Sudan National Emergency Telecommunications Plan (NETP)

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Introduction

This National Emergency Telecommunication Plan (NETP) sets out the strategy to enable and ensure communications availability during the mitigation, preparedness, response, and recovery phases of disaster risk management (DRM). This is achieved by promoting coordination across all levels of government, between public and private organizations, and within communities at risk.

This NETP considers the definition of policies, the organizational structure and the methods of coordination between the different actors during all four phases of disaster management in Sudan. It also establishes the principles that guide the allocation of resources and responsibilities for the achievement of the proposed objectives, including the expected telecommunications and information and communication technologies (telecom/ICT) response times, tasks and processes.

The NETP has a transversal nature given the importance of telecom/ICTs during disaster management. Therefore, it must be carried out under the leadership of the national government, must be an integral part of the national disaster risk management plan, and must be based on the nationwide organizational structure and governance model established for DRM.

The following sections address these points and propose a series of action items that should be completed in order to enhance and update the telecom/ICT plan for DRM in Sudan.

Objective and scope of the NETP

This NETP seeks to describe the relevant elements of telecom/ICT use for DRM in Sudan during its four phases: mitigation, preparedness, response and recovery. Particularly, the purpose of this plan is to guide the actions of the telecom/ICT sector to provide support for and improve coordination between the different agents involved in DRM in the country. This NETP also seeks to strengthen telecom/ICTs in the country so that the relevant actors in this sector can appropriately support efforts to mitigate disaster risk, as well as to prepare, respond and recover in the face of future emergencies.

This NETP is intended for all persons and institutions involved in DRM in Sudan, including authorities at all levels of government, the private sector, and other actors in the telecom/ICT and emergency aid sectors.

Structure of the NETP

This document is divided in nineteen chapters. Chapters ١ through ٤ describe the existing institutional and normative framework for emergency telecom/ICTs in Sudan. Chapters ٥ through ١٩ refer to the main components that should be considered in each of the four phases of DRM, and delineate some recommendations and key action items to be carried out in order to continue developing and updating an effective NETP. Chapters ٥ through ٩, in particular, correspond to the mitigation phase of DRM and deal with topics such as the country's vulnerability to natural hazards, the current state of the telecom/ICT sector, and the establishment of a specific telecom/ICT regulatory framework for DRM. Chapters ١٠ through ١٤ correspond to the preparedness phase of DRM and include topics regarding telecom/ICT standard operating procedures, contingency planning, and early warning systems. The response phase of DRM is covered in chapters ١٥ through ١٧ which describe topics such as communication and coordination during emergency response, collection and analysis of information, and emergency awareness and

updates. Finally, the recovery phase for DRM is addressed in chapters ١٨ and ١٩ which present topics such as the assessment of damage of the telecom/ICT infrastructure, and the reconstruction and follow up activities to be carried out after the disaster.

Summary of Action Items

The following Action Items should be undertaken by the Sudan government:

Action Item ١

Develop a comprehensive legal, policy and institutional framework for disaster risk management in Sudan. This framework should define a single institution that leads and coordinates the disaster risk management system in Sudan.

Action Item ٢

Review and update the General National Emergency Plan for the Telecommunications Sector (GNEPTS) with the proposed National Emergency Telecommunications Plan presented in this document. This NETP should combine all policy instruments, manuals and standard operating procedures developed through the years and released in different documents by the government. It should also include all the roles and responsibilities of the different stakeholders involved in the Sudan's disaster risk management process, including public and private organizations, humanitarian entities, NGOs, among others.

Action Item ٣

The National Council of Civil Defence (NCCD), jointly with relevant agencies involved in assessing and monitoring natural hazards in Sudan, should maintain updated vulnerability maps for the different types of hazards in the NETP, and especially for droughts, floods and epidemics. This information must be described at the municipal level and should be available to telecom/ICT operators. Also, it should include information on the most vulnerable communities, specifying the type of hazards they are prone to, as well as the telecom/ICT resources available in each of them.

Action Item ٤
The Telecommunication and Post Regulatory Authority shall develop and update periodically the network inventory and coverage of mobile and fixed, terrestrial and satellite telecom/ICT network and service providers, and radio and television broadcasting service providers. It should include also in the inventory other types of telecom/ICT networks relevant for disaster relief such as radio-amateur and first responders' networks.

Action Item ٥

All telecom/ICT network and service operators, terrestrial and satellite, mobile and fixed, and radio and television broadcasting providers, as well as government agencies responsible of telecom/ICT networks, e.g., first responders, must develop (or update) and present for approval by the Telecommunication and Post Regulatory Authority a vulnerability analysis of the critical infrastructure of their networks according

to the different types of hazards to which Sudan is prone to. This vulnerability analysis should also include the coverage maps of telecom/ICT networks.

Action Item ٦

The Telecommunication and Post Regulatory Authority should be held accountable for establishing specific regulations for the telecom/ICT sector on disaster risk management in the country. These regulations should be based on its functions granted by legislation, encouraging telecom/ICT network and service providers to actively participate in each one of the phases of disaster management.

Action Item ٧

The Telecommunication and Post Regulatory Authority should carry out the corresponding analysis and studies to decide which model (i. Public safety exclusive dedicated network, ii. Shared public safety and commercial network or iii. Commercial network) would fit Sudan's needs for broadband PPDR in the ٦٩٤-٧٩١ MHz frequency range.

Action Item ٨

١. *Sudan must initiate the process to be bound by the Tampere Convention. To this end, it is recommended that both the National Council of Civil Defence, the Ministry of Foreign Affairs, the Customs Authority, and the Telecommunication and Post Regulatory Authority initiate the necessary steps for the ratification of the Convention. Subsequently, the necessary legislative and regulatory adjustments for the effective implementation of the Convention must be made by the relevant authorities.*

٢. *The Telecommunication and Post Regulatory Authority*

٣. *must establish specific regulations for the implementation of the Tampere Convention.*

٤. *Coordination and collaboration with different international agencies such as the ETC (Emergency Telecommunications Cluster) and the ITU (International Telecommunications Union) on issues of preparedness and response to eventual disasters or emergencies is imperative. This will avoid duplication of efforts and overlapping of work.*

Action Item ٩

١. *Develop Standard Operating Procedures for emergency and disaster response related to communications within and between agencies and technical means for communication (voice/data), including interoperability.*

٢. *Define the government entities and the contact points (key decision makers) within these entities that must maintain communications during a disaster or emergency.*

٣. *Maintain an updated database with these focal points of every agency involved in disaster risk management.*

٤. *Analyse the possible interoperability between the equipment (wireless) and the communication networks of the government entities.*

٥. *Establish a set of radio frequencies that can be used for the communications of the contact points (key decision makers) compatible with the radiocommunication equipment being used.*

٦. *Establish alternative methods of communications if necessary, for example, through existing communication operators.*

٧. *Develop connectivity plans for the satellite equipment available to be used during a response phase as well as procedures for their use as primary or alternative communications between relevant stakeholders involved in disaster response.*

Action Item ١٠

Public and private telecom/ICT networks and service providers, including terrestrial and satellite, whether mobile, fixed or broadcasting, must individually keep their contingency plans to respond to an emergency updated. Measures such as network redundancy, mobile base stations, secondary energy sources, satellite terminals stored and ready to use, among others, must be considered and included in the network design, mainly in those regions and communities at risk according to the hazard maps and risk assessments, and considering the network vulnerability analysis.

Action Item ١١

Sudan must develop surveillance and monitoring systems for probable threats prior to the occurrence of disasters and/or emergencies, e.g., through the Remote Sensing Authority (RSA). With the cooperation of the telecom/ICT service providers, solutions to warn and alert the public must be implemented, i.e., through cell broadcast technology or broadcasting networks (radio and TV).

The Common Alerting Protocol (CAP) is one of the most efficient mechanisms to alert the population of a hazard and to provide information and communicate relevant facts to the population at risk.

Action Item ١٢

Telecommunications trainings and drills for emergencies should be regularly carried out in order to improve emergency responders' capacity with communications equipment, as well as to enhance their ability to execute policies, plans and procedures governing the use of communications networks. The telecom/ICT sector should actively participate in this drills and exercises, and develop and carry out their own, to effectively implement the NETP.

Action Item ١٣

Sudan's authorities, working together with network operators and telecom/ICT service providers, should develop mechanisms to understand the accessibility requirements needed to guarantee that vital digital communication technologies are inclusive and therefore accessible to all persons, including people with disabilities, the elderly, women and girls, as well as refugees and immigrants. This should be linked to the early warning systems to be developed in the country so that people receive and understand the alerts for early actions to take place.

Action Item ١٤

Consider planning for the development of emergency operations centres or communication and coordination command posts to provide critical communications to users in each organization involved

during the response phase of a disaster. These positions can be fixed or mobile, terrestrial or satellite, local or remote, and could be located in a vehicle or in a shelter, among other possibilities. Maintaining interoperable and continuous communications between command posts and the rest of the stakeholders is vital for an effective response to the emergency.

Action Item ١٥

During the response phase, call centres should be established to warn the affected population of new risks, to disseminate updates about the emergency situation, and to connect affected populations with their relatives. Generally, these call centres can be located in shelters, and should use means of communication that do not congest the networks, for example, text messages. To establish these call centres, Sudan could use satellite networks, that can be easily installed, or seek collaboration with telecom/ICT operators or international organizations to establish the required telecom/ICT infrastructure.

Action Item ١٦

Restoration and reconstruction of the telecom/ICT infrastructure should be based on lessons learned and on the principle of building back better. Also, these activities should involve the active participation of the private sector, including fixed, mobile and satellite network and service providers.

Action Item ١٧

Based on the experience acquired during the disaster management, a report should be developed after the response and recovery phases identifying lessons learned and including necessary modifications and improvements that should be made to the NETP. The NETP should be updated every ٢ to ٣ years.

١. Description of the four phases of disaster management[1]

Disaster risk management (DRM) has two distinct stages: risk management and crisis management. In the first stage, measures are taken to predict and warn of a disaster in advance, as well as to prevent and/or mitigate its damage. These efforts occur under normal or non-emergency circumstances and correspond to the mitigation and preparedness phases. On the contrary, crisis management takes place during emergencies and includes actions such as, search and rescue, response coordination, damage assessment, the activation of a policy response, or the mitigation of a secondary disaster. This second stage of disaster management corresponds to the response and recovery phases.

١.١. Mitigation

The mitigation phase seeks to carry out actions that aim to prevent an emergency, reduce the probability of its occurrence, and limit the negative effects of unavoidable threats. This phase includes activities such as identifying existing hazards and risks, conducting vulnerability assessments, the construction or maintenance of critical telecommunications infrastructure, and the development of written plans and procedures, such as the NETP.

During this phase, the role of telecom/ICTs is to help analyse the risk of potential disasters, disseminate information about impending hazards and on how to mitigate its impacts so that hazards do not lead to disasters, identify communities at risk, and to help to implement strategies, technologies and processes that can reduce those negative effects. Activities carried out during the mitigation phase include establishing legal and regulatory frameworks that support the use of emergency telecom/ICTs, conducting risk analysis of critical telecom/ICT infrastructure, taking steps to reduce the vulnerability of telecommunications networks and improve their capacity of recovery, and assess vulnerabilities in order to develop multi-hazard early warning systems with the appropriate technology for each case. These strategies should be implemented before and after the emergency.[2]

١.٢. Preparedness

The preparedness phase includes the planning and preparations necessary to respond to an emergency event. These include the establishment of multi-hazard early warning systems, training, operational processes, and the implementation of those written plans and procedures developed during the mitigation phase. Telecom/ICTs in this phase are essential to facilitate the dissemination of information and alerts so that the public is aware of the actions they must take during an emergency. Likewise, they must facilitate the coordination and communication of those involved in disaster management.

During this phase, it is important to develop and implement plans to guarantee that communications will not be interrupted, to continuously carry out telecom/ICT training and drills, and to regularly carry out activities designed to create awareness among those involved, including campaigns in different formats accessible to the population regarding potential hazards and the activities that people must carry out once during the response phase.

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[1] International Telecommunications Union (٢٠٢٠), *ITU Guidelines for national emergency telecommunication plans*.
[2] Federal Emergency Management Agency (FEMA), *The Four Phases of Emergency Management.*

١,٣. Response

The response phase is carried out during the emergency itself and includes humanitarian activities such as search and rescue, the evacuation of people from affected areas and the opening of shelters, among others.

The role of telecom/ICTs during this phase is vital to connect stakeholders such as first responders, government stakeholders and government agencies, communities at risk, shelters, health centers and Non-Governmental Organizations (NGOs), among others. This is especially important considering that several entities carry out a variety of activities and procedures at the local, national and international level.

١,٤. Recovery

The recovery phase runs after few weeks in the aftermath of disasters and focuses on providing the necessary aid to return to the initial levels of safety and functionality the community had before the disaster. Activities during this phase include infrastructure reconstruction, restoration of public sector operations, debris removal, among others. This restoration and reconstruction must include telecom/ICTs infrastructure, especially due to the fundamental role that the sector plays within the community. The reconstruction should be based in the lessons learned and with the principle of building back better.

Figure ١. Phases of Disaster Risk Management
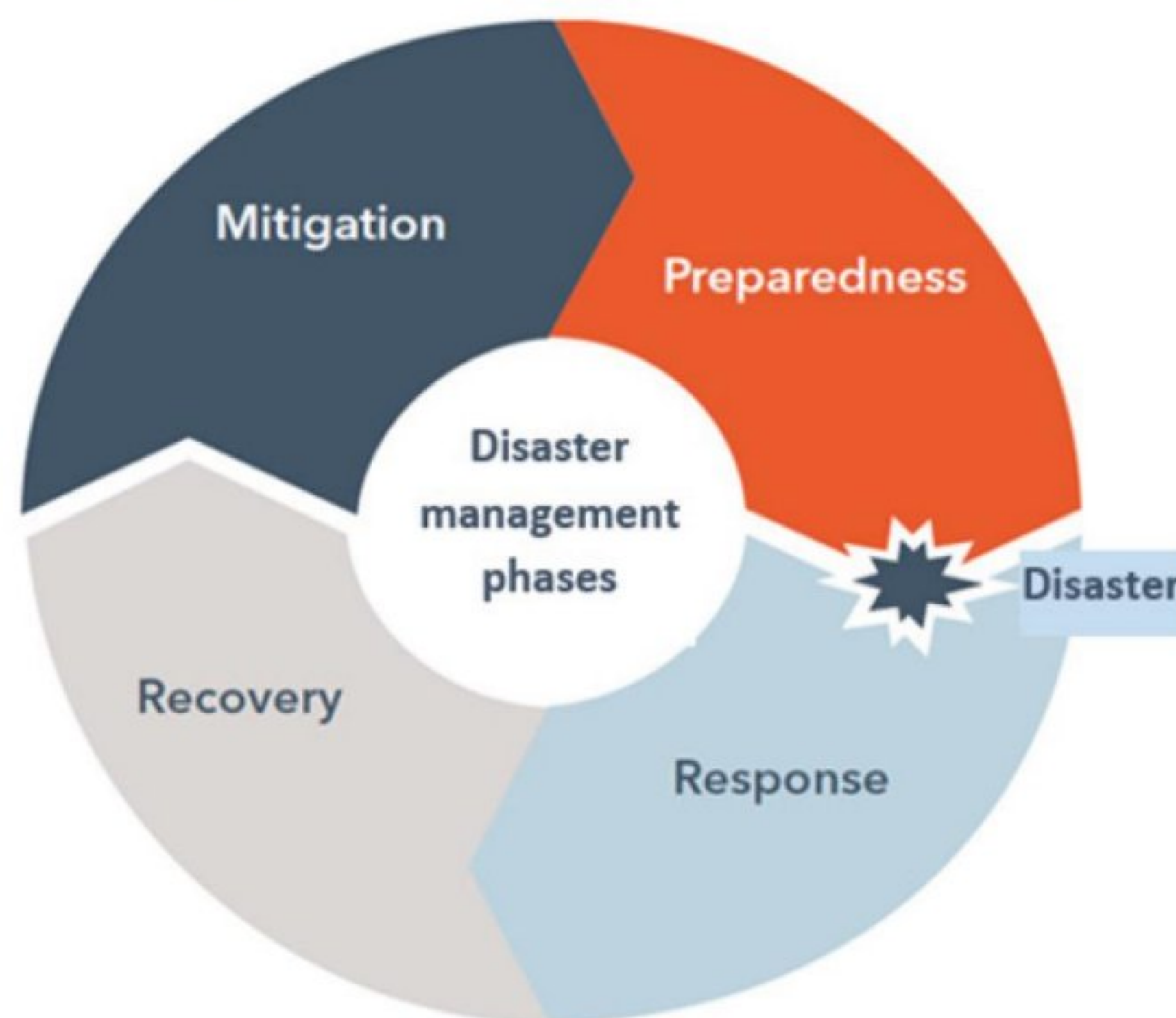
Source: ITU (٢٠٢٠)

٢. Legislation related to disaster risk management in Sudan

Legislation and regulations are key for DRM, as they are the foundation that defines the roles and responsibilities of all stakeholders involved in the DRM process. These are the frameworks upon which coordination mechanisms, communication channels and standard operating procedures are determined, and upon which decision makers in relevant agencies are identified.[٣]

Therefore, it is important to assess the current legislative and regulatory framework for DRM. This framework is described in the following subsections.

٢٫١. Constitution of Sudan[٤]

The Constitution of Sudan of ٢٠١٩ states that every person in the country has a fundamental right to life, dignity, and personal safety, which shall be protected by law. In relation with emergency management specifically, the Constitution gives the Sovereignty Council the competence of declaring a state of emergency at the request of the Cabinet. This declaration that should be ratified by the Transitional Legislative Council within fifteen days.

The declaration of emergency can be made upon the occurrence of any eminent danger or natural hazards that threatens the unity of the country or any part of it. If the Legislative Council ratifies the declaration, the Cabinet may take any measures unless they restrict or partially limit the Bill of Rights established in the Constitution.

٢٫٢. Other Normative

In Sudan there is not currently a comprehensive legal, policy and institutional framework for disaster management in place.[٥] Instead, there are many sectoral scattered laws establishing legal affairs related to disaster risk reduction,[٦] leaving multiple institutions, public and private, dealing with different elements of the DRM process with no clear mechanism for coordination.[٧] The Civil Defence Act (٢٠٠٥), for instance, established that the National Council for Civil Defence (NCCD) is the highest body for disaster management in the country, and determined its specific duties and responsibilities. But the Act for the Organization of Humanitarian and Voluntary Works (٢٠٠٦), on the other hand, established that the Humanitarian Aid Commission (HAC) is the agency responsible for regulating and coordinating the work of humanitarian organizations and examining the dangers of disasters and disputes in the country. Consequently, the jurisdiction and functions of the HAC overlap in certain aspects with those of the NCCD.[٨]

Action Item ١

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[٣] United Nations Office for Disaster Risk Reduction (٢٠١٨). Implementation guide for local disaster risk reduction and resilience strategies - A companion for implementing the Sendai Framework target E.
[٤] Sudan's Constitution of ٢٠١٩.
[٥] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*
[٦] UNISDR. *Khartoum Disaster Risk Reduction Action Plan ٢٠١٩-٢٠٢٣.*
[٧] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*
[٨] Id.

Develop a comprehensive legal, policy and institutional framework for disaster risk management in Sudan. This framework should define a single institution that leads and coordinates the disaster risk management system in Sudan.

٣. Agencies Involved in Disaster Risk Management in Sudan

٣،١. National Concil of Civil Defense (NCCD)

The NCCD is the main decision maker in case of disasters in the country, and it is the government's agency in charge of the coordination of the disaster risk management process. The Council is composed of sixteen ministries, the Governor of Khartoum state,[9] and other actors such as the police director, security organizations, state's governors, and the Civil Defence director.[10]

According to the Civil Defence Act of ٢٠٠٥, the Minister of Interior, as the head of the Council, encompasses relevant decision powers such as declaring any area as a national emergency area; organizing civil defence operations; issuing necessary directives; and chairing and directing the NCCD meetings, among others.[11]

The Act, nonetheless, also establishes duties and responsibilities to the NCCD as a whole, including the following:[12]

- Coordination of plans and civil defence operations between different authorities at the federal level.
- Targeting national efforts towards disaster management and reduction of its effects.
- Approval and monitoring of national plans for civil defence.
- Establishment of similar institutions for civil defence at the states level and specifying their authorities and mandates.

The Act also determines the duties and responsibilities for the directorate for Civil Defence, which falls under the ministry of Interior, and include:[13]

- Appointment of committees to manage civil defence operations.
- Declaration of specified areas as disaster areas.
- Temporary commandeering of fixed and mobile assets, water and electrical resources, fuel, and transportation means.

The organizational structure of the Civil Defence also comprises the Central Operations Chamber (COC), which consist of a group of technical experts from different Ministries that have the role of implementing the decisions and policies of the NCCD. Similarly, on the state level there are State Operations Chambers (SOCs), which are chaired by the state governor, and share relevant information with the COC. According

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[9] Sudanese Government. *Sudanese Civil Defense*. Retrieved from: http://www.un-spider.org/links-and-resources/institutions/sudanese-civil-defense
[10] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*
[11] id
[12] Id.
[13] Id.

to the Act, each State prepares its own Contingency Plan in consultation with the line ministries at the states' level, civil societies and local Non-Governmental Organizations (NGOs).[١٤]

٣,٢. Remote Sensing Authority (RSA)

The RSA, established in ١٩٧٧, is currently affiliated to the National Center for Research of the Ministry of Science and Technology, and has the purpose of doing research and providing services in relation with remote sensing, seismology, geoinformatics and global positioning system (GPS) technology applications for natural resources, environment and disasters. The specific objectives of the RSA include, among others, conducting research, studies, and capacity building with regards to seismology in the country.[١٥]

The RSA comprises of five departments and two units, namely: Natural Resources Mapping Department, Early Warning and Disaster Managements Department, Seismology Department, Space Technologies Department and Geophysics and Geologic Formation Department; and Seismology Data and Information Unit and Training Unit.

Figure ٢. Remote Sensing Authority (RSA) Organizational Structure
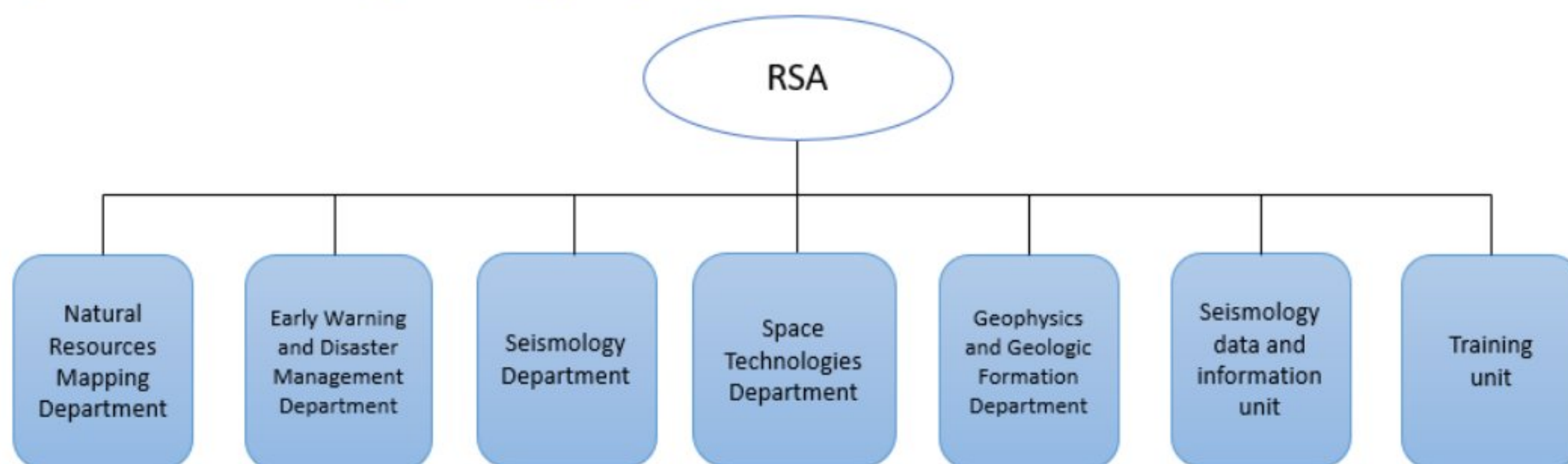
The principal objectives of some of these units related to DRM are the following:[١٦]

Natural Resources Mapping Department:

- Developing strategies and methods for the production of basic and thematic maps from various sources of information.
- Monitoring and follow-up of natural resources during different time periods, evaluating the environmental impact, and creating models and scenarios to predict the situation in the future. Research projects developed by the RSA in this area include, for instance, land degradation assessment and mapping in northern states and El Gazera scheme for ٢٠٠٥-٢٠٠٨, land fire monitoring and mapping in Dinder National Park (٢٠٠٩), and the production of topographic maps from remote sensing data.[١٧]
- Building a database of natural resources.
- Develop recommendations to help set strategies for natural resources management by decision-makers. For instance, RSA has developed research projects regarding an assessment of urban

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[١٤] Id.

[١٥] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*

[١٦] National Center for Reasearches (NCR). *Remote Sensing Authority.* Retrieved from:
http://www.ncr.gov.sd/en/index.php/styles/٢٠١٥-٠٢-١٩-١٤-٢٦-٥٢/٢٠١٥-٠٢-٢٣-٢١-٥١-٠٥?id=١٢١

[١٧] Id.

expansion in Khartoum City (٢٠٠٧), as well as on using Geographic Information System (GIS) in utility services[18].

Early Warning and Disaster Managements Department:

- Build and develop a disaster database in Sudan.
- Build, transfer and familiarize the early warning and disaster prediction and early warning systems.
- Asses the risk and damage of disasters.
- Cooperate with local, regional and international counterpart establishment.
- Raise the awareness regarding the role of space technologies for risk avoidance and disaster management.

Space Technologies Department:

- Capturing and processing different remote sensing satellite data.
- Developing of satellite digital image processing in suitable ways for applications in Sudan.

٣,٣. Telecommunications and Post Regulatory Authority (TPRA)

The Telecommunications and Post Regulating Act of ٢٠١٨ established, among other provisions (see section ٨), the Telecommunications and Post Regulatory Authority (TPRA) as the agency responsible for, among other functions, regulating and developing the telecommunications and postal sector in Sudan, including aspects such as planning, managing, allocating, licensing and supervision of the use spectrum; and establishing specifications related to standardization and type approval certifications.[19]

Regarding emergency telecommunications, the Act determines that licensees have the obligation to devote their network and equipment in case of emergencies. Nonetheless, the Act does not establish any other provisions for disaster risk management in regard of telecommunications, nor it specifically mandates the TPRA to develop a comprehensive regulatory framework related to telecom/ICTs for DRM.[20]

٣,٤. Other Relevant Agencies[21]

The Humanitarian Aid Commission (HAC), according to the Act for the Organization of Humanitarian and Voluntary Works of ٢٠٠٦, is the institution responsible for coordinating humanitarian efforts and for examining the dangers of disasters and disputes in Sudan. The HAC is a member of the NCCD, and it is the coordinating body of the Ministry of Social Welfare.

The Sudanese Red Crescent Society (SRCS) is an independent agency with the purpose of providing humanitarian and health services in the country, as well as developing disaster risk reduction activities. It has a volunteer base of ٤٦٠,٥٠٠ persons, and an information surveillance system that operates before, during and after disasters. It has eighteen state branches throughout the country.

The Federal Ministry of Health (FMOH) has the responsibility to guide, regulate and coordinate all public health or medical activities in Sudan. Regarding emergency management, the FMOH, as the institution

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[18] Id.
[19] Government of Sudan. (٢٠١٨). *Telecommunications and Post Regulating Act.*
[20] Id.
[21] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*

responsible for safeguarding public health during emergencies, has the role of identifying needs, establishing policies, and facilitating the contribution of other actors in reducing the health risk caused by disasters. It has a rapid response team for epidemic outbreaks and disaster health working groups.

Finally, Sudan hosts several international organizations that also provide support to the government in aspects related DRM, especially on issues regarding technical support (resources) for DRM. These organizations include the International Federation of Red Cross and Red Crescent Societies (IFRC), the United Nations International Children's Emergency Fund (UNICEF), the United Nations Development Programme (UNDP), the World Food Programme (WFP), and the Food and Agriculture Organization (FAO), among others.

٤. General National Emergency Plan for the Telecommunication Sector (GNEPTS)[٢٢]

In ٢٠١٧ the National Telecommunications Corporation (NTC), now the Telecommunication and Post regulatory Authority (TPRA), developed a General National Emergency Plan for the Telecommunications Sector (GNEPTS) in Sudan, with the purpose of creating "an integrated strategic plan and develop an effective joint action approach to use the various types of communications in case of emergencies and general effect disasters."[٢٣] This document is a general plan to guide the telecom/ICT sector in the DRM process, in line with the government's national DRM plan. This national DRM plan, nonetheless, has not been implemented yet, but only drafted.[٢٤]

According to the GNEPTS, an Emergency Communications Committee shall be formed in Sudan to serve as a link between the different actors that need to use telecommunications services in case of disasters. This Committee should be integrated by the government sector, by the telecommunication sector (represented by the NTC (now the TPRA), network operators and service providers), and by other relevant bodies such as electricity and oil suppliers. The principal objectives of the Committee should be to ensure not only the availability of reliable communications for government agencies and relief organizations, but also to guarantee the interoperability between all telecommunication systems during emergencies, and the continuity of the basic functions of the communications equipment. Also, this Committee should seek to ensure that licensees are able to activate the procedures relating to the dissemination of early warnings, and that they have the ability to restore the situation to pre-disaster levels, among other functions.

٤,١. Priorities established in the Plan

The GNEPTS establishes that government communications should have priority over all other types of communications. Along with this, the GNEPTS also prioritizes ensuring network readiness; that is, strengthening the telecommunication networks and enhancing their reliability by adding equipment and systems as backup elements to maintain the network's security and integrity. The GNEPTS also highlights the necessity of identifying and categorizing (for each level of damage) the communication services used in emergencies, and of developing a treatment plan to deal with each level, and specify the resources that

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[٢٢] General National Emergency Plan for Telecommunication Sector. (٢٠١٧).
[٢٣] Id.
[٢٤] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*

will be needed, priorities and responsibilities, including specific roles assigned to each telecommunications licensee. Finally, the GNEPTS determines as a priority the need to identify the procedures and steps through which the effectiveness of telecommunication systems and services are restored to their normal state.

٤٬٢. Roles assigned to relevant bodies

Based on the priorities presented in the previous section, the GNEPTS details the roles assigned to different relevant bodies involved in emergency telecommunications management, as follows.

The National Telecommunications Corporation (NTC), now the Telecommunication and Post Regulatory Authority (TPRA), as an integral part of the Emergency Communications Committee, shall according to the GNEPTS:

- Develop and issue the necessary guidelines and regulations for appropriate preparedness and prompt response to urgent needs before, during and after disaster occurs.
- Issue an organizational rules and regulations to remove barriers and obstacles that hamper the activation of resources in the event of a national disaster. This regulation shall include rules and regulations to be activated in emergency situations.
- Ensure that all companies comply with the Emergency Regulations, adhere to all decisions of the Emergency Communications Committee and ensure that all networks resume normal operations following the disaster.
- Deploy broadband, as networks and advanced Internet services play an important role in facilitating communications among citizens and assist in disaster relief operations.
- Develop technical rules to enhance reliable interoperable radio communication.
- Monitor the activities of the radiocommunication sector at the International Telecommunication Union (ITU) and benefit from its assistance.

The telecommunications operators, on the other hand, must carry out the following tasks according to the Plan:

- Develop a plan of action with a clear administrative structure for the work of emergency communications equipment and services, which shall be reviewed by the Emergency Communications Committee.
- Develop precautions and measures to protect communications infrastructures.
- Update systems and equipment and conduct periodic tests of emergency procedures that will be reviewed by the Committee.
- A representative shall be appointed by each operator to the Emergency Communications Committee who is responsible for the emergency management and the continuation of the work of each operator, and shall also be authorized to sign memorandums of understanding (MOUs) between companies under the supervision of TPRA for mutual coordination during emergency situations.

The GNEPTS highlights the importance of protecting important telecommunication assets; therefore, the GNEPTS establishes the relevance of ensuring that the emergency communications equipment and services are ready when needed, through pre-planning and repeated testing to prevent service breakdowns and avoid congestion of cell phones, land line telephones networks or the Internet.

Therefore, the GNEPTS determines that operators should take the following measures to strengthen their networks, prevent breakdowns and congestion in emergencies:

١. Telecommunication networks operators must follow some standards and criteria when they construct their network infrastructure in order to enhance the capacity and flexibility of the networks and assist in the preservation of the integrity of the components of the main network and the infrastructures. These standards include installing towers and equipment at certain height to reduce the impact of potential damage resulting from floods in flood-prone areas; placing essential equipment in more than one building, wherever possible; installing fire detection systems in all buildings; and burying telecommunication cables underground, among other requirements.

٢. Mobile phone operators are required to provide additional transmission links between key network elements and switching equipment across two distinct geographic routes. While fixed landlines telephones and Internet networks operators are required to provide alternative communication links between the main transformers (such as SDH on fibre optic cables), to connect switching centers and appropriate network elements via interconnected ring transmission networks, to provide additional microwave links, or underground wire connections and switches in alternative locations, and to secure safe international gateways and paths.

٣. Cell phone, landline phones and Internet operators should plan to provide standby components for the network (i.e., basic equipment, electrical energy and fuel) to prevent complete failure resulting from secondary damage to the equipment. These operators can fulfil these requirements by providing uninterruptible power supply (UPS) with sufficient external batteries, and by analyzing spare parts requirements and making sure they are available and safely stored.

٤. Operators should provide effective solutions to prevent network breakdown due to congestion and draw-up a clear plan to manage congestion. This plan should be submitted to TPRA for review, examination and approval. Also, operators may periodically monitor communications traffic in the main switching centers through an effective network management system, develop a plan to provide additional network capacity to meet the high traffic of communications created during emergencies, and prepare an integrated plan by cell phones and land line phones operators to connect the maximum possible number of subscribers during emergencies.

٤,٣. Organization and Structure of Emergency Management of the Telecommunications Sector

According to the GNEPTS, the emergency management structure in the telecommunications sector comprises three categories (Figure ٣): first, the government, which represents the supreme commission for emergencies in the country; second, the Emergency Communications Committee (integrated by the TPRA and the operators), and third, the emergency management team of each of the four operators in Sudan (Canar, Sudatel, MTN and Zain).

Figure ٣. Emergency Management Structure in the Telecommunications Sector (GNEPTS)
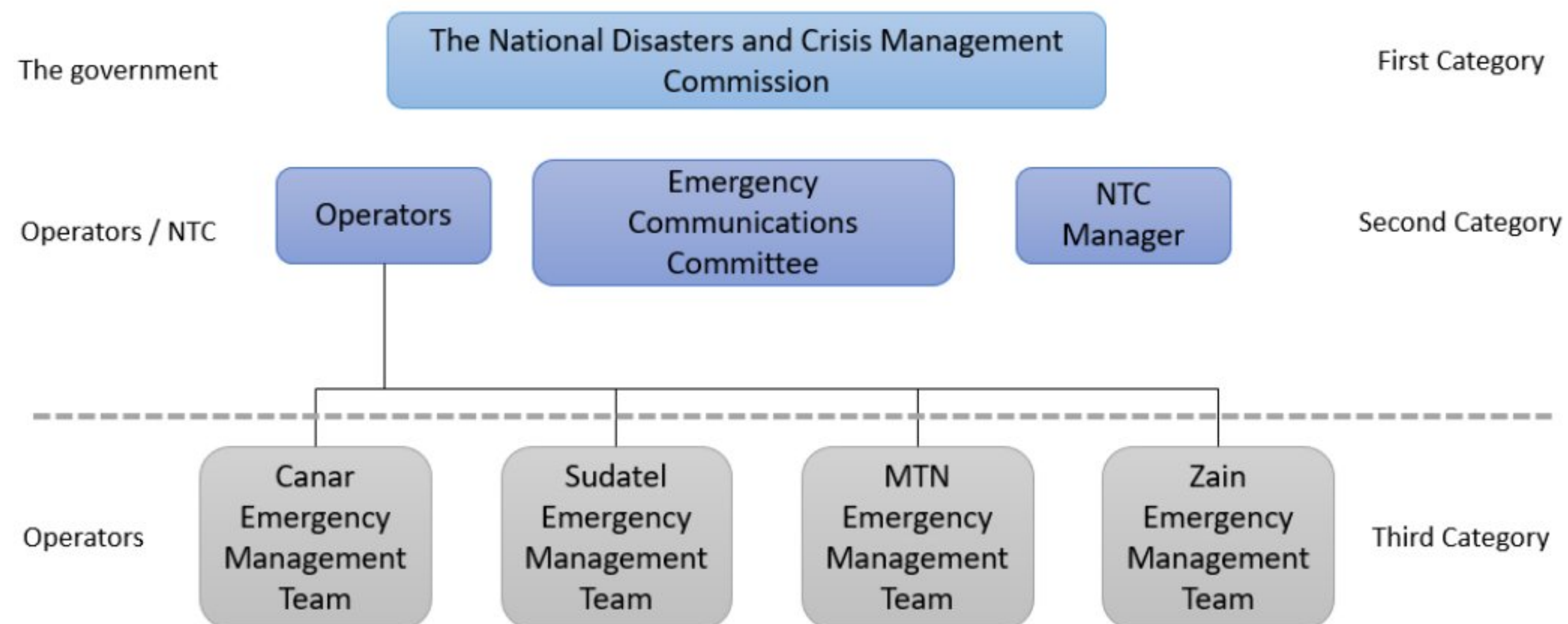
Source: GNEPTS (٢٠١٧).

In particular, the tasks of the National Emergency Communications Committee defined in the GNEPTS are the following:

١. Develop an emergency call plan in the case of a national disaster. In this plan, the Committee will delineate the tasks and oversee its implementation by all bodies. This plan must be updated in accordance with the latest advances in the area of emergency communications systems.

٢. Formulate different scenarios and the way to deal with them as planned accompanied by the available qualified, experienced human resources and know how to distribute them to respond to emergency situations.

٢. Determine the type of communications needed in an emergency from various parties involved in the event of disasters and assess priorities.

٣. Evaluate the different roles of the concerned parties responsible for preventing disasters and identify inaccuracies to be avoided in the future.

٤. Ensure that telecom networks operators are invested in preventive measures that guarantee the maximum degree of readiness and preparedness of communications networks to respond to the emergency and that they are powerful enough to withstand high loads during periods of peak demands.

٥. Ensure and review that telecom operators have detailed emergency plans to manage their own resources, and ensure that these plans are updated in accordance with the latest advances in the area of emergency communications systems.

٦. Develop a joint database of equipment and networks in a standard format to make it easily accessible to available and relevant human resources.

٧. Train manpower on the effective use of the available communications resources in emergencies.

٨. Develop an awareness program about telecommunications services and equipment used in emergencies through the organization of annual seminars and workshops and coordinate with international organizations and experts in this concern.

٩. Benefit from the efforts of the International Telecommunication Union (ITU) in the area of disaster management and prevention, in particular Tampere Convention which facilitates exchange of human resources and equipment that enables speedy deployment and the effective use of telecom

resources in emergency situations, also conclude international agreements with neighboring States to exchange experts and expertise in the area of disaster management.

١٠. Seek to obtain customs exemptions and exemption from restrictions on telecommunications equipment and systems to allow and facilitate humanitarian aid access and entry of equipment provided by other States in disaster situations.

١١. Obligate Disasters Departments in the concerned entities such as operators and Government agencies to share telecom infrastructure among them.

Finally, regarding the organization structure for the sector, the GNEPTS establishes that each operator should establish a specialized Crisis Management and Risk Prevention Department and develop a plan for emergency communications, consistent with the National Disaster Management and Communication Plan.

٤,٤. Actions during the response phase of the disaster

Mobilizing communication assets: According to the GNETPS, all operators and the government entities must manage mobilizing communication assets when a disaster strikes. This involves replacing basic physical communication infrastructures that have been damaged or destroyed; installing mobile phones or Tetra mobile stations that could be rapidly deliver telecommunications services in less than ٢٤ hours (١٦ hours for the main cities); and providing new facilities for telecommunications services (operators shall develop capacities and sophisticated solutions within six months from the enactment of the Plan).

Emergency Reporting: Operators should monitor their networks and report to the TPRA on their performance. These reports should be submitted according to different types of indicators concerning problems on the infrastructure or the service provided.

Alert levels: The Committee will change the level of alert during the emergency based on the emergency reports received from the operators with regard to service or assets, and according to vulnerability of citizens or priority stakeholders. Alarm levels are divided in four main categories for Telecommunications Sector:

- Green Alert: a normal status that does not require any support from the Emergency Committee, and only requires monitoring and receiving reports on the development of the emergency.
- Blue Alert: Potential or imminent emergency which calls for a state of preparedness and ascertaining readiness.
- Orange Alert: A state of emergency that requires the Committee's involvement.
- Red Alert: A national state of emergency which requires the full support of the Committee and all stakeholders.

Authorization of Control: Following a declaration of state of emergency (red alert) and upon the request of the competent authorities, the Committee may assume control over services and operators' network. This authorization must be included in the operators' emergency plan and ensure their readiness to implement it whenever requested.

٤,٥. Other Elements of the GNEPTS

The Plan also establishes other relevant elements to consider, which are summarized below:

Emergency Planning Meetings: Meetings will be carried out in order to provide a consultation platform for all stakeholders to be aware of the potential and expected emergencies and their impacts, to show the tasks to be carried out and who is responsible for implementing them, and to discuss and socialize the established coordination mechanisms, procedures, provision of resources and solutions, among others. These meetings will require operators to identify and distribute resources as needed, and to keep them updated, file and archive them with TPRA. These records shall be semi-annually updated or upon request.

Information Management: Confidentiality of information, updating and sharing them to the extent necessary will create a positive impact on managing the emergency successfully.

Management of Stakeholder Affairs: The TPRA must maintain a complete list of all stakeholders identified and updated continuously in light of developments. It is also necessary to define the role assigned to each stakeholder. All operators should also keep lists of stakeholders in their business areas to ensure continuity of their work. These lists must be updated periodically.

Post-emergency Phase: It is necessary to evaluate the effectiveness of the performance of all parties involved and whether they played their full part according to the developed scenario. This would enable the TPRA to learn lessons drawn from the situation and act upon them in a timely manner.

٤٫٦. Following up the Plan

The National Commission for Emergency Communications must ensure a high level of readiness on both, the operators' preparedness to meet the emergency, and the level of training of the members of the Committee to detect any potential threats and prevent their recurrence by adopting the appropriate procedures for responding. Therefore, the national plan must be subjected to experimentation and testing periodically through conducting announced and unannounced exercises. These can be field exercises, which will be conducted every two years, or tabletop exercises, conducted annually.

Finally, the GNEPTS establishes that the TPRA is the only responsible for it, and is the only agency authorized to modify it. Operators shall sign this plan and the memorandum of understanding indicating their acknowledgement and commitment to implement all the above measures.

Action Item ٢

Review and update the General National Emergency Plan for the Telecommunications Sector (GNEPTS) with the proposed National Emergency Telecommunications Plan presented in this document. This NETP should combine all policy instruments, manuals and standard operating procedures developed through the years and released in different documents by the government. It should also include all the roles and responsibilities of the different stakeholders involved in the Sudan's disaster risk management process, including public and private organizations, humanitarian entities, NGOs, among others.

Mitigation Phase

٥. Vulnerability to Disasters from Natural Hazards in Sudan

In Sudan, the climate ranges from hyper-arid in the north to tropical wet-and-dry in the far southwest. Temperatures do not vary greatly at any location; therefore, the most significant climatic variables are rainfall and the length of the dry season. Floods are usually caused by exceptionally heavy rains, which regularly generate major damage to villages and agricultural land in the proximity of rivers and drainage zones. While variations in the length of the dry season depend on which of two air flows predominate: the dry north-easterly winds from the Arabian Peninsula, or the moist south-westerly winds from the Congo River basin. The central and northern part of the country, on the other hand, are deserts among the hottest and driest areas in the world, that can experience many years of zero rainfall.[٢٥]

Sudan is vulnerable to different natural hazards, especially floods and droughts, whose impacts are exacerbated by the social and economic conditions in the country, such as driving displacement, food insecurity and related humanitarian needs.[٢٦] These conditions also increase the country's vulnerability to a third hazard: epidemics, which historically have affected hundreds of thousands of people across the territory.

Table ١ shows the total number of disaster events that have occurred in the country between ١٩٤٠ and ٢٠٢٠, as well as their impact in terms of number of deaths, and people injured and affected. Droughts are the type of hazard that has caused the greatest number of deaths and of people affected in the last ٨٠ years in the country. Even though only ٩ drought events have been registered, these have caused ١٥٠,٠٠٠ deaths, and have left more than ٢٧ million people affected. By number of deaths, the second and third types of hazards with the greatest impact are epidemics and floods, which are also the ones that occur the most (٤٠ occasions each). Combined, epidemics and floods have caused the death of nearly ١٥,٠٠٠ people, have left more than ٥٠,٠٠٠ injured, and ٧ million affected.

Table ١. Disasters in Sudan between ١٩٤٠ and ٢٠٢٠*

Type of Disaster	# Events	Deaths	Injured	Affected
Drought	٩	١٥٠,٠٠٠		٢٧,٢١٠,٠٠٠
Earthquake	٢	٣	١٥	٨,٠٠٠
Epidemic	٤٠	١٢,٢٩٠	٣١,٣٩٤	٢١٣,٩٢٦
Extreme temperature	١	١٦		
Flood	٤٠	٢,٧٦٦	١٩,٦٢٥	٦,٨٣١,٢٩٩
Industrial accident	٣	١٦٣	٢٨٠	
Insect infestation	٦			
Storm	٢	٥٣	٣٠	
Wildfire	١	٤٧		
Total	١٠٤	١٦٥,٣٣٨	٥١,٣٤٤	٣٤,٢٦٣,٢٢٥

* November ٢٥th. Covid-١٩ pandemic not included.
Source: EM-DAT: The Emergency Events Database – Universite catholique de Louvain (UCL) – CRED, D. Guha-Sapir – www.emdat.be, Brussels, Belgium

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[٢٥] Id.
[٢٦] Id.

The greatest ten events by number of deaths occurred in the last ٨٠ years have been exclusively caused by three hazards: droughts, floods and epidemics (Table ٢). The most severe disaster between ١٩٤٠ and ٢٠٢٠ was a drought occurred in ١٩٨٠–١٩٨٤, which was accompanied by widespread displacement and localized famine. It resulted in huge losses, with ١٥٠,٠٠٠ deaths, ٨.٤ million people being affected, the loss of more than half of the livestock and the complete harvest failure in Darfur and Kordofan states, and the deterioration of pasture and agricultural land.[٢٧]

Apart from the flood of July ٢٠٢٠, caused by torrential rains combined with a historical overflow of the River Nile and its tributaries, and that affected all the states in the Sudan (except South Darfur) and caused devastating damage alongside riverbanks in the northern, central and eastern regions of the country,[٢٨] the other eight most severe disasters in Sudan have been associated with epidemics. The epidemics registered in the country in ١٩٨٨ (bacterial disease), ١٩٩٨ (meningococcus) and ١٩٤٠ (yellow fever) generated at least ١,٥٠٠ deaths each, and left jointly more than ٧٤,٠٠٠ people affected. Other epidemics occurred in the last three decades, have been associated with diseases like cholera, diarrhoea and again the meningococcal bacteria. The data presented in Table ٢ does not include the ongoing Covid-١٩ pandemic, which as to March ١st ٢٠٢١, has caused more than ١,٨٠٠ deaths.[٢٩]

Table ٢. Ten disasters with the greatest number of deaths (١٩٤٠-٢٠٢٠*)

#	Year	Disaster Type	Event Name	Deaths	Injured	Affected
١	١٩٨٣	Drought		١٥٠,٠٠٠		٨,٤٠٠,٠٠٠
٢	١٩٨٨	Epidemic	Bacterial disease	٢,٧٧٠		٣٨,٨٠٥
٣	١٩٩٨	Epidemic	Meningococcal disease	١,٦٠٠		٢٠,٤٠٠
٤	٢٠٢٠	Flood		١,٥٥٥	١٣	٨٧٥,٠٠٠
٥	١٩٤٠	Epidemic	Yellow fever	١,٥٠٠		١٥,٠٠٠
٦	١٩٩٨	Epidemic	Acute diarrhoeal syndrome	١,٣٧٣		
٧	١٩٩٦	Epidemic	Cholera	٧٠٠		١,٨٠٠
٨	٢٠١٧	Epidemic	Acute Watery Diarrhoea	٦٥٧	٣٠,٧٦٢	
٩	٢٠٠٦	Epidemic	Cholera	٤٧٦		١٥,٧١١
١٠	٢٠٠٦	Epidemic	Meningococcal disease	٤٣٠		٦,٥١٦
*november ٢٥th						
Covid-١٩ pandemic not included						

Source: EM-DAT: The Emergency Events Database – Universite catholique de Louvain (UCL) – CRED, D. Guha-Sapir – www.emdat.be, Brussels, Belgium

In the last decade, the most severe type of hazard affecting the country have been floods, leaving more than ٢,٠٠٠ deaths, followed by epidemics and droughts, which, even though have not registered any associated deaths, have affected nearly ٤ million people (Table ٣).

Table ٣. Disasters in Sudan in the last decade (٢٠١٠-٢٠٢٠*)

Disaster type	# Events	Deaths	Injured	Affected
Drought	٢			٤,٠٠٠,٠٠٠
Epidemic	٤	٨٧١	٣١,٣٩٤	١,١٨٨
Extreme temperature	١	١٦		

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[٢٧] Id.
[٢٨] FAO. (٢٠٢٠). *The Sudan Flood Response Plan ٢٠٢٠–٢٠٢١ - Supporting flood-affected farmers and pastoralists.*
[٢٩] Worldometer. (٢٠٢٠). *Total Coronavirus Cases in Sudan.* Retrieved from:
https://www.worldometers.info/coronavirus/country/sudan/

Disaster type	# Events	Deaths	Injured	Affected
Flood	١٤	٢,٠٨١	٧٣٤	٢,٣٨٠,٨٣٨
Insect infestation	١			
Storm	١	٢٠	٣٠	
Total	٢٣	٢,٩٨٨	٣٢,١٥٨	٦,٣٨٢,٠٢٦

* November ٢٥th. Covid-١٩ pandemic not included.
Source: EM-DAT: The Emergency Events Database – Universite catholique de Louvain (UCL) – CRED, D. Guha-Sapir – www.emdat.be, Brussels, Belgium

٥,١. Maps and Vulnerabilities

The total area considered as drought prone in Sudan is about ٦٩,٠٠٠ square kilometres, an area that produces ٩٠٪ of the cultivated food crops and ٨٥٪ of firewood.[30] The areas frequently affected by droughts in the country include West Kordofan and Darfur states, areas located along the Blue Nile river and the main Nile river that include the Northern, Naher El Neil, Khartoum, Gezira, Kassala and Red Sea states.[31]

Floods are becoming more frequent due to increasing occupation of flood plains, deforestation, lack of preparedness, and weak monitoring.[32] Floods frequently affect areas within the River Nile basin, low areas from extreme south to far north, as well as mountain areas along the Red Sea.

Action Item ٣

The National Council of Civil Defence (NCCD), jointly with relevant agencies involved in assessing and monitoring natural hazards in Sudan, should maintain updated vulnerability maps for the different types of hazards in the NETP, and especially for droughts, floods and epidemics. This information must be described at the municipal level and should be available to telecom/ICT operators. Also, it should include information on the most vulnerable communities, specifying the type of hazards they are prone to, as well as the telecom/ICT resources available in each of them.

٦. Telecom/ICT sector in Sudan

٦,١. Mobile voice and data services[33]

There are three major mobile network operators (MNOs) in Sudan: Zain Sudan, MTN and Sudani (Sudatel). The total number of mobile subscribers in Sudan reached ٣٢.٩ million in June ٢٠٢٠, representing a penetration of ٧٧%.

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[30] International Federation of Red Cross and Red Crescent Societies (IFRC). (٢٠١٩). *International Disaster Response Law (IDRL) in Sudan.*
[31] Id.
[32] Id.
[33] Information provided directly by the authorities in charge of disaster risk management in Sudan.

Regarding mobile broadband, Sudan reached ١٦.٦ million subscribers to this service offered by all the three mobile network operators in the first half of ٢٠٢٠. This number of subscribers represents a penetration rate of nearly ٣٨.٨%.

٦,٢. Fixed voice and data services

In Sudan there are two major fixed telecommunication service providers: Thabit (Sudatel) and Canar, which offer telephone voice services and broadband services using a variety of technologies. Both companies accounted for ٩٣,٠٧٩ subscriptions in June ٢٠٢٠, *down* nearly ٤٤,١٠٠ subscriptions compared to those registered in the same month of ٢٠١٩. Regarding fixed broadband subscriptions in specific, both providers registered merely ٣٠,٦٣٤ users in the first half of ٢٠٢٠, representing a penetration rate of less than ١٪, and a reduction in the number of subscribers of around ١٠٪ in relation with the same period of the previous year (٢٠١٩).[34]

٦,٣. National fibre backbone

In ٢٠٠٣, Sudatel installed more than ٦,٠٠٠ km of fibre optic cable, further expanding it to ١٣,٠٠٠ km by ٢٠٠٨, connecting the country's major cities. In addition, there are around ٣,٠٠٠ km of fibre linking a total of ٢٧ universities, and another ٣,٠٠٠ km of fibre owned by the National Electricity Corporation (NEC).

The following map depicts the fibre optic deployment in the country, including Sudatel's, Canar's, Zain's and the National Electricity Corporation's cables, which connect the major cities in Sudan.

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[34] Id.

Map ١. Fibre optic route

Source: provided directly by the authorities in charge of disaster risk management in Sudan.

٦,٤. International Connectivity

Sudan is connected to different international submarine fibre optic cables, which provide ٢٦,٣٨١ Mbps of international Internet bandwidth, and represent nearly ٢,٠٩٤ bps per Internet user.[٣٥] These submarine cables that connect or will connect Sudan through Port Sudan landing station in the incoming years are the following:[٣٦]

- The East African Submarine Cable System (EASSy), of which Sudatel is a member, runs ١٠,٠٠٠ km from South Africa along the African east coast to Port Sudan, with onward connectivity to Europe. This cable, which went live in July ٢٠١٠, currently supports a capacity of more than ١٠ Tbps.[٣٧]
- The Africa-١ submarine cable will have a length of ١٠,٠٠٠ km and is estimated to entry into service in ٢٠٢٣. This cable will have one landing station in Port Sudan and will be featuring high performance ٢٠٠/٣٠٠/٤٠٠ Gbps.[٣٨]

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[٣٥] ITU World Telecommunication/ICT Indicator (WTI) Database – ٢٠٢٠.

[٣٦] TeleGeography (٢٠٢١) *Submarine Cable Map*. Retrieved from: https://www.submarinecablemap.com/#/country/sudan

[٣٧] Id.

[٣٨] CR. (٢٠٢١). *Africa-١ sub-sea cable system construction works begins*. Retrieved from: https://constructionreviewonline.com/news/egypt/africa-١-sub-sea-cable-system-construction-works-begins/

- The ٢Africa submarine cable project will have a length of ٣٧,٠٠٠ km and, upon completion in ٢٠٢٣, will have a landing station in Port Sudan. The ٢Africa cable system will allow the deployment of up to ١٦ fibre pairs and a capacity of up to ١٨٠ Tbps on key parts of the system.[٣٩]
- The SAS-١ and SAS-٢ submarine cables connect Port Sudan and Jeddah, in Saudi Arabia, and has an extension of ٣٣٠ km with four fibre pairs and a capacity of ١.٢٨ Gbps. It is used for data and Internet traffic as well as cable television, and it functions since ٢٠٠٣.[٤٠]
- Canar has invested in the FALCON submarine cable system (٢٠٠٧). It has a length of ١١,٨٥٩ km and a capacity of ٢,٥٦ Tbps.[٤١]

Map ٢. Submarine cable connecting Sudan
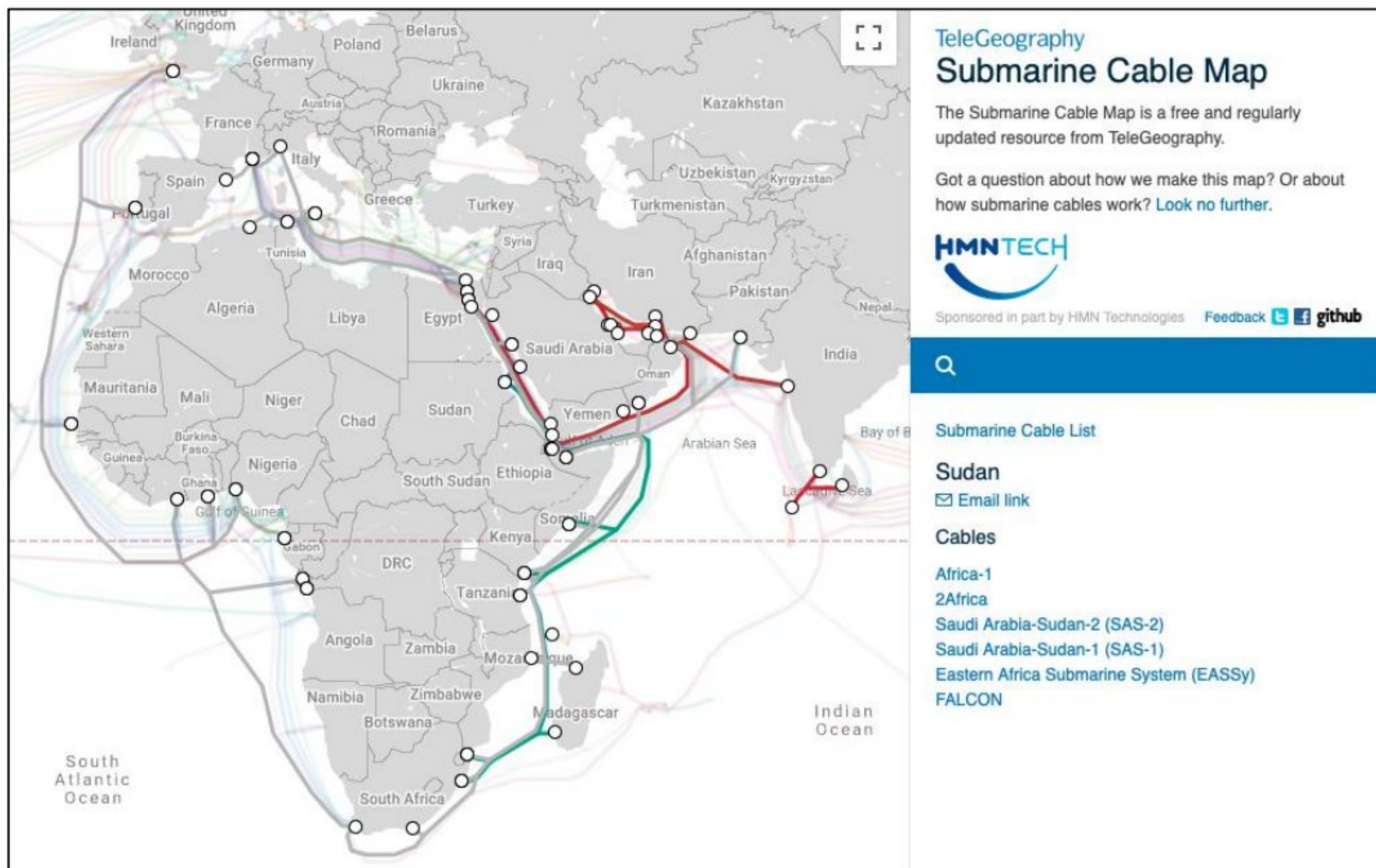
Source: TeleGeography (٢٠٢١)

Finally, Egypt and Sudan launched in ٢٠٠٤ a ٤٠٠ km long fibre optic cable connecting the two countries, providing Sudan with a link to Egypt's national fibre optic infrastructure.[٤٢] Along with this, Port Sudan is connected to Galabat in Ethiopia through a cable built in ٢٠٠٦. Another fibre is currently being laid by Sudatel and other foreign operators to the south of the country.[٤٣]

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[٣٩] Submarine Cable Networks. *Home – ٢Africa*. Retrieved from: https://www.submarinenetworks.com/en/systems/asia-europe-africa/٢africa

[٤٠] TeleGeography. (٢٠٢١). *Submarine Cable Map*. Retrieved from: https://www.submarinecablemap.com/#/country/sudan

[٤١] Submarine Cable networks. *FALCON*. Retrieved from: https://www.submarinenetworks.com/systems/asia-europe-africa/falcon#:~:text=The٪٢٠FLAG٪٢٠Alcatel٪٢DLucent٪٢٠Optical,٪٢C٪٢٠Yemen٪٢C٪٢٠Sudan٪٢٠and٪٢٠Egypt.&text=The٪٢٠FALCON٪٢٠cable٪٢٠system٪٢٠was,cable٪٢٠owned٪٢٠by٪٢٠FLAG٪٢٠Telecom.

[٤٢] World Bank. (٢٠١٤). *Broadband Networks in the Middle East and North Africa*.

[٤٣] Sudatel. Terrestrial Network. Retrieved from: https://www.sudatel.sd/wholesale/

٦,٥. Satellite

Sudatel has set up a nationwide Very Small Aperture Terminal (VSAT) satellite network with more than ١,٠٠٠ stations, offering the service to companies and small remote communities. Also, this company provides since ٢٠٠٤ two-way satellite broadband and VoIP services for United Nations relief teams in Sudan through its subsidiary NewSat.

In ٢٠١٩, Sudatel signed a deal with Arab Satellite Communications Organization (Arabsat) to provide satellite broadband services across the country via the Arabsat ٦A Ka-band satellite, successfully launched by SpaceX in April, ٢٠١٩.[44] Also, the government's Institute of Space Research and Aerospace (ISRA) successfully launched in November ٢٠١٩ (with support of Chinese Long March ٤B satellite launch vehicle) a Chinese built satellite to obtain reliable data for topographic mapping and environmental monitoring, among other purposes including defence and intelligence applications.[45]

Action Item ٤
The Telecommunication and Post Regulatory Authority shall develop and update periodically the network inventory and coverage of mobile and fixed, terrestrial and satellite telecom/ICT network and service providers, and radio and television broadcasting service providers. It should include also in the inventory other types of telecom/ICT networks relevant for disaster relief such as radio-amateur and first responders' networks.

٧. Vulnerability analysis of critical telecom/ICT infrastructure

The telecom/ICT operators and the government agencies responsible for government telecom/ICT networks in Sudan must develop and present a vulnerability analysis of the critical infrastructure of their networks, based on the risk maps and assessments of the different types of hazards to which Sudan is prone to (presented in Section ٥).

Telecommunications operators should also include coverage maps of their networks in this vulnerability assessment, which must be approved by the *Telecommunication and Post Regulatory Authority (TPRA)*, and must be part of Sudan's NETP, maintaining the confidentiality deemed necessary.

Action Item ٥

All telecom/ICT network and service operators, terrestrial and satellite, mobile and fixed, and radio and television broadcasting providers, as well as government agencies responsible of telecom/ICT networks, e.g., first responders, must develop (or update) and present for approval by the Telecommunication and Post Regulatory Authority a vulnerability analysis of the critical infrastructure of their networks according to the different types of hazards to which Sudan is prone to. This vulnerability analysis should also include the coverage maps of telecom/ICT networks.

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[44] Shay, S. (٢٠١٩). *The space race in the Red sea region.*
[45] Id.

٨. Specific Telecom/ICT Regulatory Framework for Disaster Management

The Telecommunications and Post Regulating Act of ٢٠١٨ establishes the Telecommunications and Post Regulatory Authority (TPRA) as the agency responsible for, among other functions, regulating and developing the telecommunications and postal sector in Sudan; laying down guidelines, plans, programs and rules for the provision of telecommunications and postal services at the national level; laying down systems for planning, managing, allocating, licensing and supervision of the use spectrum; and establishing specifications related to standardization and type approval certifications; among others.[٤٦]

The Act also determines the TPRA's organizational structure, and establishes provisions related to licensing; to the assembly, manufacturing, importation, and exportation of telecommunications and broadcasting equipment; interconnection and infrastructure sharing; allocation of frequencies; and obligations of licensees, public post operators and private post operators.[٤٧]

Nonetheless, apart from establishing that licensees have the obligations to "devote his network and equipment in case of emergency"[٤٨], there are no additional provisions regarding emergency telecommunications according to the Act. In particular, the Act does not specifically mandate the TPRA to develop a comprehensive regulatory framework related to telecom/ICTs for DRM.

The TPRA should be held accountable by law of establishing a regulatory framework that includes all the necessary provisions in each of the four phases of disaster risk management for the telecom/ICT sector. Based on the mandate provided by the law, the TPRA should develop the following regulations:

Mitigation and Preparedness phases

١. Oblige telecommunications service providers to carry out vulnerability analyses of their networks according to risk maps of different geographical areas and to establish corresponding contingency plans that guarantee, to the extent possible, vital communications for emergency management and disaster risk reduction, as well as the timely restoration of user communications. These plans should be submitted to and approved by the TPRA.

٢. Require that radio and commercial broadcasting operators, public and private television broadcasting operators, as well as civil society entities with assigned radio frequencies, transmit information campaigns for the mitigation of disasters and emergencies. These campaigns should be developed in coordination with the NCCD and the TPRA, and should have a regulated duration and broadcasting timeline.

٣. Require that radio and commercial broadcasting operators, public and private television broadcasting operators, as well as mobile providers, disseminate alerts to inform the population of a hazard accurately and in a timely manner.

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[٤٦] Government of Sudan. (٢٠١٨). *Telecommunications and Post Regulating Act.*
[٤٧] Id.
[٤٨] Id. Chapter V, art. ٢٥. Num q.

Response phase

١. Ensure that providers of commercial fixed and mobile telecommunications services take the necessary measures to make available their networks and sufficient capacity for communications to the authorities and affected population, free of charge and in a timely manner, as soon as a disaster situation or emergency is declared.

٢. Require mobile service operators to provide SMS messages to their customers, and encourage them to use these messages instead of mobile data services. Also, require that commercial telecommunications, as well as fixed and mobile service providers to limit the duration of calls to, for example, a maximum of ٢ minutes in the geographic area of the disaster for a period of ١٢ hours following the event that generates the emergency. These norms would not apply to calls made from or to the numbers of the authorities involved in the emergency response.

٣. Ensure that providers of commercial fixed and mobile telecommunications services give priority in communications to calls made by the authorities for a period of ٢٤ hours after the emergency is declared, extendable as decided by the responsible authority (e.g. the TPRA).

٤. Oblige radio broadcasting, commercial and community operators, as well as public and private television broadcasting operators, to transmit messages to inform and update the public about the disaster. These messages could include helpful content regarding health services, shelter, food, and family reunification, among others.

٥. Oblige telecommunications service providers to immediately assess the damage to their networks and implement the previously prepared contingency plans, in order to re-establish communications as soon as possible.

٦. The TPRA could facilitate the issuance of authorizations for the use of the radioelectric spectrum on a temporary basis to national and / or international organizations for a period not exceeding ٦ months in order to attend the emergency. No charges should be generated for the temporary use of the radioelectric spectrum during the emergency.

Recovery phase

١. Require commercial and telecommunications service providers to reestablish permanent solutions after a disaster, in order to restore and improve communications to end users, with the aim of building back better.

Action Item ٦

The Telecommunication and Post Regulatory Authority should be held accountable for establishing specific regulations for the telecom/ICT sector on disaster risk management in the country. These regulations should be based on its functions granted by legislation, encouraging telecom/ICT network and service providers to actively participate in each one of the phases of disaster management.

٨,٢. Frequencie for Public Protection and Disaster Relief (PPDR)

The International Telecommunication Union (ITU) Region ١ frequency arrangements for broadband PPDR in the ٦٩٤-٧٩١ MHz frequency range in accordance with the Arab States are presented in Table ٤.

Table ٤: Frequency arrangement for broadband PPDF in the ٦٩٤ – ٧٩١ MHz frequency range

Frequency arrangement	Paired arrangements				Notes
	Mobile station TX (MHz)	Centre gap (MHz)	Base station TX (MHz)	Duplex separation (MHz)	
a)	698-703	50	753-758	55	2 × 5 MHz
b)	698-708	45	753-763	55	2 × 10 MHz
c)	698-713	40	753-768	55	2 × 15 MHz
d)	698-718	35	753-773	55	2 × 20 MHz

Source: Recommendation ITU-R M.٢٠١٥-٢

The implementation of PPDR in these frequencies is based on International Mobile Telecommunications (IMT) technology with bandwidths of ٢ x ٥ MHz, which has the potential to be harmonized in Region ١, and is in line with ٣GPP Band ٦٨.[49]

There are three models for PPDR using these frequencies:[50]

١. Model one: Exclusively public safety-dedicated network, with spectrum being used exclusively by public safety users.
٢. Model two: Shared public safety and commercial network, with distinct public safety and commercial network cores, and priority access and pre-emption rights for public safety use during emergencies and other times of need.
٣. Model three: Commercial network, *i.e.*, public safety users obtain services from one or multiple commercial providers.

The model to be used should be based in a specific study for Sudan, and should include an analysis of the compliance of the following general principles:[51]

- Interoperability: Allow first responders on the network to access other users, as authorized, from anywhere and at any time.
- Permanent access: Allow first responders to have permanent, immediate and uninterrupted access to the network.
- Coverage: Provide access in uncovered urban, rural and remote areas.
- Resilience: Be resilient and robust in meeting the access requirements mentioned above.
- Provide mission critical services: Offer mission critical services to first responders, including data and video.
- Security: Include network security mechanisms for information and data.

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[49] ITU (٢٠١٨) Recommendation ITU-R M.٢٠١٥-٢.
[50] Following "Progress Report on National Public Safety Broadband Network", Canada (٢٠٢٠).
[51] Id.

- Sustainability: Be friendly to the environment and establish resources to keep updated in the future, meeting the goals and needs required.
- Accessibility: Be accessible to the entire community of first responders.
- Spectrum use: Use spectrum efficiently and effectively.

Action Item ٧

The Telecommunication and Post Regulatory Authority should carry out the corresponding analysis and studies to decide which model (i. Public safety exclusive dedicated network, ii. Shared public safety and commercial network or iii. Commercial network) would fit Sudan's needs for broadband PPDR in the ٦٩٤-٧٩١ MHz frequency range.

٩. International Conventions or Treaties

٩,١. African Risk Capacity (ARC) Agreement[٥٢]

On July ١١ of ٢٠١٨, Sudan signed a Memorandum of Understanding (MoU) with the African Risk Capacity (ARC) to work together and better prepare to efficiently deal with extreme weather events and natural hazards. ARC was established in ٢٠١٢ as a Specialised Agency of the African Union to help Member States improve their capacities to better plan, prepare and respond to weather-related disasters; and particularly, to reduce the risk of loss and damage caused by extreme weather events affecting Africa's populations. This is accomplished by providing, through sovereign disaster risk insurance, targeted responses to natural hazards in a more timely, cost-effective, objective and transparent manner.

٩,٢. Tampere Convention

Sudan is a signatory to the Convention since December ٤[th], ١٩٩٨. However, the country has not given its consent to be bound by it.[٥٣]

The country should initiate the procedures to ratify the treaty and take the necessary legislative actions to apply the contents of the Convention to current legislation, adding or complementing the provisions of the current regulations regarding telecommunications for international assistance on DRM.[٥٤]

If the country ratifies the Convention, it is important that both the TPRA and the Ministry of Foreign Affairs, as well as the customs authority, initiate the required steps for its implementation. Likewise, it would be relevant to make some legislative and regulatory adjustments at the national level, complementing the current regulations on international assistance for disaster management. These steps will help all those involved in DRM in the country internalize and effectively adopt this legal framework for cooperation.[٥٥]

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[٥٢] Reliefweb. (٢٠١٨). *Sudanese Government signs MoU with African Risk Capacity to address impacts of extreme weather events.* Retrieved from:
https://reliefweb.int/report/sudan/sudanese-government-signs-mou-african-risk-capacity-address-impacts-extreme-weather
[٥٣] United Nations Treaty Collection. *Chapter XXV – Telecommunications.* Retrieved from:
https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXV-٤&chapter=٢٥
[٥٤] International Telecommunications Union (٢٠٢٠), *ITU Guidelines for national emergency telecommunication plans.*
[٥٥] Id.

In accordance with the above, and within the framework of the Tampere Convention, the responsible authority regarding telecom/ICT regulation, TPRA, must establish specific regulations for the implementation of the Convention, including, for example:[٥٦]

١. Exempt from any type of charge, including charges for the use of radio spectrum and for service license, among others, international aid provided through the Tampere Convention.
٢. Temporarily and expeditiously issue any authorization for the use of the radio spectrum that is necessary, in line with the provisions of national legislation.
٣. Simplify or exempt any other existing regulation that prevents the use of telecom/ICT resources from international aid under the Tampere Convention.

To execute the agreement, in the event of ratification, it is also recommended to inform the government entities of the cooperation framework so that stakeholders have a clear knowledge of the relevant legal provisions and can effectively apply them when a disaster strike.

٩,٣. International Cooperation

Finally, there are other mechanisms within the framework of international cooperation that Sudan can use to improve DRM. For example, the United Nations Office for the Coordination of Humanitarian Affairs; the United Nations Office for Disaster Risk Reduction; or the Emergency Telecommunications Cluster, can offer a set of tools that countries can use to promote more efficient disaster management.[57]

In particular, in relation to international cooperation for the management of telecom/ICTs for DRM, it is recommended that Sudan work together with the International Telecommunications Union (ITU), considering it develops different activities on issues of telecommunications for emergencies. These activities include the publication of manuals on emergency telecommunications; emergency radiocommunications specifications applicable to all phases of a disaster; databases of available frequencies for emergency radiocommunication services on land and space, and the International Emergency Preferences Scheme and a Common Alert Protocol, among others.[58]

Action Item ٨

١. Sudan must initiate the process to be bound by the Tampere Convention. To this end, it is recommended that both the National Council of Civil Defence, the Ministry of Foreign Affairs, the Customs Authority, and the Telecommunication and Post Regulatory Authority initiate the necessary steps for the ratification of the Convention. Subsequently, the necessary legislative and regulatory adjustments for the effective implementation of the Convention must be made by the relevant authorities.

٢. The Telecommunication and Post Regulatory Authority must establish specific regulations for the implementation of the Tampere Convention.

٣. Coordination and collaboration with different international agencies such as the ETC (Emergency Telecommunications Cluster) and the ITU (International Telecommunications Union) on issues of preparedness and response to eventual disasters or emergencies is imperative. This will avoid duplication of efforts and overlapping of work.

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[٥٦] Id.
[٥٧] Id.
[٥٨] Id.

Preparedness Phase

١٠.   Standard Operating Procedures (SOP)

Standard Operating Procedures (SOPs) are defined as formal written guidelines or instructions for incident response. They generally have both operational and technical components and allow emergency response personnel to act in a coordinated manner across all disciplines in the event of an emergency.[٥٩] These detailed instructions or procedures promote a uniform and standardized response during emergency response operations. These SOPs should be aligned with the legislative and regulatory frameworks as well as with the specific policies and plans related to DRM.

In addition, from a technical point of view, SOPs should consider the existing interoperability possibilities and, if necessary, the allocation of radioelectric spectrum in a specific band that allows communication to take place, based on the existing radio equipment. As such, it is important that Sudan maintains updated standard operating procedures, especially those regarding telecom/ICTs.

Action Item ٩

١. *Develop Standard Operating Procedures for emergency and disaster response related to communications within and between agencies and technical means for communication (voice/data), including interoperability.*

٢. *Define the government entities and the contact points (key decision makers) within these entities that must maintain communications during a disaster or emergency.*

٣. *Maintain an updated database with these focal points of every agency involved in disaster risk management.*

٤. *Analyse the possible interoperability between the equipment (wireless) and the communication networks of the government entities.*

٥. *Establish a set of radio frequencies that can be used for the communications of the contact points (key decision makers) compatible with the radiocommunication equipment being used.*

٦. *Establish alternative methods of communications if necessary, for example, through existing communication operators.*

٧. *Develop connectivity plans for the satellite equipment available to be used during a response phase as well as procedures for their use as primary or alternative communications between relevant stakeholders involved in disaster response.*

١١.   Contingency Plans

A contingency plan for telecom/ICT must include specific procedures depending on the unique characteristics of the location, such as the level of connectivity of the site, the available facilities or equipment deployed in the area, redundancy, and power sources, among other elements.

This contingency planning, in addition, should include solutions and alternatives that can be deployed to maintain operations and communications by the agencies responsible for DRM in the affected area. This should be helpful for making advance decisions on resource management, and to develop procedures for

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[٥٩] United States Department of Homeland Security (٢٠١٤), *National Emergency Communications Plan.*

the expected use of the full range of available technical and logistical responses, especially with respect to telecommunications.

Action Item ١٠

Public and private telecom/ICT networks and service providers, including terrestrial and satellite, whether mobile, fixed or broadcasting, must individually keep their contingency plans to respond to an emergency updated. Measures such as network redundancy, mobile base stations, secondary energy sources, satellite terminals stored and ready to use, among others, must be considered and included in the network design, mainly in those regions and communities at risk according to the hazard maps and risk assessments, and considering the network vulnerability analysis.

١٢.   Early Warning Systems

Warning and alerting systems are key to informing the public of any threat by a hazard and delivering important emergency information that enables the public to prepare and respond in a timely manner. The impact of a hazard could be significantly reduced if proper information is provided on time. Therefore, warning and alerting systems are critical to saving lives.

Fixed, mobile and broadcasting, terrestrial and satellite telecom/ICT services, are important tools to alert the community of impending disasters. Mobile broadcast technology can allow for the distribution of notifications via mobile operators, and mobile applications developed by governments can provide warnings and alerts as well. Digital broadcasting radio and television can also provide alerts and warnings to communities at risk.

Some of these solutions could be implemented in Sudan in joint cooperation between the government and the telecom/ICT service providers. The implementation of an Alert Aggregator based on Common Alerting Protocol (CAP) for multi-hazard alerts via different dissemination technologies, e.g., cell broadcast, should be a priority for the government.

The Common Alerting Protocol (CAP) is one of the most efficient mechanisms to warn people of a disaster immediately and communicate a few key facts of any emergency through different means, such as through mobile and landline telephones, Internet, sirens, broadcast radio and television, cable television, among others. The government should implement CAP alert systems following the ITU recommendations.

Action Item ١١

Sudan must develop surveillance and monitoring systems for probable threats prior to the occurrence of disasters and/or emergencies, e.g., through the Remote Sensing Authority (RSA). With the cooperation of the telecom/ICT service providers, solutions to warn and alert the public must be implemented, i.e., through cell broadcast technology or broadcasting networks (radio and TV).

The Common Alerting Protocol (CAP) is one of the most efficient mechanisms to alert the population of a hazard and to provide information and communicate relevant facts to the population at risk.

١٣.   Drills and Training

The development of an effective NETP should consider including practical strategies that improve the capacities and training of all people involved in the management of emergency telecom/ICT. This is important because taking into account the development of these capabilities improves the speed, quality and effectiveness of emergency preparedness and response.

The Emergency Telecommunications Table-top Simulation Guide, developed by the ITU (٢٠٢٠), as well as the online training tool on How to Develop Tabletop Simulation Exercises (TTX), provide all the relevant information needed to develop and carry out this type of exercises.[٦٠]

Action Item ١٢

Telecommunications trainings and drills for emergencies should be regularly carried out in order to improve emergency responders' capacity with communications equipment, as well as to enhance their ability to execute policies, plans and procedures governing the use of communications networks. The telecom/ICT sector should actively participate in this drills and exercises, and develop and carry out their own, to effectively implement the NETP.

١٤.   Support for People with Specific Needs

Telecom/ICTs can also be a key tool in disaster response and management operations to reach traditionally marginalized or especially vulnerable groups before, during and after a disaster. Telecom/ICTs can use multiple modes and channels, such as TV, radio, SMS-text messages, or the different Internet-based services and resources: video, instant messaging over the Internet, web conferencing, and social networks, among others, which all allow instant communication and sharing of photos and/or videos and satellite communications.[٦١]

In that sense, dissemination of disaster preparedness and planning content should be provided in multiple formats. For example, subtitles can be included in visual communications so that persons with auditive difficulties could receive the message; or visual and sound alerts could be introduced in public spaces in order to meet the needs of as broad a swath of the population as possible.

Action Item ١٣

Sudan's authorities, working together with network operators and telecom/ICT service providers, should develop mechanisms to understand the accessibility requirements needed to guarantee that vital digital communication technologies are inclusive and therefore accessible to all persons, including people with disabilities, the elderly, women and girls, as well as refugees and immigrants. This should be linked to the

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[٦٠] These documents can be consulted in the following links: https://www.itu.int/en/ITU-D/Emergency-Telecommunications/Documents/Publications/٢٠٢٠/TTX_Guide.pdf
https://academy.itu.int/index.php/training-courses/full-catalogue/practical-disaster-response-how-develop-table-top-simulation-exercises-ttx

[٦١] Id.

early warning systems to be developed in the country so that people receive and understand the alerts for early actions to take place.

Response Phase

١٥. Communication and Coordination

In the response phase, all contingency plans and standard operating procedures developed in the mitigation and preparedness phases must be executed. Telecom/ICTs must be determined to enable communications between first responders, decision makers in the government and the community.

During the disaster response phase, authorities can establish emergency operations centres or communication and coordination command posts to provide critical communications to users in each organization involved. These positions can be fixed or mobile, local or remote, and could be located in a vehicle or in a shelter, among other possibilities.

The functions of these centres or posts are to assess the emergency situation, inform a dispatcher, and identify and request appropriate resources when necessary. Therefore, these command posts should be in contact with each other (one in a remote location outside the perimeter of potential danger, and the other one at the site of the emergency, for example), in order to respond to the direct requirements that are generated in the emergency area, to dispatch equipment and personnel, anticipate the need to provide more support and assistance, and position additional resources in the area.

Considering this, it is important to maintain interoperable and continuous communications between command posts and between the rest of the stakeholders involved in the response to the emergency. As such, it is necessary to use all available means of communication and maintain close coordination with the various agencies involved.

SOPs and contingency plans, including temporary satellite connectivity and any other available means of communication, are particularly important when terrestrial networks are affected by the emergency situation, and key decision makers need to communicate to coordinate the emergency response.

Action Item ١٤

Consider planning for the development of emergency operations centres or communication and coordination command posts to provide critical communications to users in each organization involved during the response phase of a disaster. These positions can be fixed or mobile, terrestrial or satellite, local or remote, and could be located in a vehicle or in a shelter, among other possibilities. Maintaining interoperable and continuous communications between command posts and the rest of the stakeholders is vital for an effective response to the emergency.

١٦.   Collection and Analysis of Information

A key element during the response phase of disaster management is to develop ICT assessments to prioritize the deployment of critical ICT infrastructure to the most affected areas, and to collect and analyse information related to the immediate needs of the population affected by the emergency to manage the safe delivery of the response. Gathering and evaluating information is particularly important because this information can be communicated in a timely manner to the corresponding authorities (e.g. health entities, firefighters, civil police, among others), and to respond to the needs of the affected population as soon as possible.

For achieving this, it is necessary to use all the available telecom/ICT networks, and to include the collection of geospatial information from the disaster, for example using the Remote Sensing Authority's services[١٢] to analyse the information obtained and coordinate the response planning geographically.

١٧.   Emergency Awareness and Updates

During the response phase, it is also necessary to continue monitoring and warning of *new risks* to the affected population and to disseminate updates about the emergency situation.

To achieve this goal, multiple methods of communication such as sound and television broadcasting, text messages and/or audio messages through mobile operators, social networks, applications, among others, should be employed.

Call centres should be established in order to connect affected populations with their relatives during the response phase. Generally, these call centres can be located in shelters, and should use means of communication that do not congest the networks, for example, text messages. These call centres can also be established in collaboration with telecom/ICT operators in additional locations such as hostels and hotels.

In the event that the country does not have the capacity (*e.g.* equipment, human or financial resources) to establish this type of call centres, this service can be provided by international organizations, such as the UN through one of its branches. In the Central African Republic, for example, the Emergency Telecommunications Cluster established a dedicated Covid-١٩ call centre in the country's capital, Bangui, in order to give advice to callers and to refer potential cases of Covid-١٩ to the Ministry of Health as part of the national response to the pandemic.[١٣]

Action Item ١٥

During the response phase, call centres should be established to warn the affected population of new risks, to disseminate updates about the emergency situation, and to connect affected populations with their relatives. Generally, these call centres can be located in shelters, and should use means of communication that do not congest the networks, for example, text messages. To establish these call centres, Sudan could

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[١٢] Retrieved from: http://www.un-spider.org/sites/default/files/٢٠١٥Beijing/Workinggroup١_٤_Amna٪٢٠Hamid٪٢٠Elton_RSSA.pdf
[١٣] ETC (٢٠٢٠). Central African Republic – Situation Report # ٣٧. Available at: https://www.etcluster.org/sites/default/files/documents/ETC٪٢٠CAR٪٢٠SitRep٪٢٠٣٧_July٪٢٠٢٠.pdf

use satellite networks, that can be easily installed, or seek collaboration with telecom/ICT operators or international organizations to establish the required telecom/ICT infrastructure.

Recovery Phase

١٨. Assessment of damage, reconstruction and improvement of telecom/ICT infrastructure

During the recovery phase, the damage caused to the telecom/ICT networks should be evaluated as a precursor to timely reconstruction and improvement of the damaged infrastructure. This reconstruction should seek, at a minimum, to restore communications to the same conditions as they were before the disaster. But, preferably, ICT infrastructure should be rebuilt on the principle of *building back better*; that is, reconstructing a more resilient infrastructure that can withstand future disasters.

It is necessary to maintain the availability of a minimum level of communications for those who carry out the damage assessment and reconstruction activity and to establish communication priorities in order to manage available communications resources.

Action Item ١٦

Restoration and reconstruction of the telecom/ICT infrastructure should be based on lessons learned and on the principle of building back better. Also, these activities should involve the active participation of the private sector, including fixed, mobile and satellite network and service providers.

١٩. Recovery Activities Follow-up

Telecom/ICTs must have the capacity to support the recovery activities of the affected area after the disaster. This includes continuing to transmit relevant information for, among other objectives, updating the public on the emergency on topics such as health services, shelter, food, or family reunification.

Action Item ١٧

Based on the experience acquired during the disaster management, a report should be developed after the response and recovery phases identifying lessons learned and including necessary modifications and improvements that should be made to the NETP. The NETP should be updated every ٢ to ٣ years.

Annexes

The following information must be collected and included in Sudan's NETP taking into account the confidentiality needed in specific cases, e.g., coverage of commercial networks.

A١. Inventory of Telecom/ICT networks

Radio broadcasting

Company	Station Name	Transmitter Location (address)	Frequency (FM/AM)	Coverage (localities)

Television broadcasting

Company	Station Name	Transmitter Location (address)	Frequency	Coverage (localities)

Mobile providers

Mobile Provider	Coverage (District, Cities/Localities)	Technology (٢G, ٣G, ٤G)

Fixed providers

Fixed Provider	Coverage (District, Cities/Localities)	Technology	Service

Satellite

[Satellite equipment, equipment location, voice and/or data services, satellite provider, frequencies, etc.]

Amateur Radio

[Network specifications to be provided, e.g., repeater locations, frequencies, voice and/or data service, type of equipment, etc.]

A٢. Disaster management network

[Frequencies of operation (HF, VHF, UHF, etc.), repeater locations – radio sites, inventory of mobile and portable radio terminals, callsigns, who is responsible for the equipment/network, etc.]

A٣. Private networks

[Name/owner, site locations, frequencies, coverage, etc.]

A٤. Contact information

[Contact information of key people from the government and the private sector (networks), who need to have priority in their communications in case of an emergency]

Name	Institution	Private/Public	Contact information

A٥. International telecom/ICT support

[Contact information of key telecom/ICT people/international organizations for disaster relief]

Name	International Organization	Contact information

A٦. Standard Operating Procedures

[SOPs for communications within the National Council of Civil Defence (NCCD), and between the NCCD and other bodies involved in disaster risk management and high-level government authorities, first responders, etc. What means of communication will be used? (including wireless technology, frequencies, equipment, etc.) What are alternative means of communication?]

A٧. Contingency Plans

[Summary of contingency plans from telecom/ICT services providers. The detailed plans are generally not made publicly available.]

Acronyms

CAP	Common Alerting Protocol
COC	Central Operations Chamber
DRM	Disaster Risk Management
ETC	Emergency Telecommunications Cluster
FAO	Food and Agriculture Organization
FMOH	Federal Ministry of Health
GNEPTS	General National Emergency Plan for the Telecommunications Sector
HAC	Humanitarian Aid Commission
IFRC	International Federation of Red Cross and Red Crescent Societies
ISP	Internet Service Provider
ITU	International Telecommunications Union
MNO	Mobile Network Operator
NCCD	National Council of Civil Defense
NETP	National Emergency Telecommunications Plan
NGO	Non-Governmental Organization
NTC	National Telecommunications Corporation
SOP	Standard Operating Procedure
SRCS	Sudanese Red Crescent Society
telecom/ICT	telecommunications and Information and Communication Technologies
TPRA	Telecommunication and Post Regulatory Authority
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
WFP	World Food Programme

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١٠. World Health Organization. (٢٠١٠). Emergency Country Profile – Sudan.