

# IAEA Marine Environment Laboratories

**Nuclear science  
to help protect the  
marine environment**



**IAEA**

International Atomic Energy Agency

*Atoms for Peace and Development*

# Nuclear science and technology to address global marine challenges to protect ocean health and support the sustainable use of the ocean

Human activities impact the planet and humanity in numerous ways. Marine environment pollution and climate related ocean changes, including ocean acidification, warming and deoxygenation, threaten the health of the ocean. Habitat destruction and harmful algal blooms also have distinct impacts on the future of our coasts.

The work of the IAEA Marine Environment Laboratories is focused on giving Member States the tools they need to sustainably manage and protect the ocean. Hosted by the Principality of Monaco, they are comprised of three laboratories: the Radiometrics Laboratory, the Radioecology Laboratory and the Marine Environmental Studies Laboratory. The Laboratories also serve as the focal point of the International Coordination Centre for Ocean Acidification. Research and development activities conducted in these laboratories provide Member States with reliable data, tools, knowledge and capacity to address their most pressing marine and environmental challenges to support policy decisions, to report on UN Sustainable Development Goals and to work towards achieving them.

## Radiometrics Laboratory

The Radiometrics Laboratory (RML) provides expertise in marine radioactivity measurement, monitoring and assessment and in the application of radiotracers for marine pollution, climate change and oceanographic studies. RML operates specialized radiochemistry laboratories and an underground counting facility for the analysis of low levels of radionuclides in marine and atmospheric samples and environmental forensics applications. RML maintains an open access marine radioactivity data portal (MARIS), assists Member States to prepare for nuclear and radiological incidents or emergencies that could impact the marine environment and is accredited for the production of IAEA Certified Reference Materials. By supporting radioanalytical data quality in Member States for seawater, sediment and marine biota, RML contributes to the credibility of monitoring and research results.



## Radioecology Laboratory

The Radioecology Laboratory (REL) uses nuclear tools to assess the pathways and impact of a broad range of contaminants, including plastics and biotoxins, in the marine food chain, on marine ecosystems and ecosystem services, using largely experimental set-ups. In addition, REL advances knowledge on aspects of the marine carbon cycle including on Blue Carbon – the carbon captured by the world's ocean and coastal ecosystems – to help countries mitigate and adapt to the effects of climate change and in support of biodiversity. In 2016, REL initiated experimental work on various aspects of marine plastic pollution, including assessments of the effects of microplastics on fish and corals.



## Marine Environmental Studies Laboratory

The Marine Environmental Studies Laboratory (MESL) develops new methods and quality assurance measures for the monitoring of non-radioactive, priority and emerging contaminants in the marine environment and marine resources, including seafood. It develops associated reference materials and proficiency tests that laboratories around the world can use to develop their capabilities and generate reliable scientific data. MESL also uses isotopic and other fingerprinting methods to forensically source and track the movement of contaminants in the marine environment. These tools are useful for experts to assess the potential impacts of hazardous contaminants such as heavy metals, methyl mercury, persistent organic pollutants and petroleum hydrocarbon, in particular in responding to emergencies and as indicators of healthy, productive marine ecosystems.



## Ocean Acidification — International Coordination Centre

To promote international collaboration on ocean acidification, a climate-related ocean change, the IAEA Marine Environment Laboratories in Monaco also host the Ocean Acidification International Coordination Centre (OA-ICC). The Centre organizes training courses in Member States and provides access to data and resources to advance research in this emerging field of scientific study. It works to raise awareness of the issue among various stakeholders and inform about the role that nuclear and isotopic techniques can play in assessing its impacts on biodiversity and marine resources. The OA-ICC works with many international partners, including the Global Ocean Acidification Observing Network (GOA-ON), and supports the UN Ocean Decade endorsed programme Ocean Acidification Research for Sustainability (OARS).



## Analytical Laboratories for the Measurement of Environmental Radioactivity Network

Comprising 195 laboratories from 90 countries, the Analytical Laboratories for the Measurement of Environmental Activity (ALMERA) network is a co-operative effort of analytical laboratories to provide reliable and timely analysis of radionuclides in environmental samples. ALMERA is coordinated by the IAEA Radiometrics Laboratory in Monaco, in collaboration with the IAEA Terrestrial Environmental Radiochemistry Laboratory in Seibersdorf, Austria. The network provides a platform for reliable information on radionuclides in air, water, soil, sediment and vegetation, which can be used for both routine and emergency environmental monitoring by Member States.



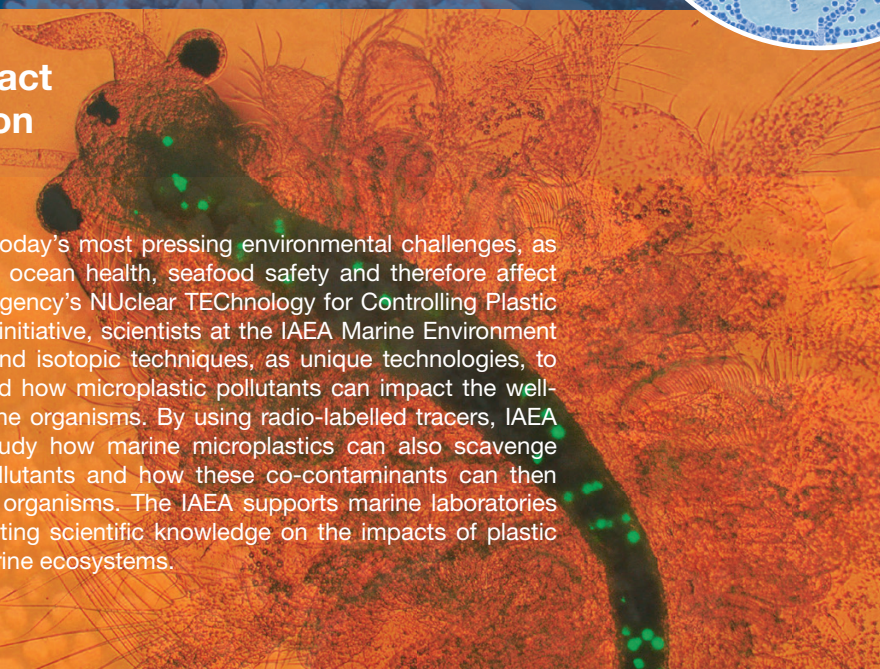
## Marine Radioactivity Information System

The IAEA Marine Environment Laboratories have been keeping track of radioactivity levels in the marine environment for over 60 years and have amassed a wealth of global data available through its online data portal, the IAEA Marine Radioactivity Information System (MARIS). The portal provides open access to over 800,000 verified marine radioactivity measurement results representing more than 100 different radionuclides or radionuclide ratios in seawater, biota, sediments, and suspended matter from both the open ocean and coastal locations.



## Tackling the impact of plastic pollution on marine life

Plastic pollution is one of today's most pressing environmental challenges, as it can potentially endanger ocean health, seafood safety and therefore affect human health. Within the Agency's Nuclear TECHNOlogy for Controlling Plastic Pollution (NUTEC Plastics) initiative, scientists at the IAEA Marine Environment Laboratories use nuclear and isotopic techniques, as unique technologies, to track and better understand how microplastic pollutants can impact the well-being and function of marine organisms. By using radio-labelled tracers, IAEA researchers are able to study how marine microplastics can also scavenge other dissolved marine pollutants and how these co-contaminants can then additionally impact marine organisms. The IAEA supports marine laboratories across the world in generating scientific knowledge on the impacts of plastic pollution in coastal and marine ecosystems.



## Future Priorities

The IAEA Marine Environment Laboratories will continue to engage in research and development activities that strengthen Member States' expertise and knowledge to devise solutions for addressing their most pressing marine and environmental challenges, and to report on UN Sustainable Development Goals. To ensure success, the IAEA Marine Environment Laboratories will focus on the following points of action:

- Championing global efforts to reverse the decline in ocean health as an official partner of the United Nations Decade of Ocean Science for Sustainable Development (2021-2030).
- Addressing marine microplastics using nuclear technologies to assess abundance, distribution, and impact of plastic pollution on marine ecosystems and associated biota.
- Supporting the development of capacities and harmonized methodologies to establish a global NUTEC Plastics Network of Laboratories for marine microplastics monitoring.
- Providing technical support to seafood safety by enhancing research and analytical efforts, given the crucial role of sustainable seafood production for Member States' economies.
- Developing new Blue Carbon initiatives to support Member States in addressing climate change impacts through the restoration and sustainable use of coastal and marine ecosystems.
- Ensuring global marine radioactivity monitoring data reliability and comparability through enhanced quality reference products
- Demonstrating excellence in low level underground measurements of radioactivity for advanced research and characterisation of Certified Reference Materials.
- Marine radioactivity monitoring and research on sources, behaviour, fate and radiological impact of radionuclides in the marine environment
- Providing Member States with enhanced access to marine radioactivity data and information through the MARIS Marine Radioactivity Information System Internet-based portal.
- Producing cutting-edge marine modelling for nuclear and radiological emergencies.
- Developing and sharing state-of-the-art analytical methodologies and guidelines for the monitoring of marine priority pollutants and contaminants of emerging concern.
- Committing to increased collaboration with United Nations Agencies to address top climate change and marine pollution impacts.



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