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MILESTONE MS53

FIELDCOURSE ON CHERNOBYL FALLOUT IN THE ENVIRONMENT

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1 Introduction

The field training courses are part of WP5 *Knowledge Exchange*, Task 5.3 *Maintaining and enhancing competence*. The overarching objective of this work package is to enhance and maintain European capacity and skills in radioecology by establishing a dynamic interaction promoting effective collaboration between researchers, tool developers, regulators and industry. The main efforts addressed in the frame of task 5.3 are aimed at developing training packages to maintain and enhance professional competence. The field training courses play an important role in providing an opportunity for trainees to take part in measurement campaigns and gather experience in developing sampling strategies and application of different measurement techniques.

Two field training courses were agreed to be held in the two radioecological observatory sites initially established in the STAR. These courses would make use of the wealth of expertise and local knowledge held by the Polish and Ukrainian partners. Due to external circumstances the order of the planned training courses was changed and the training course in Poland was carried out first (MS 57) while the training course in Ukraine was held in 2016 (this report).

The preliminary course programme has been published via the Radioecology Exchange web site http://www.radioecology-exchange.org/content/training-courses and a flyer has been distributed among ALLIANCE members and other platforms in early 2016. (ANNEX 1).

The course was organized as part of COMET training course series by: National University of Life and Environmental Sciences of Ukraine (NUBiP of Ukraine), Ukrainian Institute of Agricultural Radiology (UIAR) Norwegian University of Life Sciences (NMBU), and Centre for Environmental Radioactivity (CERAD), in cooperation with Stockholm University (SU).

The training course took place at National University of Life and Environmental Sciences of Ukraine (NUBiP of Ukraine), Ukrainian Institute of Agricultural Radiology (UIAR) in Kiev, Ukraine 5th – 8th September 2016. The field exercises were carried out at sites within the Chernobyl 10 km zone which was strongly contaminated by the Chernobyl accident in 1986.

2 Course structure

The training course was focused on most aspects of environmental radiation impact and risks associated with the contamination from the Chernobyl accident in 1986. Key processes controlling the behaviour of radionuclides in different ecosystems were outlined in the light of recent radioecology research, including basic concepts, variables/parameters and kinetics needed for modelling purposes.

Application of appropriate methods for assessing the radiation impact and risk in the context of the complex suite of radionuclides from the Chernobyl accident were discussed and then practiced during the field exercises. Lectures and exercises covered the whole impact assessment process starting with sampling strategies and protocol preparation, sampling campaign, sample pre-treatment and preparation, hot particles and the use of state-of-the-art measurement techniques . Special attention was paid to the problems given by the uneven distribution of radionuclides in the environment due to the fallout of highly radioactive particles.

The intensive (4 days) course included theory (lectures) and training in the lab (radiochemistry, gamma, alpha, beta and liquid scintillation spectrometry, sequential extractions, autoradiography, fish sampling and dissection) and in the field (water fractionation and soil, plants, wood, aerosol sampling, particle hunting in soil and sediments). The one day in the field took place within the contaminated 10 km zone around the Chernobyl reactor at the following places:

- evacuated town of Pripyat (measurement of inhomogeneous dose rate)
- experimental Chernobyl pilot site (CPS) "Red Forest" (underground water fractionation and selection of hot particles, determining the frequency of radiobiological effects of pine trees)
- experimental site Kopachi (sampling of soil, vegetation and wood, the layered soil sampling)

Participants visited also radiobiological laboratory of state enterprise "Ecocenter" in the Chernobyl exclusion zone (ChEZ).

Course programme

Day 1, Sep 5

Time	Title/subject	Type	Lecturer
09:00 – 09.15	Welcome and practical information		Rector of NUBiP of Ukraine Stanislav Nikolaienko
9:15 - 10:00	The Chernobyl accident	Lecture	UIAR Professor Valery Kashparov
10:00 – 10:15	Coffee and tea		
10:15 - 11:00	Contamination of the 30 km ChEZ Selection of study sites	Lecture	UIAR Professor Valery Kashparov
11:00 -12:00	Radionuclides speciation, mobility and bioavailability and influence on its environmental behavior.	Lecture	NMBU Professor Brit Salbu
12:00-13:00	Lunch break		
13:00 – 14:00	Biological uptake, accumulation, dose estimates and biological responses	Lecture	SU Associate Professor Clare Bradshaw
14:00 – 15:00	Relevance of hot particles. Speciation and characterization of particles	Lecture	NMBU Professor Brit Salbu
15:00 – 16:00	The use of sequential extractions to estimate mobility	Lecture	NMBU Professor Brit Salbu

Day 2, Sep 6

Time	Title/subject	Type	Lecturer
8:00 - 11:00	Drive to field-site		
11:00 - 13:00	Water sampling	Field exercise	UIAR/NMBU
13:00 - 14:00	Lunch break		
14:00 - 17:00	Soil sampling Biota sampling	Field exercise	UIAR/NMBU
17:00 – 18:00	Ecosystem transfer for wildlife	Lecture	CEH Professor Nick Beresford and David Copplestone
18:00 - 21:00	Drive back		

Day 3, Sep 7

Time	Title/subject	Type	Lecturer
09:00 – 10:00	Sampling of soil, plants/biota and animal products	Lecture	UIAR Professor Valery Kashparov
10:00 – 10:15	Coffee and tea		
10:15 – 11:00	Impact and risk estimates – overall uncertainties	Lecture	NMBU/Brit Salbu
11:00 – 12:30	Sample preparation and measurements	Lecture	UIAR /Head of laboratory Sviatoslav Levchuk
12:30 – 13:30	Lunch break		
13:30 – 17:00	Parallel sessions: 1.Sample preparations, measurements of radionuclides, radiochemistry/separation 2.Particle hunting in soil and sediments, aerosol sampling, autoradiography, Fish sampling and dissection 3.Water fractionation, sequential extractions	Laboratory exercise	UIAR Head of laboratory Sviatoslav Levchuk Leading Researchers Valentyn Protsak and Igor Maloshtan NMBU Senior Engineer Marit N. Pettersen

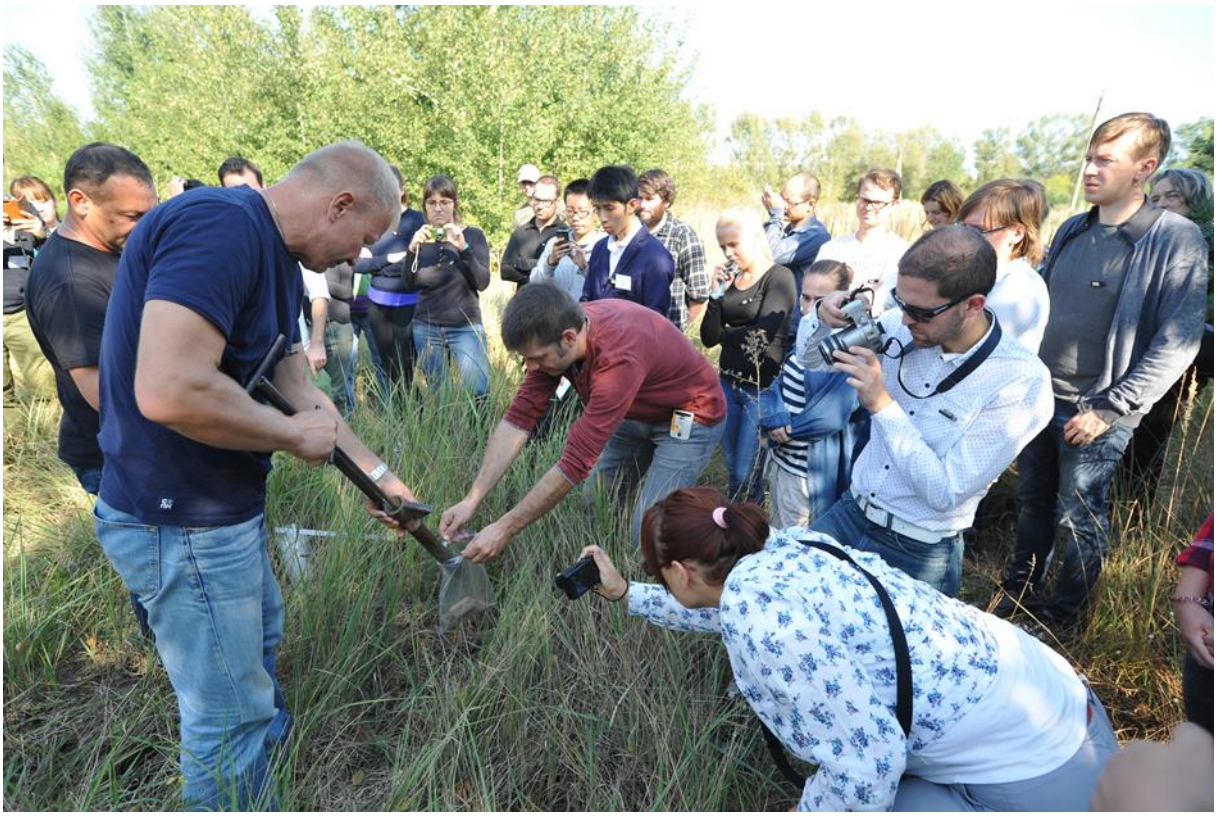
17:00	*Joint dinner*		

Day 4, Sep 8

Time	**Title/subject**	**Type**	**Lecturer**
9:00 – 10:00	The migration of radionuclides in the unsaturated zone and with groundwater	Lecture	UIAR Head of lab., Sviatoslav Levchuk
10:00 – 10:15	Coffee and tea		
10:15 – 12:30	Parallel sessions: 1.Sample preparations, measurements of radionuclides, radiochemistry/separation 2.Particle hunting in soil and sediments, aerosol sampling, autoradiography, Fish sampling and dissection 3.Water fractionation, sequential extractions	Laboratory exercise	UIAR Head of laboratory Sviatoslav Levchuk Leading Researchers: Valentyn Protsak and Igor Maloshtan NMBU Senior Engineer: Marit N. Pettersen
12:30 – 13:30	Lunch break		
13:00 – 16:00	Parallel sessions: 1.Sample preparations, measurements of radionuclides, radiochemistry/separation 2.Particle hunting in soil and sediments, aerosol sampling, autoradiography, Fish sampling and dissection 3.Water fractionation, sequential extractions	Laboratory exercise	UIAR Head of laboratory Sviatoslav Levchuk Leading Researchers: Valentyn Protsak and Igor Maloshtan NMBU Senior Engineer: Marit N. Pettersen
16:00 – 16:30	Closing remarks and course evaluation		Professor Valery Kashparov

Picture 1 Participants in the “Red forest” ready for fieldwork (Photo: V. Kasparov)

Picture 2 Measuring dose from contaminated trees (Photo: V. Kasparov)



Picture 3 Fieldwork in Chernobyl (Photo: V. Kasparov)

Picture 4 Laboratory exercise (Photo: V. Kasparov)

Picture 5 Participants attending lectures. Lecturer: Professor B. Salbu (Photo: V. Kasparov)

Picture 6 Looking for hot particles (Photo: V. Kasparov)

3 Participants

Due to the specific course structure the number of trainees was originally limited to 15 persons, but due to overwhelming interest the course was reorganized into parallel sessions in lab and including 29 persons. List of participates are given in ANNEX 5.

Eleven countries were represented: Japan (6), Ukraine (5), UK (4), Spain (3), China (2), Norway (2), France (2), Czech Republic (2), Sweden (1), Finland (1) and Austria (1). Taking into account occupation profiles, 22 participants represented universities, 3 came from authorities and 4 came from research institutes.

Picture 7 All participants and lecturers in front of Chernobyl reactor 4 (Photo: V. Kasparov)

At the end of the course, all participants received the course attendance certificate (Annex 2).

4 Course Material

Before the course, the participants were given a list of literature to look into if they were interested, to prepare for the course. All lectures were given using MS Powerpoint presentations. For each exercise planned, as well laboratory as field an introductory presentation or short description were prepared in advance. All materials were printed out and provided to the students prior to lecture and laboratory exercises.

After the course, original PDF of all presentation were made available to all course participants

Final version of all lectures and exercises are currently available at Radioecology Exchange web site http://www.radioecology-exchange.org/content/training-courses

5 Participant feedback

At the end of the course all participant were asked to fill a feedback questionnaire (Annex 3). All 20 participants answered back.

It consists of series of question concerning the quality of course content, practical aspects, exercises and facilities rated on a scale of 1 to 5. The simple statistics of obtained answers are presented in Annex 4. The questionnaire also included two open questions concerning course aspects that the students rated the best and aspects that can be improved the next time. Overall the feedback from the students were positive.

6 Future plans

The course organiser registered far more applications than the number of participants planned. All the participants also stated in the questionnaire that the course should be held on a regular basis. This means that the course met the expectations of the audience and it is worth repeating.

ANNEXES

Annex 1: course flyer

Annex 2: certificate

Annex 3: feedback questionnaire

Annex 4: feedback questionnaire analysis

Annex 5: participation list

ANNEX 1

EU COMET course

"FIELDCOURSE ON CHERNOBYL FALLOUT IN THE ENVIRONMENT"

at

National University of Life and Environmental Sciences of Ukraine

(NUBiP of Ukraine)

Ukrainian Institute of Agricultural Radiology

(UIAR)

Kiev, Ukraine

5th – 8th September 2016

Organised by Ukrainian Institute of Agricultural Radiology

(UIAR), National University of Life and Environmental Sciences of Ukraine

(NUBiP of Ukraine)

and

Centre for Environmental Radioactivity (CERAD), Norwegian University of Life Sciences (NMBU)

in cooperation with

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

Hosted by

National University of Life and Environmental Sciences of Ukraine

(NUBiP of Ukraine),

Ukrainian Institute of Agricultural Radiology

(UIAR)

Mashinobudivnykiv Str. 7, Chabany, Kyiv-Svjatoshin distr., Kyiv reg., 08162 UKRAINE

Background

On April 26, 1986, a sudden surge of power during a reactor systems test destroyed Unit 4 of the nuclear power station at Chernobyl, Ukraine, in the former Soviet Union. The accident and the fire that followed released massive amounts of radioactive material into the environment. The Chernobyl accident contaminated wide areas of Belarus, the Russian Federation and Ukraine and fallout were transported all the way throughout Europe. The Chernobyl disaster was the worst nuclear power plant accident in history in terms of cost and casualties. It is one of only two classified as a level 7 event (the maximum classification) on the International Nuclear Event Scale, the other being the Fukushima Daiichi nuclear disaster in 2011.

Scope and Objectives of the course

The training course focuses on most aspects of environmental radiation impact and risks associated with enhanced radioactivity released from different sources and accumulated in the environment but focusing on the Chernobyl accident fallout.

Application of appropriate methods for assessing the radiation impact and risk in the context of the complex suite of radionuclide fallout will be discussed. Key processes controlling the behavior of 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.

The intensive (4 days) course includes theory (lectures) and training in the lab (radiochemistry and radiation measurements) and one day in the field. The field exercise will take place in the Chernobyl Exclusion Zone (CEZ).

Learning Outcome: After the course, the students should have an overview over Chernobyl accident as a sources, the main radioecology of nuclides from such an event and be able to conduct measurements of some key radionuclides.

Course description

The course is given intensively over four days (September 5th – 8th) in Kiev, Ukraine. Lectures, fieldwork and laboratory exercises are given integrated within these four days.

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.

Draft Course program

LECTURES IN SHORT CA 12 HOURS		LABORATORY EXERCISES, DEMONSTRATIONS, CA 10 HOURS
The Chernobyl accident Contamination of the 30 km zone, selection of study sites		Soil sampling, sample preparations
Speciation of radionuclides Water sampling and fractionation		Particle hunting
Mobility and transport of radionuclides in the environment Sequential extractions, mobility estimates		Sequential extractions
Sampling of plants/biota and animal products Sample preparations - measurements		Water sampling and fractionation
Source identification using isotope ratios and MS teckniques		
Relevance of hot particles. Particle charaterization		
Impact and risk estimates – overall uncertainties		+ one day in the field

ChEZ Field Visit (1 day)

Chernobyl (150 km from Kiev)

A one-day trip to the Chernobyl Exclusion Zone to see the Shelter, the city of Pripyat, various NUBiP experimental sites, etc., will be organized one day fom 07:00 to 20:00. If you wish to join the trip, please contact the Meeting Coordinators (see above) by latest 1 June 2016, and send a scanned copy of the first page of your passport by email.

Target Audience

The target audience are researchers/scientists and PhD/MSc students in radioecology who wants to develop their knowledge on the Chernobyl accident and the sampling strategy when fallout is uneven distributed.

Condition for participation

In order to apply for admission to join the course through the EU COMET project contact Valeryia Morozova, mvs@uiar.kiev.ua (Phone +38044 5267445) to obtain a registration form.

Application deadline is June 1st, 2016. There will be limitations to number of students – maximum 20 students.

Date and Venue

The course will take place from 5th to 8th September 2016 at the Ukrainian Institute of Agricultural Radiology (UIAR) of NUBiP of Ukraine, Mashinobudivnykiv Str. 7, Chabany, Kyiv-Svjatoshin distr., Kyiv reg., 08162 UKRAINE.

Important dates:

Pre-Registration/Intention to participate deadline:	**June 1st, 2016**
Request for accommodation:	**June 1st, 2016**
Training course:	**September 5th-8th, 2016**

Contact & Information

Scientific co-ordination and registration	For accommodation and travel information
Valery Kashparov vak@uiar.kiev.ua Tel: +380 (44) 526-1246 Fax: +380 (44) 526-0790 Mobile: +380 505772785	Valeryia Morozova mvs@uiar.kiev.ua +38044 5267445

Recommended background reading

1. Environmental consequences of the Chernobyl accident and their remediation: twenty years of experience //Report of the Chernobyl Forum Expert Group 'Environment', Ed. Anspaugh, L. and Balonov, M., Radiological assessment reports series, *IAEA, STI/PUB/1239*, 2006, 166p. **(Web-site)**
2. Handbook of Radioactivity Analysis. Third Edition. Edited by Michael F.L'Annunziata, Elsevier, 2012, 1379 p.
3. Khomutinin Y.V., Kashparov V.A., Zhebrovska K.I. Sampling optimisation when radioecological monitoring. Kiev: VIPOL, (2001) 160p. (Russ –Web-site) (Eng-Web-site)
4. IAEA 2004. Soil sampling for environmental contaminants. International Atomic Energy Agency IAEA-TECDOC-1415, Vienna.
5. ICRU 2006. Sampling for radionuclides in the environment. International Commission on Radiation Units and Measurements Report #75. Journal of the ICRU Volume 6 No 1 2006.
6. ISO 2007. International Standard Reference Number: 18589-2. Measurement of radioactivity in the environment – soil. Part 2: Guidance for the selection of the sampling strategy, sampling and pre-treatment of the samples.
7. Kashparov V., Yoschenko V.I., Levtchuk S.E., Tschiersch J., Wagenpfeil F. Application of the method of repeated mixing to non-uniformly contaminated bulky samples //*Journal of Radioanalytical and Nuclear Chemistry*, v. 246, No. 1, 2000. P. 165-172 .

8. Kashparov V.A., Lundin S.M., Zvarich S.I., Yoschenko V.I., Levtchuk S.E., Khomutinin Yu.V., Maloshtan I.N., Protsak V.P. Territory contamination with the radionuclides representing the fuel component of Chernobyl fallout //*The Science of The Total Environment*, vol.317, Issues 1-3, 2003, pp. 105-119. **(Web-site)**
9. Kashparov V.A., Lundin S.M., Khomutinin Yu.V., Kaminsky S.P., Levtchuk S.E., .Protsak V.P., Kadygrib A.M., Zvarich S.I., Yoschenko V.I., Tschiersch J. Soil contamination with ^{90}Sr in the near zone of the Chernobyl accident // *Journal of Environment Radioactivity*, v.56, № 3, 2001, pp.285-298. **(Web-site)**
10. Kuriny V.D., Ivanov Yu.A., Kashparov V.A., Loshchilov N.A., Protsak V.P., Yudin E.B., Zhyrba M.A., Parshakov A.E. Particle-associated Chernobyl fall-out in the local and intermediate zones //*Annals of Nuclear Energy*, vol.20, N.6, p.415-420, 1993. **(Web-site)**
11. Salbu B., Krekling T., Oughton D.H., Ostby G., Kashparov V.A., Brand T.L., Day J.P. Hot Particles in Acciden-tal Releases From Chernobyl and Windscale Nuclear Installations //*Analyst*, January 1994, Vol.119(1), p.125-130. **(Web-site)**
12. Kashparov V.A., Ivanov Yu.A., Zvarich S.I., Protsak V.P., Khomutinin Yu.V., Kurepin A.D., Pazukhin E.M. Formation of Hot Particles During the Chernobyl Nuclear Power Plant Accident. //*Nuclear Technology*. – 1996.- v.114, N1.- pp.246-253. **(Web-site)**
13. Kashparov V.A., Oughton D.H., Zvarich S.I., Protsak V.P., Levchuk S.E. Kinetics of fuel particle weathering and ^{90}Sr mobility in the Chernobyl 30-km exclusion zone //*Health Physics*.- 1999.- vol.76, N.3.- pp.251-259. **(Web-site)**
14. Salbu B., Krekling T., Lind D.H., Oughton D.H., Drakopoulas M., Simionovichi A., Snigireva I., Snigirev A., Weitkamp T., Adams F., Janssens K., Kashparov V. High energy X-ray microscopy for characterization of fuel particles // *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, Volumes 467-468, Part 2, 21 July 2001, p.1249-1252. **(Web-site)**
15. Kennedy V. H., Sanchez A. L., Oughton D. H., Rowland A. P. Use of Single and Sequential Chemical Extractants to Assess Radionuclide and Heavy Metal Availability From Soils for Root Uptake //Analyst, 1997,122, P. 89R-100R. (Web-site).
16. Tessier A., Campbell P.G.C., Bisson M. Sequential Extraction Procedure for the Speciation of

Particulate Trace Metals //Anal. Chem., 51 (1979), p. 844-851(Web-site).

17. Rauret G. Extraction procedures for the determination of heavy metals in contaminated soil and sediment //Talanta, 46 (1998), p. 449–455(Web-site).
18. Kashparov V.A., Ahamdach N., Zvarich S.I., Yoschenko V.I., Maloshtan I.N., Dewiere L. Kinetics of dissolution of Chernobyl fuel particles in soil in natural conditions. //*Journal of Environmental Radioactivity*, v.72, Issue 3, 2004, p.335-353. **(Web-site)**

Practical information

Host Institution: Ukrainian Institute of Agricultural Radiology (UIAR) Websites: www.uiar.org.ua of the National University of Life and Environmental Sciences of Ukraine (NUBiP of Ukraine), Website: http://nubip.edu.ua/en/

Ukrainian Visa: Participants from European countries, USA, Canada, Japan and CIS countries do not need a visa to enter the Ukraine. Should you require an additional invitation letter for visa application purposes, please contact the EU COMET course Coordinators (see above).

Security and Travel Advisory: It is very important that you do not take a taxi proposed to you by people in the airport or at the railway station. You can make arrangements the necessary arrangements before your arrival (http://kbp.aero/en/transport/sky-taxi/) or call the taxi to wait for you near the airport terminal or railway station where you are arriving. Furthermore, it is advisable to in advance for the amount you will have to pay.

Should you require any assistance with arranging a taxi, please provide us with the date, time and number of flight you arrive, and the hotel you have booked.

Should you encounter any problems please contact the EU COMET course Coordinators (see above).

Transportation airport (train station) – hotel / meeting venue

Meeting participants will need to make their own way from the airport (or from the train station for those who arrive by train) to the meeting venue/hotel and back. The distances from the meeting venue/ recommended hotels are as follows:

- Boryspil International Airport 40–50 km;
- Zhulyany (Kyiv) Airport 10–15 km;
- Kiev Passajirskij Railway Station 5–15 km.

From Boryspil International Airport to the city:

Shuttle bus – metro (shuttle bus ticket price is UAH 50 (~USD 3); goes every 20 minutes; the schedule can be found on the airport website http://kbp.aero/en/transport/sky-bus/). Take the shuttle bus to the subway (metro) station Kharkivska on the green line (see attached Metro Map).

The price for a single journey on the subway is UAH 4 (~USD 0.25). Tokens for travel can be purchased at any metro station.

The regular price for taxi from the railway station would be around UAH 100–200 (~USD 5-10).

By car / taxi: Regular price for taxi from Boryspil Airport (http://kbp.aero/en/transport/sky-taxi/) is around UAH 300–500 (~USD 25)

How to get to the main building of NUBiP of Ukraine:

During the meeting arrangements will be made to transport of participants from the subway (metro) station “Holosiivs`ka” (Hotel “Mir” and “Park Hotel Golosievo” are located near this station) to the main building of NUBiP of Ukraine and back.

Alternatively, the participants can reach the main building by walking:

10 minute walk from the subway stations “Holosiivs`ka” or “Vystavkovyi Centre”. Time to the city centre by metro is 10 minutes.

By bus/trolley bus (ticket price UAH 4–5):

From subway station “Lybidska”:

Trolley bus № 2, 4, 11, 12 till the trolley bus stop “Hotel Holosiivskyi” or
Bus № 212 till the bus stop (on demand) “Korpus № 3”

From subway station “Vystavkovyi Centre”:

Bus № 212 (direction city centre) till the bus stop (on demand) “Korpus № 3”
Trolley bus № 2, 4, 11, 12 till the trolley bus stop “Hotel Holosiivskyi”

Emergency telephone numbers/addresses:

UN House Reception: +380 (44) 253-9363
First aid / ambulance: 103
Police: 102
Medical Clinic BORYS: +380 (44) 238-0000

The national currency of Ukraine is Hryvnia (UAH): Approximate Exchange rates: USD 1 = ~ UAH 23 / EUR 1 = ~ UAH 26 / 1 Russian Ruble = ~ UAH 0.33

Meals: The meeting organizers/hosts will arrange for coffee breaks for participants during the meeting.

Hotels in close vicinity of meeting venue

Participants are required to make their own hotel reservations and any costs incurred in relation thereto are the participant’s sole responsibility. Participants are welcome to choose hotels other than those suggested below, depending on their preferences. Please contact the Meeting Coordinators should you require any additional advice or assistance in choosing a hotel and making your reservations.

ANNEX 2

We hereby certify that

NAME

attended in a training course:

"FIELDCOURSE ON CHERNOBYL FALLOUT IN THE ENVIRONMENT"

at

Ukrainian Institute of Agricultural Radiology (UIAR),
National University of Life and Environmental Sciences of Ukraine
(NUBiP of Ukraine)

in cooperation with

Centre for Environmental Radioactivity (CERAD), Norwegian University of Life Sciences (NMBU)

funded by

EU project: Coordination and implementation of a pan-European instrument for radioecology, COMET
with support from the SiU project

Course content

Lectures	Field and laboratory exercises
The Chernobyl accident	Water sampling
Contamination of the 30 km ChEZ	Water fractionation
Radionuclides speciation, mobility and bioavailability and influence on its environmental behavior	Fish sampling and dissecting Biota sampling
Biological uptake, accumulation, dose estimates and biological responses	Soil sampling and sample preparation
Relevance of hot particles, speciation and characterization of particles	Particle hunting in soil and sediments
The use of sequential extractions to estimate mobility	Sequential extractions
Ecosystem transfer to wildlife	Radiochemistry/separation
Sampling of soils, plants/biota and animal products	Measurements of radionuclides
Impact and risk estimates – overall uncertainties	
The migration of radionuclides in the unsaturated zone and with groundwater	

Course leaders:

Valeriy Kashparov Brit Salbu Lindis Skipperud Sviatoslav Levchuk

ANNEX 3

FEEDBACK QUESTIONNAIRE

For each question below, please circle the answer which most accurately reflects your view.

Content

1. How clear were the objectives of the course?	Unclear 1 2 3 4 5 Very clear
2. How well structured was the course? *(Was the introduction clear, did it progress logically)*	Poorly 1 2 3 4 5 Well
3. How relevant was the course content?	Irrelevant 1 2 3 4 5 Relevant
4. How did you find the amount of material covered?	Too much 1 2 3 4 5 To little
5. How difficult did you find the material covered?	Difficult 1 2 3 4 5 E asy
6. How interesting did you find the material covered?	Not interesting 1 2 3 4 5 Interesting

Practical

7. How did you find the practical exercises?	Not interesting 1 2 3 4 5 Interesting
8. Did the exercises help you understand the material presented in the course?	No 1 2 3 4 5 Yes
9. Were you given sufficient guidance to enable you to carry out the exercises?	No 1 2 3 4 5 Yes
10. Was the balance between presentations and practical exercises correct?	No 1 2 3 4 5 Yes

Facilities

11. How suitable were the field exercise areas?	Not suitable 1 2 3 4 5 Suitable
12. How suitable were the laboratory facilities?	Not suitable 1 2 3 4 5 Suitable
13. How suitable was the lecture room?	Not suitable 1 2 3 4 5 Suitable

14. Were meals provided acceptable?	No 1 2 3 4 5 Yes

Summary

15. Please name up to three:	
best things on the course: I. II. III.	things that could be improved (and how): I. II. III.

16. Did the course fulfil your expectations? *If not, please state why below*	No 1 2 3 4 5 Yes

17 . Should the course be held on regular basis?	No Yes

If you would like to make any additional comments, please use the space below. Leave your name if you require any feedback

Thank you

Chernobyl course Feedback Questionnaire

ANNEX 4

FEEDBACK QUESTIONNAIRE

COMET fieldcourse in Chernobyl

Number of answers: 20

		Sum	Avg
Content			
1. How clear were the objectives of the course?	1 - 5	**84**	**4,2**
2. How well structured was the course?	1 - 5	**83**	**4,15**
3. How relevant was the course content?	1 - 5	**89**	**4,45**
4. How did you find the amount of material covered?	1 - 5	**58**	**2,9**
5. How difficult did you find the material covered?	1 - 5	**65**	**3,25**
6. How interesting did you find the material covered?	1 - 5	**88**	**4,4**
Practical			
7. How did you find the practical exercises?	1 - 5	**81**	**4,05**
8. Did the exercises help you understand the material presented in the course?	1 - 5	**82**	**4,1**
9. Were you given sufficient guidance to enable you to carry out the exercises?	1 - 5	**82**	**4,1**
10. Was the balance between presentations and practical exercises correct?	1 - 5	**82**	**4,1**
Facilities			
11. How suitable were the field exercise areas?	1 - 5	**88**	**4,4**
12. How suitable were the laboratory facilities?	1 - 5	**87**	**4,35**
13. How suitable was the lecture room?	1 - 5	**67**	**3,35**
14. Were meals provided acceptable?	1 - 5	**78**	**3,9**
Summary			
16. Did the course fulfil your expectations? If not, please state why below	1 2 3 4 5	**89**	**4,45**
17. Should the course be held on regular basis?	No = 1 Yes = 5	**100**	**5**

ANNEX 5

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