

EVOLUTION OF RADIATION SAFETY CULTURE IN AFRICA: IMPACT OF THE CHERNOBYL ACCIDENT

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CONTENTS

- Introduction
- The Chernobyl Nuclear Accident
- International Response - the IAEA
 - The Conventions
 - Safety Standards
 - Missions : WAMAP, RAPAT, RaSSIA, IRRS
 - Intervention Mechanisms: Model Project; TSA
 - Evaluation Tools: RAIS, SAT, RASSIMS, SARIS
- National Response
- Africa Regional Response – the FNRBA
- Radiation Safety Infrastructure in Africa Today
- Challenges and Opportunities

INTRODUCTION 1/4

- **Safety Culture is:** The assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, *protection and safety issues receive the attention warranted by their significance.* (IAEA Glossary)
- **Radiation Safety Infrastructure** is a necessary condition **but not** sufficient for the emplacement of **Radiation Safety Culture**

INTRODUCTION 2/4

- **Radiation Safety Culture** is the fabric woven from the different fibres of **Radiation Safety Infrastructure**:
 - **Legislation** to ensure safety
 - Institution (**Regulatory Body**) established by legislation to:
 - ☐ Make Regulations, safety principles
 - ☐ Carry out inspections;
 - ☐ Authorize practices and facilities;
 - ☐ Enforce safety regulations
 - **The Regulatory Body should be:**
 - ☐ Effectively independent;
 - ☐ Adequately funded
 - ☐ Staffed by competent people;
 - ☐ Able to have its own organizational structure
 - ☐ Able to have a Management System;
 - **The Regulatory Body should be empowered to:**
 - ☐ Coordination
 - ☐ Advisory Bodies
 - ☐ Interaction with licensee
 - ☐ Interact with other national and international bodies with similar objectives

INTRODUCTION 3/4

Needs for Radiation Safety Infrastructure in Africa

- **Activities carried out in Africa**
 - Health Sector - DR, RT, NM
 - Mining Sector - NDT, NG, RTT
 - Petroleum Sector - NDT, NWL, NG, RTT
 - Manufacturing Sector- NG, RTT
 - Agriculture & Animal Husbandry - NG, SIT,
 - Education and Research
 - Nuclear Reactor Operation - 8 No. NRR
 - Nuclear Power – 2 No. in operation & 10 MS planning NPP
- **Effect of the activities carried out outside Africa**

INTRODUCTION 4/4

- 54 Member States in the African Union
- 1986 - 27 MS in the IAEA
- 2016 – 44 MS in the IAEA
- All participate in TC Program



THE CHERNOBYL ACCIDENT 1/3

- According to the INSAG Report, the Chernobyl accident of April 1986 was the product of a lack of **safety culture** due to a **flawed reactor design** that was **operated with inadequately trained personnel**.
- The operating personnel did not comply with operational procedures.
- The combination of these factors provoked a nuclear accident of maximum severity in which the reactor was totally destroyed within a few seconds.
- The resulting steam explosion and fires released at least 5% of the radioactive reactor core into the atmosphere and **downwind** – some 5200 PBq (I-131 eq).

THE CHERNOBYL ACCIDENT 2/3

- Geography (Africa and Chernobyl (Europe) are in the same hemisphere but in the southern part)
- Climate (Accident happened in April when the wind direction was SW-NE)
- Two Chernobyl plant workers died on the night of the accident, and a further 28 people died within a few weeks as a result of acute radiation poisoning. **Nobody died in Africa from the accident.**
- Africa was saved from the immediate impact of the nuclear fallout by **geography** and **climate**.
- **But not for long!!!**

THE CHERNOBYL ACCIDENT 3/3

- 1988 - import of contaminated beef
- 1990 - import of powdered milk
- Several countries with or without the appropriate infrastructure embarked on food monitoring for radioactive contamination
- 1991 - the Bamako Convention on the Ban of the Import into Africa and Control of Trans-boundary Movement and Management of Hazardous Wastes within Africa (1991);

INTERNATIONAL RESPONSE 1/2

- **Conventions**
- **Standards**
 - BSS
 - Guides
- **Missions**
 - *WAMAP*
 - *RAPAT*
 - Radiation Safety, and Security of Radioactive Sources, Infrastructure Appraisal (RaSSIA)
 - *Integrated Regulatory Review Service (IRRS)*
 - *Occupational Radiation Protection Appraisal Service (ORPAS)*
 - *Emergency Preparedness Review (EPREV)*
 - *Waste Safety Appraisal Service*
 - *Transport Safety Appraisal Service (TranSAS)*
 - *Education and Training Appraisal (EduTA)*

INTERNATIONAL RESPONSE 2/2

- **TC Programmes and Projects on Safety**
 - Model Project
 - Thematic Safety Area Programming
- **Tools**
 - *Radiation Safety Information Management System (RASIMS)*
 - *Self-Assessment of Regulatory Infrastructure for Safety (SARIS)*
 - *Regulatory Authority Information System (RAIS)*
 - *Control of Sources Network*

THE MODEL PROJECT 1/3

- The Model Project on the “**Establishment of Radiation Protection Infrastructure**” in Member States 1995-2004
- The Model Project was based on five Milestones set to meet the requirements of the BSS.
- **Milestone 1:** *Establishment of Legislative and Regulatory Infrastructure.*
- **Milestone 2:** *Establishment of Occupational Exposure Control Programme*
- **Milestone 3:** *Establishment of Medical Exposure Control Programme*
- **Milestone 4:** *Establishment of Public Exposure Control Programme*
- **Milestone 5:** *Establishment of Emergency Preparedness and Response Programme*

THE MODEL PROJECT 2/3

- The Model Project was brought to a close in 2004, but the level of achievement of the Milestones needs to be continuously assessed
 - by self, by peers in the region and finally by the international community and strive for continuous improvement of radiation safety in all applications of ionizing radiation.
 - Its end marked the ‘coming of age’ of the regulatory authorities in Africa, which was compelled by the need to consolidate and sustain the achievements of the Model Project.
 - five years later, led to the establishment of the ***Forum of Nuclear Regulatory Authorities in Africa*** in March 2008.

THE MODEL PROJECT 3/3

- ACHIEVEMENT OF THE MILESTONES IN 2005
 - New awareness in the region about radiation safety
 - Several African Member States have “mainstreamed” radiation safety
 - Stimulated direct contact among the regulatory bodies in the region

NATIONAL RESPONSE 1/2

- **The Nigerian Case**

- May 1986, CERT, ABU Zaria with the support of the British Council, organized a National Conference on the Impact of the Chernobyl Nuclear Accident on Nigeria
- 1988 Beef Shipment carrying foreign flag
 - Ship turned back with its cargo
- 1988 Beef Shipment carrying Nigerian flag
 - Ship berthed and off loaded tonnes of frozen beef
 - CERT was directed by the Government to establish level of radioactivity in imported beef
 - Level of Sr-90 and Cs- 137
 - Government banned importation of beef and poultry
 - Government strengthened the food and drug safety legislation - **an unintended consequence (benefit) of Chernobyl**

NATIONAL RESPONSE 2/2

- In combination with the requirements of a TC project for the supply of a research reactor led to the promulgation of the ***Nuclear Safety and Radiation Protection Act 19 of 1995!***; and
- The establishment of the **Nigerian Nuclear Regulatory Authority** in 2001

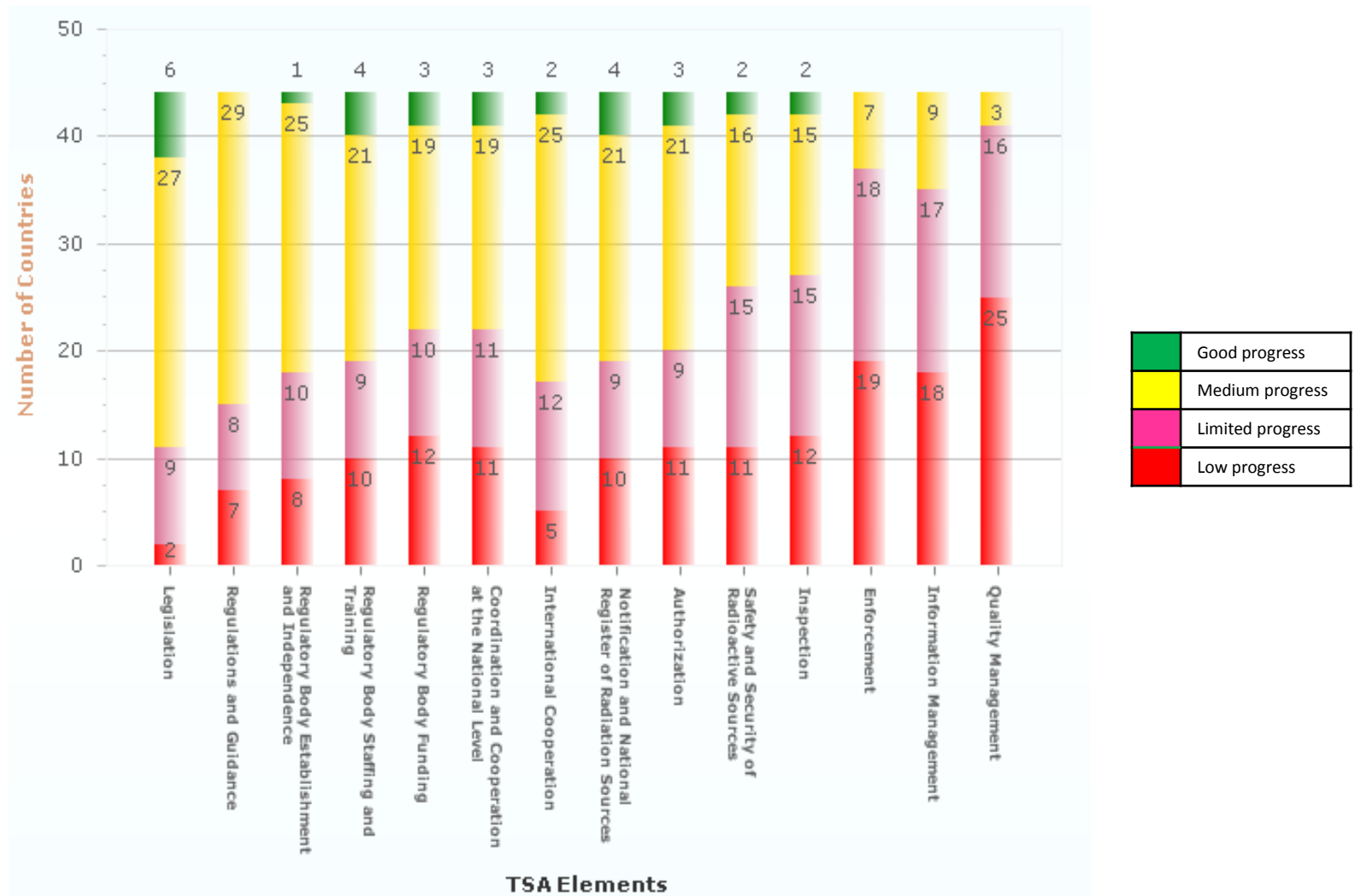
THEMATIC SAFETY AREAS 1/6

- **Thematic Safety Areas**
 - TSA 1: Regulatory Infrastructure for Radiation Safety
 - TSA 2: Radiological Protection in Occupational Exposure
 - TSA 3: Radiological Protection in Medical Exposure
 - TSA 4: Public & Environmental Exposure Control
 - TSA 5: Emergency Preparedness and Response
 - TSA 6: Education and Training
 - TSA 7: Transport Safety
- Each TSA has a standard set of “essential elements” used to identify needs, identify assistance needs and monitor progress.
- **140 Countries currently (44 in Africa)**

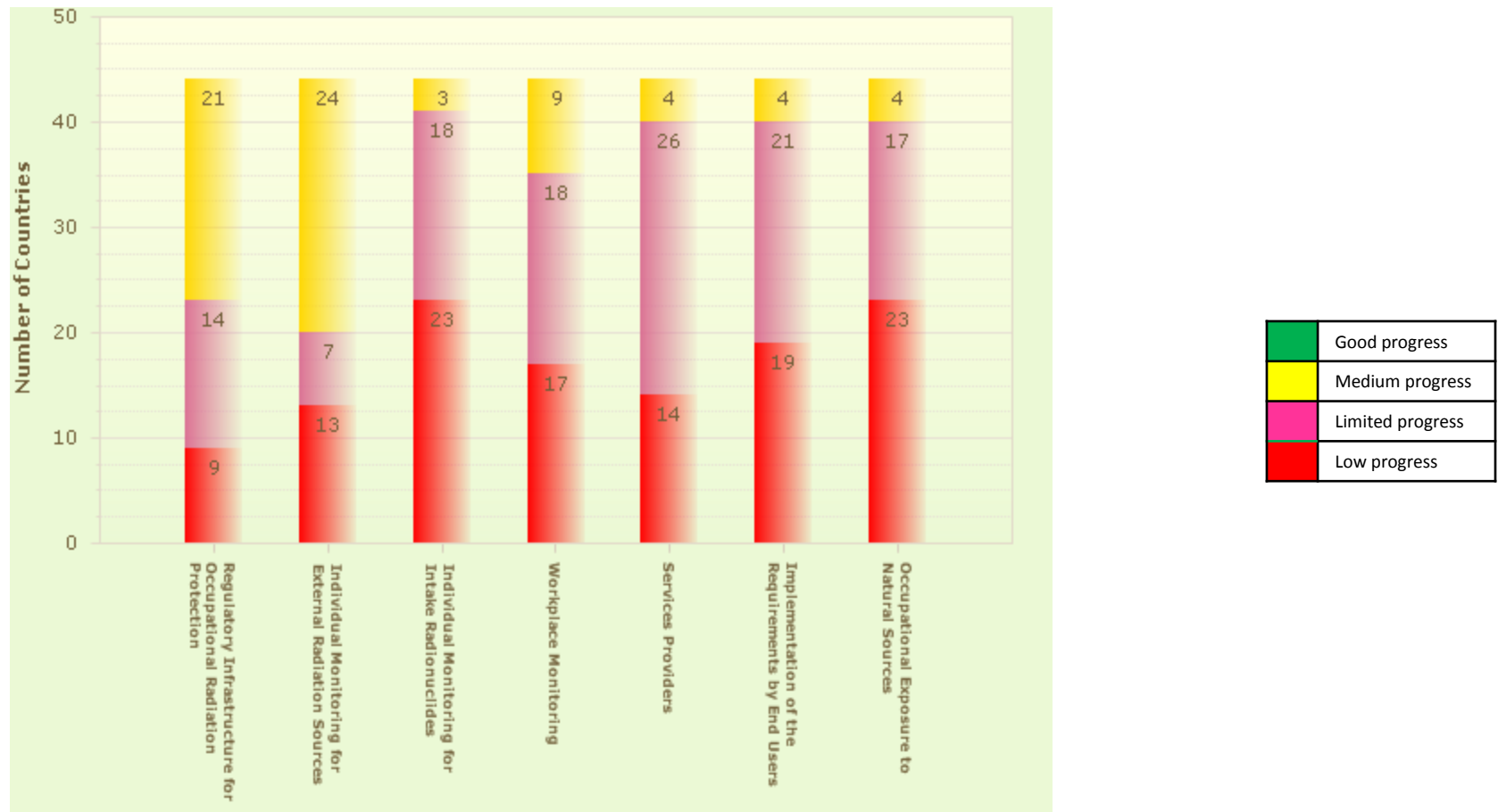
THEMATIC SAFETY AREAS 2/6

- African Member States Member States that can be considered to have a high-level of radiation safety infrastructure:
 - Regulatory infrastructure for radiation safety -21%
 - Occupational protection - 5%
 - Protection in Medicine - 7%
 - Protection of the public and environment - 4%

THEMATIC SAFETY AREAS 3/6 TSA1



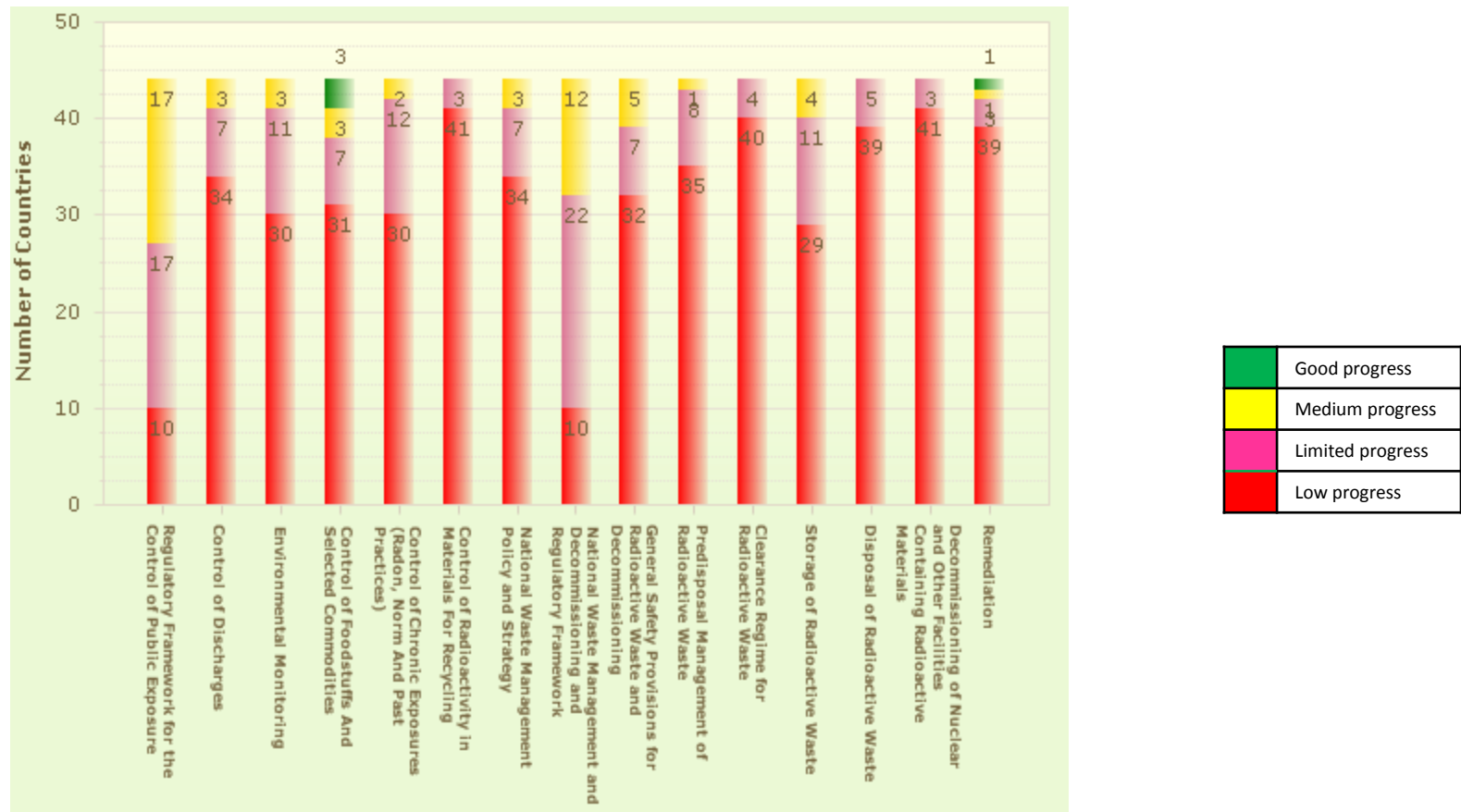
THEMATIC SAFETY AREAS 4/6 TSA 2



THEMATIC SAFETY AREAS 5/6 TSA 3



THEMATIC SAFETY AREAS 6/6 TSA 4



FORUM OF REGULATORY BODIES IN AFRICA –REGIONAL INITIATIVE 1/2

- Established in 2007 and held its first meeting in October 2008 in Vienna with 18 Member States and
- Approved its charter in March 2009 in Pretoria, South Africa
- The objectives of the **Forum** are to:
 - Provide a platform for fostering regional cooperation;
 - Provide for the exchange of expertise, information and experience;
 - Provide opportunity for mutual support and coordination of regional initiatives; and
 - Leverage the development and optimization of resource utilization.

FORUM OF REGULATORY BODIES IN AFRICA –REGIONAL INITIATIVE 2/2

- TWG1: Upgrading Legislative and Regulatory Infrastructure
- TWG2: Upgrading Safety in Radiotherapy
- TWG3: Upgrading Safety in Uranium Mining and Milling
- TWG4: Regulatory Framework for Licensing of Nuclear Power Plant
- TWG5: Upgrading Safety in Nuclear Research Reactor
- TWG6: Education and Training and Knowledge Management
- TWG7: Upgrading Safety of Radioactive Waste Management Infrastructure
- Identified 2 Management tools
 - Self-assessment among regulatory bodies
 - Networking among regulatory bodies
- To address both the fundamentals and the thematic safety areas

CHALLENGES 1/2

- All the available tools measure/evaluate **Radiation Safety Infrastructure** AND NOT **Radiation Safety Culture**
- RSC is a fabric with 3 dimensions of people, technology and institution
- RSI are fibres of different colours
- Weak Radiation Safety Infrastructure
 - Some have legislation but **not consistent** with International Standards
 - Some have legislation but **not implemented**
 - Some have legislation but **not enforced**
 - Some have draft legislation but **not promulgated**
 - Several have **no draft legislation**

CHALLENGES 2/2

- Different levels of regulatory infrastructure
 - RB established by law
 - RB established as an ad hoc committee not by law
 - RB lacks powers to make regulations
 - RB lacks powers to enforce radiation safety
- Dwindling Resources (IAEA & MS)
- Increased Use of Ionizing Radiation in
 - Mining
 - Human health (radiotherapy); and
 - even attraction to nuclear energy
- Low level of cooperation among RBs except through IAEA

OPPORTUNITIES

- Globalization through the use of IAEA standards
- Coming into force several international agreements and codes;
- Promotion of transparency and sharing of experience and lessons learned through the IRRS
- Establishment of the African Commission on Nuclear Energy;
- Increase in Medical Applications especially radiotherapy
- Renewed interest in mining activities
- Interest in NPP in the Region

RECOMMENDATIONS 1/2

- The IAEA needs to:
 - Develop guidance documents on Radiation Safety Culture, including how to measure it;
 - Provide more resources for training and assistance for strengthening radiation infrastructure in the region;
 - Develop innovative strategies for the achievement of the TSA tasks
 - Encourage manufacturers of radiation equipment to get involved in strengthening radiation safety infrastructure in the Region
- The MS through the General Conference should dedicate the next project cycle to consolidation of Radiation Safety Infrastructure, as a necessary condition for Radiation Safety Culture

RECOMMENDATIONS 2/2

- The African MS should, through the General Conference, seek the support of other regions to dedicate the next project cycle to consolidation of Radiation Safety Infrastructure, as a necessary condition for Radiation Safety Culture
- The African Union should operationalize the African Commission on Nuclear Energy (AFCONE) with the sole objective of emplacing a sustainable radiation safety culture throughout the Region
- The AU should encourage manufacturers of radiation equipment and mining companies to get involved in strengthening radiation safety infrastructure in the Region
- FNRBA should rediscover itself and dedicate its resources to emplacement of radiation safety culture in the region

THANK YOU