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	
4. Sampling and measurement strategy	Chapter 5
5. Dedicated inventory methodology for specific industries	Chapter 6
6. Case studies	Chapter 7 - 10
7. Lessons learned	Chapter 11

“Guidance on how to establish a NORM inventory”

1. **General methodology flow chart**
2. **Inventory information**
3. Sources of information
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6. Case studies
7. Lessons learned

General methodology flow chart

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

1st datamining phase -
Before contacting companies

2nd datamining phase -
Contacting industry

Keeping the inventory up to date

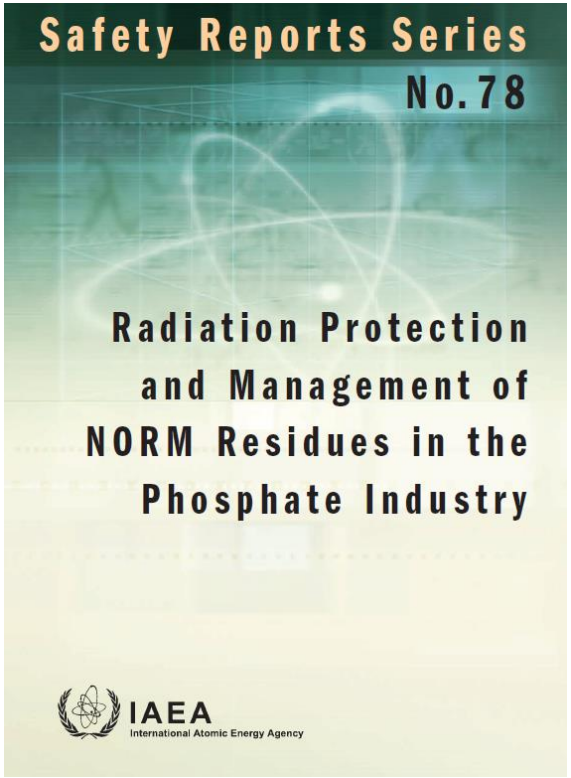
Start-up phase
Consortium for inventory building

(Independent) non- legislator	(connected to) legislator
Companies: **no obligation to provide information**	Legislative power: **define notification requirements**
Experts: **knowledge on field & industrial network**.	**Not always right background** for inventory building
More **open attitude** from companies (trust = crucial)	Needs to know **where to start** and which industries to include
Non-disclosure agreements: **C**ompany determines which information to give	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**

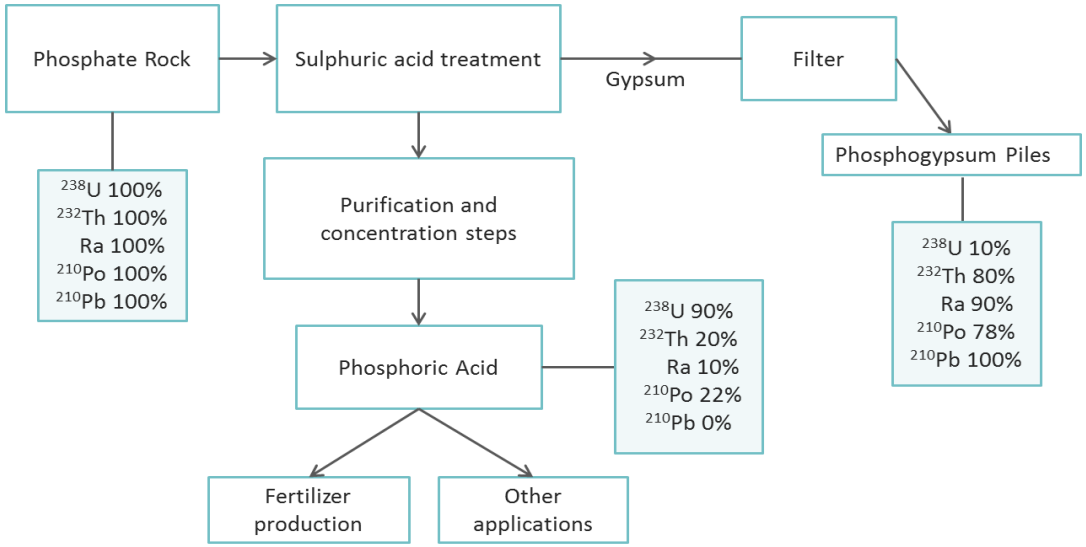
Updated list of industries for IAEA Environet project

Start-up phase

Define scope of the inventory study

Description operating or legacy site:

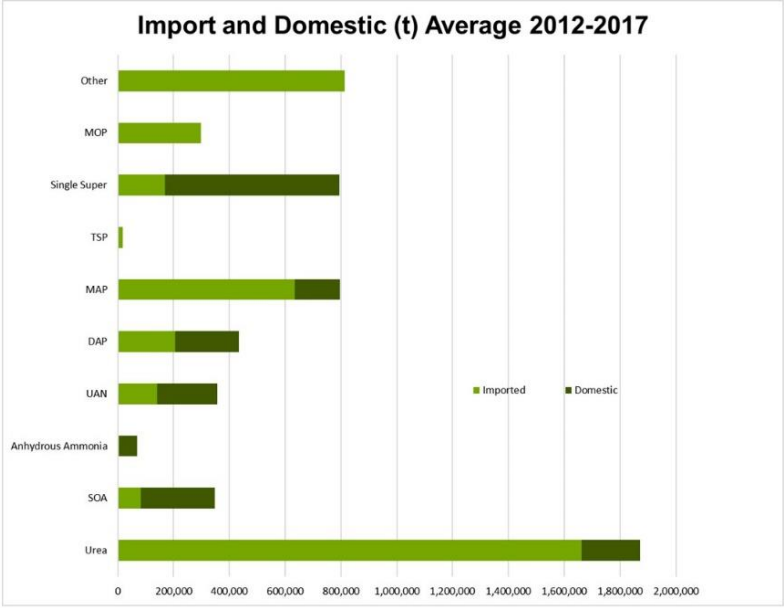
- Name of the site, owner
- Location data
- Short history of the plant
- Description of specific industrial activity **(qualitative information)**
- Flow sheet + mass & activity balances **(quantitative information)**



- **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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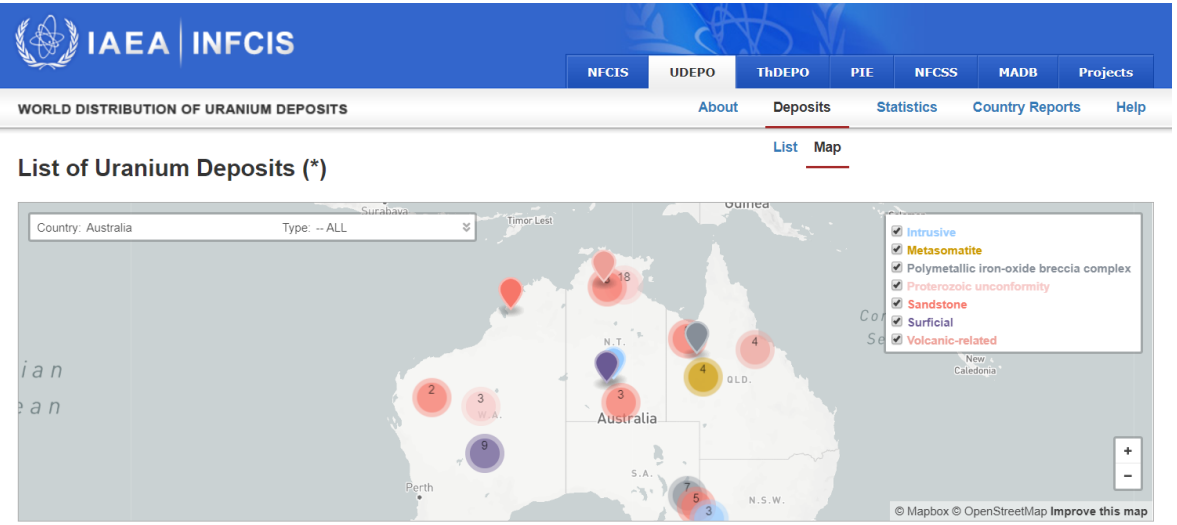
Sources of information
Radiological & non-radiological



*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 industrials sectors

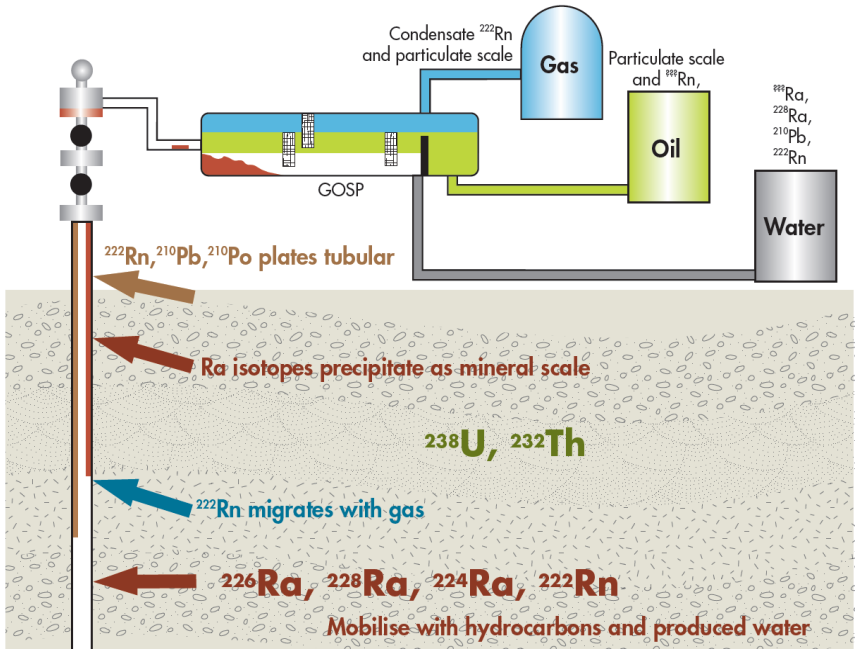


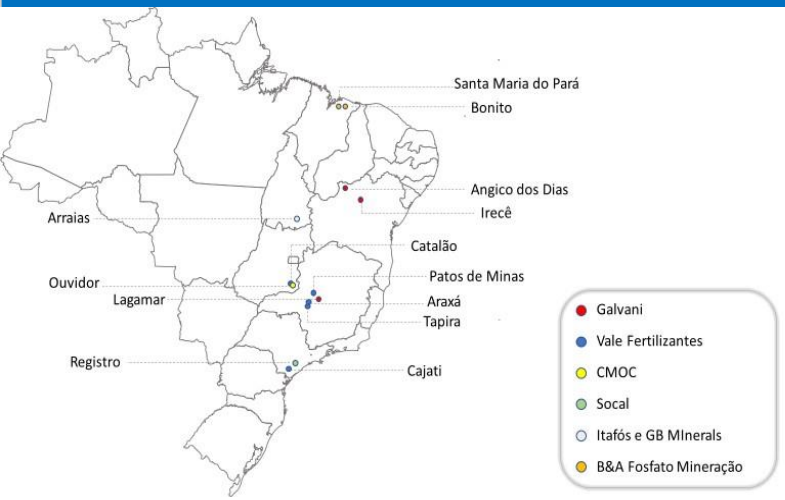
Photo from Oilfield services inc.

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

OGP Guidelines for the management of NORM in the oil & gas industry - Report 412 Sept, 2008

Country specific case studies



Phosphate mines and producers in operation in Brazil

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

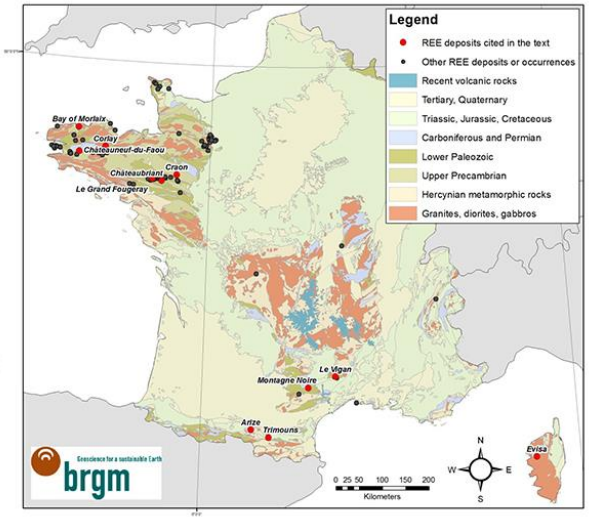
https://bahr.no/en/

- 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 NORM 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 stategies

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

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