Royaume du Maroc
Ministère de l'Energie, des Mines et de l'Environnement
المملكة المغربية
وزارة الطاقة والمعادن والبيئة

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Nuclear applications in Morocco- Status quo and ways forward

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Introduction

In accordance with the Very High Directives of His Majesty King Mohammed VI:

- strengthening aspects of cooperation with African countries and broadening the scope of South-South cooperation;
- several Government agreements and conventions concerning economic operators have been signed in different sectors including nuclear applications;
- the general framework for cooperation between Morocco and these countries and cover, in particular, aspects related to technical assistance, exchange of experience and training in nuclear applications;
- encouragement of partnerships between public and private organizations and institutions or companies working in the fields of these sectors including nuclear applications.

International Commitments: Safety, Security and Guarantees

Morocco has signed and ratified all international treaties and conventions

Nuclear Safety Convention (May 2019)

- Convention on the Physical Protection of Nuclear Material CPPNM (2002) and its amendment (2015)

2011

International Convention for the Suppression of Acts of Nuclear Terrorism (2010)

CODE DE CONDUITE SUR LA SÛRETÉ ET LA SÉCURITÉ DES SOURCES RADIOACTIVES

IAEA International Atomic Energy Agency

2004

United Nations Security Council Resolutions 1540 (2004) and 1373 (2001)

Joint Convention on Spent Fuel Management and Radioactive Waste Management

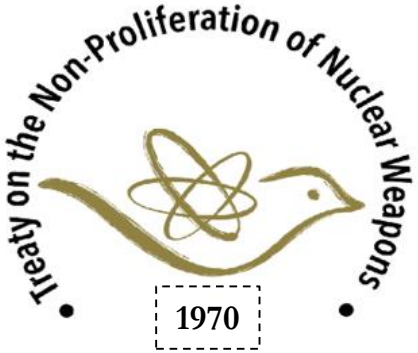
(1999)

- Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency (1993)

- Convention on the Early Notification of a Nuclear Accident

(1993)

Generalized Guarantees Agreement (1975)



1970

accession to the IAEA

1957

Law 142-12 on nuclear safety, security and guarantees complies with international commitments

Regulatory framework: 1/4

❖Law No. 142-12 relating to nuclear and radiological safety and security and the creation of the Moroccan Security Agency and of Nuclear and Radiological Safety (AMSSNuR) as an independent regulatory authority to ensure :

- ✓ compliance with nuclear and radiological safety and security standards
- ✓ safety and security of activities and installations involving sources of ionizing radiation,
- ✓ advises and assists government authorities on matters relating to nuclear and radiological safety and security,
- ✓ assists the government in international negotiations in the areas of its competence.

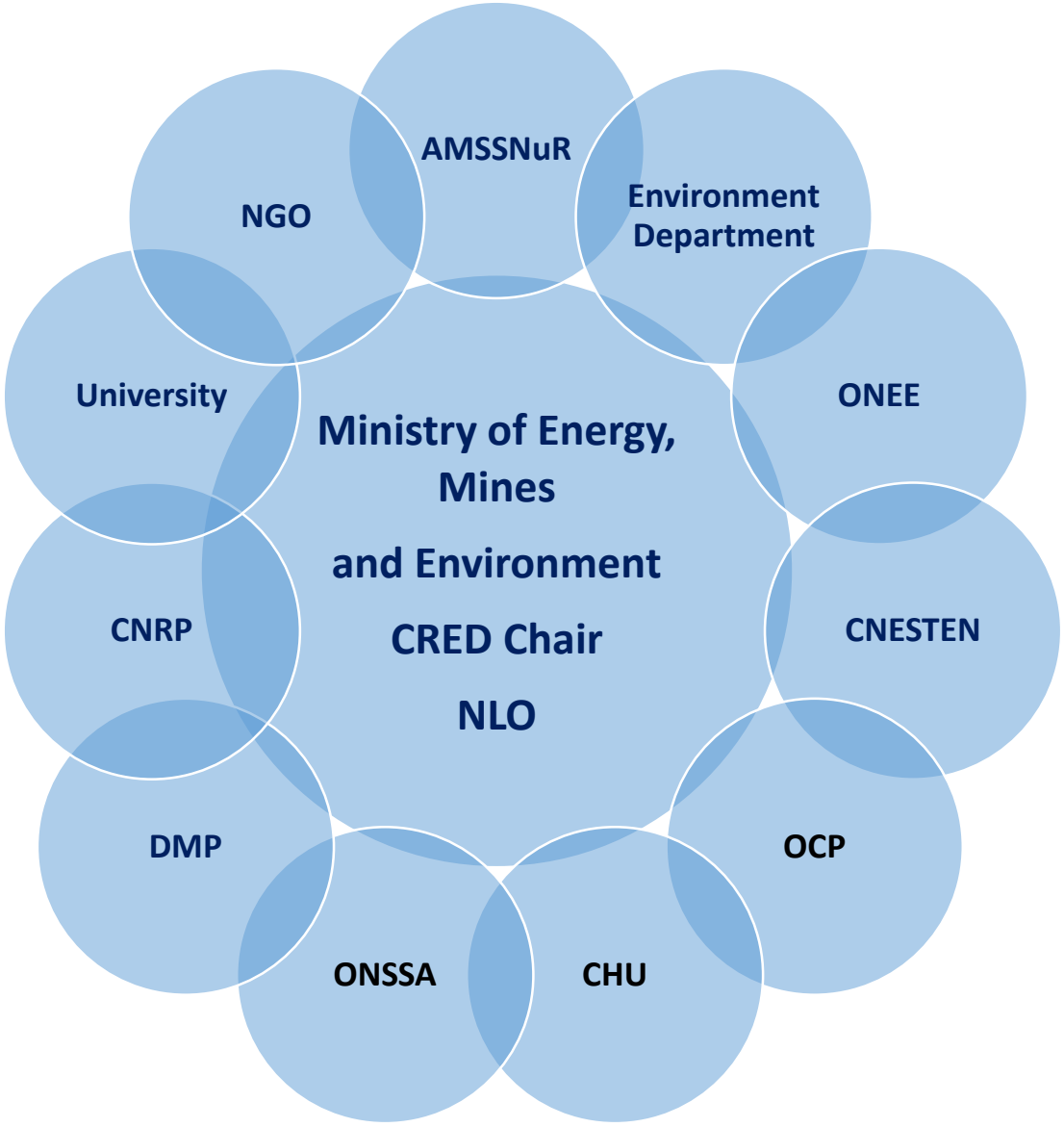
Regulatory framework: 2/4

Updating the legislative and regulatory framework relating to nuclear and radiological safety and security, civil liability and guarantees

- ✓ Amending Law No. 12.02 on civil liability in the event of nuclear damage in order to take into account the requirements of the Convention on supplementary compensation for nuclear damage. It should be noted that Morocco ratified this convention in 1999 and entered into force in 2015.

- ✓ Decree n ° 2-20-131 relating to Authorizations and declarations of installations and activities and associated sources of ionizing radiation falling within Category II.
    1. Decision No. 3.08.21 regarding licenses related to activities, installations and associated sources of ionizing radiation belonging to the second category and related to departments and facilities affiliated with them, territorial groups, institutions and other legal persons subject to public law,
    2. Decision No. 3.11.21 specifying the classifications of activities, facilities and associated sources of ionizing radiation belonging to the second category,
    3. Decision No. 3.12.21 regarding setting exemption levels related to activities, facilities and related sources of radiation belonging to the second category.
- ✓ Decree implementing the provisions of Article 34 of Law No. 142.12, designating the MEME as the governmental authority to authorize the import, export and transit of nuclear materials whether by land, river, airport or port, after study of the authorization request file by the AMSSNuR.
- ✓ Draft decree on the terms and conditions for granting authorizations to organizations providing technical services in the field of radiation protection.
- ✓ Draft decree on the safety and authorization of category 1 facilities and activities.

Strengthened Institutional Framework



- CNESTEN is recognized by the IAEA as Collaborating Center in three important socio-economic sectors: Water, Environment and Industry,
- MEME has adopted a strategic vision by 2030 for CNESTEN.
- AMSSNuR as th Chair of the regional intergovernmental organization called the Forum for Nuclear Regulators in Africa (FNRBA).
- NGO: MYGN, WIN

RDCs

Morocco has established 5 AFRA RDCs for:

1. **Environmental Isotope Hydrology**
2. **Techniques in Human Nutrition**
3. **Non-Destructive Testing in Industrial Applications**
4. **Education and Training in Radiation Protection**
5. **Clinical Radiotherapy and Medical Physics**

RDC in the field of Deuterium Dilution Techniques in Human Nutrition (CNESTEN-UIT)

The Nutrition Research Joint Unit CNESTEN-Ibn Tofeil University is providing:

- Theoretical and practical trainings in Deuterium Dilution Techniques/Human Nutrition;
- Research and application of Deuterium Dilution Techniques in Human Nutrition;
- Advisory services in measuring deuterium enrichment by Fourier Transform Infrared Spectrometry (FTIR) for assessment of body composition and human milk intake by breastfed infants;
- Analysis of biological samples, assistance in the quality assurance as well as data evaluation;
- Organization of inter-laboratory studies on FTIR analysis of deuterium;
- Support to promote in the region ethical issues in terms of the legal framework, receipt and sending of biological samples.

RDC in the Field of Non-Destructive Testing Techniques (CNESTEN)

CNESTEN is providing:

- Harmonization of certification and qualification schemes for NDT personnel;
- Teaching and on-the-job training of NDT personnel in levels I, II and possibly III;
- Dissemination and demonstration of innovative NDT practices in the main NDT methods;
- Assistance for establishing national radioactive waste management infrastructures (manpower, facilities and legal framework).

RDC in Education and Training in Radiation Protection

- Theoretical and practical training in Radiation Protection;
- Organizing Regional Posgraduate Educational Course (PGEC) on radiation protection and safe use of radiation sources;
- Advisory services on specific elements of the Thematic Safety Areas;
- Supporting regional efforts to promote Basic requirements for the safety of radiation sources;
- Hosting RTCs on radiation safety and related topics, performing consultancy and expert missions for the region;
- Hosting IAEA Fellows or Scientific Visit nominees in radiation safety and related topics.

The11th edition for the PGEC (from November 2020 to April 2021) for 28 participants from 16 Africans counties.

Nuclear applications

Industrial field

- 400 radiometric and x-ray instruments used for quality control in the petroleum chemistry, papermaking and cement industries;
- 2 cyclotron units used in the production of Fluor-18;
- More than 13 institutions for non-destructive monitoring (45 sources of industrial radiography),

Security

- 12 particles accelerators,
- 400 scanners for baggage inspection.

Education and scientific research

- Scientific research activities using X-rays, diffraction, spectrometry, X-ray generator and many (more than 426) low-activity radioactive sources.

Public health,

- 38 radiotherapy centers (62 linear accelerators, 30 detectors for ionizing radiation sources)
- 2 x-ray machines (KAMA),
- 26 Radiology Centers (44 radiotherapy rooms),
- More than 5,500 radiological diagnostic facilities, including 10,000 radiological diagnostic devices.

Nuclear Research Reactor:

The first nuclear facility in Morocco was established through a 2 megawatt nuclear research reactor and associated laboratories.

Agricultural and Water

- nuclear and isotopic techniques are used to contribute to the sustainable management of natural resources,
- During the past twenty years, major national aquifers have been characterized using isotopic methods

Nuclear applications and Technical Cooperation with the IAEA

monitoring → management → Evaluation

Steering of Technical Cooperation with IAEA in the field of the peaceful use of nuclear applications

National Framework Program signed on September 19, 2018 between the IAEA and Morocco for the period 2018-2023 :

- project completion rate exceeded 95% during the year 2020;
- 6 technical cooperation projects with the IAEA scheduled for the 2022/2023 cycle;

Nuclear applications and Technical Cooperation with the IAEA

Integrating new nuclear technologies serving socio-economic sectors

- Developing the Triga markII Reactor Facility for Applications in socioeconomic Sectors,
- Implementing the Sterile Insect Technique in the souss Valley
- Enhancing Control of Chemical Food and Feed Contaminants, Animal Disease Diagnosis and Trade in Fresh Fruits,
- Enhancing Hybrid lmaging in Oncology, Cardiology and Neurology
- Evaluating the National Nutrition Programme Focused on Breastfeeding and Newborns' Nutritional Status and Theil' Development during the First 1000 Days ,
- Characterising Thermal waters Using Isotopic and Nuclear Techniques,
- Assessing Seawater Intrusion in Arid Coastal Aquifers Using Isotopic and Nuclear Techniques,
- Strengthening National Infrastructure for Radiation Safety and Security,
- Building Capacity of the Regulatory Body on Radiological Safety and Environmental Monitoring,
- Enhancing National Capacity for Knowledgeable Decision Making about Nuclear Power,

Triangular cooperation (IAEA- Morocco Instit-African Instit)

- **IAEA-CIV- MOR :** Promoting Technical Cooperation among Developing Countries (TCDC) in Africa through Triangular Partnerships (AFRA) by strengthening and sustaining skills and knowledge in using radio-isotopic methods to support, promote and improve conservation agriculture in CIV.
  - Main achievements: Human resource development; Support to the local team; Field sampling enhancement; Radionuclide (^{137}C) analyses**.**
- **IAEA-Madagascar-Morocco:** Enhancing training and certification schemes as well as promoting industrial applications of Non Destructive Techniques (NDT) through collaboration between CNESTEN-Morocco and INSTN-Madagascar.
  - Main achievements: Support to the local team, Human resource development.
- **IAEA- SENEGAL- MOROCCO:** Promoting Institutional Capacity Building Through Triangular Partnerships in Nuclear Medicine.
- **Moroccan institutions have prepared with their peers in the region a total of 56 triangular proposals, demonstrating a tremendous interest in strengthening collaborations to better address regional needs through using nuclear science and technology.**

Thank you!

Mr. Karim EL-ASSEFRY biography

Mr. Karim EL-ASSEFRY is the Head of Nuclear Applications and Safety Division within the Ministry of Energy, Mines and Environment (MEME). He is also the IAEA National Liaison Officer (NLO) in charge of steering the technical cooperation between Morocco and the IAEA since 2020.

He has served as the Head of Power Generation Section within MEME for 5 years. He worked also in private sector as an engineer in charge of photovoltaics projects with Krannich Solar Company in Spain.

Mr.EL-ASSEFRY is a Founding Member of Renewable Energy University Network (REUNET)

He is also a founding member of Moroccan Young Generation in Nuclear (MYGN) and member of his executive office.

He holds an Engineer diploma on Renewable Energy and Energy Efficiency from the National Mining Institute of Rabat (ENSMR), Morocco in 2011.