An Insight into the Centre for Nuclear Safety and Security

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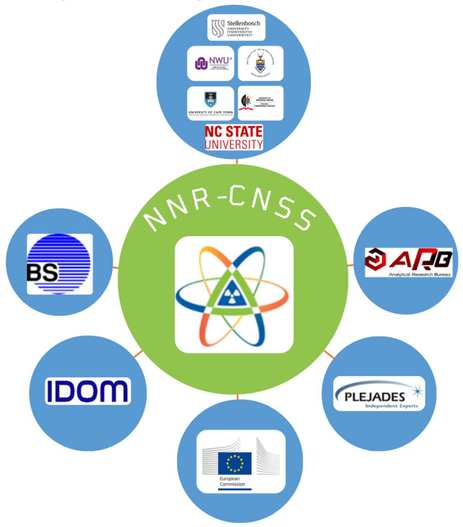
1. Introduction

The Centre for Nuclear Safety and Security (CNSS), established by the National Nuclear Regulator (NNR) of South Africa in September 2016, hosted by the University of Pretoria (UP), serves as the NNR's technical and scientific support (TSO) unit. The CNSS follows a **hub-and-spoke model**, leveraging local and international academic and research expertise to tackle key Safety and Security issues, guided by its **four Strategic Pillars.**



CNSS Partner Institutions & Collaborators

Pillars		Strategic Objectives
Strategic Partnerships	Pillar 1	Leverage strategic partnerships through the CNSS to build capacity
Education & Training	Pillar 2	Strengthen training and capacity development of regulatory staff
Regulatory Research & Development	Pillar 3	Build regulatory research infrastructure and capacity
Technical & Scientific Support	Pillar 4	Ensure effective technical and scientific support to the regulator

CNNS Strategic Pillars

2. Education and Training

CNSS provides nuclear safety and security training to build regulatory capacity and develop a skilled workforce, offering programs to national and regional organizations through local and international collaborations.

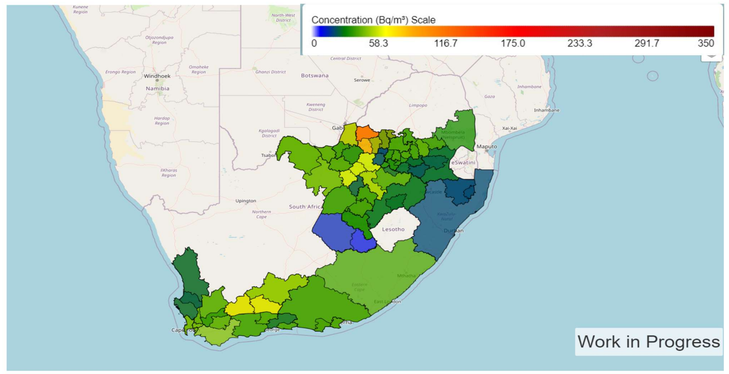
NNR-CNSS collaborated with WINS (World Institute for Nuclear Security) for Regional Training on Transport Security Management of Nuclear Materials (May 2023) and hosted a Regulatory Capacity Building Workshop under the European Commission's (EU Com) Technical Cooperation Project (Ref: **INTPA/2022/RP/0067**) (Feb 2023/2025).

3. Regulatory Research and Development (RRD)

The CNSS carries out RRD activities in line with established NNR processes and policies, as well as in line with research practices of Partner Institutions consistent with international best practices. Research areas are initiated based on nuclear regulatory needs to enhance regulatory decision-making and add value to the national and international state of knowledge in the field of nuclear safety & security. Research is undertaken in two aspects, internally within the CNSS and externally with partner institutions. The current research themes can be categorized into Environmental Radioactivity including Radon Monitoring, as well as Nuclear Power Plants (NPPs).

3.1 Radon Surveying and Mapping

The CNSS is currently conducting indoor radon survey on a national scale in South Africa to support the NNR. The radon measurements are conducted in residential homes and public buildings (schools, kindergartens, workplaces and other buildings with high public occupancy) using Solid State Nuclear Track Detectors . The results of the survey are used to produce a radon risk map and a national radon database.



National Radon Risk Map in Development

3.2 Radiological Characterization of Sites

The CNSS monitors and trends radioactivity levels in mine tailings, soil, rocks and water (surface and ground water), terrestrial and marine biota. **The current environmental radioactivity monitoring projects focus on the following aspects:**

- **Legacy sites:** To monitor activity concentrations in and around the mine tailings in order to evaluate the extent of contamination and identify high risk sites.
- **Potential sites for Nuclear Installations:** To establish the baseline natural environmental radioactivity conditions of sites in their pre-operative states and perform independent verification for NNR.

Environmental Sampling for Site Characterization

3.3 NPP Projects

The CNSS conducts advanced Safety and Accident Analyses Research in support of the regulatory mandate in all areas of nuclear operations. This includes multi-physics simulations, integrating neutronics and thermal-hydraulics, radiation transport, and shielding analysis. It also explores innovative concepts like accident-tolerant fuels and performs Probabilistic Safety/Risk Assessments (PSA/PRA). Research extends to facilities such as Koeberg Nuclear Power Plant and other nuclear installations, ensuring safety, efficiency, and compliance with regulatory standards and practices.

Multi-Physics Code Package explored at the CNSS

4. Specialized Services Offered by CNSS

- **Radon Measurements and Diagnostics**;
- **Environmental Radiation Testing** (Soil, Water, Building Materials, Air, Agricultural Produce);
- **Consultancy Services** (Environmental Radiological Characterization of Sites)