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Organismo Internacional de Energía Atómica

Capacity building at the Marine Environment Laboratories (MEL) of the IAEA

Contribution to the

Conference on Developing a Global Strategy for Capacity Building in the Ocean Sciences

Bremen, August 16 – 18

Background:

The Marine Environment Laboratories (MEL) were founded in March 1961 in Monaco as a consequence of the global nuclear fallout from atmospheric weapon testing in the 50's and 60's. It was first named "International Laboratory of Marine Radioactivity". The location Monaco was chosen in agreement with the Prince Rainier III after the international conference on nuclear waste held in Monaco in 1959. The Principality has early shown its interest in protecting the marine environment by the ocean research activities by Prince Albert I of Monaco at the end of the 19th century and the subsequent marine science activities in Monaco. For example in 1921 the International Hydrographic Bureau (IHB – BHI) was established in Monaco.

The nuclear global fallout gave concern to the world population and as a consequence the test ban on nuclear atmospheric tests was formed. Land and sea biosphere was contaminated by the global fallout. The initial dedication of the Marine Laboratories of the IAEA was the study of behaviour of radionuclides in the marine environment but MEL steadily expanded its scope to the application of isotopic techniques to ultimately better protect the marine environment. The MEL has recently been merged with the Terrestrial Environment Laboratory of the IAEA located in Seibersdorf near the IAEA headquarter in Vienna.

The main scope of the MEL is training and capacity building with Member States in order to enable them to analyse marine samples on radioactive and non-radioactive substances and to establish high quality monitoring programmes. One major task is also the production of reference materials from marine origin and to carry out proficiency tests and intercomparison exercises with laboratories in Member States for a better quality of marine data.

At present, the MEL consists of three sections, the Radiometrics Laboratory (RML), the Radioecology Laboratory (REL) and the Marine Environmental Studies Laboratory (MESL), which covers also non-radioactive contaminants and provides reference materials. There is a strong collaboration with other UN-Organisations like UNEP, UNESCO/IOC, FAO, UNIDO as well with regional sea conventions such as OSPAR, HELCOM, MED POL, ROPME, Caribbean Sea Area as well with

international collaboration projects in the Black, Caspian, Red and Yellow Sea regions and West Indian Ocean region.

Technical Cooperation & Capacity Building for Member States

In collaboration with the IAEA's Technical Cooperation (TC) Programme, MEL supports capacity-building in developing Member States through applied marine environmental research. Subjects include marine radioactivity and radioecology, radiochemistry and marine pollution assessment. MEL also hosts yearly dozens of trainees from developing countries to work in the laboratories and enhance their scientific skills and knowledge.

MEL has been a focal point of many collaborative initiatives in areas of expertise such as certification of reference materials, marine radioactive and non-radioactive pollution monitoring and assessment, training and methodological development and harmonisation. These areas expanded during the past decade to include advanced analytical techniques and a wide range of radiotracer applications to marine studies, such as climate and environmental change, submarine groundwater discharge (SGD), Harmful Algae Blooms (HABs), seafood safety. At the same time, in this past decade increasingly complex regional and inter-regional technical co-operation projects required a more integrated approach, including several of the areas of expertise mentioned above. In order to increase the effectiveness of the support provided by MEL to regional networks of laboratories and its contribution to other networks of excellence, MEL has started to formalize its existing network collaborations.

MEL contributes to the implementation of dozens of national IAEA-TC projects throughout the developing world, addressing key problems like petroleum pollution, red tides, and radioactive, heavy metal and pesticide contamination. In Angola, MEL is helping to determine the quantity and type of hydrocarbons in the water column, sediments and mussels on the Benguela coastline. In Southern Guatemala, MEL researchers are assisting with the analysis of toxic metals in the marine environment. And in Pakistan, MEL is supporting the evaluation of pollutant behaviour and contaminant transport in inland and coastal industrial zones through the application of both nuclear and non-nuclear techniques.

In the framework of regional and inter-regional TC projects, the IAEA provides support to developing Member States' laboratories, transferring its knowledge and skills to carry out marine environmental studies using nuclear analytical and radiotracer techniques in the following areas:

- Capacity building: group and individual training, provision of equipment, expert advice;
- Methodological support: sampling, sample preparation, and analysis for the measurement of radionuclides in the marine environment;
- Applications of radiotracer, isotopic and radio-ecological techniques to assess radioactive and non-radioactive contaminants in the marine environment;
- Support for coordinated monitoring of radionuclides in coastal regions;
- Networking.

To help address the widening red tide phenomenon throughout the world, MEL is introducing the receptor binding assay method to numerous countries of SE Asia,

Africa, Latin America and the Caribbean and Latin American regions. A new Mediterranean regional project is assisting States — from Albania to Cyprus to Serbia and Montenegro — with assessment of radionuclides in the Sea. An ongoing regional project in Asia is improving the States' capacity for planning and responding to marine radiological emergencies. The project includes China, Bangladesh, Indonesia, Korea, Malaysia, Mongolia, Thailand and Vietnam. An ongoing regional project in Africa (RAF7008) is improving the Member States' capacity for the assessment of contamination in the marine environment.

Research Fellows and Training Initiatives

MEL offers a wide range of training and provides internships for recent graduates interested in acquiring new laboratory skills and other expertise. Intended for Member States, regional organizations and other UN agencies, MEL's training courses cover a broad range of topics related to the use of radionuclides in marine studies, as well as analysis of non-radioactive pollutants.

Under the IAEA's Technical Cooperation (TC) programme, regional courses are offered several times a year to provide training on equipment use and methods customized to regional needs. This approach helps build local expertise and strengthens networking by bringing together researchers and technicians from across the developing world.

Equipment and techniques used in nuclear and non-nuclear methods often must be adapted to conditions in national laboratories. TC fellowships provide researchers from IAEA Member States with the opportunity to learn first-hand about the methods used at MEL and then customize them for their own research. Because of this adaptability, the fellowship programme attracts not just marine radiochemists and radioecologists, but also geologists and biologists.

Over the past five years, more than 30 long-term TC fellows and professional trainees from 17 countries have honed their research skills through on-the-job laboratory research at MEL and in training courses organized in collaboration with Member States laboratories.

The Technical Cooperation Department of the International Atomic Energy Agency, a specialized organization within the United Nations system, helps to transfer nuclear and related technologies for peaceful uses to countries throughout the world. The TC Programme disburses more than $70 million (US dollars) worth of equipment, services, and training per year in approximately 100 countries and territories which are grouped into four geographic regions.

Through training courses, expert missions, fellowships, scientific visits, and equipment disbursement, the Technical Cooperation Programme provides the necessary skills and equipment to establish sustainable technology in the counterpart country or region. With more than 800 on-going projects, the TC Programme strives to have an impact on Member States' problems that can be solved with nuclear technology.

Co-ordinated Research Programmes (CRP) is another good way of supporting capacity building of developing Member States. These are developed in relation to a well defined research topic on which an appropriate number of institutions are invited to collaborate and represent an effective means of bringing together researchers in both developing and industrialised countries to solve a problem of common interest. Each CRP is essentially a network of 5-15 national research institutions which work within an operational framework for research with a similar and well defined global or

regional thematic or problem focus which is relevant to, or can be tackled through, nuclear technology.

MEL Training Capacities:

I/ RADIOMETRICS LABORATORY

Remarks: A group training course in RML requires six months preparation (including purchase of consumables), two weeks for the lab setup and one week for clean-up. Three persons are needed to supervise the trainees in the laboratory and four lecturers for periods between two days to the full length of the course for the theoretical part.

Training Capacity:

Maximum number of fellows per year: 6 (depending on the length and subject of training the given number may vary; typical length of training should be 6 months)

Maximum number of training courses per year: 1-2 (3 in 2 years)

Maximum number of trainees per course: 12

Training course languages: English and French

Main subjects of training offered:

- Sampling and sample processing,
- Radiochemical and radiometric analyses of marine samples (anthropogenic and natural radionuclides),
- Sediment dating,
- Marine radioactivity monitoring and assessment,
- Radiological assessment,
- Modeling of dispersion and transfer of radionuclides,
- Tracer applications in oceanography and pollution studies

Budgetary requirements:

- Training course (2 weeks, 12 participants): 20 000 € for consumables, 12 000 € for 4 days ship rental for training courses involving sampling at sea
- Fellowships: 1000 €/month bench fees

II/ RADIOECOLOGY LABORATORY

General

Remarks: A group training course in REL requires six months preparation (including purchase of consumables), two weeks for the lab setup and one week for clean-up. Four persons are needed to supervise the trainees in the laboratory and a minimum of two lecturers for the theoretical part.

Training Capacity

Maximum number of fellows per year: 4 for a 6 months period - Max 2 fellows at the same time- typical length of training should be 6 months
Maximum number of training courses per year: 1 training, 2-3 weeks long
Maximum number of trainees per course: 20 (in 2 groups)
Training course languages: English & French
Main subjects of training offered: Marine Radioecology and Biogeochemical cycling of radionuclides; Applications to other contaminants and climate change investigations.

Budgetary requirements:

- Training course (3 weeks, 20 participants): 15 000 € for consumables and minor equipment
- Fellowships: 1000 €/month bench fees

III/ MARINE ENVIRONMENTAL STUDIES LABORATORY

Remarks: A group training course in MESL requires four months preparation (including purchase of consumables), two weeks for the lab setup and clean-up. One expert for organic pollutants and two for trace metals are needed to supervise the trainees in the laboratories and a minimum of 2 lecturers for the theoretical part (one for organic pollutants and one for trace metals).

There is an increasing demand of training course on sampling techniques; these courses would require renting a boat suited to operate equipments like rosette water sampler, multiple sediment corer, box corer, etc. Three experts are needed for sampling training.

One of MESL's main activities is the analyses of samples issued from extra-budgetary projects. Since the amount of these extra-budgetary-funded samples is not constant, the number of training courses that MESL can carry out per year is variable, the more EB samples to be analyzed, the less number of fellows can be trained.

Training Capacity

- Maximum number of fellows per year: 4 for a 3 months period - max 2 at the same time
- Approximate number of training courses per year: 4 trainings (2 for organic pollutants and for trace metals), 2-3 weeks long
- Maximum number of trainees per course: 6-8 trainees
- Training course languages: English & French
- Main subjects of training offered: Analytical techniques on trace metals (AAS & ICP-MS), Mercury speciation (Solid AAS & GC-AFS).
- Organotin speciation (GC-FPD & GC-MS).
- Analytical techniques on petroleum hydrocarbons (GC-MS, GC-FID & Spectrofluorometer), Analytical techniques on organochlorine pesticides and PCBs (GC-ECD & GC-MS), Analytical techniques on PBDEs (GC-ECD & GC-MS)
- Monthly training fee for a fellowship: 1500 US$ for trace metals. 2000 US$ for organic pollutants