Metrology for the harmonisation of measurements of environmental pollutants in Europe

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Introduction of MetroPOEM

- **Key facts:**
  - ✓ Start date: 01 October 2022
  - ✓ Duration: 36 months
  - ✓ 22 partners from 13 countries will contribute with in total **320 months of work**!
    Austria, Czech Republic, Denmark, Finland, France, Germany, Norway, Romania, Serbia, Slovenia, Switzerland, Türkiye and United Kingdom
  - ✓ Project Website: https://www.npl.co.uk/euramet/metropoem
  - ✓ This project was selected for funding from the Green Deal Call 2021 of the European Partnership on Metrology research funding program: https://www.metpart.eu/

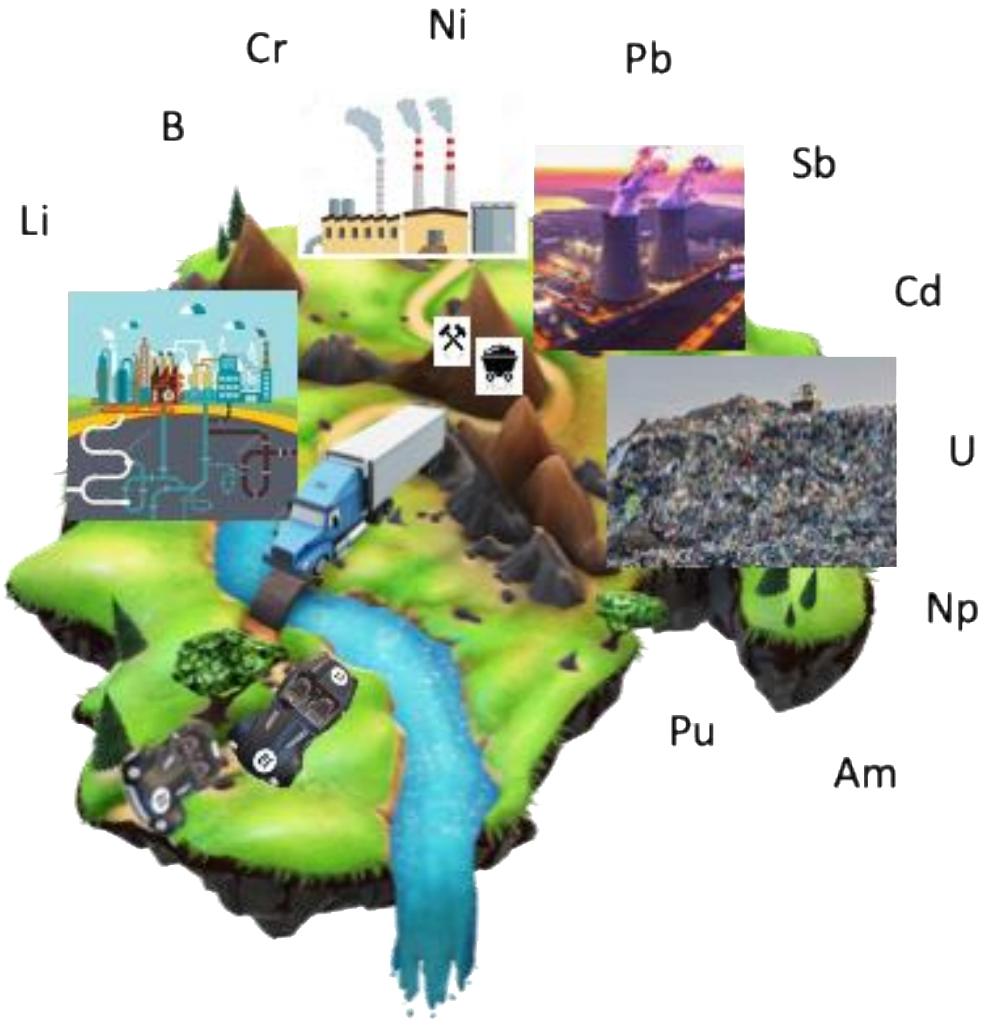
The European Green Deal, Document: “COM/2019/640 final”

Introduction of MetroPOEM

- **Key Aspects:**

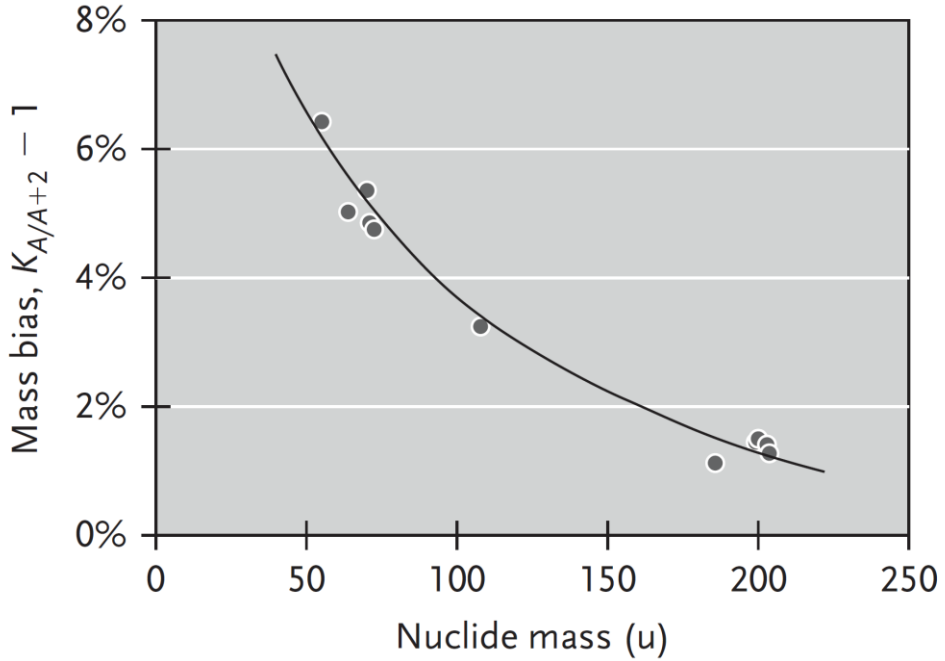
- **The zero-pollution ambition promoted by the European Green Deal,** requires highly sensitive and state-of-the-art detection techniques for the measurement of ultra-low amounts of pollutants.

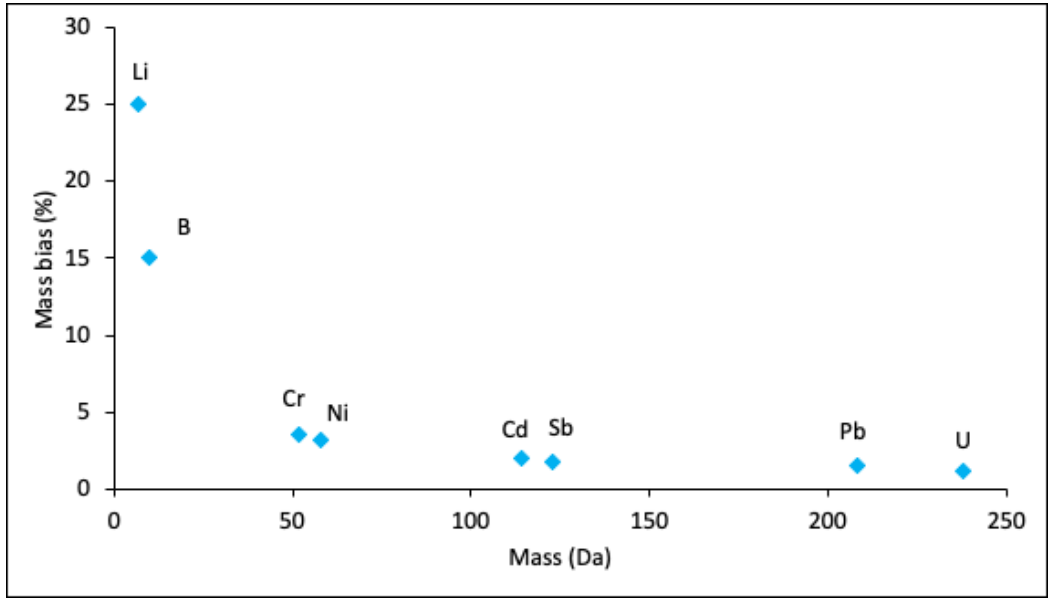
- **Mass spectrometry** is a key method,
  - ✓ with high potential for reducing measurement uncertainties and detection limits,
  - ✓ but there is no existing traceability chain for radioactive elements,
  - ✓ and there is a lack of SI-traceable isotope reference materials for stable isotopes.



The lack of SI-traceable isotope reference materials for stable isotopes

The **mass bias effect** (instrumental mass fractionation) breaks the traceability chain, especially for measurements with ICP-MS systems



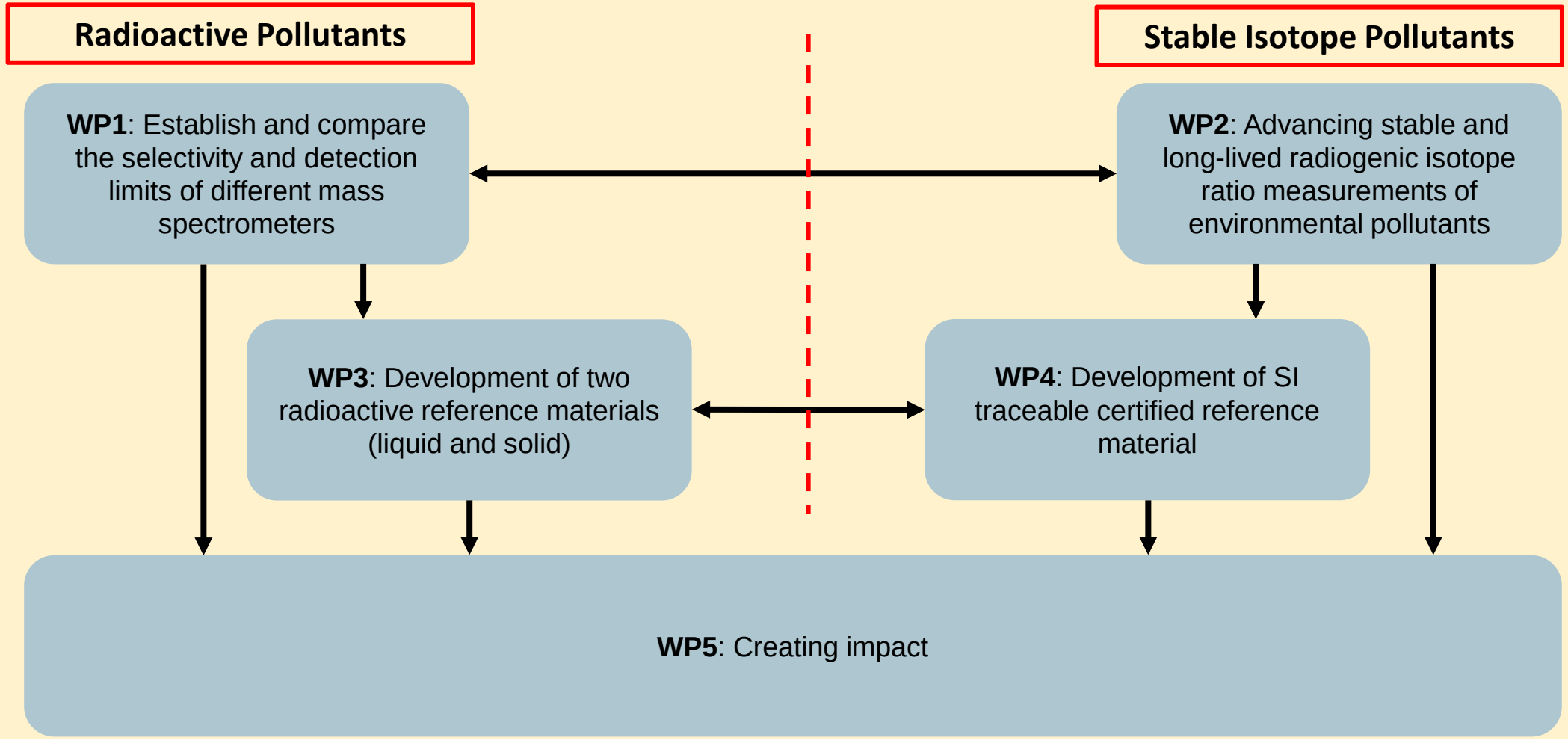


Mass spectrometry systems included in the project

- **ICP-QMS** Inductively Coupled Plasma Quadrupole Mass Spectrometer
- **ICP-MS/MS** Inductively Coupled Plasma Tandem Mass Spectrometer
- **ICP-SFMS** Inductively Coupled Plasma Sector Field Mass Spectrometer
- **MC-ICP-MS** Multi-Collector Inductively Coupled Plasma Mass Spectrometer
- **SIMS** Secondary-Ion Mass Spectrometer
- **TIMS** Thermal Ionisation Mass Spectrometer
- **AMS** Accelerator Mass Spectrometer
- **ICP-TOF-MS** Inductively Coupled Plasma Time of Flight Mass Spectrometer
- **SNMS** Secondary Neutral Mass Spectrometer
- **HR-ICP-SF-MS** High Resolution Inductively Coupled Plasma Sector Field Mass Spectrometer
- **ICP-QQQ-MS** Triple quadrupole Inductively Coupled Plasma Mass Spectrometer

Work packages

WP6: Management and coordination



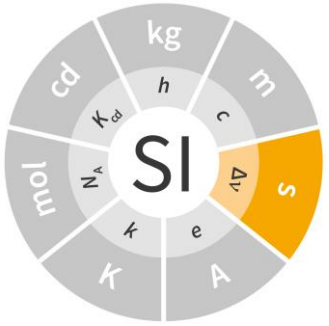
WP5: Creating Impact

Progress

- Stakeholder committee in progress
- Website in place: https://www.npl.co.uk/euramet/metropoem
- Presence in LinkedIn and ResearchGate
  - ✓ https://www.linkedin.com/in/metropoem-project-308762251/
  - ✓ https://www.researchgate.net/project/MetroPOEM-Metrology-for-the-harmonisation-of-measurements-of-environmental-pollutants-in-Europe
- First press release issued
  - ✓ https://www.stuk.fi/web/en/about-us/cooperation/metropoem-project

Impact of MetroPOEM

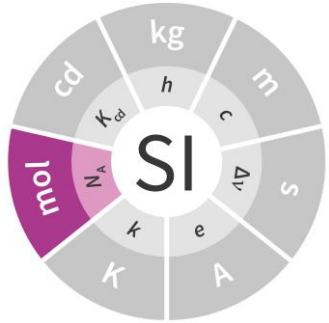
- **Establish link** between radiometric techniques and mass spectrometry, bridging the gap between the activity (Bq) and the amount of substance (mol) of an isotope
- Traceable aqueous radionuclide standards (U, Np, Pu, Am, Sr, Ra) suitable for mass spectrometry systems
- Close the **traceability gap** for isotope ratio measurement resulting from isotopic fractionation (mass bias)
- Guide on the use of mass spectrometry for **low level radionuclide detection**
- Report of different instrument's **advantages and limitations**
- Three Si-traceable **reference materials**
- Establish Si-traceable **calibration chain** for single collector ICP-MS
- **Harmonized methods** for measurement of polluting elements using mass spectrometric techniques



Activity (Bq = s^{-1})

$$n = \frac{A \times T_{1/2}}{N_A \times \ln 2}$$

Amount of substance (mol)

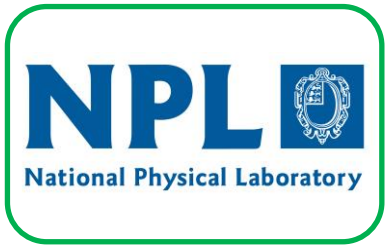


N_A: Avogadro constant (mol^{-1}) $T_{1/2}$: Half-life (s)

WP6

WP3

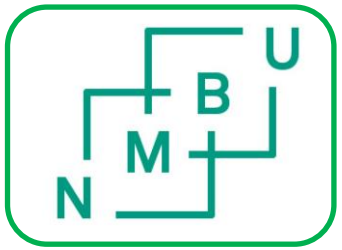
WP2



WP1

WP4

Consortium



WP5

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