EPREV REPORT

IAEA

Emergency Preparedness Review

EPREV

PEER APPRAISAL OF THE ARRANGEMENTS IN THE REPUBLIC OF KENYA REGARDING THE PREPAREDNESS FOR RESPONDING TO A RADIATION EMERGENCY

2015-03-01 to 2015-03-10

International Atomic Energy Agency

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FOREWORD

Within the United Nations system, the International Atomic Energy Agency (IAEA) has the statutory functions of establishing standards of safety for the protection of health against exposure to ionizing radiation, and of providing for the application of these standards. In addition, under the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention) the IAEA has a function, if requested, to assist Member States in preparing emergency arrangements for responding to nuclear accidents and radiological emergencies.

In response to a request from the Government of Kenya, the IAEA fielded an Emergency Preparedness Review (EPREV) mission to conduct, in accordance with Article III of the IAEA Statute, a peer review of Kenya's radiation emergency preparedness and response arrangements vis-à-vis the relevant IAEA standards.

The number of recommendations, suggestions and good practices is in no way a measure of the status of the emergency preparedness and response system. Comparisons of such numbers between EPREV reports from different countries should not be attempted.

Contents

Executive Summary

This report provides the results of the Emergency Preparedness Review (EPREV) mission to Kenya from 1–10 March 2015. The mission was undertaken by the International Atomic Energy Agency (IAEA) in response to a request from the National Disaster Operations Centre (NDOC) and the Kenya Nuclear Electricity Board (KNEB), the National Liaison Officer. EPREV missions are designed to provide a peer review of emergency preparedness and response (EPR) arrangements in a country, based on the IAEA Safety Standards. This mission represents the first peer review mission to use the newly approved General Safety Requirement (GSR) Part 7, which was approved by the IAEA Board of Governors on 3 March 2015. The team for the EPREV mission consisted of international EPR experts from IAEA Member States as well as a team coordinator from the IAEA Secretariat.

This report includes recommendations and suggestions for improvements based on safety requirements and good practices that are considered as models for other Member States. In some cases, improvements in line with the detailed findings are already being undertaken. In other cases, the Government of Kenya should adopt an action plan to implement the recommendations and suggestions.

The findings in the report are applicable to the current hazards in the country, focusing on radiological hazards. Since Kenya is pursuing a nuclear power programme under Vision 2030, the report also notes, where applicable, implications for emergency preparedness and response that must be addressed prior to a nuclear power plant (NPP) becoming operational. By conducting the EPREV mission now, Kenya is able to address many recommendations and suggestions which are applicable to all nuclear or radiological emergencies. This will allow the country to focus on the additional emergency preparedness and response requirements for nuclear power plants should one be constructed.

The EPREV team considers it the highest priority for Kenya to define its national coordinating mechanism for radiation emergency preparedness and response. The coordinating mechanism in Kenya has historically been led at the national level by the NDOC. In 2013, as a result of the increase in security related emergencies and disasters in the country, a new National Disaster Management Unit (NDMU) was created "to be the leading emergency and disaster management unit in Kenya." This has led to significant progress in preparing for conventional emergencies, but has temporarily resulted in uncoordinated preparedness efforts with regard to radiation emergencies. The national coordinating mechanism consists of a group of stakeholders and organizations that are responsible for preparedness arrangements. Responsibility for implementing specific arrangements under the coordinating mechanism may fall to different organizations. The national coordinating mechanism should include relevant expertise from line ministries, in particular the technical expertise in the Radiation Protection Board (RPB). The organizations defined as members of the national coordinating mechanism are collectively responsible for:

- Ensuring that the nuclear or radiological emergency arrangements are coordinated with those of conventional (all-hazards) emergencies;
- Coordinating a national radiation hazard assessment;
- Coordinating arrangements and resolving differences and incompatibilities;
- Ensuring that functions and responsibilities are clearly assigned and understood by all;
- Coordinating communication with the public in preparedness for a nuclear or radiological emergency.

The national coordinating mechanism should focus on conducting a national hazard assessment for nuclear or radiological emergencies in order to establish a planning basis. The hazard assessment should identify facilities and activities in which radioactive materials are used and also consider sources outside of regulatory control (e.g., detection of undeclared material at ports or borders). The hazard assessment should consider possible emergencies resulting from these events, including very low probability events, and their consequences.

The planning basis established by the hazard assessment should be included in a national level radiation emergency preparedness and response plan. There are currently three such documents, resulting from the temporary duplication of preparedness responsibilities:

- National Emergency Response Plan & Standard Operating Procedures (NDMU, Approved June 2014);
- Draft National Radiation Emergency Plan (NDOC);
- Draft Kenya National Chemical, Biological, Radiological, and Nuclear (CBRN) Response Plan (NDOC).

The National Emergency Response Plan (NERP), while approved, does not address nuclear or radiological emergencies. The two draft plans do include these hazards, but overlap on preparedness and response arrangements with the NERP. Whichever national plan will eventually be adopted, it by Kenya should be coordinated with plans and procedures drafted by the line ministries, county and local governments, operating organizations and relevant facilities. In particular, the Kenya Airports Authority, Kenya Maritime Authority and Kenya Ports Authority have developed plans and procedures for Jomo Kenyatta International Airport in Nairobi and the Port of Mombasa & Kilindini Harbour that could be used as examples for other organizations and facilities.

The team noted throughout the mission a consistent adoption of the Incident Command System (ICS) by response organizations at all levels throughout the country. Individuals not only knew the basis of the system, but had ready access to guides and incident management handbooks that defined their roles, responsibilities, and integration into the command and control structure during a disaster or emergency. The widespread implementation of the ICS in the country will allow for its rapid adoption to nuclear or radiological emergencies as well.

The EPREV team also noted the excellent cooperation between the NDOC, NDMU, RPB and all the stakeholders and response organizations in the implementation of the mission and in detailed discussions regarding the EPR arrangements in the country.

This report serves as the final record of the EPREV mission. The IAEA will continue to work with Kenya through existing projects to continue to improve EPR arrangements. It is expected that Kenya will develop an Action Plan to implement the recommendations and suggestions in the report, and will invite the IAEA for an EPREV follow-up mission to review the implementation.

1. Introduction

1.1. Objective and Scope

The purpose of this EPREV mission was to conduct a review of Kenya emergency preparedness and response arrangements and capabilities. The EPREV focused on emergency preparedness Categories III and IV. In light of the fact that Kenya is embarking on a nuclear power programme, additional consideration was given to the national preparations and arrangements for Category I. The review was carried out by comparison of existing arrangements against the relevant IAEA safety standards.

It is expected that the EPREV mission will facilitate improvements in Kenya's emergency preparedness and response arrangements, and those of other Member States, from the knowledge gained and experiences shared between Kenya and the EPREV team and through the evaluation of the effectiveness of the Kenyan arrangements, its capabilities and its good practices.

The key objectives of this mission were to enhance nuclear and radiation safety, emergency preparedness and response, by:

- Providing Kenya with an opportunity for self-assessment of its activities against IAEA safety standards;
- Providing Kenya with a review of its emergency preparedness and response arrangements;
- Providing Kenya with an objective evaluation of its emergency preparedness and response arrangements with respect to IAEA safety standards and guidelines;
- Providing Kenya with recommendations and suggestions for improvement;
- Contributing to the harmonization of emergency prepradeness and response approaches among IAEA Member States;
- Promoting the sharing of experience and exchange of lessons learned;
- Providing key staff in Kenya with an opportunity to discuss their practices with reviewers who have experience with different practices in the same field;
- Providing reviewers from IAEA Member States and IAEA staff with opportunities to broaden their experience and knowledge of EPR; and
- Providing other States with information regarding good practices identified in the course of the review.

1.2. Preparatory Work and Review Team

At the request of the Government of Kenya, a preparatory meeting for EPREV was conducted from 30 September 2014 to 1 October 2014. The preparatory meeting was carried out by the appointed Team Coordinator, Mr Mark BREITINGER, and Kenyan counterparts.

The particpants held discussions regarding EPR (and policy issues) with the Liasion Officer, Dr Edward Kiema KISENGE, and personnel from key organizations in the host country. The discussions resulted in agreement of the scope of the EPREV mission.

Dr KISENGE made presentations on the national context, the current status of EPR in Kenya and the self-assessment results to date.

IAEA staff presented the EPREV principles, process and methodology. This was followed by a discussion on the tentative work plan for the implementation of the EPREV mission in March 2015.

1.3 Reference for the Review

The primary reference for the review is IAEA Safety Standards Series Safety Requirement No. GSR Part 7, *Preparedness and Response for a Nuclear or Radiological Emergency* [1]. In addition, Safety Guides GSG-2, *Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency* [2], and GS-G-2.1, *Arrangements for Preparedness for a Nuclear or Radiological Emergency* [3], were used as review criteria.

The terms used in this report are consistent with those found in the IAEA standards referred to in the above paragraph.

2. DETAILED FINDINGS ON GENERAL REQUIREMENTS

2.1. Emergency management system

The Constitution of Kenya, Rev. 2010, defines disaster and emergency management and clearly outlines the roles of the national and county governments in this respect.

The Ministry of Interior is given the role of policy making body for disaster and emergency management by Presidential Order No. 2/2013. The same order also recognizes the National Disaster Operation Centre (NDOC) within the Ministry of Interior and Coordination of National Government as the coordinating body for emergency response.

In August 2013, a new entity, the National Disaster Management Unit (NDMU), was established by a Presidential Directive (CAB/NSC/14/2/32) as, "an effective and competent disaster management unit", in an effort to strengthen and coordinate disaster management in the country.

The Radiation Protection Act of 1982 (CAP 243) established the Radiation Protection Board (RPB) within the Ministry of Health as the regulator, overseeing safety and security of radioactive and nuclear material. The RPB is also the designated National Competent Authority (NCA).

The emergency management system in Kenya is defined by the National Emergency Response Plan (NERP), drafted by NDMU and adopted in June 2014. The plan gives NDMU overall leadership for preparedness and response to natural and human made hazards. The objective of the NERP is to administer a comprehensive emergency/disaster programme in collaboration with stakeholders in order to save lives, protect property and safeguard development gains. However, the plan does not address radiation emergencies.

There are drafts of two national emergency plans that have been developed in parallel to the NERP, which do address radiation emergencies. These plans are the Draft National Radiation Emergency Plan (NREP) and the Draft Kenya National Chemical, Biological, Radiological, and Nuclear (CBRN) Response Plan. These plans were prepared by the NDOC in cooperation with the RPB.

Recommendation 1.
Observation: The National Emergency Response Plan is a state level document establishing the emergency management system. However, radiation emergency preparedness and response is not addressed.
Basis for recommendation: GSR Part 7, paragraph 4.1, states: "The government shall ensure that an emergency management system is established and maintained on the territories and within the jurisdiction of the State for the purposes of emergency response to protect human life, health, property and the environment in the event of a nuclear or radiological emergency."
Recommendation: The government should ensure that there is a single national plan that addresses radiation emergency preparedness and response, and that it is consistent with existing all-hazards arrangements in the country.

While the emergency management system is defined by the NERP, the NERP is a new document, and not all stakeholders are aware of the plan and understand it in the same way. Response organizations such as the Kenya Ports Authority (KPA), Kenya Maritime Authority (KMA) and Kenya Airports Authority (KAA) have developed sector specific plans and are unaware of the existence of the NERP. In addition, authorities such as the RPB were unaware of the newly defined emergency management system contained within the NERP.

Recommendation 2.
Observation: Not all stakeholders are aware of the new emergency management system defined in the National Emergency Response Plan.
Basis for recommendation: GSR Part 7, paragraph 4.1, states: "The government shall ensure that an emergency management system is established and maintained on the territories and within the jurisdiction of the State for the purposes of emergency response to protect human life, health, property and the environment in the event of a nuclear or radiological emergency."
Recommendation: The government should ensure that all stakeholders and response organizations are aware of the emergency management system, in particular the NERP, and that it is implemented accurately in related plans and procedures.

2.2. Roles and responsibilities in emergency preparedness and response

General

The NDMU is charged, among other roles and responsibilities, with the overall leadership, coordination, control, monitoring, and response management during disasters. The National Disaster Operation Centre (NDOC) is the national centre to coordinate disaster management efforts by serving as a focal point for resource tracking, dispatching and situational awareness.

The draft NREP recognizes the role of the NDOC as the organization responsible for implementing policies communicated from the Ministry of Interior and Coordination of National Government for disaster and emergency management, but without providing any more details. This draft plan also recognizes the NDOC as the institution in charge of coordinating and managing response for emergencies. The RPB is, however, tasked in the draft NREP with coordination of incidents involving radioactive or nuclear materials in response, recovery and storage; providing technical expertise, specialized equipment and personnel support; and providing shielding and storage for radioactive materials.

Similarly, the draft Kenya National CBRN Response Plan tasks the NDOC with coordination and management of the response; and the RPB with coordination of emergencies involving radioactive materials in response, recovery and storage; providing technical expertise, specialized equipment and personnel support; and providing shielding and storage for radioactive materials. This draft plan includes a list of facilities and activities in Kenya.

Recommendation 3.
Observation: Roles and responsibilities in emergency preparedness and response are not clear. There is one plan in force and two in the draft stage that are not consistent in regard to the clear allocation of roles and responsibilities for a nuclear and radiological emergency among operating organizations, the regulatory body and response organizations.

Recommendation 3.
Basis for recommendation: GSR Part 7, paragraph 4.7, states: "The government shall ensure that all roles and responsibilities for preparedness and response for a nuclear or radiological emergency are clearly allocated in advance among operating organizations, the regulatory body and response organizations."
Recommendation: The government should ensure that the national emergency response plan for emergency preparedness and response integrates all relevant plans and procedures from response organizations, operating organizations and sector specific plans such as those at ports and airports.

Coordinating mechanism

There is no defined national coordinating mechanism as specified in GSR Part 7. The responsibilities of each stakeholder and response organization are not currently defined, resulting in a system where expertise in certain areas is not recognized and incorporated into preparedness efforts including planning, training, equipping, and exercising. Specifically, the technical expertise of the RPB, while recognized across the government, has not been actively engaged in planning and preparedness efforts. This directly affects the usability and relevance of the hazard assessment, and the ability to establish a planning basis for nuclear and radiological emergencies, as discussed further in GSR Part 7, Requirement 4, *Hazard Assessment*. This has resulted in inconsistent responsibilities and planning efforts for radiation emergencies, which is reflected in the fact that the NDMU works on the basis of the NERP, while the NDOC and other agencies are actively working to draft the NREP and the National CBRN Response Plan. Moving to a single, defined national coordinating mechanism would result in increased abilities to communicate preparedness information to the public in order to establish and maintain public trust prior to an emergency.

This national coordinating mechanism will take on increased importance if Kenya will pursue a nuclear power programme, as the number of stakeholder and response organizations will increase commensurate with the increased hazard associated with an NPP.

Recommendation 4.
Observation: There is no defined national coordinating mechanism for the preparedness stage, resulting in overlapping plans and procedures, and missed opportunities to leverage existing expertise in certain areas.
Basis for recommendation: GSR Part 7, paragraph 4.10, states: "The government shall establish a national coordinating mechanism to be functional at the preparedness stage, consistent with its emergency management system." The document continues to define the specific functions of the national coordinating mechanism.
Recommendation: The government should establish a national coordinating mechanism for emergency preparedness for radiological emergencies.

Regulatory body

The RPB has been assigned the role of the Regulatory Body and issues licenses to facilities and activities using sources of ionizing radiation. All operating organizations are required to appoint a Radiation Safety Officer (RSO) to enforce a code of practice (COP) developed specifically for that activity or facility. COPs contain procedures to handle radiological emergencies, but the specified responsibilities of the RSO do not include any responsibilities related to an effective response on the site. In discussions with the RPB personnel, it was

stated that guidelines to develop COPs exist, but they were not made available to the team. It was also stated that emergency preparedness and response arrangements would be addressed in greater detail in the new 'Nuclear and Radiation Safety Bill' that is under development.

Recommendation 5.
Observation: No principles, requirements and associated criteria that are specific for emergency preparedness and response of the operating organization are stipulated within the provided legislation.
Basis for recommendation: GSR Part 7, paragraph 4.13 states: "The regulatory body shall require that arrangements for preparedness and response for a nuclear or radiological emergency be in place for the on-site area for any regulated facility or activity that could necessitate emergency response actions. Appropriate emergency arrangements shall be established by the time the source is brought to the site, and complete emergency arrangements shall be in place before the commencement of operation of the facility or commencement of the activity. The regulatory body shall verify compliance with the required arrangements."
Recommendation: The regulatory body should require, ensure and verify that each operating organization develops arrangements for preparedness and response for a nuclear or radiological emergency.

If Kenya pursues a nuclear power programme, the role and expertise of the regulatory body will need to be expanded to ensure that adequate emergency arrangements are in place for the NPP.

Operating organizations

None of the facilities visited was able to produce emergency procedures. In discussions with staff from the operating organizations, emergency procedures were only loosely defined and understood by a few individuals. The first visit was made to the Kenya Agricultural Research Institute (KARI), an institution licensed to use a cobalt-60 irradiator for sterilizing tsetse flies in an effort to reduce incidence of African trypanosomiasis. The RSO was asked what would be done if the source got stuck. The RSO pointed out a handle to manually return slugs into the safe position, but there were no radiation safety protocols to be followed to conduct this procedure.

The second visit was made to the International Livestock Research Institute (ILRI), licensed to use a caesium-137 irradiator for biological cell labelling. While a management system was maintained by the institute and regular training on emergency matters were conducted, no radiation safety protocols were followed when entering the room with the irradiator and the room designated for the storage of radioactive waste.

The operators are, however, aware and understand many nuclear security related requirements. At both visited facilities, KARI and ILRI, technical measures such as fences, walls, cages, locks and interlocks for doors, as well as administrative measures, including access control procedures, alarmed access points, key control procedures and closed-circuit television (CCTV), are in place. However, these security measures are not integrated into radiation safety measures.

Recommendation 6.
Observation: Facilities and activities, including emergency preparedness category III facilities with Category I sources, were not able to demonstrate the existence of

Recommendation 6.
emergency preparedness or response arrangements.
Basis for recommendation: GSR Part 7, paragraph 4.16 states: "The operating organization shall establish and maintain arrangements for on-site preparedness and response for a nuclear or radiological emergency for facilities or activities under its responsibility, in accordance with the applicable requirements."
Recommendation: Operating organizations should develop and implement radiation emergency preparedness and response arrangements which are consistent with the emergency management system and nuclear security system.

If Kenya pursues a nuclear power programme, the operating organization will need to coordinate closely with national, regional and local authorities to ensure that emergency preparedness and response arrangements are in place prior to fuel being loaded in the NPP.

2.3. Hazard assessment

A limited hazard assessment has been conducted as part of the draft NREP but has not been finalised. It was not considered during the development of the NERP. The use of Category I sources in multiple facilities and activities places Kenya in emergency preparedness category III, as defined in GSR Part 7. In all, Kenya uses a wide range of sources in all five source categories. Despite this, and notwithstanding the occurrence of security incidents throughout the country, neither the government nor the operating organizations have made arrangements to respond to the emergencies resulting from the use of radioactive materials, including incidents during transport.

A hazard assessment is used to establish the planning basis for the national emergency preparedness and response plan. A hazard assessment associated with nuclear or radiological facilities is conducted to identify potential hazards and related consequences, such as doses that could be incurred. The next step would be to categorize nuclear or radiological facilities and activities into emergency preparedness categories I, II, III, IV or V, in accordance with the GSR Part 7. These categories of facilities would then be used as planning basis for the emergency preparedness and response plans following a graded approach.

If Kenya decides to pursue a nuclear power programme, this will place the country in emergency preparedness category I and will necessitate the updating of EPR arrangements at the national level.

Recommendation 7.
Observation: The government has not finalised a hazard assessment as part of the preparedness efforts.
Basis for recommendation: GSR Part 7, paragraph 4.18 states: "Hazards identified and potential consequences of an emergency shall provide a basis for establishing arrangements for preparedness and response for a nuclear or radiological emergency. These arrangements shall be commensurate with the hazards identified and the potential consequences of an emergency."
Recommendation: The government should conduct a hazard assessment to establish a planning basis for emergency preparedness and response arrangements that is coordinated with a nuclear security threat assessment and identifies facilities and activities where radiological emergencies are possible.

2.4. Protection strategy for an emergency

Dose limits are set in Radiation Protection (Standards) Regulations, 1986, Rev. 2012. There are no special limits set for emergency situations. The limit to prevent deterministic effects for radiation workers is set to 500 mSv and 50 mSv for stochastic effects. There are no operational intervention levels defined, nor are there any protection strategies in place. The IAEA GSG-2 [2] standard has not been implemented.

Firefighters and members of the Disaster Response Unit (DRU) under the Kenya Defence Forces use criteria from the Unites States for on scene actions, which is due to the fact that a number of CBRN training courses were organized as part of bilateral international assistance to Kenya.

This requirement takes on added importance for countries in emergency preparedness category I, meaning those with NPPs.

3. DETAILED FINDINGS ON FUNCTIONAL REQUIREMENTS

3.1. Managing emergency response operations

Kenya's disaster profile is dominated by droughts, fires, floods, technological accidents, diseases and epidemics that disrupt people's livelihoods, destroy the infrastructure, divert planned use of resources, interrupt economic activities and slow development. The NERP has been formulated to respond timely and effectively to disasters.

The NDMU is tasked with command and control during large disasters in Kenya, including on-scene incident management. Smaller incidents and emergencies are handled by the senior police officer at the scene. After activation of the NERP, the command and control of the disaster emergency will take place at a Joint Operation Centre (JOC) and will be led by the Director of the NDMU. The NERP states that national level coordination will be established at the NDMU headquarters, unless the disaster a dictates different course of action.

The NDMU is responsible for overall leadership coordination and control and management of disasters. The Director of the NDMU is authorized to mobilize resources to respond and recover from the effects of disaster emergencies or the threat of a disaster emergency. The NDMU has adopted an Incident Command System (ICS) with clear leadership for management of disaster events in the country.

The broad implementation of the ICS allows for a standardized on-site and off-site response and provides a system for decision making during an emergency. It also enables a flexible and scalable framework to be used to respond appropriately to any emergency. The implementation of this system should be expanded to include the unique decisions and authorities needed during a radiation emergency.

Good practice 1.
Observation: All response organizations, facilities and activities visited and interviewed during the mission not only knew that the Incident Command System (ICS) was the designated system for managing disasters and emergencies, but had at least some expertise and guides on the operation of the ICS.
Basis for good practice: GSR Part 7, paragraph 5.7 states: "Arrangements shall be made for the establishment and use of a clearly specified and unified command and control system for emergency response under the all-hazards approach…"
Good practice: Kenya has adopted and widely implemented the Incident Command System for managing the response to disasters and emergencies across the country.

3.2. Identifying, notifying a nuclear or radiological emergency and activating an emergency response

Facilities and activities licensed by the RPB use the RPB as a notification point for emergencies. The RPB maintains a roster of duty officers for receiving these notifications; however, this is not in place 24/7.

Suggestion 1.

Suggestion 1.
Observation: The Radiation Protection Board maintains a roster of on-call officers as a notification point, but not on a 24/7 basis.
Basis for suggestion: GSR Part 7, paragraph 5.11, states: "The notification point(s) shall be maintained continuously available to receive any notification or request for support and to respond promptly or to initiate a preplanned and coordinated off-site response …"
Suggestion: The Radiation Protection Board should consider extending the duty roster of its on-call officers to be continuously available in order to be able to receive prompt notification of emergencies.

For radiological emergencies that do not occur at an authorized facility or activity, such as transportation accidents or detections at ports or borders, there is no general national emergency number that members of the public could use to reach emergency services. There was such a number in the past, but it was discontinued as a result of budget cuts. Currently, there are several multi-digit phone numbers for accident, fire, medical and security emergencies, and it sometimes happens that a number of units respond to the same emergency unnecessarily. In Nairobi only, the police can be contacted by using the number '999'. There are no procedures or arrangements for any of the call centres or emergency services to follow when they are notified of a possible radiation emergency.

During the EPREV mission, discussions with the Kenya Communications Authority, the NDMU and the NDOC discovered that the previous system could be re-implemented at no cost to the line ministries, as it is a system of national significance.

Recommendation 8.
Observation: Emergency notification points are not capable of adequately initiating a response to a radiological emergency.
Basis for recommendation: GSR Part 7, paragraph 5.11, states: "Off-site notification point(s) shall be established to receive notification of an actual or potential nuclear or radiological emergency. The notification point(s) shall be maintained continuously available to receive any notification or request for support and to respond promptly or to initiate a preplanned and coordinated off-site response appropriate to the emergency class or the level of emergency response. The notification point(s) shall have immediate communication with the response organizations that are providing support using suitable, reliable and diverse means of communication."
Recommendation: The government should ensure that all operations centres receiving notifications from the public are adequately trained to initiate a coordinated response to a radiological emergency.

In certain cases, the NDOC may deploy an assessment team to perform an initial assessment and to determine the need for additional resources. However, this team is not able to detect or assess a radiological emergency. The same is true for other first responders, such as those dispatched by the NDMU, who, during the course of interviews, were not aware of the trefoil warning sign for ionizing radiation. If a radiation emergency was somehow suspected, the NDOC could contact the Kenya Defence Forces (KDF) the Disaster Response Unit (DRU) or the RPB, which have equipment for radiation detection and hazardous materials response. The deployment of the DRU would have to be approved by Defence Headquarters, meaning that they are unlikely to serve as a first response organization.

Recommendation 9.
Observation: First responders are not capable of recognizing a radiation emergency.
Basis for recommendation: GSR Part 7, paragraph 5.17, states: " For facilities and activities in categories I, II and III, and for category IV, arrangements shall be made: (1) to promptly recognize and classify a nuclear or radiological emergency …"
Recommendation: The National Disaster Management Unit should ensure that first responders are adequately trained and equipped to recognize a radiological emergency.

While the RPB is the sole competent authority for radiation matters and could provide advice during a response, there was no contact information for the RPB found at the NDOC; for example, it was not featured on the wall at the NDOC which listed important phone numbers of response organizations.

Suggestion 2.
Observation: There are no contact details for the Radiation Protection Board among the important operational contacts at National Disaster Operations Centre.
Basis for suggestion: GSR Part 7, paragraph 5.11, states: "The notification point(s) shall be maintained continuously available to receive any notification or request for support and to respond promptly or to initiate a preplanned and coordinated off-site response … "
Suggestion: The National Disaster Operations Centre should consider updating its operational contacts and routinely testing them.

There is no emergency classification system to ensure that facilities and activities can categorize an emergency and initiate timely and appropriate response actions. Having a classification system allows the operating organization to initiate actions to protect workers, helpers and the public. There is a well-defined classification system in place at the Port of Mombasa, which outlines Tier I (shipboard/localized), Tier II (port-wide) and Tier III (regional or nation-wide) emergencies. These designations are well understood by all personnel at the port and in Mombasa County, and could serve as an example for developing a classification system for radiological emergencies.

Suggestion 3.
Observation: There is no emergency classification system for radiological emergencies, potentially delaying the response and resulting in too few or too many resources responding to the emergency.
Basis for suggestion: GSR Part 7, paragraph 5.14 states: "The operating organization of a facility or activity in category I, II, III or IV shall make arrangements for promptly classifying, on the basis of the hazard assessment, a nuclear or radiological emergency."
Suggestion: The government and operating organizations should consider establishing a system for classifying radiological emergencies.

ILRI performs awareness training for its employees and for first responders on a regular basis, so that they know where dangerous sources are located on the facility and what procedures to follow in case of an emergency. The procedures give instructions on whom to notify and what to do when an emergency occurs — e.g. that, in case of a spill of radioactive material, they

must leave the lab, evacuate the immediate premises, and notify the RSO. Private firefighters in the facility are instructed on their actions in case of a fire in the lab involving sources.

KARI uses alarming dosimeters when operating its irradiator to alert its staff in case of a radiation emergency. However, its RSO does not know the value of dose rate for which the alarm is set and does not understand dose rate values and their dangerous levels. The RSO does not have established procedures to be followed once notified by an employee that a dosimeter alarm has been triggered.

The St. John's Ambulance service uses social media to get notifications from the public by following Twitter. The service takes further advantage of the new communication possibilities by having callers tweet the photo of the scene of an incident, which helps to better identify the emergency and respond appropriately. Similarly the Kenya Red Cross follows Twitter as well.

Good practice 2.
Observation: Some first responders, such as the St. John's Ambulance and Kenya Red Cross, use social media to get notifications from the public, which helps them identify an emergency, respond adequately and monitor developments.
Basis for good practice: GSR Part 7, paragraph 5.11, states: "Off-site notification point(s) shall be established to receive notification of an actual or potential nuclear or radiological emergency. The notification point(s) shall be maintained continuously available to receive any notification or request for support and to respond promptly or to initiate a preplanned and coordinated off-site response appropriate to the emergency class or the level of emergency response. The notification point(s) shall have immediate communication with the response organizations that are providing support using suitable, reliable and diverse means of communication."
Good practice: Some first responders, such as the St. John's Ambulance and Kenya Red Cross, monitor social media to receive notifications from the public and to monitor evolving emergencies and disasters.

Many services in Kenya, including the Red Cross ambulance service, police forces in Mombasa County and the Mombasa County Disaster Management Committee use CCTV in the cities and on response vehicles to monitor the situation during emergencies and events. The collected information enables the emergency services to choose the best access to crowded places, avoid traffic jams and help determine if additional resources are needed to respond to the scene.

Radiological monitoring in the container terminal in Mombasa Port is conducted by a central alarm station (CAS). In case of an alarm, the information is compared to the manifest and listed contents. In the event of a discrepancy, a second inspection is performed. If the secondary inspection reveals further uncertainty, or if the dose rate is too high for Kenya Ports Authority and Kenya Revenue Authority officers to approach the container, the RPB is contacted. The RPB has an office located in the Port and is able to respond quickly during normal business hours. The RPB then assumes responsibility for assessing the alarm and determining follow-on actions.

3.3. Taking mitigatory actions

The NERP does not provide any arrangements specific to radiation emergency. In the draft NREP, the RPB is assigned the role of providing an assessment of on-site consequences that

might have significant off-site impact; it also is tasked with ensuring that on-site measures are taken to mitigate off-site consequences. The RPB would also provide technical support to the operating organization, if requested. However, no procedures have been developed to implement these responsibilities in the draft NREP.

There are some arrangements for the RPB to provide expertise remotely and also to dispatch to the site a team capable of assessing the radiation hazard and mitigate the radiological consequences; however, these arrangements are limited to facilities and activities licensed by the RPB. The RPB has provided the individuals for this team, together with a scheme for initial response to a notification of a radiological emergency. According to this arrangement, the RSO is designated, after performing an initial assessment of the situation, to initiate the request for additional off-site or national resources, as needed, and to activate the on-site emergency manager. The on-site emergency manager coordinates the implementation of mitigatory action before arrival of the RPB team. The on-scene controller manages all response actions at the scene and alerts other responding organizations if necessary. The RPB team performs actions to mitigate the accident and implements protective and initial recovery actions.

For Category III facilities, there are arrangements in place with off-site firefighting teams only. For some Category IV activities, arrangements are in place. All airports in Kenya have procedures that include instructions on taking mitigatory actions for radiation emergencies. Outside of airports, some firefighting services have training and procedures for taking mitigatory actions. This is the result of ad hoc training and is not standardized across the country.

There are procedures in place at the Megaports facility; however, the programme is limited by the lack of a designated isolation space for analysis of containers that have triggered an alarm and for temporary storage awaiting final transport to storage. KPA is reluctant to designate such a space even for temporary storage and isolation of hazardous substances because of past experiences with dumping.

3.4. Taking urgent protective actions and other response actions

The National Police Service is responsible for immediate protective actions, including securing and cordoning the affected or threatened area, and should activate other first responders and ‘secondary responders’, e.g. the RPB, as needed. If public protective actions, such as evacuation or sheltering, are needed, the NDMU is responsible for implementing these actions as part of its all-hazards responsibilities, even though, as pointed out in 2.1, the NERP does not address radiation emergencies.

3.5. Providing instructions, warnings and relevant information to the public

Procedures for providing instructions to the public have not been prepared yet. As a result, in the current situation, first responders, specifically the police, will provide instructions to the public as considered appropriate by them, based on their specific experience.

There is experience in the country that could be leveraged for establishing national guidance. During an oil spill at the port in 2002, KPA and KMA had to coordinate providing instructions to individuals fishing in the harbour, reroute vessels entering and exiting the port,

and let the greater public know that the emergency was localized and did not affect areas outside the harbour.

Information and related instructions are provided to the public through handheld megaphones and by SMS alerts on mobile phones. The Communications Authority of Kenya will provide the public with relevant instructions delivered by the NDOC or first response organizations. For technical reasons connected with the SMS service, the public group being warned is expected to be much larger than just the people in the affected area, which makes it essential to give clear information.

Specific groups among the population have not been identified yet. As the Kenyan population can be seen as bilingual (the national languages in Kenya are Swahili and English), it is expected that the government will be able to reach the majority of the public. It may be useful to give special attention for non-English speaking foreigners and specific ethnic groups.

Recommendation 10.
Observation: There are no procedures in place to promptly issue instructions or warnings to the public following a radiological emergency.
Basis for recommendation: GSR Part 7, paragraph 5.44 states: "Arrangements shall be made to provide the public with information and instructions in order to identify and locate people who may have been affected by a nuclear or radiological emergency."
Recommendation: The National Disaster Management Unit, in cooperation with the Radiation Protection Board and National Disaster Operations Centre, should develop specific procedures for promptly providing instructions and warnings to the public who may be affected by a radiological emergency.

Providing instructions and warnings to the public becomes increasingly complex in areas surrounding an NPP and should be considered early in the preparations its construction. Past lessons from Member States have shown that demonstrating to the public the ability to provide instructions and warnings and showing the effective implementation of protective actions is crucial to the successful adoption of a nuclear power programme.

Good practice 3.
Observation: When requested by response organizations, the Kenya Communications Authority can initiate an SMS notification through the cellular service towers that will automatically notify each mobile phone connected to the tower.
Basis for good practice: GSR Part 7, paragraph 5.44, states: "Arrangements shall be made to provide the public with information and instructions in order to identify and locate people who may have been affected by a nuclear or radiological emergency."
Good practice: The public in an area potentially affected by a disaster can be quickly notified and given instructions via an SMS broadcast.

3.6. Protecting emergency workers and helpers in an emergency

The RPB is mandated by the Radiation Protection Act to ensure protection of people against the harmful effects of ionizing radiation during normal operations at facilities and during emergencies. It is supported by regulations for dealing with radiological emergencies. Section

3(3) of the Radiation Protection Act allows for implementation of the IAEA requirements in cases where national regulations are not sufficient on issues of radiological protection and emergencies.

There are no practical arrangements in place to ensure that emergency workers and helpers — including employees at facilities and activities using radioactive material as well as first responders — are protected from harmful effects of ionizing radiation. Arrangements for managing and controlling the doses received by emergency workers and helpers in an emergency are not complete or are missing entirely.There are no provisions for 'just in time' training of individuals whose expertise may be needed but who are not trained in radiation safety.

When responding to a scene of a radiological emergency DRU personnel are provided with personal protective equipment such as breathing masks, protective suits and overshoes. There is a limited capability to protect personnel undertaking rescue missions at the scene of a radiological emergency. Responding personnel are provided with alarming dosimeters but not with passive ones, such as thermoluminescent dosimeters (TLDs), for measuring accumulative personal dose. There is no system for keeping dose records for DRU personnel.

Recommendation 11.
Observation: There are no provisions for managing, controlling and recording doses of first responders or other responders at the scene during a radiological emergency.
Basis for recommendation: GSR Part 7, paragraph 5.49, states: "The operating organizations and response organizations shall ensure that arrangements are in place for the protection of emergency workers and of helpers in an emergency for the range of anticipated hazardous conditions in which they might have to perform response functions. These arrangements, as a minimum, shall include ….. (c) managing, controlling and recording the doses received; …"
Recommendation: The Radiation Protection Board, in cooperation with the National Disaster Operations Centre and the National Disaster Management Unit, should make arrangements to control and record the doses received by responders at a radiation emergency.

3.7. Managing the medical response in a nuclear or radiological emergency

The NERP establishes a framework for medical response for all-hazards emergencies. It includes provisions for setting up medical camps and for the mobilization of all available health resources and possible assets for emergency interventions. It also lists medical facilities and available medical equipment throughout the country. In protracted situations, the NERP envisages a medical representative to be part of the incident command system for assuring the welfare and safety of the responding teams. The document, however, does not address specifically the medical response during a nuclear or radiological emergency.

The draft NREP and the draft Kenya National CBRN Response Plan envisage St. John's Ambulance, the Kenya Red Cross and the Kenyatta National Hospital as institutions that would perform monitoring for internal and external contamination of CBRN materials and offer treatment for affected individuals. According to these draft plans, the Department of Safety and Health Services of the Ministry of Health is to establish a registry of affected

individuals and conduct long term monitoring of the population for potential long term health effects.

The medical first aid service is provided by the Kenya Red Cross, St. John's Ambulance Service and other services. At the county level, the medical first aid service can be provided by emergency units at hospitals and some other medical institutions as well.

The Kenya Red Cross has been trained to use ICS during larger disaster responses. The personnel are trained to provide both basic and advanced life support care. Advanced trauma care training is currently developed and implemented. There are, however, no procedures for radiation emergencies, no knowledge on protective measures and no instructions for personnel on the precautions to take. There is no equipment for radiation detection or contamination monitoring.

St. John's Ambulance Service personnel received training in ICS. There are response procedures in place. Responders are provided with instructions and trained to ensure personal safety in all emergencies, including radiation emergencies. No equipment for radiation detection or contamination monitoring is available, though. The responders are instructed not to enter any potentially hazardous areas.

At Kenyatta National Hospital, there are resources for performing monitoring for possible contamination and provision for their initial treatment, including properly trained and equipped personnel. This knowledge is ad hoc and not defined in any procedures or reinforced through regular training. The staff is unaware of how to handle and treat a contaminated patient and how to do appropriate triage.

Recommendation 12.
Observation: There are no arrangements in place for the first aid, medical transport and initial medical treatment of individuals that might have been contaminated or overexposed.
Basis for recommendation: GSR Part 7, paragraph 5.61, states: "Arrangements shall be made so that, in a nuclear or radiological emergency, individuals with possible contamination can nonetheless promptly be given appropriate medical attention. These arrangements shall include ensuring that transport services are provided where needed and providing instructions to medical personnel on the precautions to take."
Recommendation: The Ministry of Health, in coordination with the Radiation Protection Board, should develop arrangements for providing first aid, medical transport, and initial medical treatment of individuals that might have been contaminated or overexposed during a radiation emergency.

Kenya Red Cross and St. John's Ambulance Service personnel are not aware of the clinical symptoms of radiation exposure. General practitioners across the country are also not aware of the symptoms and would not consider acute radiation syndrome as part of the differential diagnostic procedure.

Recommendation 13.
Observation: There are no measures to ensure that medical practitioners can recognize radiation induced health effects.
Basis for recommendation: GSR Part 7, paragraph 5.60, states: "Arrangements shall be made for medical personnel, both general practitioners and emergency staff, to

Recommendation 13.
be made aware of the clinical symptoms of radiation exposure.”
Recommendation: The Ministry of Health, in coordination with the Radiation Protection Board, should ensure that general practitioners and emergency staffs are aware of the clinical symptoms of radiation exposure.

3.8. Communicating with the public throughout a nuclear or radiological emergency

The NERP contains elaborated concepts of operations for managing public information and also for information management and rumour control. There is a good recognition of the need for a single focal point for media relations, and it is codified in the plan. The plan does not fully address procedures to ensure that this single focal point will have the latest information in order to provide timely, clear, and appropriate information to the media and the public. Some of the institutions have well established systems for communicating with the public on emergencies and measures to be taken by the public. The Kenya Red Cross has a department for public relations and a designated spokesperson.

There are no specific arrangements for communication with the public and media in a nuclear or radiological emergency or to incorporate expertise such as that from the RPB. It is not clear how messaging is coordinated between NDOC and NDMU, both of which issue press releases.

3.9. Taking early protective actions and other response actions

The National Environmental Management Authority (NEMA), part of the Ministry of Environment, is responsible for management and conservation of the environment. In the Environmental Management and Coordination Act of 1989, and supporting regulations, the authority is tasked with licensing, inspection, and enforcement of facilities and activities that may impact the environment. During disasters, the authority works with the responsible technical agency to monitor and assess the environmental impact. In the case of a radiation emergency, the authority would coordinate with the RPB, although specific arrangements for the coordination do not exist.

There are no arrangements or criteria in place for lifting restrictions on protective actions or a strategy for decontaminating people, commodities and the environment. However, based on the current hazards in Kenya, the need for these arrangements is limited. This requirement will be critical to implement in detail if Kenya pursues a nuclear power programme.

3.10. Managing radioactive waste in a nuclear or radiological emergency

The RSOs are responsible for ensuring that regulations on radiation protection are implemented, including the proper care of radioactive waste during normal operation of the facility. However, there are no provisions for the storage of waste generated during an emergency. This is particularly applicable to collecting water used during firefighting operations. Similarly, there are no arrangements for radiological emergencies not originating at a licensed facility or activity. NEMA is tasked with gathering radioactive waste, and it has some provisions in place to store waste at the National Material Testing and Research Laboratory in Nairobi. There is a new Central Radioactive Waste Processing Facility being constructed at Oloolua, Ngong, which will have the ability for processing and storage of

radioactive waste. The large storage capacity at this new facility could allow for the storage of waste generated during an emergency.

Suggestion 4.
Observation: The Radiation Protection Act and the relevant regulations do not make provision for development of a strategy for managing radiological waste that is generated during emergencies.
Basis for suggestion: GSR Part 7, paragraph 5.81, states: "National policy and strategy for radioactive waste management shall apply for radioactive waste generated in a nuclear or radiological emergency taking into account these requirements."
Suggestion: The Radiation Protection Board should establish a policy and strategy that will address the management of radioactive waste during emergencies.

3.11. Mitigating non-radiological consequences of a nuclear or radiological emergency and emergency response

The Disaster Management Unit of the Ministry of Health is charged with addressing health consequences of emergencies. The unit is able to respond to the health hazards of the public related to an emergency and to provide medical and psychological counselling. There is extensive experience from past conventional emergencies. Only one person is employed in the unit at the moment, but there is a possibility of engaging experts from other national institutions, for example from different state and privately owned medical institutions.

3.12. Requesting, providing and receiving international assistance for emergency preparedness and response

Kenya is not party to the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*. It is a member of the East African Community, which has multilateral disaster management agreements to provide resources in case of a disaster. Kenya also has a bilateral agreement with United States of America on assistance during disasters. The agreement could not be reviewed during the mission so details are unavailable.

The NDOC is designated as the national warning point, as defined in the IAEA Incident and Emergency Communication Manual. It is in charge of assessing if the national capabilities to cope with the emergency are exceeded and if international assistance is needed. If that is a case, the NDMU will ask the NDOC to coordinate the sending of the request for international assistance to a particular country or the IAEA.

The RPB is the National Competent Authority–Domestic (NCA-D). Three RPB employees are administrators of the Unified System for Information Exchange (USIE) and five RPB staff participated in the regional workshop on Notification, Reporting and Requesting Assistance organized in Nairobi in 2013.

Suggestion 5.
Observation: Kenya is not party the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*.
Basis for suggestion: GSR Part 7, paragraph 5.91, states: "Arrangements shall be put in place and maintained for requesting and obtaining international assistance by States or international organizations and for providing assistance to States (either

Suggestion 5.
directly or through the IAEA) in preparedness and response for a nuclear or radiological emergency, on the basis of international instruments (e.g. the Assistance Convention), bilateral agreements or other mechanisms.”
Suggestion: The government should consider ratifying the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.*

3.13. Terminating a nuclear or radiological emergency

The NERP contains provisions for the “stand down” of response teams and organizations after an emergency. The draft NREP contains provisions for shifting to recovery. It also includes provisions for the recovery phase after an emergency. These arrangements could be modified to incorporate specific aspects of terminating a nuclear or radiological emergency, as defined in GSR Part 7.

If Kenya will pursue a nuclear power programme, the requirement to develop specific criteria for terminating an emergency and transitioning to recovery and an existing exposure situation will be of the utmost importance.

3.14. Analysing the emergency and the emergency response

Since radiation emergencies in the country have been extremely limited, there is no system in place or experience with analysing the emergency and the emergency response. However, lessons can be learned from conventional emergencies and all-hazards drills and exercises.

The Kenya Red Cross has review procedure for emergencies and exercises, which enables the organization to improve emergency preparedness and response.

There is one example of a localized radiation emergency at the international airport in Nairobi. ILRI was shipping a package with liquid radioactive material, which was damaged during storage after arrival at the airport, resulting in a localized spill of radioactive material. A successful response was initiated and conducted, and the spill was cleaned up. Following the safe removal of the package and the decontamination of the area, a technical support organisation (TSO) was contacted to verify the results. Following the emergency, ILRI and KAA identified lessons learned, most importantly on the need for a separate storage area for hazardous materials and the need for direct delivery of hazardous materials.

This approach for analysing the response, which was conducted on an ad hoc basis, should be codified under the emergency management system and implemented by all response organizations and operating organizations.

4. DETAILED FINDINGS ON REQUIREMENTS FOR INFRASTRUCTURE

4.1. Authorities for emergency preparedness and response

Not all response organizations are aware of their authorities, responsibilities and roles during a radiation emergency, since there is no approved national emergency plan for radiation emergencies. Similarly, many organizations are unaware of the emergency management system and the authorities of other organizations.

4.2. Organization and staffing for emergency preparedness and response

During any emergency with more than one discipline, the National Police Service is designated as the incident commander, and other organizations, such as the fire brigade, operate under its command. The Kenya Defence Forces, who can support disaster response to CBRN or hazardous material emergencies if needed, will operate under its own command structure. The DRU is able to support response to CBRN emergencies with a hazardous material response team of 30 personnel with specific equipment such as monitors and decontamination facilities for personnel. For search and rescue, the DRU is able to respond with the USAR team of 80 personnel and specific equipment and detection instruments.

Appropriate staffing levels for specialized technical expertise cannot be guaranteed during a radiation emergency. It is likely that radiation protection, radiation safety, and other resources will be unable to support 24/7 operations during a large radiation emergency. There have been no tests of the response time to determine how long it would take to muster appropriate staffing for different types of radiation emergencies.

4.3. Coordination of emergency preparedness and response

The NDOC is charged with the responsibility of coordinating all national level emergencies in the country. However, similar to the discussion about the lack of a national coordinating mechanism in the preparedness stage, there are dual systems for coordination during a response. It is not clear whether either the NDOC or the NDMU will have the necessary systems and arrangements in place to ensure that all response organizations will have a common situational awareness.

4.4. Plans and procedures for emergency response

The Radiation Protection Act and the supporting regulations make provision for operating organizations to prepare emergency preparedness and response plans and procedures to deal with radiological events.

Operating organizations are licensed by the RPB and as such are required, as one of the licensing conditions, to prepare emergency plans and procedures, although this is not consistently enforced. The operating organizations of some Category III facilities, namely ILRI and Kenyatta National Hospital, have prepared some procedures for emergency response.

Similarly, specific facilities, including the Port of Mombasa and Jomo Kenyatta International Airport, under the authority of the Kenya Maritime Authority, the Kenya Ports Authority and

the Kenya Airport Authority, have developed specific plans and procedures for emergency response; however, these plans and procedures have not been developed in coordination with the NERP, draft NREP, or draft National CBRN Response Plan. The specific procedures put in place at the Megaports facility could serve as an example for the development of similar procedures at other facilities and activities using radioactive materials.

There is inconsistent restriction on the distribution of these plans, with some being public and others being controlled at the facility level, resulting in unequal awareness by response organizations and stakeholders. Plans at the Jomo Kenyatta International Airport are strictly controlled, while plans at the Port of Mombasa are not restricted, but have not been distributed.

4.5. Logistical support and facilities for emergency response

Emergency response facilities are located around the country. At the national level, the NDOC and NDMU maintain emergency centres. At the county level, disaster management committees have limited facilities available for establishing coordination or emergency centres. Facilities including the Port of Mombasa and the Jomo Kenyatta International Airport have designated and established emergency centres. Authorized users including ILRI, KARI, and Kenyatta National Hospital, do not have dedicated emergency centres.

Communications between responders and coordination centres, as well as those between emergency centres at different levels of government, take place mostly on an ad hoc basis. Contact information is not exchanged and routinely tested. Some communications can be conducted via radio, for example at the port and the airport, but most are carried out through personal mobile phone. This means that communication is not reliable and that contact information may change between shifts in the event of continuous operations, or for different emergencies, and is not logged or reviewed. In the case of national centres with dedicated phone lines, service is provided by a single provider, and there are no backup systems or contingency plans.

Response organizations do not have sufficient or adequate tools for response to radiation emergencies. With the exception of the Megaports facility, all other responses rely mainly on the limited equipment available from the DRU and the RPB, located in Nairobi and six regional offices, which could result in extended response times to radiation emergencies.

The National Disaster Operation Centre maintains an operations room, which is staffed 24/7. The centre has common communication lines and police radios. The CCTV camera system providing an overview of Nairobi streets does not currently work. The telephone lines for phones and faxes are provided by a single service provider. The centre does not use procedures for daily operations. Important telephone numbers are kept on the walls, but there is no system in place to regularly update them.

4.6. Training, drills and exercises for emergency preparedness and response

The government conducted a large scale hazardous materials exercise at the Humanitarian Peace Support School in October 2014. The exercise involved over 500 participants exercising the response to a terrorist attack at an industrial facility. The focus was on testing the NERP and coordination procedures.

The RPB participates in a training programme for the Kenya Border Services Rural Border Patrol Unit, Kenya Revenue Service Customs Officers, and other front line officers for identification of radioactive materials at border crossings and initial response actions. The programme initially targeted only domestic services. However, it was decentralized and expanded in 2013 and is now taught at the border crossings rather than at headquarters. The course is conducted jointly with Uganda and the United Republic of Tanzania. Fourteen courses have been conducted so far. The last one took place in January 2015. This training increases the interoperability of international partners from neighbouring states by ensuring a common frame of reference and similar response procedures. This can be especially important at border crossings where States must work in close coordination to respond to radiation emergencies.

Good practice 4.
Observation: Radiation detection, identification, and initial response training is conducted at border crossing locations and is carried out jointly with officials from Kenya, Uganda and the United Republic of Tanzania
Basis for good practice: GSR Part 7, paragraph 6.28, states: "Response organizations shall make arrangements for the selection of personnel and for training to ensure that the personnel selected have the requisite knowledge, skills, and abilities to perform their assigned response functions."
Good practice: Joint international training for radiation detection, identification, and initial response at border crossings ensures that front-line agents are trained and that neighbouring States can work together during an emergency.

The RPB organizes table top and field exercises, but not on a regular basis. In February 2013, it organized a table top exercise on notification and response to a radiological event involving the detection and interdiction of radioactive materials at Manyani Training School, Voi, with participants from border enforcement agencies (Kenya Wildlife Service, General Service Unit, and Administration Police), in collaboration with United States Department of Energy. It also organized a table top exercise in November 2014 and a field exercise in February 2015 on the response to a radiological event at the Port of Mombasa, which included participants from the RPB, Kenya Revenue Authority (Customs), Kenya Ports Authority and Kenya Maritime Authority.

Similarly, the NDOC organizes periodic exercises but none so far have involved a radiological emergency scenario. Some response organizations have never held or participated in an exercise to test their response arrangements.

ILRI performs trainings and drills for its employees and for first responders on a regular basis. But The Kenya Agricultural Research Institute has not had an exercise yet. It also has not had any training related to radiation matters.

The fire services of the Nairobi County conduct regular training for their staff on a daily basis, including drills, but radiation matters are not addressed regularly.

St. John's Ambulance Service also conducts regular training for its staff. They have had training on radiation matters since 1998, but not for all of their responding staff. They also conduct exercises on corporate and national levels. Some of these exercises are regular, e.g. annual exercises at the airport.

The new radioactive waste reprocessing facility has yet to recruit staff who will need to be trained on the job.

The Kenya Red Cross maintains extensive training and exercising program, but radiation matters are not covered.

The Kenya Airport Authority maintains extensive training and exercising program, based on annual implementation plans. They conduct full scale field exercises on a two year cycle and partial exercises in between. This could be used as an example of an integrated training and exercise program for other response organizations.

Most responding organisations had limited training on radiation matters, which was mostly provided as part of international assistance on CBRN capacity building, such as that conducted for the DRU and firefighters. But there is a clear gap and a need to establish a national training programme.

The NERP includes provisions for training and exercising but these have not implemented. There are no annual national training and exercising plans. There is an overall lack of knowledge, clearly evident in the first responders group and other stakeholders. Even Radiation Safety Officers at times demonstrated lack of basic knowledge, emphasizing a need for refresher trainings at regular intervals.

Recommendation 14.
Observation: While the National Emergency Response Plan includes adequate provision for training and exercising, they are not implemented.
Basis for recommendation: GSR Part 7, paragraph 6.30, states: "Exercise programmes shall be developed and implemented to ensure that all specified functions required to be performed for emergency response, all organizational interfaces for facilities in category I, II or III and the national level programmes for category IV or V are tested at suitable intervals."
Recommendation: The National Disaster Management Unit, in cooperation with all stakeholders, should implement plans for training and exercising of the response arrangements for all levels.

Good practice 5.
Observation: The RPB in collaboration with relevant stakeholders succeeded in having radiation topics included in the police and customs education curriculums, so that basic knowledge on radiation is ensured for these first responders.
Basis for good practice: GSR Part 7, paragraph 6.28, states: "The operating organization and response organizations shall identify the knowledge, skills and abilities necessary to perform the functions specified in Section 5. The operating organization and response organizations shall make arrangements for the selection of personnel and for training to ensure that the personnel selected have the requisite knowledge, skills and abilities to perform their assigned response functions. The arrangements shall include arrangements for continuing refresher training on an appropriate schedule and arrangements for ensuring that personnel assigned to positions with responsibilities in emergency response undergo the specified training.
Good practice: The police and customs education curriculum includes topics on radiation hazards, safety and protection.

4.7. Quality management programme for emergency preparedness and response

Most stakeholders have not implemented a quality management system, with two exceptions noted below. Response organizations maintain supplies, equipment and communication systems on an ad hoc basis. Plans, procedures and contact information are not reviewed or updated on set intervals.

ILRI has a quality management programme in place that includes annual external audits. It pays special attention to reviewing and evaluating response in actual events and exercises and to implementing lessons identified.

The KAA maintains an extensive quality management programme for the airports in the country. It follows the requirements of international standards for civil aviation.

Both the ILRI and KAA quality management programmes can be used as examples for other response organizations.

5. SUMMARY OF FINDINGS

The EPREV mission identified fourteen recommendations, five suggestions and five good practices. They are as follows:

Recommendations

1. The government should ensure that there is a single national plan that addresses radiation emergency preparedness and response, and that it is consistent with existing all-hazards arrangements in the country.
2. The government should ensure that all stakeholders and response organizations are aware of the emergency management system, in particular the NERP, and that it is implemented accurately in related plans and procedures.
3. The government should ensure that the national emergency response plan for emergency preparedness and response integrates all relevant plans and procedures from response organizations, operating organizations and sector specific plans such as those at ports and airports.
4. The government should establish a national coordinating mechanism for emergency preparedness for radiological emergencies.
5. The regulatory body should require, ensure and verify that each operating organization develops arrangements for preparedness and response for a nuclear or radiological emergency.
6. Operating organizations should develop and implement radiation emergency preparedness and response arrangements which are consistent with the emergency management system and nuclear security system.
7. The government should conduct a hazard assessment to establish a planning basis for emergency preparedness and response arrangements that is coordinated with a nuclear security threat assessment and identifies facilities and activities where radiological emergencies are possible.
8. The government should ensure that all operations centres receiving notifications from the public are adequately trained to initiate a coordinated response to a radiological emergency.
9. The National Disaster Management Unit should ensure that first responders are adequately trained and equipped to recognize a radiological emergency.
10. The National Disaster Management Unit, in cooperation with the Radiation Protection Board and National Disaster Operations Centre, should develop specific procedures for promptly providing instructions and warnings to the public who may be affected by a radiological emergency.
11. The Radiation Protection Board, in cooperation with the National Disaster Operations Centre and the National Disaster Management Unit, should make arrangements to control and record the doses received by responders at a radiation emergency.
12. The Ministry of Health, in coordination with the Radiation Protection Board, should develop arrangements for providing first aid, medical transport, and initial medical treatment of individuals that might have been contaminated or overexposed during a radiation emergency.
13. The Ministry of Health, in coordination with the Radiation Protection Board, should ensure that general practitioners and emergency staffs are aware of the clinical symptoms of radiation exposure.

14. The National Disaster Management Unit, in cooperation with all stakeholders, should implement plans for training and exercising of the response arrangements for all levels.

Suggestions

1. The Radiation Protection Board should consider extending the duty roster of its on-call officers to be continuously available in order to be able to receive prompt notification of emergencies.
2. The National Disaster Operations Centre should consider updating its operational contacts and routinely testing them.
3. The government and operating organizations should consider establishing a system for classifying radiological emergencies.
4. The Radiation Protection Board should establish a policy and strategy that will address the management of radioactive waste during emergencies.
5. The government should consider ratifying the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

Good Practices

1. Kenya has adopted and widely implemented the Incident Command System for managing the response to disasters and emergencies across the country.
2. Some first responders, such as the St. John's Ambulance and Kenya Red Cross, monitor social media to receive notifications from the public and to monitor evolving emergencies and disasters.
3. The public in an area potentially affected by a disaster can be quickly notified and given instructions via an SMS broadcast.
4. Joint international training for radiation detection, identification, and initial response at border crossings ensures that front-line agents are trained and that neighbouring States can work together during an emergency.
5. The police and customs education curriculum includes topics on radiation hazards, safety and protection.

Appendix I: IAEA Mission Team Composition

No.	Name and LAST NAME	Position	Organization
1.	Mr Marjan TKAVC	EPREV Team Leader	Slovenian Nuclear Safety Administration
2.	Mr Mark BREITINGER	EPREV Team Coordinator	IAEA IEC
3.	Dr Nera BELAMARIC	EPREV Team Member	Independent Expert, Croatia
4.	Mr Mothusi RAMERAFE	EPREV Team Member	National Nuclear Regulator, South Africa
5.	Mr Peter VAN BEEK	EPREV Team Member	Centre for Regional Nuclear Preparedness (CKV), The Netherlands

Appendix II: Mission Schedule

IAEA EPREV MISSION TO KENYA
1-10 March 2015
PROGRAMME

<table>
<tr><th>Time</th><th>IAEA Team A</th><th>IAEA Team B</th></tr>
<tr><td colspan="3">Sunday 1 March</td></tr>
<tr><td>All day</td><td colspan="2">Internal Meeting for IAEA Review Team (Hotel Small Meeting Room)</td></tr>
<tr><td colspan="3">Monday 2 March</td></tr>
<tr><td>09:00 – 13:00</td><td colspan="2">Entry Meeting with all stakeholders and organizations (Hotel Large Meeting Room)
Master of Ceremony: National Liaison Officer
• Welcome and Introduction (Kenya National Liaison Officer)
• Opening Remarks (Director, National Disaster Management Unit)
• Keynote Address (Deputy Inspector General of Police)
• All-Hazards Emergency Preparedness and Response in Kenya (Director, National Disaster Operations Center)
• Radiation Emergency Preparedness and Response in Kenya (Chief Executive Officer, Radiation Protection Board)
• Presentation of EPREV Objectives and Process (IAEA Team Coordinator
• Review of Programme (IAEA Team Leader)
• Closing Remarks (Kenya National Liaison Officer)</td></tr>
<tr><td>14:00 – 17:00</td><td colspan="2">Interviews (Hotel Small Meeting Room)
• NDOC
• RPB
• KNEB</td></tr>
<tr><td>17:00 – 18:00</td><td colspan="2">Daily Meeting for IAEA Review team (Hotel Small Meeting Room)</td></tr>
<tr><td colspan="3">Tuesday 3 March</td></tr>
<tr><td>09:00 – 12:00</td><td>Site Visit
• National Disaster Operations Centre</td><td>Fly to Mombasa</td></tr>
<tr><td>13:00 – 14:00</td><td>Site Visit
• RPB</td><td rowspan="2">Site Visit (begin as soon as arrival in Mombasa):
• Kenya Ports Authority
• Kenya Maritime Authority</td></tr>
<tr><td>14:30 – 17:00</td><td>Site Visit
• Kenyatta Hospital</td></tr>
<tr><td>17:00 – 18:00</td><td>Daily Meeting for IAEA Review team (Hotel Small Meeting Room)</td><td>Daily Meeting for IAEA Review team (Hotel Lobby)</td></tr>
<tr><td colspan="3">Wednesday 4 March</td></tr>
<tr><td>09:00 – 14:00</td><td>Site Visit:
• Kenya Agricultural Research Institute (KARI)</td><td>Site Visit (09:00 – 12:00):
• Mombasa Country Disaster Management Committee</td></tr>
</table>

	• International Livestock Research Institute	
15:00 – 17:00	Site Visit: • National Disaster Management Unit	Fly to Nairobi
17:00 – 18:00	*Daily Meeting for IAEA Review team (Hotel Small Meeting Room)*	
Thursday 5 March		
09:00 – 11:00	Site Visit: • Nairobi Fire Services Interviews (Hotel Small Meeting Room)	
11:00 – 13:00	Interview: • St. John's Ambulance Service	
14:00 – 17:00	Interviews (Hotel Small Meeting Room) • Kenya Airports Authority • Communication Authority of Kenya	
17:00 – 18:00	*Daily Meeting for IAEA Review team (Hotel Small Meeting Room)*	
Friday 6 March		
09:00 – 11:00	Site Visit: • Central Radioactive Waste Processing Facility	
11:00 – 13:00	Site Visit: • Kenya Red Cross	
13:00 – 14:00	Interview: • KDF DRU	
16:30 – 17:00	Interview: • National Environmental Management Authority	
17:00 – 18:00	*Daily Meeting for IAEA Review team (Hotel Small Meeting Room)*	
Saturday 7 March		
09:00 – 18:00	*IAEA Review Team Report Writing (Hotel Small Meeting Room)*	
18:00	*Preliminary Draft Report sent to Kenya counterparts*	
Sunday 8 March		
All day	Kenyan counterparts review Preliminary Draft Report	
Monday 9 March		
08:00 – 10:00	IAEA and Counterparts Meeting to review Detailed Findings (NDOC, NDMU, RPB, KNEB)	
10:00 – 13:00	Exit Meeting with all stakeholders and organizations (Hotel Large Meeting Room) *Master of Ceremony: National Liaison Officer* • Welcome and Introduction (Kenya National Liaison Officer) • Keynote Address (Principal Secretary, Ministry of Interior) • Presentation of Findings (IAEA Team Leader) • Review of Action Plan Development and Future Activities (IAEA Team Coordinator)	
Tuesday 10 March		
09:00 – 12:00	Initial Action Plan Development Meeting (IAEA, NDOC, NDMU, RPB, KNEB)	
12:00	Conclusion of EPREV Mission	

Appendix III: List of Attendees to EPREV Mission Meetings

No.	Name	Organization
1.	Stephen Onchiri	NDOC
2.	Pius Masai	NDMU
3.	Ochilo Nyachio	KNEB
4.	Collins Juma	KNEB
5.	James Keter	RPB
6.	Isaac Munda	RPB
7.	Nyangala Scaver	NDOC
8.	Francis Wamae	NDIMU
9.	Richard Kirui	NDIMU
10.	Juan Muhai	ILRI
11.	Patrick Ondenyi	KPA
12.	Eliud Lacat	DCI
13.	Ali Gakwel	Government Chemist
14.	Irene Kiige	St John’s Ambulance
15.	Collins Bosire	KRA
16.	Jepher Kiragu	KALRO
17.	Moses Nauthu	NEMA
18.	Alice Nyakndi	NDOC
19.	Collins Omondi	KBS
20.	Pauline Mulongo	KNEB

No.	Name	Organization
21.	Emmanuel Wandera	KNEB
22.	George Onyango	NDOC
23.	Motogwa Dismus	NDOC
24.	Beth Kaboro	RPB
25.	Winfred Ndubai	KNEB
26.	Stelamaris Muthike	KMA
27.	Jack Emaidi	KNPS
28.	Dr. Beatrice Mulama	Kenyatta National Hospital
29.	Erustus Gutebe	KIRDI/NSCC
30.	Jonathan Kertich	NDOC
31.	Joel Kamande	RPB
32.	Lilian Matu	KNEB
33.	Wilbrod Kaleri	KPS
34.	Patrick Leshan	NDIMU
35.	Jerad Isabokie	PHQs
36.	Charles Arisa	KAA
37.	Jaction Mboya	NCC Fire
38.	Fred Majiwa	St. John’s Ambulance
39.	Jonathan Kigotho	NDOC
40.	Venant Ndighila	KRCS
41.	Joseph Ashimala	PHQs

No.	Name	Organization
42.	Gaxton Kimoti	NDIMU
43.	James Owiny	KNH

References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Preparedness and Response for a Nuclear or Radiological Emergency, GSR Part 7, IAEA, Vienna (DRAFT v10.6 2015)

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, GSG-2, IAEA, Vienna (2011).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Arrangements for Preparedness for a Nuclear or Radiological Emergency, GS-G-2.1, IAEA, Vienna (2007).

Acronyms

(Alphabetic order)

Abbreviation	Full Name
CAS	Central Alarm Station (Megaports)
CBRN	Chemical, Biological, Radiological, and Nuclear
CCTV	Closed-Circuit Television
COP	Code of Practice
DRU	Disaster Response Unit (KDF)
EPR	Emergency Preparedness and Response
EPREV	Emergency Preparedness Review
IAEA	International Atomic Energy Agency
ICS	Incident Command System
IEComm	Incident and Emergency Communication
ILRI	International Livestock Research Institute
JOC	Joint Operations Center
KARI	Kenya Agricultural Research Institute
KDF	Kenya Defence Forces
KMA	Kenya Maritime Authority
KPA	Kenya Ports Authority
NCA	National Competent Authority
NDMU	National Disaster Management Unit
NDOC	National Disaster Operations Center

Abbreviation	Full Name
NPP	Nuclear Power Plant
NERP	National Emergency Response Plan
NREP	National Radiation Emergency Plan
RPB	Radiation Protection Board
RSO	Radiation Safety Officer
SMS	Short Messaging Service
TSO	Technical Support Organisation
USIE	Unified System for Information Exchange