

Towards a new guidance for establishing a NORM inventory

Task group 2 – IAEA NORM project
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Task 2: Guidance on the Assembly of Relevant NORM Information by Member State (NORM Inventories)

Develop a document providing guidance on the **need and process for assembling information regarding NORM management infrastructures and NORM inventories**

- Discuss **value and use** of comprehensive NORM inventories, including legacy sites
- Identify important **elements of a NORM inventory**
- Develop **step-by-step guidance**
- Identify potential sources of information and strategies for addressing **data gaps**
- Compile **lessons-learned** from Member States

Desired Outcome:

- **Development of comprehensive national-level inventories to inform NORM policy and strategies, and support development of effective NORM-management infrastructure**



“Guidance on how to establish a NORM inventory”

1. General methodology flow chart } Chapter 3
2. Inventory information } Chapter 4
3. Sources of information } Chapter 5
4. Sampling and measurement strategy } Chapter 6
5. Dedicated inventory methodology for specific industries } Chapter 6
6. Case studies } Chapter 7 - 10
7. Lessons learned } Chapter 11

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General methodology flow chart

Start-up phase -
Fixing & limiting scope of the study

1st dataming phase -
Before contacting companies

2nd dataming phase -
Contacting industry

Keeping the inventory up to date

Start-up phase

Consortium for inventory building

(Independent) non- legislator

Companies: **no obligation to provide information**

Experts: **knowledge on field & industrial network.**

More **open attitude** from companies
(trust = crucial)

Non-disclosure agreements:

Company determines which information to give

(connected to) legislator

Legislative power: **define notification requirements**

Not always right background for inventory building

Needs to know **where to start** and which industries to include

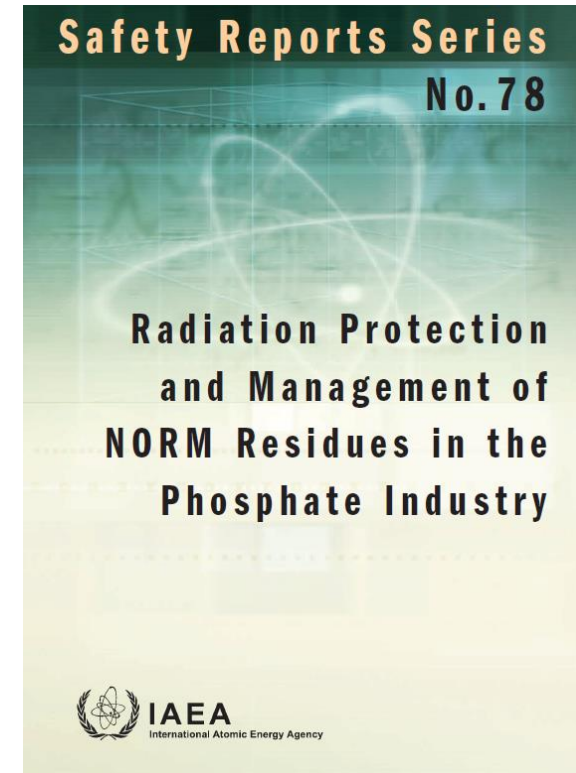
Companies might provide the **minimal required** information (limited to well-known issues).

Start-up phase

Initial reading

Industrial sectors of concern

- Mining and processing of uranium and other natural resources
- Extraction of rare earth elements
- Production and use of thorium and its compounds
- Production of niobium, ferroniobium, and tantalum
- Production of oil and gas
- The zircon and zirconia industries
- Manufacture of titanium dioxide pigment
- The phosphate industry
- Production of iron and steel, tin, copper, aluminium, zinc and lead
- Combustion of fossil fuel and biomass
- Water treatment
- Geothermal energy production



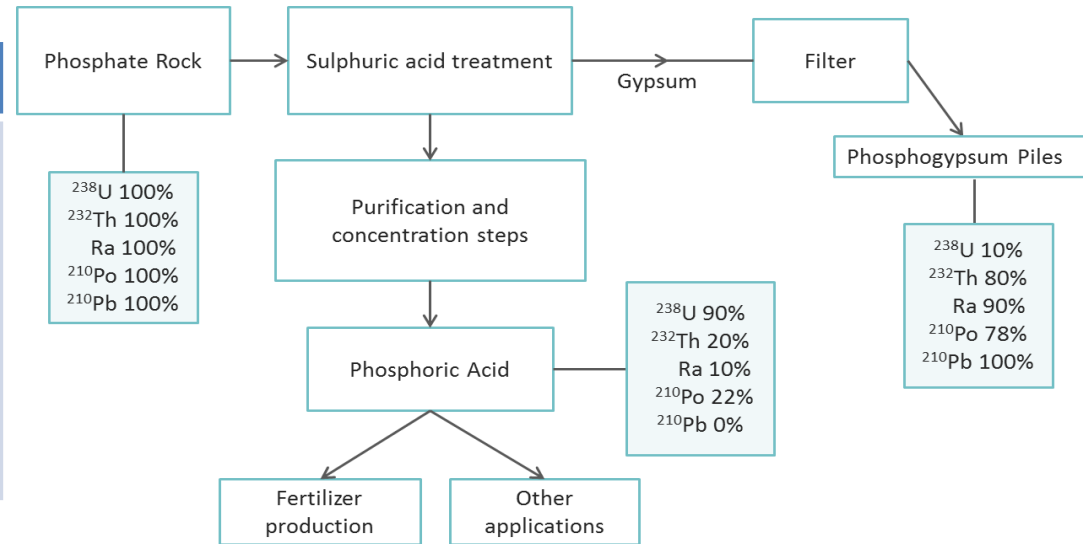
➤ Building on experiences from **neighboring countries**

Start-up phase

Define scope of the inventory study

Description operating or legacy site:

- Name of the site, owner
- Location data
- Short history of the plant
- Description of specific industrial activity **(qualitative information)**
- Flow sheet + mass & activity balances **(quantitative information)**



❖ Availability location related data?

- ✓ Address, (GPS) coordinates, altitude, dimensions, aerial map, accessibility, land registry,...

❖ Too much detail is not useful, achievable or manageable

➔ Relevant for radiation protection, waste management?

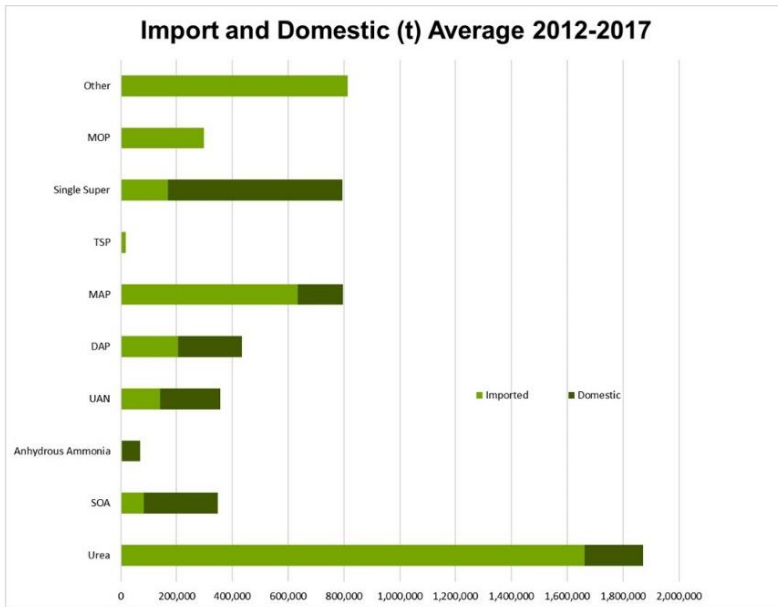
❖ Simplifications in data representation for complex decay chains (significant disequilibrium)

❖ Production rates for specific periods considering **modifications in industrial processes or the ore selection.**

1st datamining phase

Before contacting companies

Australian Fertilizer Market



The graph shows average fertilizer sales in Australia for the calendar years 2012 to 2017. *Domestic single super is manufactured from imported phosphate rock.

<https://www.fertilizer.org.au/Fertilizer-Industry/Australian-Fertilizer-Market>

Gathering data to assure a **targeted survey**

Tracking companies of concern:

- Existing **surveys** and **licences**
- Contacting **industrial federations**
- **Import/ export statistics** and trade registers
- Legacy sites: national databases

➤ Via **sentinel goods**:

- ❖ Phosphorus/potassium fertilizers for fertilizer industry
- ❖ Clinker production for cement industry

1st datamining phase

Before contacting companies



Phosphate mining and fertilizer complex in Cajati and its phosphogypsum stack in 04/19/2016 (source: Google Earth).

Starting point:

Mining/extraction & import of raw materials

Non-radiological information:

- Type of material, chemical properties, volumes, available sites,...
- Type of Excavation process (open pit, borehole, underground mining)
- Circumstances (exploitation technology, ventilation)

➔ first impression expected NORM related issues

2nd datamining phase

Contacting industry

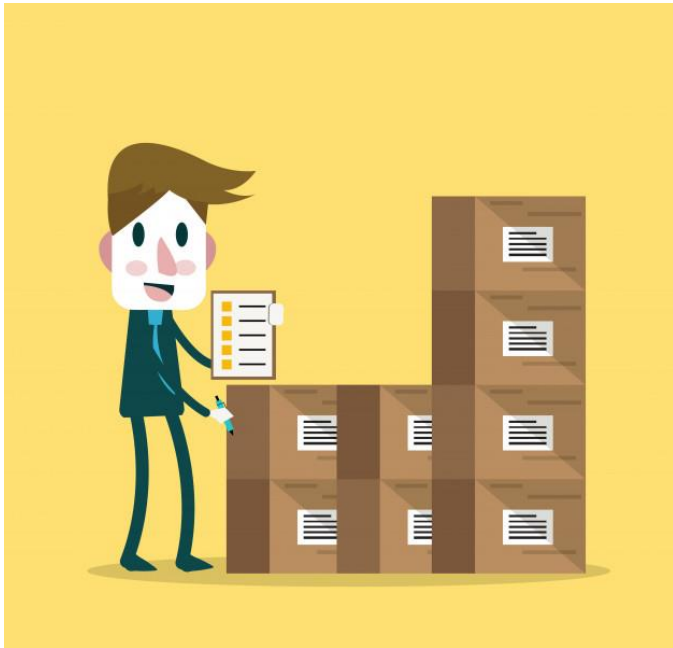
Challenge: getting industrial partners involved

- **Added value** for a company to participate to the inventory study?
- **Dealing with industrial confidentiality:** reach agreement with industry regarding **what happens with the collected information**

Strategies for implementing a:

- **Questionnaire:** tailored to the industrial sector under study
- **Measurement campaign**
- **Site visits**

Keeping the inventory up to date



<https://www.ilamindia.in>

Changes in the industrial landscape:

- Updating the inventory every 5-10 years

Include radiological information in:

- Licencing requirements
- Notification requirements

To keep the inventory alive:

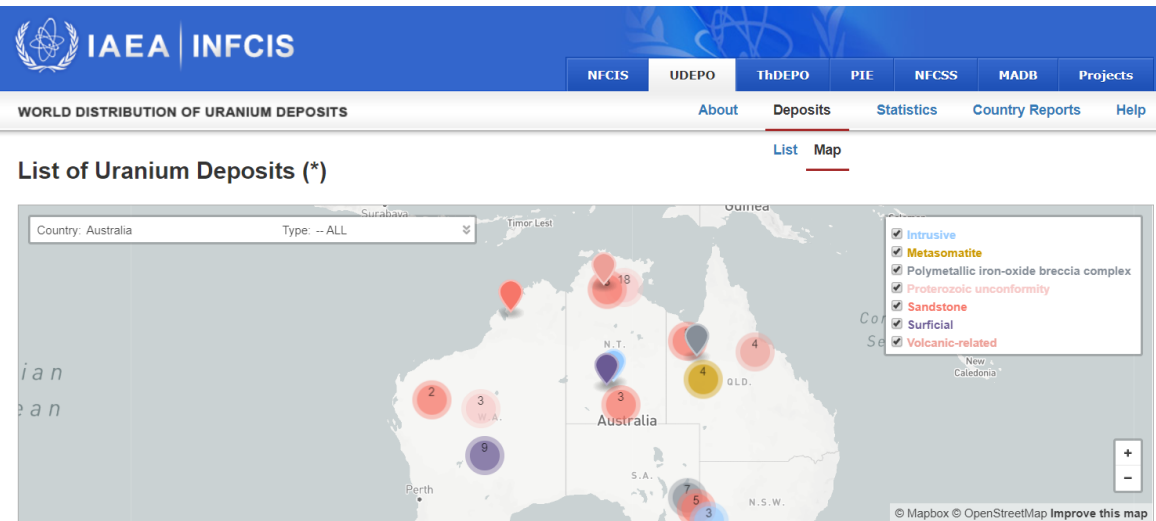
- Participate in the international networks
- Maintain the connection with local industry & local researchers
- Keep track of updates in international documents

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Sources of information

Radiological & non-radiological



World Distribution of Uranium Deposits (UDEPO), (2016 edition) – IAEA – TECDOC 1843
<https://infcis.iaea.org/>

➤ Guidance on using specific sources of information

- ❖ World distribution of uranium & thorium deposits (IAEA: UDEPO & ThDEPO)
- ❖ NORM databases
- ❖ Detection portal data
- ❖ Airborne gamma ray spectroscopy studies
- ❖ ...

Under preparation:

- Assessing reliability of radiological information
 - ❖ Old measurement results are not necessary representative for current industrial activity
 - ❖ Reliability of the used measurement protocol?

Sampling and measurement strategy

- **Adapted sampling plan** (bulk materials, liquids,...):
 - ❖ Trace elements
 - ❖ Impact segregation by wind, moisture content variations, particle size effects,...
 - ❖ Modification in the selection of ores, industrial process

- QA for sampling and measurement procedures

- Under preparation: Section on low-cost approaches

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Strategies for specific industrial sectors

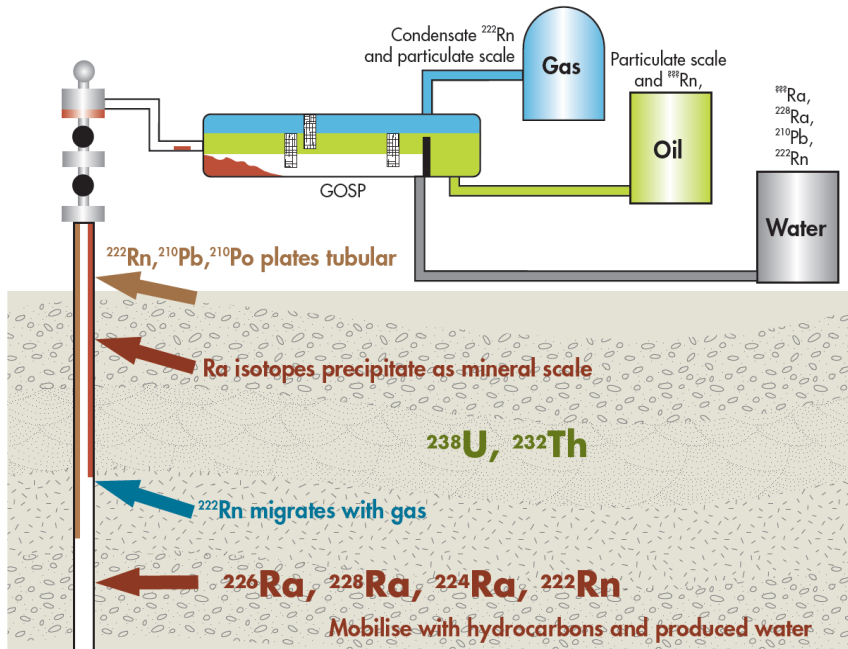
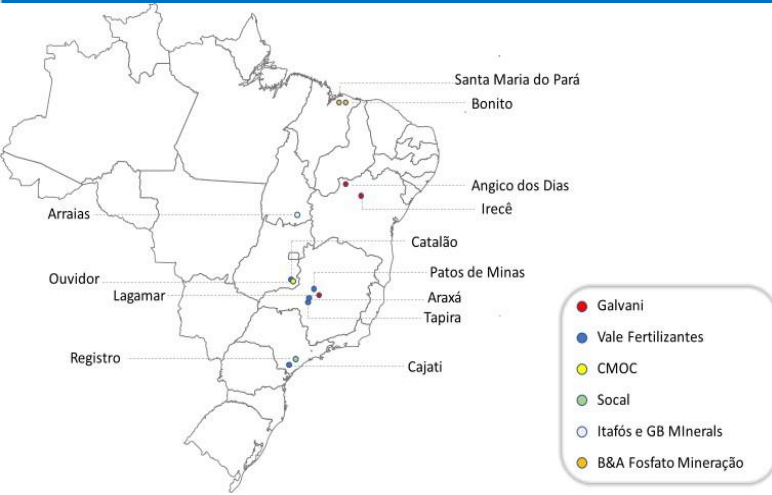


Photo from Oilfield services inc.

Challenges primary oil production:

- Oil field equipment = **sealed**
 - ❖ Need external measurements
- NORM occurrence is **highly variable**
- NORM deposits may **accumulate very quickly or slowly during several years**
- Guidance on identifying relevant practices:
 - ❖ More NORM in past practices related to pipe rattling

Country specific case studies



Phosphate mines and producers in operation in Brazil

<http://www.dnpm.gov.br/dnpm/sumarios/sumario-mineral-2015>



Oil & gas in Norway

<https://bahr.no/en/>

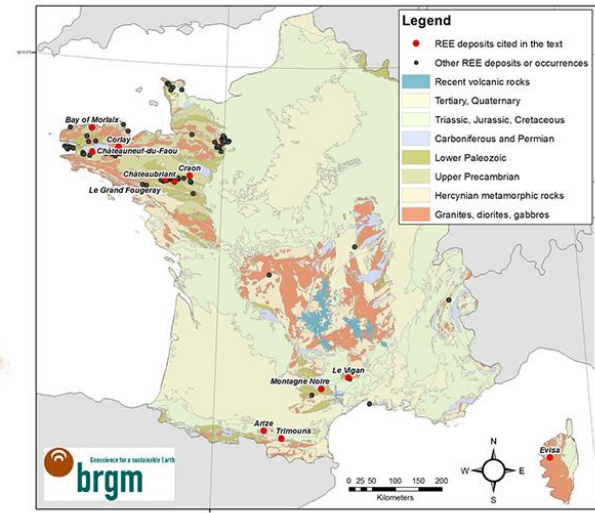
➤ Overview of national case studies & how to deal with country specific situations

Zircon & zirconia industry
Italy



<http://eastminerals.asia/zircon-sand-2/>

Rare earth processing
France



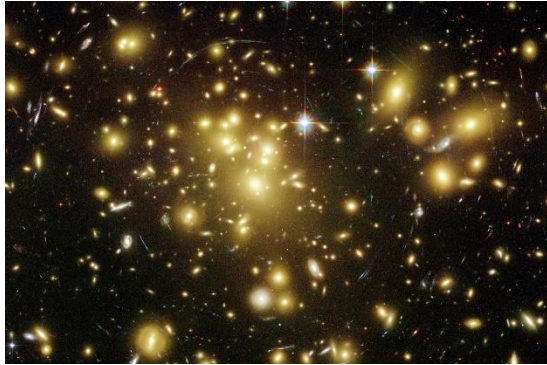
<http://www.eurare.eu/countries/france.html>

More case studies are welcome!!!

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Lessons learned



<https://metode.org/>

Coming up next:

*The Cosmic Natural
Radioactivity inventory...*

- Inventory building approaches need to be modified for **specific industries & countries**
- A need for **dedicated strategies to get industrial participants on board** of an inventory study
- A need for **cost effective** sampling and measurement strategies

- **Interested in contributing to the TEC-DOC in preparation? Providing case studies?**

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