipment in direct mode on the same frequency
- Use of multi band equipment in the same technology covering several radio frequency bands

Otherwise, interconnection between different networks can be achieved through microwave links.

3.9.2 Maritime Radio Services

The Maritime Radio Service has applications in disaster communications, it uses the Global Maritime Distress and Safety System (GMDSS), this service is only used by ships and Marine Rescue centres for the purpose of safety of life at sea.

For short-range communications, typically within 20 km, the VHF band is used. In an emergency, it is recommended to first call the vessel on the specific channel frequency before moving to another channel to establish communication such as satellite or coastal radio stations.

3.9.3 Aeronautical Radio Services

The Aeronautical radio service also uses the Global Maritime Distress and Safety System (GMDSS); it has frequency bands allocated for communications with and among aircraft. Aeronautical communications uses the 118-136 MHz VHF frequencies, additional bands are allocated for Radio Navigation equipment used during flight. TRA should protect this band from interference especially from FM broadcasting stations.

3.9.4 Location Services

Radio Navigation systems have a complementary role in disaster communications, the system that is most commonly used is the Global Positioning System (GPS). Location services help facilitate the searching process; relief personnel, goods, supplies, equipment and the vehicles should be equipped with position locating equipment. However a special consideration should be given to the vulnerability of the GPS due to targeted interference.

3.10 The Spectrum management role in public safety

3.10.1 Spectrum Harmonization

The global harmonization of spectrum for public safety is very important, especially during response and relief operations, it enable the exchange of telecom equipment between neighbouring countries during and after a disaster. TRA role is to ensure harmonization with neighbouring countries in spectrum used for emergency over different bands.

3.10.2 UHF Band allocations and public safety

The TRA should allocate part of the UHF band for public safety and emergency use by broadband services. Broadband public safety plan is acquired in some countries and it is be very effective during response and relief cases.

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Figure A.1: Summary of Telecommunications Emergency Services and the corresponding stakeholders during the first three phases of Emergency Management:

Prevention: Early Awareness	Preparedness: Onset of a Disaster	Response: During a Disaster
<p>Emergency Services :</p> <ul style="list-style-type: none"> -Satellite radio navigation -Satellite remote monitoring -SMS awareness services -Broadcasting awareness programs -Web Content and Social networks 	<p>Emergency Services :</p> <ul style="list-style-type: none"> -Cell Broadcasting -Broadcasting programs -Web Content and Social networks -Safety Services (Maritime, Aeronautical) -Satellite services -Priority Calls 	<p>Emergency Services :</p> <ul style="list-style-type: none"> -Cell Broadcasting -Broadcasting programs -Mobile BTS and equipment -Priority Calls -Satellite Services -Amateur services -PMR services -Web Content and Social networks -Safety Services (Maritime, Aeronautical)
<p>Stakeholders :</p> <ul style="list-style-type: none"> -MOT -MOI -MOH -TRA -Telcos -Broadcasters -Research Org -NGOs -Satellite Operators 	<p>Stakeholders :</p> <ul style="list-style-type: none"> -MOT -MOI -MOH -MOD -MOINT -MoPW -TRA -Telcos -Broadcasters -Amateur Radio society -NGOs -Satellite Operators -Airport 	<p>Stakeholders :</p> <ul style="list-style-type: none"> -MOT -MOI -MOH -MOD -MOINT -MoPW -TRA -Telcos -Broadcasters -Amateur Radio society -NGOs -Satellite Operators -Airport -customs