EU COMET course

"COURSE ON NATURALLY OCCURING RADIOAKTIVE MATERIAL (NORM) IN THE ENVIRONMENT"

at
Silesian Centre for Environmental Radioactivity Central Mining Institute
POLAND

7th – 10th September 2015

Organised by Silesian Centre for Environmental Radioactivity Central Mining Institute
and
Norwegian University of Life Sciences (NMBU), Centre for Environmental Radioactivity (CERAD),

in cooperation with

EU project: Coordination and implementation of a pan-European instrument for radioecology, COMET

Hosted by
Silesian Centre for Environmental Radioactivity Central Mining Institute
Plac Gwarkow 1
40-166 Katowice, Upper Silesia, POLAND

Background

In contrast to the monitoring and prevention of occupational radiation risk associated with enhanced natural radioactivity (NORM), relatively little attention has been paid to the environmental impact associated with residues containing enhanced activity concentration of naturally occurring radionuclides. Such materials are often deposited directly into environment usually close to the NORM production site (e.g., mining), a practice that is forbidden in the management of other types of radioactive waste. In view of the new initiatives in radiation protection, to protect not only humans but also the environment, there is a need to consider the occurrence of anthropogenic enhanced levels of natural radioactivity as a particular unique case representing environmental hazards.

Residues containing high activity concentrations of natural radionuclides differ significantly from radioactive materials arising from that of the nuclear industry or from spent radioactive sources, in particular with respect to physical conditions (open diffuse sources within an operating site, no containment) as well as chemical composition. In addition, NORM usually occurs in mixtures with a series of other stressors (e.g., heavy metals or organic chemicals). Therefore, the environmental impact will depend on the radiation risk combined with the risks associated with other pollutants and a multiple stressor scenario should be considered. There are no precise international regulations regarding NORM, and the non-nuclear industry is often unaware of potential environmental problems that may arise from enhanced levels of natural radioactivity.

Scope and Objectives

The training course focuses on most aspects of environmental radiation impact and risks associated with enhanced natural radioactivity released from different sources and accumulated in the environment. Application of appropriate methods for assessing the radiation impact and risk in the context of the complex suite of natural radionuclides will be discussed, and the inconclusiveness of existing regulation will be explained. Key processes controlling the behavior of naturally occurring radionuclides in different ecosystems will be outlined, including basic concepts, variables/parameters and kinetics needed for modeling purposes. Sampling strategies and protocols will be presented, and training will include the use of state-of-the-art measurement techniques as well as the use of Environmental Risk Assessment models (ERICA tool).

The intensive (4 days) course includes theory (lectures) and training in the lab (radiochemistry and radiation measurements) and at the field (dosimetry, sampling expedition). The field exercises will take place at sites contaminated by NORM.

Learning Outcome: After the course, the students should have an overview over NORM sources, the main radioecology of NORM nuclides and be able to conduct measurements of some key NORM nuclides. To accomplish this the students need to acquire knowledge of:

- NORM sources
- Measurement of key NORM radionuclides
- the transport of NORM radionuclides in various ecosystems with special focus on physico-chemical forms (speciation) and their influence on mobility and biological uptake.
- Environmental impact and risk assessments i.e. competence that is needed within national preparedness associated with NORM contamination.
- Regulation of NORM
- Mitigation

Course description

The course is given intensively over 4 days (September 7th - 10th) in Katowice, Upper Silesia, POLAND. Lectures, fieldwork and laboratory exercises are given integrated in these four days.

Course Topics

LECTURES	LABORATORY EXERCISES, DEMONSTRATIONS, COMPUTER SESSIONS AND FIELD STUDIES
Key sources of NORM, and non-nuclear NORM industry	Soil, soil solution and biota sampling – methodology & statistical rules –records and documentation
Radiation protection and Regulation of NORM – and overlapping regulation dealing with non-radioactive pollutants	NORM contaminated sites identification - sampling of soil cores/profiles
Key physical and chemical processes affecting ecosystem transfer of naturally occurring radionuclides and metals in the environment – with sampling implications	Sampling of sediments and water - bottom sediments sampling (cores/profiles) and water fractionation at site/in lab
Sampling strategies and sample preparation protocols (soil cores/profiles, soil gas/soil solution, bottom sediments, water, vegetation/biota)	*In situ* gamma spectrometry and dose rate mapping
Radiochemical separations and measurements of NORM nuclides (alpha and gamma spectrometry, track and TL detectors, liquid scintillation spectrometry (LSC), mass spectrometry, radiochemistry)	Radon in soil gas measurement and radon exhalation measurement
Radionuclides speciation, mobility and bioavailability - sequential extraction procedure and fractionation techniques	Radium measurement - extractions, radiochemical separations and LSC measurement
High resolution gamma spectrometry - direct measurement of radium 226, correction for lead 210, disequilibrium effects	High resolution gamma spectrometry - direct measurement of radium-226, correction for lead 210, disequilibrium effects
Doses (external, internal) from NORM to biota/humans: calculation/assessment (ERICA, RESRAD)	Dose (external, internal) to biota/humans calculation/assessment (ERICA , RESRAD)

Target Audience

The target audience are NORM industry professionals and relevant authority representatives, as well as researchers or PhD students involved in radioecology who want to develop their knowledge in NORM issues.

Accommodation and travel information

Rooms will be arranged for in Hotel Olympia Spodek (about 65 Euro/night, ten minutes walking distance for the course venue - http://www.stylehotels.pl/en/olympia) or in the hostel just next to the course venue for the economic price (15 Euro/night in a double room - http://www.gwarek.katowice.pl).

The course venue is located 35 km from Katowice airport and 65 km from Kraków-Balice airport. The travel from Warsaw by a direct quick train takes 3 hours (four times per day)

Working language of the course will be English.

Fee There will be no registration fee. The course is covered by the EU COMET project. Participants are expected to cover their own travel and subsistence costs.

Condition for participation

To apply for admission to join the courses through the EU COMET project please use the attached registration form or contact Bogusław Michalik (b.michalik@gig.eu) to obtain a registration form. Application deadline is June 26, 2015.
The number of students will be limited to a maximum of 16.

Date and Venue

The course will take place from 7th – 10th September 2015 at Silesian Centre for Environmental Radioactivity Central Mining Institute, Plac Gwarkow 1, 40-166 Katowice, Upper Silesia, POLAND.

Important dates:

Pre-Registration/Intention to participate deadline:	**June 26th, 2015**
Request for accommodation:	**September 1st, 2015**
Training course:	**September 7th-10th, 2015**

Contact & Information

Scientific co-ordination and registration	For accommodation and travel information
Bogusław Michalik e-mail : b.michalik@gig.eu tel. +48 32 2592380	Anna Szymańska e-mail : a.szymanska@gig.eu tel. +48 32 2592295

Recommended background reading

IAEA publications

1. Radiation Protection and NORM Residue Management in the Production of Rare Earths from Thorium Containing Minerals Safety Reports Series 68 http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1512_web.pdf
2. Radiation Protection and NORM Residue Management in the Titanium Dioxide and Related Industries Safety Reports Series 76 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1568_web.pdf
3. Radiation Protection and NORM Residue Management in the Zircon and Zirconia Industries Safety Reports Series 51 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1289_web.pdf
4. Assessing the Need for Radiation Protection Measures in Work Involving Minerals and Raw Materials Safety Reports Series 49 http://www-pub.iaea.org/mtcd/publications/pdf/pub1257_web.pdf

5. Radiation Protection and the Management of Radioactive Waste in the Oil and Gas Industry Safety Reports Series 34 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1171_web.pdf
6. Radiation Protection against Radon in Workplaces other than Mines Safety Reports Series 33 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1168_web.pdf
7. Monitoring and Surveillance of Residues from the Mining and Milling of Uranium and Thorium Safety Reports Series 27 http://www-pub.iaea.org/MTCD/publications/PDF/Pub1146_scr.pdf
8. Naturally Occurring Radioactive Material (NORM V) Proceedings of an International Symposium held in Seville, 19-22 March 2007 Proceedings Series - International Atomic Energy Agency http://www-pub.iaea.org/MTCD/publications/PDF/Pub1326_web.pdf
9. Management of NORM Residues IAEA TECDOC 1712 http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1712_web.pdf

Journal Articles

1. Lind OC, Strømman G, Rosseland BO, Stegnar P, Tolongutov B, Salbu B. Environmental Impact Assessment associated with the former uranium mining site at Kadji-Saj, Kyrgyzstan. Journal of Environmental Radioactivity 2013:123:37-49.
2. Michalik B. NORM impacts on the environment: An approach to complete environmental risk assessment using the example of areas contaminated due to mining activity. Applied Radiation and Isotopes 2008;66:1661-5.
3. Michalik B. Is it necessary to raise awareness about technologically enhanced naturally occuring radioactive materials. Journal of Environmental Monitoring 2009;11:1825-33.
4. Michalik B, Brown J, Krajewski P. The fate and behaviour of enhanced natural radioactivity with respect to environmental protection. Environmental Impact Assessment Review 2013;38:163 - 71.
5. Mrdakovic Popic J, Bhatt CR, Salbu B, Skipperud L. Outdoor 220Rn, 222Rn and terrestrial gamma radiation levels: investigation study in the thorium rich Fen Complex, Norway. Journal of environmental monitoring 2012;14:193-201.
6. Oughton DH, Strømman G, Salbu B. Environmental impact assessment of U mining sites in Central Asia utilizing the ERICA tool. Journal of Environmental Radioactivity 2013:123:90-98.
7. Popic J, Salbu B, Strand T, Skipperud L. Environmental impact assessment of radionuclide and metal contamination in the thorium (Th) rich Fen area, Norway. In: Strand P, Brown J, Jolle T, editors. International Conference on Radioecology & Environmental Radioactivity. Bergen, Norway: NRPA; 2008. p. 390.
8. Popic JM, Salbu B, Strand T, Skipperud L. Assessment of radionuclide and metal contamination in a thorium rich area in Norway. Journal of environmental monitoring: 2011;13:1730-8.
9. Skipperud L, Jørgensen AG, Heier LS, Rosseland BO, Salbu B. Po-210 in fish from Taboshar uranium mining Pit Lake, Tajikistan. Journal of Environmental Radioactivity 2013:123:82-89.
10. Skipperud L, Strømman G, Yunusov M, Stegnar P, Uralbekov B, Tilloboev H, et al. Environmental Impact Assessment of radionuclide and metal contamination at the former U sites Taboshar and Digmai, Tajikistan. Journal of Environmental Radioactivity 2013:50-62.
11. Strømman G, Rosseland BO, Skipperud L, Heier LS, Burkitbaev M, Uralbekov B, et al. U isotope ratio in water and fish from Pit Lakes in Kurday, Kazakhstan and Taboshar, Tajikistan. Journal of Environmental Radioactivity 2013:123:71-81.

12. Salbu B, Burkitbaev M, Shishkov I, Kayukov P, Uralbekov B, Strømman G, et al. Environmental Impact Assessment associated with the former uranium mining site at Kurday, Kazakhstan. Journal of Environmental Radioactivity 2013:123:14-27.
13. Stegnar P, Yunusov M, Tilloboev H, Zjazjev G, Skipperud L, Salbu B. Gamma and Rn dose Assessment associated with former uranium mining sites in Tajikistan. Journal of Environmental Radioactivity 2013:123:3-13.