



New and advanced applications of nuclear science and technology towards a sustainable environment

IAEA Collaborating Centre at ANSTO

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Science. Ingenuity. Sustainability.



ANSTO's Lucas Heights campus.

ANSTO

ANSTO Research and Infrastructure

Research themes

Environment Ø	Human health	Nuclear fuel cycle $$	 Strategic program
Environmental change Water resource sustainability	Nuclear technology for disease characterization and treatment	Fuel resources and systems and spent fuel management	ANSTO Synroc [®]
Contaminant impact	Radiotherapy and theranostics	Reactor systems	

Research infrastructure

Landmark and national	Institutional
Australian Synchrotron (AS) National Deuteration Facility (NDF)	Biosciences
Australian Centre for Neutron Scattering (ACNS) Nuclear Stewardship (NS)	Isotope Tracing in Natural Systems (ITNS)
Centre for Accelerator Science (CAS)	Nuclear Materials Development and Characterisation (NMDC)

Research enablers

Research office	Industry and stakeholder engagement	
Group office	User office	



Environmental Research at ANSTO

How can we inform sustainable environmental management strategies and add to our capacity to respond to modern environmental challenges?

Environmental change

Scale and speed of environmental change

Water

Sustainability and quality of key water resources and aquatic ecosystems

Contaminant impacts

3

Pathways and impacts of contaminants in biota and the environment



ANSTO Collaborating Centre: Infrastructure and expertise



Australian Synchrotron

Environmental Radioactivity Measurement Centre





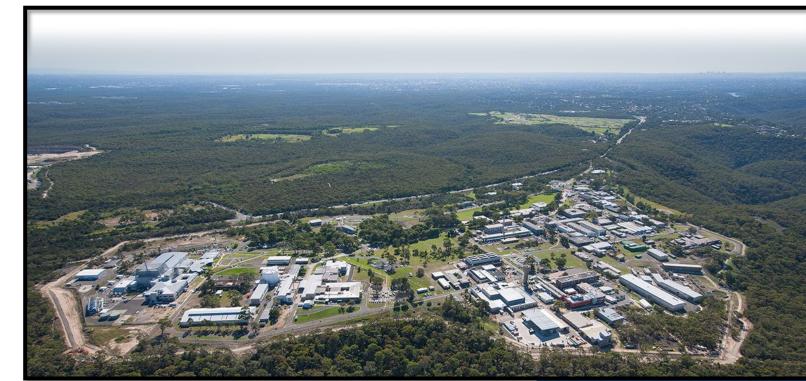
ANSTO Collaborating Centre

Collaboration topic:

New and advanced techniques and applications of nuclear science and technology towards a sustainable environment

Department of NA, Divisions of NAPC & NAEL

- 1.4 Nuclear Science
- 2.3 Water Resources
- 2.4 Environment
- **Region:** Asia and the Pacific
- Duration: 4 years



Objective

 To provide support to the IAEA Member States in the field of new and advanced techniques and applications of nuclear science and technology towards a sustainable environment.

Benefits

- Very ambitious, comprehensive but coherent programme with benefits and impact on
 - ✓ Networking
 - ✓ New scientific results
 - ✓ Training
 - ✓ Novel methodologies and techniques
 - ✓ New stakeholders
 - Improved utilization of nuclear techniques
 - ✓ Strengthen Partnership

\rightarrow Both to the IAEA and ANSTO





Focus areas for the Collaborating Centre

- 1. Nuclear (Accelerator, Research Reactor and Isotopic) Techniques in Provenance and authentication of products of illicit trade
- 2. Applications of Isotope Hydrology Sustainable water resources
- 3. Nuclear and Isotopic Techniques in Art, Archaeology and Cultural Heritage
- 4. Nuclear techniques in Environmental Change and Radioecology

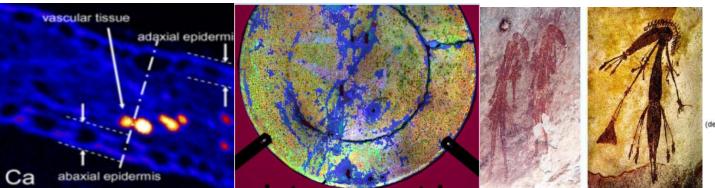
 Climate change, Marine Environment, Atmospheric pollution
 and NORM/Legacy sites

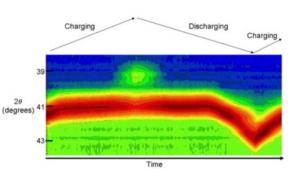




History of collaboration

- IAEA ANSTO CC projects:
 - 1) 2007-13: Neutron scattering applications in materials research and various industries
 - 2) 2016-2020: Multi-analytical techniques for materials research, environmental studies and industrial applications
 - 3) Proposed: 2020-2024: Nuclear and Isotopic Techniques for the Environment









History of collaboration

ANSTO's membership in IAEA Networks

ALMERA Regional Leadership



GNIP, NWAL, IDN, RANET, ANENT, WATEC, TWGRR, LABONET, DISPONET, IPN, ENVIRONET, INLEX, SAGNA

ANSTO's membership in IAEA CRPs

12 CRPs: F11020, F11022, F22026, F31006, G42008, J02013, K41015, K41016, K41017, K41019, T14003, T22002

ANSTO's membership in IAEA TC Projects

12 TC Projects: RLA 7023, RAS5081, RAS7028, RAS7029, RAS7030, RAS7031, RAS6097, RAS7035, RAS7037, RAS9092, RAS0086

What's been achieved so far

Next-generation batteries



Particle based emulsifier towards functional food



New method for radiocarbon age of rock art



ANSTO

Budj Bim UNESCO World Heritage site



Neutron tomography of fossils



Portable XRF technology - a viable approach for seafood provenance

- ANSTO has unique expertise in determining the origin of food using a range of techniques
- Research has confirmed that the repurposed portable X-ray fluorescence technology is a viable approach to test seafood provenance for use at external sites
- Prediction accuracy using the portable device was estimated at 87%, which is comparable to lab-based testing

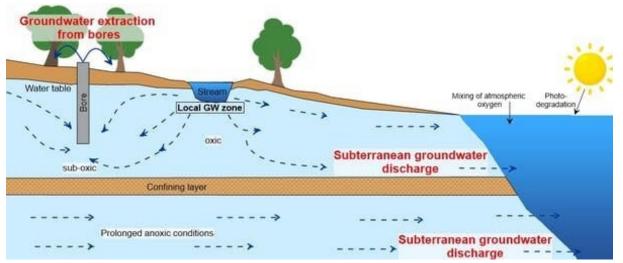




https://www.ansto.gov.au/news/portable-xrf-technology-viable-approach-for-seafood-provenance

¹⁴C a key tool in identifying a hidden source of greenhouse gases – organic matter in groundwater

- When groundwater especially from deep down – is pumped to the surface, it brings with it dissolved organic matter preserved from long ago.
- Once sunlight and oxygen hit this matter, it can easily turn into carbon dioxide.



- That means groundwater is likely to be yet another source of planet-heating greenhouse gases (GHG) -> is not included in our carbon budgets.
- Problem will increase, as over-extraction of easily accessible groundwater forces use of deeper water, which has much more of this greenhouse gas-producing organic matter

 — needs to be factored it in to the way we deal with climate change.



https://www.nature.com/articles/s41467-022-29711-9

Cultural Heritage

- Cutting-edge nuclear research techniques have been combined with historical artefacts to provide never-beforeseen images
- Collaboration between ANSTO and the Museum of Applied Arts and Sciences
- Using ANSTO's world-dass nuclear scientific capabilities including the Australian Synchrotron, particle accelerators and the neutron imaging instrument 'DINGO' we have examined historical artefacts at an atomic level to reveal their inner workings or hidden secrets from the past

https://www.ansto.gov.au/whats-on/invisible-revealed-at-powerhouse-museum



THANK YOU

