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Project Activities 1.5 & 1.6
Final Summary Report

Capacity Building for the National Water Laboratories

by

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Introduction

This report summarises the assessments, support and inputs to each national water laboratory by the KE3/NKEC, detailed in the previous six mission reports under activities 1.5 and 1.6. Each laboratory was visited up to four times by the KE3/NKEC.

T he national water laboratories are very different in their capacities, and the support provided was customised to suite their needs. This ensured that all their capacities improved and the laboratories were on the path of producing results that would be acceptable on international basis and essential for credible river basin management plans.

Activity 1.5 Support the analytical quality control assurance procedure.

Most laboratories had previously been trained in certain aspects of quality control, and participated in a number of inter-laboratory exercises. However, there were still gaps which were addressed by the KE3/NKEC. This was achieved by delivery of customised interactive training courses. These included the preparation and submission of powerpoint presentations, lectures, handouts, exercises, & software demonstrations. For some topics the training included working directly with the staff at the bench using their own analytical data, so that the results could be included in their laboratory quality manual, an important component of ISO 17025 accreditation.The successful trainees were awarded Project training certificates which were also recorded as formal training records in the laboratory quality manual. The following six training topics were identified and covered:

i Internal analytical quality controls (AQC).

Internal analytical quality control (AQC) standards are used to check whether the analytical methods are functioning correctly and it is a standard approach in most international laboratories. These are additional standards which should be analysed at the same time as the samples. By plotting these AQC results on to a special chart called a Shewhart Chart, which is derived statistically, the analyst and the managers can check to see if the results are within the normal limits. This quality control technique is very useful as it should be applied with every analysis, and not just applied only periodically, as external quality controls are. This training was submitted by international formal courses and, where possible, included customised, at the bench, training using the laboratories local data.

Many of the laboratories did not have such AQC systems in place relying mainly on inter-laboratory checks. Following the concentrated training , all the laboratories initiated and applied such systems, and significant tangible improvements and outputs were demonstrated for the beneficiaries. To ensure that these procedures were sustained a record of the AQC results was included as an obligatory requirement in the ToR for the analysis of the JFS samples.

ii Analytical Methods Validation

Most analyses apply methods that have been previously developed from ISO or Soviet GOST reference methods. Some specifications will be included the standard methods and are a useful guide. However the analytical laboratories that use the methods must also check their own specifications that they achieve at the bench.

To check the specifications of the method within each laboratory, the technique called method validation should be applied. This technique uses data from a set of analyses to determine the critical specifications of precision, bias, limit of detection, and recovery for the tested method. This method validation procedure uses specialised statistical techniques to calculate the specifications, The

validation is important as the specifications verify the quality of the analytical data and is a means of comparing results from different laboratories.

Training was submitted by international formal courses and local training which included the application of dedicated software called AQC99 prepared by the Water Research Centre in the UK and was donated to all the laboratories.

In the assessment it was noted that some laboratories notably Hydromet in Moldova and RCACFEP in Belarus had used similar techniques previously but for most laboratories this was a new concept. As the preparatory work required is quite extensive, some laboratories have still to apply this to all their methods but as they have all been trained to undertake this themselves. It is anticipated that all the laboratories will have validated their main methods by the end of the project.

iii International Laboratory Accreditation (ISO 17025)

To ensure the laboratories results and procedures are credible, ideally the laboratory should be accredited.

Accreditation can be:

- National,
- International EN ISO/IEC 17025:2005,
- Good Laboratory Practice GLP Organization for Economic Cooperation and Development (OECD)

For the WFD the international ISO 17025 is considered the most appropriate. In the assessment only Hydromet in Moldova had been awarded this accreditation, but all the laboratories were keen to achieve this.

The ISO17025 consists of many components which should be included preparing the main reference Quality Manual. This manual defines the quality assurance management procedures for:

- ✓ Staff
- ✓ Equipment, reagents & standards.
- ✓ Sampling
- ✓ Analysis
- ✓ Quality Control
- ✓ Data management
- ✓ Documentation & Reporting

Introductory training courses were submitted to all the laboratories and were supplemented by a visit to the accredited Hydromet Lab in Moldova which provided a good working example and outlined these procedures in detail.

Following training, the laboratories are clear about the processes involved and there initiation. However, accreditation can take a number of years and further support may be required at the latter stages, usually from the accrediting agency, to finally reach the required standard and which is beyond the lifetime of the project. To assist the laboratories recommendations were submitted to all of them on the next steps they would need to take. The capacities of the laboratories significantly differ, so that some laboratories were very close to achieving accredition, such as in Belarus and Georgia, while others would need further resources.

Iv Laboratory Auditing Procedures

To enable the laboratories to improve their capacities the senior staff needed to be trained on the laboratory auditing procedures, a fundamental concept of ISO 17025. To assist the EPIRB Joint Field Survey results were audited focusing on a few results but going deeply into the background documentation of the data including:

i.) Water sampling procedures
ii.) Sample submission to the laboratory
iii.) The chain of custody
iv.) The analytical method
v.) The standard operating procedure
vi.) The quality controls
vii.) Analytical equipment and reagents
viii.) Staff training

This was not only an important mechanism to verify the JFS results but also provided training on the auditing process and enabled a further assessment of the laboratories.

v Laboratory Information Management Systems (LIMS)

To ensure the laboratories' data is recorded and processed systematically, a specialised data base software can be used, called a Laboratory Information System (LIMS). In the assessment it was noted that no beneficiary laboratories had such a recording systems but were keen to learn about their applications.

An example of such software was presented to outline their functions and benefits. A LIMS system is not essential but it should be considered later when the laboratory accreditations are more developed. In addition, following the training, the laboratories had further ideas of how data could be analysed using such systems. Therefore, even if the laboratories decide not to obtain such systems immediately, the training should give them ideas for certain upgrades and improvements on their own current data management systems.

vi Standard Operating Procedures

A Standard Operating Procedure (SOP) is a document containing simple instructions on how to perform a routine task or analysis. It ensures that these tasks and analyses are performed consistently, safely, and in compliance with applicable regulations. It was noted in the assessment that though some laboratories had SOPs, often thesewere copies of technical references and so too complicated.

To prepare an optimum SOP, a training course outlining seven steps was submitted. The SOPs should be vital for all laboratories who wish to become accredited and also to avoid losing operational information and skills especially where there is a large turnover of staff, which many of the governmental laboratories suffer.

Activity 1.6: Assess the needs regarding laboratory infrastructure, equipment and training.

Chemical Analysis

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

It was noted that all the laboratories had sufficient capacities to analyse the main general parameters, as was recorded in the Checklist/ Wish list and reviewed and discussed in the 3rd Mission Report. However it was identified that all the laboratories had problems analysing all the micropollutants.

It was decided that the project would concentrate on sampling and analysis of the Organo Chlorine Pesticides (OCPs), as these were regarded as serious pollutants and there were still stocks of these chemicals in many of the project countries, which could still be possibly illegally used. The threat was recognised by all the six countries and this analysis was chosen as a useful entry point to support the all the laboratories to ultimately achieve the same level and also to assess their capabilities. In fact it was found that the capacities of the countries to analyse the OCPs differed significantly requiring a variety of approaches.
The audit of the JFS analytical results highlighted analytical issues which the KE3/NKEC assisted with, making recommendations for improvements. Therefore using these separate approaches proved useful for assessing the laboratories infrastructure, equipment and training.

Water Sampling and Monitoring

Task 1.6.2: Assessments of the capacity building needs of the physiochemical monitoring programme

An important part of the function of the laboratories is taking samples of water, which must be carried out correctly, or else the analysis could suffer from contamination or decomposition of sensitive parameters.

The laboratories sampling procedures were assessed in the field by KE3/NKEC who also provided training and recommendations for improvements. This was supplemented by The Chemical Sampling Guidance Manual prepared, which included all major aspects of sampling including sample preservation and quality control procedures and was distributed to all the laboratories.

Further training was also delivered during the JFS and which should continue in 2014.

1) ARMENIA

Background

The main organisation responsible for surface water resources quality monitoring in Armenia is the "Environmental Impact Monitoring Centre" (EIMC) under the Ministry of Nature Protection of the Republic of Armenia. The EICM has 90 staff throughout country and has been assisted by a number of previous projects including the EU Kura 1& II projects, the GEF and GIZ projects.

Copies of the Training Powerpoints are available on the EPIRB website.

Activity 1.5-Quality Control

Internal analytical quality controls (AQC).

Following training the EIMC implemented the new procedures which proved to be very effective. In fact, as a result, the EIMC discovered a new problem with the TOC analyser using the AQC system, enabling them to correct and obtain more accurate results. (Mission Reports 4 & 6)

Analytical Methods Validation

Training was submitted via international formal courses and customised direct training of senior staff. It is anticipated that the new quality control department established will validate their main methods ready for the next JFS .
(Mission Reports 4 & 7).

International Laboratory Accreditation (ISO 17025)

An introductory training course was delivered at EMIC and staff visited the accredited Hydromet Lab in Moldova. EIMC is very keen to develop its procedures and obtain accreditation. There had been a recent change in the senior management which resulted in the establishment of a new QC department as recommended in the training courses. This improvement indicates the high commitment of the laboratory to achieve its goal and the new departments had made important steps under the guidance of the project to implement these requirements.

In the later stages of accreditation, it is recommended that further support be given to EIMC, ideally from the accrediting agency, to reach the required standard. However the training given has provided sufficient information to start this process.
(Mission Reports 4 & 6).

Laboratory Auditing Procedures:

The JFS results were audited and six recommendations were submitted. One analysis of particular concern was that of Arsenic for the groundwater samples, which included higher than expected concentrations. A number of extra tests were recommended and undertaken by EIMC to resolve this issue and an external check of the results indicated lower normal concentrations as detailed in Mission Reports 6.

Laboratory Information Management Systems (LIMS)

EIMC has a relatively large data processing department and in the short term the LIMS training could provide ideas on upgrading of their systems. In the future EIMC should consider obtaining a LIMS system especially to complement their accreditation. (Mission Report 4).

Standard Operating Procedures

The EIMC initially did not have SOPs, but the recently established Quality Control Dept will help their preparation and development. They would be very useful for EIMC, as it suffers for a high turnover of staff, and SOPs would avoid losing operational knowledge and skills. (Mission Reports 4 & 6).

Activity 1.6 Analysis & Sampling

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

Micro-pollutants

Agilent GC/MS

The laboratory has advanced analytical equipment including: GC/MS, GC/FID, GC/ECD, ICP/MS, IC and TOC. Training was given on the application of this equipment especially in the chromatography dept to improve their current analysis of Volatile Organic Compounds (VOC), Organic Chlorinated Pesticides (OCP) & Aromatic Hydrocarbons. Analysis of these organic parameters suffered from a number of problems, including sample extraction and concentration methods, epuipment operational issues and software concerns. These issues were addressed and separate recommendation reports were submitted to assist the EIMC which has since resolved most of the problems. However there remain maintenance and software issues which only the manufacturer (Agilent) can resolve. (Mission Reports 4 &6).

Task 1.6.2: Assessments of the capacity building needs of the physiochemical monitoring programme

Sampling and Monitoring

The EIMC was trained and audited on water sampling for different types of parameters and the on-site water sampling audit and training was carried out at Hrazdan River, Yerevan on 10th October 2013. The site was chosen as it needed to be assessed for an EIA including hydro-biological biological monitoring for a new road bridge. Following the audit five recommendations were submitted in the 6th Mission Report.
Further training was also given during the JFS and will continue in 2014.

2) AZERBAIJAN

Background

Surface water quality is monitored by the National Environmental Monitoring Department (NEMD) of the Centre for Environmental Pollution Monitoring of the Ministry of Ecology and Natural Resources

of the Azerbaijan Republic. The central laboratory of the NEMD is the pollution monitoring laboratory of natural waters, located in Baku. There are two other laboratories in Kazakh and Beylagan, which analyse the main chemical/physical parameters.

Activity 1.5 Quality Control

Internal Analytical Quality Controls

Following training the NEMD developed internal quality controls for certain parameters such as nitrates, ammonia and phosphates using Shewhart Charts which were displayed on posters in their laboratory. It is anticipated that NEMD will further progress this with the analysis of other parameters such as the heavy metals. This was a tangible output for the laboratory, a positive step to to international accreditation and an important check for future JFS results. It is recommended that this is progressed prior to the next JFS(Mission Report 4).

Analytical Method Validation

Training included at the bench training for the operation of the software AQC 66 using results obtained for the analysis of two batches Nitrites by the spectrophotometric method, see Sixth Mission Report.

International Laboratory Accreditation (ISO 17025)

NEMD are keen to get their laboratory to ISO 17025 accredited. it is recommended that NEMD establishes a dedicated QC department and in the latter stages work with an international accreditation agency such as TURAK from Turkey (Mission Report 4).

Laboratory Auditing Procedures

The audit trail during the Sixth mission raised some major issues and nine recommendations were made to improve the analysis results, especially for the next JFS.

Laboratory Information Management Systems (LIMS)

There is currently a data recording system used be the NEMD so the LIMS system is not a priority but it should be considered when the accreditation has been fully developed. (Mission Report 4).

Standard Operating Procedures

There were calibration problems noted in some of the methods therefore it was recommended that NEMD clarifies the analysis and sampling methods by preparing new SOPs (Mission Report 4)

Activity 1.6 Analysis & Sampling

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

Micro-Pollutants

The laboratory was unable to analyse any organic micropollutants, as there was no operational GLC. However in 2012 NEMD obtained a new Agilent GLC, which was installed, and commissioned in 2013. To analyse the micro organic pollutants still requires a UPS, solvents and calibration standards. Following meetings at a senior level , assurances were made that these items would be obtained and they would try to develop the OCP analysis and would be available prior to next JFS (Mission Reports 4 & 6).

Atomic Absorption Spectrometry (AAS) Analysis

It was noted that use of the AAS for heavy metal analysis was limited due to the short lifetime of the expensive graphite tubes (only 20 firings). This is not normal, usually the tube should last very much longer (~ 100 firings). A technical report was submitted in Annex 5 of the 6th Mission report providing advice on overcoming the problem. Furthermore senior staff obtained further guidance from the AAS experts during their visit to the Moldova Laboratory in November 2013. (Mission Report 6)

Task 1.6.2: Assessments of the capacity building needs of the physiochemical monitoring programme

Sampling and Monitoring

The NEMD had previously been trained on water sampling for different types of parameters. And this was complemented by on-site training at Kurdakhani Lake on 3rd October 2013. Five recommendations to improve the sampling were given in the 6th Mission Report.

3) BELARUS

Background

Analysis of water quality in Belarus is distributed across a number of institutes Monitoring of physico-chemical parameters was transferred to the Republican Centre of Analytical Control in the Field of Environmental Protection (RCACFEP) under the Ministry of Natural Resources and Environmental Protection. Whilst the Republican Centre for Radiation Control and Environmental Monitoring (RCRCEM)) under the Department of the hydrometeorology of the Ministry of Natural Resources and Environmental Protection is responsible for the monitoring of hydrobiological parameters as well as storage and processing of all surface water quality (and other environmental) data.
Additionally, the Central Research Institute of the Complex Use of Water Resources (CRICWR) was used by the Project to analyse the JFS Ground water samples.

Activity 1.5 Quality Control

QC Workshop in Minsk

The RCACFEP staff had previously been trained on certain aspects of quality control, and participated in a number of inter-laboratory exercises such as Aquacheck. However there were a number of important additionally issues which were addressed by the consultant .

Internal analytical quality controls

The RCACFEP already had AQC systems in place. In fact for the analysis using chromatographic and concentration techniques expensive deuterated organics analogues were used as internal standards, which are excellent analytically, but can also be very expensive. Recommendations to further improve their systems were submitted.

The Research Institute of the Complex Use of Water Resources which analysed the JFS groundwater samples did not similar systems. However local training was given as detailed in the Seventh mission Report and it is anticipated that they will apply this technique in future. It is recommended that this is progressed prior to the next JFS.

Analytical Method Validation

The RCACFEP laboratory had undertaken method validation for some of their methods and was keen to develop further method validations. It is anticipated they will undertake this prior to the next JFS (Mission Reports 3 & 7).

International Laboratory Accreditation ISO 17025

The laboratories are nationally but not internationally accredited. The RCACFEP maintains that as the national accreditation complies with ISO 17025, the international accreditation is not urgent.

Obtaining accredition for the RCRCEM the Hydrobiological Laboratory, could be difficult, since identifying a competent national accrediting agency would be challenging. The project can assist in in ensuring that the procedures in place are to international standards.

Laboratory Auditing Procedures.

Following the audit of the JFS results three recommendations were made to improve the procedures which are noted in the 7th Mission Report.

Standard Operating Procedures

These are applied but need to be developed further so that the standardised methods can be assured with changes in staff. (Mission Reports 3 & 7)

Laboratory Information Management Systems (LIMS)

A data recording system is in place but it is not very advanced system. The training course provided ideas in which the system could be improved in the future. (Mission Reports 3)

Activity 1.6 Analysis & Sampling

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

Micro-pollutants

The RCACFEP national centre headquarters is responsible for the sampling and analysis of the trace metals and the organic micropollutants. There are also 26 regional associate (Oblast) laboratories in Belarus which assist with the sampling and which analyse the other basic physico-chemical parameters

The RCACFEP has advanced equipment, ideal for analysing most of the micropollutants including:

i. Agilent Quaternary HPLC with Fluorescent Detector) FLD & Diode Array Detector (DAT
ii. GLCs with ECD & MS detectors used for the analysis for certain pesticides such as organo-chlorine and PCBs parameters.
iii. A GLC with NPD & FID Detector for the analysis of nitrogen & phosphorus pesticides such as simazine and atrazine.

The staff appeared to be well trained and could analyse many of the micropollutants. The department believe that visiting other European centres of excellence would help them to improve their knowledge and capacity. It is recommended that the Project considers this request and includes the other countries to be included in such a study tour.

Task 1.6.2: Assessments of the capacity building needs of the physiochemical monitoring programme

Sampling and Monitoring

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An Audit/Training of the water sampling at the Svisloch River a tributary of the Dnieper, at Korolystshevichy Bridge was undertaken on 5th December 2015. (Mission Report 7)
The consultant provided advice and training on the three type of sampling quality controls viz.:

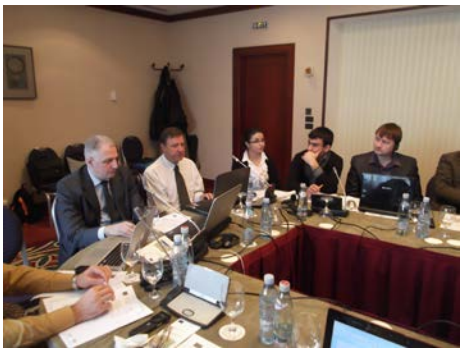
i.) Duplicate sampling
ii.) Field Blanks &
iii.) Spikes recovery samples

4) GEORGIA

Background

The Department of Environmental Pollution Monitoring of the National Environmental Agency (NEA) of the Ministry of Environment Protection of Georgia is responsible for the ambient surface water quality monitoring Georgia.

Activity 1.5 Quality Control



Tbilisi Regional Workshop

The staff have been previously trained on certain aspects of quality control, and participated in a number of inter laboratory exercises. However there were a number of issues that need to be addressed by the Project including the following:

Internal analytical quality controls

NEA applied Shewhart charts for a number of parameters using dedicated software , but needed to increase the number of AQC charts for more parameters. NEA has assured the project that most of the parameters will have the AQCs in place for the next JFS. (Mission Report 4)

Analytical Method Validation

Following initial operational problems with the AQC 99, which were resolved in Mission 6, the NKEC submitted a refresher training course on operation of the software and as a practical exercise the AQC99 was used to validate the method for the analysis of Ammonia. NEA assured the Project that it would try to validate more methods prior to the next JFS.

International Laboratory Accreditation ISO 17025

NEA is very keen to be internationally accredited and has already made significant progress to achieve this. It was recommended that NEA initially requests to be accredited for just a few of its parameters which have been validated then to learn from this to progress to be fully accredited. It is hoped this could be achieved soon and would set a good example for the other countries. (Mission Report 4)

Laboratory Auditing Procedures.

A thorough laboratory audit was undertaken and nine recommendations for improvements were submitted in the 6th Mission Report.

Laboratory Information Management Systems (LIMS).

A data recording system is in place but this is not a very advanced however the course was useful as it provided ideas in which the system could be improved in the future.((Mission Report 4)

Standard Operating Procedures

NEA have SOPs in place, however it was recommended to simplify them so that new staff could more easily undertake the analysis. (Mission Report 4)

Activity 1.6 Analysis & Sampling

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

Micro-pollutants

The organic compounds are analysed by a number of GLCs, including ones with ECD and MS detectors, which were used to analyse six organic micro-pollutants. Advice was submitted in the 4th Mission report on how to improve the extraction procedures

The mixed standard and internal standard Isodrine supplied by the project were not used because the certan vial had still been not procured, and could still take a long time to procure. It was recommended that the mixed standards should be transferred for storage in a crimped septum vial and to use a syringe to extract the standard especially as the standard has a short shelf life (Mission Report 4).

Equipment Problems

Fluorescence Spectrophotometer

Servicing the AAS

There was a Fluorescence Spectrophotometer, which required attention as it had never been used following its commissioning. The consultant re-commissioned and trained staff on the operation of the apparatus so that they were able to analyse the water for petroleum products. This tangible output was much appreciated by NEA as the equipment had not been used for over five years.

There were two Atomic Absorption Spectrophotometers in the NEA laboratories which were both faulty and unable to analyse any heavy metals. As the situation was critical the Project assisted in funding the repair of one of the AAS in Tbilisi. Unfortunately a diagnosis by the manufacturer, funded by the project, of the other AAS in Batumi found it to be too expensive repair. However, NEA have procured a new ICP spectrometer which supersede the older AASs and NEA can analyse most heavy metals in water very well (Mission Report 4).

Task 1.6.2: Assessments of the capacity building needs of the physiochemical monitoring programme

Sampling and Monitoring

The department has specific technical staff responsible for monthly sampling , including on-site analysis for pH, DO, salinity, EC, & Temp, and completing a visual assessment form for each sampling site. The on-site sampling training/audit was undertaken at Tbilisi Sea Lake on 25th September 2013 and five recommendations were submitted in the 6th Mission report.

5) MOLDOVA

Background

The State Hydrometeorological Service (SHS) under the Ministry of Environment (MoE) is the lead organisation for ambient surface water quality monitoring in Moldova. The surface water quality monitoring programme of SHS comprises both physico-chemical as well as hydrobiological quality elements to be analysed within its network. The network comprises about 50 locations, with samples for physico-chemical parameters taken 4 – 12 times per year.

Activity 1.5 Quality Control

Regional QC Workshop in Chisinau

Internal analytical quality controls

SHS has applied Shewhart charts for most of parameters and used dedicated software but all the departments seem to apply them differently. Therefore it was recommended for one system should be agreed and applied consistently (Mission Reports 2,3 & 5).

Analytical Method Validation

The formal training was supplemented with on the bench training on the operation of the software AQC99 using results obtained for the analysis of two batches ammonia by the spectrophotometric method ((Mission Reports 2,5 & 7).

International Laboratory Accreditation ISO 17025

Moldova is one of the leading member countries having a well accredited water monitoring agency (SHS) for laboratory quality control, as it has been not only nationally but also has been internationally accredited. HSH0 had some excellent software for constructing Shewhart Charts, calculating the method validation and the limit of detection. A training workshop was held on site to further improve these systems and to provide international training for other project participating countries. In addition, in November 2013 the Hydromet Laboratory was used as an example for other Project participating countries during a regional workshop (Mission Report 2).

Laboratory Auditing Procedures.

The audit training of JFS results focused on the iron and Alpha HCB organochlorine pesticide analyses. Most aspects of quality control were fine though there were four issues that needed addressing which are detailed in the 7th Mission Report.

Laboratory Information Management Systems (LIMS).

A data recording system is in place integrated with a GIS system which is useful for presenting the results especially for decision makers. However the LIMS system could be used to integrate the quality control, results and the course contents should prove was useful for providing ideas in which their current data management systems could be upgraded in the future.

Standard Operating Procedures

As required by the ISO 17025 accreditation SHS have SOPs in place. However it was recommended to simplify them so that the new staff could more easily undertake the analyses. (Mission Reports 2,3 & 4).

Activity 1.6 Analysis & Sampling

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

Micro-pollutants

The laboratory had a very competent Chromatography Department with excellent equipment and staff.

The mixed OCP standard submitted by the project proved to be useful. The organic compounds were analysed by a number of GLCs, including equipment with ECD and MS detectors. These were currently being used to analyse 15 organic micro-pollutants.

The internal standard Isodrine also submitted by the project had yet to be applied, which should be important to calculate the extraction efficiencies. Therefore it was recommended that this should be applied soon, especially for the next JFS joint field survey. (Mission Report 5)

Task 1.6.2: Assessments of the capacity building needs of the physiochemical monitoring programme

Sampling and Monitoring

Sampling water at Westmurka Reservoir

An audit and training for the Sampling Department was submitted on-siteat Westmurka Reservoir, near Kishner Gate at the sampling platform on 10th April. Seven recommendations were submitted in the 5th Mission Report.

6) UKRAINE

Background

There were several authorities involved in monitoring of surface water quality, including the Ecological Inspectorates of the Ministry of Environment and Natural Resources; the State Hydrometeorological Service of the Ministry of Emergency Situations and Chernobyl Affairs; the State

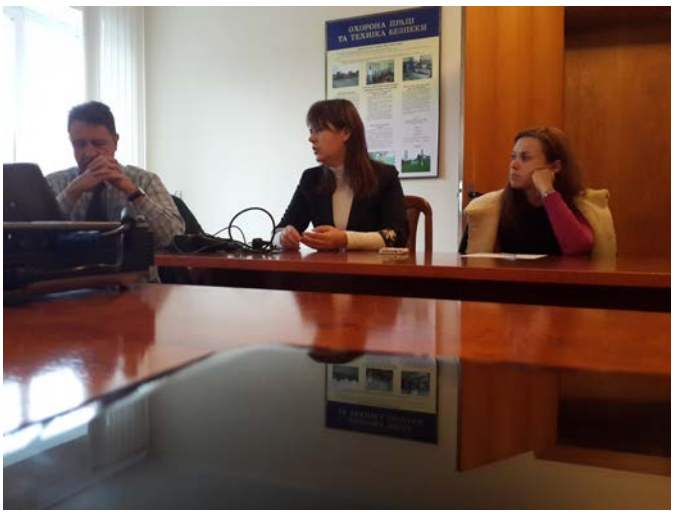
Sanitary-Epidemiological Services (SES) of the Ministry of Health; the State Agency for Water Resources of Ukraine. However the main agencies dealing with the pilot water basins were:

1) Basin Management Authority of Water Resources BUVR (Chernivtsi)
2) Dnieper River Basin Management Council (BUVR)(Vyshhorod)

For the JFS the Upper Dnieper Water Basin-Ukraine Geological Company (UDWBUGC) undertook the OCP analysis for the Dnieper River Basin Management Council (Vyshhorod) (BUVR) Similarly Basin Management Authority of Water Resources BUVR (Chernivtsi) was unable to analyse the OCPs owing to a lack of staff and equipment. Therefore the OCP analysis was subcontracted to the Research Centre of Preventative Toxicology, Food & Chemical Safety (RCPTFCS) of the Public Health Ministry of Ukraine.

Activity 1.5 Quality Control

QC Workshop in Kiev



AQC Workshop held in Chernitzvi

Initially there were limited quality controls in place within the water management councils BUVR. However following the training submitted by the project both council laboratories improved.

Internal analytical quality controls.

Initially both BUVR Councils had no internal quality controls, however following training, they introduced the Shewhart charts in both departments with the Prut BUVR using dedicated software to assist them.

Analytical Methods Validation

Niether BUVRs had validated their methods though training has been given and they may need further support to initiate this. It was recommended that the (RCPTFCS) could be engaged to assist with this procedure so that the main methods could be validated ready for the next JFS.

Laboratory Auditing Procedures.

Four organisations including the BUVR, RCPTFCS and UDWBUGC were involved in the analysis of the JFS and all were audited. Six recommendations were submitted for the Upper Dnieper BUVR and five for the Prut BUVR which are detailed in the 7th Mission Report.

Laboratory Information Management Systems (LIMS).

All the organisations have data management systems for the water analysis, though none has a LIMS system. The training was useful in advising in future upgrades of their systems.

A data recording system is in place but this is not a very advanced system however the course was useful as it provided ideas in which the system could be improved in the future.

Standard Operating Procedures

Only the RCPTFCS has such procedures in place. However such systems would be very useful for BUVRs, as they both suffer from a high turnover of staff and SOPs would help maintain operational knowledge and skills.

Activity 1.6 Analysis & Sampling

Task 1.6.1: Assessment and optimisation of laboratory analytical capacity

Micro-pollutants

The Dnieper River Basin Management Council laboratory has a GLC and applied mainly GOST methods. Unfortunately in the last mission it was noted that there was high turnover of staff which included the loss of the Chromatography staff. The Council was therefore searching for an experienced chromatographer to continue the work.

The Upper Dnieper Water Basin-Ukraine Geological Company (UDWBUGC) undertook the OCP analysis for the Dnieper River Basin Management Council (Vyshhorod) (BUVR) and a number of recommendations were made in the 7th Mission Report to improve this analysis.

Similarly the Upper Prut OCP analysis was subcontracted to the Research Centre of Preventative Toxicology, Food & Chemical Safety (RCPTFCS) of the Public Health Ministry of Ukraine.
and the analysis was audited during the 7th Mission. This laboratory has been internationally accredited with ISO 17025 for about three years. All supporting information for the audit was submitted by the RCPTFCS and was of excellent standard. It was therefore recommended that this laboratory should be used as a model and local training centre. It was also recommended that links via a technical working group should be established between BUVR and the research centre so that BUVR could be assisted with their quality controls and methods. As a first step to encourage this co-operation the consultant arranged a training workshop at which both organisations were present on 29th November 2013. (Mission Report 7)

Summary & Recommendations for future development

From the initial assessments made by the consultant it was noted that most of the laboratories could analyse the following parameters:

i. General Conditions
ii. Nutrient Conditions
iii. Salinity
iv. Acidification Status
v. Trace Metals

However there were gaps in the capacities of the laboratories to analyse the micropollutants and to apply sufficient quality controls compliant with the requirements of the WFD.

It was recognised that it would be impossible to fully resolve all the issues, such as the award for international accreditation and the analysis of all the micropollutants, within the lifetime of the project. Therefore the inputs were focused on aspects were compliance could be achieved using the above quality controls procedures and to ensure all laboratories could analyse at least the OCPs. Training and recommendations were submitted to all the laboratories to achieve this result.

The problem that some countries currently face is the lack of resources. This could be addressed by the following recommendations:

i.) The Project encourages the countries' senior decision makers to provide all support possible to to meet the resource gaps.
ii.) Approach other funding agencies for additional support e.g. for the refurbishment of the actual laboratories
iii.) The Project should consider submitting any other extra specialised training e.g. the operation of specialised GLC software; to resolve other outstanding lab issues. If this requested by some of the beneficiaries this could be facilitated by the budget line for the activities 2.5 and 2.6 for the development and implementation of programme of measures.
iv.) To improve cooperation and integration between transboundary countries, technical working groups could be established. This is an issue which needs to be formally agreed by the countries.
v.) Any further gaps in the quality of the analysis or quality controls should also be identified by the laboratory audits of the data submitted in the next JFS.
vi.) A number of the beneficiaries have requested that the project arranges study tours of other European laboratories that are internationally accredited which could be very useful

The inputs by the KE3/NKEC for the laboratories are summarised in Tables 1 & 2 in annex 1 and the

cross references of the inputs to the mission reports are listed in Annex 2 Table 3.

Activities 1.5/1.6, Outputs Summary

During the project activities 1.5/1.6, the consultant adopted an inter-active working approach with the staff as much as possible, which was very productive. This included the following outputs, which should significantly improve the operation of their laboratories:

1. Chemical Sampling Guidance Manual.
2. Six mission reports providing detailed technical information & recommendations.
3. Interim Laboratory Recommendation Report.
4. Seven powerpoint training presentations.
5. Final Summary Report.
6. Technical guidance note for maintaining AAS Graphite Furnace Cuvettes.
7. International and local Training Courses.
8. Training Certificates for successful trainees.
9. Re-commissioning of the Fluorescence Spectrophotometer together with operational training for NEA in Batumi to analyse petroleum compounds.
10. Re-commissioning of the Turbidity meter for Hydromet, Moldova together with operational training for on site analysis.
11. Audit Report of the JFS Chemical Analysis.
12. Advisory Reports for NEA to apply for the repair of the AAS
13. Recommendation Report for Chromatography Dept in EIMC Armenia.
14. Method Validation Software.
15. Documentation for chemical analysis contracts for JFS for correct quality controls and report format.
16. Documentation to fund training materials/chemicals for OCP analysis.

Future Laboratory Capacity Building

I t is recommended that the Laboratories receive in the future the following support:

i.) Follow- up technical assistance on the progress of important issues such as the validation of methods and the analysis of OCPs.
ii.) Options for study tours of other European Laboratories
iii.) Facilitating the establishment of technical working groups e.g. QC & Accreditation, and Analysis of Micropollutants.
iv.) Specialised training/studies in . sediment analysis, GLC software training by Agilent, & On-line monitoring.
v.) Participation in inter-laboratory analysis checks e.g. Aquacheck or ICPDR.
vi.) Technical Assistance with writing proposals for funding for equipment or laboratory facilities.
vii.) In- house training on hydrobiological parameters.

When the project has completed, it is recommended that laboratories continues their progress by:

i.) Sustaining the established Technical Working Groups to continue exchanging transboundary information.
ii.) Finalise their ISO 17025 accreditation.
iii.) Establish LIMS computer systems.

iv.) Finalise the analysis of all the important priority pollutants.

If these issues are addressed then the laboratories should all be at an international standard that would be fully recognised for the implementation integrated river basin management and compliance for the WFD.

Annex 1: Summary Tables of Project Inputs

Table 1 Summary of 1.5 Project Inputs

Country / Activity 1.5	Armenia	Azerbaijan	Belarus	Georgia	Moldova	Ukraine
Quality Control	Application of internal analytical quality controls international & local training – Shewhart Charts now being applied	Application of internal analytical quality controls international & local training Shewhart Charts now being applied .	Application of internal analytical quality controls international & local training Shewhart Charts being applied	Application of internal analytical quality controls international & local training Shewhart Charts being applied	Application of internal analytical quality controls international & local training Shewhart Charts being applied	Application of internal analytical quality controls international & local training Shewhart Charts now being applied
	Procedures and software for validating analytical methods international & local training –	Procedures and software for validating analytical methods international & local training Example submitted for Nitrites (6th Mission Report)	Procedures and software for validating analytical methods international & local training –	Procedures and software for validating analytical methods international & local training – Example submitted for Ammonia (6th Mission Report	Procedures and software for validating analytical methods international & local training – Example submitted for Ammonia (7th Mission Report	Procedures and software for validating analytical methods international & local training –

	Development of International Accreditation Procedures international & local training New QC department established	Development of International Accreditation Procedures international & local training New QC department recommended	Development of International Accreditation Procedures international & local training QC department established	Development of International Accreditation Procedures international & local training QC department established	Development of International Accreditation Procedures international & local training New QC department established	Development of International Accreditation Procedures international & local training New QC department recommended
	Laboratory Auditing Procedures local training	Laboratory Auditing Procedures local training	Laboratory Auditing Procedures local training	Laboratory Auditing Procedures local training	Laboratory Auditing Procedures local training	Laboratory Auditing Procedures local training
	Introduction to Laboratory Information Management Systems (LIMS) International Training	Introduction to Laboratory Information Management Systems (LIMS) International Training)	Introduction to Laboratory Information Management Systems (LIMS) International Training)	Introduction to Laboratory Information Management Systems (LIMS) International Training	Introduction to Laboratory Information Management Systems (LIMS) International Training	Introduction to Laboratory Information Management Systems (LIMS) International Training)
	Standard Operating	Standard Operating	Standard Operating	Standard Operating	Standard Operating	Standard

	Procedures International & local training	Procedures International & local training	Procedures International & local training	Procedures International & local training	Procedures International & local training	Operating Procedures International & local training

Table 2 Summary of 1.6 Project Inputs

Country / Activity	Armenia EIMC	Azerbaijan NEMD	Belarus RCACFEP & RCRCEM	Georgia NEA	Moldova Hydromet	Ukraine Upper Dnieper BUVE Prut BUVR
1.6- Analysis	Training & Resolving GLC Analytical problems for the GLC Analysis of OCPs, VOCs and aromatic hydrocarbons Special Report submitted (6th Mission Report).	Progressed the commissioning of New GLC with the supplier requires UPS, standards & solvents to develop OCP	Offered for the project to the supply the mixed calibration standard and Isodrine for OCP analysis	Training & Resolving GLC Analytical problems for the GLC Analysis of OCPs, (6th Mission Report).	Training on GLC Analysis to assist on current analysis & Determine more parameters	Offered for the project to the supply the mixed calibration standard and Isodrine for OCP analysis
	Address the problem of high Arsenic results by the ICP/MS (6th & 7th Mission Report)	Progressed the extra requirements for GLC e.g. UPS, standards & solvents – still ongoing	Audit of the JFS analysis 3 Recommendations submitted (7th Mission Report)	Re-commissioned the Fluorescence Spectrometer and trained staff on its operation for the analysis of petroleum products	Addressed the preparative procedures for GLC analysis (Special Reports (6th Mission Report)	Submitted advice to improve the analysis of OCP s
	Addressed the preparative procedures for GLC analysis (Special Reports (6th Mission Report)	Addressed the AAS problem using the graphite cuvettes. Special Report submitted (6th Mission Report).	Processed the Checklist and wish list for all the analysis	Assisted and progressed the repair of one AAS in Tbilisi	Progressed the supply by the project of the mixed calibration standard and Isodrine for OCP analysis	Audit of the JFS analysis a total of eleven Recommendations submitted (6th Mission Report)
	GLC PowerPoint training	GLC PowerPoint training		Assisted and progressed the	Re-commissioned the portable	Processed the Checklist and wish

	presentation	presentation		diagnosis of the AAS problem in Batumi- -still ongoing	turbidity meter and trained staff on its operation	list for all the analysis
	GLC PowerPoint training presentation	Trained staff on the calibration for the portable EC ,meter		Addressed the preparative procedures for GLC analysis (Special Reports (6th Mission Report)	Audit of the JFS analysis. Four Recommendations submitted (6th Mission Report)	
	Progressed the supply by the project of the mixed calibration standard and Isodrine for OCP analysis	Audit of the JFS analysis & Nine recommendations submitted (6th Mission Report)		Audit of the JFS analysis Nine Recommendations submitted (6th Mission Report)	Processed the Checklist and wish list for all the analysis	
	Audit of the JFS analysis & six recommendations submitted (6th Mission Report)	Processed the Checklist and wish list for all the analysis		Processed the Checklist and wish list for all the analysis		
	Processed the Checklist and wish list for all the analysis					
Comments	Specialised training may still be required by Agilent for the operation of the GC/MS software		The RCACFEP could analyse most parameters well. So direct inputs for 1.6 was limited.	Though one AAS in Batumi still required attention. This has now been superseded by the		

			However a study tour of a European Lab is recommended	installation of a new ICP		
Sampling	Chemical Sampling Manual	Chemical Sampling Manual	Chemical Sampling Manual	Chemical Sampling Manual	Chemical Sampling Manual	Chemical Sampling Manual
	Sampling training submitted at Hrazdan River Yerevan Five recommendations submitted (6^{th} Mission Report)	Sampling training submitted at Kurdakhani Lake Five recommendations submitted (6^{th} Mission Report)	Sampling training submitted Svisloch River a tributary of the Dnieper, at Korolystshevichy Bridge Five submitted recommendations (6^{th} Mission Report)	Sampling training submitted at Tbilisi Sea Lake Five recommendations submitted (6^{th} Mission Report) submitted	Sampling training submitted at Westmurka Reservoir, near Kishner Gate Chisinau Seven recommendations submitted (5^{th} Mission Report)	JFS sampling training
	JFS sampling training	JFS sampling training	JFS sampling training	JFS sampling training	JFS sampling training	JFS sampling training

Annex 2 – Cross Reference of Mission Reports

Table 3: Details of Training/Support in Mission Reports (MR)

Topic / Country	AQC	ISO 17025	SOP	Method Validation	LIMS	Laboratory Auditing	Micro - Pollutants	Sampling
Armenia	MR 4 MR 6	MR 4 MR 6	MR 4 MR 6	MR 4 MR 7	MR 4	MR 6	MR 4 MR 6	MR 6 JFS
Azerbaijan	MR 4	MR 4	MR 4	MR 4 MR 6	MR 4	MR 6	MR 4 MR 6	MR 6 JFS
Belarus	MR 3 MR 7	MR 3 MR 7	MR 3 MR 7	MR 3 MR 7	MR 3	MR 7		MR 7 JFS
Georgia	MR 4	MR 4	MR 4	MR 4 MR 6	MR 4	MR 6	MR 4	MR 6
Moldova	MR 2 MR 3 MR 5	MR 2	MR 2 MR 5	MR 2 MR 5	MR 2	MR 7	MR 5	MR 5 JFS
Ukraine	MR 2 MR 3 MR 4 MR 7	MR 2 MR 3 MR 4 MR 7	MR 2 MR 3 MR 4 MR 7	MR 2 MR 3 MR 4 MR 7	MR 2 MR 3 MR 4	MR 7	MR 4	JFS