Appendix 1:

Training Reports in the African Region:

Training Report

UN Environment Capacity Building for POPs Analysis

For Ghanaian Laboratory Personnel

at the EPA, Accra, Ghana

19 April – 27 April 2018

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Summary

The training of theory and practice of POPs analysis was very helpful for both the laboratory staff of the Environmental Protection Agency (EPA, 8 staff members) stationed in Accra and the visiting laboratory staff from the Water Research Institute (CSIR, 2 staff members) and from the Ghana Atomic Energy Commission (GAEC, 6 staff members), both also stationed in Accra. Theoretical aspects of the analysis of POPs served as an introduction to the activities that took place in the practical training that followed. Environmental samples, including a PUF, fish homogenate and a sediment sample were Soxhlet-extracted, cleaned-up and fractionated. Due to power failures GC-MS analyses could unfortunately not be performed but all calculations were done with the use of a standard set of data.

Introduction

The Ghanaian EPA in Accra is responsible for Stockholm POPs measurements in the UN Environment Global Monitoring Programme. They invited both other laboratories (CSIR and GAEC) to participate in this training because they want to join forces to create a stronger base for measuring pesticides in Ghana. This training program was a refresher course in PCB and OCP analysis for staff that had previously been trained, and presented material for the first time to new staff (see Annex 1 for participants list). The training was intended to assist the laboratories in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 19 and 27 April 2018. The first two days were used for the theoretical training, consisting of lectures given by Dr. Sicco Brandsma. Martin van Velzen also participated in the lecture, thus creating a lively discussion with the participants.

The following topics were covered: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis and QA/QC. The context of industrial chemical pollution and the regulations in place needed to address them were sketched, with several examples of the sources, exposure pathways, persistence, bioaccumulation, and toxicity of industrial chemicals, with special emphasis on Stockholm POPs and new POPs such as chlorinated paraffins. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps and following that analysis by GC were explained for the matrices of interest. A presentation was given on QA/QC of laboratory analysis reviewing the principles of QA/QC, QA/QC tools and practice using examples relevant to POPs analysis. Sampling QA/QC, study design guidelines and proficiency testing and interlaboratory studies were also handled during the lecture.

The course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

Also, a presentation was given by Ms. Saada Mohammed who is employed at CSIR and currently doing a PhD research project in cooperation with the Department of Environment & Health at the Vrije Universiteit in Amsterdam. She started a preliminary test to use silicon wristbands as passive sampler. During the course of this training she asked everybody to wear a wristband (total 7 days) and place another wristband outside the house where they live. She also asked all volunteers to fill in a questionnaire. In total around 12 people participated.

The following days, until 27 April consisted of hands-on training in the laboratory in which the staff was trained in extraction and clean-up of test materials with a focus on air and biota samples, and analysis by GC-MS. This part of the training was given by VU Senior Technician Mr. Martin van Velzen. Printed manuals with procedure descriptions were given for use by the laboratory staff (Annex 2).

The hands-on training consisted of showing all steps necessary for the analysis of POPs in environmental samples. This was done by taking three types of sample matrices: PUFs (air sample), fish (tilapia) and a sediment sample. All samples were extracted and cleaned by the methods described in the training manual (see Annex 2). In short, the samples were Soxhlet extracted (PUF with dichloromethane and fish and sediment with a mixture of hexane:acetone (3:1 v/v) and subsequently cleaned with alumina (deactivated with 8% water) and fractionated with silica (deactivated with 1.5% water). The final extracts were subsequently ready for measuring by GC-MS. Also a calibration curve was prepared by the trainees in order to quantify the samples. Due to unforeseen problems with the electric power supply of the building (during three nights the power went off) we were not able to measure the samples during the training period. However, the samples were taken by the people from CSIR to be analyzed in their laboratory by GC-MS and will return after the measurements to EPA so they can perform the analysis when the problems with the power outages are solved.

During the training emphasis was put on working clean and precise. The last day a lecture was given about the procedures necessary to perform a correct calculation of the results. Because we were not able to analyze the samples prepared during this course a “handmade” dataset to do calculations was provided to the trainees. In a group session we constructed calibration curves in Excel and calculated the “samples” taking all QA/QC aspects in account.

Conclusions and recommendations

In total, 16 certificates of course completion were given at the end of the training. The trainers received positive feedback on the training. The practical part of the training was valuable to the participants who practiced techniques hands-on and learned some skills regarding GC(MS) maintenance. A large amount of practical and theoretical knowledge was transferred to a motivated, young and well-educated group of participants.

The following recommendations can be given.

1. Make permanent set-ups in the laboratory for extraction (Soxhlet) and evaporation instead of taking it apart after use.
2. Try to make the laboratories as much dust-free as possible because that can cause problems with blank values.
3. Start analysing a series of blanks to build up knowledge about the background in the lab (construct a Shewart chart).
4. Take advantage of the knowledge that can be found in literature to develop new methods.

Annex 1. Participants in the laboratory training

Name	Organisation
Dr. Crentsil Kofi Bempah	GAEC
Dr. Harriet Kuranchi-Mensah	GAEC
Mr. Francis Aryeequaye	GAEC
Mrs. Beatrice Puplampu	GAEC
Mrs. Gladys Adjei	GAEC
Mr. Ibrahim Kwame Kwarteng	GAEC
Dr. Kwadwo Ansong Asante	CSIR
Ms. Grace Adoley Dartey	CSIR
Mr. Hope Smith Lomotey	EPA
Mr. Abdalla Abubakakri Siddiq	EPA
Mr. Jeremiah Asumbere	EPA
Mr. John Kofi Nyante	EPA
Mr. Michael Akwei	EPA
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Annex 2. Training Manual for Ghanian laboratory personnel

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis

for the Mauritius Sugarcane Industry Research Institute (MSIRI), Mauritius Cane Industry Authority (MCIA), Reduit, Mauritius

14 - 22 September 2017

Jacob de Boer and Rianne van Dijk

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Summary

The training of theory and practice of POPs analysis was attended by employees of the Mauritius Sugarcane Industry Research Institute (MSIRI), but in addition also from two other institutes at Mauritius. Theoretical aspects of the analysis of POPs served as an introduction to the activities that took place in the practical training that followed. Environmental samples, including a PUF, sediment, human milk, molasses and a dust sample from the lab itself. These samples were Soxhlet-extracted, cleaned-up, fractionated, and POPs were identified and quantified using GC-MS during the training.

Introduction

This UN training was the first one in the MSIRI laboratory but the second one at Mauritius. The first one was given, also by the Vrije Universiteit, in another laboratory at Mauritius, the Government Analyst Division (GAD) of the Ministry of Health and Quality, National Laboratories Complex, several years ago. Staff of that laboratory was also present in this training as well as staff from the National Environmental Laboratory (NEL). Annex 1 shows the participants list of the recent training. The training was intended to assist the laboratories in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 14 and 22 September 2017 in Reduit. The first two days were used for theoretical training, consisting of lectures given by Prof.Dr. Jacob de Boer. Ms. Rianne van Dijk BSc prepared the laboratory for the hands on training starting immediately after the theoretical training.

The following topics were covered: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis, safety issues and QA/QC. An additional lecture was devoted to the reasons of human errors, which are important to understand why QA/QC is so important in the laboratory. This lecture in particular genereted much interest and discussion. New Pops such as chlorinated paraffins were also addressed and the results of thje recent UNEP Interlab study were also shown and discussed. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps and following that analysis by GC were explained for the matrices of interest. Attention was also given to the mirror study and details of this study and selection of samples were discussed. The course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

The following five days consisted of hands-on training in the laboratory in which the participants were trained in extraction and clean-up of test materials with a focus on air, sediment, molasses and human milk. This part of the training was given by VU Technician Ms. Rianne van Dijk BSc.

The hands-on training consisted of showing all steps necessary for the analysis of POPs in environmental samples. This was done by taking four types of matrices: PUFs (air sample), human milk, molasses and sediment and a dust sample for background checks from the laboratory and extract and clean these by the methods described in the training manual (see annex 2). In short, the samples were Soxhlet extracted and subsequently cleaned with Alumina (8% water) and fractionated with Silica (1.5% water). After that the final extracts were measured on a GC-MS. Due to safety regulations on the MSIRI laboratory does not allow to run a 16 hour during Soxhlet overnight, so this was carried out on the day. Water leakage during Soxhlet caused a short circuit and terminated two extraction, which were started again the next day. The fume hoods on the lab did not perform properly, causing uncomfortable smell and headache with many participants.

Emphasis was put on working clean and precise. The molasses and milk samples were liquid-liquid extracted. Risk for cross-contamination of the rotary evaporator were explained. Copper powder was prepared for the Sulphur removal from sediment.

GC-electron impact MS settings were explained and calibration curves were demonstrated.
One group session was organized in how to do the final calculations in Chem Station.
Advice was given on the accelerated solvent extraction (ASE) in the GAD laboratory.

Conclusions and recommendations

At the end of the training certificates of course completion were given to all participants. The trainers received positive feedback on the training.
The following recommendations can be given.

1. Replacement or adjustment of the fume hood(s).
2. Chemical waste bins should be stored inside the fume hoods. The waste bins should also be sealed.

3. Replacement of rotary vapor with Kuderna Danish to prevent blank issues or thoroughly check rotary evaporator between sample series.
4. Replacement of the heating mantle (Soxhlet) bya water bath. This will prevent short circuit risks.
5. Use of a pipette tip box. This will be beneficial for the ease of use and prevents negative effects of dust.
6. Check the exact volume of the pipette/syringe before every use for internal standards. Keep track of the (changes in) volume with the help of an Excel worksheet. The volume always must meet the requirements (predefined acceptable deviation).
7. For personal safety, it is important to wear no slippers or sandals at the lab.
8. Purchase of appropriate (small volume (10-20 mL) and sealable) vials for preparing standard solutions.
9. Be aware that dust will contaminate samples, so a clean workplace is of high importance.
10. Consider to establish a separate room for POP analysis/low contaminated samples. The main laboratory is not suitable for this because of the open windows and ceiling fans. The separate room should not be exposed to open windows/fans and needs to be air-conditioned. A proper fume hood should be installed.
11. Always rinse all glassware before use with the type of solvent that will be used. Also cover the glassware (that can't be sealed) with aluminium foil before/after use.
12. Purchase of powder-free nitrile gloves instead of latex gloves. Nitrile gloves are stronger and provide a better safety. Change the gloves regularly during the day, especially if one spills solvents on the gloves.
13. If possible, consider to connect a PC to the balance. A PC will reduce the risk of mistakes when recording the weight.
14. Consider to place solvents inside a fire-resistant cabinet.
15. Consider to place a towel dispenser close to the sink.

Although the list of recommendations is relatively long, the laboratory made a positive impression on the trainers. The staff is motivated and the director and vice-director were highly motivated and convinced of the importance of the monitoring for the Global Monitoring Program (GMP). An active sampler was also present and the lab is prepared to make that available for work for the GMP. In summary, this laboratory has potential to play an important role in further UN Environment and GMP activities.

Annex 1. Participants in the laboratory training

PARTICIPANT	INSTITUTION
Nirmal Prakash BABEEA	GAD
Ranooka CHUCKOWREE	MSIRI
Mr. Devindranath DINDYAL	NEL
Sareeta CHOYTOO	NEL
Tesha MARDAMOOTOO	MSIRI
Sivapragassen PAKEEROO	GAD
Sheba Jahan Ara ROJUBALLY-CADINOUCHE	NEL
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Annex 2. Training Manual

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis

For Malinese and Senegalese Laboratory Personnel

at the Fondation CERES-Locustox, Dakar, Senegal

29 September – 6 October 2017

Heather Leslie and Martin van Velzen

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20 October 2017

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Summary

The training of theory and practice of POPs analysis was very helpful for both the laboratory personnel of CERES-Locustox (6 staff members) stationed in Dakar and the visiting laboratory personnel (2 staff members) from the Laboratoire de Toxicologie et de Contrôle de Qualité Environnementale, a part of the LABORATOIRE CENTRAL VETERINAIRE in Bamako, Mali. Theoretical aspects of the analysis of POPs served as an introduction to the activities that took place in the practical training that followed. Environmental samples, including a PUF, fish homogenate and blanks were Soxhlet-extracted, cleaned-up, fractionated, and POPs were identified and quantified using GC-µECD during the training.

Introduction

CERES-Locustox stationed in Dakar and the visiting laboratory personnel from the Laboratoire de Toxicologie et de Contrôle de Qualité Environnementale are responsible for Stockholm POPs measurements in the UN Environment Global Monitoring Programme. Both laboratories had received training from the Vrije Universiteit in the framework of an earlier UN Environment Capacity Building Project. Some personnel now working at these laboratories were not present in their current functions during the former training period. This training programme was a refresher course in PCB and OCP analysis for personnel which had been previously trained, and presented material for the first time to new staff (see Annex 1 for participants list). The training is intended to assist the laboratories in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 29 September and 6 October 2017. The first day was used for theoretical training, consisting of lectures given by Dr. Heather Leslie. Martin van Velzen participated in the lectures and worked getting the lab prepared for training starting the next business day.

The following topics were covered: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis and QA/QC. The context of industrial chemical pollution and the regulations in place needed to address them were sketched, with several examples of the sources, exposure pathways, persistence, bioaccumulation, and toxicity of industrial chemicals, with special emphasis on Stockholm POPs and potential POP candidates such as chlorinated paraffins. In order to identify and understand possible differences between the analytical methods for POPs used in the participating countries and the reference laboratories, and additionally to generate data on levels and geographical trends of POPs per continent, national samples are to be collected in all participating countries including Senegal and Mali. A presentation was given describing the procedures, sample matrix selection, how to avoid contamination during sample preparation, and logistics for transport of samples from Africa to Europe. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps and following that analysis by GC were explained for the matrices of interest. A presentation was given on QAQC of laboratory analysis reviewing the principles of QAQC, QAQC tools and practice using examples relevant to POPs analysis. Sampling QAQC, study design guidelines and proficiency testing and interlaboratory studies were also handled during the lecture.

The course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group. Other aspects were discussed including the selection of and logistics of mirror samples (samples to be analyzed in Senegal, Mali and in Amsterdam for comparison). Printed manuals with procedure descriptions were given for use by the laboratory staff (Annex 2), as well as DVDs dedicated to the analytical research conducted and coordinated at the Vrije Universiteit Amsterdam.

The following days, until 6 October consisted of hands-on training in the laboratory in which the staff was trained in extraction and clean-up of test materials with a focus on air and biota samples, and analysis by GC-µECD. This part of the training was given by VU Senior Technician Mr. Martin van Velzen.

The hands-on training consisted of showing all steps necessary for the analysis of POPs in environmental samples. This was done by taking two types of sample matrices: PUFs (air sample) and fish (biota). For both matrices a blank sample was included. Both types were extracted and cleaned by the methods described in the training manual (see annex 2). In short, the samples were Soxhlet extracted and subsequently cleaned with Alumina (8% water) and fractionated with Silica (1.5% water). After that the final extracts were measured on a GC-µECD.

Emphasis was put on working clean and precise. During the 5 days of hands-on training time was reserved for another two lectures about measuring PCBs and OCPs and Quality Control / Quality Assurance. Also a group session was organized in how to do the final calculations by constructing a calibration curve with Microsoft Excel.

Conclusions and recommendations

In total, 10 certificates of course completion were given at the close of the training. The trainers received positive feedback on the training. The classroom part was well-explained and easy to understand, despite the course being given in the second language of the participants. The practical part of the training was valuable to the participants who practiced techniques hands-on and learned some skills regarding GC maintenance. A large amount of practical and theoretical knowledge was transferred to a motivated, young and well-educated group of participants.

The following recommendations can be given.

1. Make permanent setups in the laboratory for extraction and evaporation instead of taking it apart after use.
2. Try to make the laboratories as much dust-free as possible because that can cause problems with blank values.
3. Start analysing a series of blanks to build up knowledge about the background in the lab (construct a Shewart chart).
4. Take advantage of the knowledge that can be found in literature to develop new methods.


DIRECTION

Annex 1. Participants in the laboratory training

Name	Organisation
Marie Ndao	CERES-Locustox
Ndeye Bineta Camara	CERES-Locustox
Anna Marcelle Fall	CERES-Locustox
Ndeye Yarame Gueye	CERES-Locustox
Anna Ndiaye	CERES-Locustox
Adama Ndiaye	CERES-Locustox
Cedric Fanoli	CERES-Locustox
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Annex 2. Training Manual for Senegal/Mali laboratories

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis

For Tanzanian Laboratory Personnel

at the Government Chemist Laboratory Agency

Dar es Salaam, Tanzania

12 July – 20 July 2018

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Summary

The training of theory and practice of POPs analysis was very helpful for the laboratory personnel of the Government Chemist Laboratory Agency (GCLA) stationed in Dar es Salaam. Theoretical aspects of the analysis of POPs served as an introduction to the activities that took place in the practical training that followed. Environmental samples, including a fish homogenate and honey were Soxhlet-extracted, cleaned-up, fractionated and analysed for PCB/OCB by GC-ECD. In additionan, sediment and water samples were extracted by Solid Phase Extraction (SPE) for PFOS analysis.

Introduction

The GCLA stationed in Dar es Salaam is responsible for Stockholm POPs measurements in the UN Environment Global Monitoring Programme. This training program was a course in both PCB and OCP analysis as well as PFOS analysis for personnel of GCLA (see Annex 1 for participants list). The training was intended to assist the laboratory in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 12 and 20 July 2018. The first two days were used for theoretical training, consisting of lectures given by Dr. Sicco Brandsma. Martin van Velzen participated in the lectures and thus creating a lively discussion with the participants.

The following topics were covered: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean-up, GC analysis and QA/QC. The context of industrial chemical pollution and the regulations in place needed to address them were sketched, with several examples of the

sources, exposure pathways, persistence, bioaccumulation, and toxicity of industrial chemicals, with special emphasis on Stockholm POPs and potential POP candidates such as chlorinated paraffins. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean-up and fractionation steps and following that analysis by GC were explained for the matrices of interest. A presentation was given on QA/QC of laboratory analysis reviewing the principles of QA/QC, QA/QC tools and practice using examples relevant to POPs analysis. Sampling QA/QC, study design guidelines and proficiency testing and interlaboratory studies were also handled during the lecture.

The course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

The following days, until July 20th, consisted of hands-on training in the laboratory in which the staff was trained in extraction and clean-up of test materials with a focus on biota samples, and analysis by GC-ECD. Besides the PCB/OCB analysis also a training was given for the extraction/cleanup and measurement of PFOS in water and sediments. This part of the training was given by VU Senior Technician Mr. Martin van Velzen. Printed manuals with procedure descriptions were given for use by the laboratory staff (Annex 2).

The hands-on training consisted of demonstrating all steps necessary for the analysis of POPs in environmental samples. This was done by taking two types of sample matrices: honey and fish (Red Snapper), and a blank sample. All samples were extracted and cleaned by the methods described in the training manual (Annex 2). In short, the samples were Soxhlet extracted and subsequently cleaned with alumina (deactivated with 8% water) and fractionated with Silica (deactivated with 1.5% water). After that the final extracts were ready for measuring on GC-ECD. A calibration curve of OCPs was prepared by the trainees in order to quantify the samples. Due to unforeseen connection problems with the autoinjector and software of the GC-ECD, we were not able to measure the samples during the training period. However, the samples were stored to analyze on a later date. For the PFOS analysis we performed two types of extraction/cleanup methods: for water and sediment samples according to the schemes in the training manual. Since this is the first time perfluorinated compounds would be analyzed in this lab, we used three blank samples and three drinking water samples. For the same reason, also for the sediments we used three blanks and three sediment samples. The trainees also prepared PFOS stock solutions and a calibration curve for quantification of the samples. Unfortunately, in the week before we arrived the LC-Orbitrap that was going to be used for measuring the PFOS samples was not working properly. We had contact with a service engineer by remote desktop connection but he couldn't solve the problem. We stored the calibration curve and the final sample extracts in the fridge, so those could be measured when the LC-Orbitrap would be repaired.

During the training emphasis was put on working clean and precise. The last day a lecture was given about the procedures necessary to perform a correct calculation of the results. Because we were not able to analyze the samples prepared during this course a “handmade” dataset to do calculations was provided to the trainees. In a group session we constructed calibration curves in Excel and calculated the “samples” taking all QA/QC aspects in account.

Conclusions and recommendations

In total, 8 certificates of course completion were given at the closure of the training. The trainers received positive feedback on the training. The practical part of the training was valuable to the participants who practiced techniques hands-on and learned some skills regarding GC and LC maintenance. A large amount of practical and theoretical knowledge was transferred to a motivated, young and well-educated group of participants.

The following recommendations can be given.

1. Make permanent setups in the laboratory for extraction (Soxhlet) and evaporation instead of taking it apart after use.
2. Try to make the laboratories as much dust-free as possible because dust can cause problems with blank values.
3. Start analysing a series of blanks to build up knowledge about the background in the lab (construct a Shewart chart).
4. Take advantage of the knowledge that can be found in literature to develop new methods.

Annex 1. Participants in the laboratory training

Name	Organisation
Emmanuel Gwae	GCLA
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Kagera Ng'weshimi	GCLA
Francis Kway	GCLA
Elias Mulima	GCLA
Gabriel Gabriel	GCLA
Boniphace Majinyali	GCLA
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Annex 2. Training Manual for Tanzanian laboratory personnel

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis

for the University of Zambia (UNZA), Department of Chemistry, Lusaka, Zambia

23-30 April 2018

Jacob de Boer and Jacco Koekkoek

Dept. of Environment and Health, Faculty of Science, Vrije Universiteit, Amsterdam, the Netherlands

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Summary

The training of theory and practice of POPs analysis was attended by employees of the University of Zambia (UNZA), Dept. of Chemistry, in Lusaka. The host was Dr. James Nyirenda (PhD), Head of the Department. Theoretical aspects of the analysis of POPs served as an introduction to the activities that took place in the practical training that followed. An enriched passive air filter (PUF) and a fish sample, from the interlab study UNEP 2012 were analyzed during the hands-on training. These samples were extracted, cleaned-up, fractionated, and POPs were identified and quantified using GC-MS during the training.

Introduction

This UN training was the second one in this laboratory of the University of Zambia. The first one was given several years ago, also by the Vrije Universiteit. Annex 1 shows the participants list of the recent training. The training was intended to assist the laboratory in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 25 and 30 April 2017 in Lusaka. The first two days were used for theoretical training, consisting of lectures given by Prof. Dr. Jacob de Boer.

The following topics were covered during the theoretical sessions: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis, safety issues and QA/QC. An additional lecture was devoted to the reasons of human errors, which are important to understand why QA/QC is so important in the laboratory. New POPs were also addressed and the results of the recent UNEP Interlab study were also shown and discussed. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps and following that analysis by GC were explained for the matrices of interest. Attention was also given to the mirror study and details of this study and selection of samples were discussed.

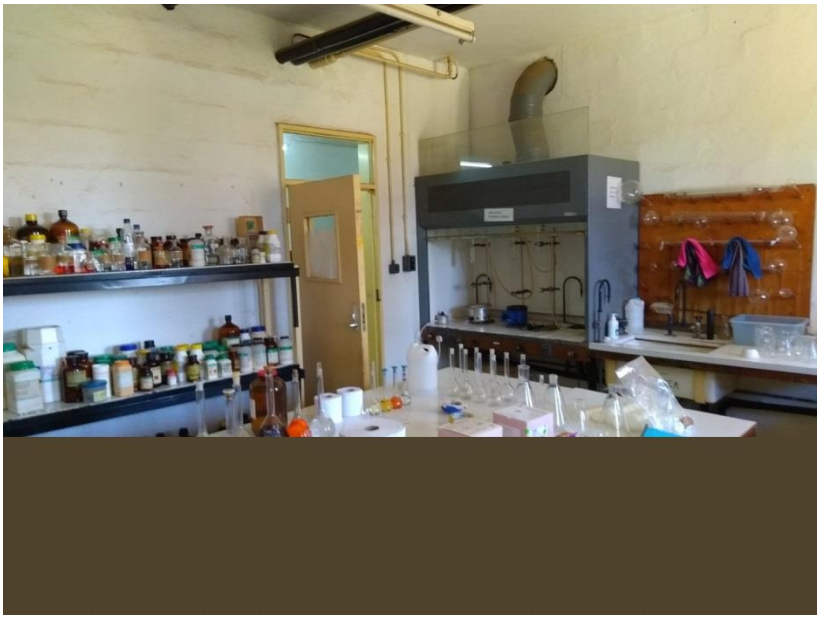
During the course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

The following five days consisted of hands-on training in the laboratory. Mr. Jacco Koekkoek (BSc) prepared the laboratory for the hands on training starting immediately after the theoretical training. Prior to the training an inventory was made of required consumables. The procurement included a gas chromatography (GC) column, spare parts for the GC, chemicals and analytical standards.

The laboratory is based in the building of the School of Natural Sciences. The laboratory room for sample extraction and clean-up is small, but it is feasible to work there with small numbers of samples. Some rooms and equipment are shared with others scientists. As on many locations, also here dust was a major problem and the old fashioned design of the building doesn't help to prevent dust settlement in the rooms. At the time of the training it we tried hard to keep it on an acceptable level. Soxhlet glassware and a rotary evaporator were available and after a thorough cleaning used for the extraction and evaporation of extracts and eluates, these could be used the next day.

The GC-MS (6890N, 5975MSD, Agilent) is located in a separate air conditioned room which is not equipped with an exhaust for the discharge of the gasses from the pump and the hot air from the blow out of the GC oven.

The MS pump was not functioning well at the moment of the training. The pomp was generating an uncomfortable smell and the color of the oil inside the pump was unusual. Unfortunately, there was no replacement oil available. It is not clear what has happened with this pump.



The trained method is comprehensively described in a manual what was given to the people of UNZA in both a hard and digital copy.

During the training two samples and a blank were analyzed. The two samples were:

- Enriched passive air filter (PUF)
- Fish sample, interlab study UNEP 2012

The fish sample was manually homogenized prior to the sample intake and dried with sodium sulphate. The passive air filter was cut into small pieces.
Unfortunately, at the start of the training the ordered internal standard solutions, labelled ^{13}C PCBs and ^{13}C OCPs, had not arrived yet. Instead a mixture of PCB103 and PCB198, 100 ng/mL each, provided by Vrije Universiteit, was used.
Due to the unreliable availability of tap water for cooling, the extraction could only be carried out during the day. The extraction time was limited to ten hours due to unavailability of water on the second day.
The obtained raw extracts were cleaned by applying the standard method of deactivated (8%) alumina and n-pentane. The nonpolar OCPs were separated from the polar ones by applying deactivated silica gel (1.8%), n-hexane and a mixture of n-hexane and diethyl-ether. The glass columns for the clean-up and fractionation of the extracts were provided by the Vrije Universiteit.
Later on, the decision was made to combine the two fractions of the last clean-up step. This was based on the availability of mass selective detection and to keep the data processing less complicated.

The sample extracts were ready for measurement on the fourth day of the practical part of the training. Unfortunately, there was not enough time to train the additional clean-up method of acidified silica gel.

Measurements

Prior to the training the provided column Restek Rxi-5ms column (60m * 0.25mm * 0.25µm) was installed in the GC. The liner, septum were replaced. The standard solutions were not available at the start of the training. As alternative, a calibration range was made of the solutions ES-5399 (CIL) and QORC01A (QUASIMEME) in the range of 15 – 350 ng/mL. Both solutions were provided by the Vrije Universiteit. The sensitivity of the system wasn't good. It seemed to lack approximately a factor ten of sensitivity. The peak shapes were, however, good. On the fourth day, the extracts were measured.

Results

Despite the lack of sensitivity of the GC-MS system, the results of the analysis were relatively good and promising for the future. The recoveries of the internal standards were around 100%. Despite the precautionary measures some POPs were detected in the blank, e.g. DDT, PCBs and HCH. The recoveries of the POPs in the enriched PUF were in general good, 60% (Endrin) to 120% (PCB101).

The results of the fish sample were below average; recovery levels between 150 – 400% in comparison with the assigned values. The main reason for the deviations is most likely the GC-MS system. Due to the lack of sensitivity the calibration is not functioning properly and especially so for the OCPs. Also, the extra cleanup with acidified silica might have improved the analysis.

Conclusions and recommendations

At the end of the training certificates of course completion were given to all participants. The trainers received positive feedback on the training.

The following recommendations can be given.

1. An enhanced maintenance of the GC-MS is recommendable, focusing on the vacuum pump and the mass selective detector.
2. For the coming period it is important to spend time on the development of a basic quality system by
    - Regularly analyzing on blanks and control samples
    - Archive the results in a Shewart control chart
    - Check the correctness of the balance by weighing a mass standard (before use)
    - Check the correctness of the pipette by weighing the dispense with water (before use)
    - Determine the mass of every addition by the preparation of all standards
3. Clean the lab on a regular basis and every day when samples are being prepared. Be aware that dust will contaminate samples, so a clean workplace is of high importance.

The technicians were enthusiastic and made a positive impression on the trainers. The staff is motivated and convinced of the importance of the monitoring for the Global Monitoring Program (GMP). However, this laboratory had done very little since the previous training. If this would happen again after this training, it would not be worth to invest furthermore. The

laboratory and UN Environment should discuss this situation and explore which possibilities are available for the necessary improvements, according to the aforementioned recommendations.

Annex 1. Participants in the laboratory training

Name	Position
Mr. Chipo Syabbamba	Chief Scientist
Mr. Chilufya Lengwe	Scientist
Mr. Osward Musonda	Scientist
Mr. Edward Mweendo	Assistant Technician
Mr. Golden Zyambo	Chief Scientist
Ms. Annie Phiri	Assistant
Mr. Emmanuel C. Mulenga	Inspector
Mr. Harold Kalaba	Inspector
Mr. Derrick Mwanakatwe	Assistant
Mr. Bwalya Katati	Scientist
Mr. Robert Salati	Senior Agriculture Officer

Contact person for Mauritius:
James Nyirenda (PhD)
Head Department of Chemistry
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Annex 2. Training Manual

The manual is attached as a separate file

RESEARCH CENTRE
FOR TOXIC COMPOUNDS
IN THE ENVIRONMENT (RECETOX)

PROGRESS REPORT

Implementation of the "GEF GMP2 project" by RECETOX in 2017 - part 1

Training in Kenya

PCA/2015/UNEP, DTIE, Chemicals and Waste Branch/RECETOX

Ing. Kateřina Šebková, Ph.D.
RNDr. Roman Prokeš, PhD.
RNDr. Petr Kukučka, Ph.D.
RNDr. Petra Přibylová, Ph.D.
prof. RNDr. Jana Klánová, Ph.D.

Brno, September 2017

Report citation: Šebková, K., Prokeš, R., Kukučka, P. Přibylová, P., Klánová, J.: Progress report on Implementation of the GEF GMP2 project by RECETOX in 2017 Training in Kenya - part 1, Stockholm Convention Regional Centre in the Czech Republic, Research Centre for Toxic Compounds in the Environment (RECETOX), Masaryk University, Brno, Czech Republic, 25 pages, RECETOX report No. 627, September 2017.

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Acknowledgements

The Stockholm Convention Regional Centre hosted at RECETOX would also like to acknowledge the support of the RECETOX research infrastructure in carrying out the work in 2017, in particular by the Trace Analytical Laboratories providing experts and trainers for sampling, sample treatment and laboratory analysis hands-ons. The RECETOX research infrastructure is supported by the project LM2015051 financed by the Czech Ministry of Education, Youth and Sports.

Introduction

This interim report is based on the agreement (PCA) signed between the Chemicals and Waste Branch of the UNEP (hereafter referred to as "UNEP") and Research Centre for Toxic Compounds in the Environment (hereafter referred to as "RECETOX"), serving also as the Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology for the Central and Eastern Europe, to support capacity building activities on POPs monitoring, signed on 1 February 2016 (PCA/2015/UNEP, DTIE, Chemicals and Waste Branch/RECETOX).

The work is undertaken as a part of the implementation of the relevant parts of the UNEP/GEF project Project "GEF GMP2" GF4030-1508/1509/1510. This comprises three regional projects supporting POPs monitoring activities undertaken in nine countries of Pacific Islands (GEF 6978), seven countries of Asia Pacific region (GEF 4894), and 15 countries in Africa (GEF 4886).

Overall objective of the agreement is to support UNEP Chemicals and Waste Branch in implementing three out of four GEF projects granted to UNEP to enhance implementation of the Stockholm Convention by building capacities for POPs monitoring, providing training to laboratories and to supplement sampling materials until end of 2018.

RECETOX activities under the agreement are covering three sets of activities

activities 2.1. (as referenced in the contract) **purchase, preparation and shipment of passive samplers for ambient air POPs sampling** to each partner country in Africa, Pacific Islands, and Asia including sampling media (PUF disks),

2.3. and 3.2 (as referenced in the contract) **capacity building activities - training of laboratory experts in two countries in Africa**,

and activity laboratory analyses of samples collected by active sampling of air in Africa.

This progress report describes the work undertaken by RECETOX in the first half of 2017, from January to end of June 2017 as follows:

- POPs analysis training in/for African labs: POPs analysis training in Kenya.
- Active air sampling in Kenya and Ghana: sampling + preparation for laboratory analyses.

RECETOX also participated in a meeting of the project committee in China in April 2017, during the disclosure of results of the POPs analysis proficiency test undertaken in 2016. The Project Committee comprises representatives of the UNEP Chemicals and Waste Branch and representatives of all expert laboratories involved in the project implementation (CVUA, ITM, MTM, Laboratory in Barcelona, SCRC in Uruguay and SCRC Czech Republic (RECETOX).

Finally, there is also a two-page summary of progress in the project implementation provided in a separate document; the present report is annexed to this summary to provide further details on activities undertaken, in particular the training in Kenya.

POPs analysis training in/for two African labs

In line with the signed agreement and activities 2.3c and 3.2.c and outcomes of the expert online meeting on 26 November 2016, the RECETOX is to train two countries experts - laboratories in Kenya and in Morocco.

Discussions on the dates and availability of the laboratories in Africa made it possible to carry out a training in Kenya between 22-25 May 2017 at the Department of Chemistry, University of Nairobi, Nairobi, Kenya.

Due to a religious period (Ramadan) and schedule of the joint meeting of the Conferences of the Parties to Basel, Rotterdam and Stockholm Convention did not allow to carry out the training in Morocco in the first half of 2017. The schedule was postponed to end of November 2017 and report of the training will thus be provided by end of 2017.

Participants of the training in Nairobi, Kenya with Dr. Roman Prokeš and Petr Kukučka, trainers from RECETOX

Training in Kenya

The training prepared for Kenya was based on the discussions with dr. Vincent Madadi and his colleagues as well as on the information provided in the form/checklist for training needs that is reproduced in Annex 1 to this report.

Agenda of the training prepared in a close cooperation with the University of Nairobi is provided in Annex 2 and the training was scheduled from 22-25 May 2017. It comprised of both lectures, hands on sampling as well as a thorough training in the laboratory including sample clean up, extraction, volume reduction and laboratory analyses. Laboratory analyses also consisted of the maintenance of the instrument, set up of a analytical method, calibration and validation of the method and experimental run-ups of test samples. In addition, a session was also dedicated to the evaluation of results and QA/QC procedures implementation. The greatest emphasis was placed on the introduction and validation of the method to analyze brominated POPs.

Objective of the training was: advance the work to cover also PBDEs, work with GCMS-troubleshooting and operational maintenance, calibration and validation of methods

The Group of participants varied in size a bit - there were 10-15 people from University of Nairobi, mainly from Department of Chemistry.

The biggest challenge encountered were frequent power outages every day that resulted in delay of extraction steps and validation of chromatographic method, as the analytical equipment had to be restarted several times. This situation is not helping the stability of the chromatographic system and to the reproducibility of results.

RECETOX provided the following consumables for the training:

Agilent consumables:

-septa: 5190-3158 Agilent septa, Advanced Green, non-stick, 11 mm, 400/pk

-o-ring S/SL: 5190-2269 Agilent inlet liner O-ring, non-stick fluorocarbon, certified, 100/pk

-ferrules, short, 0.4 mm id, graphite/vespel (for S/SL inlet): 5181-3323

Ferrule, 0.4 mm id, 15% graphite/85%Vespel, 0.1 to 0.25 mm column, 100/pk

-ferrules, long, 0.4 mm id, graphite/vespel (for MS interface):

5062-3508 Ferrule, 0.4 mm id, preconditioned for MSD interface, 15%

graphite/ -85% Vespel, 0.25 mm column, long, recommended Agilent GC/MS

transfer lines with MS interface column nut, p/n 05988-20066, 10/pk

-gold plated seal: 5190-2209 Agilent GC inlet seal, gold plated, with

washer, 10/pk

-Syringe 10 uL for 7673/7683/7693 autosampler: 9301-0725 ALS Syringe, 10µl straight, fixed needle, 23/42/cone, 6/pk

-filament EI: G7005-60061 Filament, high temperature, EI ion source

a multiplier for Agilent MS systems.

Restek consumables:

-liners, sky, double cyclo for S/SL inlet Agilent: 23310.5 Topaz 4.0 mm

ID Cyclo Double Taper Inlet Liner

columns for GC:

pesticides and PCBs : SGE HT8 column 60mx0,25mmx0,25um.

For PBDEs (including BDE 209): Restek RTX-1614 column 15mx0,25mmx0,1um.

Standard solutions for calibration of analytical method on GC-MS: OCP, PCB, PBDEs (and PAHs)

and vials with inserts or high recovery conic vials.

These consumables above were shipped to Kenya prior the training via DHL, but it was very difficult to clear some boxes from the customs.

In addition, a list of further items to be purchased for Kenya for further use during the GMP2 project was discussed and prepared in the margins of the training and Kenya was to send it to coordinator of the procurement in the GMP-2 project (Örebro, Heidi Fiedler).

On sampling - we covered all core topics - air both passive and active sampling including sampler maintenance, storage and troubleshooting. Moreover, we sampled water in Nairobi and surroundings as well as ran a test sample by active sampler.

In addition, standard operating procedures for sampling of air by passive samplers and active sampler were provided as well as training videos for sampling air and water were screened and provided to training participants on USB disks for later reference and use.

Finally, both the trainers and participants of the training were asked to fill in relevant questionnaires on the training components, approach and performance. The questionnaires are reproduced in Annex 3 - first by participants (3a) and second by RECETOX trainers (3b).

There were eight participants receiving the training in its full scope and some other members of the Department of Chemistry who participated in the lectures or demonstration part of the training only. A list of participants is provided in Annex 4.

The participants comprised from lecturers to technicians and laboratory staff that is also responsible for working/implementing GMP2 in Kenya. Overall, understanding of the national coordinator is excellent (it has to be, as he is coordinator of the POPs monitoring in Africa and a very experienced chemist in the field of POP sampling and analyses.

There were less women then men (3 vs 6 of those who participated 95% of time) and the participation in lectures were predominantly male.

Evaluation of the Training

Traditionally, RECETOX asks both the participants and trainers to evaluate the course of the week. These opinions are provided in Annex 3.

Questionnaire for Participants contains a set of ten questions that are collecting information on the field of expertise of the participant and main work content as well as their involvement in implementation of the Stockholm Convention nationally. In addition, there were questions on the overall training set-up, quality of the trainers as well as substantive matters. Filled questionnaires are reproduced without changes Annex 3a.

Questionnaire for Trainers strives to assess the level of knowledge before the training and afterwards and it is evaluated by trainers (anyone involved in contact/interaction with Macedonian experts during the training). The questionnaire is divided into three sections (Lecture Part, Sampling or sample treatment (clean-up/extraction) + relevant hands on and Chemical analysis and data management + relevant hands on) and each lecturer filled all sections. Filled questionnaires are provided in Annex 3b.

Active air sampling in Kenya and Ghana - preparation for laboratory analyses

This part of the report contains a brief summary of work undertaken in 2017 regarding sampling by active samplers and preparation for laboratory analyses. Active air sampling is undertaken by low volume samplers Leckel LV6. There are two sites, one is in Chiromo Campus in Nairobi and the other is located in the premises of the Ghana Atomic Energy Commission, National Nuclear Research Institute operated by the Nuclear Chemistry and Environmental Research Center at East Legon in Accra, Ghana.

Operating active sampler - Kenya (photo by RECETOX)

The samples are taken regularly in line with the standard operating procedure / sampler handling manual that is part of the SOP submitted for comments to other expert laboratories in December 2016. So far no comments were received to the SOP contents.

The GMP2 project requires receiving 5 samples from each sampling site per year and analysis of all Stockholm Convention POPs will be undertaken. The design of the sampling head allows to take sample allowing analysis of both OCPs and brominated POPs and dioxins in one sample (however, the pretreatment steps do need to follow a particular sequence.

Sampling is ongoing at both sites, however the site in Kenya started with a delay, due to malfunctioning equipment that needed to be shipped back to Europe for maintenance. The sampler was re-installed and calibrated during the training in May and is working from that moment on. Samples from both sites for first half of the year would be shipped to RECETOX together with samples collected for a feasibility study on photovoltaic active sampler by end of summer 2017, second half of the year would be shipped together with samples collected for MONET program in spring 2018. Analyses of samples would take place subsequently.

Conclusions

This report provided description of activities undertaken by RECETOX in implementation of the agreement with UNEP Chemicals and Waste Branch.

All activities undertaken by RECETOX were implemented in accordance with the Implementation Plan and agreed GEF-GMP2 project timeline (as endorsed by steering committee meeting in Ghana in July 2016).

As provided above, implementation of the training activity is ongoing. The first training, however is successfully completed.

It took place in Kenya 22-26 May 2017, University of Nairobi, Department of Chemistry. RECETOX delivered some spare parts/consumables for gas chromatography analyses, sample clean-up and spare chromatographic columns.

We also brought standard operating procedures for active sampling/sampler handling, passive sampling of air and water (including demonstration videos in English covering sample preparation, deployment and use for later reference of participants), provided training in collecting soil samples as well as trained participants in laboratory work - air and water samples clean up by using Soxhlet extraction as well as SPE (solid phase extraction for water samples).

Significant portion of work was devoted to the work with GC-MS, its calibration, run of standard solutions and validation of a method for PBDE analysis. In addition, part of work was devoted to improvement in QA/QC management as well as in work with generated information and data management.

The result of the training is nine trained experts. They strengthened their personal knowledge and capacity in POPs sampling, pre-treatment, analyses, and improved their use of internal standards and filing and filing/working with protocols/sample records as well as with proper data management. The result is 9 trained experts despite the difficulties faced such as difficulty to clear material necessary for the training as well as frequent power outages on site so the analytical part was especially challenging (due to non-stability of the analytical system).

Finally, as shown above, activity 2.4 c (analyses) is still to take place. The sampling is ongoing by using Leckel LV6 samplers located in Nairobi, Kenya and GAEC, Legon - Accra, Ghana from early 2017. A first batch of samples reached RECETOX in end June 2017 from Ghana. Analyses will be performed once all samples collected in 2017 will be at RECETOX. This is expected to take place by end of 2017 or early 2018.

Annex 1 Check-list for training demand in Kenya

This annex contains a filled document provided by Kenya that defines its needs for the training.

Check List[1]

Prepared by: [Prof. Shem O. Wandiga, Department of Chemistry, University of Nairobi]

Date the form was filled out: 30th July 2016

1. General

Name of Laboratory:	POPs and Pesticides Research Laboratory, Department of Chemistry, University of Nairobi.
Address of Laboratory:	Department of Chemistry, School of Physical Sciences, College of Biological and Physical Sciences, University of Nairobi, P. O. Box 30197-00100, Nairobi, Kenya.
E-mail:	wandigas@uonbi.ac.ke
Phone:	+254 020 4446138
WebPage:	http://chemistry.uonbi.ac.ke/
Contact person:	Prof. Shem O. Wandiga

2. Technical part - Existing capacity to analyze POPs

2.1. Description of the Laboratory:

2.1.1. Name and address of the institution hosting the Laboratory

Department of Chemistry, School of Physical Sciences, College of Biological and Physical Sciences, University of Nairobi, P. O. Box 30197-00100, Nairobi, Kenya.

[1] This check list has been prepared by the expert back-up laboratories as a self-assessment of laboratories participating in the UNEP/GEF projects to support the implementation of the Global Monitoring Plan. The information provided will assist to develop the programme for the hands-on training in the developing country laboratory. It is intended to obtain a better idea of the actual working conditions of the POPs laboratories and what would be necessary to improve their contribution to a sustainable POPs monitoring. The information therein adds to the data already contained in the UNEP POPs Laboratory Databank.

2.1.2. Main activity of the Laboratory

Research and Teaching Laboratory

2.1.3. Economic resources/main incomes of the laboratory

1) Research projects
2) University of Nairobi
3) Consultancy

2.1.4. Present role in relation to the Stockholm Convention on POPs, other MEAs or regional agreement

The POPs and pesticide laboratory at the Department of Chemistry has a long history of training postgraduate students in sampling, sample preparation and analysis of Pesticides in Kenyan Environment. It is the designated laboratory by the ministry of environment for POPs analysis and capacity building activities.

Members of the Department of Chemistry University of Nairobi, who are also members of the POPs & Pesticide research laboratory, have been in charge coordinating the implementation of the Global Monitoring Plan since 2008. In the process they have also spearheaded the drafting of the first Africa Regional POPs monitoring report in 2009 and the Second Africa POPs regional POPs Monitoring report in 2015. The drafting workshops for the first and second Africa POPs regional monitoring reports were held at the University of Nairobi in 2008 and 2014.

The Department of Chemistry staff members have also been involved in coordinating the ambient air and in Africa under the MONET Africa which is implemented by the RECETOX, Masaryk University Brno, Czech Republic and the mothers' milk sampling.

The POPs and pesticide laboratory participated in the project for assessment of existing capacity for analysis of POPs in Developing countries in 2007. It also participated in the UNEP/GEF GMP1 project in 2010/2011. It is the central University laboratory committed to POPs and pesticide analysis and reference laboratory for Environmental analysis of POPs under the National Environment Management Authority.

Currently the laboratory is one of the key laboratories in Kenya certified for analysis of Physico-chemical parameters for Pesticide registration in Kenya.

2.1.5. Analytical work in collaboration with other laboratories

The Department of Chemistry POPs laboratory has been involved in both local and regional collaboration projects in Africa. The staff members of the laboratory have hosted the Africa Network for analysis of Chemical Pesticides (ANCAP) training. They have also hosted the National trainings on analysis of Pesticides to build capacity for national analytical laboratories. Department currently hosts the Africa Central Analytical Laboratory for Equatorial Africa Deposition Network.

2.1.6. Any needs or follow-up from this self-assessment?

The laboratory needs to continue strengthening the analytical capacity for analysis of POPs pesticides, PCBs and PBDEs. Whereas the POPs pesticides and PCBs are analysed on routine basis, the laboratory seeks to expand analytical capacity to include PBDEs to enhance its capacity for POPs parameters. It also seeks to

participate in international inter-laboratory proficient analysis to monitor and assess her performance and the quality of data generated. It is continuously working on improving the capacity to become a regional centre for Chemicals analyses in line with the University overarching vision to become a World Class Centre of Excellence in pursuit of knowledge generation, preservation, dissemination and application in Science and Technology.

2.2. Analytical quality issues

2.2.1. Which matrices and POPs are analysed in the Laboratory and with which separation/detection system?

Please use the following abbreviations and the table below and expand as appropriate.

For the groups of POPs: Organochlorine pesticides – OCPs
Polychlorinated biphenyls – PCB; polybrominated flame retardants – BFR
dioxin-like POPs (PCDD, PCDF, dl-PCB) - dl-POPs;
perfluorinated alkylated chemicals - PFAS

Extraction methods: C = Supercritical fluid (SFE) D = Dilution F = Solid phase (SPE)
L = Liquid/liquid M = Microwave P = Pressurized fluid (PFE)
S = Soxhlet U = Ultrasonic

Separation: Capillary gas chromatographic column (please specify length, type) - HRGC
Liquid chromatographic column (please specify) – HPLC or UPLC

Detector: ECD LRMS MS/MS TOF MS HRMS

Matrix type	POP(s)	Extraction methods	Separation	Detector
Abiotic				
Abiotic – air	OCPs, PCB, dl-PCB	S	HRGC- 30 m, 60 m	ECD, LRMS
Abiotic - water	OCPs, PCB, dl-PCB	L, SPE	HRGC- 30 m, 60 m	ECD, LRMS
Abiotic – other: soil, sediments, food stuff,	OCPs, PCB, dl-PCB	S	HRGC- 30 m, 60 m	ECD, LRMS
				ECD, LRMS
Biota				
Biota - human milk	OCPs, PCB, dl-PCB	S	HRGC- 30 m, 60 m	ECD, LRMS
Biota – other: Fish, vegetables	OCPs, PCB, dl-PCB	S	HRGC- 30 m, 60 m	ECD, LRMS

2.2.2. Please provide approximate number of samples analysed *per* class of POPs in 2015

OCP- 1,000 Samples

PCB- 200 Samples

dl-PCBs -200 Samples

2.2.3. Is there any quality system in the Laboratory if so, which? Who is responsible?

The Laboratory does not have ISO 17025 certification.

However the University is IS0 9000 certified. The University Directorate of Quality Assurance Division was established to ensure QA within the service departments in the university. The directorate ensures development and implementation of Quality Assurance Policy and Procedures for monitoring the programme quality and that of delivery processes, and general Quality Assurance matters.

2.2.4. Does the Laboratory use standardised methods or own validated methods? (Please specify)

Yes

For specific pesticides, the laboratory applies EPA standard methods of analysis.

However for POPs analysis the Laboratory applies in-house method adapted from IVM-VU University during the GMP1 project. The method covers analysis of air, soil, sediments, fish and mothers milk.

2.2.5. Does the Laboratory apply blank tests? (Please specify)

Yes

Matrix blanks

Method blanks

Instrument blanks.

2.2.6. Does the Laboratory carry out recovery tests? (Please specify)

Yes

Spike recovery of standards

Surrogate recoveries.

2.2.7. Does the laboratory carry out performance tests of the equipment? (Please specify)

Yes

Blank test

Repeatability tests

2.2.8. Does the Laboratory use certified reference materials or laboratory reference materials? (Please specify)

Yes

Sediment CRM

Fish CRM

2.2.9. Does the Laboratory take part in interlaboratory studies?

Yes

International Atomic Energy agency inter-calibration studies.

UNEP inter-laboratory comparison studies.

2.2.10. Are there written method descriptions and instructions? Please describe location, accessibility, updating procedures.

Yes

The methods are kept in the laboratory reference materials cabinets.

2.2.11. How has the laboratory validated its methods? (Please specify)

Yes

By running spike recoveries and CRM through all the steps in the method for sample preparation and analysis. Individual steps for sample preparation are validated by spiking the standards and determining the recoveries.

By running replicate samples.

2.3. Documentation

2.3.1. Does the Laboratory have routines for documentation of:

2.3.1.1. Commissions and projects

Yes :

Commissioned projects and grants are kept in files separately from the laboratory by the Department administrator.

Analytical reports are kept in the Laboratory computer, hard disks, while hard copies are filed in box files.

2.3.1.2. Sampling procedures

Yes : The Laboratory follows formal sampling procedures for different matrices which are documented and filed in the laboratory.

2.3.1.3. Registration and storage of samples

Yes :

All samples that come to the laboratory are recorded in the laboratory sample log book.

The logbooks also show the sample matrix, date of entry to the laboratory, contact person, sample storage, date of extraction, cleanup and analysis.

Sample storage is done in the chest freezers at -18°C and the refrigerators at 4 °C for water samples.

2.3.1.4. Analytical methods

Yes .

POPs like OCPs, PCBs and dl-PCBs are analysed following in house method adapted from IVM-VU University during the GMP1 training.

The laboratory applies EPA methods for different pesticides analysed in the laboratory.

2.3.1.5. Analytical work/activities

Yes

All analytical activities are recorded in a separate logbook which shows the date of activity, for instance standard preparation dates, concentrations by volume and weight and internal standards used.

2.3.1.6. Instrumental issues

Yes

Each instrument has a logbook for registration of all activities carried out. These include instrument status, sample matrices and methods used, method parameters & analytes, calibration conditions, gases pressures and instrument error logged.

2.3.1.7. Result reports

Yes .

The results are stored in the computers, hard disks, and printed copies which are stored in box files and theses.

2.3.1.8. Operational costs

Yes

The operational costs for the instruments are documented and stored in box files. These include quotations, invoices and receipts for purchases.

2.3.1.9. Validation and performance results

Yes

Before embarking on analyses, the instruments are calibrated using standards, blank samples and calibration standards.

2.3.2. How are these documents filed?

1) Hard copies are filed in the box files.
2) Soft copies are stored in Computer and external hard disks.

2.3.3. Is there a laboratory information management system (LIMS)?

No.

But we use excel files to track the laboratory processes.

2.4. Laboratory space/premises

2.4.1. Is the Laboratory (space) used in this GMP project shared with another activity?

No.

The space dedicated to POPs analysis is about 100 m^2. Whereas the laboratory is used hosted in the Department of Chemistry University of Nairobi and is used for training postgraduate students, their area of specialisation remains on POPs and pesticides research and analyses.

2.4.2. Is the laboratory free from external disturbances such as temperature, humidity, vibrations, energy supply, *etc.?*

Yes.

There is no extreme temperature and humidity experience in the laboratory. In addition the GC/MS is in an air conditioned room, whereas the GC/ECD room is not air conditioned but there is effort to get all instrument rooms air conditioned. There are no vibrations experienced in the laboratory.

The laboratory has 24 hour power supply from the Department of Chemistry. There is also the college generator to provide power backup in case of electricity power failures. However, recently the college generator developed fault, but efforts are being made to correct the problem. The GC/MS operates on the 5 KVolt UPS and similar efforts are being made to have the GC/ECD run on UPS.

2.4.3. Is the laboratory space adequate for organic trace analyses?

2.4.3.1. Hoods

Yes

The laboratory has one fume hood where extraction takes place. There laboratory is also connected to the Department of Chemistry fume hoods/ventilation systems that connects all laboratory within the Department.

2.4.3.2. Materials free of contaminants

Yes

The laboratory is divided into sample preparation room and two separate rooms for GC/MS and GC/ECD instruments. Samples are taken to the analytical rooms only after they have been processed for analysis.

Samples are stored in different freezers and refrigerators to void contamination in the laboratory. In addition, there are separate refrigerators to storage of standards and sample extracts.

2.4.3.3. Sample storage

Yes

There are three different chest freezers, and four refrigerators for storage of the samples based on matrices. Air samples are stored separately from the solid samples such as soils, sediments and fish.

2.4.3.4. Chemicals' storage

Yes

The laboratory chemicals are stored in laboratory cabinets. Bulk chemicals are stored separately in the Departmental chemical store.

2.4.3.5. Laboratory safety regulations

Yes

Laboratory has safety regulations posted within the laboratory. Within the Department, the overall safely is managed by the college safety committee.

2.4.3.6. Is the access to the laboratory regulated?

Yes

Laboratory access is highly controlled and is limited to students and staff working under the research group.

2.5. Laboratory personnel

2.5.1. Is the personnel familiar with QA/QC?

Yes

The student and staff working in the laboratory are trained on QA&QC while working in the laboratory.

2.5.2. Are there routines for training the personnel?

Yes

The staff and students working in the laboratory are trained routinely within the University and also participate in national training workshops and international training workshops.

2.5.3. Are there specific qualification requirements for the personnel?

Yes.

All staff in the laboratory have at least MSc. Degrees and above and the students are mainly masters and PhD students. Undergraduate students working on POPs projects work under close supervision.

2.5.4. Are there job descriptions for the personnel?

Yes.

The laboratory staff and employees of the Department of Chemistry, University of Nairobi. Each staff has clear Job description.

2.5.5. Is there documentation on the qualifications of the personnel?

Yes

The laboratory personnel are members of academic or technical staff of the Department of Chemistry, University of Nairobi. All academic staff have Masters Degrees and above

2.5.6. Are the personnel resources sufficient?

Yes.

We sufficient personnel, six academic members of staff with masters and PHD degrees working on POPs. We also have 3 technical members of staff who are involved in the research group and several PhD and Msc. Students who are over 10.

We are consistently looking for research grants to boost our research activities. We also get financial resources from the University who cater for salaries of the staff, utility bills and general administrative & financial support.

We are also involved in consultancy services and postgraduate research grants which generate additional resources to sustain the operational costs of the laboratory.

2.6. Equipment

2.6.1. Is there extraction equipment for POPs analyses (Please specify):

[In addition to narrative, please attach a photo]

Yes

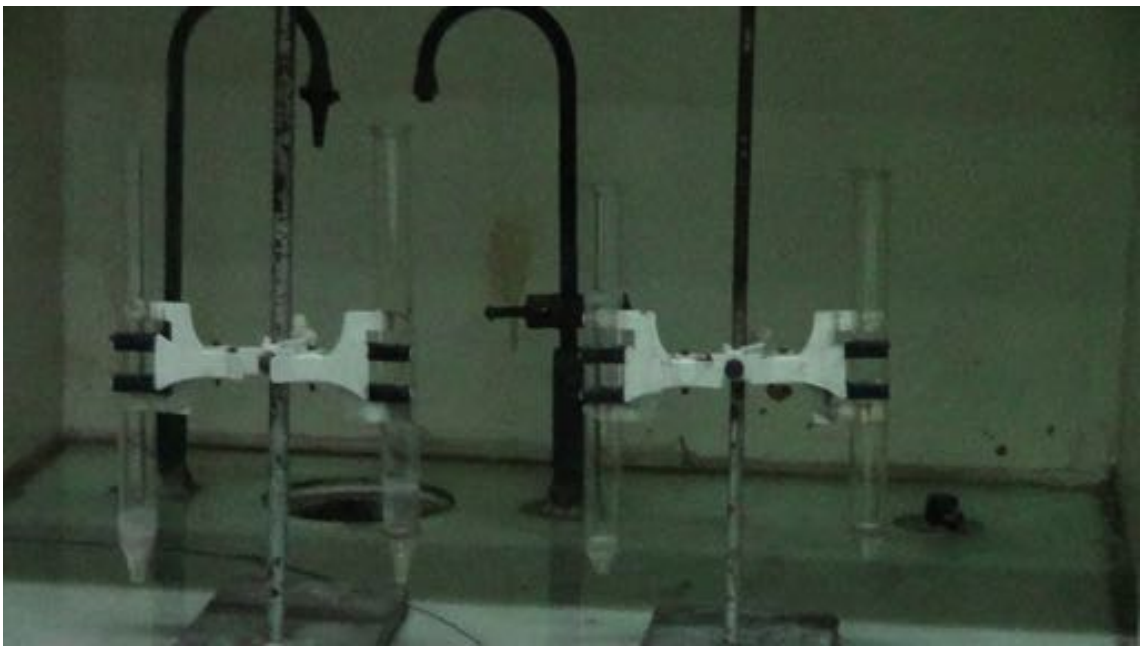
We use manual Soxhlet extraction system for solid samples.

2.6.2. Is there clean-up equipment for POPs analyses? (Please specify)

[In addition to narrative, please attach a photo]

Yes

We used alumina cleanup using chromatographic columns.



2.6.3. Which equipments (please modify where necessary[2]) are used for POPs analysis:

[In addition to narrative, please attach a photo]

HRGC and HRGC/LRMS

2.6.3.1. HRGC/ECD [instrument/model] for analysis of:

Yes. Agilent 6890N with µECD used for analysis of OCPs, PCBs and dl-PCBs.

[2] Such as GC/GC, MS/MS, TOF-MS, *etc.*

2.6.3.2. HRGC/MS [instrument/model] for analysis of:

Agilent 6890- 5872-2 MS used for analysis of OCPs, PCBs and dl-PCBs.

We would like to advance to analysis of PBDEs.

2.6.3.3. HRGC/HRMS [instrument/model] for analysis of:

N/A

2.6.3.4. LC-MS/MS [instrument/model] for analysis of:

N/A

2.6.4. How is the technical service of the instruments organized?

The instruments are serviced locally by the department staff. In case of a major problem, there are local agents for the manufacturers who are called for service.

2.6.5. Are there plans to buy new equipment for POPs analyses? Or is there an urgent need for some equipment?

We would wish to increase the resolution of our analyses to Dioxins and furans that require HRGC/HRMS. However, currently there is no immediate plan to buy new higher resolution equipment.

We are currently expecting a second HRGC/LRMS to our research group through our international research collaborations. With the HRGC-µECD and HRGC/LRMS we can analyse OCPs, PCBs and we hope to start analysis of PBDEs soon. We hope that by end of 2016 when we receive the additional equipment, we will be able to dedicate one equipment to POPs parameters only while the other will be used for pesticides and hydrocarbons.

2.7. Spares

2.7.1. Do you experience difficulties with supply of spare parts?

Yes.

The major difficulty is to do with delays in procurements and shipping of spares from abroad. Basically it takes 2-6 months to clear processing and shipping of spare parts from Europe or USA. This demands advance financial resources so that procurements can start ahead of time.

2.7.2. Is there an urgent need of some spare parts?

Yes

We need some GC-ECD and GC/MS spares which include:

1) GC/MS & GC/ECD capillary columns
2) Diffusion pump
3) Filaments
4) Ferrules and septa
5) Liners and gold seals
6) Syringes

7) Syringes or digital pipettes and tips

8) Cleanup and fractional columns

9) Autosampler vials with inserts

10) Standard solutions: OCPs, PCBs, dl-PCBs and PBDEs standard solution mixtures

2.8. Methods/procedures used for POPs analysis

Please briefly describe which methods/procedures are used in the laboratory, *e.g.*, by name of the method such as EPA 8082 (and essential steps, materials)

We apply an in-house method adapted from IVM- VU University. The major steps include:

1) Extraction by Soxhlet method- extraction by hexane: acetone 3:1 for 16 hours.

2) Concentration by rotary evaporation

3) Cleanup by alumina column

4) Fractionation by deactivated silica column using hexane and diethyl ether/hexane.

5) Analysis by GC/ECD or GC/MS, capillary column

2.9. Additional Comments on 2.1-2.7

1) We would really wish to increase the through put of our extraction systems and we are looking for automatic Soxhlet system to help us increase the number of samples per day.

2) We are looking for collaborations that can help us with a HRGC/HRMS to expand our scope of analyses to dioxins/furans.

3) We would like to advance to analysis of PBDEs. Particularly to start off would like to get PBDE standard solutions.

3. TECHNICAL PART - CAPACITY BUILDING/TRAINING NEEDS

Based on the response to the above questions an evaluation will be made and the needs for capacity building/training in your laboratory will be specified.

Preferred dates for the hands-on training (initial): __April/May 2017_____

3.1. Laboratory infrastructure where the training will be held

Sample preparation procedures: POPs & pesticide research laboratory, Department of Chemistry, University of Nairobi.

Clean-up equipment: POPs & pesticide research laboratory, Department of Chemistry, University of Nairobi.

Separation: POPs & pesticide research laboratory, Department of Chemistry, University of Nairobi.

Detection: POPs & pesticide research laboratory, Department of Chemistry, University of Nairobi.

3.2. Number/qualification of persons to be trained

[Please indicate when staff from more than one laboratory will participate]

8 personnel.

Minimum- BSC. Degree.

3.3. Matrices/sample types

Air, Mothers' Milk, Fish and sediments.

3.4. POPs

OCPs, PCBs, dl-PCBs and PBDEs.

3.5. Narrative

4. ADDITIONAL COMMENTS

[Please provide information you feel necessary to know before starting preparation of the training]

Annex 2 Agenda for the training in Kenya

This annex contains agenda for the training prepared in cooperation of RECETOX and Department of Chemistry (6 pages).

Research Centre
for Toxic Compounds
in the Environment

UNEP GEF GMP2 TRAINING WORKSHOP, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF NAIROBI, 22ND -26TH MAY 2017, NAIROBI, KENYA
PROGRAMME
DAY ONE, MONDAY 22ND MAY 2017

SESSION 1 TIME 08:00 AM - 10:00 AM- OPENING SESSION			
08:00-09:00 AM : ARRIVAL AND REGISTRATION 09.00-09.40 AM : OPENING REMARKS BY THE DEPARTMENT OF CHEMISTRY **09.40-10:00 AM : GROUP PHOTOS AND TEA BREAK**			
SESSION 2 TIME 10:00 AM - 13:00 PM			
	TOPIC: air sampling	**LEAD PERSON**	**VENUE/ROOM**
	Active air sampling:	Roman Prokeš	Lab134/Room115
	-middle volume air sampler Leckel MVS6		
	-low volume air sampler Baghirra LVS15-FV with photovoltaic panels		
LUNCH BREAK 13:00 PM-14:00			
SESSION 3: TIME 14:00 PM -16:00 PM			
	Sampling plan for next year	Roman Prokeš	Lab134/Room115
TEA BREAK 15:50 PM 16:20 PM			
SESSION 4: 16:20 PM -17:00 PM			
	Data analysis	Roman Prokeš	Lab134/Room115
	DAY 1 CLOSING REMARKS		

Research Centre
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in the Environment

UNEP GEF GMP2 TRAINING WORKSHOP, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF NAIROBI, 22ND -26TH MAY 2017, NAIROBI, KENYA
PROGRAMME

DAY TWO, TUESDAY 23RD MAY 2017

SESSION 5 TIME 08:30 AM - 10:30 AM			
	TOPIC	**LEAD PERSON**	**VENUE/ROOM**
	Laboratory instrumental training, GC maintenance, diagnostics	Petr Kukučka	Lab134/Room115
	Spot water sampling -5 sites (all day long)	Roman Prokeš	Lab134/Room115
TEA BREAK 10:30 AM-11:00 AM			
SESSION 6 TIME 11:00 AM - 13:00 PM			
	Laboratory instrumental training, MS maintenance, diagnostics	Petr Kukučka	Lab134/Room115
LUNCH BREAK 13:00 PM-14:00			
SESSION 7: TIME 14:00 PM -15:50 PM			
	Laboratory instrumental training, MS maintenance, diagnostics	Petr Kukučka	Lab134/Room115
TEA BREAK 15:50 PM-16:20 PM			
SESSION 8: 16:20 PM -17:00 PM			
	Laboratory instrumental training, summary	Petr Kukučka	Lab134/Room115
	DAY TWO CLOSING REMARKS		

Research Centre
for Toxic Compounds
in the Environment

UNEP GEF GMP2 TRAINING WORKSHOP, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF NAIROBI, 22ND -26TH MAY 2017, NAIROBI, KENYA
PROGRAMME
DAY THREE, WEDNESDAY 24TH MAY 2017

SESSION 9 TIME 08:30 AM - 10:30 AM			
	TOPIC	**LEAD PERSON**	**VENUE/ROOM**
	Laboratory instrumental training, MS tune, checking proper operation, QAQC	Petr Kukučka	Lab134/Room115
	Sample preparation – SPE (solid phase extraction)	Roman Prokeš	Lab134/Room115
	TEA BREAK 10:30 AM-11:00 AM		
SESSION 10 TIME 11:00 AM - 13:00 PM			
	Laboratory instrumental training, GC-MS acquisition method set up	Petr Kukučka	Lab134/Room115
	SPE extraction	Roman Prokeš	
	LUNCH BREAK 13:00 PM-14:00		
SESSION 11: TIME 14:00 PM -15:50 PM			
	Laboratory instrumental training, GC-MS acquisition and processing method set up	Petr Kukučka	Lab134/Room115
	SPE extraction	Roman Prokeš	Lab134/Room115
	TEA BREAK 15:50 PM-16:20 PM		
SESSION 12: 16:20 PM -17:00 PM			
	Laboratory instrumental training GC-MS processing method set-up	Petr Kukučka	Lab134/Room115
	DAY THREE CLOSING REMARKS		

Research Centre
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in the Environment

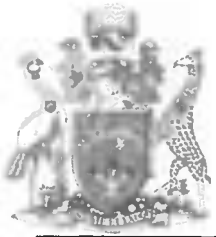
UNEP GEF GMP2 TRAINING WORKSHOP, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF NAIROBI, 22ND -26TH MAY 2017, NAIROBI, KENYA
PROGRAMME
DAY FOUR, THURSDAY 25TH MAY 2017

SESSION 13 TIME 08:30 AM - 10:30 AM			
	TOPIC	**LEAD PERSON**	**VENUE/ROOM**
	Laboratory sample prep training, PBDEs analysis	Petr Kukučka, Roman Prokeš	Lab134/Room115
TEA BREAK 10:30 AM-11:00 AM			
SESSION 14 TIME 11:00 AM - 13:00 PM			
	Laboratory sample prep training, PBDEs analysis	Petr Kukučka, Roman Prokeš	Lab134/Room115
LUNCH BREAK 13:00 PM-14:00			
SESSION 15: TIME 14:00 PM -15:50 PM			
	Laboratory sample prep training, PBDEs analysis	Petr Kukučka, Roman Prokeš	Lab134/Room115
TEA BREAK 15:50 PM-16:20 PM			
SESSION 16: 16:20 PM -17:00 PM			
	Laboratory sample prep training, PBDEs analysis	Petr Kukučka, Roman Prokeš	Lab134/Room115
	DAY FOUR CLOSING REMARKS		

Research Centre
for Toxic Compounds
in the Environment

UNEP GEF GMP2 TRAINING WORKSHOP, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF NAIROBI, 22ND -26TH MAY 2017, NAIROBI, KENYA
PROGRAMME
DAY FIVE, FRIDAY 26TH MAY 2017

SESSION 17 TIME 08:30 AM - 10:30 AM			
	TOPIC – Information Dissemination and Capacity Building Workshop to Enhance Capacities for Monitoring of Toxic Compounds in Ambient Air in Africa	**LEAD PERSON**	**VENUE/ROOM N**
	Introduction and objective of the workshop	Kateřina Šebková	Room115
	Overview of ongoing long-term air monitoring activities in Africa - implementation of the Global Monitoring Plan	Kateřina Šebková	Room115
	TEA BREAK 10:30 AM-11:00 AM		
SESSION 18 TIME 11:00 AM - 13:00 PM			
	MONET in Africa		Room115
	Training video available for MONET		Room115
	Active versus passive air sampling – calibration study	Petr Kukučka	Room115
	LUNCH BREAK 13:00 PM-14:00		
SESSION 19: TIME 14:00 PM -16:00 PM			
	Lessons learned from using the active sampler for air sampling	All	Room115
	Introduction to a new tool - photovoltaic sampler	Roman Prokeš	Room115
	TEA BREAK 15:50 PM-16:20 PM		
SESSION 20: 16:20 PM -17:00 PM			



Research Centre
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in the Environment

	New monitoring activities in Africa	Kateřina Šebková	Room115
	Introduction to a new training video - water sampling	Kateřina Šebková	Room115
	Discussion	All	
	WORKSHOP CLOSING REMARKS **AWARD OF CERTIFICATES** **END OF THE WORKSHOP**		Room115

Annex 3 Questionnaires - Evaluation of the training

part 3a) Participants

This annex contains questionnaires filled by training participants (limited to these who participated in majority of the sessions - 9 participants (18 pages) and two trainers (13 pages).

These are reproduced without changes.

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional): Florence Masese

1. What was the most **valuable/important** for you in this training?

The Hand-On experience training on how to handle the GC/MS instrument.

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

The running of the GC/MS, the sources of error, Tuning, Calibration, integration, and Actual setting of GC/MS machine

3. Can you comment on agenda /methods/approach used in the training?

Agenda The Agenda for the workshop was a brilliant idea. Gives a headstart for students who want to do air sampling.

Methods The method given were educative and an eye opener on other alternative methods

Approach Use of extendable water sample, we usually get a boat to get water from ambient bottles.
↳ A bit of theory before the practical would have made it a bit easier.

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training: Very helpful. I wish we would actually have a theory lesson on this before the actual practical training.

Hands on: More in this area, maybe more people should go through handling of equipment to practice knowledge acquired

Discussion: Most of our questions were answered and I was happy with the way Peter communicated his knowledge.

5. Any message to your lecturers and trainers

Thank you very much for sharing your knowledge and making us know more about analyses of POPs / PBDE compounds using GC/MS.

Thank you for taking time to complete the questionnaire – RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional):

1. What was the most **valuable/important** for you in this training?

Introduction on GC-MS working method Validation steps and result interpretation

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

GC-MS-Tuning and maintenance Sample collection for water and Sample preparation by SPE

3. Can you comment on agenda /methods/approach used in the training?

Agenda

The agenda to build capacity on POPs, PBDEs: Analysis is very right for our university and region

Methods

Hands on method intended was okay, though some limitation in machine access and power interruption

Approach

The approach by trainers is commendable!

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training:

Was very appropriate for the capacity building for the manpower.

Hands on:

Very useful in building confidence in the trainees.

Discussion:

Protocols/procedures should have been provided alongside the training.

5. Any message to your lecturers and trainers

Am grateful to them, and ask them to keep in touch with us for more capacity building in our university.

Thank you for taking time to complete the questionnaire – RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional):

1. What was the most **valuable/important** for you in this training?

GC-MS Training
Water and Air Sampling
Sample preparation.

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

Water pollutants (pop)
Handling Sampling equipments, Mounting and dismounting of the air Sampler.

3. Can you comment on agenda /methods/approach used in the training?

Agenda Well thought of

Methods Hand on activities that give a first hand experience

Approach Well handled but due to power outages and allocated time some agendas were rushed.

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training:

- Very helpful
- Give some background theoretical approach to bring everyone to a comparatively same level.

Hands on:

Well done

Discussion:

Well handled.

5. Any message to your lecturers and trainers

- Work well down
  Continue with the partnership to ensure the experience gained builds the capacity of the involved person and the institution the represent.
- Increase the Length of the training in order to Comprehensively handle all the Agenda prepared.

Thank you for taking time to complete the questionnaire – RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional):

1. What was the most **valuable/important** for you in this training?

+collecting water samples from the river and using the cartridge for filteration and prepare to analyze. + moreover the GC machine to learn how to work with

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

Sample preparation, finding different way/information on analyzing the POPs, working with GC machine.

3. Can you comment on agenda /methods/approach used in the training?

Agenda

it was OK for me in this case

Methods

it was much better if we could do some activities to get in touch much more with different parts of the traning

Approach

N/A

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training: it was mentioned above to do some practical activities...

Hands on:

Discussion:

5. Any message to your lecturers and trainers

I thank to the trainers who answered all the Questions very friendly and completely!

Good luck.

Thank you for taking time to complete the questionnaire – RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional):

1. What was the most **valuable/important** for you in this training?

- Information on the running of the GC/MS
how to develop the Methods for analysis
- Sample preparation was also important
- Sample handling
- The Different Parts of GC/MS

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

- Sampling
- cleaning and assembling the sampling (apparatus)

3. Can you comment on agenda /methods/approach used in the training?

Agenda The agenda was ok because there is need to build Capacity, Information Dissemination Could include notes

Methods The methods also was good

Approach Practical approach is good but there was need for each Participant to test especially the Equipment

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training:

Sampling was done well, Sample prep also but needed to do the analysis

Hands on:

Discussion:

5. Any message to your lecturers and trainers

Thank you very much for sharing with us such useful information. As we work in the Lab may require to consult with you if it is ok.

Thank you again

Thank you for taking time to complete the questionnaire – RECETOX team

---

Consider more time for a workshop of this nature 5 days not enough.

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Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional): ENOCK OSORO

1. What was the most **valuable/important** for you in this training?

- GC-MS Training
- Water sampling
- Preparation of samples for GC-MS analysis.

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

→ How to do water sampling
→ Water preparation for GC-MS analysis
→ operating the GC-MS i.e - instrumental warming conditions, Calibration and method development

3. Can you comment on agenda /methods/approach used in the training?

Agenda → The agenda was good i.e TO train people on POPs analysis

Methods → Direct training of participants on different areas of POPs analysis. It was good approach.

Approach → The approach is also good TO people to have hands on experience on POPs analysis.

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

The training was Helpful.

Practical training: → More time needed for training on the GC-MS. time.

Hands on: It was Helpful.

Discussion:

5. Any message to your lecturers and trainers

→ I will like to thank the two trainers for their efforts in Making the training a success. It was a good training but they should be given more time. I suggest that the training to be conducted as follows:-
1st week - Sampling and sample Preparation
2nd week - GC-MS analysis and trouble shooting
total 2 weeks training.

Thank you for taking time to complete the questionnaire – RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional): Vincent O. Madadi

1. What was the most **valuable/important** for you in this training?

GCMS Calibration using Isotope dilution for analysis of PBDEs.

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

Laboratory QA/QC in analysing POPs

3. Can you comment on agenda /methods/approach used in the training?

Agenda

The training program was well planned but time was short for every item to be completed.

Methods

- Hands on approach is very important and ideal for onsite training.

Approach

- Approach was old.

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Yes. very helpful.

Practical training:

- It was very helpful to do hands on training on GC/MS and water sampling and active air sampling.
- Would have wished to analyse some of the real samples in the lab.

Hands on:

Would love used to do PBDE analysis in difficult samples such as mothers milk.

Discussion:

The training was appropriate for improving the analyses of POPs at local lab.

5. Any message to your lecturers and trainers

Thank you for your valuable time and commitment. We will need to make the final list of consumables that are necessary for ECMP2 project.

Thank you for taking time to complete the questionnaire -- RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional):

DOUGLAS [illegible] OKUMU

1. What was the most **valuable/important** for you in this training?

use of the GC-MS instrument

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

- lots of information on instrumentation sampling and sample preparation

3. Can you comment on agenda /methods/approach used in the training?

Agenda

Addresses problems facing human being and the environment

Methods

Approach

simple direct and easy to understand

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training:

It was very helpful, I will appreciate if I can get notes on GC-MS instrument, sample preparation and sampling.

dokumu@uonbi.ac.ke

Hands on:

Discussion:

5. Any message to your lecturers and trainers

Thank you for taking time to complete the questionnaire – RECETOX team

Research Centre for Toxic Compounds in the Environment

Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Evaluation Questionnaire for Participants

Hands-on: laboratory training in Kenya (22-25 May 2017)

Name (optional): Wilfred B Orengi

1. What was the most **valuable/important** for you in this training?

Knowledge of Sampling methods, instrument Calibration (standard) and setting Instrument Part.

2. Please provide **the most interesting** information/knowledge for you that you received from RECETOX team during the training

Instrument setting and Calibration and various Components of the System as well as troubleshooting

3. Can you comment on agenda /methods/approach used in the training?

Agenda

Globally acceptable Protocol for Sampling Instrument setting and Calibration Techniques and taken long

Methods

The presentation method, Good

Approach

Good

4. What do you think about the **practical training /hands-on**? Was it helpful? Is there anything else you would appreciate seeing or learning regarding capacities for analysing POPs?

Practical training:

Helpful, but requires, Constant experience application on both instrument and on the Exercise of Sampling

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Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology

Hands on:

Hands on, was, Very rare.

Discussion:

This were excellent with both voice, audio and video presentation

5. Any message to your lecturers and trainers

Thank you and keep up the spirit of teaching and training

Thank you for taking time to complete the questionnaire – RECETOX team

part 3b) TRAINERS

Questionnaire for Trainers (1)

Hands-on: laboratory training in Kenya - GEF/GMP2 project to Enhance Capacities for POPs Monitoring in Africa (Nairobi, Kenya, 22-25 May 2017)

Name (optional): TRAINER 1

Title(s) of the training units

Number of participants:

1. Lecture part:

A. Please rate the overall knowledge of the audience **before** the training on the scale 1-10 (1 = never heard of/none, 10 = excellent; write not available if not discussed or not subject of the training that **you** carried out)

on the Stockholm Convention -5

chemicals management frameworks (global, international, national level) -5

physicochemical properties of chemicals discussed -5

occurrence of POPs in the environment -6

sampling techniques -6

analytical techniques -6

B. Please comment on the time allocated for this module (sufficient, too much, too little etc…) in the overall training schedule.

More time for practical work would probably be better.

C. Please describe reaction of the audience to the information provided:

They appreciated this training in their lab.

D. Were there any questions? (please list them if there were any)

Yes, we were discussing a lot of questions from the practical to theoretical issues of environmental chemistry mainly focused on the air and water analyses.

E. Potential of using the transferred knowledge by trainees?

in which field?

They can improve their knowledge about environmental chemistry and apply this information in future study, job, education in the framework of building a new infrastructure in their country.

F. Overall rating of the audience in 3 sentences/bullet points:

- pleasant atmosphere of training
- questioning, skilful and hard trainees
- effort/application of new information

G. Were there any challenges during the training?

Power cuts, obsolete infrastructure

H. Any suggestions for improvement of the training regarding this module?

To get more information about the education level of participants and their facilities before the training.

I. Any further comments you may have: -

Thank you for completing the form and your work and attention given to the training!

SCRC Czech Republic

Questionnaire for Trainers (2)

Hands-on: laboratory training in Kenya - GEF/GMP2 project to Enhance Capacities for POPs Monitoring in Africa (Nairobi, Kenya, 22-25 May 2017)

Name (optional): TRAINER 1

Title(s) of the training units

Number of participants:

2. Sampling or sample treatment (clean-up/extraction) + relevant hands on:

A. Please rate and briefly comment on the overall knowledge of the audience before the training on **sampling techniques/sample clean-up pretreatment** for (use scale 1-10 (1 = never heard of/ none, 10 = excellent):

Air -6

Water -5

Soil -4

Biota -3

human matrices -2

Is relevant material available in the premises (please circle your answer)? **YES (partly)** NO

What equipment they are normally using?

Passive sampling devices, soxhlet extraction, GC

Any surprises?

Non-availability of expendable supplies, blackouts

B. Please comment on the time allocated for this module (sufficient, too much, too little etc…) in the overall training schedule.

More time for practical work would probably be better.

C. Please describe reaction of the audience to the information provided:

They appreciated this training in their lab.

D. Were there any questions? (please list them if there were any)

Yes, we were discussing a lot of questions about various techniques, standards, practical work, maintenance and supply

E. Potential of using the transferred knowledge by trainees?

in which field?

They can improve their knowledge about the sampling and sample preparation and apply this information in future study, job, education in the framework of building a new infrastructure in their country.

F. Overall rating of the audience in 3 sentences/bullet points:

- pleasant atmosphere of training
- questioning, skilful and hard trainees
- effort/application of new information

G. Were there any challenges during the training?

Power supply, timetable

H. Any suggestions for improvement of the training regarding this module?

To get more information about the education level of participants and their facilities before the training.

I. Any further comments you may have: -

Thank you for completing the form and your work and attention given to the training!

SCRC Czech Republic

Questionnaire for Trainers (3)

Hands-on: laboratory training in Kenya - GEF/GMP2 project to Enhance Capacities for POPs Monitoring in Africa (Nairobi, Kenya, 22-25 May 2017)

Name (optional): TRAINER 1

Title(s) of the training units

Number of participants:

2. Chemical analysis and data management + relevant hands on:

A. Please rate and briefly comment on the overall knowledge of the audience before the training on **chemical analysis and data management** for (use scale 1-10 (1 = never heard of/none, 10 = excellent):

Air -4

Water -4

Soil -4

Biota -3

human matrices -3

QA/QC -3

Is relevant material/equipment available in the premises (please circle your answer)? **YES (partly)** NO

What equipment they are normally using?

Gas chromatography

Any surprises?

Different unit than declared before

What practices are they using?

Application of basic information

What about QA/QC? In place? Please comment

They have some basic knowledge.

What about data management?

They have a minimal knowledge.

B. Please comment on the time allocated for this module (sufficient, too much, too little etc…) in the overall training schedule.

More time would be needed.

C. Please describe reaction of the audience to the information provided:

They appreciated this training in their lab.

D. Were there any questions? (please list them if there were any)

Yes, we were discussing a lot of questions about maintenance and supply of their GC

F. Were there any challenges during the training?

Power supply

E. Potential of using the transferred knowledge by trainees?

in which field?

POPs analyses of environmental matrices, potential building of new capacities in Kenya.

F. Overall rating of the audience in 3 sentences/bullet points:

- pleasant atmosphere of training
- questioning, skilful and hard trainees
- effort/application of new information

G. Were there any challenges during the training?

Power supply

H. Any suggestions for improvement of the training regarding this module?

To improve power supply with the generator usage or photovoltaic panels.

I. Any further comments you may have:

Thank you for completing the form and your work and attention given to the training!

SCRC Czech Republic

Questionnaire for Trainers (1)

Hands-on: laboratory training in Kenya - GEF/GMP2 project to Enhance Capacities for POPs Monitoring in Africa (Nairobi, Kenya, 22-25 May 2017)

Name (optional): TRAINER2

Title(s) of the training units

Number of participants:

1. Lecture part:

A. Please rate the overall knowledge of the audience **before** the training on the scale 1-10 (1 = never heard of/none, 10 = excellent; write not available if not discussed or not subject of the training that **you** carried out)

on the Stockholm Convention 6

chemicals management frameworks (global, international, national level) 5

physicochemical properties of chemicals discussed 6

occurrence of POPs in the environment 6

sampling techniques 7

analytical techniques 6

B. Please comment on the time allocated for this module (sufficient, too much, too little etc…) in the overall training schedule. Time allocated enough, but delays due to problems with power down

C. Please describe reaction of the audience to the information provided: They knew quite a bit of things but many things were new to them

D. Were there any questions? (please list them if there were any) Yes, instrument-wise, smapling-wise, sample prep-wise

E. Potential of using the transferred knowledge by trainees? yes

in which field? monitoring of ambient air, scientific projects on indoor exposure and outdoor exposure

F. Overall rating of the audience in 3 sentences/bullet points:

prepared and cooperating

listening with asking questions

helpful

G. Were there any challenges during the training?

frequent power outages

H. Any suggestions for improvement of the training regarding this module?

I. Any further comments you may have:

Thank you for completing the form and your work and attention given to the training!

SCRC Czech Republic

Questionnaire for Trainers (2)

Hands-on: laboratory training in Kenya - GEF/GMP2 project to Enhance Capacities for POPs Monitoring in Africa (Nairobi, Kenya, 22-25 May 2017)

Name (optional): TRAINER2

Title(s) of the training units

Number of participants:

2. Sampling or sample treatment (clean-up/extraction) + relevant hands on:

A. Please rate and briefly comment on the overall knowledge of the audience before the training on **sampling techniques/sample clean-up pretreatment** for (use scale 1-10 (1 = never heard of/ none, 10 = excellent):

air 7

water 6

soil 6

biota 5

human matrices 5

Is relevant material available in the premises (please circle your answer)? YES NO

What equipment they are normally using? Soxhlets, column clean-up, nitrogen evaporation, furnace, GC-ECD, GC-MS

Any surprises? not functional UPS for the GC-MS systems

B. Please comment on the time allocated for this module (sufficient, too much, too little etc…) in the overall training schedule:.sufficient, but power outages

C. Please describe reaction of the audience to the information provided: some information was new to them. They were attentive listeners, asking questions.

D. Were there any questions? (please list them if there were any) Yes

E. Potential of using the transferred knowledge by trainees? yes

in which field? environmental monitoring, scientific projects

F. Overall rating of the audience in 3 sentences/bullet points:
attentive listeners
asking questions
helpful and flexible

G. Were there any challenges during the training? frequent power outages

H. Any suggestions for improvement of the training regarding this module?

I. Any further comments you may have:

Thank you for completing the form and your work and attention given to the training!

SCRC Czech Republic

Questionnaire for Trainers (3)

Hands-on: laboratory training in Kenya - GEF/GMP2 project to Enhance Capacities for POPs Monitoring in Africa (Nairobi, Kenya, 22-25 May 2017)

Name (optional): TRAINER2

Title(s) of the training units

Number of participants:

2. Chemical analysis and data management + relevant hands on:

A. Please rate and briefly comment on the overall knowledge of the audience before the training on **chemical analysis and data management** for (use scale 1-10 (1 = never heard of/none, 10 = excellent):

air 7

water 6

soil 6

biota 5

human matrices 5

QA/QC 4

Is relevant material/equipment available in the premises (please circle your answer)? YES NO

What equipment they are normally using? GC-MS, GC-ECD

Any surprises? power outages, non functional UPS

What practices are they using? blanks, reference materials,

What about QA/QC? In place? Please comment

yes, but not evaluated in detail

What about data management?

B. Please comment on the time allocated for this module (sufficient, too much, too little etc…) in the overall training schedule. sufficient

C. Please describe reaction of the audience to the information provided:

Most of teh information was new to them

D. Were there any questions? (please list them if there were any) Yes, instrumental techniques, hardware, software, method set-up and optimization

F. Were there any challenges during the training? power outages

E. Potential of using the transferred knowledge by trainees? yes

in which field? environmental monitoring, scientific projects

F. Overall rating of the audience in 3 sentences/bullet points:

attentive listeners

asking a lot of questions

immediate hands-on

G. Were there any challenges during the training? frequent power outages

H. Any suggestions for improvement of the training regarding this module?

I. Any further comments you may have:

Thank you for completing the form and your work and attention given to the training!

SCRC Czech Republic

Annex 4 List of participants

Research Centre
for Toxic Compounds
in the Environment

UNEP GEF GMP2 TRAINING WORKSHOP, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF NAIROBI, 22ND -26TH MAY 2017, NAIROBI, KENYA
DAY FOUR, THURSDAY 25TH MAY 2017
ATTENDANCE LIST

NO.	NAME	INSTITUTION	TELEPHONE	EMAIL ADDRESS	SIGNATURE
1	**PETR KUKUCKA**	**RECETOX**	**00420608966271**	**prokes@recetox.muni.cz**	kukucka
2	ROMAN PROKES	RECETOX	00420549494513	kukucka@recetox.muni.cz	
3	**PROF. SHEM WANDIGA**	UNIVERSITY OF NAIROBI		**wandigas@uonbi.ac.ke**	
4	**PROF. JOHN ONYARI**	UNIVERSITY OF NAIROBI	**0724144904**	**jonyari@uonbi.ac.ke**	
5	**VINCENT MADADI**	UNIVERSITY OF NAIROBI	**0720742415**	**vmadadi@uonbi.ac.ke**	
6	CHARLES MIRIKAU	UNIVERSITY OF NAIROBI	**0722263912**	**cmirikau@uonbi.ac.ke**	
7	**ENOCK OSORO**	UNIVERSITY OF NAIROBI	0710958742	osoroenock@yahoo.com	
8	**VANE ONDIERE**	UNIVERSITY OF NAIROBI	**0726165999**	**bona.reri@yahoo.com**	
9	FLORENCE MASESE	UNIVERSITY OF NAIROBI	**0722238627**	**maseseflorence15@gmail.com**	
10	**LAETITIA KANJA**	UNIVERSITY OF NAIROBI	**07222639912**	lkanja@uonbi.ac.ke	

Research Centre
for Toxic Compounds
in the Environment

11	DOUGLAS OKUMU	UNIVERSITY OF NAIROBI	0724961856	dokumu@uonbi.ac.ke	
12	**ANNANCIATA MUIA**	UNIVERSITY OF NAIROBI	0721721548	ammuia@uonbi.ac.ke	
13	**KENETH MALOBA**	UNIVERSITY OF NAIROBI	0721756134	Kenneth.maloba@uonbi.ac.ke	
14	**MBURIA ALEXANDER M.**	GOVT CHEMIST DEPT	0721113498	Mburiambae@yahoo.com	
15	**YASSER ABBASI**	UNIVERSITY OF TWENTE	0735090571	y.abbasi@utwente.nl	
16	**WILFRED ORANGI**	UNIVERSITY OF TWENTE	0723 81975	worangi@uoni.ac.ke	
17	**Dr. Ketarina Sebkova**	RECETOX			

Training Reports in the Asian-Pacific Region:

Training Report

UN Environment Capacity Building for POPs Analysis

for the Ministry of the Environment (MOA), Phnom Penh, Cambodia

28 March-5 April 2019

Jacob de Boer and Jacco Koekkoek

Dept. of Environment and Health, Faculty of Science, Vrije Universiteit, Amsterdam, the Netherlands

www.science.vu.nl/environmentandhealth

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Summary

The training of theory and practice of POPs analysis was organized by the Ministry of the Environment (MOA), Phnom Penh, Cambodia. The host was Mr. Siv Kung, Head of the Laboratory of the Environmental Protection Agency (EPA) of Cambodia. The training was attended by nine participants. Theoretical aspects of the analysis of POPs served as an introduction to the practical training that followed. The trained method is comprehensively described in a manual that was given to the people of the MOE in a hard and digital copy. During the training two samples and a blank were analyzed. The two samples were two passive air samplers enriched with polychlorobiphenyls (PCBs) and organochlorine pesticides (OCPs). The staff of the laboratory was generally not well-prepared for this type of analyses. They will need much more training starting from scratch for some staff members to reach the desired level needed for the Global Monitoring Program work.

Introduction

Both the theoretical and the practical part of the workshop was attended by nine participants, partly from the Camcontrol laboratory, partly form the from the MOA-EPA offices (see Annex 1). The training was intended to assist the laboratory in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 28 March and 5 April 2017 in Pnom Penh. The first two days were used for theoretical training, consisting of lectures given by Prof. Dr. Jacob de Boer. The following topics were covered during the theoretical sessions: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis, safety issues and QA/QC. An additional lecture was devoted to the reasons of human errors, which are important to understand why QA/QC is so important in the laboratory. New POPs were also addressed and the results of the recent UNEP Interlab study were also shown and discussed. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps and following that analysis by GC were explained for the matrices of interest. Attention was also given to the mirror study and details of this study and selection of samples were discussed. During the course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

Unfortunately, some of the trainees had no understanding whatsoever from chemistry. For example, two staff members were trained in the English language, but never studied chemistry. Obviously, a basic knowledge of chemistry, but preferably much more than that (i.e. understanding of analytical chemistry and instrumentation such as gas chromatography and mass spectrometry) is essential to follow this training. In addition, there were serious language issues. Much of the presentations had to be translate before it was understood. Overall, presumably only a fraction of the theoretical background taught in the training has been understood by the participants.

The following five days consisted of hands-on training in the laboratory. Mr. Jacco Koekkoek (BSc) prepared the laboratory for the hands on training starting immediately after the theoretical training. Prior to the training an inventory was made of required consumables. The procurement included a gas chromatography (GC) column, spare parts for the GC, chemicals and analytical standards. The laboratory of the MOE is not equipped for the analysis of POPs. Therefore, the on-site training took place in the Camcontrol laboratory of the Ministry of Commerce. This laboratory analyses products for custom inspections and fraud repression. It is well equipped for the POPs analysis. Before the start of the training all the equipment and fume hoods were cleaned. The trained method, comprehensively described in a manual, was given to the participants in a hard and digital copy.

During the training two samples and a blank were analyzed. The two samples were two passive air samplers enriched on a level of 15 - 30 ng with PCBs and 50 – 100 ng with OCPs.

The passive air samplers were cut in small pieces. At the start of the training the ordered internal standard solutions, labelled ^{13}C PCBs and ^{13}C OCPs, were not delivered on time. Instead, a mixture of PCB103 and PCB198 - 100 ng/ml, provided by the Vrije Universiteit was used. The power supply appeared to be very unreliable. Power sometimes went off for several hours. Consequently, the extraction had to be limited to a few hours. The obtained raw extracts were cleaned by applying the standard method of deactivated (8%) alumina oxide and pentane. The less polar pesticides and PCBs were separated from the polar pesticides by applying deactivated silica gel (1.8%), hexane and a mixture of hexane and diethyl-ether. The glass columns for the clean-up and fractions of the extracts were provided by the Vrije Universiteit. Later on the decision was made to combine the two fractions of the last clean-up step. This was based on the availability of mass selective detection and to keep the data processing more uncomplicated.

Unfortunately, due to the problems with the power supply the extracts could not be analysed. The last two days were therefore used to practice the data processing. First the principle of isotope dilution was exercised with an artificial dataset in Excel. The second exercise was the data processing of the data obtained during the POP training in Lusaka. This was done with the data processing software from the Agilent Chemstation.

Conclusions and recommendations

It will be a long road until this staff will be well-trained for the analysis of POPs for the GMP. The knowledge and the experience with the POPs analysis is limited. Despite the impossibility to measure the extracts due to the frequent power failures, this training can at best be considered as the starting point for setting up a good quality POP laboratory.
The first priority is a basic training in analytical chemistry for the staff members. Alternatively, some staff members need to be appointed from external. A proper GC system needs to be set up and kept running. If the problems with power supply cannot be fixed, the alternative of a GC system with electron capture detection (ECD) detection should be considered.
A method for only PCBs can be set up as an initial action. The number of compounds is limited and easier to manage. The start of a method is already difficult enough. When the PCB method is running well, time may come to start with the OCPs.

Simultaneous with the start of the PCB it will be important to start with the development of a basic quality system by:

- Analyzing blanks and control samples on a regular basis and archive the results in a Shewart control chart
- Checking the correctness of the balance by weighing a certified mass standard (
- Checking the correctness of the pipette by weighing the dispense with water (before use)
- Determine the mass of every addition by the preparation of all standards
- Clean the entire laboratory on regular (weekly) basis and the benches every day during the sample preparation

Obviously, the level of this laboratory is still far from what is needed for the GMP. The staff is willing but it will most likely necessary to add new, well-trained staff members.

Annex 1. Participants in the laboratory training

Name	Affiliation
Siv Kung	Head Laboratory MOE
Srey Sokchanmonyroth	Camcontrol Laboratory official
Huot Channthavy	Camcontrol Laboratory official
Phan Bunrann	Camcontrol Laboratory official
Meng Hong	Camcontrol Laboratory official
Nuon Rydo	MOE Laboratory officer
Hiru Chandath	Water Quality Management Dept. MOE
Nath Dyveasna	MOE Laboratory officer
Soura Puntork	Hazardous Substance Management MOE

Contact person for Cambodia: Mr. Siv Kung

Annex 2. Training Manual

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis for the Research and Development Center for Environmental Quality and Laboratory, Ministry of Environment and Forestry, PUSPIPTEK-Serpong, Tangerang Selatan, Banten, Republic of Indonesia

4-12 April 2019

Jacob de Boer and Rianne van Dijk

Dept. of Environment and Health, Faculty of Science, Vrije Universiteit, Amsterdam, the Netherlands

www.science.vu.nl/environmentandhealth

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Summary

The training of theory and practice of POPs analysis was attended by employees of the Research and Development Center for Environmental Quality and Laboratory of the Indonesian Ministry of Environment and Forestry. Two days training in theoretical aspects of the analysis of POPs served as an introduction to the practical laboratory activities that took place in the 5-days practical training that followed. An enriched passive air filter (PUF) and a fish and sediment sample were analyzed during the hands-on training. These samples were extracted, cleaned-up, fractionated, and POPs were identified and quantified using GC-MS during the training. The host of the entire training was Ms. S. Yunes. The laboratory organized every day coffee/tea breaks and lunch breaks and on the last day they have organized a special lunch in a Padang restaurant.

Introduction

The training was intended to assist the laboratory in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The on-site training took place between 4 and 12 April 2019 in Serpong, near Jakarta. The first two days were used for theoretical training, consisting of lectures given by Prof. Dr. Jacob de Boer.

The following topics were covered during the theoretical sessions: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis, safety issues and QA/QC. An additional lecture was devoted to the reasons of human errors, which are important to

understand why QA/QC is so important in the laboratory. New POPs were also addressed and the results of the recent UNEP Interlab study were also shown and discussed. The analytical scheme was explained to the trainees to prepare them for the hands-on training that followed. Details regarding the solvent extraction, clean up and fractionation steps were explained for the matrices of interest. Attention was also given to the mirror study and details of this study and selection of samples were discussed. The lectures were well attended and the course was profesionnally organized. There were ca. 40 participants in the theoretical training. During the course participants were actively participating, asking questions and sharing their own knowledge, experiences and opinions with the group.

The following five days consisted of a hands-on training in the laboratory given by Ms. Rianne van Dijk (BSc). There were 14 participants in the practical training, 13 from Indonesia and one from Myanmar (See Annex 1).

The laboratory is located on pleasant premises owned by the Ministry. The laboratories were clean and dedicated for the work on micro-pollutants such as POPs. The laboratories were air-conditioned and relatively free from dust. Soxhlet glassware and a rotary evaporator were available and after a thorough cleaning these were used for the extraction and evaporation of extracts and eluates.

The training started with a discussion on good laboratory practice (always work in a clean and safe environment). Preparations for the analyses were made like rinsing the glassware, activate the silica and drying the fish sample with sodium sulphate in a mortar (to dry overnight).

Internal standard solutions were prepared and the essence of weighing the standard (instead of working on volume base) was explained.

The principle of polyurethane foam (PUFs) was explained and the PUFs were cut into pieces by the participants and placed in the Soxhlet. Three Soxhlet's were started for the 16 hour extraction. A theoretical overview of calculations from weight to volume was given.

The Soxhlet extracts (PUF and solvent blank) were concentrated and cleaned and fractionated using aluminum oxide and deactivated silica. The principle of calculation of the calibration curves was explained, followed by a discussion.

Stock solutions and working solutions for the calibration curve were prepared. A lot of time was spent on the importance of weighing standards. We observed for example that the traditional glass syringes were not accurate and therefore emphasized again that weighing is really important in this case. After that, the participants calculated the concentrations. We have also discussed the analysis of the calibration curve solutions (reinjections, storage and how to add these in your sequence). The preparation and use of copper powder to remove Sulphur from sediment samples was explained. Blank problems and sediment sampling were discussed. Calculations of the concentrations of the POPs were carried out.

It appeared to be difficult to make a new method on the GC-MS in the Chromeleon software because this involves a lot of programming. Due to time constraints, it was therefore decided that the measurements will be performed after the training when the GC-MS method would be ready. At the end of the training some of the participants gave a summary of the training. It was good to have this feedback about what they have learned and points for improvement.

Conclusions and recommendations

This laboratory made a professional impression. It was one of the best laboratories we have trained during the entire UNEP capacity building project. The staff was enthusiastic and made a very positive impression on the trainers. They are motivated and convinced of the importance of monitoring for the Global Monitoring Program (GMP). The laboratory is well organized and professional. All participants were eager to learn new techniques. They also came with examples from daily practice of POP analyses from which one could distill that they have experience in this type of analysis and carry out analyses on a regular basis.

The following improvements can be recommended. To ensure a good and save working space, the staff should add an extra elephant trunk ventilation/exhaust system. Also an (extra) air-condition system in the dioxin laboratory will improve the working conditions of the employee.

All data should be collected in specified Excel sheets for calibration curves, sample weights etc. The spreadsheets used during the training can serve as an example.

Data should always be corrected based on the internal standard. The injection standard is only used to check if there are problems with enhancement or suppression of the injected sample.

Always wear a lab coat, goggles, proper shoes (no flip-flop's) and gloves. Safety should really get more attention.

At the end of the training certificates of course completion were given to all participants. The trainers received positive feedback on the training.

Annex 1. Participants in the UNEP POP training at the Research and Development Center for Environmental Quality and Laboratory, Ministry of Environment and Forestry, PUSPIPTEK-Serpong, 4-12 April 2019.

Name	Organisation
Yuriska Andiri	P3KLL
Yohana S.H. Pandiangan	P3KLL
R. Onig W.	P3KLL
Sri Endah K.	P3KLL
Siti Masitoh	P3KLL
Ness Kaptarina	P3KLL
Retno Puji Lestari	P3KLL
Yunesfi Syofyan	P3KLL
R. Dewi	P3KLL
Ricky Nelson	P3KLL
Bayu Hendrawan	PSLB3 - KLHK
Ariyastuti	PSLB3 - KLHK
Tia Agustiani	PTL - BPPT
Fuzi Suciati	PTL - BPPT
Thirzin	Myanmar

Annex 2. Training Manual

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis

for Laboratory Personnel

of the Institute of Chemistry and Chemical Technology of the Mongolian Academy of Sciences

6 - 14 February 2017

Jacob de Boer and Jacco Koekkoek

Dept. of Environment and Health, Faculty of Science, Vrije Universiteit, Amsterdam, the Netherlands

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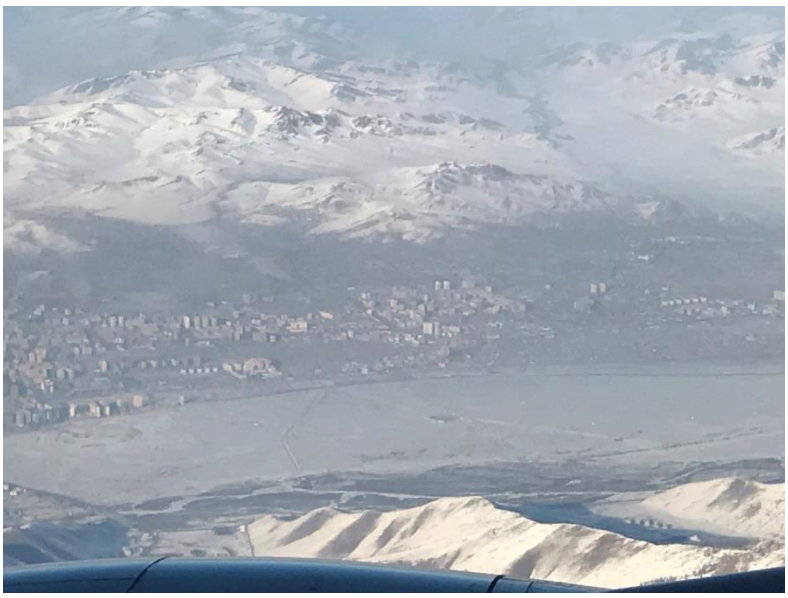

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Summary

The training of theory and hands-on training of POPs analysis was very helpful for the staff of the Institute of Chemistry and Chemical Technology (ICCT) of the Mongolian Academy of Sciences. Theoretical aspects of the analysis of POPs were presented and discussed at the first two days of the training session. Subsequently, five full working days were spent on the practical training. Environmental samples, including a PUF, fish homogenate and blanks were Soxhlet-extracted, cleaned-up, fractionated, and POPs were identified and quantified using GC-μECD during the training. Although current conditions are basic, this ICCT laboratory has a high potential for serving as a reliable POPs laboratory for the GMP in the near future.

Introduction

This type of training as part of a capacity building project for the Global Monitoring Program (GMP) of the Stockholm Convention was given for the first time in Mongolia. Until now the Institute of Chemistry and Chemical Technology (ICCT) of the Mongolian Academy of Sciences had not carried out any work for the GMP. However, the staff was highly motivated to start these activities and responsible authorities seem to be willing to encourage such monitoring from the near future onwards. Based on a completed questionnaire and regular contacts by email and skype between the Vrije Universiteit and Dr. Enkthuul Suranjev, an inventory was made from which a list of articles was composed to be included in the procurement. This procurement included the delivery of consumables such as two GC columns, spare parts, glassware, chemicals and analytical standards to ICCT. Several laboratories are located in the building of ICCT and unfortunately no lab is equipped for the sample preparation of POPs analysis. The laboratory conditions were rather basic, but plans were there for renewal and further extension of instruments and other relevant items. This training programme was therefore focused on the basic principles of the PCB and OCP analysis, including theoretical concepts, with a focus on practical implication of the theory, and quality assurance and quality control procedures and tools, followed by hands on training and demonstrations of extraction, clean up and gas chromatographic (GC) analysis.

The Training

The on-site training took place between 6 and 14 February 2017. The first two days were exclusively used for theoretical training, consisting of lectures given by Prof. Dr. Jacob de Boer. There were 11 participants, including a few participants from other laboratories in Ulaanbataar (Institutes of Plant Protection and Veterinary Medicine), but one extra presentation on publication of scientific results attracted 25 participants.

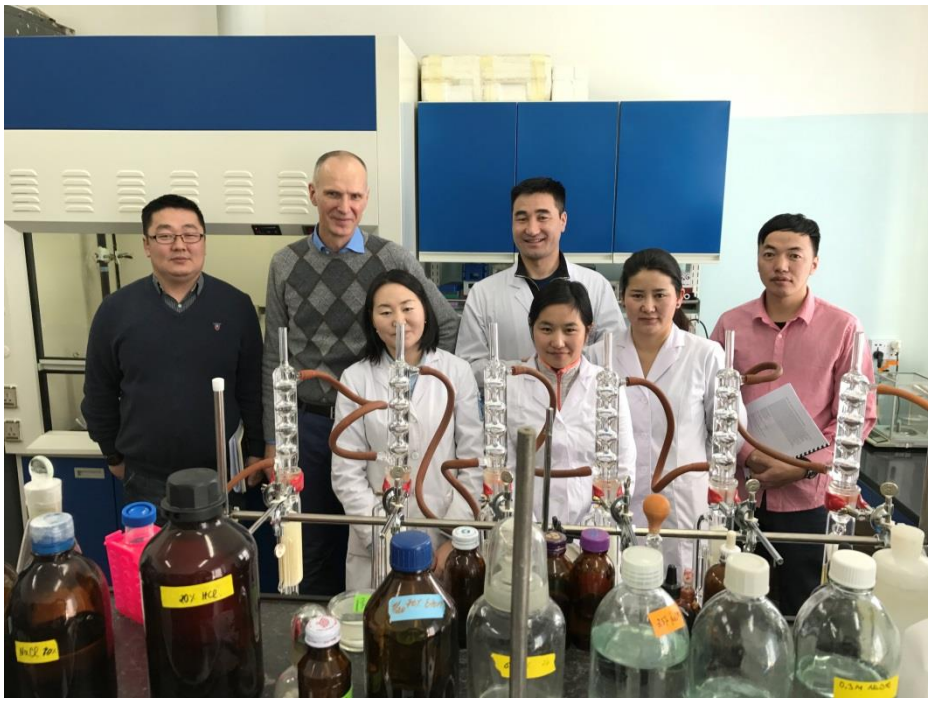
The following topics were covered: the relevance of POPs monitoring and the context of the UN Environment Global Monitoring Program, sampling and sample storage, extraction and clean up, GC analysis and QA/QC. One presentation on the national Samples study (Mirro study) was given describing the procedures, sample matrix selection, how to avoid contamination during sample preparation, and logistics for transport of samples to Europe. Attention was also spent to new POPs and their analysis. Proficiency testing and interlaboratory studies were also handled during the lecture, including the use of certified reference materials and certified analytical standards and addresses where to obtain those.

The course participants were actively participating, asking several questions. Printed manuals with procedure descriptions were given for use by the laboratory staff (Annex 2), as well as DVDs dedicated to the analytical research conducted and coordinated at the Vrije Universiteit Amsterdam.

The hands-on training in the laboratory in which the staff was trained in extraction and clean-up of test materials with a focus on air and biota samples, and analysis by GC-µECD, was attended by six participants. For reasons of limited space in the lab, more participants could not be included, as was agreed beforehand This part of the training was given by VU Senior Technician Jacco Koekkoek BSc. The sample preparation was carried out in a physical chemistry lab during the training. The lab is equipped besides several small instruments with three work benches and two fume hoods. The work benches were full with jars and bottles filled with different solutions. Important to mention is that all over the benches etc. lays a small film of sand and dust. This is mainly remnant of sand storms which occurs frequently during spring. New Soxhlet glassware was bought together with a heater. The glass columns for the clean-up and fractions of the extracts were provided by the Vrije Universiteit.

The GC (7890A, Agilent) is placed a separate room not equipped with an exhaust for the discharge of the gasses from the column and µECD detector and hot air from the blow out

from the GC oven. The gasses are provide by a hydrogen and nitrogen generator. Unfortunately, the applied procedure is to switch off the GC and generators after the measurements and keep the column installed in the GC. By this procedure the column is exposed to moisture and oxygen which erodes the stationary phase what will have a strong negatively influence on the chromatographic performance.



The hands-on training consisted of showing all steps necessary for the analysis of POPs in environmental samples. The trained method is comprehensively described in a manual what was given to the people of ICCT in a hard and digital copy.

Sample preparation

During the training five samples and a blank were analyzed. The five samples were:

- Soil sample originated from the industrial area in Ulaanbaatar
- Soil sample originated from Khovd province, Western Mongolia
- Sediment used in inter lab study UNEP 2016
- Collected sand and dust in the lab of the sample preparation
- Enriched passive air filter (PUF)
- A blank

The soil samples could not be dried prior the analysis because the lack of time. The water content was estimated as lower than 5% and it was estimated that this amount would not influence the efficiency of the extraction. The soil samples were manually homogenized prior the sample intake. The passive air filter was cut in small pieces.

At the start of the training the ordered control standard (PCB-112) were not available due to a late delivery. Instead a mixture of PCB112, PCB155 and PCB198 - 5 µg/ml (CIL, EC-5460) provided by the Vrije Universiteit was used.

The glassware was washed with soap and water and rinsed with acetone prior the extraction.

The samples were extracted for 16 hours. The obtained raw extracts were cleaned by applying the standard method of deactivated (8%) alumina and pentane. The non-polar compounds were separated from the more polar pesticides by applying deactivated silica gel (1.8%), hexane and a mixture of hexane and acetone. The latter solvent was used as an alternative for di-ethylether what was not available.

The evaporation of the large volumes was done by a rotary evaporator and unfortunately this was also necessary for the small volumes. ICCT doesn't have equipment to evaporate small volumes with a gently nitrogen stream.

The sample extracts were ready for measurement on the third day of the practical part of the training.

On the fourth day the additional clean-up method of acidified silica gel and a mixture of hexane and dichloromethane was trained.

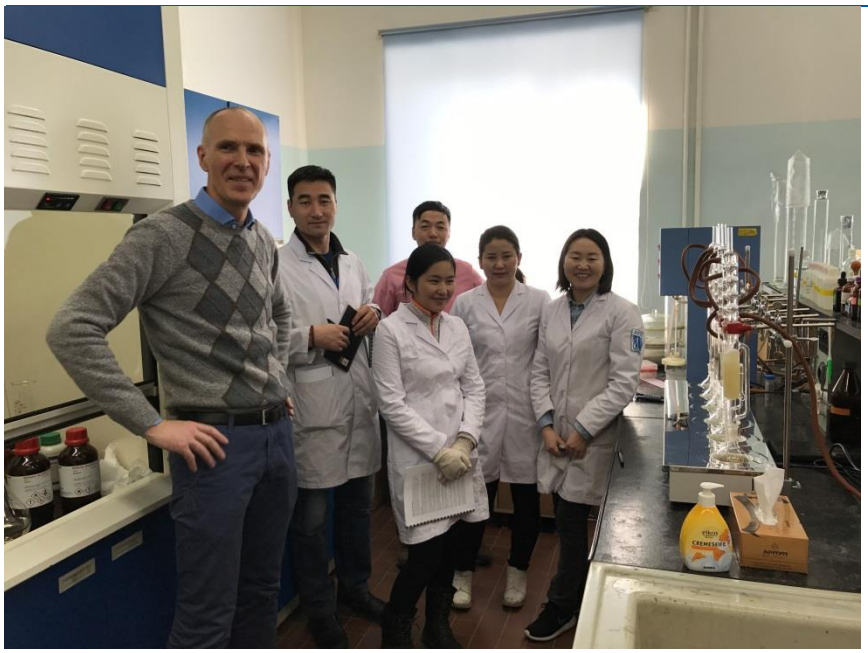
Measurements

Prior to the training the provided column Restek Rxi-5ms column (60m * 0.25mm * 0.25µm) was installed in the GC. The injection liner, septum and ECD liner were replaced.
The calibration standards were prepared from the standard solutions – OCP, ES-5467-A and PCB, EC-5495 both CIL – in the range of 0.5 – 100 ng/g.
The sensitivity and peak shape of all the compounds were good.
On the fourth day, the extracts of the soil samples were diluted and re-measured.

Data processing

The GC is controlled by the Agilent software Chem station. It should be possible also to use this software for the calculating of the concentrations in the measured extracts. But unfortunately the short time available did not allow to find a working data processing method.

As an alternative a data processing method was set up by using Mass Hunter software. The software used for the processing of the data is not useful in the future. The best option is look for alternatives. There are enough different software available who can handle data files which generated by Chem Station.



ICCT has the ambition to set up a lab for the analyzing of dioxins. The best option is to develop a POPs laboratory first and separate the dioxin lab from the other labs.

Also, it is important to start with the development of a basic quality system by

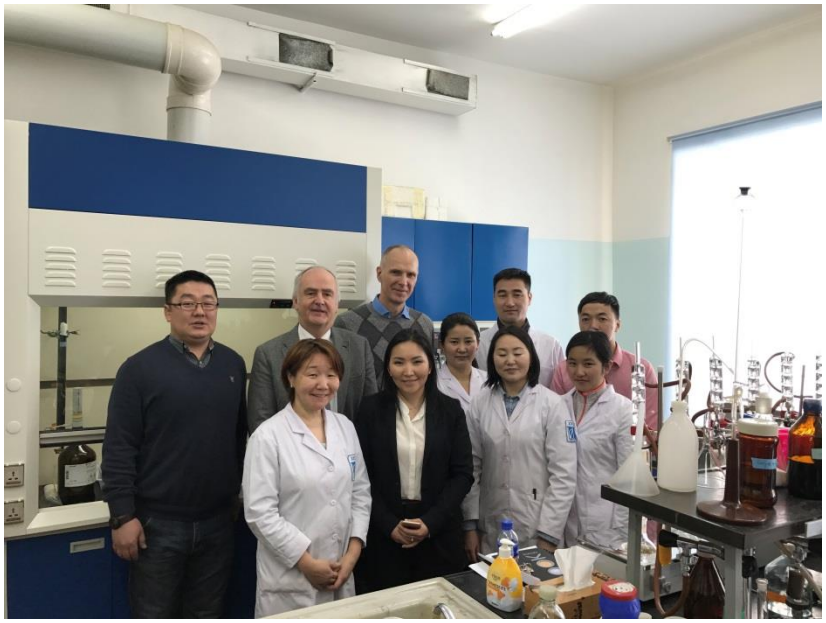
- Analyzing on regular base of blanks and control sample and archived the results in a Shewart control chart
- Checking the correctness of the balance by weighing a mass standard (before use)
- Checking the correctness of the pipette by weighing the dispense with water (before use)
- Determinate the mass of every addition by the preparation of all the standards
- Clean the lab on regular base and every day during the sample prep

Conclusions and recommendations

The laboratory is still of a very basic quality. Numerous improvements need to be made. These are not necessarily very expensive. It will be essential to make the laboratory dust-free and keep it like that. Unnecessary items, glassware and chemicals should be removed from the laboratory and packing materials should also be taken away. To reduce dust levels, new deliveries of chemicals and glassware need to be unpacked at a different place. More and clean glassware need to be bought and solvents should be regularly available. The GC needs to be kept under gas and power continuously to avoid deterioration of the columns used. Most important is, that regular analyses of POPs are carried out so that the staff can build up routine. Some more training at a later stage, e.g. by a traineeship in a reference lab, may be useful.

However, the head of the laboratory and the staff are highly motivated to make the lab work for the GMP. The lab head received her training (PhD) in Germany. She also made the effort to attend the UNEP Interlab Study Workskop in Beijing, China in March 2017 to learn more about POPs analysis. They also have an active sampler and would be willing to work with that, if appropriate, for the GMP and the capacity building project.

In summary, this is a laboratory with potential. On the longer term this lab could serve as a very useful POP laboratory for the GMP in Asia.



Annex 1 LIST OF PARTICIPANTS

Name, Surname	Affiliation
Enkhtuul Surenjav	Institute of Chemistry and Chemical Technology (ICCT)
Narandalai Byamba-Ochir	ICCT
Khureldavaa Otgonbayar	ICCT
Lkhagvamaa Erdene	ICCT
Munkhtsetseg Battsend	ICCT
Khulan Bayasgalan	ICCT
Amarsanaa Badgaa	ICCT
Uyanga Tsogtsaikhan	Institute of Plant Protection
Tsiiregzen Andarai	ICCT
Otgonsuren Davaajav	Institute of Veterinary Medicine
Bayarjargal Munkhuu	ICCT

Contact addres and responsible for the training:

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Annex 2. Training Manual

The manual is attached as a separate file.

Training Report

UN Environment Capacity Building for POPs Analysis

For Philippine Laboratory Personnel

at the Environmental Management Bureau, Quezon City, Philippines

4 and 5 December 2017 and 13 August – 17 August 2018

Jacob de Boer and Martin van Velzen

Dept. of Environment and Health, Faculty of Science, Vrije Universiteit, Amsterdam, the Netherlands

www.science.vu.nl/environmentandhealth

17 October 2018

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Summary

The training of theory and practice of POPs analysis was very useful for the laboratory personnel of the Environmental Research and Laboratory Services Division (ERLSD) that is part of the Environmental Management Bureau (EMB) stationed in Quezon City and to some representatives of the other departments within the EMB. Due to private circumstances of one of the trainers the theory and practical training were done separately. Theoretical aspects of the analysis of POPs served as an introduction and were given in December 2017. The practical part took place in August 2018. Environmental samples, fish homogenate and a sediment were both Soxhlet-extracted and ASE extracted, cleaned-up and fractionated for PCB/OCP analysis. The extracts were measured on the GC-ECD. Both samples were also extracted and cleaned for the analysis of PFAS together with water samples (drinking water and water from a septic tank). These couldn't be analyzed due to a problem with the LC-MS.

Introduction

The EMB stationed in Quezon City is responsible for Stockholm POPs measurements in the UN Environment Global Monitoring Programme. This training program was a course in both PCB/OCP analysis and PFAS analysis (see Annex 1 for participants list). The training is intended to assist the laboratory in the POPs analysis work necessary for the mirror analyses, interlaboratory study, and tasks in the Global Monitoring Network of the UN Stockholm Convention on Persistent Organic Pollutants.

The Training

The first two days of theoretical training, consisting of lectures, were given by Prof. Jacob de Boer. These presentations took place on December 4 and 5 2017 (See Programme Theoretical Training in Annex).

After an introduction in the reasons of monitoring of POPs and the context of the UN Environment Global Monitoring Program, several lectures were given on the various steps of the analytical method for ndl-POPs, in particular OCPs and PCBs. These included sampling and sample storage, extraction and clean up, GC analysis and QA/QC. To prepare the trainees for the hands-on training that followed, QA/QC in particular was extensively discussed, with emphasis on the preparation of quality charts and use of reference materials. A more philosophical lecture was included on the reasons of making mistakes in a laboratory. After each presentation time was included for discussion and questions. At the second day the results of last interlaboratory study were discussed. Part of the second day was devoted to new POPs such as PFASs and specific problems around the more difficult to analyse POPs such as toxaphene and mirex. Due to time constraints the newest POPs such as PCNs and CPs could not be discussed.

The hands-on training was scheduled for August 13 until August 17 (2018). The staff was trained in extraction and clean-up of test materials for PCBs and OCPs with a focus on sediment and biota samples, and analysis by GC-ECD. This part of the training was given by VU Senior Technician Mr. Martin van Velzen. Printed manuals with procedure descriptions were given for use by the laboratory staff (Annex 2).

The hands-on training focused on all steps necessary for the analysis of POPs in environmental samples. This was done by taking a blank sample and two types of sample matrices: a fish (*Tilapia*) and a sediment sample. All samples were extracted and cleaned by the methods described in the training manual (see Annex 2). In short, the samples were both Soxhlet extracted and ASE extracted and subsequently cleaned with Alumina (deactivated with 8% water) and fractionated with Silica (deactivated with 1.5% water). For the sediment sample, sulphur was removed using activated copper powder. For the fish sample also the total fat content was calculated. The final extracts were analyzed on the GC-ECD with a dual column system (HP-5 and DB-608, 30m x 0.25 mm x 0.25 µm). A calibration curve of a selected set of PCBs was prepared by the trainees in order to quantify the samples. In both fish and sediment sample no quantifiable amounts of PCBs were present. The internal standards (PCB 112, 155 and 198) added to the samples and the blank were found with a recovery around ca. 100% for all samples. Besides the PCB/OCP analysis also all steps needed for the analysis of PFAS compounds were shown. For this six samples were taken: a blank MilliQ water sample, a drinking water sample, a water sample from the local septic tank and the fish and sediment sample (in duplicate) which were also used for PCB/OCP analysis. The fish and sediment samples were pretreated (see schedule in Annex 2) and all samples were extracted and cleaned using solid phase extraction (SPE). For the analysis a new internal standard mix was prepared consisting of labeled PFAS compounds. Due to computer issues of the LC-MS system it was not possible to measure the samples during the training.

During the training emphasis was put on working clean and precise. The last day a lecture was given about the procedures necessary to perform a correct calculation of the results (QA/QC). Because no quantifiable amounts of PCBs were found in the samples a “handmade” dataset to do calculations was provided to the trainees. In a group session the

trainees constructed calibration curves in Excel and calculated the “samples” taking all QA/QC aspects into account.

During the closing session of both the theoretical and the practical training certificates of course completion were given to the participants (Annex 4). The trainers received positive feedback on the training.

Conclusions and recommendations

This laboratory is in a phase of building up its capabilities. A new dioxin laboratory funded by the government is for example planned. The room for that laboratory was already built and prepared. A GC/triple quad MS was available as well as several LC/MS instruments. The entire staff showed a high motivation to reach a higher level of analytical quality for POPs. Experience was already present with the technician in trace metal, phenol and VOC analysis. The PUF sampling started at 1 January 2018. The laboratory also had a passive high volume air sampler from Japan (see photo).

The practical part of the training was valuable to the participants who practiced techniques hands-on and learned some skills regarding sample extraction/cleanup and standard preparations for both PCB/OCP and PFAS analysis and optimizing the GC-ECD program.
Still, several difficulties need to be solved. The suction capacity of the fume hoods is too low. There are administrative issues with ordering certified standards for the various POPs which cause serious delays in the work. It seems useful to offer a training in an external reference laboratory for at least one staff member. However, there is potential is this laboratory to grow into its role as POPs laboratory for the Global Monitoring Plan of the Stockholm Convention.

Annex 1. Participants in the laboratory training

Name	Division
Ma Fatima Anneglo R. Molina	Environmental Research Laboratory and Services Division
Ellaine Gellie S. Nicdao	Environmental Research Laboratory and Services Division
Maria Veronica C. Eulogio	Department of Health - East Avenue Medical Center
Noemi Ruth Q. Infante	Environmental Research Laboratory and Services Division
Renz Jonnar D. Subida	Environmental Research Laboratory and Services Division
Roberto L. Co	Environmental Research Laboratory and Services Division
Roger C. Evangelista Jr.	Environmental Research Laboratory and Services Division
Rosemarie G. Hibo	Environmental Research Laboratory and Services Division
Sammy L. Aytona	Environmental Research Laboratory and Services Division
Benzon Karl T. Bongar	Environmental Research Laboratory and Services Division
Stephen C. Yecpot	Environmental Quality Management Division – Chemical Management Section

Contact person from EMB:
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Philippines

Annex 2. Training Manual for the Philippine laboratory staff

This manual is attached as a separate file.

Annex 3. Laboratory Training on POPs Analysis Continuing regional Support for the POPs Global Monitoring Plan (GMP) under the Stockholm Convention in the Africa Region Project (Phase II), Quezon City, 4-5 December 2017

International Expert: Professor Jacob de Boer

Training Program Theory and Background:

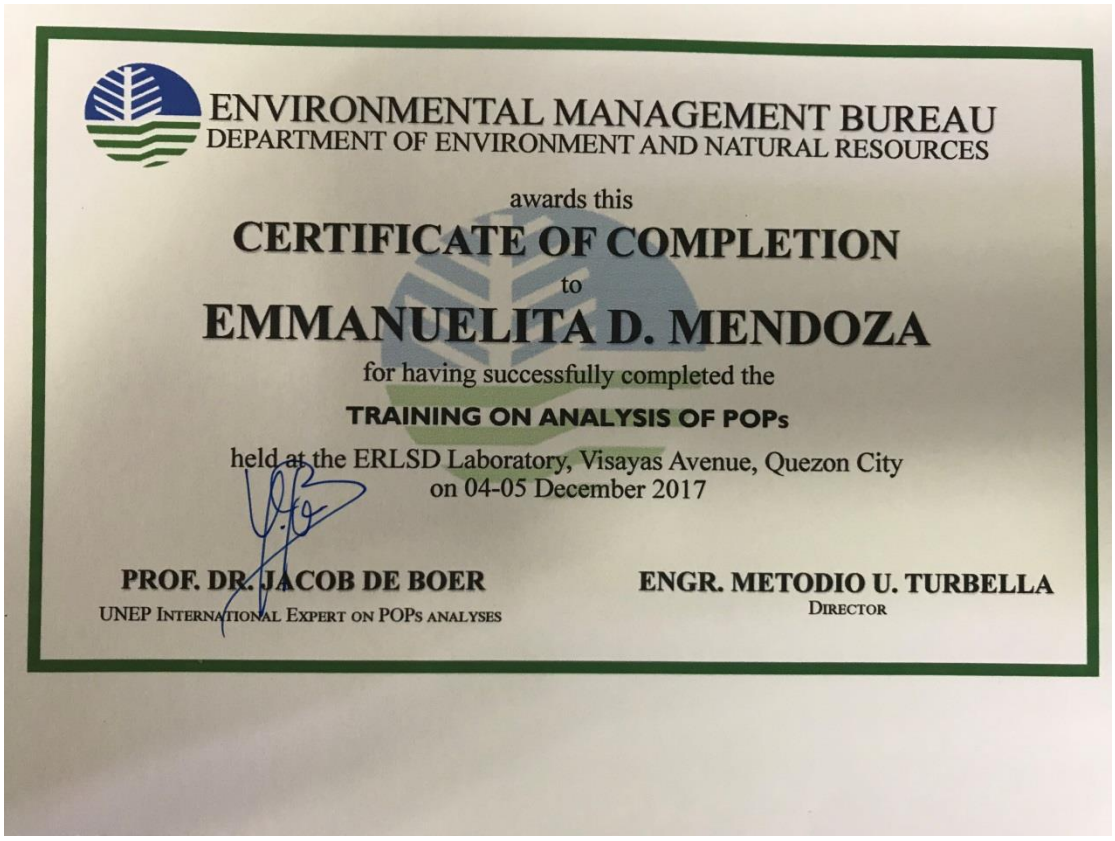
4 December

9.00	Visit Prof. de Boer to laboratories
10.00	Introduction (trainer, participants)
10.15	Why we need to monitor
10.45	Break
11.15	Analysis of PCBs and OCPs by Gas Chromatograph
12.15	Discussion
12.30	Lunch
13.30	Extraction and Clean-up
14.15	QA/QC
15.15	Break
15.45	Why do we make mistakes?
16.30	Discussion
17.00	Closure

5 December

9.00	Sampling
9.45	Lessons from the last interlab study
10.30	Break
11.00	Perfluor alkyl substances
11.30	New POPs
12.00	Lunch
13.00	Toxaphene, Mirex, Kepone
13.30	Lipids
14.00	National samples and PUFs
14.45	Break
15.15	Final discussion
16.00	Closure

Annex 4. Certificate Theoretical Training



ENVIRONMENTAL MANAGEMENT BUREAU
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

awards this

CERTIFICATE OF COMPLETION

to

EMMANUELITA D. MENDOZA

for having successfully completed the

TRAINING ON ANALYSIS OF POPs

held at the ERLSD Laboratory, Visayas Avenue, Quezon City
on 04-05 December 2017

PROF. DR. JACOB DE BOER
UNEP International Expert on POPs analyses

ENGR. METODIO U. TURBELLA
Director

Economy Division

UN environment
United Nations Environment Programme

Training Report

Training on the Sampling and Reporting under the POPs Global Monitoring Plan in the Pacific Region

Wednesday, 6 December – Friday, 8 December 2017

Apia, Samoa

1. The hands-on training on the sampling and reporting under the UN Environment/GEF project "Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Pacific Region" (GMP2) was organised jointly by UN Environment and the Basel Convention Coordinating Centre for Capacity Building and Transfer of Technology hosted by Uruguay (BCCC-LATU). The training took place at the Tanoa Tusitala Hotel in Apia, Samoa from 6th to 8th December 2017.

2. This training was held in response to the questions aroused in the Pacific countries during the implementation of the project. The objective of this training is to ensure the sampling of air, water, human milk and matrices of national interest is following the globally agreed standard operating procedures, and to support the successful implementation of the POPs Global Monitoring Plan in the Pacific Region. The UNEP/GEF project responds to Article 16 of the convention, which requires to evaluate the effectiveness of the convention four years after entry into force then periodically, by monitoring the concentration of POPs in the environment and in humans. The project aims at producing high quality monitoring data, which is essential for evaluating the effectiveness of the Convention and for developing regulations, policies and programs. However, data quality requires good analytical capacities.

1. Opening of the Training

3. Ms. Haosong Jiao, United Nations Environment Programme Chemicals and Health Branch, opened the training. She thanked all the countries for their long-term support to UN Environment and this project, introduced the objectives of this training, and the importance of taking this opportunity to answer all questions aroused during the implementation to get best results in the project.

4. The Ministry of Environment of Samoa welcomed the participants, and expressed their best wishes to the training to be successful and fruitful.

5. The participants of the training then introduced themselves in turn, expressed the necessity of the training on ensuring the project in good practice, and their expectation of this training to be fruitful and successful.

6. Dr. Heidelore Fiedler, international expert from Örebro University, thanked the participants for brought up questions and issues to the expert laboratories and to UNEP, which raised the awareness of the importance of this training on achieving the goals of the project, and introduced the role of the expert laboratories in the POPs Global Monitoring Plan and in this training.

2. Adoption of the Agenda

7. All participants agreed with the agenda that had been circulated before the training. The training was organized in accordance with the activities under the GMP2 project, namely air sampling, water sampling, human milk survey, sampling of matrices of national interest, and reporting (see Annex 2).

3. Attendance

8. The training was conducted by Dr. Heidelore Fiedler, international expert from Örebro University. The training was attended by the following GMP national coordinators: Mr. Vincent Lao from Fiji, Mr. Teema Biku from Kiribati, Ms. Joann Kmanta from Marshall Islands, Mr. Haden Talagi from Niue, Ms. Zena Kulialang rengulbai from Palau, Mr. Lucie Isaia and Ms. Fiasosoitamalii Siaosi from Samoa, Ms. Rosemary Ruth Apa from Solomon Islands, and Mr. Faoliu Teakau from Tuvalu. Representatives from UNEP and the Secretariat of the Pacific Regional Environment Programme (SPREP) were also present at the training. The list of participants is set out in annex to this report.

4. Introduction to the Discussion

1.1 Standard operating procedures for passive air sampling

9. After a status overview for the GMP2 project in the Pacific Region, the training started from the sampling, storing, labelling and shipment of air samples. Dr. Heidelore Fiedler first shared with all participants the questions arose by different countries since the start of the air sampling activities, especially some issues occurred during the sampling and labelling procedures. National coordinators from GMP participating countries exchanged more details about natural or human factors for the delay of air sampling and rose a few more questions about the detailed procedures of air sampling. The group decided to go through every step of air sampling in accordance to the standard operating procedure. (See Annex V, training summary).

10. There are five PASs numbered 1,3,5,9,11 and three types of PUFs provided for each country for passive air sampling. It is a challenge for countries to select the correct PUF for each PAS and label the collected samples accurately. The training spent a long time going through why five PASs and 3 types of PUFs were prepared and why labelling was important. Moreover, a detailed labelling and recording table was prepared for each of the 8 countries presenting in the training. Guidance documents and the recording table prepared were circulated with national coordinators.

1.2 Standard operating procedures for water sampling

11. A presentation on the status of the water sampling activities in the Pacific Region was made, emphasizing that only for this region, all GMP participating countries were conducting water sampling. And progress was acknowledged as some countries have sent water samples to the expert laboratory. Dr. Heidelore Fiedler presented the key steps of water sampling, and answered questions about technical details rose by national coordinators, such as the depth of water to be collected and how many times the bottle should be washed. Besides, she mentioned that Bottle B was planned to be stored as back-up in case Bottle A got lost through shipment. Since all samples arrived safely, it was not needed to keep a Bottle B. For this reason, the group decided that Bottle B for 2017 would be used as Bottle A for 2018. New labels for the bottles were shared with national coordinators. Tips for the labelling and storage of water samples were also introduced during the training (See Annex V, training summary).

1.3 Hands-on training for the sampling of air and water

12. In addition to the regular training sessions, on-site training on the setting up and collecting of air samples and the sampling of water was conducted. The on-site training captured more details that could hardly be reflected through in-door presentations, and by conducting one round of sampling all together, participants gained strengthened knowledge of the standard operating procedures with more attention paid to details.

13. A set of air sampler, together with PUFs in their original packages were brought to the air sampling site in Apia, Samoa. Delegates from Samoa introduced the selecting and maintaining of the air sampling site according to the UN Environment guidance documents for air sampling. Dr. Heidelore Fiedler emphasized the different labs on the PAS and different types of PUFs, and introduced in details the steps to install the samplers and tips to pay attention to. National coordinators practiced together the installation of the air sampler. This training was taken into a video for future tutorial purpose.

14. Following the on-site training at the air sampling site, a hands-on training was conducted for the sampling of water. All participants reviewed the steps of water sampling mentioned in the presentations the day before and collected together one water sample, which was used as the 4th quarter water sample of 2017 for Samoa.

15. The on-site training provided an opportunity for all participants to practice the sampling of air and water together, and more questions about detailed steps were discussed and answered. The on-site training recalled the importance of always referring to the UN Environment standard operating procedures.

1.4 Standard Operating Procedure or the sampling of human breast milk

16. The Pacific Region has participated in the GMP1 project including the human milk survey. With the capacity and experience remained in the country, some countries, such as Tuvalu, Niue, Palau have made good progress with the sampling of human milk. However, challenges from some other countries mainly come from the ethical clearance and the difficulties of selecting 50 donors due to the small population.

17. Regarding the storage of human milk samples, national coordinators shared the difficulties of storage of human milk because of lack of fridge at donor's home. Solutions were discussed and the suggestions were provided that if possible, samples could be collected from hospital or directly transported back to

the laboratory. For the security of mothers, tablets are not suggested to be provided to donors. Pooled samples should be kept frozen or use dichromate tablets with careful consideration of safety. It is necessary to contact CVUA, Ms. Karin Malisch, before shipment to ensure smooth receiving of the package. For countries with small population (for example Niue, with 2 new born each year), samples could be as individuals without pooling wit careful packaging. Before doing so, it is highly recommended to contact CVUA first.

18. Questions rose from national coordinators regarding how the human milk data could contribute to the national implementation plan or other obligations under the Stockholm Convention. As the Pacific Region has participated in the GMP1 project, with two rounds of data generated, there could be a trend analysis to understand the facts and set priorities for regions and countries.

19. The meeting concluded that ethical clearance should be obtained as soon as possible to facilitate the human milk sampling. UN Environment could provide official letters directly or via WHO upon request to support the sampling of human milk. Countries are suggested to keep smooth communication with UN Environment and CVUA for the collection and shipment of human milk samples.

1.5 Sampling of matrices of national interest

20. Key steps for the sampling of matrices of national interest under the GMP project was presented, including the institutional arrangements, sampling procedures, tips for labelling, storage and custom clearance. So far no samples received from the Pacific countries. Considering in some issues happened with custom clearance, the UNEP official custom clearance letter was circulated with the national coordinators again in support of the shipment of national samples. Besides, countries were suggested to select common commercial matrices and to mark them as “zero commercial value”.

21. As agreed in the GMP2 inception workshop, sampling plan for national matrices should be sent to IVM for clearance before conducting the sampling activities. Through discussion, participants shared the status of sampling of national matrices in each country, as well as their questions about how to identify the matrix and the size of sample.

22. Dr. Heidelore Fiedler went through the steps of sampling of matrices of national interest together with all participants, and explained that the quantity of samples depended on the POPs to be analyzed, thus for the analysis of dl-POPs, samples were requested to be 500g to 1kg. For the analysis of basic POPs, samples could be 100g to 200g. Fish was mandatory for all and other options like lamb, beef, egg, chicken, etc. Samples should be frozen and well packed as requested in the SOP. Given this, it is important to contact VU Amsterdam about the sampling plan so quantity and is confirmed.

23. Regarding the analytical capacity for matrices of national interest, a site visit to the national laboratory of Samoa was organized. Presentation was given by the delegates of the laboratory on the institutional arrangements, technical instruments, and the analysis of food, water and other samples.

24. Under the POPs GMP project, another important activity is the interlaboratory assessment. For the Pacific Region, only the South Pacific University has a POPs laboratory at this stage and has participated in all the past 3 rounds of interlaboratory assessment. Dr. Heidelore Fiedler introduced the adding value of interlaboratory assessment on capacity building and intercaliboration performance checking, and

encouraged the national laboratory of Samoa and USP to register for the 4th interlaboratory assessment in 2018.

1.6 Preparing reports for the POPs GMP project

25. The training was organized in a way that promoting maximum discussions among experts, national coordinators and other stakeholders. With training on the standard operating procedures for the sampling, labelling, storage and shipment of air, water, human milk and national samples conducted, and with countries presented their progress and their questions answered, the third day training started with the discussion on the reporting as requested under the GMP project.

26. A list of reports requested as indicated in the project agreements were listed, including national workplan, and interim substantive and expenditure reports. As one appendix of the project agreement, a standard workplan has been provided since the agreement was signed. Based on this, countries were encouraged to develop their own workplan if needed according to their institutional arrangements and any other factors. One good example was presented in the training.

27. Due to the late start of the project, there was some delay and questions regarding the interim reports. Taken the training opportunity, an example of substantive and financial reports were presented. It was emphasized that countries should indicate clearly the reporting period, concrete progress under each activity, the initial budget and actual expenditures, as well as the subtotals and the total expenditure. It is also important to submit the interim reports on time.

28. Through the training, delegates from the GMP Pacific countries have strengthened communication and information exchange regarding the progress of sampling activities, and concluded to keep frequent and smooth communication with each other to support each other for the successful delivery of all activities in high quality.

2.8 Final remarks

29. GMP Pacific countries and national coordinators are familiar with the standard operating procedures UN Environment prepared in support of the sampling of air, water, human milk and matrices of national interest

30. GMP Pacific countries and national coordinators are equipped with the necessary knowledge foundation to conduct the sampling of air, water, human milk and matrices of national interest following the correct procedures

31. GMP Pacific countries and national coordinators are sensitized about the importance of submitting the interim reports on time and in correct format

32. Opportunities for the regional cooperation are identified and explored

List of Annexes:

- **Annex I: Agenda**
- **Annex II: Concept note**
- **Annex III: List of participants**
- **Annex III: Training summary**

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Annex I: Agenda

Training on the Sampling and Reporting under the POPs Global Monitoring Plan in the Pacific Region

6-8 December, 2017

Apia, Samoa

Target audience: National coordinators of the POPs Global Monitoring Plan from **Fiji, Kiribati, Marshall Islands, Niue, Palau, Samoa, Solomon Islands Tuvalu and Vanuatu.**

Objectives:

- Support the successful implementation of the POPs Global Monitoring Plan in the Pacific Region;
- To ensure the sampling of air, water, human milk and matrices of national interest is following the globally agreed standard operating procedures;

Time	Agenda Item	Presenter
Wednesday, 6th December, 2017		
Day 1: Training on Air and Water Sampling under the POPs Global Monitoring Plan		
9:00 – 9:15	Introduction of participants	All participants
9:15 – 9:30	Introduction of the objectives and arrangement of the training	Haosong Jiao (Chemicals and Health Branch)
9:30 – 10:30	Training on air sampling: • Overview; • Standard operating procedure for air sampling; • Q&A on air sampling	Heidelore Fiedler (MTM), All participants
10:30 – 10:45	*Coffee Break*	All participant

10:45 – 12:00	Training on water sampling: • Overview; • Standard operating procedure for water sampling; • Q&A on water sampling	Heidelore Fiedler (MTM), All participants
12:00 – 13:00	*Lunch Break*	
13:00 – 13:30	*Transfer to the air sampling site*	*All participants*
13:00 – 15:30	At the air sampling site: • Tutorial on the setting up, collecting, labelling, storing and shipment of air samples • Q&A on air sampling	All participants
15:30 – 16:00	*Transfer from the air sampling site to the water sampling site*	
16:00 – 17:00	At the water sampling site: • Tutorial on the collecting, labelling, storing and shipment of water samples • Q&A on water sampling	All participants
17:00 – 17:30	Wrap up of the training on air and water sampling	Haosong Jiao (Chemicals and Health Branch)
Thursday, 7th December, 2017		
Day 2: Training on the Sampling of Human Milk and Matrices of National Interest		
9:00 – 9:30	Presentation of countries on the status of sampling of human milk, including questions aroused during the implementation.	All participants
9:30 – 10:30	Training on human milk sampling: • Overview; • Standard operating procedure for human milk sampling; • Q&A on human milk sampling	Heidelore Fiedler (MTM)
10:30 – 10:45	*Coffee Break*	
10:45 – 12:30	Presentation of countries on the status of sampling of human milk samples, including questions aroused during the implementation.	All participants
12:00 – 13:30	*Lunch Break*	

13:30 – 15:00	Training on the sampling of matrices of national interest: • Overview; • Standard operating procedure for national samples; • Q&A on national samples	All participants
15:00 – 15:30	*Coffee Break*	
15:30 – 17:00	Training on the sampling of matrices of national interest (cont.)	All participants
17:00 – 17:30	Wrap up of the training on human milk survey and on the sampling of matrices of national interest	Haosong Jiao (Chemicals and Health Branch)
Friday, 8th December, 2017		
Day 3: Tutorial on the Preparation of the Workplan and Reports for the POPs Global Monitoring Plan		
9:00 – 9:30	Requirements for the national workplan, progress reports, financial reports and interim reports as requested by the POPs Global Monitoring Plan	Haosong Jiao (Chemicals and Health Branch)
9:30 – 10:15	A case study of the national workplan	Heidelore Fiedler (MTM)
10:15 – 10:30	*Coffee Break*	
10:30 – 11:00	Working group exercise on the revision of national workplans	All participants
11:00 – 11:30	Discussion and expert review on national workplans	Heidelore Fiedler (MTM)
11:30 – 12:00	Group discussion on the preparation of national reports requested by the POPs Global Monitoring Plan: • Status quo of the preparation of the requested reports in each country • Q&A on the report templates and relevant issues • Other elements to consider	All participants
12:00 – 12:15	Discussions on follow-up activities to be implemented	All participants
12:15 – 12:30	Wrap up of the training	Haosong Jiao (Chemicals and Health Branch)

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Annex II: Concept Note

Training on the Sampling and Reporting under the POPs Global Monitoring Plan in the Pacific Region

Wednesday, 6 December – Friday, 8 December 2017
Apia, Samoa

Concept Note

A) Operating Details:

- Subject: Training on the Dioxin and Furan Inventories under the National Implementation Plans and Training on the Sampling and Reporting under the POPs Global Monitoring Plan in the Pacific Region.
- Dates and time: Wednesday, 6 December 2017 – Friday, 8 December 2017.
- Venue: Tanoa Tusitala Hotel
  P.O.Box 101
  Beach Street,
  Sogi, Apia
  Samoa
  Tel.: (685) 211 22
  Mobil: (685) 770 0112
  Email: conferencing.tth@tanoahotels.com
  Website: www.tanuatusitala.com
- Participants: National coordinators of the POPs Global Monitoring Plan from Fiji, Kiribati, Marshall Islands, Niue, Palau, Samoa, Solomon Islands Tuvalu and Vanuatu.
- Contact persons: Ms. Haosong Jiao (E-mail: haosong.Jiao@un.org) at UN Environment.

B) Objectives

- Support the successful implementation of the POPs Global Monitoring Plan in the Pacific Region;
- To ensure the sampling of air, water, human milk and matrices of national interest is following the globally agreed standard operating procedures.

C) Background

Persistent organic pollutants (POPs) are a group of chemicals including those that had/have been widely used in agricultural and industrial practices and those unintentionally produced and released from many anthropogenic activities around the globe. The Stockholm Convention on Persistent Organic Pollutants was

established in May 2001 to “protect human health and the environment from persistent organic pollutants by reducing or eliminating releases to the environment”, with 28 substances having been addressed under the Convention until the eighth Conference of Parties held in April 2017.

Article 16 of the Stockholm Convention indicates every four-year after the date of entry into force an effectiveness evaluation of the Convention, including a Global Monitoring Plan (GMP), which records the presence of POPs in the environment and in humans at regional basis. UN Environment Chemicals and Health Branch with financial assistance from the Global Environment Facility (GEF), conducted the first Global Monitoring Plan in parallel in Africa, Latin America and the Caribbean, and the Pacific Islands Regions from 2009 to 2012. These projects enabled provision of quality data on human exposure and environmental concentration of the 12 POPs originally included for the effectiveness evaluation. In decision SC-6/23, the COP requested the Secretariat “to continue to support training and capacity-building activities to assist countries in implementing the global monitoring plan for subsequent effectiveness evaluations and to work with partners and other relevant organizations to undertake implementation activities”. UN Environment is implementing four GEF MSP POPs Global Monitoring Plan follow-up projects in the African, Asian, Latin America and the Caribbean and Pacific Islands Regions (GEF IDs 4886, 4894, 4881, and 6978) from 2016 to 2020. The projects focused initially on the 23 POPs listed in the Stockholm Convention in core matrix human milk to examine human exposure, water and core matrix of national interest to examine environmental exposure, and ambient air to examine long-range transport.

UN Environment is the executing agency for the Africa, Asian and Pacific Regions. The Stockholm Convention Regional Centre (SCRC) in Uruguay is the executing agency for the GRULAC region. The projects are implemented in close cooperation with, among others, the Secretariat of the Basel, Rotterdam and Stockholm Conventions (BRS Secretariat), the World Health Organization (WHO), UNITAR, and five expert laboratories (IVM VU University, MTM Oerebro, CSIC, CVUA, and RECETOX). The objective of the GMP2 projects is to strengthen the capacity for implementation of the updated POPs GMP, and to create the conditions for sustainable monitoring of the 23 POPs in each region.

In the Pacific region, with the project being implemented, questions regarding the operating procedures, labelling of samples, etc. Hands-on training ensuring countries are following the correct operating procedures is necessary to guarantee the quality of sampling under the GMP project and to further support countries on their obligations under the Stockholm Conventions. The objective of this training is to ensure the sampling of air, water, human milk and matrices of national interest is following the globally agreed standard operating procedures, and to support the successful implementation of the POPs Global Monitoring Plan in the Pacific Region.

Annex IV: List of Participants

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Training Reports in the LAC Region:

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United Nations Environment Programme

CAPACITY BUILDING AND TRAINING COURSES – Report for ANTIGUA AND BARBUDA -

Training dates: From: 25th March 2019 To: 29th March 2019

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Antigua and Barbuda

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs IN ANTIGUA AND BARBUDA

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention.

Up to now, trainings have been accomplished in Barbados, Brazil, Colombia, Jamaica, and Uruguay. This report makes reference to the training performed in Antigua and Barbuda.

1.2 Training and Capacity Building Course at Antigua and Barbuda.

The Training and Capacity Building course was performed by Dr Manuela Ábalos and Dr Marinella Farré from the CSIC, at the Department of Analytical Services in St John´s (Antigua) between the 25th and the 29th March 2019. Contact people in Antigua were Dr. Linroy Christian and Mrs. Lael Bertide-Josiah.

In total, 8 people from the Pesticide Research Laboratory attended the course (Table 1). As agreed, the training was focused on the analysis of pesticides, marker PCBs in ambient air, sediments and mother milk. To this end, some instruments placed at the laboratory were used. Concretely, some experiments with real samples were mostly analyzed by GC-ECD, even though GC-FID was also available for the training.

The training was focused on the analysis of OCP by GC-ECD. In particular, air, milk and mineral were some examples of matrices subject of study. Among different experiences and discussions, a number of real samples were subject of analysis during whole training course with the aim to get basic experience with real samples. Continuing the training, some e-mails were exchanged in which supplementary information as well as some SOPs was provided.

Table 1. List of attendants participating in the Capacity Building Training Course on POPs carried out at the Department of Analytical Services in St John´s (Antigua), Kingston between the 25th and the 29th March 2019.

Full Name
Linroy Christian
Laël Bertide-Josiah
Kadine Gomes
Ayokunle Ogunbiyi
Eden Bird
Ian Francis
J Gahmarn Thomas
Jermel Charles

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Also, some pictures taken during the course are also provided (Figure 1).

Figure 1. Pictures taken during the training course in Antigua.

2. Signature/Date

Dr. Esteban Abad
Laboratory of Dioxins, IDAEA-CSIC

Thursday, 11 July 2019

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United Nations Environment Programme

CAPACITY BUILDING AND TRAINING COURSES – Report for ARGENTINA -

Training dates: From: 30th February 2019 To: 4th October 2019

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC, MTM (University of Örebro)
Trainee: Argentina

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs in ARGENTINA

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training ancd capacity building courses on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training is based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention.

Table 1 shows the Trainings and Capacity Building courses organized in Jamaica, Brazil, Uruguay, Barbados, Antigua and Barbuda between 2018 and 2019.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Argentina. In this sense, Argentina asked to be trained on the analysis of fluorinated contaminants, PFAS, in a variety of matrices including water, mother milk and human serum. The training was performed at the Instituto Nacional de Tecnología Industrial, hereafter, INTI.

Table 1. Training and Capacity Building courses performed during 2018-2019.

Country	Dates
Antigua & Barbuda	25/03/19 to 29/03/19
Argentina	20/09/19 to 04/10/19
Barbados	28/05/18 to 01/06/18
Brazil	19/02/18 to 23/02/18
Colombia	27/11/17 to 01/12/17
Jamaica	22/01/18 to 26/01/18
Uruguay	16/04/18 to 20/04/18

1.2 Training and Capacity Building Course at Argentina.

The Training and Capacity Building course in Argentina was performed by Dr Esteban Abad from the CSIC in collaboration with Prof. Heidi Fiedler, Dr. Ingrid Ericson and Dr. Alina Koch from the MTM group of the University of Orebro. The training was given at the INTI in Buenos Aires, 30th September and 4th October 2019.

In total, 12 people attended the course (Figure 1) from several departments at INTI.

As agreed, the training was focused on the analysis of PFAS in water, mother milk and serum. As for the purposes of the training, a LC-MS instrument placed at the laboratory was available: HPLC-MS/MS (QqQ).

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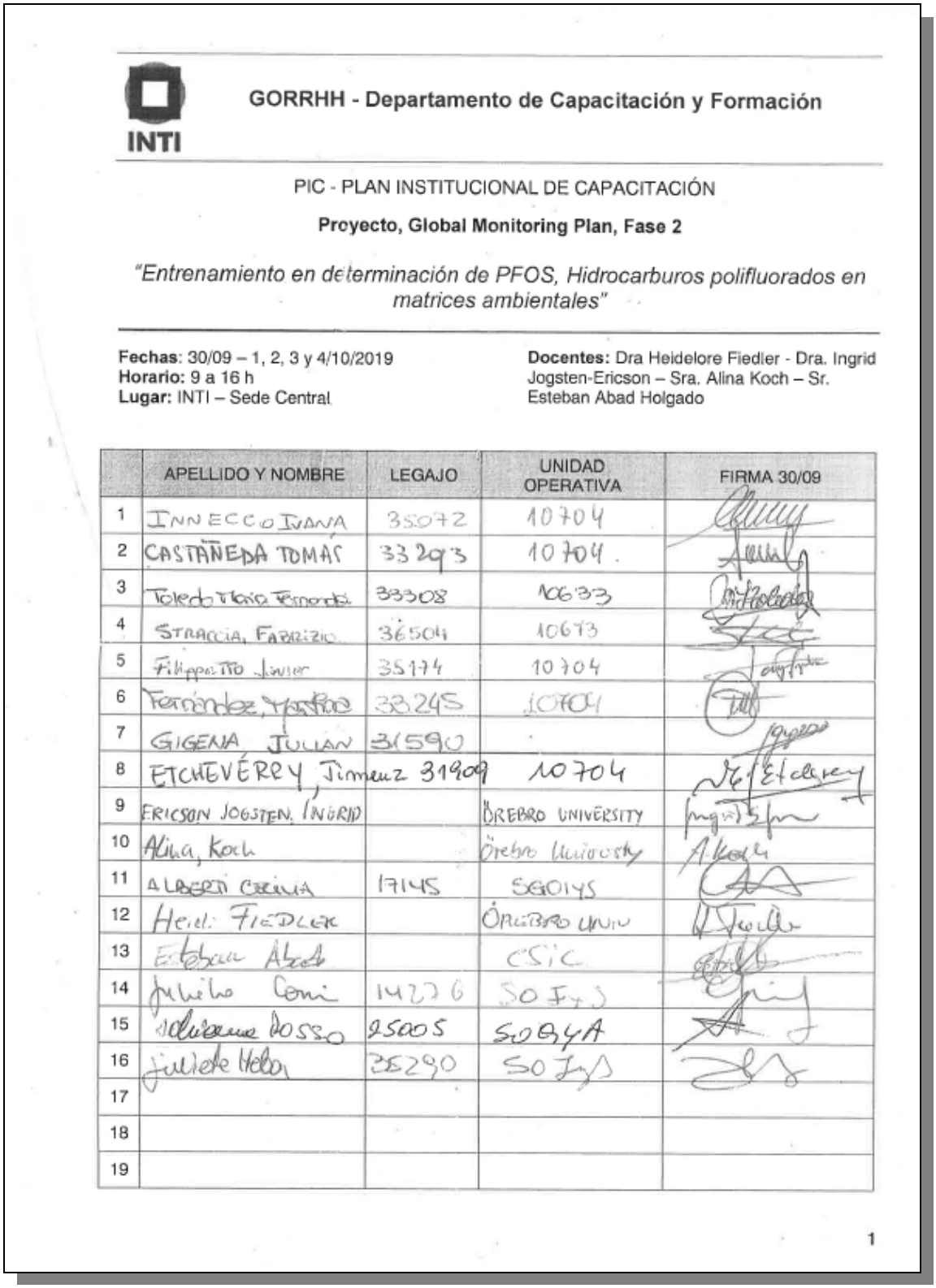

INTI

GORRHH - Departamento de Capacitación y Formación

PIC - PLAN INSTITUCIONAL DE CAPACITACIÓN

Proyecto, Global Monitoring Plan, Fase 2

"Entrenamiento en determinación de PFOS, Hidrocarburos polifluorados en matrices ambientales"

Fechas: 30/09 – 1, 2, 3 y 4/10/2019
Horario: 9 a 16 h
Lugar: INTI – Sede Central

Docentes: Dra Heidelore Fiedler - Dra. Ingrid Jogsten-Ericson – Sra. Alina Koch – Sr. Esteban Abad Holgado

	APELLIDO Y NOMBRE	LEGAJO	UNIDAD OPERATIVA	FIRMA 30/09
1	INNECCO IVANA	35072	10704	
2	CASTAÑEDA TOMAS	33293	10704	
3	Toledo Flavia Fernanda	33308	10633	
4	STRACCIA, FABRIZIO	36504	10673	
5	Filippetto Javier	35174	10704	
6	Fernández, Martina	33245	10704	
7	GIGENA, JULIAN	31590		
8	ETCHEVERRY, Jimena	31909	10704	
9	ERICSON JOGSTEN, INGRID		ÖREBRO UNIVERSITY	
10	Alina, Koch		Örebro University	
11	ALBERTI CARINA	17145	SGOIYS	
12	Heid. FIEDLER		ÖREBRO UNIV	
13	Esteban Abad		CSIC	
14	Julieta Coni	14276	SOIyS	
15	Adriana Bosso	25005	SOBYA	
16	Julieta Hebe	35290	SOIyS	
17				
18				
19				

1

Figure 1. List of attendants and teachers participating in the Capacity Building Training Course on POPs carried out at INTI, Buenos Aires, Argentina, between the 30th Setember 2019 and 4th October 2019.

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The course started on Monday, September 30th with an institutional presentation of the objectives pursued, followed by a short talk and introduction given by the teachers and finally a self introduction by participants attending the training.

In the following photographs you can see the entrance of INTI and the initiation meeting of the capacity building workshop (Figure 2).

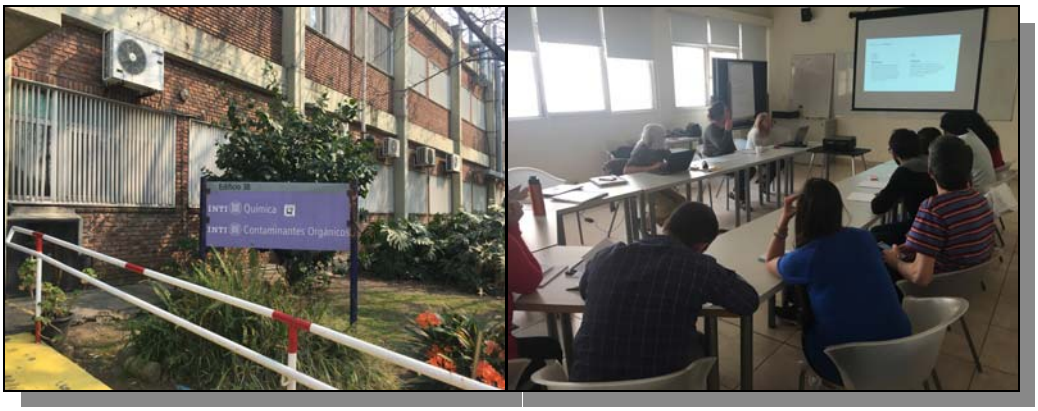

Figure 2. On-site training and capacity building course at INTI. First session: get together, objectives and goals.

Typically, the training and capacity building course is organized into two types of activities, a theoretical (Figure 3) and the most important practical part in the laboratories which occupied most of the time. This type of operational scheme work was adopted during the 5-day course, giving priority to the practical part.

Figure 3. Training course, morning session, theoretical part.

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In this figure is showed different moments during the theoretical sessions, prior to the start of the practical sessions. In these sessions theoretical notions were given, showing the materials and reagents that are going to be used so that the attendants were familiar prior to their use (Figure 4).

Figure 4. Short meeting at the laboratory to explain the tasks to be performed during the session as well as the reagents, standards and material to be used for.

Roughly, the practical training comprises two different parts, the sample preparation and the instrumental analysis. Sample preparation include the extraction of the contaminants (target compounds) from the bulk and the unavoidable clean up process to eliminate part of the raw material co-extracted during the extraction and other interfering substances prior to the instrumental analysis. In these pictures is showed some of these steps and discussions between teachers and participants on the analytical process (Figure 5).

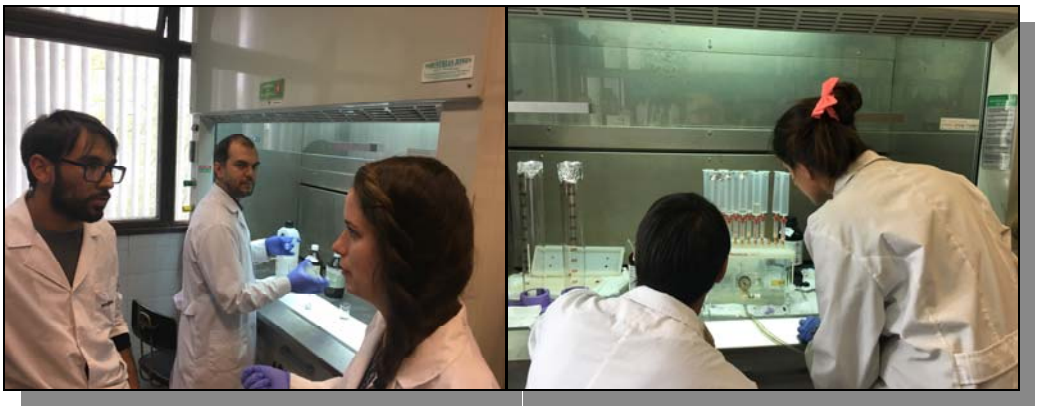

Figure 5. Analysis of PFAS in real samples: sample preparation.

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Special attention was paid on the instrumental part. The analysis of PFOS is based on the used o a hybrid combination of liquid chromatography coupled to mass spectrometry. In this case, the laboratory was equipped with a LC/MS (QqQ). LC was performed by high pressured liquid chromatography (HPLC). In this regard, it should pointed out that today HPLC is not the best option for the analysis of PFAS whereas UPLC becomes the most suitable and reliable approach for this purposes. Despite this inconvenience, strong efforts were made and analysis of PFOS was achieved (Figure 6).

Figure 6. Analysis of PFAS in real samples: Instrumental analysis by LC-MS (QqQ).

Afterwards, all efforts were focused on the achievement of good linearity, reproducibility and the analysis of real samples (Figure 7).

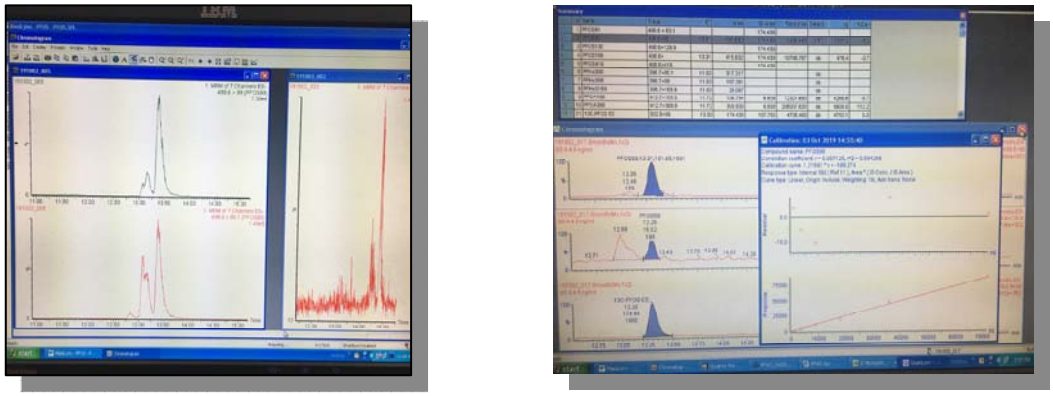

Figure 7. Participants running the HPLC/MS and some spectra on PFAS analysis.

As a conclusion, after 5-day training and capacity building focused on the analysis of PFAS in different environmental and biological samples, attendants were able to see and practice the full workflow commonly used for the analysis of such as contaminants, from the extraction to the quantification.

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2. Signature/Date

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CAPACITY BUILDING AND TRAINING COURSES – Report for BARBADOS -

Training dates: From: 28th May 2018 To: 1st June 2018

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Barbados

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs in BARBADOS

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention.

Figure 1 shows the Trainings and Capacity Building courses organized in Jamaica, Brazil, Uruguay and Barbados in the first semester of 2018.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Barbados.

Figure 1. Training and Capacity Building courses calendar for the first semester 2018.

1.2 Training and Capacity Building Course at Barbados.

The training in Barbados was conducted by Dr. Marinella Farré and Dr. Manuela Ábalos at the Department of Biological and Chemical Sciences, UWI-Cavehill-Bridgetown between May 28th and June 1st 2018.

In total, 7 people from 3 different institutions (Table 1) attended the course and training was mainly focused on the analysis of PFAS, PCB and pesticides in air and water. To this end, instrumentation available at the lab was used. Concretely, GC-ECD, and HPLC-MS /MS (QTOF) were employed. Unfortunately, GC-MS /MS (QqQ) was not operative for the training.

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Table 1. List of attendants participating in the Capacity Building Training Course on POPs carried out in Barbados, between the 28th May and 1st June 2018.

Full Name	Institution
Emma Smith	UWI
Joanne Simmons-Boyce	UWI
Kenville Grimes	UWI
Lionel Sobers	UWI
Marsha Skeete	Forensic Sciences Centre
Alex Waterman	Forensic Sciences Centre
Rasheeda Greene	Governmental Analytical Services

Figure 2 shows some pictures corresponding to a certain moment during the training in Barbados. In addition, achieved data obtained during the training is also showed in Figure 3.

Figure 2. Some pictures of both attendants and teachers during the training in Barbados.

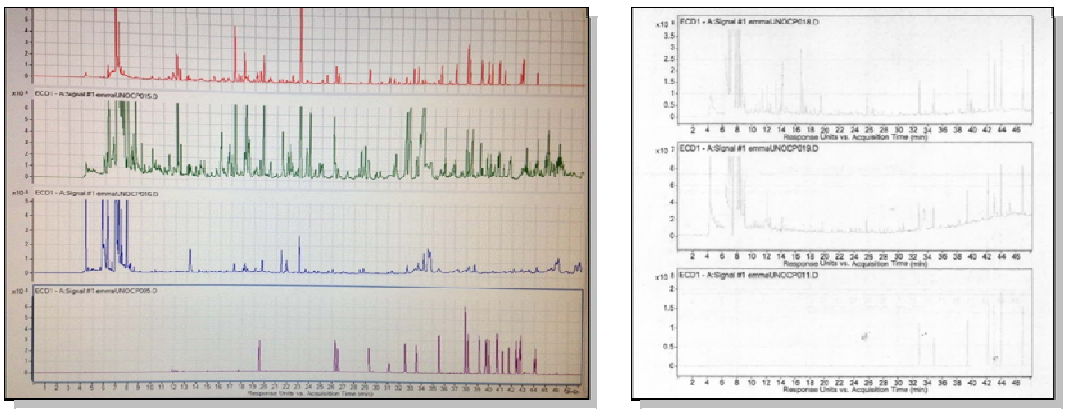

Figure 3. Chromatograms and PCBs and pesticides achieved during the training in Barbados.

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2. Signature/Date

Dr. Esteban Abad
Laboratory of Dioxins, IDAEA-CSIC

Thursday, 20 December 2018

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CAPACITY BUILDING AND TRAINING COURSES – Report for BRAZIL -

Training dates: From: 19th February 2018 To: 23rd February 2018

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC, MTM (University of Örebro)
Trainee: Brazil

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs in BRAZIL

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training was based on the analysis of real samples and standards,. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention.

Figure 1 shows the Trainings and Capacity Building courses organized in Jamaica, Brazil, Uruguay and Barbados in the first semester of 2018.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Brazil.

Figure 1. Training and Capacity Building courses calendar for the first semester 2018.

1.2 Training and Capacity Building Course at Brazil.

The Training and Capacity Building course in Brazil was performed by Dr Esteban Abad from the CSIC in collaboration with Prof. Heidi Fiedler and Pof. Leo Yeung from the MTM group of the University of Örebro. The training was given at the Companhia Ambiental do Estado de São Paulo (CETESB) in Sao Paolo 19th and 23sd February 2018.

In total, 13 people attended the course (Table 1) from 2 different institutions: 12 people from CETESB and 1 person from the Oswaldo Cruz Foundation (FIOCRUZ).

As agreed, the training was focused on the analysis of PBDEs and PFAS in ambient air, and water. Nevertheless, other biological matrices were also examined for PFAS. To this end, some instruments placed at the laboratory were available at CETESB: GC-ECD, GC-MS (CI), GC-MS/MS (QqQ), HRGC-HRMS, HPLC-MS/MS(Q-TOF). For the purpose of this training only GC-MS, GC-MS/MS and HPLC-MS/MS (Q-TOF) were used.

In addition to that, the training also included the use of a high volume sampling device with the end to collect ambient air in the GRULAC region using an active sampling device.

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As examples, next figures show some spectra achieved during the training course. On the left side is shown a chromatogram of PBDEs, whereas on the right part is given a chromatogram of PFAS achieved as for the first time in CETESB (Figure 2).

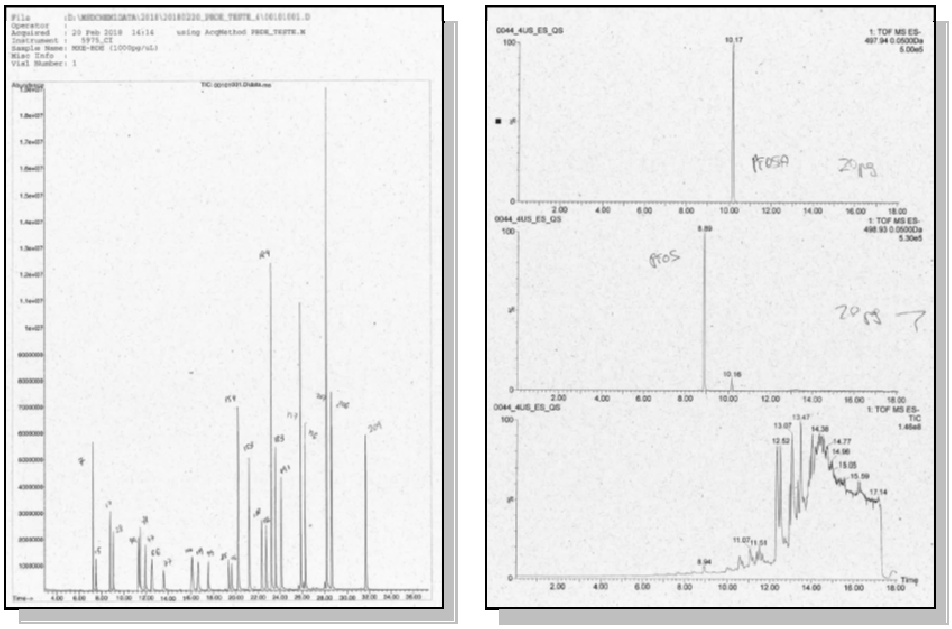

Figure 2. On left a chromatogram of PBDEs and on right a chromatogram of PFAS.

Table 1. List of attendants participating in the Capacity Building Training Course on POPs carried out at CETESB, Sao Paolo, Brazil, between the 19th and 23th February 2018.

Full Name	Institution
Giacomo Camillo Grizzo Cuocco	CETESB
Maria Cristina N. de Oliveira	CETESB
Ivo Freitas de Oliveira	CETESB
Bárbara Held	CETESB
Camila Rodrigues da Silva	CETESB
Carlos Alberto Marques de Souza	CETESB
José Reinaldo Leite Barros	CETESB
Neusa Akemi Niwa	CETESB
Maíra Mendes Lopes	CETESB
Lenice da Silva Guimarães	CETESB
Neusa Akemi Niwa	CETESB
Maria Yumiko Tominaga	CETESB
Thomas Manfred Krauss	Fundação Oswaldo Cruz – FIOCRUZ Instituto Nacional de Controle de Qualidade em Saúde – INCQS

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Figure 3. Some moments during the training course in Brazil.

1.3 Shipment of Sampling Equipment

As part of the tasks carried out by CSIC, in 2017 some arrangements were done in collaboration with the Regional Centre in Uruguay to provide a high volume air sampler in the GRULAC region. Concretely, the hosting participant of the high volume air sampler was the CETESB in Sao Paolo.

The high volume sampler was purchased in Barcelona (MCV, Cerdanyola, Barcelona, Spain) through the supervision of the CSIC and shipped to the CETESB. At present, the system is ready to be use and the CETESB is in a position to collect ambient air samples using the active air sampler (See Figure 4).

Figure 4. Pictures showing installation of an active air sampler and the training in Brazil.

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CAPACITY BUILDING AND TRAINING COURSES – Report for CHILE -

Training dates: **From:** 30th November 2020 **To:** 15th December 2020

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Chile

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1. CAPACIYTY BUIDING AND ON-LINE TRAINING COURSES ON POPs in CHILE

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Argentina, Colombia, Brazil and Mexico and on-line training on POP analyses in the following countries: Perú, Chile and Ecuador.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention. Final decision on analytes and matrices is taken by countries in close agreement with Expert lab and depends mainly on the country capacity in terms of instruments, reagents, and of course, needs.

Figure 1 shows the Trainings and Capacity Building courses calendar organized.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Chile.

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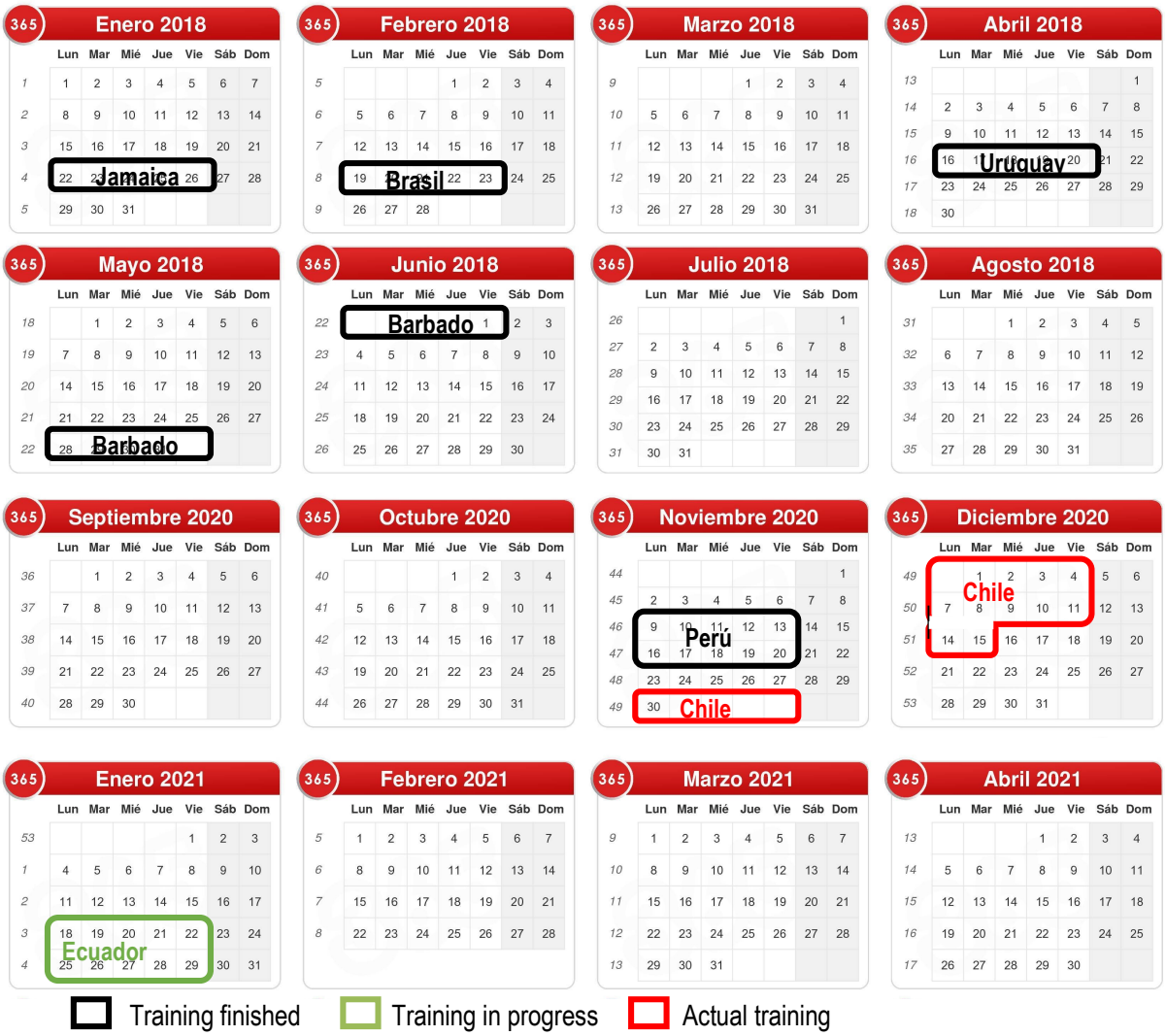

Figure 1. Training and Capacity Building courses calendar.

1.2 Training and Capacity Building Course at Chile.

The Training and Capacity Building course in Chile was given by M.G. Martrat, M.A. Adrados and J. Parera, from the Laboratory of Dioxins of CSIC in Barcelona (Expert Laboratory for the GRULAC Region). The training was given on-line with the participation of the Departamento de Salud Ambiental – Supdepartamento del Ambiente, Instituto de Salud Pública de Chile in Ñuñoa, Santiago (Chile) and the Laboratorio de Ensayos, Centro EULA, Universidad de Concepción in Concepción (Chile), between 30th November and 15th December 2020.

In total, 9 people attended the course from 2 different institutions (See Table 1): 6 people from ISP and 3 people from EULA. Some pictures taken during training are giving in Figure 2.

As agreed, the training was focused on the analysis of PCB and Pesticides in air and milk samples. To this end, instrumentation available at the lab was used. Among the instrumentation available at ISP, a GC-ECD was

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available to be used during the training. Figure 3 shows a GC-ECD chromatogram corresponding to the analysis of PCBs analysed during the training.

Table 1. List of attendants participating in the online Capacity Building Training Course on POPs, between the 30th November and 15th December 2020.

Full Name	Institution
Luis Honda	ISP
Muriel Alfaro	ISP
Nancy Barrio	ISP
Lourdes Jachero	ISP
Natalia Torrejón	ISP
Patricia Venegas	ISP
Katia Ramírez	EULA
María Pérez	EULA
Floria Roa Gutierrez*	EULA*

*Research visit at EULA from Instituto Tecnológico de CostaRica (TEC)

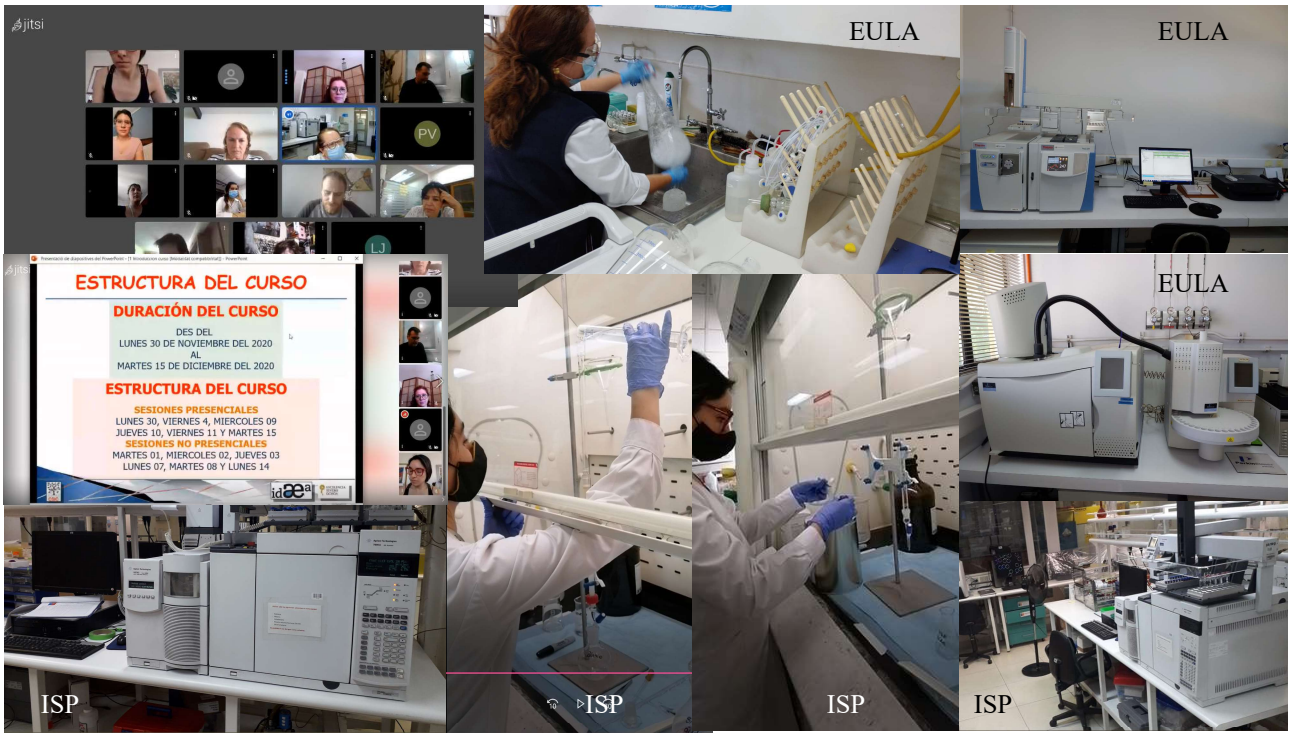

Figure 2. Some pictures from the training course on PCB and Pesticides in Chile.

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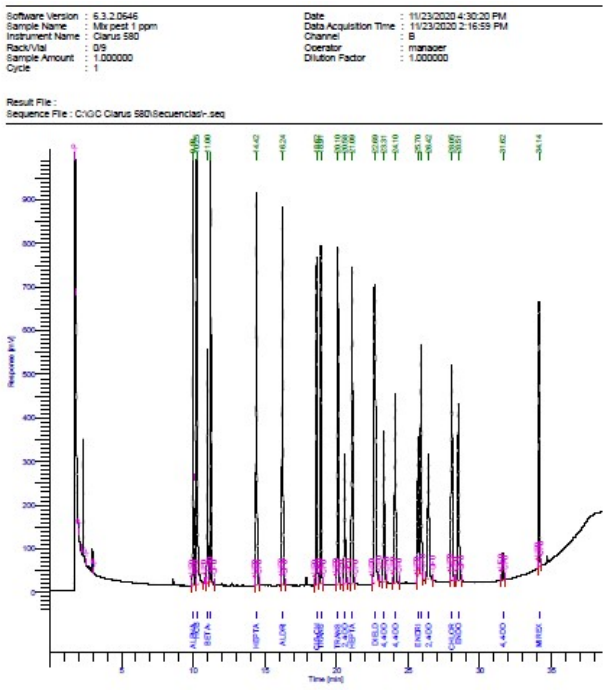
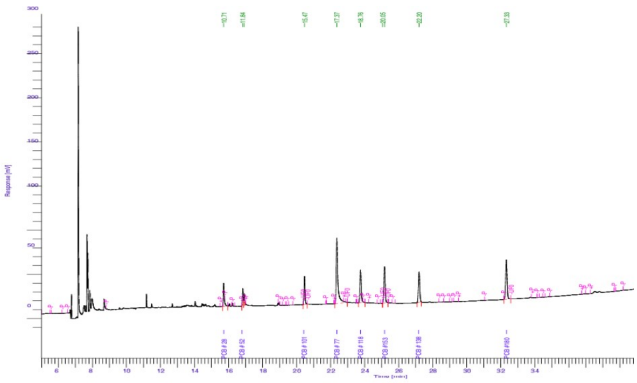
A



B



B

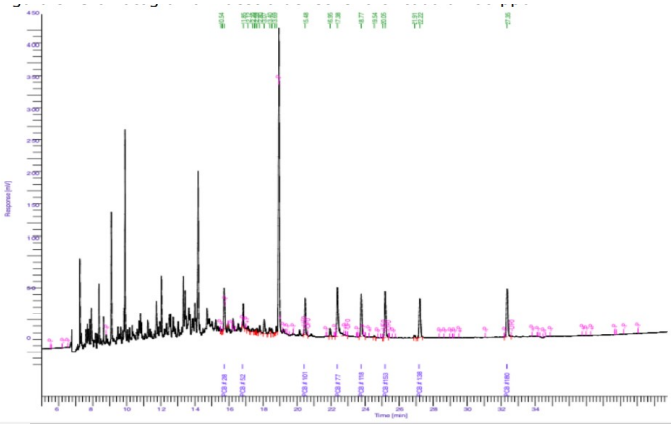


Figure 3. GC-ECD chromatograms achieved during the training course of (A) a standard mixture of pesticides, (B) a standard solution of marker PCB (50 ppb) and (C) a milk sample spiked with marker PCBs (100 ppb) from ISP.

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Finally, Annex I show the supplementary information generated during the preparation and performance of the online training, as well as the evidence provided by the country and the follow-up of the training that has been carried out by CSIC. Annex II show the Laboratroy of the Instituto Tecnológico de Costa Rica.

2. Signature/Date

Dr. Esteban Abad
Laboratory of Dioxins, IDAEA-CSIC

Thursday, 24th December 2020

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ANNEX I

SUPPLEMENTARY INFORMATION ON-LINE TRAINING CHILE

General

1. Programa curso 30 noviembre al 15 diciembre 2020
2. Listado participantes entrenamiento

Presentaciones Powerpoint realizadas durante las sesiones presenciales

3. Kick-off meeting lunes 30 noviembre
4. Presentación Powerpoint lunes 30 noviembre - Introducción curso
5. Presentación Powerpoint viernes 4 noviembre - Extracción purificación
6. Presentación Powerpoint viernes 4 noviembre – Captación de aire
7. Presentación Powerpoint viernes 11 diciembre – Esquemas analíticos 1
8. Presentación Powerpoint viernes 11 diciembre - esquemas analíticos 2
9. Presentación Powerpoint miercoles 15 diciembre - esquemas analíticos 3
10. Presentación Powerpoint miércoles 15 diciembre – Resumen general

Videos elaborados por el CSIC

11. Video extracción leche materna
12. Video extracción OCP en aire
13. Video extracción PCB en aire
14. Video filtración sobre sulfato de sodio
15. Video acondicionamiento espumas PUF
16. Video limpieza material laboratorio
17. Video limpieza sílice
18. Video preparación Alúmina 8%
19. Video preparación sílice 1,5%
20. Video preparación sílice acida 44%
21. Video preparación sílice básica 33%
22. Video preparación y realización columna alúmina 8%
23. Video preparación y realización columna Florisil OCP
24. Video preparación y realización columna Florisil PCB
25. Video preparación y realización columna sílice acida pipeta Pasteur
26. Video preparación y realización columna sílice multicapa
27. Video preparación y realización columna silice1,5%

Procedimientos preparados por el CSIC

28. Procedimiento extracción en aire
29. Procedimiento extracción en leche materna
30. Procedimiento limpieza de material de vidrio
31. Procedimiento acondicionamiento PUFs
32. Procedimiento limpieza sílice
33. Procedimiento preparación alúmina 8%
34. Procedimiento preparación sílice 1,5%
35. Procedimiento preparación sílice acida 44%
36. Procedimiento preparación sílice básica 33%
37. Procedimiento preparación y realización columna alúmina 8%
38. Procedimiento preparación y realización columna Florisil OCPs

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39. Procedimiento preparación y realización columna Florisil PCBs
40. Procedimiento preparación y realización columna sílice 1,5%
41. Procedimiento preparación y realización columna sílice acida pipeta
42. Procedimiento preparación y realización columna sílice multicapa 6/1/12
43. Procedimiento preparación y realización columna sílice multicapa 60/5/120

Grabaciones sesiones on-line

44. Video sesión inicial 30 noviembre 2020
45. Video sesión resolución dudas 15 diciembre 2020
46. Video sesión final 15 diciembre 2020

Resultados aportados

47. Fotos instalaciones laboratorio ISP
48. Presentación PowepPoint centro EULA
49. Video presentación centro EULA
50. Video limpieza material vidrio ISP
51. Video limpieza sílice ISP
52. Video preparación sílice acida ISP
53. Video preparación sílice básica ISP
54. Video realización sílice multicapa ISP
55. Video filtración sobre sulfato de sodio anhidro ISP
56. GC-ECD cromatograma PCBs mix 1 ppm ISP
57. GC-ECD cromatograma pesticidas 1 ppm ISP
58. Limpieza material laboratorio limpieza silice EULA
59. Informe COPs en leche ISP
60. Respuesta informe COPs en leche CSIC

E-mails y Whatsapp seguimiento del entrenamiento on-line

61. E-mails de seguimiento del entrenamiento on-line
62. Whatsapp de seguimiento del entrenamiento on-line

Cuestionarios de afianzamiento de los conocimientos adquiridos

63. Cuestionario entrenamiento aire
64. Respuestas de los participantes al cuestionario entrenamiento aire
65. Cuestionario entrenamiento aire resuelto por el lab experto
66. Cuestionario entrenamiento leche materna
67. Respuestas de los participantes al cuestionario entrenamiento leche materna
68. Cuestionario entrenamiento leche materna resuelto por el lab experto

FAQs

69. FAQs

Valoración del entrenamiento on-line realizada por Chile

70. Email valoración del entrenamiento on-line realizado por Chile

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ANNEX II

SUPPLEMENTARY INFORMATION ABOUT LABORATORIO DEL INSTITUTO TECNOLÓGICO DE COSTA RICA

71. Presentación PowerPoint Laboratorios del Instituto Tecnológico de Costa Rica

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CAPACITY BUILDING AND TRAINING COURSES – Report for URUGUAY -

Training dates: From: 28th November 2017 To: 2nd December 2017

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Colombia

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs in COLOMBIA

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training was based on the analysis of real samples and standards,. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention.

Figure 1 shows the Trainings and Capacity Building courses organized in Jamaica, Brazil, Uruguay and Barbados in the first semester of 2018.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Colombia.

Figure 1. Training and Capacity Building courses calendar for the first semester 2018.

1.2 Training and Capacity Building Course at Colombia.

The Capacity Building training course organized for Colombia was performed in Colombia in 2017. More concretely, the training was performed between 28th November and 2nd December 2017. The training was given in the city of Medellin at the SIU (Sede de Investigación Universitaria - University of Antioquia, UdeA). The hosting research group was GDCON, leaded by Prof. Gustavo Peñuela, and Mr. Andrés Ramírez as a main people in charge.

In total, 9 people from 6 different institutions attended the training course. Table 1 shows a list of attendants and the corresponding institution.

In general, the training was based on the analysis of real samples, both biotic (milk, emulating mother milk) and abiotic (polyurethane foam for air samples). The target compounds were the analysis of basic POPs and congener-specific analysis of individual marker PCBs. Instrumental was based on the used of both, GC-ECD and GC-LRMS. In Figure 2, a number of pictures of the Capacity Building Training Course in Colombia are given. These pictures show different moments and stages of the analysis of basic POPs and marker PCBs and some of the obtained chromatograms.

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Table 1. List of attendants participating in the Capacity Building Training Course on POPs carried at the SIU in Medellin, Colombia between November and December 2017.

Full Name	Institution	Position
Camilo Zapata Mora	Universidad Nacional sede Manizales - Departamento de Ingeniería Química	Estudiante de Maestría en Ingeniería Ambiental, apoya las redes internacionales de monitoreo de COPs en Colombia
Daniela Suárez Avendaño	Universidad Pontificia Bolivariana - Laboratorio Ambiental	Analista de Laboratorio
Diego Arcelio Rico Sierra	Corporación Autónoma Regional de Cundinamarca (CAR) - Dirección de Monitoreo-Modelación y Laboratorio Ambiental (DMMLA) – Área de cromatografía	Analista de laboratorio
Carlos Martín Velásquez Ramírez	IDEAM - Grupo Laboratorio de Calidad Ambiental	Líder Técnico Grupo Laboratorio de Calidad Ambiental IDEAM
Carolina Ramirez García	Ministerio de Ambiente y Desarrollo Sostenible – DAASU	Consultora - Proyectos Convenio de Estocolmo
Adrian Muñoz Calderon	Universidad de Antioquia - GDCON	Analista de laboratorio
Sara Elisa Gallego	Universidad de Antioquia - GDCON	Analista de laboratorio
Duvan Esteban Hoyos Ossa	Universidad de Antioquia - GDCON	Coordinador Área Instrumental.
Boris Santiago Ávila	Universidad de Antioquia - GDCON	Analista del proyecto encargado del muestreo de leche materna.

Figure 2. Capacity Building Training Course carried at the SIU (University of Antioquia, UdeA) in Medellín, Colombia between 28th November and 2nd December 2017.

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2. Signature/Date

Dr. Esteban Abad
Laboratory of Dioxins, IDAEA-CSIC

Thursday, 20 December 2018

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CAPACITY BUILDING AND TRAINING COURSES – Report for ECUADOR -

Training dates: **From:** 18th January 2021 **To:** 29th January 2021

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Ecuador

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1. CAPACIYTY BUIDING AND ON-LINE TRAINING COURSES ON POPs in ECUADOR

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Argentina, Colombia, Brazil and Mexico and on-line training on POP analyses in the following countries: Perú, Chile and Ecuador.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention. Final decision on analytes and matrices is taken by countries in close agreement with Expert lab and depends mainly on the country capacity in terms of instruments, reagents, and of course, needs.

Figure 1 shows the Trainings and Capacity Building courses calendar organized.

This report refers to the activities carried out during the Capacity Building and Training Course organized for Ecuador.

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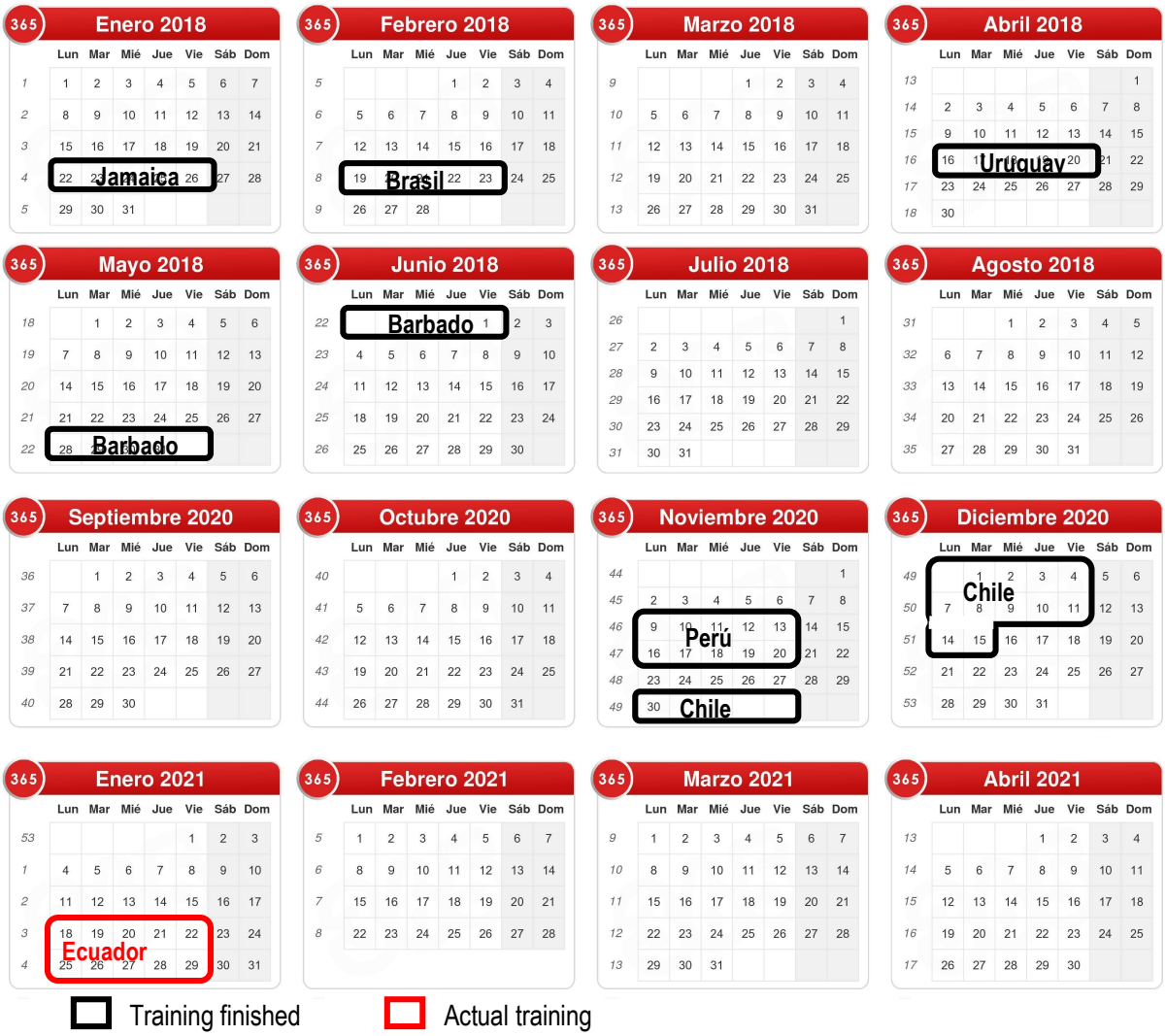

Figure 1. Training and Capacity Building courses calendar.

1.2 Training and Capacity Building Course at Ecuador.

The Training and Capacity Building course in Ecuador was given by M.G. Martrat, M.A. Adrados and J. Parera, from the Laboratory of Dioxins of CSIC in Barcelona (Expert Laboratory for the GRULAC Region). The training was given on-line with the participation of the Agencia de Regulación y Control Fito y Zoosanitario – AGROCALIDAD – Quito (Ecuador), Escuela Superior Politécnica del Litoral (ESPOL) – Laboratorio de Análisis Químico Instrumental, Facultad de Ciencias Naturales y Matemáticas, Guayaquil (Ecuador) and Ministerio de Energía y Recursos Naturales No Renovables (MEER), Dirección de Aplicaciones Nucleares y Cooperación Técnico, Quito (Ecuador), between 18th and 29th January 2021.

In total, 6 people attended the course from 3 different institutions (See Table 1): 2 people from Agrocalidad, 3 people from ESPOL and 1 people from MEER. Some pictures taken during training are giving in Figure 2.

As agreed, the training was focused on the analysis of PCB and Pesticides in water, air, biota, soil and milk samples. To this end, instrumentation available at the lab was used. Among the instrumentation available at

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Agrocalidad, a GC-ECD was available to be used during the training. Figure 3 shows a GC-ECD chromatogram corresponding to the analysis of PCBs analysed during the training.

Table 1. List of attendants participating in the online Capacity Building Training Course on POPs, between the 18th and 29th January 2021.

Full Name	Institution
Silvana Yolanda Díaz Castro	AGROCALIDAD
Alexander Medina Lopez	AGROCALIDAD
Cesar Ramiro Castro Palacios	MEER
Joan Vera Villalobos	ESPOL
Christian Alberto Moreno Alvarado	ESPOL
Julio Andrei Cedeno Esobar	ESPOL

Figure 2. Some pictures from the training course on PCB and Pesticides in Ecuador.

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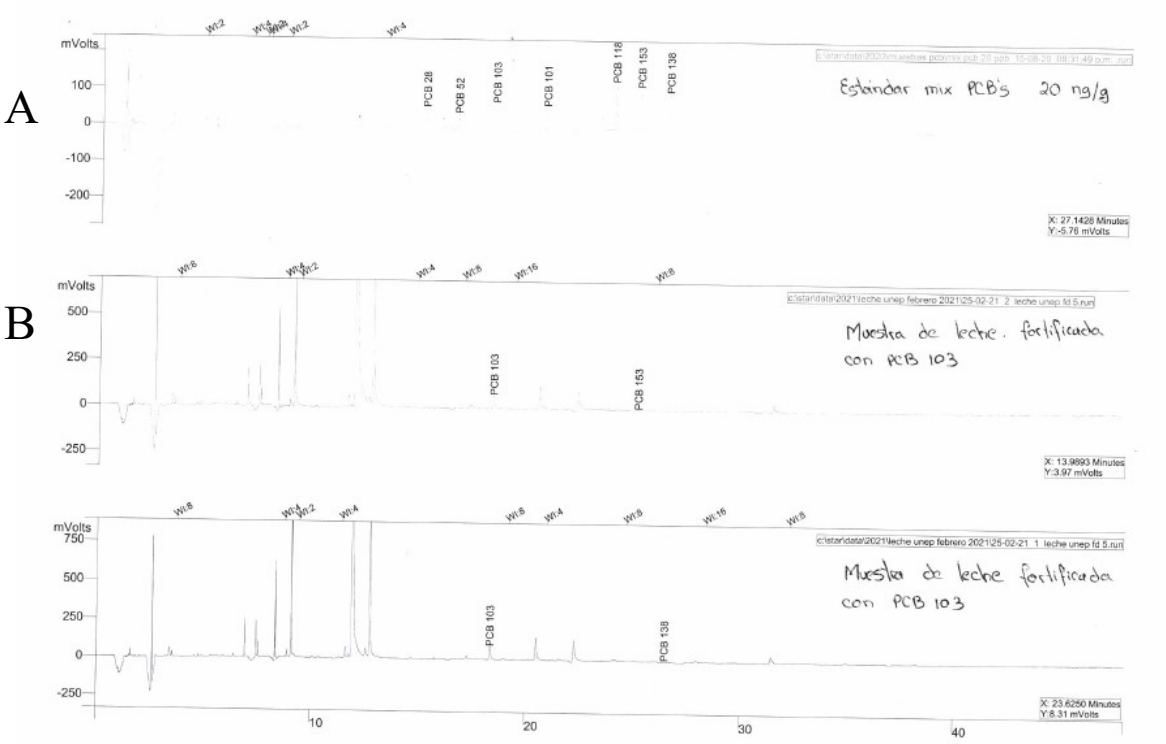

Figure 3. GC-ECD chromatograms achieved during the training course of (A) a standard mixture of PCBs and (B) a milk sample fortified with CB-103 from Agrocalidad.

Finally, Annex I show the supplementary information generated during the preparation and performance of the online training, as well as the evidence provided by the country and the follow-up of the training that has been carried out by CSIC.

2. Signature/Date

Dr. Esteban Abad
Laboratory of Dioxins, IDAEA-CSIC

Thursday, 4th February 2021

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ANNEX I

SUPPLEMENTARY INFORMATION ON-LINE TRAINING ECUADOR

General

1. Programa curso 18 al 29 enero 2021
2. Listado participantes entrenamiento

Presentaciones Powerpoint realizadas durante las sesiones presenciales

3. Kick-off meeting lunes 18 enero
4. Presentación Powerpoint lunes 18 enero - Introducción curso
5. Presentación Powerpoint miercoles 27 enero - Esquemas
6. Presentación Powerpoint viernes 29 enero - esquemas analíticos 1
7. Presentación Powerpoint viernes 29 enero - esquemas analíticos 2
8. Presentación Powerpoint viernes 29 enero - esquemas analíticos 3
9. Presentación Powerpoint viernes 29 enero - esquemas analíticos 4
10. Presentación Powerpoint viernes 29 enero - esquemas analíticos 5
11. Presentación Powerpoint viernes 29 enero - esquemas analíticos 6
12. Presentación Powerpoint viernes 29 enero - esquemas analíticos 7
13. Presentación Powerpoint viernes 29 enero – Captación aire
14. Presentación Powerpoint viernes 29 enero – PBDEs

Videos elaborados por el CSIC

15. Video extracción leche materna
16. Video extracción OCP en aire
17. Video extracción PCB en aire
18. Video extracción aguas
19. Video extracción biota
20. Video extracción suelos
21. Video filtración sobre sulfato de sodio
22. Video acondicionamiento espumas PUF
23. Video limpieza material laboratorio
24. Video limpieza sílice
25. Video liofilización
26. Video preparación Alúmina 8%
27. Video preparación sílice 1,5%
28. Video preparación sílice acida 44%
29. Video preparación sílice básica 33%
30. Video preparación sílice nitrato de plata
31. Video preparación y realización columna alúmina 8%
32. Video preparación y realización columna Florisil OCP
33. Video preparación y realización columna Florisil PCB
34. Video preparación y realización columna sílice acida pipeta Pasteur
35. Video preparación y realización columna sílice multicapa
36. Video preparación y realización columna silice1,5%
37. Video preparación y realización columna alúmina PBDEs
38. Video preparación y realización columna sílice nitrato de plata

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Procedimientos preparados por el CSIC

39. Procedimiento extracción leche materna
40. Procedimiento extracción en aire
41. Procedimiento extracción PBDEs en aire
42. Procedimiento extracción aguas
43. Procedimiento extracción biota
44. Procedimiento extracción suelos
45. Procedimiento acondicionamiento espumas PUF
46. Procedimiento limpieza material laboratorio
47. Procedimiento limpieza sílice
48. Procedimiento liofilización
49. Procedimiento preparación Alúmina 8%
50. Procedimiento preparación sílice 1,5%
51. Procedimiento preparación sílice acida 44%
52. Procedimiento preparación sílice básica 33%
53. Procedimiento preparación sílice nitrato de plata
54. Procedimiento preparación y realización columna alúmina 8%
55. Procedimiento preparación y realización columna Florisil OCP
56. Procedimiento preparación y realización columna Florisil PCB
57. Procedimiento preparación y realización columna sílice acida pipeta Pasteur
58. Procedimiento preparación y realización columna sílice multicapa 60/5/120
59. Procedimiento preparación y realización columna sílice multicapa 6/1/12
60. Procedimiento preparación y realización columna silice1,5%
61. Procedimiento preparación y realización columna alúmina PBDEs
62. Procedimiento preparación y realización columna nitrato de plata

Grabaciones sesiones on-line

63. Video sesión inicial 18 enero 2021
64. Video sesión resolución dudas 04 febrero 2021
65. Video sesión final 11 febrero 2021

Resultados aportados

66. Video instalaciones laboratorio AGROCALIDAD
67. Video extracción leche materna AGROCALIDAD
68. Video purificación extracto leche materna AGROCALIDAD
69. Video purificación y fraccionamiento PCBs leche materna AGROCALIDAD
70. Cromatograma PCBs en leche materna AGROCALIDAD 1
71. Cromatograma PCBs en leche materna AGROCALIDAD 2
72. Informe final extracción leche materna AGROCALIDAD
73. Presentación PowepPoint centro ESPOL
74. Fotos centro MEER

E-mails y Whatsapp seguimiento del entrenamiento on-line

75. Whatsapp de seguimiento del entrenamiento on-line

Cuestionarios de afianzamiento de los conocimientos adquiridos

76. Cuestionario entrenamiento aire
77. Respuestas de los participantes al cuestionario entrenamiento aire
78. Cuestionario entrenamiento aire resuelto por el lab experto

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79. Cuestionario entrenamiento leche materna
80. Respuestas de los participantes al cuestionario entrenamiento leche materna
81. Cuestionario entrenamiento leche materna resuelto por el lab experto
82. Cuestionario entrenamiento aguas
83. Respuestas de los participantes al cuestionario entrenamiento aguas
84. Cuestionario entrenamiento aguas resuelto por el lab experto
85. Cuestionario entrenamiento suelos
86. Respuestas de los participantes al cuestionario entrenamiento suelos
87. Cuestionario entrenamiento suelos resuelto por el lab experto
88. Cuestionario entrenamiento biota
89. Respuestas de los participantes al cuestionario entrenamiento biota
90. Cuestionario entrenamiento biota resuelto por el lab experto
91. Cuestionario final
92. Respuesta de los participantes al cuestionario final
93. Cuestionario final resuelto por el lab experto

FAQs

94. FAQs

Valoración del entrenamiento on-line realizada por Ecuador

95. Email valoración del entrenamiento on-line realizado por Ecuador

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CAPACITY BUILDING AND TRAINING COURSES – Report for JAMAICA -

Training dates: From: 22nd January 2018 To: 26th January 2018

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Jamaica

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs in JAMAICA

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention.

Figure 1 shows the Trainings and Capacity Building courses organized in Jamaica, Brazil, Uruguay and Barbados in the first semester of 2018.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Jamaica.

Figure 1. Training and Capacity Building courses calendar for the first semester 2018.

1.2 Training and Capacity Building Course at Jamaica.

The Training and Capacity Building course was performed by Dr Manuela Ábalos and Dr Marinella Farré from the CSIC, at the Pesticide Research Laboratory, Kingston between the 22th and the 26th January 2018.

In total, 4 people from the Pesticide Research Laboratory attended the course (Table 1). As agreed, the training was focused on the analysis of pesticides, marker PCBs and PFAS in ambient air, sediments and mother milk. To this end, some instruments placed at the laboratory were used. Concretely, some experiments with real samples were analyzed by GC-ECD, GC-NPD, GC-MS and LC-MS/MS.

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Table 1. List of attendants participating in the Capacity Building Training Course on POPs carried out at the Pesticide Research Laboratory, Kingston between the 22th and the 26th January 2018.

Full Name	Institution
Prof. Tara Dasgupta	Pesticide Research Laboratory, UWI-Mona-Kingston, Jamaica
Ms Reena McKenzie	Pesticide Research Laboratory, UWI-Mona-Kingston, Jamaica
Babumon Thankappan	Pesticide Research Laboratory, UWI-Mona-Kingston, Jamaica
Dipali Nair	Pesticide Research Laboratory, UWI-Mona-Kingston, Jamaica

As examples, next figures show some spectra achieved during the training course (Figures 2-4).

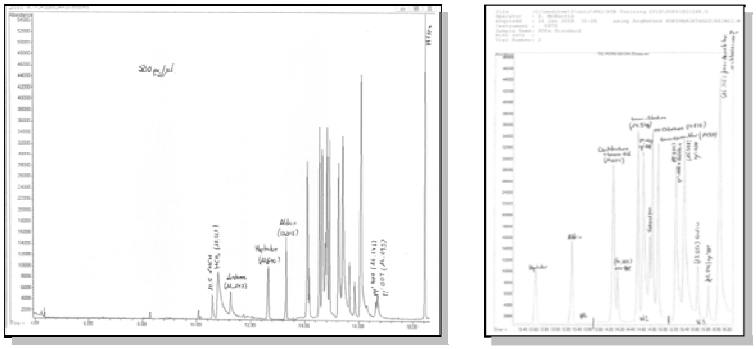

Figure 2. Analysis of basic POPs by ECD

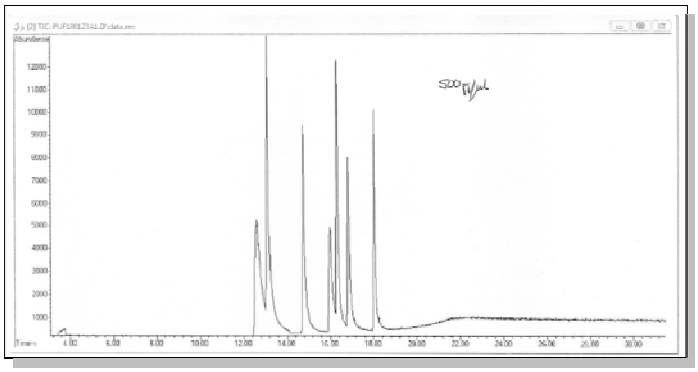

Figure 3. Analysis of marker PCBs

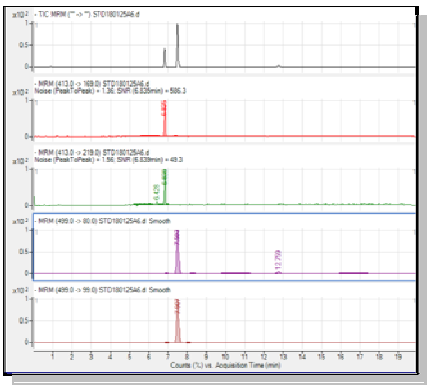

Figure 4. Analysis of PFAS by LC-MS/MS

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Also, some pictures taken during the course are also provided (Figure 5).

Figure 5. Pictures taken during the training course in Jamaica.

2. Signature/Date

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Laboratory of Dioxins, IDAEA-CSIC

Thursday, 20 December 2018

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United Nations Environment Programme

CAPACITY BUILDING AND TRAINING COURSES – Report for PERU -

Training dates: **From:** 09th November 2020 **To:** 20th November 2020

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Peru

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1. CAPACIYTY BUIDING AND ON-LINE TRAINING COURSES ON POPs in PERU

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Argentina, Colombia, Brazil and Mexico and on-line training on POP analyses in the following countries: Peru, Chile and Ecuador.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention. Final decision on analytes and matrices is taken by countries in close agreement with Expert lab and depends mainly on the country capacity in terms of instruments, reagents, and of course, needs.

Figure 1 shows the Trainings and Capacity Building courses calendar organized.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Peru.

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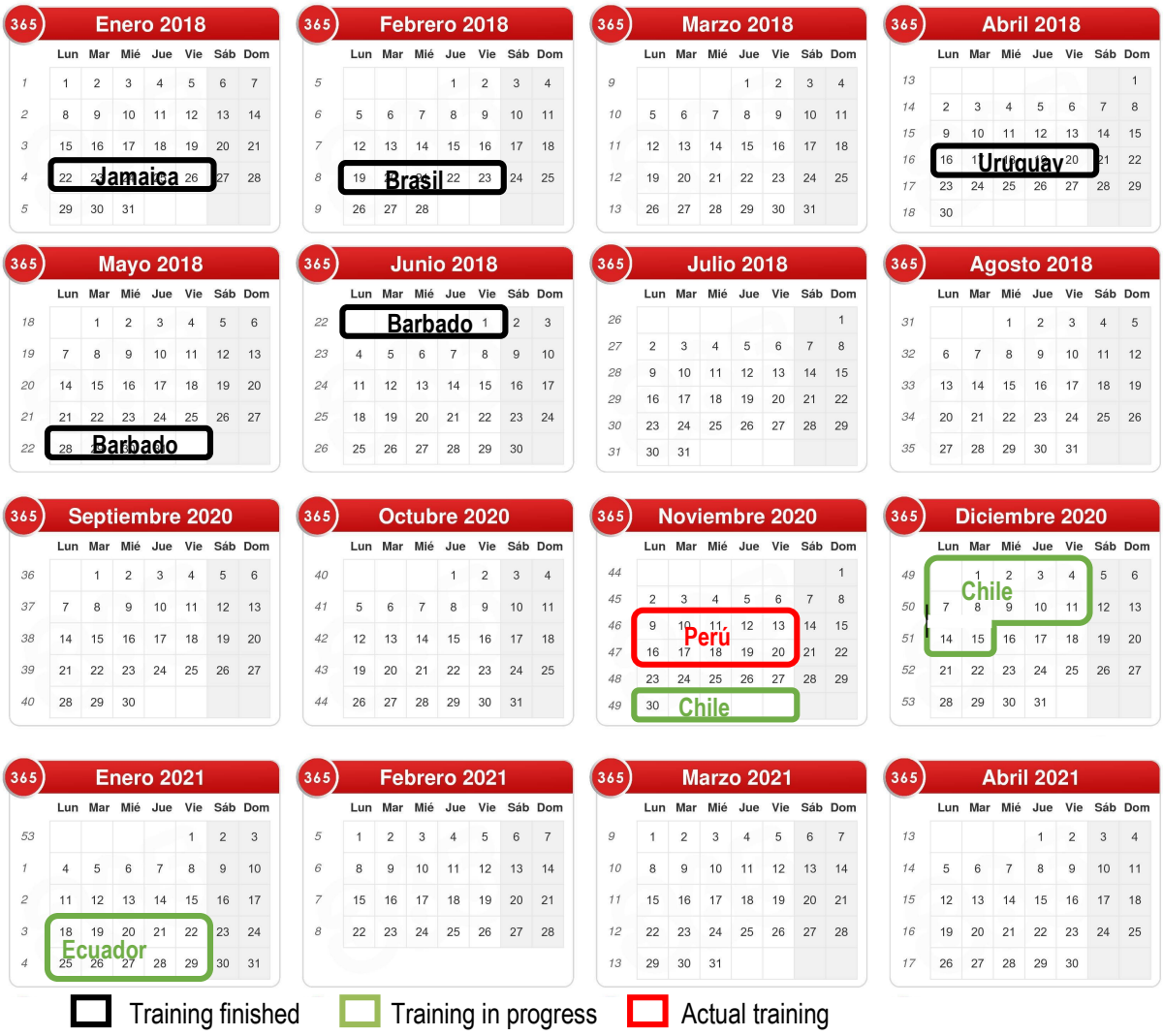

Figure 1. Training and Capacity Building courses calendar.

1.2 Training and Capacity Building Course at Peru.

The Training and Capacity Building course in Peru was given by M.G. Martrat, M.A. Adrados and J. Parera, from the Laboratory of Dioxins of CSIC in Barcelona (Expert Laboratory for the GRULAC Region). The training was given on-line with the participation of the Laboratorio de Control Ambiental – DIGESA MINSA in Lima (Peru) and the Laboratorio de Control Ambiental de la DIRESA in Apurímac (Peru), between 09th and 20th November 2020.

In total, 10 people attended the course from 2 different institutions (See Table 1): 9 people from DIGESA and 1 from DIRESA. Some pictures taken during training are giving in Figure 2.

As agreed, the training was focused on the analysis of PCB and Pesticides in air and milk samples. To this end, instrumentation available at the lab was used. Unfortunately, GC-ECD was not operative for the training due to the lack of gases.

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Table 1. List of attendants participating in the online Capacity Building Training Course on POPs, between the 09th November and 20th November 2020.

Full Name	Institution
Profesora Soledad Osorio	DIGESA
Químico Sixto Guevara Vásquez	DIGESA
Químico Carlos Lavado Atoc	DIGESA
Lourdes Hernández Uculmana	DIGESA
Químico Pier Ruiz Ponce	DIGESA
Marylu Godoy Chinchay	DIGESA
Técnico Raúl Laura Huanaco	DIGESA
Elva Jauregui López	DIGESA
Químico Omar Bravo Tirado	DIGESA
Ing. Química Nancy Monzón Pareja	DIRESA

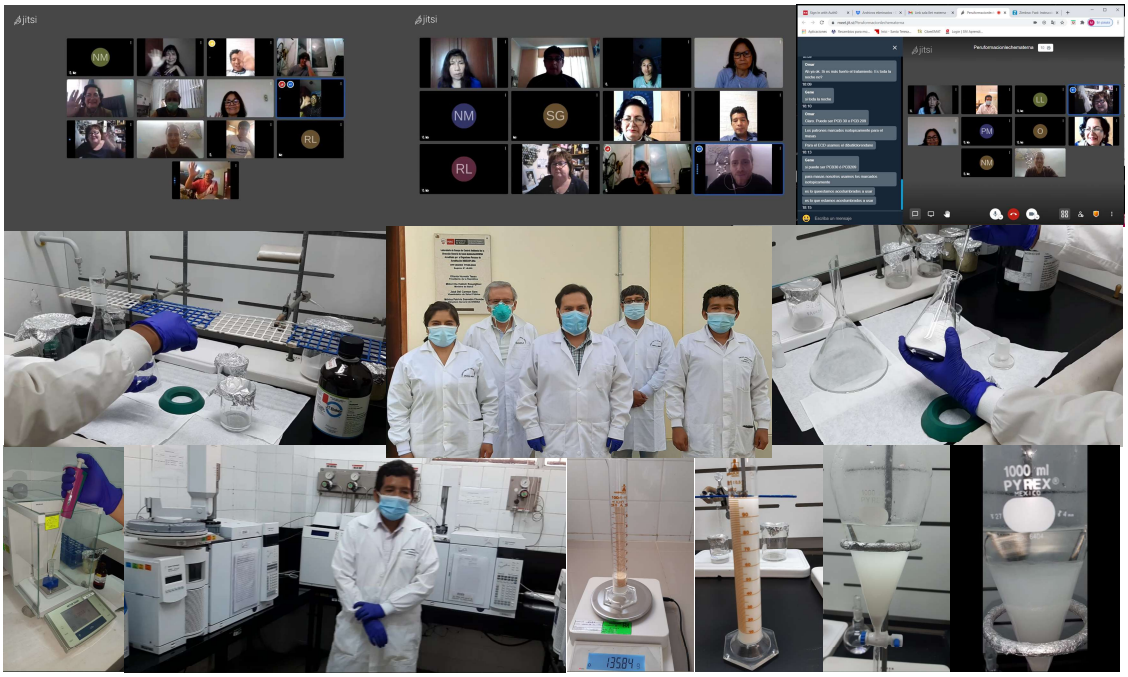

Figure 2. Some pictures from the training course on PCB and Pesticides in Peru.

Finally, Annex I show the supplementary information generated during the preparation and performance of the online training, as well as the evidence provided by the country and the follow-up of the training that has been carried out by CSIC.

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2. Signature/Date

Dr. Esteban Abad
Laboratory of Dioxins, IDAEA-CSIC

Thursday, 26 November 2020

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ANNEX I

SUPPLEMENTARY INFORMATION ON-LINE TRAINING PERU

General

1. Programa curso 9 al 20 noviembre 2020
2. Listado participantes entrenamiento

Presentaciones Powerpoint realizadas durante las sesiones presenciales

3. Kick-off meeting lunes 9 diciembre
4. Presentación Powerpoint lunes 9 diciembre - Introducción curso
5. Presentación Powerpoint jueves 12 diciembre - Extracción purificación
6. Presentación Powerpoint viernes 13 diciembre - esquemas analíticos 1
7. Presentación Powerpoint viernes 13 diciembre - esquemas analíticos 2
8. Presentación Powerpoint viernes 13 diciembre - esquemas analíticos 3

Videos elaborados por el CSIC

9. Video extracción leche materna
10. Video extracción OCP en aire
11. Video extracción PCB en aire
12. Video filtración sobre sulfato de sodio
13. Video acondicionamiento espumas PUF
14. Video limpieza material laboratorio
15. Video limpieza sílice
16. Video preparación Alúmina 8%
17. Video preparación sílice 1,5%
18. Video preparación sílice acida 44%
19. Video preparación sílice básica 33%
20. Video preparación y realización columna alúmina 8%
21. Video preparación y realización columna Florisil OCP
22. Video preparación y realización columna Florisil PCB
23. Video preparación y realización columna sílice acida pipeta Pasteur
24. Video preparación y realización columna sílice multicapa
25. Video preparación y realización columna silice1,5%

Procedimientos preparados por el CSIC

26. Procedimiento extracción en aire
27. Procedimiento extracción en leche materna
28. Procedimiento limpieza de material de vidrio
29. Procedimiento acondicionamiento PUFs
30. Procedimiento limpieza sílice
31. Procedimiento preparación alúmina 8%
32. Procedimiento preparación sílice 1,5%
33. Procedimiento preparación sílice acida 44%
34. Procedimiento preparación sílice básica 33%
35. Procedimiento preparación y realización columna alúmina 8%
36. Procedimiento preparación y realización columna Florisil OCPs
37. Procedimiento preparación y realización columna Florisil PCBs
38. Procedimiento preparación y realización columna sílice 1,5%

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39. Procedimiento preparación y realización columna sílice acida pipeta
40. Procedimiento preparación y realización columna sílice multicapa 6/1/12
41. Procedimiento preparación y realización columna sílice multicapa 60/5/120

Grabaciones sesiones on-line

42. Video sesión inicial 09 noviembre 2020
43. Video sesión resolución dudas 13 noviembre 2020
44. Video sesión final 20 noviembre 2020

Resultados aportados

45. Video instalaciones laboratorio DIGESA
46. Presentación PowepPoint instrumentación analítica laboratorio DIGESA
47. Presentación PowerPoint DIRESA-APURIMAC
48. Video limpieza material vidrio DIGESA
49. Video limpieza sílice DIGESA
50. Video preparación sílice acida DIGESA
51. Video preparación sílice básica DIGESA
52. Imagen jpg análisis leche materna 1 de 8 DIGESA
53. Imagen jpg análisis leche materna 2 de 8 DIGESA
54. Imagen jpg análisis leche materna 3 de 8 DIGESA
55. Imagen jpg análisis leche materna 4 de 8 DIGESA
56. Imagen jpg análisis leche materna 5 de 8 DIGESA
57. Imagen jpg análisis leche materna 6 de 8 DIGESA
58. Imagen jpg análisis leche materna 7 de 8 DIGESA
59. Imagen jpg análisis leche materna 8 de 8 DIGESA
60. Video análisis leche materna DIGESA

E-mails y Whatsapp seguimiento del entrenamiento on-line

61. E-mails de seguimiento del entrenamiento on-line
62. Whatsapp de seguimiento del entrenamiento on-line
63. E-mails de dudas de los participantes surgidas durante las sesiones no presenciales

Cuestionarios de afianzamiento de los conocimientos adquiridos

64. Cuestionario entrenamiento aire
65. Respuestas de los participantes al cuestionario entrenamiento aire
66. Cuestionario entrenamiento aire resuelto por el lab experto
67. Cuestionario entrenamiento leche materna
68. Respuestas de los participantes al cuestionario entrenamiento leche materna
69. Cuestionario entrenamiento leche materna resuelto por el lab experto

FAQs

70. FAQs (En proceso)

Valoración del entrenamiento on-line realizada por Perú

71. Email valoración del entrenamiento on-line realizado por Perú

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CAPACITY BUILDING AND TRAINING COURSES – Report for URUGUAY -

Training dates: From: 16th April 2018 To: 20th April 2018

1. PROJECT INFORMATION

Project: Project "GEF GMP2 GF4030-4F34"

Project actual start date 29 February 2016
Project expected completion date 30 April 2020

UNEP GEF Project ID: 4881

GEF Project Title: Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Latin American and Caribbean Region

Trainer: CSIC
Trainee: Uruguay

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1. CAPACIYTY BUIDING AND ON-SITE TRAINING COURSES ON POPs in URUGUAY

1.1 Introduction

As part of the tasks to be performed within the GMP-2 Project, CSIC is organizing the on-site training on POP analyses in the following countries: Uruguay, Antigua and Barbuda, Barbados, Jamaica, Chile, Argentina, Colombia, Ecuador, Peru, Brazil and Mexico.

In general, the training was based on the analysis of real samples and standards. The target compounds depend on the capacity of the countries, but always focus on those substances listed in the Stockholm Convention. Final decision on analytes and matrices is taken by countries in close agreement with Expert lab and depends mainly on the country capacity in terms of instruments, reagents, and of course, needs.

Figure 1 shows the Trainings and Capacity Building courses organized in Jamaica, Brazil, Uruguay and Barbados in the first semester of 2018.

This report makes reference to the activities carried out during the Capacity Building and Training Course organized for Uruguay.

Figure 1. Training and Capacity Building courses calendar for the first semester 2018.

1.2 Training and Capacity Building Course at Uruguay.

The Training and Capacity Building course in Uruguay was given by Dr Esteban Abad and Mr. Jordi Sauló, both from the Laboratory of Dioxins of CSIC in Barcelona (Expert Laboratory for the GRULAC Region). The training was given at the Laboratorio Tecnológico del Uruguay (LATU) in Montevideo (Uruguay), between 16th and 20th April 2018.

In total, 8 people attended the course from 2 different institutions (See Table 1): 6 people from LATU and 2 people from the Dirección Nacional de Medio Ambiente (DINAMA). Some pictures taken during training are giving in Figure 2.

As agreed, the training was focused on the analysis of Dioxins, furans and brominated compounds in air, sediments and milk samples. Among the huge instrumentation available at LATU, a GC-MS/MS (QqQ) were available to be used during all the training sessions. Figure 3 shows chromatograms corresponding to the analysis of dioxins and furans analyzed during the training.

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Table 1. List of attendants participating in the Capacity Building Training Course on POPs carried out at CETESB, Barbados, between the 28th May and 1st June 2018.

Full Name	Institution
Natalia Baldyga	LATU
Agustín Campanella	LATU
Ana Clara Bianchi	LATU
Laura Olazabal	LATU
Roberto Puentes	LATU
Liliana Sedraschi	LATU
Marina Torres	LATU
Alejandro Mangarelli	DINAMA
Rodrigo Souza	DINAMA

Figure 2. Some pictures from the training course on dioxins and brominated compounds in Uruguay.

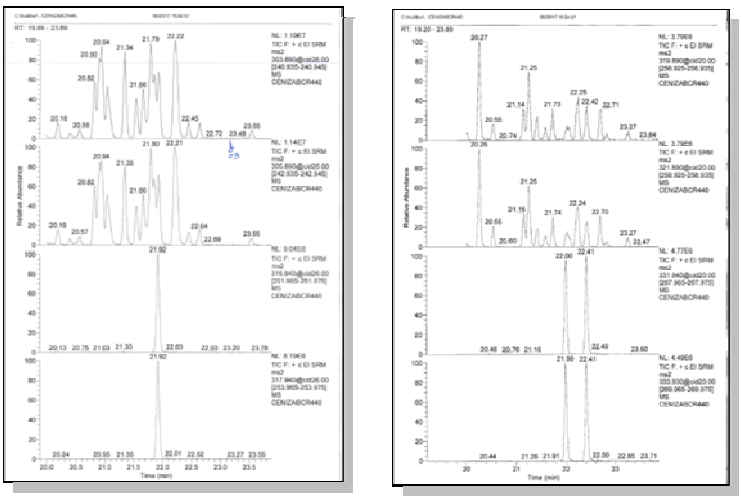

Figure 3. Examples of chromatograms of tetra chlorinated furans and dioxins in real samples from Uruguay achieved during the training course.

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2. Signature/Date

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Thursday, 20 December 2018

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