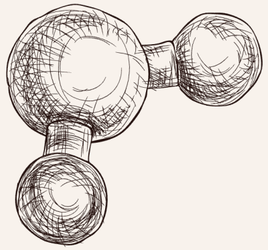
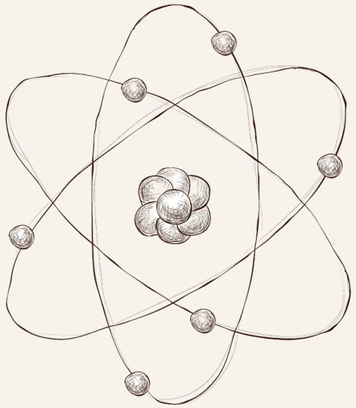
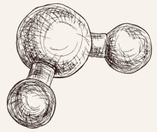




DETECTING RADIOACTIVE INCIDENT AND INITIATING THE INITIAL RESPONSE IN EARLY STAGE

SP Dr. Kedar Khadgi
Nepal Police Hospital
Nepal



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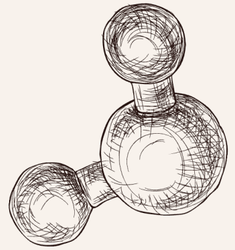
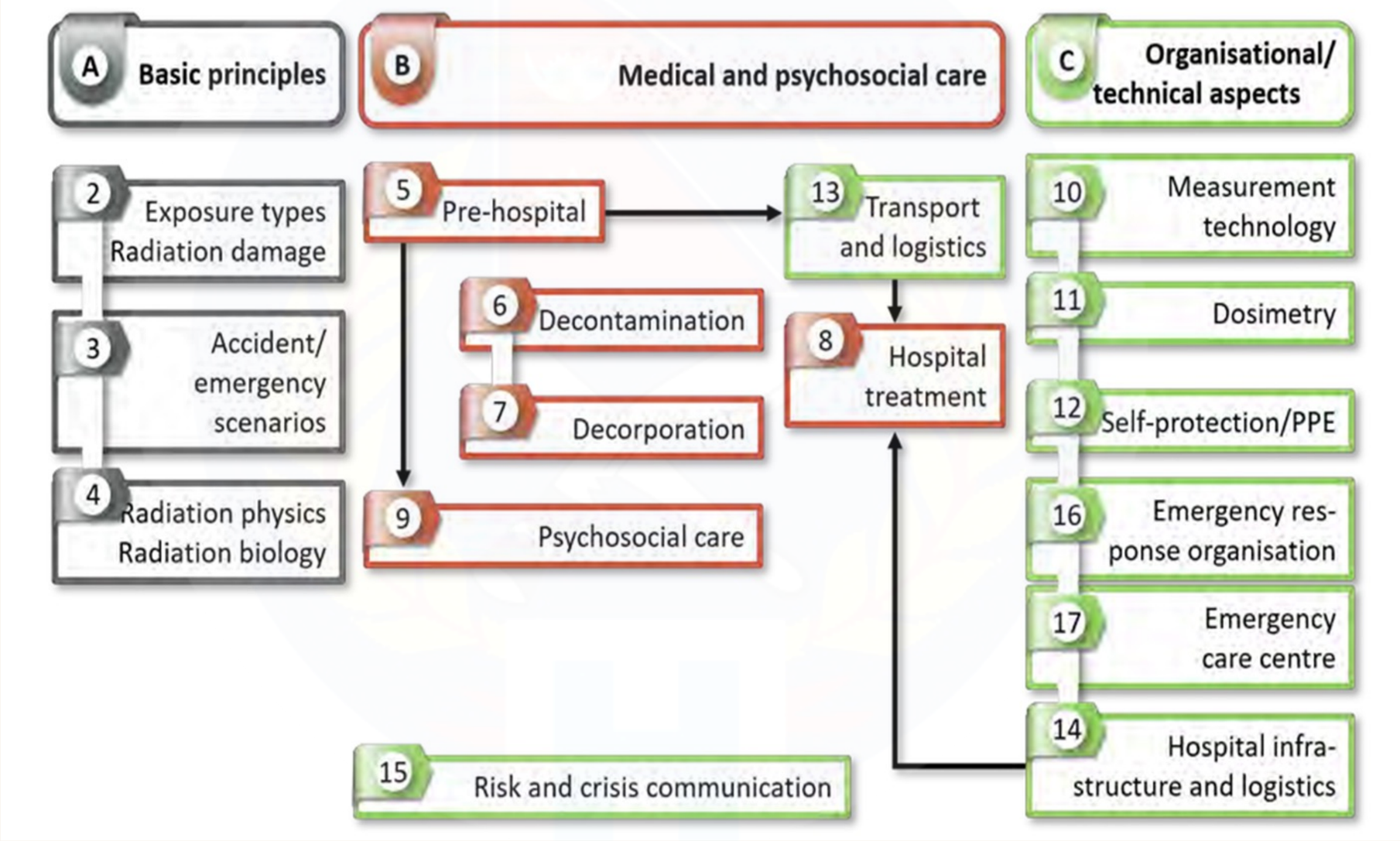


Radiation Emergency



	External Exposure to Radiation			Internal Exposure to Radiation	
Origin of radiation	Sealed or unselaed radioactive source, X-ray unit, accelerator	Contamination of the environment Objects, ground, water, air	Contamination of the body with non-absorbable radioactive material Skin, clothing	Contamination of the body with absorbable radioactive material Skin, wound	Incorporation Ingestion, inhalation, injection
Action	Immediately switch off or shield source Remove patients from danger zne without delay	Leave contaminated zone immediately	Decontaminate	Decontaminate as soon as possible	Identify radionuclide/chemical compound without delay Decorporation
Caution !	Minimize time spent in radiation field	Potential spread of contamination	Potential spread of contamination	Potential spread of contamination	Faeces/urine may spread contamination
Risk for response workers	Potentially high until source is switched off or removed	Potentially high	Low	Low	Very Low

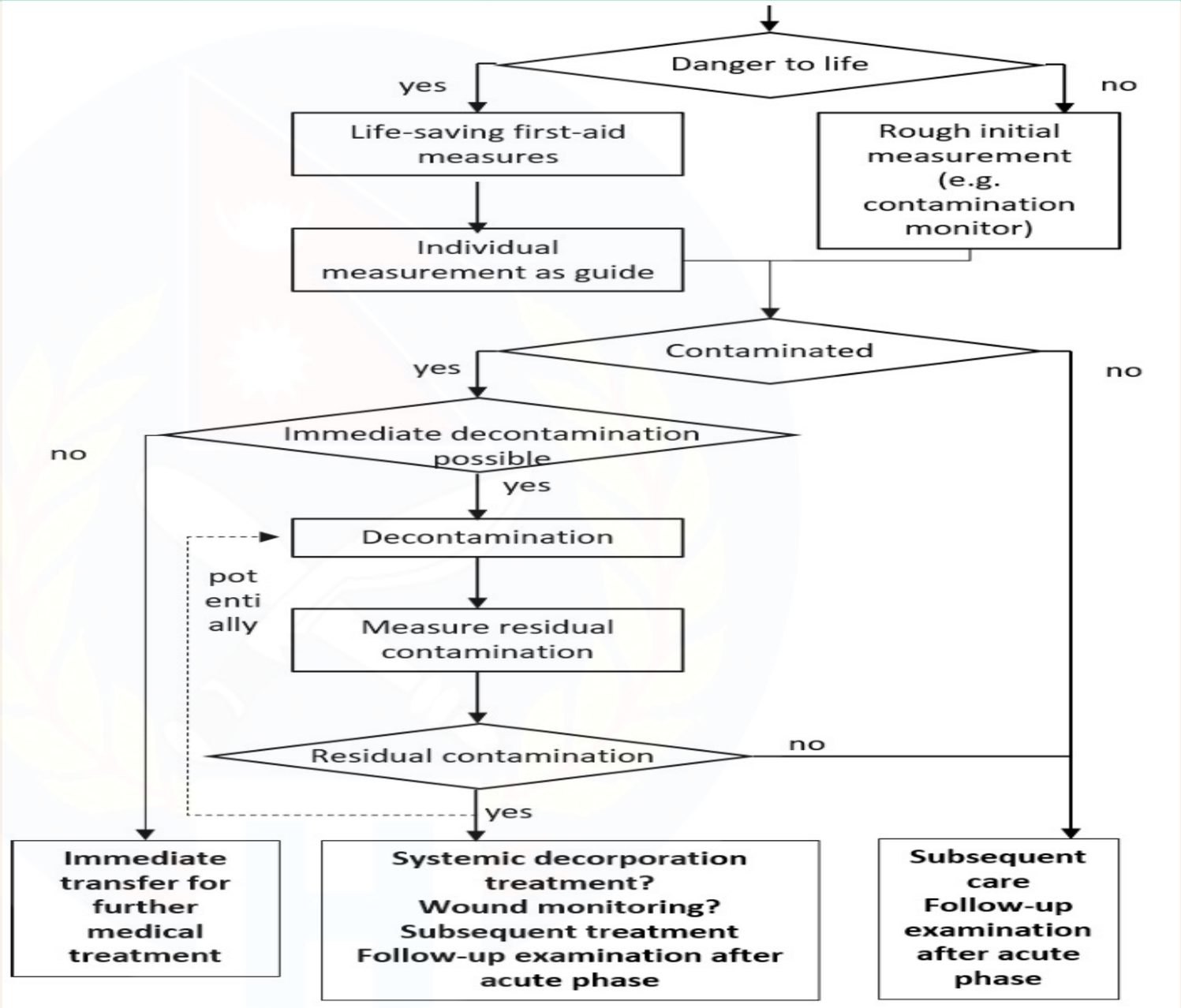


Figure: Treatment of contaminated radiation emergency patients

Radioactive Incident Detection

- Detection is awareness of criminal or unauthorized act with nuclear security implications or measurements indicating the unauthorized presence of nuclear or radioactive material.

- Early detection of incident and prompt response to itis crucial to limit the detrimental effects of radiation.

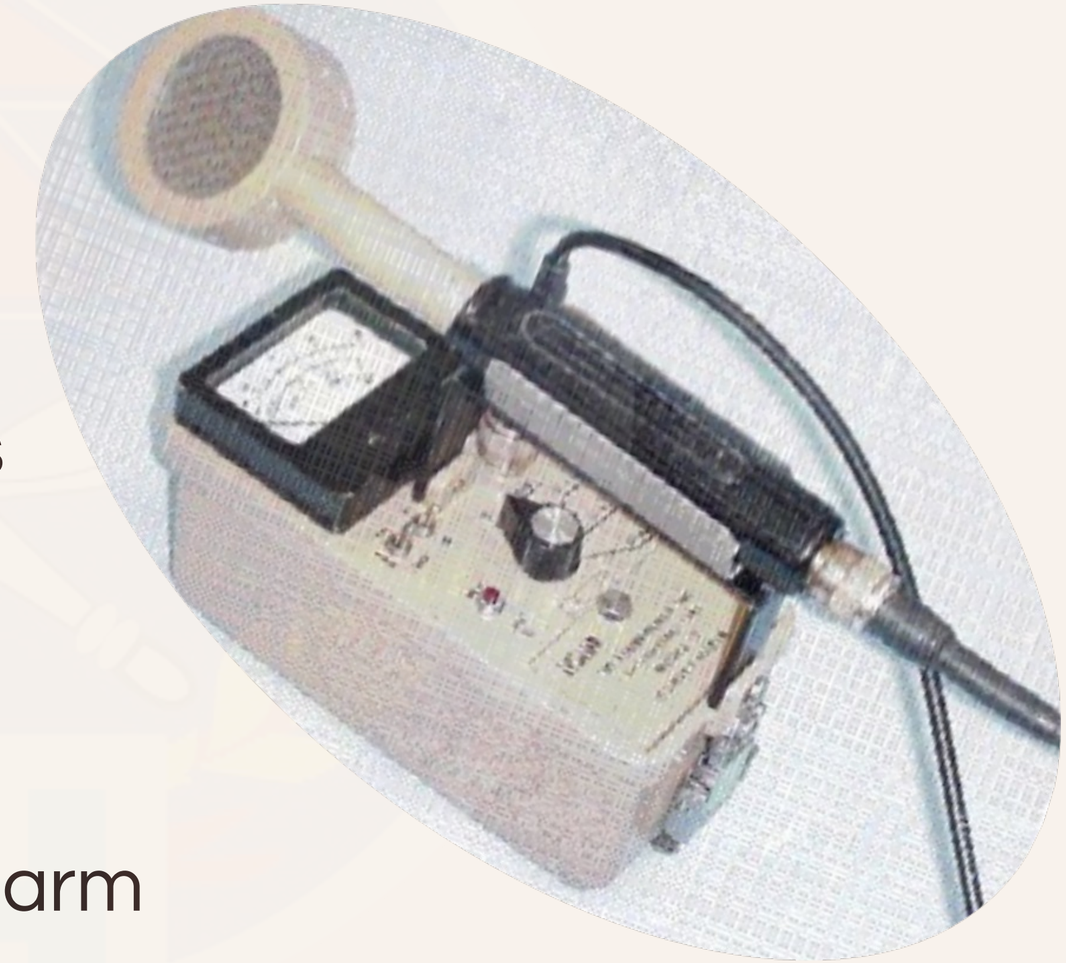
- Detection of Radioactive source needs instrument like gamma spectroscopy, detection library and artificial intelligence

CAS for Detection, Alarm and Assessment

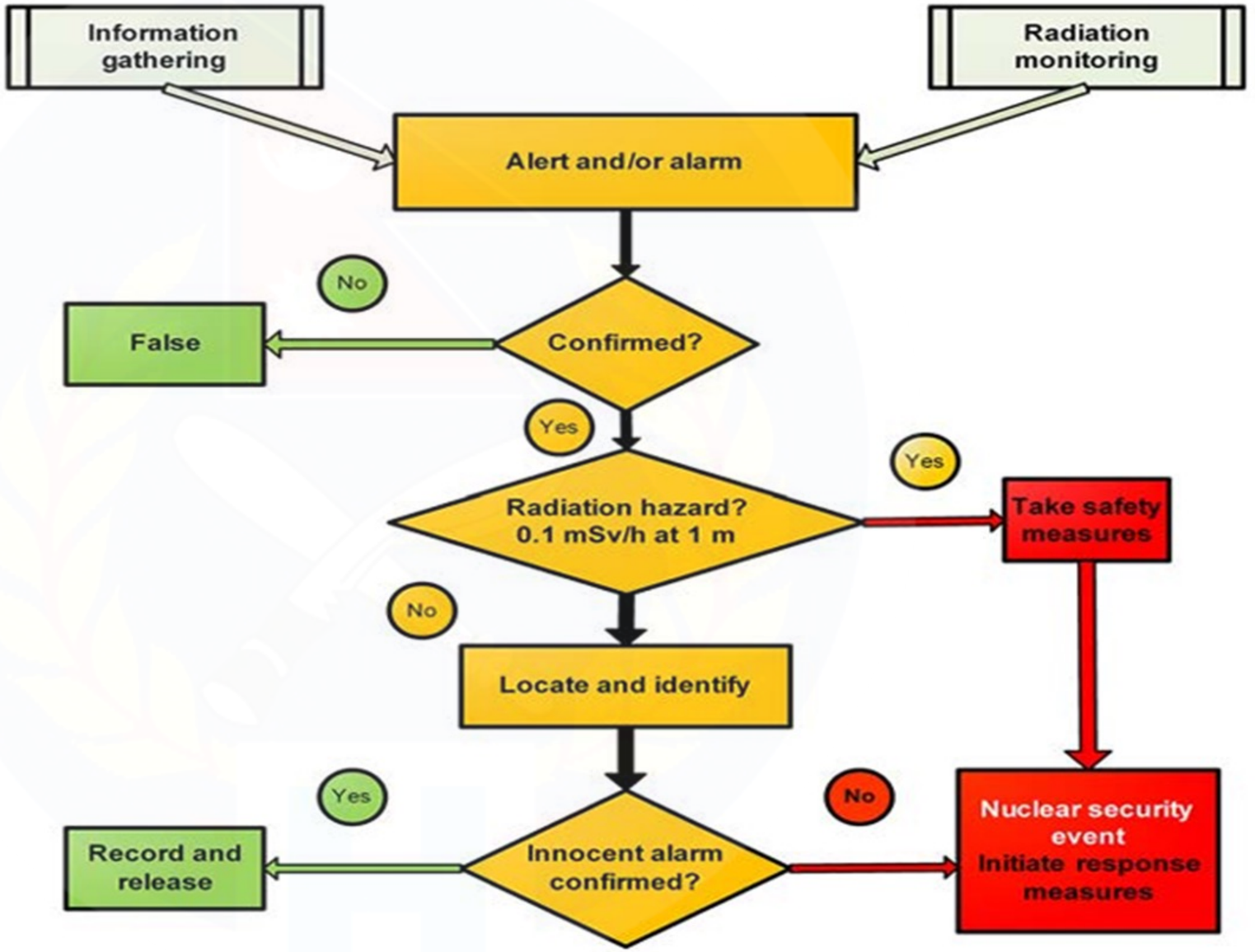
- CAS stands for Criticality Alarm System
- Primary function is to sound an alarm in the event of critical accident.
- Mandatory in nuclear plants for prompt alarm in any event of criticality incident.

CAS Comprises of

- Radiation detectors
- Data Acquisition modules
- Control terminals
- Emergency evacuation alarm



Generic Process for Initial Assessment of Alerts and Alarms



Initial Response: Objectives

- To promptly act to protect the public in order to minimize the radiological and non-radiological (e.g. psychological) health effects.
- To protect emergency personnel during response operations.
- To gather and protect information that can be useful in managing health effects, for law enforcement purposes and in preventing similar emergencies in the future.
- To establish and maintain public trust in the response.
- To provide a basis for an extended response.

Stakeholders Involved in Initial Response

- Internal: Local individuals directly involved to incident. Eg:- Fire Brigade, Emergency Medical Personnel

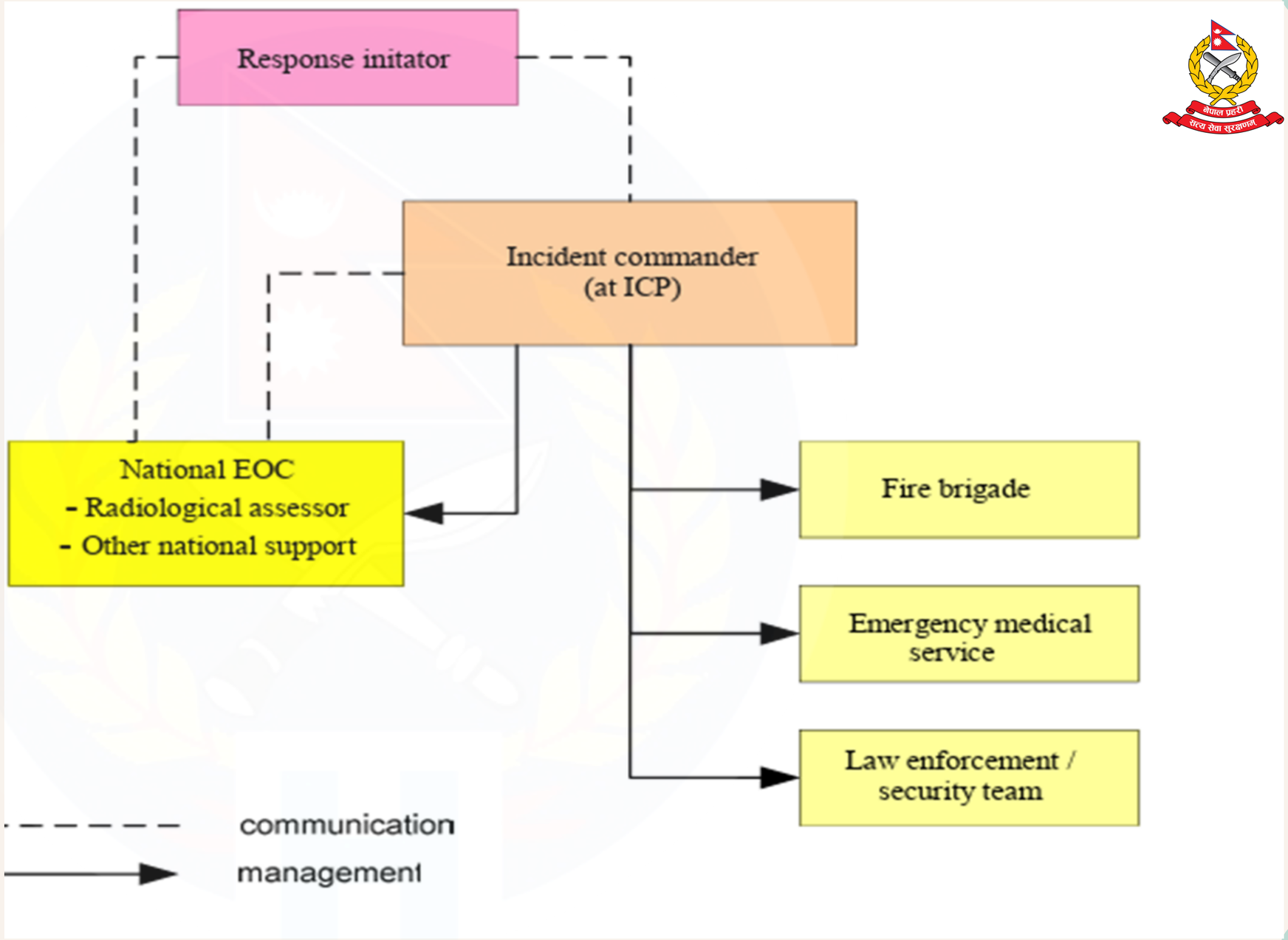
- External: Regulatory bodies concerned with regulation and safety, Public who could be exposed and concerned about the radioactive incidents. Eg:- National Emergency Officials

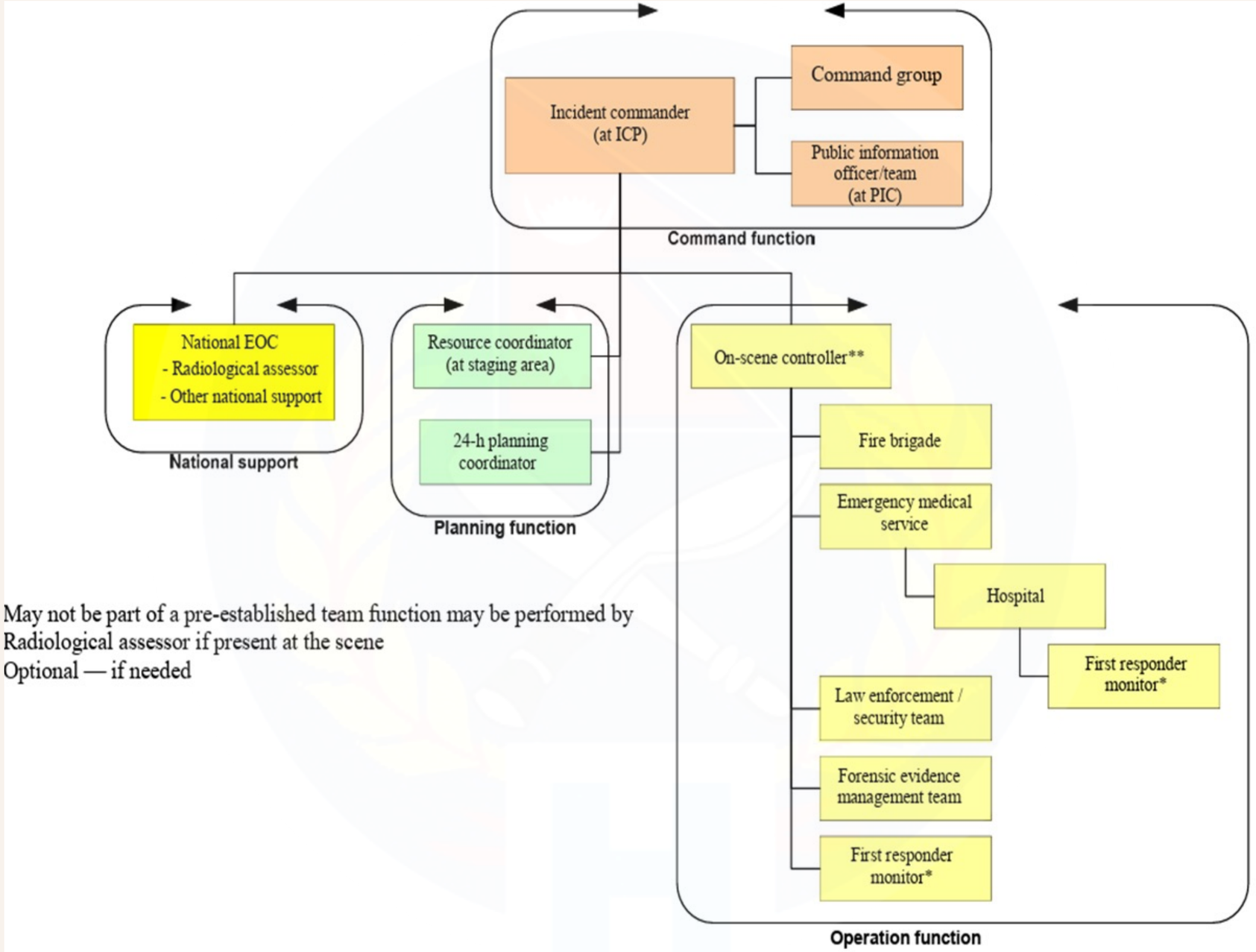
Initial Response Activities:

Who

and

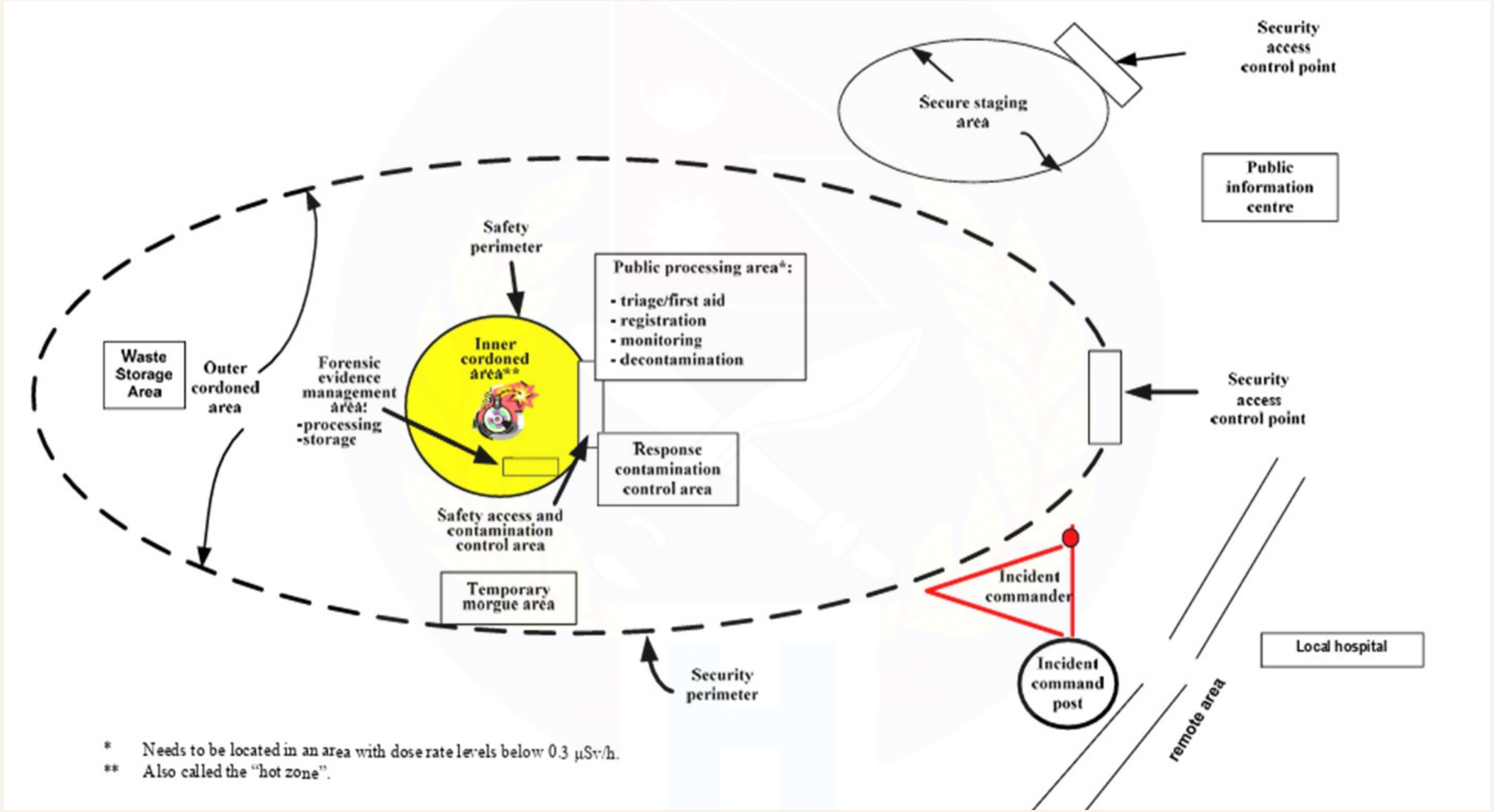
How ?





May not be part of a pre-established team function may be performed by
Radiological assessor if present at the scene
Optional — if needed

Generic layout of the response facilities and locations within areas established for a radiological emergency incidents

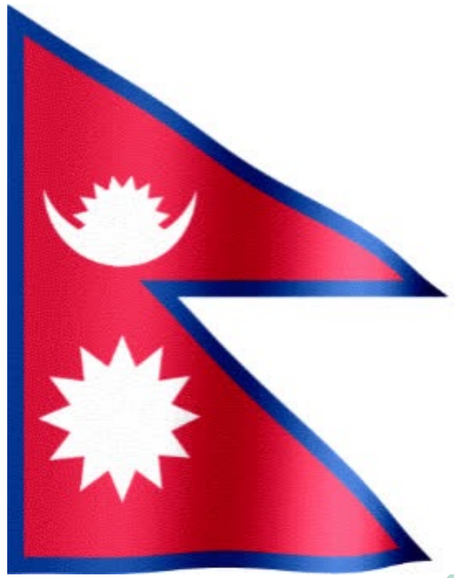


* Needs to be located in an area with dose rate levels below 0.3 μSv/h.

** Also called the "hot zone".

Radiation and Response:

Country Policy and Current Scenario, Nepal



Introduction of Nepal

- South Asian Country situated in between India and China
- Official Name: Federal Democratic Republic of Nepal
- Area: 147,516 km2 (56,956 sq. mi)
- Official language: Nepali
- Population: 31,105,068
- Literacy Rate: 76.3 % increases by10.4 % in10 years.(M- 83.6 %, F- 69.4 %)
- Religion: Hindu (81.34%), Buddhism(9.04%), Muslim (4.38%), Kirant (3.04%), Christianity (1.41%)

Map of Nepal


Lake Manasarovar
Zhari Namco
Tangra Yumco
Brahmaputra
C H I N A
Simikot
Baitadi
Dadeldhura
Dipayal Silgadhi
Jumla
Bhimdatta
Dhangadhi
Ghaghara
Dunai
Mustan
Jomsom
Lake Paiku
Pum Qu
Brahmaputra
N E P A L
Birendranagar
Salyan
Sharda
Nepalgunj
Tulsipur
Pyuthan
Baglung
Pokhara
Kodan
Nuwakot
Mount Everest
Gandaki
Butwal
Siddharthanagar
Bharatpur
KATHMANDU
Patan
Hetauda
Ramechhap
Okhaldhunga
Kamalamai
Arun
Taplejun
Sun Kosi
Dhankuta
Ilam
Birgunj
Janakpur
Dharan
Rajbiraj
Biratnagar
I N D I A
Gandaki
0
50 km

Use of Nuclear Science and Technology in Nepal

- Use of radioactive substances is limited to small quantities in medicine, research, and industry.
- While the existence of some nuclear material ore deposits has been reported, commercial mining is non existent in pragmatic terms.
- As of early 2018, 48 organizations in Nepal possessed radioactive sources, distributed across medical centres (in eight locations), research centres (nine), and academic institutions (thirty one).

- Radioisotopes identified in the country are used in:-
  - Radiotherapy(Co-60, Ir-192)
  - Nuclear medicine (Tc-99, I-131)
  - Academic institutions (Co-60, Cs-137, Sr-90, Po-210, Ti-204)
  - Research centers (Cs-137, Sr-90, Am 241)
  - Department of Mines and Geology (samples of uranium, thorium and potassium).

Major Organizations

01 Ministry of Education Science and Technology

02 Ministry of Defence

03 Ministry of Home (Nepal Police, Armed Police Force)

04 Ministry of Industry and commerce and supplies

05 National Academy of Science and Technology(NAST)

06 Department of Mines and Geology

07 National Health Research Council (NHRC)

08 Department of Food Technology and Quality Control

Key Achievements and Strengths

- The formulation of the Radioactive Material (Usage and Regulation) Act 2020 has opened doors to a more progressive national approach to radiation emergencies.

- Nepal took the membership of IAEA in 2008. Nepal started the International Atomic Energy Agency (IAEA) technical cooperation project in 2016 to improve national preparedness for radiation emergencies.

- The Nepal Academy of Science and Technology has been designated as responsible for providing dosimetry services in Nepal since November 2016.

- There is a national inventory of radioactive material (at the Central Department of Physics, Tribhuvan University) set to support nuclear physics curriculum, radiation monitoring and regulatory activities in 2017.

- A new project, submitted to IAEA for the new project cycle, establishes a national post academic programmee in medical physics and clinical training in Nepal.

- The Nepali Army is developing a CBRN Disaster Management Plan that will include radiation emergencies.

- Radiological and Nuclear Smuggling and Detection Training January 2024 by National Nuclear Security Agency(NNSA) under Nuclear Smuggling Detection and Deterrence program (NSDD) at National Police Academy, Maharajgunj Nepal.

Legal framework

- National Nuclear Policy, 2007
  - To make proper use of nuclear energy by its development, research and necessary control only for peaceful utilization

- Nuclear Materials Regulatory Directives, 2015
  - Regulating Import, export, transportation, storage and use of Nuclear Material

- The Radioactive Materials Use and Regulation Act, 2020
  - Started to develop and implement a disaster preparedness and management plan at the national level

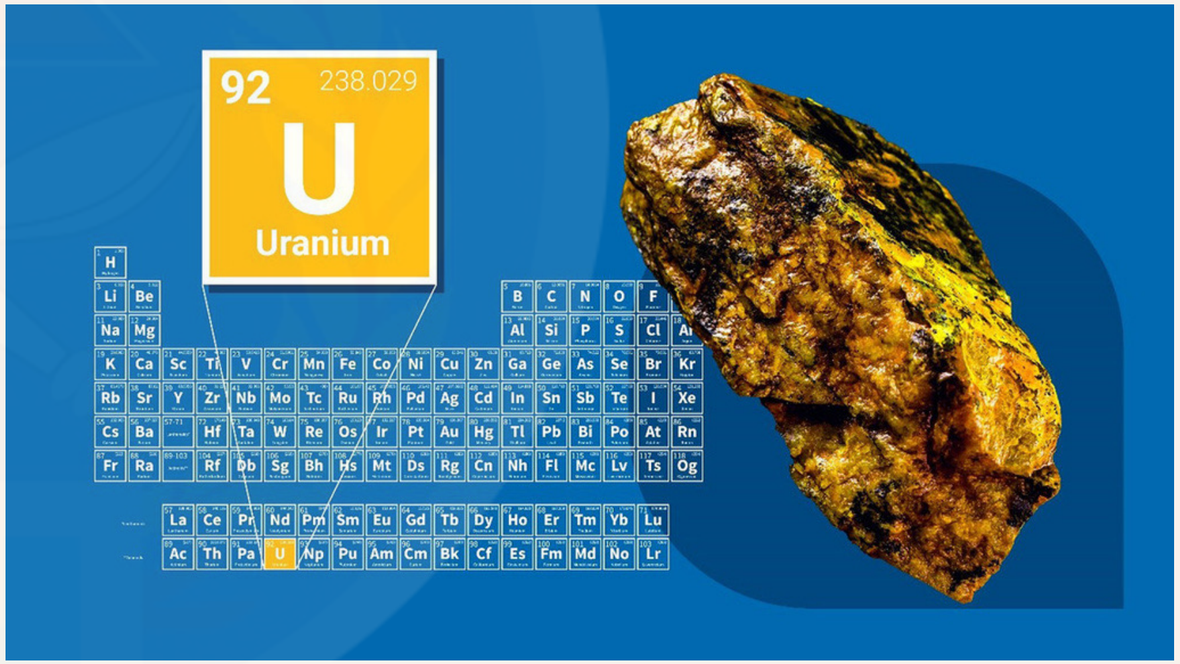
- Radioactive Substance (Utilizations and Regulations) Rules, 2022

Radiological Nuclear safety current scenario of Nepal Police

- Procedures (SOP)
  - Clear responsibilities and job description
- Assessment (radiation detection (baseline vs additional) and reporting)
  - Equipment (detectors, PPE, ancillary, decontamination)
- Response
  - Prompt emergency response
  - Identification, investigation, and isolation of source
  - Risk assessment and mitigation
- Management (crime scene management, forensic analysis from Laboratory / NAST)

Uranium Related Issues in Nepal

- Natural Uranium deposit in Upper Mustang, Makwanpur, Chitwan and Baitadi districts of Nepal to be known.
- On March 2021, a case of related suspicious radioactive Uranium trafficking came to Nepal Police and later it was confirmed to be non radioactive natural Uranium.



4 arrested with 2.5kg ‘uranium’ in Kathmandu

Onlinekhabar
Friday, March 12, 2021

0 Comments

1.1k Shares

Police arrested four persons in possession of 2.5 kg unprocessed uranium, in Kathmandu, in March 2021. Photo: Aryan Dhimal

Challenges

1. Mechanisms for detecting and responding to radiological and nuclear emergencies are not completely established and fully functioning.
2. Insufficient Legal Frameworks
3. Financial Constraints
4. Co-ordination Problems
5. Lack of Proper and Sufficient Trainings
6. Human Resources
   - Brain Drain
   - Difficult to Retain
   - Lack of Expertise

What we Need?

1. One Central Regulatory Authority/Body.
2. Frequent trainings to develop skilled human resources.
3. Collaboration with neighbouring countries.
4. Establishment of nuclear Research Facilities.
5. As Nepal has not faced major radiation emergency in past so we need drills for early response and rescue operations.

Nepal Police Hospital (NPH)

Maharajgunj, Kathmandu

Phone no 01-4512430, 4512530,4512630

Email:- nph@nepalpolice.gov.np || web: https://nph.nepalpolice.gov.np

Overview

- Establishment: 9 April 1984 A.D
- OPD/Daily: 1200(Average)
- Current Bed: 300
- Doctors: 125
- Nurses:98
- Paramedics:116
- Technical (Diet, Biomedical etc:25
- Administration: 110

Current Available Services

OPD/Clinical Services

- General Medicine
- Pediatrics
- Orthopedic Surgery
- General Surgery (Urology, Plastic Surgery)
- ENT Surgery
- Cardiology
- Pulmonology
- Nephrology
- Psychiatric
- Obstetric and Gynaecology
- Anaesthesiology
- Dental Surgery
- Hepatology
- Ophthalmology
- Skin
- Neurology
- Nutrition and Diet

Nursing Services

- Wards (General, Emergency ICU, NICU, Post OP, Haemodialysis etc.

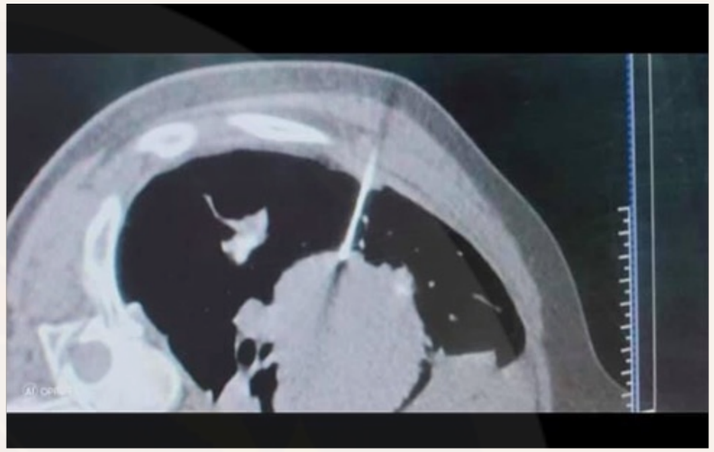
Diagnostic/Therapeutic/Para Clinical Services

- Pathology
- Physiotherapy
- ECHO/EEG/Holter etc.
- **Radiology (X-Ray, CT, MRI, Intervention Radiology, USG.)**
- Pharmacy
- Bronchoscopy/Endoscopy

Radiation Protection in Radiology Department at Nepal Police Hospital

- Justification
- Optimization
- Dose Limit: recommendation by the International Commission on Radiological Protection are as following:
  - occupationally-exposed workers limits
    - an effective dose of 20 mSv a year, averaged over defined periods of 5 years with no single year >50 mSv 1
  - public exposure limits
    - 1 mSv in a year

Photo Gallery



THANK YOU

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- Joint external evaluation of IHR core capacities of Nepal: mission report, 28 November-2 December 2022