



**Science and Security Nuclear Forensics**  
**R&D and Professional Capacity Building**  
**– Mission and Perspectives of the Regulatory Body**  
**and Expectation for Research institutions**

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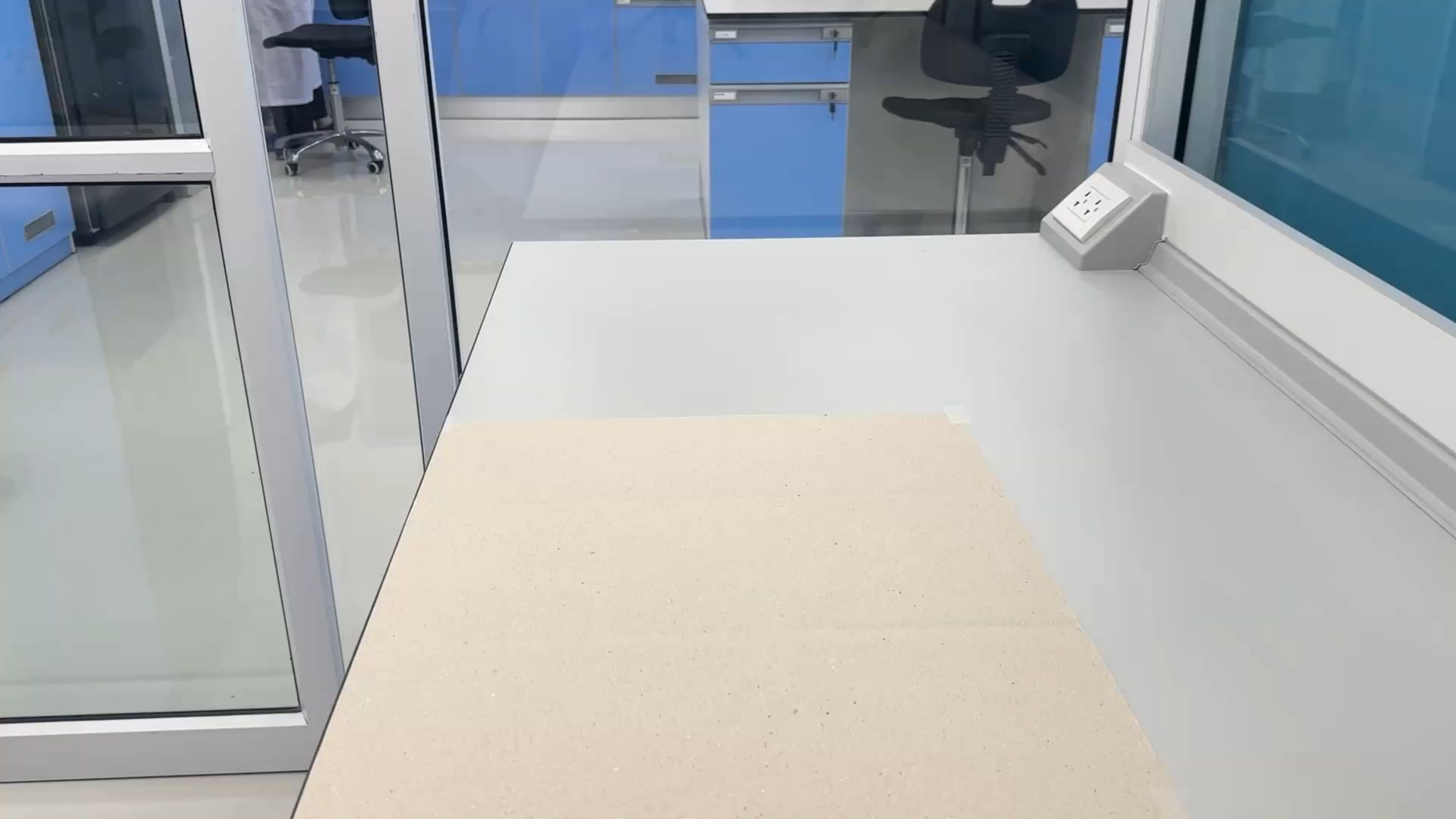
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OFFICE OF ATOMS FOR PEACE

11 DECEMBER 2025







# Nuclear Forensics in Nuclear Security

## ▪ NUCLEAR FORENSICS IN SUPPORT OF INVESTIGATION (IAEA NSS No.2-G)

### Nuclear Forensics:

preventive measures & mechanisms of response



#### Prevention

- Identifies security weaknesses (materials from secure facilities)
- Deterrence (awareness of capabilities discourages illicit trafficking)



#### Response

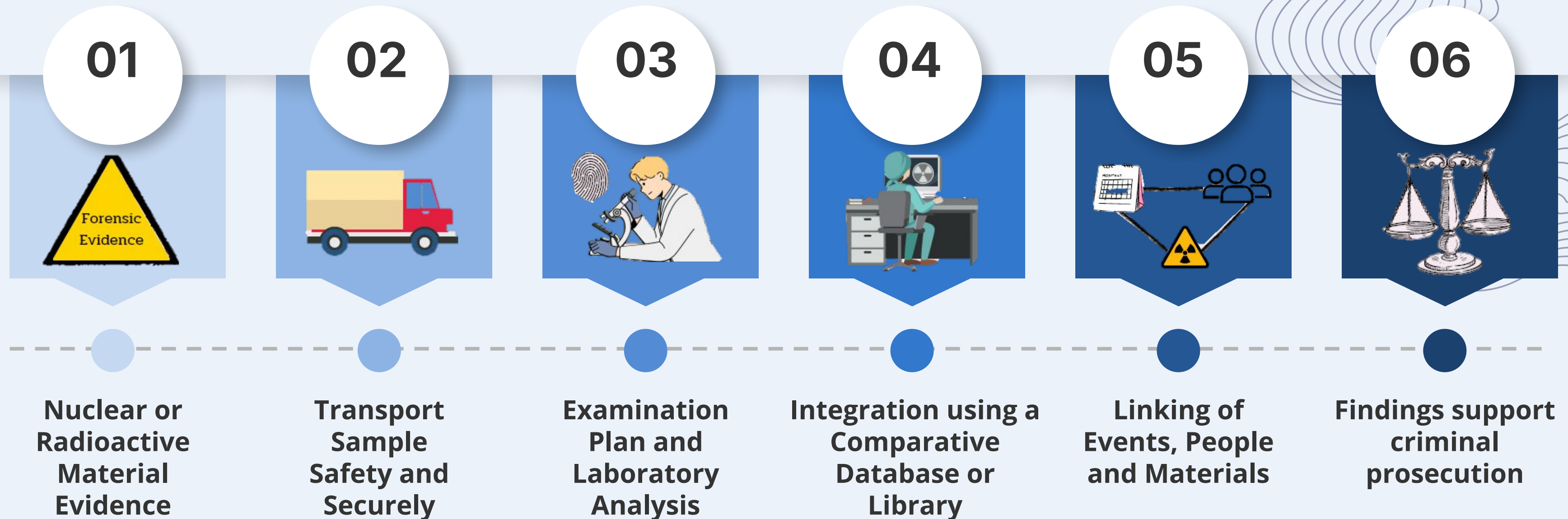
- Complements traditional forensic (criminal investigations)
- Essential for national response (unregulated materials)

### Enhanced nuclear security & deterrence of radiological & nuclear terrorism

Lessons learned	Interdicted sample analysis	Robust capability
<ul style="list-style-type: none"><li>- Understand &amp; mitigate risks</li><li>- Identify deficiencies</li><li>- Improve physical protection &amp; procedures</li></ul>	<ul style="list-style-type: none"><li>- Evidence for law enforcement</li><li>- Determine origin, intended use, physical protection pathway</li></ul>	<ul style="list-style-type: none"><li>- Strong deterrent against future illicit activities</li><li>- Identify &amp; close security gaps</li><li>- Proactive deterrent</li></ul>



# Human resource development and capacity building



**Thailand faced challenges in developing a nuclear forensics capability.**

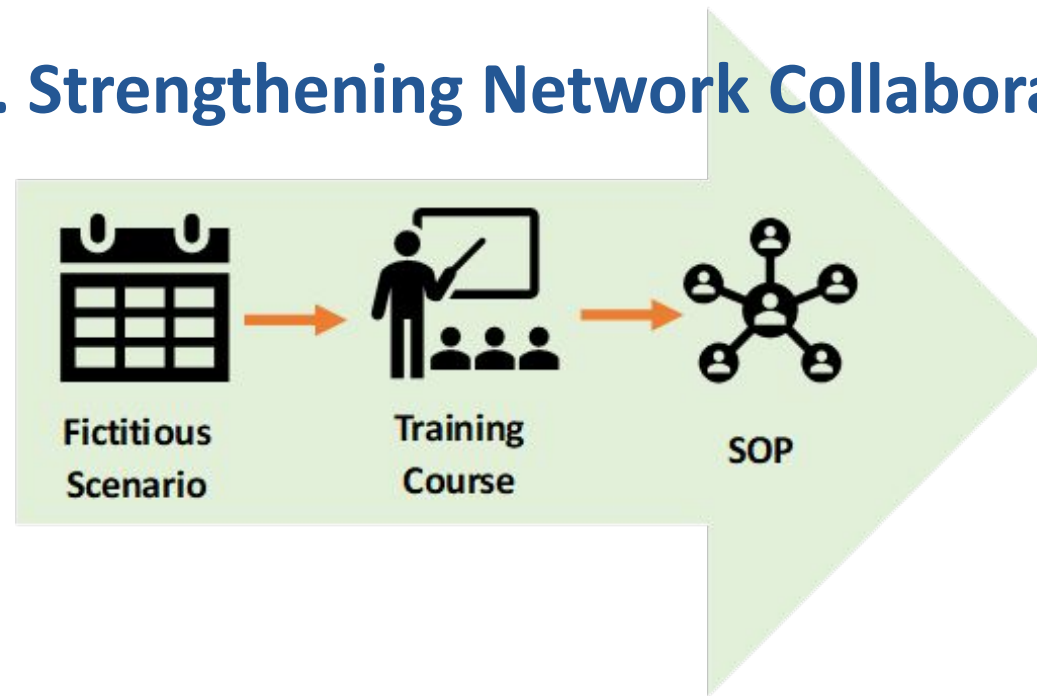
- **Harmonizing current resources to provide effective nuclear security support.**

- **Identify the critical factors related to nuclear and radioactive materials in nuclear security.**

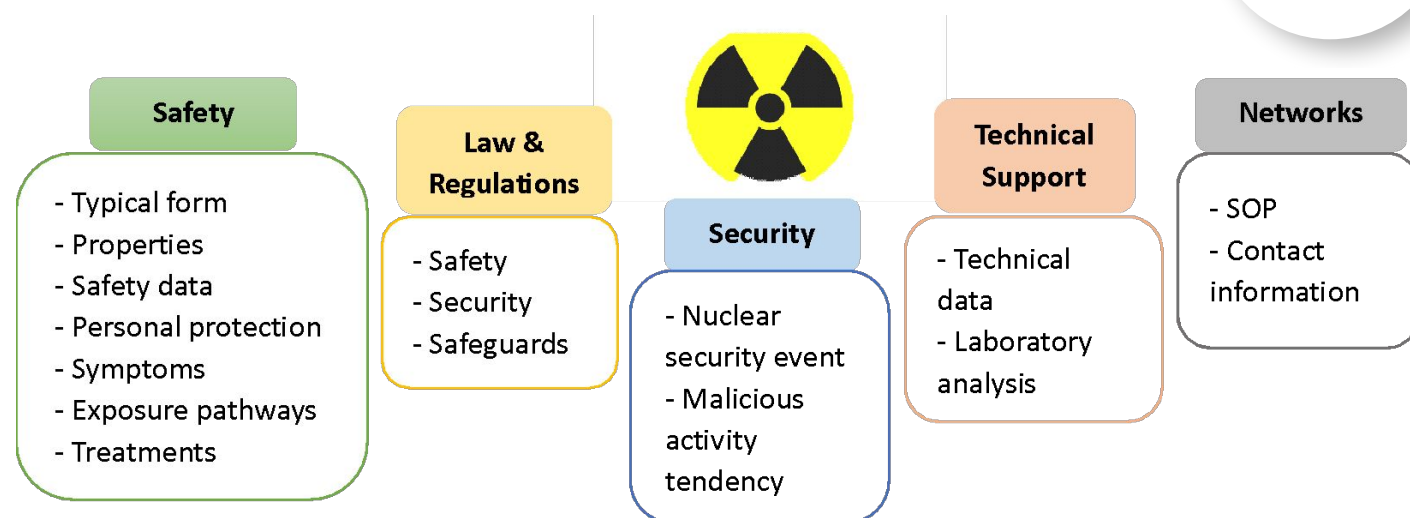
**Management allocated a restricted budget for capacity building.**

# Human resource development and capacity building

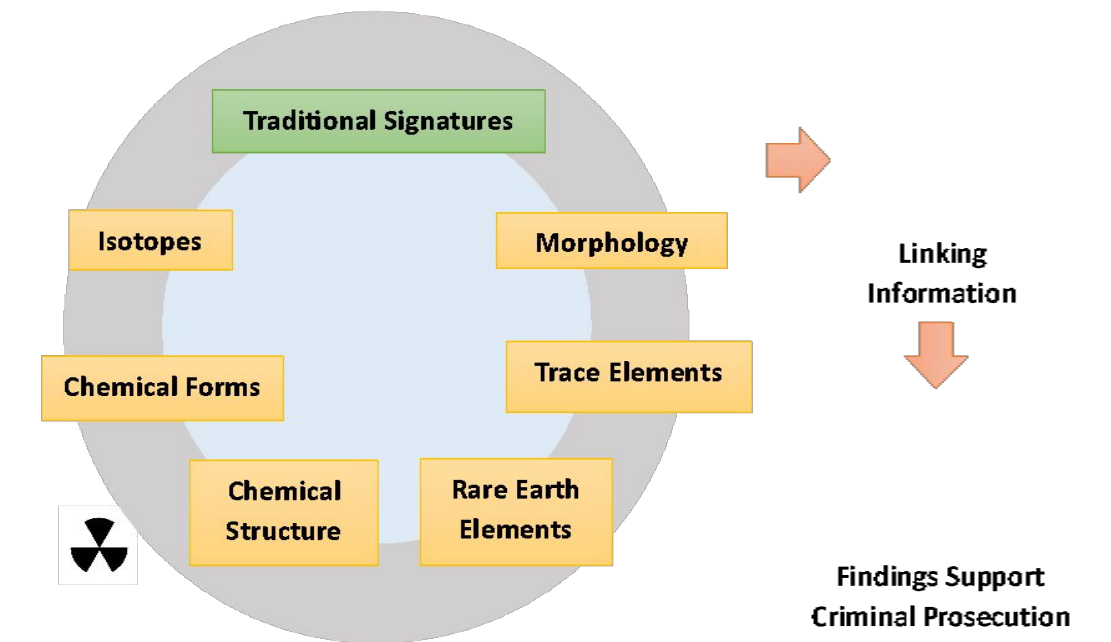
## A. Strengthening Network Collaboration



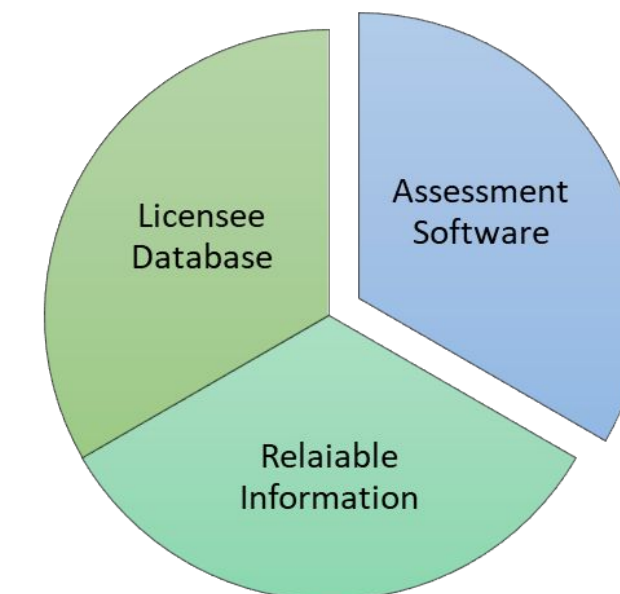
## B. Radiological Crime Scene Management



## C. Nuclear Forensics Laboratory

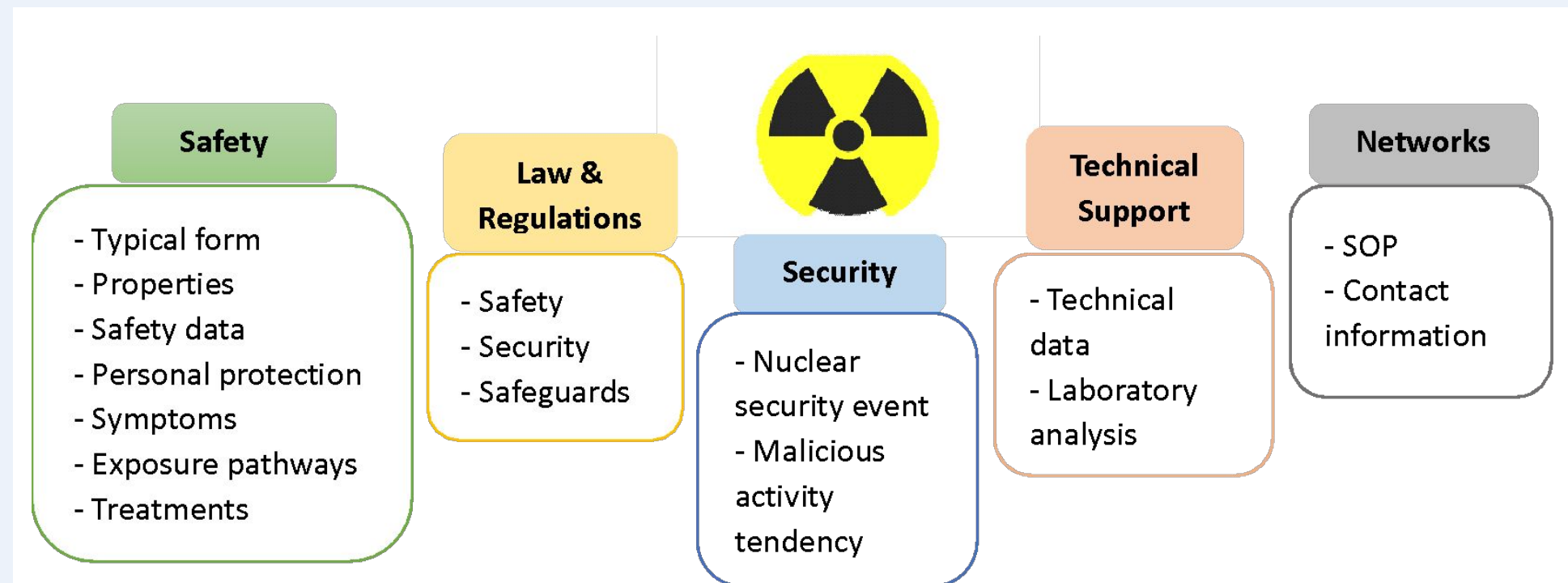
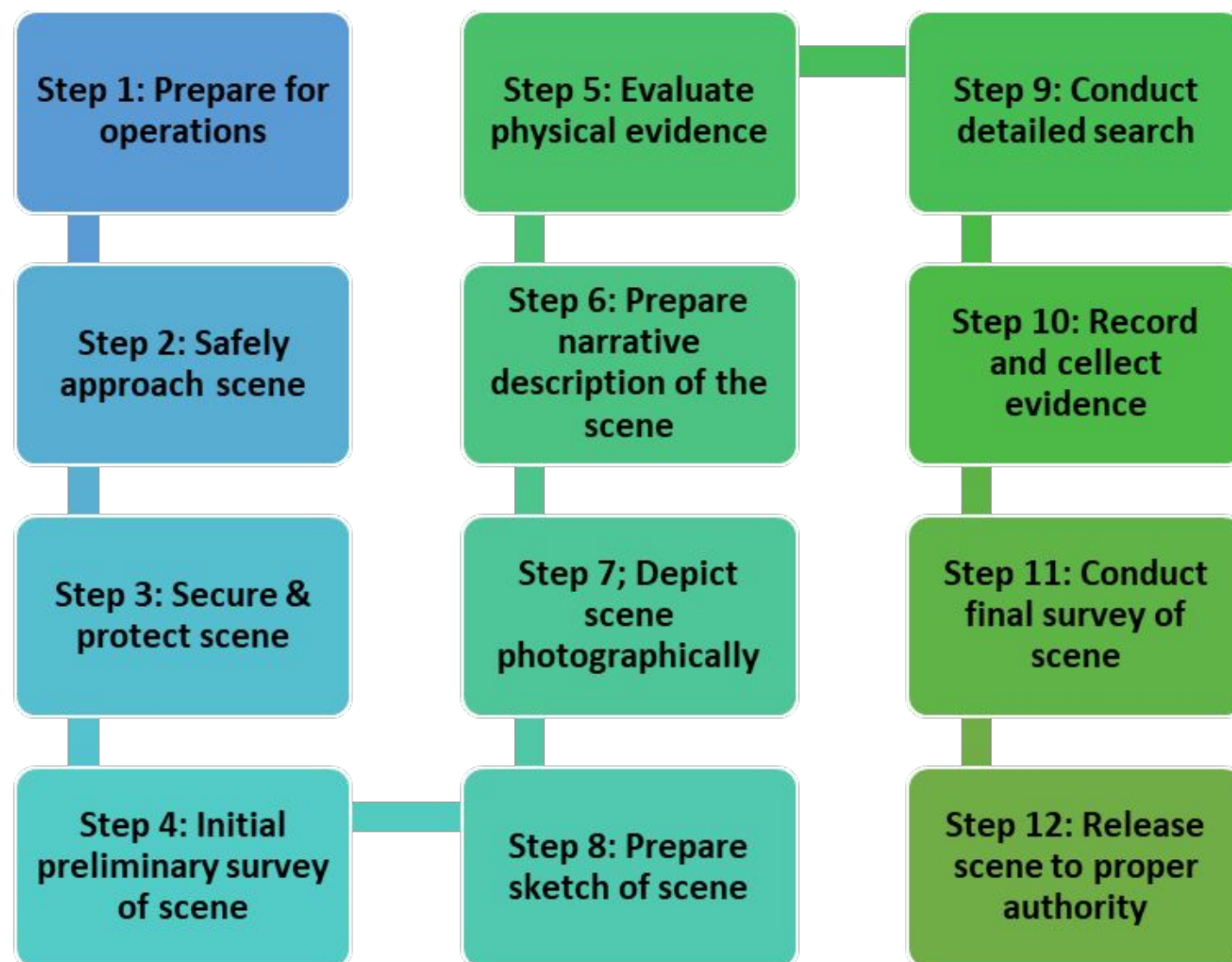


## D. National Library Development

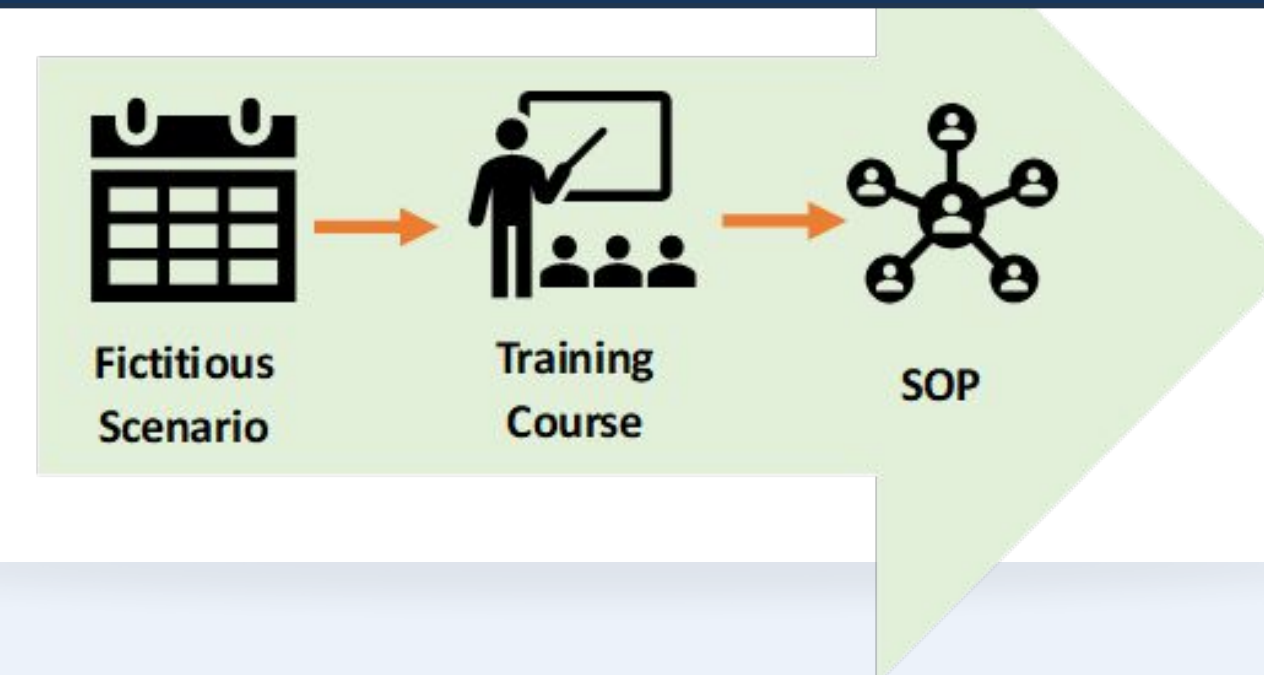


# Human resource development and capacity building

## A. Radiological Crime Scene Management



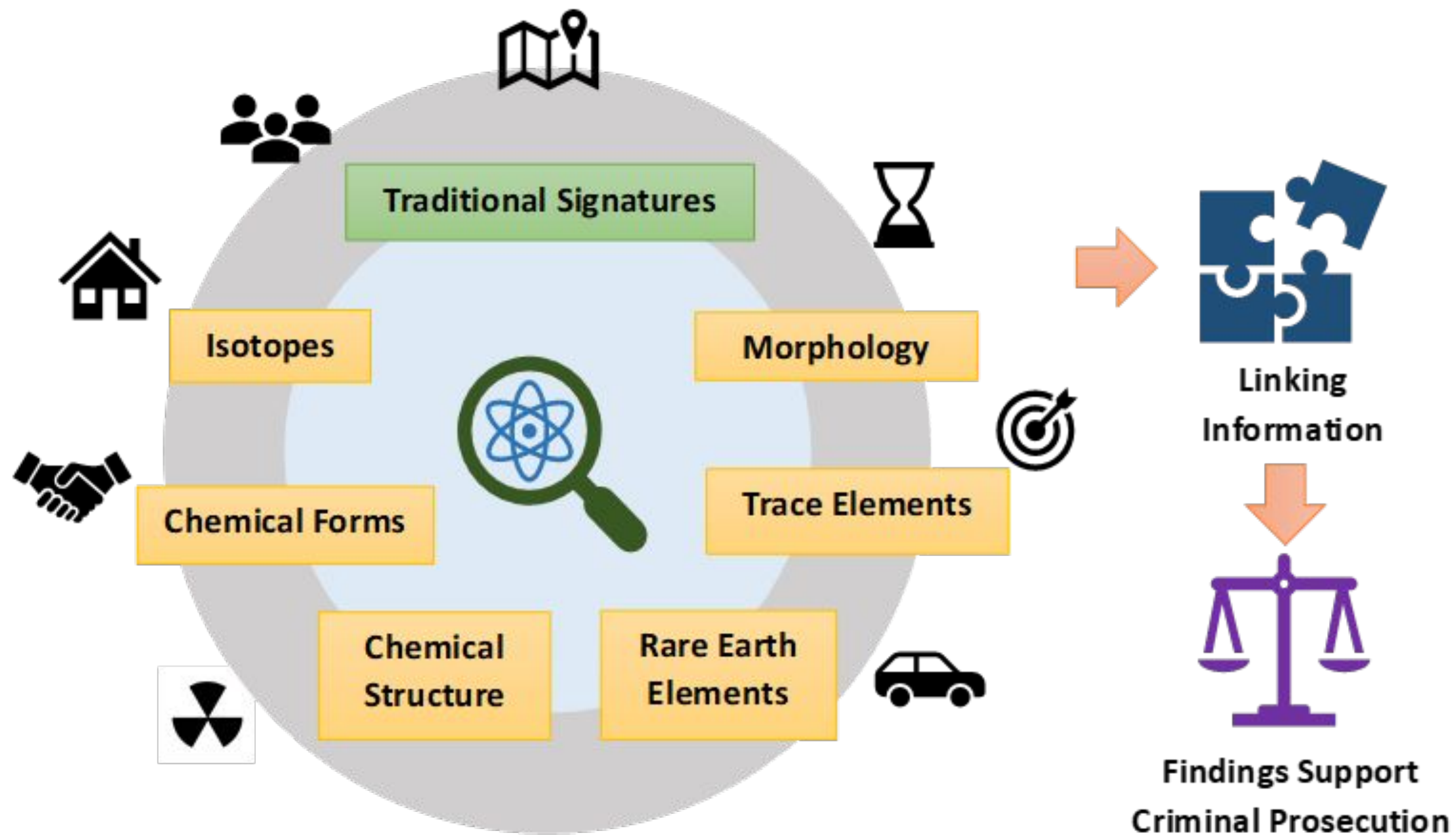
## B. Strengthening Network Collaboration



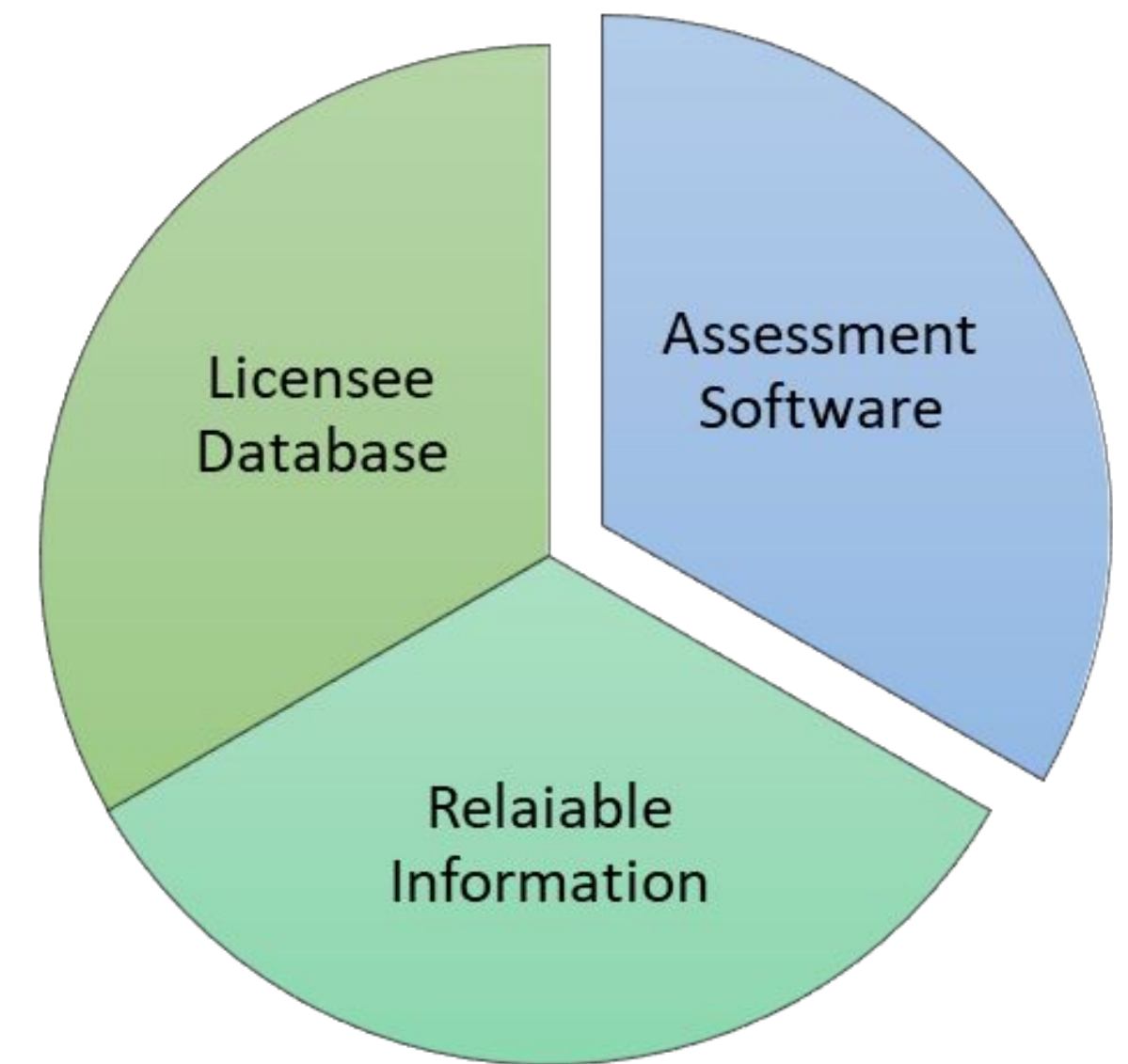


# Human resource development and capacity building

## C. Nuclear Forensics Laboratory



## D. National Library Development





# Nuclear Forensics Laboratory

Nuclear  
Forensic  
s  
Signatur  
e  
Types

Physical  
characteristic

Chemical form

Elemental composition

- Ratios between elements
- Trace elements

Isotopic  
composition

- Radioisotopes
- Stable isotopes
- Decay products



Sample receiving room



Clean laboratory



Destructive  
analysis



Non-destructive  
analysis

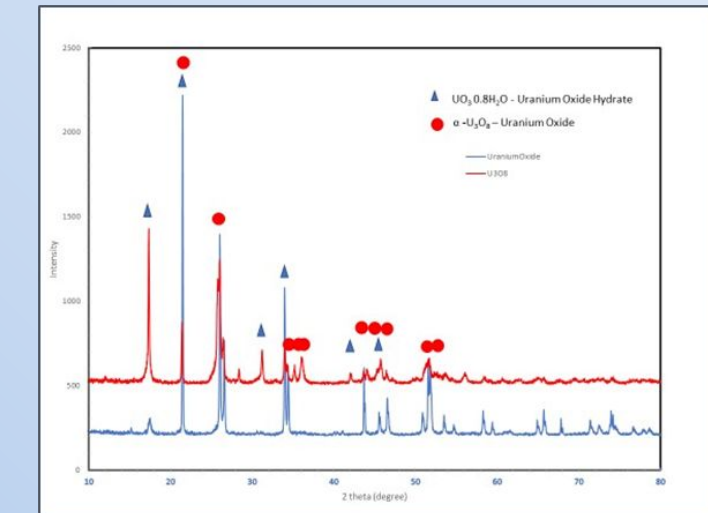
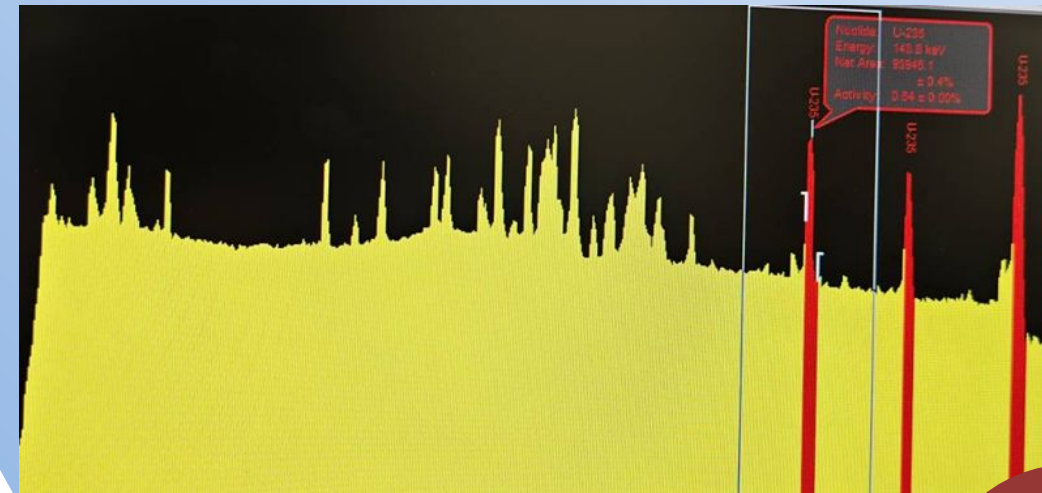
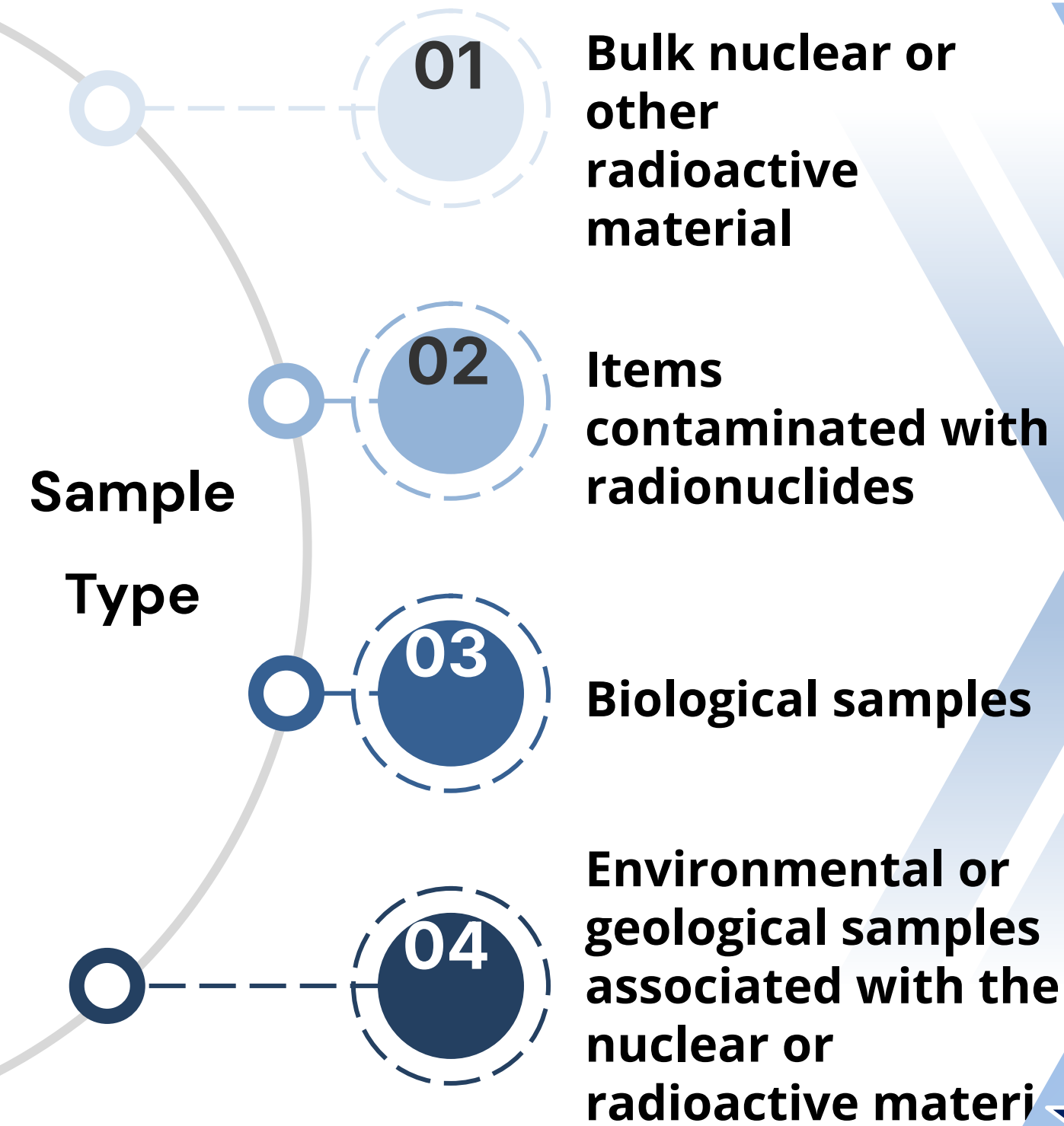




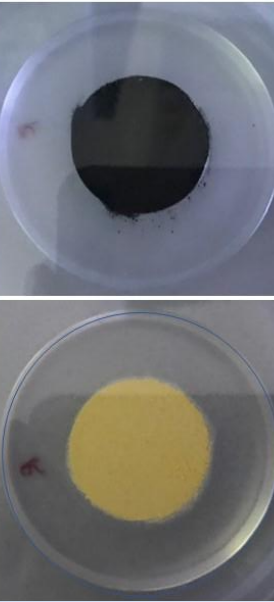
# Nuclear Forensics Laboratory

»» ISO/IEC 17025  
Non-destructive analysis

»» Chemical form and  
Phase analysis



Uranium Oxide Hydrate  $\text{UO}_2 \cdot 0.8\text{H}_2\text{O}$   
Uranium Oxide  $\alpha\text{-U}_3\text{O}_8$



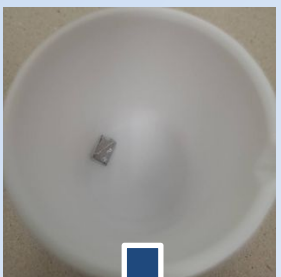
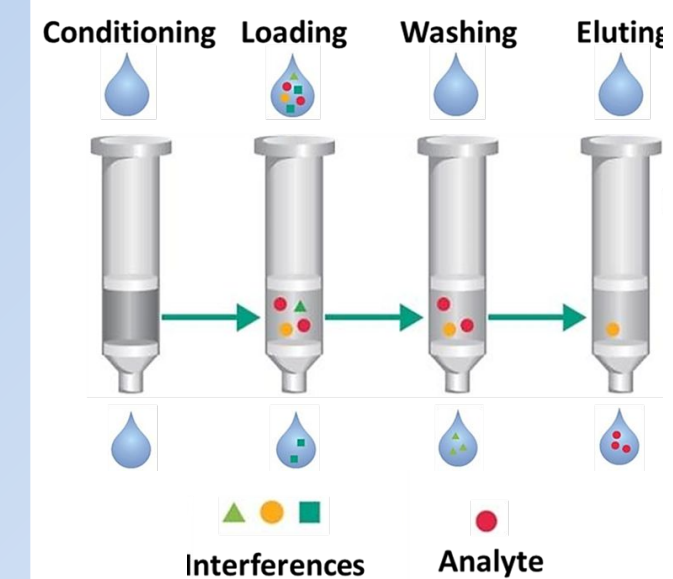
R&D

»» Isotopic composition

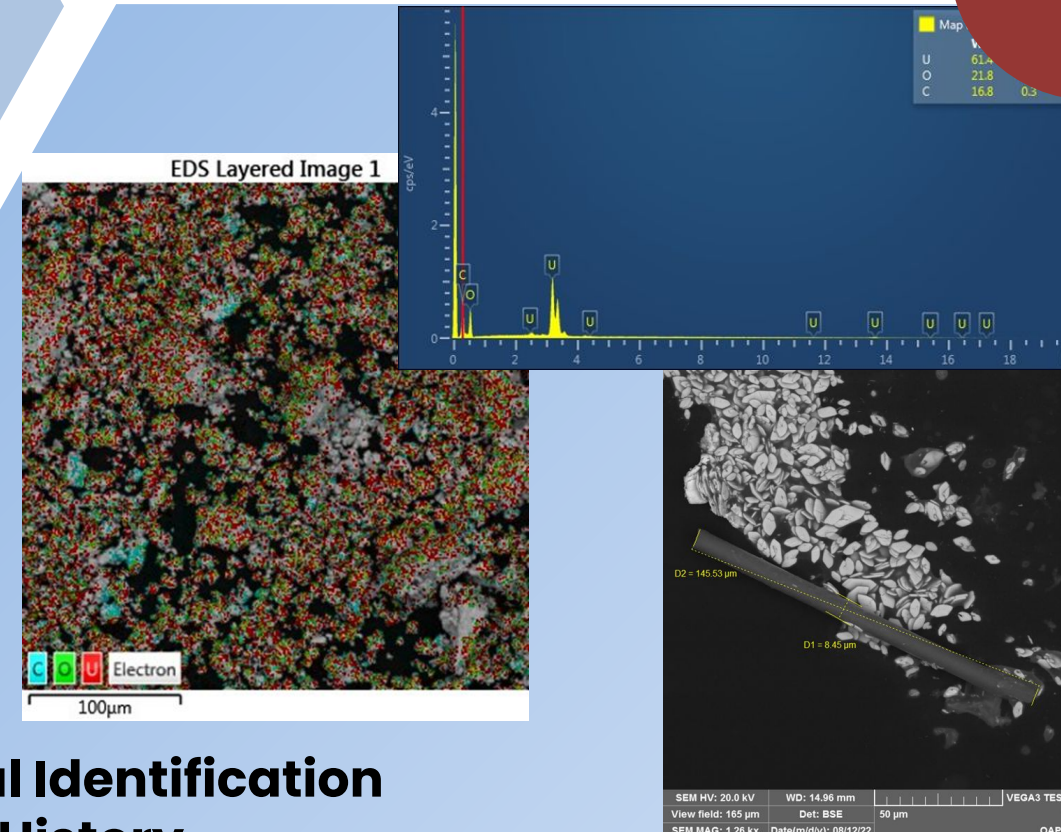
$^{234}\text{U}$ ,  $^{235}\text{U}$ ,  $^{236}\text{U}$ ,  $^{238}\text{U}$ ,  $^{239}\text{Pu}$ ,  $^{241}\text{Am}$

»» Chemical composition

trace impurities, REEs



»» Material Identification  
»» Process History  
»» Detection of Contaminants





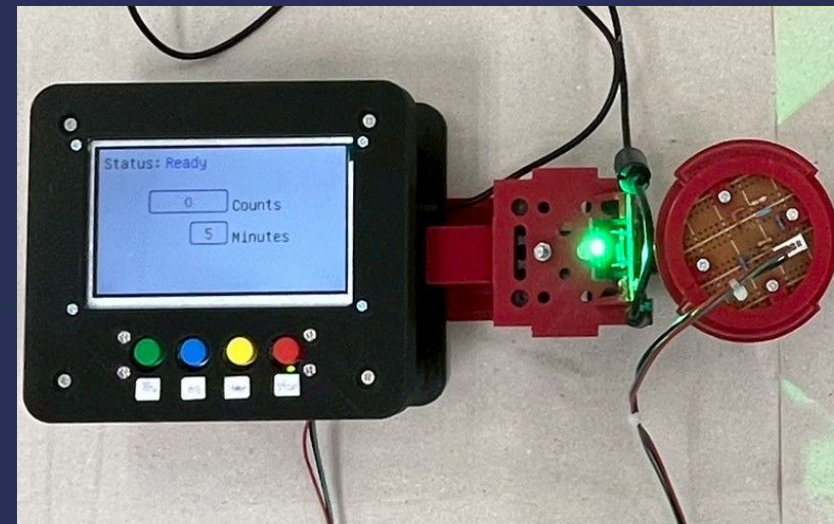
# Nuclear Forensics

## Coordinated Research Project (CRP)



### **J02013: Applying Nuclear Forensic Science to Respond to a Nuclear Security Event**

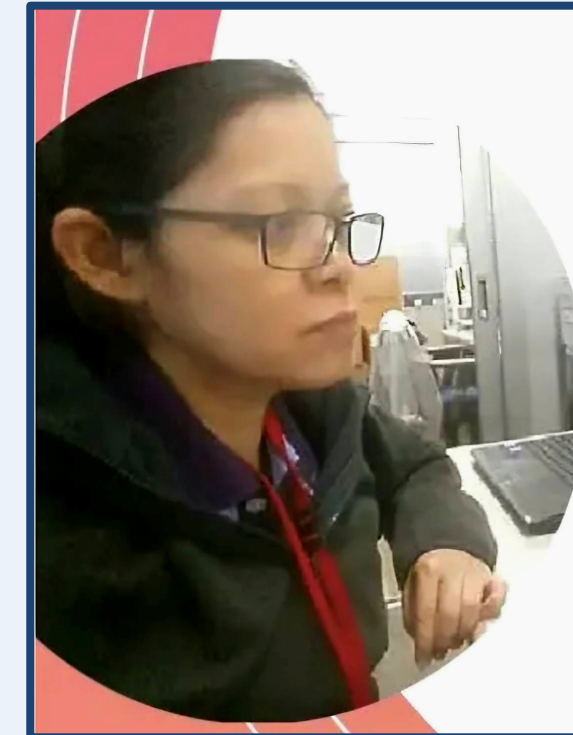
(Establishment of Assessment Software for Nuclear Forensics Signatures to Deter Unauthorized Activities Involving Nuclear and Radioactive Materials in Thailand, 2019–2023)



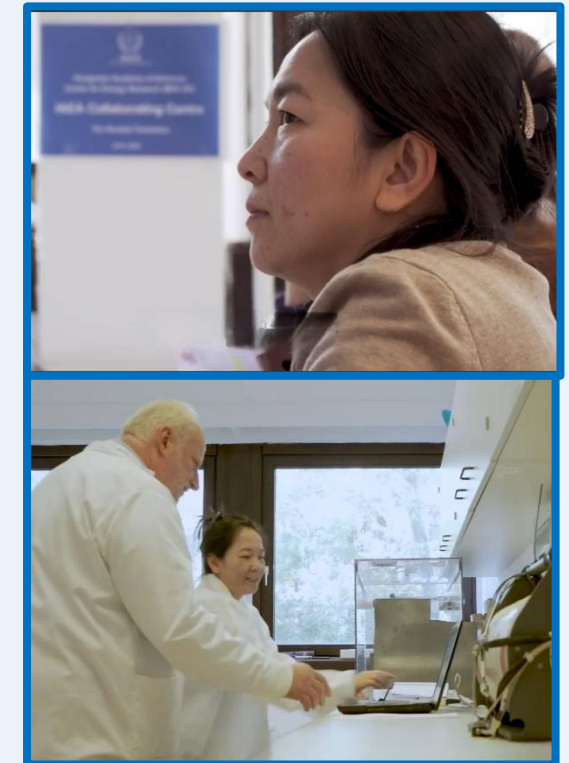
### **J02020: Nuclear Forensics Science to Bridge the Radiological Crime Scene to the Nuclear Forensics Laboratory**

(Application of UVC Screening Technique for Investigation of Illicit Trafficking of Nuclear or Other Radioactive Materials to Identify Vulnerability at Border Control and Support Radiological Crime Scene Management, 2023–2026)

MEXT&ISCN/JAEA



IAEA



## Expectation for Research institutions

01

Capacity building

02

Technological development

03

Collaborative effort



# Nuclear Forensics in Thailand

## Nuclear Energy for Peace Act, B.E.2559 (2016)



Thailand's primary law governing the development and use of nuclear energy and radiation for peaceful purposes.

## Law Enforcement Investigation



Nuclear forensic science can be used alongside traditional forensic methods to support criminal investigations.

## International Obligations and Instruments



- Treaties
- Conventions
- Agreements





# Regional Collaboration in Southeast Asia



01 Project 30: Network of Excellence for Nuclear Forensics in the Southeast Asia Region. (OAP will serve as a hub laboratory in the regional network)

02 Practical Arrangements agreement on cooperation in the area of nuclear forensics science

- ✓ Capacity building
- ✓ Scientific visit
- ✓ Fellowship program
- ✓ Material analysis
- ✓ Interlaboratory comparison







**THANK YOU**