Environmental Protection of
International River Basins Project
Contract No. 2011/279-666

This project is funded by
The European Union

A project implemented by a Consortium
led by Hulla & Co. Human Dynamics KG

Mission Report

for Second Mission of the KE3 Ecology and Biology Expert 14th October to 17th November 2012

Table of Contents

Introduction

Owing to concerns about the capacities of the laboratories, it was agreed that this second mission would cover *Activity 1.5 "Support the analytical quality control assurance procedure"* and *Activity 1.6 "Assess the needs regarding laboratory infrastructure, equipment and training"* to investigate the capabilities and quality controls of the water quality laboratories for five member countries. The mission starting on 14th October and completed on 17th November according to the operational plan is shown in Appendix 3.
The tasks included the following:

1) Visit five beneficiary countries and discuss their water laboratories' capabilities of sampling, analysing and the quality controls of the results for monitoring the biological and physical /chemical parameters for compliance with the WFD.

2) Highlight the requirements to improve the laboratories' capacities, which would be developed in separate report proposing the Project's recommendations for each country.

3) To participate and lecture at the River Basin Monitoring Workshop in Batumi, which included:

i. Presentation for the River Basin Monitoring for Biological and Physical Chemical Parameters according to the WFD.
ii. Presentation for the River Basin Monitoring for the procedures for ensuring good quality results.
iii. Moderator for the group discussions on the checklists for Biological and Physical Chemical Parameters.

4) Finalise the "Checklists" and "Wishlists" for biological and chemical physical parameters for each member state.

National Monitoring Laboratories' Reviews /Analytical Capacity and Quality Control Gap Assessment/

1) Armenia (21-25 October 2012)

Background

The main organisation responsible for surface water resources quality monitoring 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 projects which are detailed below.

Environmental Impact Monitoring Centre (EIMC), Ministry of Natural Protection, Yerevan

Present

Seyan Minusyan, - Deputy Head of Environmental Impact Monitoring Centre (EIMC), Ministry of Natural Protection,
Vahagn Tonoyan, - Project Country Water Management Expert

Other Support Projects

Owing to the support provided by the EU KURA-II project, and continuing under the KURA-III project, EIMC became actively involved in sampling and analysis of hydrobiological parameters mainly benthic invertebrate fauna. The EU Kura Projects have undertaken the following:

1) Prepared a draft river basin management plan using field surveys of the pilot area of the certain tributaries of the Kura River and transboundary between Armenia and Georgia.
2) Undertook hydrobiological studies using benthic macroinvertebrates, and phytobentos. Phytoplankton is currently being studied.
3) A hydromorphological study was undertaken.
4) The EU initially funded training and studies at 8 sampling locations. However the EIMC decided to increase the number of locations to 40 points and co-financed this extra work. This meant that of the 44 water bodies identified, 25 water bodies were monitored instead of 8, which provided more useful representative information.
5) Four reference points were selected according to their differing typology and morphology.
6) Inter-calibration exercises were undertaken with Georgia.
7) The Ecological Quality Ratios (EQR) were currently being determined and will be highlighted in the next Kura Group meeting on November 28th.
8) It was envisaged that the study of the biological element of fish would be undertaken by the Hydroecology Institute together with the National Parks Department.

GEF USAID Project for the Kura

This project has also assisted on the training for biological elements. Furthermore, inter-laboratory comparison tests were carried out with all the Caucasus' countries and were facilitated by a Slovakian Institution.

GIZ Sustainable Biodiversity Project (24th October)

Present

1) Thomas Eberherr, Team Leader GIZ Armenia
2) Asighik Danieiyan, Biological Expert GIZ Armenia
3) Vahagn Tonoyan, Project Country Water Management Expert

This project was started in 2009, which should extend to 2017, and includes four components to:

1) Support the government implement the Convention of Biodiversity.
2) Ensure sustainable forests.
3) Sustain other natural areas.
4) Provide regional co-operation for Armenia with Georgia, Azerbaijan.

To accomplish this, the project has:

i. Assisted in establishing national monitoring plans, and GIS systems.
ii. Provided environmental education courses using a system of 28 indicators with 150 schools.
iii. Addressed pressures using cost effective measures.
iv. Supplied a limited amount of equipment, such as sampling nets.
v. Remote sensing hardware & software monitoring forests and agriculture.

GIZ was keen to co-operate with the EPIRB Project, especially in the training for hydrobiological analysis.

Laboratory Capacity

Water samples are routinely analysed for some 49 parameters, which includes about 18 heavy metals, although mercury is not included. These are listed in the summary checklist in appendix 4.The number of routinely analysed organic micropollutants is limited owing to the lack of certified standards and further training requirements, which the Project could consider. The following points were noted:

- There are spectrophotometers and an IC which all operate well to analyse the general chemical/physical/ parameters.
- Assistance and training for biological monitoring especially in phytobentos and macrophytes, (zoobentos, and phytoplancton will be provided by new biodiversity project with GIZ. It is recommended that the Project co-operates with Asighik Danieiyan, GIZ Biological Expert, who will firstly prepare guidelines and in Spring submit a 12 days on–site training programme.
- Further development of the analysis of the Priority Substances and the hazardous ones, also other organic compounds is ongoing but training and standards are required. The department has advanced analytical equipment including: GC/MS, GC/FID, GC/ECD, ICP/MS, IC and TOC. Furthermore, the TOC requires installation, and training.It was proposed that training and assistance should be provided by the Project.
- The ICP/MS (Perkin Elmer 9000) can analyse 30 metals in one analytical run but owing to the high consumables costs, (10 cylinders of argon per month), it is operated only twice per month.
- The GC/ECD is used for a limited six parameters and further training is required for at least fourteen priority parameters.

- There is a sample preparation microwave digester for metals, for soils, & sediments, which requires commissioning and staff training.
- The laboratory requires assistance from the Project to be internationally accredited.
- Limited analytical quality control (AQC) procedures are undertaken but these need to be formalised and improved.

Data Processing

The department uses Microsoft Excel for recording results, and Microsoft Access for archiving the results, however, a customised laboratory information management system would be more efficient in processing the data.
The department has already started trying to identify water bodies in the Project pilot areas so that the sampling points can be identified and computerised to enable the field studie. Seyan Minusyan was also interested in exploring the use of River Basin Management Councils and automatic monitoring stations to assist in managing the areas.

Sampling

The surface water quality monitoring network comprises 131 sampling points. The sampling frequency varies between 7-12 times per year, with most of the sampling sites being sampled once every month. The routine surface water quality monitoring programme are analysed for some 45 – 50 parameters, comprising the more traditional water quality parameters, heavy metals, organic micropollutants (notably organochlorinated pesticides) and microbiological parameters (Coliforms total, intestinal enterococci, Escherichia coli).

Requirements

Training has been requested for the following training:

1) Application of internal analytical quality controls.
2) The procedure and software for validating analytical methods.
3) Developing and improving the GC methods for analysing organic compounds in the WFD priority list.
4) Developing and expanding the hydrobiological elements.
5) Assisting with the Installation, commissioning and training on the TOC analyser.
6) Assisting with the Installation, commissioning and training on the Microwave Digester.
7) Assisting with the international accreditation.
8) Assistance and training for biological monitoring especially in phytobentos and macrophytes.
9) Co-oerate with the GIZ Sustainable Biodiversity Project to agree on training programmes.

2) Azerbaijan (05-11 November 2012)

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 NEM is the pollution monitoring laboratory of natural waters, located in Baku. There are two other laboratories in Kazakh and Beylagan, which analyse the chemical/physical parameters.

Kazakh Laboratory, Ministry of Ecology & Natural Resources, 5th to 6th November

Present

1) Matanat Avazova Deputy Director, Monitoring Centre of Environmental Pollution
2) Huseynova Vusala,
3) Abdullayeva Duzdana
4) Gasimova Inara
5) Khalilova Naila
6) Huseynova Zemfira
7) Rustam Rajabov - Project Country Water Management Expert

The laboratory analyses consists of routinely measuring 15 physico- chemical parameters and measure DO, pH, EC, Turbidity, TDS on-site. Training support has been previously provided by other projects including quality control, though further training is required especially on internal AQC and method validation.

The procedure for undertaking the colorimetric analysis was investigated by Key Expert 3 (KE3). It was noted that the procedure for operating the spectrophotometer was incorrect, as the staff could not understand the manufacturer's manual, which was in English. The KE3 trained the staff on the correct zeroing procedure, which enabled the staff to obtain the correct calibration graph.

Baku Monitoring Centre of Environmental Pollution 6th to 11th November

Present

1) Arastun Hasanov, Director National Department Environmental Monitoring Azerbaijan
2) Matanat Avazova Deputy Director, Monitoring Centre of Environmental Pollution
3) Aliyev Vasif, Head of Laboratory
4) Emil Abdulazizov, Chemical Engineer
5) Ms Mammadova, Sabina Head of AAS Laboratory
6) Ms Vafa Nasibova, Head of Biomonitoring
7) Ms Dushdurova, Aybeniz Head of Water Laboratory
8) Rafig Verdiyev, Hydrology Lecture, Baku State University
9) Gulnur Salmanova, Hydrology student, Baku State University
10) Samiza Yusibova, Hydrology student, Baku State University
11) Vaqif, Hydrology student, Baku State University
12) Rustam Rajabov Project Country Water Management Expert

Laboratory Capacities

The laboratory routinely analyses some 31 parameters routinely and analyses DO, pH, EC, Turbidity, TDS on-site, which is detailed in appendix 4.
The chemical laboratory has a UV/Vis (Lambda) spectrophotometer to analyse nutrients analysis. The laboratory analyses control samples to check the accuracy and precision, but this procedure could be improved if AQC charts were used to check if the results are statistically correct. The Project could train the staff on this technique.

The laboratory has obtained a new Agilent GC/MS which requires installation, and commissioning. It is proposed that if the MENR agrees to fund this, and the commissioning is timed at the same time the Project Expert is present, then assistance with training could be provided by the Project.

Benthic macroinvertebrates analysis is undertaken by Ms Vafa Nasibova, Head of Biomonitoring, who was trained by the previous projects. This analysis and sampling included:

i. Multi-habitat sampling by wading and using kick nets & hand net sampling (Method EN27828).
ii. Stony Substrate sampling (Method EN 282665).
iii. Large deep slow flowing pools sampling (Method EN/ISO 9391).
iv. Identification of taxa and species.

The department requires further training by the Project on certain taxa and biotic indices and Ecological Quality Ratios (EQR).

The laboratory is nationally accredited but requires training to become internationally accredited. It was suggested that the Project could assist with this and also facilitate a link with an international accreditating agency, e.g. TURAK in Turkey. Furthermore, it was suggested that the Project could involve the Caspian Sea Laboratory and also national biological institutes.

Sampling

Routine surface water quality monitoring programmes comprise 44 locations with monthly analysis of surface water samples for common physico-chemical parameters, and quarterly analyses of a limited number of heavy metals.

Baku State University

Present
1) Professor Fada Imarov
2) Rustam Rajabov, Project Country Water Management Expert

The progress of the project river basin analysis (RBA) was discussed. The RBA consists of four chapters:

Ch.1 Physical Geography of the River Basin
Ch.2 Social and Economic Analysis
Ch.3 Pressures and Impacts -
Ch.4 Monitoring

The main pressures on the Project pilot rivers are:

i. Uncontrolled water abstraction for irrigation.
ii. Manmade reservoirs on 3 of the 4 rivers which impacting on the normal flows of the rivers and cause dried rivers during the summer time.
iii. Over-grazing of cattle in the plains and mountain regions causing desertification and erosion and therefore producing excess silt in water.
iv. Illegal logging for fuel, causing deforestation, - this has diminished recently owing to gas being supplied to more communities.

v. Uncontrolled channels being made by farmers to divert the natural flows of small streams to combine together to produce larger flows.
vi. Mining for marble, where the washings are discharged into the rivers.
vii. One of the largest iron mines in the Caucuses, where a proposal to construct an iron smelting and steel works is being considered.

The deadline for the completion of the RBA report is mid November 2012.

Requirements

Training has been requested for the following:
1) Training on certain taxa of benthic macroinvertebrates.
2) Training on the assessment of the biotic indices and Ecological Quality Ratios (EQR).
3) The laboratory has obtained a new Agilent GC/MS which requires installation, and commissioning. It is proposed that if the MENR agrees to fund this, and the commissioning is timed at the same time the Project Expert is present,, then assistance with training could be provided by the Project.
4) The laboratory is nationally accredited but requires training to become internationally accredited. It was suggested that the Project could assist with this and also facilitate a link with an international accreditating agency, e.g. TURAK in Turkey.

Furthermore, it was suggested that the Project could involve the Caspian Sea Laboratory and also national biological institutes.

3) Georgia (26 -27 October 2012)

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.

Environment Pollution Department, National Environmental Agency (NEA). Tbilisi 26th October

Present

1) Marina Arabidze NEA Georgia Head of Environment Pollution Department
2) Elina Bakrodze , Departmental Manager
3) Anna Natziashuil, Head of Water Monitoring.
4) Zurab Jincharadze, Project Deputy Team Leader

Laboratory Capacity

Three laboratories are involved: the Laboratory of Atmospheric Air, Water and Soil Analysis (the central laboratory of NEA, located in Tbilisi), the Laboratory of Environmental Pollution Monitoring in Kutaisi and the Black Sea Monitoring Division Laboratory in Batumi. The Department undertakes monitoring of fresh surface water quality within Georgia on regular basis and has a total of 41 staff.

The laboratories can analyse for some 37 parameters, which includes hydrocarbons, polycyclic aromatic hydrocarbons, pesticides the full list is noted in the Checklist, Appendix 4.
The inorganic anions are analysed by a Dionex Ion Chromatograph and the organic compounds are analysed by a number of GLCs, including ones with ECD and MS detectors. For sample preparation there is rotary evaporator, soil microwave digester and liquid/liquid extraction equipment. There are problems with the purity of gases and the hydrogen generator is not functioning. Currently certain pesticides, PAHs and hydrocarbons are analysed. Further training on organic analysis especially in the identification of chromatographic peaks is required.
Currently there is a problem with the Perkin Elmer (PE) AAS, as the gas safety system is faulty and switches off the gases, so cannot be operated. To resolve this, PE need to diagnose the problem which has quoted the cost to be 3500 US $, and then further payment would be required to repair it, which is considered excessive. Assistance to resolve this could be considered by the Project.
Following the support from previous projects they have started analysing macro-invertebrates, but the department requires further training on the assessment of other biological elements with more staff recruited.
The laboratory is nationally accredited and is making steps to also be internationally accredited having prepared a Quality Manual and Standard Operating Procedures (SOPs). However, further assistance is required by the Project for further training on Analytical Quality Controls and internal auditing. The laboratory undertakes private analysis but to avoid concerns about a conflict of interest the sample bottles are only labelled with numbers, not locations or customer.

Data Processing

The data is processed in a dedicated data processing department for monthly and annual reporting to evaluate trends etc. but to make this more effective training is required in GIS and LIMS software.

Sampling

Sampling is undertaken at 43 locations of 22 rivers and at one location in Paliastomi Lake. The sampling frequency is once per month. Samples are analysed for a suite of more than 33 different parameters. The monitoring of bathing areas, Lake Ku, Lake Lisi, and Tbilisi Sea, commenced in May 2009. The latter monitoring includes microbiological (total coliforms , Escherichia Coli, Faecal Streptococcus) in addition to physico-chemical parameters.

The department has specific technical staff responsible for sampling monthly from each site, including on-site analysis for pH, DO, salinity, EC, & Temp, and completing a visual assessment form for each sampling point.

Other Relevant Projects

Previous projects including the Kura projects have supplied hydrobiological equipment such as boats, kick-nets, and microscopes. Owing to the support of these projects the department has started analysing macro-invertebrates, however further training on the other biological elements is required.
The US Aid GEF project has trained on a simplified rapid assessment using hydrobiological elements.

Finnish Biomonitoring Project

Present

1) Eloheimo Kari (Freshwater Centre (SYKE- Finnish Environment Institute)

2) Kristian Meissner Senior Researcher (Freshwater Centre (SYKE- Finnish Environment Institute)

The project has operated for a number of years and is due to terminate shortly. It has provided training on a number of topics, including the sampling for macroinvertebrates and has carried out an audit on this sampling, which the staff completed very successfully.

Kristian Meissner recommended that more training was required for analysing the typology particularly of reference sites and GIS. Furthermore, he was concerned that the sampling staff were not vaccinated so could be vulnerable to infections from water born diseases, such as Weils Disease. Interestingly, Finland does not use the "one out all out" system for biological assessments and also does not subscribe to the multi-habitat sampling approach, as advocated in the previous ISO standards. SYKE facilitates inter laboratory proficiency tests for benthic macroinvertebrates, which could be applied to the Project.

Batumi Laboratory - Black Sea Monitoring Division, Environment Pollution Department NEA (1st November)

Present

1) Mr George Komakhidze, Head of the Black Sea Monitoring Division
2) Ms Marina Mgeladze, Chief Monitoring Specialist,
3) Mr Revaz Diasamidze, Hydro-biologist, benthos specialist
4) Mr Revaz Goradze, Hydro-Fauna Specialist
5) Ms Tsiuri Gvarishvili, Specialist of phytoplankton
6) Ms Dodo Zghenti, Water Microbiologist
7) Ms Eteri Mikashavidze, Specialist of macro zoobenthos
8) Ms Meri Khalvashi, Specialist of zooplankton
9) Mr Archil Guchmanidze, Specialist of marine mammals
10) Ms Marina Arabidze Head of Environment Pollution Department

The division consists of two units:

1) Biodiversity Units, which studies fish, phytoplankton, zooplankton, macro -invertebrates, and phytobentos
2) Pollution Monitoring Unit, which studies physico chemical pollution of the lake and regional rivers.

The chemical laboratory has a Perkin Elmer AAS (600) which has a carbon furnace and flame atomiser, which is superior to the AAS in Tbilisi. Unfortunately, this cannot be used because there is a problem with the energy of lamps and requires repairing. Advanced AAS training is required, which could be provided by the Project. In addition there is a modern Luminescence Spectrophotometer, which has never been used as it has not been installed, commissioned and training submitted, these problems require resolution.

The Hydrobiology Laboratory has the equipment required for sampling hydrobiological elements including a boat and electrical fish monitoring equipment. A number of staff are fully experienced in these analyses and could be used as trainers by the Project. The staff was enthusiastic to participate in the Project and requested training on the WFD monitoring methodology.

Requirements

Training has been requested for the following:

1) Training on the assessment of other biological elements , such as benthos phytoplankton, and macrophytes.
2) Facilitate the participation of the experienced hydrobiologists at Batumi Laboratory within the project. Training on the WFD monitoring methodology.
3) Training on Analytical Quality Controls and internal auditing.
4) Training for analysing the typology particularly of reference sites.
5) Training on the use of LIMS and GIS systems.
6) Training on organic analysis especially in the identification of chromatographic peaks.

Whilst the above training is undertaken, the Laboratory Expert could assist the laboratories in resolving the problems with the AASs, and other equipment.

4) Moldova (14-17 October 2012)

Background

The State Hydrometeorological Service (SHS) under the Ministry of Environment (MoE) is the key 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, its network. The network comprises about 50 locations, with samples for physico-chemical parameters taken 4 – 12 times per year.

State Hydromet Services, Ministry of Environment [14th –17th October.]

A number of meetings were held with the staff which included:

Present

1) Mr. Mihail Roibu – Director of SHS
2) Ms. Elina Plesca – First Deputy Director of SHS
3) Mr. Valeriu Cazac – Head of Hydrology Department, SHS
4) Ms. Valentina Ceres – Head of Hydro-forecasts Division, SHS
5) Mr. Vitalie Jocot – Engineer-hydrologist, SHS
6) Mr. Gavril Gilca – Head of Environmental Quality Monitoring Department (EQMD), SHS
7) Ms. Svetlana Stirbu – Deputy Head of EQMD, SHS
8) Ms. Ana Budisteanu – Quality Manager, EQMD, SHS
9) Ms. Victoria Luchianova – Senior Engineer, Hydrobiology Division, SHS
10) Ms. Nina Balan – Main Specialist of HyD, SHS
11) Mr. Nicolae Zuza, Representative of HyD, SHS
12) Dr Andriy Demydenko- Project Team Leader

Hydrology Department

The following needs of the department were submitted:

i. In-depth training on hydromorphological analysis is required, as the department wishes to establish a new hydromorphological unit. It was recommended that the key expert on hydromorphology assists with this issue.
ii. A study to prepare for the affects of climate change, which has already reduced the quantity of water, this could also increase the concentrations of pollutants.
iii. The department does not monitor flows of abstraction and discharge, these needs further investigations.
iv. Online data is available to the public and could be developed.
v. Studies of the air transport of pollutants by the application of computer models.
vi. Ideally, they would also like to have computer modelling software such as MIKE 11, which is expensive and unfortunately beyond the scope of this project.

Environmental Quality Monitoring Department

Analytical Capacity

The laboratory is well-equipped, and its quality control procedures are very advanced, as noted below. Nevertheless, the laboratory is not analysing at its full capacity due to a combination of factors: as they require certified reference material, reagents and other consumables; and further training.

i. Some 46 parameters are analysed which are noted in the summary checklist (Appendix 4)
ii. There are spectrophotometers and an IC which all operate well to analyse the general chemical/physical/ parameters.
iii. The following biological parameters are measured but at different levels: phytobentos, phytoplankton, benthic macroinvertebrates, zooplankton, chlorophyll A and microbiological parameters. Five staff are responsible for these analyses.
iv. The Atomic Absorption Spectrophotometer (AAS) was comprehensive, consisting of carbon furnace, flame and hydride accessories capable of analysing most heavy metals at the required the detection limits.
v. The GLC has a MS detector and therefore capable for analysing most of the WFD organic priority substances, however, it is limited by the number of available standards and additional training.
vi. There is a new FIA fluorescence mercury analyser but this cannot be currently used because ultra pure and expensive of hydrochloric acid is required, which needs further investigation.
vii. There are spectrophotometers and an IC, which all operate well to analyse the general chemical/physical/ parameters.

Sampling programmes

i. The river sampling program is scheduled quarterly and monthly depending on the parameters.
ii. Fish are not monitored by Hydromet but are monitored by another government agency.
iii. The sampling programme had been prepared for the River Prut with 7 sampling points. This amounts to 160 samples/ year with differing analytical suites at quarterly and monthly frequencies.

Quality Assurance

i. It was internationally accredited for ISO 17025, for 11 parameters.
ii. It participates in international inter-laboratory calibration schemes, such as those at ICPDR, Slovakia, and Monaco.

iii. There is a customised software for method validation entitled, which complies with the recommended procedures of Eurochem.
iv. All analysis includes the use of internal analytical quality controls, using another software that produce Shewhart Charts.
v. The quality controls also include spiked recovery samples.
vi. The department is keen to increase Hydromet's facilities as a training centre - training on quality control has already been submitted to certain laboratories in Ukraine by Hydromet.

State Hydromet Services, Ministry of Environment (Second visit) [11th to 14th November]

Quality Control Workshop

The objectives of the quality control workshop were to train staff on important aspects of quality control and to introduce the AQC and validation software to the Ukraine laboratory staff. This was also an excellent opportunity to develop co-operation between the two countries especially in working together on the transboundary pilot studies of the River Prut.

The subjects covered by this quality control workshop were:
i. Introduction to Laboratory Accreditation 17025.
ii. Production of Standard Operating Procedures (SOPs).
iii. Laboratory Information Management Systems (LIMS).
iv. Introduction to Analytical Quality Control, Precision and Accuracy.
v. Practical Demonstration of Internal AQC system used in Hydromet.
vi. Validation of Analytical Methods.
vii. Practical Demonstration of Method Validation Software used by Hydromet.

The agenda is shown in Appendix 2 and the copies of the PowerPoint Presentations have been submitted separately. Electronic copies of the PowerPoints, together with the method validation software (AQC99), developed by the UK Water Research Centre, were submitted to the delegates by the KE3.

The training workshop was very interactive indicating that the delegates understood the concepts and were keen to develop and improve their AQC systems. The Ukraine delegates also wanted to obtain the Moldovan AQC software. This software could be very useful as further training material for the Project not only for Ukraine but also for all the other Member countries and needs further investigation.

Requirements

Training has been requested for the following:

1) Further training on the biotic indices.
2) Training on processing the data producing Ecological Quality Ratios (EQR).
3) Further advanced training on the analysis of four biological elements but excluding fish.
4) Assist to facilitate Hydromet to be a centre of excellence for the region and submit training on quality assurance.
5) Assist to obtain more international keys for the identification of the WFD biological elements .
6) Provide training on the selection of reference water bodies.

7) Facilitate inter-calibration on biological EQR with other transboundary countries.
8) Establish quality positive and negative controls for the microbiological analysis.
9) To enable the laboratory to analyse certain organic priority parameters, it requires further training and certified standards that could be considered by the Project.
10) Facilitate the establishment of a Prut River Basin Council, which could link with a similar council in Ukraine. Within this new council, technical sub-working groups could be established to advise and integrate surface water monitoring, hydromorphological and groundwater aspects.
11) As the training workshop was so successful and has assisted Moldova to improve their AQC systems, it is recommended that similar workshops are held to at other locations and be integrated with the next missions of the KE3.

It was requested that assistance to resolve the equipment problems undertake by the Project Expert whilst undertaking on- site training.

5) Ukraine (17-18 October 2012)

Background

There are 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. To simplify this, it was decided to initially visit the key authorities responsible for monitoring the rivers in the pilot regions. The State Hydrometeorological Service has been contacted but to date is unable to participate in the project.

Basin Management Authority of Water Resources (BUVR) Chernivtsi (17th October to 18th October)

Present

1) Mr. Oleksandr Toniyevych – Deputy Head of Dniester-Prut BUVR
2) Mr. Stanislav Soloninka – Head of Information and System Support Monitoring Division, Dniester-Prut BUVR
3) Ms. Teofila Pleshko - Head of Basin Laboratory for Water and Ground Monitoring, Dniester-Prut BUVR
4) Ms. Tetiana Bozhyk – Leading Engineer, Advanced Development and International Relations Division, Dniester-Prut BUVR
5) Dr Andriy Demydenko- Project Team Leader

Sampling

i. There are four sampling points on the River Prut where samples are taken monthly and quarterly.
ii. Two samples are also taken by another oblast but sent to the BUVR laboratory for analysis.
iii. The department also undertakes private analysis of effluent producers.
iv. To administer this, the River Basin Management Council for the River Neister has been established but not for the River Prut.

Laboratory Capacity

i. About forty chemical'physical parameters are analysed.
ii. There is an AAS but only has a flame atomiser, so it is difficult to reach low detection limits for certain heavy metals e.g. Cd & Hg.
iii. There is specific equipment for the analysis of oil.
iv. There is a dedicated database system for processing the analytical results, which may need to be updated and expanded to include data from other agencies, such as SES, which also analyses river water samples.
v. The laboratory also undertakes soil analysis for irrigation purposes.

Dnieper River Basin Management Council (Vyshhorod) 19th October)

Present

1) Mr. Arkadii Sakevych - Head of Dnieper BUVR
2) Mr. Ivan Dremlyuga - Deputy Head of Dnieper BUVR
3) Mr. Mykola Stetsenko – Head of Control and Public Relations Division
4) Mr. Ihor Strelets - Division Head, Dnieper BUVR
5) Ms. Olga Kravtsova – Head of Basin Laboratory for Water Monitoring, Dnieper BUVR
6) Dr Andriy Demydenko- Project Team Leader

Laboratory Capacity

The laboratory can analyse 27 physical/chemical parameters and 65 radiological parameters, which is detailed in the checklist Appendix 4.However, no hydrobiological parameters are analysed. Organo-chlorine pesticides can be analysed by capillary GC but the training on the operation was limited, as the staff were unable to change the columns and rely on the service company (Macrohohim) to undertake this.
There is a modern Foss Kjeldahl Nitrogen (2300) analyser that was donated by another project in 2008 but unfortunately has never been used owing to lack of training and because the operation manual was only in English. Similarly there is a Leica Microscope (MZ75) donated by the same project but has also never been used. These need to be investigated to check with the original project donating the equipment.
There is specific equipment for oil analysis and an AAS used for heavy metal analysis but was limited to only flame atomisation.
The laboratory has been nationally accredited but not internationally.

Data Processing

The upper Dnieper includes six oblasts with seven fixed sampling points in each oblast amounting to a total of 22 sampling points.
There is database for processing the results from each of these sampling points which applies Google Earth software as a platform. This has integrated thematic layers showing details associated with each of these locations, highlighting the analytical results; water users, and morphological changes due to gravel extraction. It is anticipated this will in future include the data from SES, groundwater & biological data. This could be a useful resource that could be used and developed further by the Project.

The National Academy of Sciences of Ukraine, Institute of Hydrobiology, 16th November,

Present

1) Dr. Volodymyr Yakushyn – Deputy Director on Scientific Work
2) Dr. Volodymyr Yuryshynets – Deputy Director on Scientific Work
3) Dr. Sergiy Afanasyev – Head of Ichthyology and Ecology of River Systems Department (IERSD)
4) Dr. Olena Letytska – Leading Engineer, (IERSD)
5) Dr Andriy Demydenko- Project Team Leader

Background

The department was founded in 1940 and there is a great deal of archived biological data available. It specialises in four main areas:

1) Traditional hydrobiology & biodiversity;
2) Radiological & eco-toxicology;
3) Ecology;
4) Biotechnology &Aquaculture.

There were 10 units including: sanitary control, water resources, physical, toxicological, chemical, & ecological analysis units.

The department has a very advanced HPLC/MS/MS (Agilent) used for a US Aid funded co-operation project with the US EPA analyzing wastewater treatment works effluent discharging into the rivers for: hormones, steroids, antibiotics , trichlorosan, caffeine, which is state of art world research.

The biological research units are also undertaking interesting research for cultivating algae, daphnia fish eggs, midge larvae, shellfish and sturgeon to undertake toxicological research and test modelling. There is apparatus that can model different environmental conditions such as temperature, nitrogen, oxygen, and sunlight. The research also includes the cultivation of water hyacinth used to promote a species that can survive the low temperatures and then be applied for biological water purification.

Leititske Olena is an expert on benthic macro-invertebrate who has been certified as a trainer of trainer for AQUEM - the validated system of sampling applied by the IPDPR. She has worked in a number of UNDP and EU projects in transboundary river basin monitoring and could be used in the Project. She has assisted in developing a specialist software for the classification of benthic macroinvertebrates, which can used to calculate biomass. It can also inter-correlate the Western classification ID number system and Soviet ID number system, which could be extremely useful for the Project. Olena agreed to produce a demo version of the software so that the Project could evaluate it.

The department was keen to be involved in the Project and would like to complete the Checklist.
They have participated in other projects and in Slovakian inter-calibrations of biomonitoring and have received a certificate for training to be trainers. These trained staff could assist the project. They would also be interested in any training for international accreditation.

Requirements

Training has been requested for the following:

1) Develop the operation of the Foss Kjeldahl Nitrogen (2.300) analyser, the Leica Microscope (MZ 75).
2) Assist in developing more methods and parameters using the GLC.
3) Train staff on agreed analysis of agreed biological elements such as benthic macro invertebrates.
4) Investigate the application of automatic monitoring stations in the pilot regions.
5) Assist in the development of the laboratory to be internationally accredited with appropriate internal quality controls.
6) Advise in the further development of the database, e.g. to include groundwater data.

The National Academy of Sciences of Ukraine, Institute of Hydrobiology has a great deal of expertise to offer the project, therefore it is recommended that the Project investigates if some of their students could be used, especially in the hydrobiological analysis.
Furthermore it was proposed that Leititske Olena should be considered as a possible trainer on sampling for Macroinvertebrates and the Project investigates the application of her specialised software she has developed in other Member states.

Summary & Conclusions

A. Five member states were visited and their national water laboratories were reviewed. The Biology and Ecology expert assessed their procedures in place and determined the reliability of the equipment used.
B. Many countries had similar requirements on quality control and trainings for more hydrobiological elements but also had specific issues the need to be addressed individually.
C. Following the laboratory reviews, recommendations have been submitted for each country. It is proposed that the **Recommendations for Laboratory Capacities Report** will also include these issues and should then be submitted to each of the beneficiaries to ensure their agreement and to avoid any omissions.
D. Following this, it is proposed for the KE3 to draft a programme and a strategy on how and when the Project can address these issues following the co-operation with the beneficiaries**.**

A Laboratory Quality Control Workshop was held in Moldova, which the delegates found to be very useful in improving their AQC systems and was much appreciated. It is proposed that similar workshops will be held in other countries and plans have been made to submit this in Belarus to coincide with the next KE3's next mission.

Appendix 1 - List Of Delegates At The Laboratory Accreditation & Quality Control Training Workshop In Chisinau (13th November 2012)

List of Delegates at the Laboratory Accreditation & Quality Control Training Workshop In Chisinau

#	Name	Position	Contacts
		Moldova	
1.	Mr. Leahu Arcadie	Chief of the Center for Ecological Researches, Ecological Agency Chisinau	+373 22 28 15 77 (tel.) +373 69 08 38 69 (mob.)
2.	Ms. Budisteanu Ana	Quality Manager, Department of Environmental Quality Monitoring, SHS	+373 22 76 68 77 (tel.) +373 60 29 90 77 (mob.)
3.	Ms. Molnicean Natalia	Engineer, Surface Water Quality Center, Department of Environmental Monitoring, SHS	+373 69 27 17 92 (mob.)
4.	Ms. Jurcu Valentina	Engineer-hydrobiologist, Surface Water Quality Center, SHS	+373 22 76 24 66 (tel.) +373 79 35 52 39 (mob.) valea-31@mail.ru
5.	Ms. Racovet Natalia	Engineer, Surface Water Quality Center, SHS	+373 22 76 24 66 (tel.) +373 68 25 26 14 (mob.) nataliaracovet1901@yahoo.com
6.	Ms. Cumanova Anna	Chief of the Center for Soil Quality Monitoring, SHS	+373 22 76 68 77 (tel.) CMCS@mail.md ana.cumanova@meteo.gov.md
7.	Ms. Orlova Nadejda	Chief of the Center for Physical and Chemical Analyses SHS	+373 22 76 68 77 (tel.) nadejda.orlova@meteo.gov.md
8.	Ms. Balan Violeta	Chief of the Center for Atmospheric Air Quality Monitoring, SHS	+373 22 76 25 66 (tel.) airpollution2007@yahoo.com violeta.balan@meteo.gov.md
9.	Ms. Melnic Marina	Engineer, Surface Water Quality Center, SHS	+373 69 17 56 72 (mob.)
10.	Ms. Cunician Liudmila	Chief of the Surface Water Quality Monitoring Center (SWQMC), SHS	+373 22 76 24 66 (tel.) CMCAS@mail.md ludmila.cunicean@meteo.gov.md
11.	Mr. Bujac Victor	CWM, Human Dynamics	+373 22 28 85 53 (tel.) +373 69 71 55 77 (mob.) victor_bujac@yahoo.com
		Ukraine	
12.	Ms. Pleshko Teofila	Head of Basin Laboratory for Water and Ground Monitoring, Dniester-Prut BUVR	+380 50 978 18 76 (mob.) dpbuvr@dpbuvr.org.ua
13.	Ms. Kravtsova Olga	Head, Basin Laboratory for Water Monitoring, Dnieper BUVR	+380 459 65 40 32 (tel.) +380 99 044 65 58 (mob.) Blmvdbuvr@ukr.net

Appendix 2 - Agenda for the Workshop in Chisinau for Laboratory Accreditation and Quality Control

Agenda for the Workshop in Chisinau for Laboratory Accreditation and Quality Control

Technical Assistance & Capacity Building	
Course	**Laboratory Accreditation and Quality Control**
Date	13th November 2012 (1 day)
Objectives	Introduction to the procedures and techniques required for international accreditation for water laboratories
Target group	Staff involved in River Basin Management Monitoring
Materials	Computer PowerPoint Presentations with Projector, Flip Charts, supporting information and software
Location	Hydromet, Chisinau, Moldova

DAY 1			
Time	**Method**	**Content**	**Lecturer**
9.00 -9.15		Welcome to delegates	Head Of Hydromet
9.15-9.45		Introduction to the Project and the Training Workshop	Victor Burjac
9.45 –10.30	Lecture 1	Introduction to Laboratory Accreditation 17025	Michael Jackman
10.30–10.45		*Coffee Break*	
10.45-11.45	Lecture 2	Production of Standard Operating Procedures (SOPs) & Laboratory Information Management Systems (LIMS)	Michael Jackman
11.45-12.30		Questions and Discussions	
12.30 – 13.30		*Lunch*	
13.30 – 14.30	Lecture 3	Introduction to Analytical Quality Control, Precision and Accuracy	Michael Jackman
14.30 – 15.00	Lecture 4	Practical Demonstration of Internal AQC system used in Hydromet	Hydromet Lab Staff
16.00 – 16.15		*Coffee Break*	
16.15 – 16.45	Lecture 5	Validation of Analytical Methods	Michael Jackman
16.45 – 17.30		Practical Demonstration of Method Validation Software used by Hydromet	Hydromet Lab Staff

Appendix 3 - Operational Plan for Mission 2

14 Oct	**Travel day:** KE3 departs at 5:25 from Penang to Chisinau
15 Oct	**Chisinau:** KE3 arrives in Chisinau at 9:20 am, TL arrives to Chisinau by car, visiting Hydromet labs (KE3, TL, CWME, 2 benef. repr.)
16.Oct	**Chisinau:** continuation of work with Hydromet labs staff (KE3, TL, CWME, 2 benef. repr.). TL, KE3, 2 benef. repr. travel by car to Chernivtsi
17. Oct	**Chernivtsi**: visiting Prut BUVR labs (KE3, TL, 2 benef. repr.)
18. Oct	**Chernivtsi**: continuation of work with Prut BUVR labs staff (KE3, TL, 2 benef. repr.). KE3, TL, 2 benef. repr. travel to Kiev by car
19. Oct	**Vyshgorod (Kiev region):** field visit, Dnipro BUVR labs (KE3, TL, 2 beneficiary repr.)
20. Oct	**Kiev**: meetings with Mr. Obodovskiy (KE3, TL)
21. Oct	**Travel day:** KE3 arrives in Yerevan
22. Oct	**Yerevan:** meetings with… (KE3, CWME)
23. Oct	**Yerevan:** meetings with… (KE3, CWME)
24. Oct	**Yerevan:** work on report
25. Oct	**Travel day:** KE3 travels from Yerevan to Tbilisi by car
26. Oct	**Tbilisi:** visiting Environmental Laboratory of the National Environmental Agency - NEA (KE3, DTL)
27. Oct	**Tbilisi:** visiting NEA Environmental Laboratory (0.5 day); working on report ? (0.5 day)
28. Oct	**Travel day:** KE3, DTL and GE workshop participants travel to Batumi by bus
29. Oct	**Batumi:** WFD Monitoring Workshop - Day-1
30. Oct	**Batumi:** WFD Monitoring Workshop - Day-2
31. Oct	**Batumi:** WFD Monitoring Workshop - Day-3: the Black Sea Day Seminar by EnviroGRIDS
1.Nov	**Batumi:** visiting the Black Sea Environmental Laboratory (KE3, DTL, GE beneficiary repr.)
2. Nov	**Batumi/travel:** work with the Black Sea Env Laboratory (0.5 day); travel to Tbilisi by car (0.5 day)
3. Nov	**Tbilisi:** KE3 work on report
4. Nov	**Travel day:** KE3, DTL travel from Tbilisi to Ganja by car; CWME, AZ beneficary repr. travel from Baku to Gazakh by car
5. Nov	**Qazakh:** KE3, DTL, CWME, AZ beneficiary visit Ganja/Qazakh Regional Environmental Laboratory
6. Nov	**Qazakh/travel**: working with the regional lab (0.5 day); travel to Tbilisi (DTL) / Baku (KE3, CWME, AZ benef) by car/ 0.5
7. Nov	**Baku**: visiting Environmental laboratory of the National Monitoring Department of MoE (KE3, AZ CWME)
8. Nov	**Baku**: visiting Environmental laboratory of the National Monitoring Department of MoE (KE3, AZ CWME)
9. Nov	**Baku**: work on report
10.Nov	**Baku**: work on report

11. Nov	**Travel day:** flight from Baku to Chisinau (KE3), flight from Kiev to Chisinau (TL)
12. Nov	**Chisinau**: meetings with… (KE3, TL)
13. Nov	**Chisinau**: meetings with… (KE3, TL)
14. Nov	**Chisinau**: meetings with… (KE3, TL), car travel from Chisinau to Kiev (TL, KE3)
15. Nov	**Kiev**: meetings with… (KE3, TL)
16. Nov	**Kiev**: meetings with… (KE3, TL), departure from Kiev to Penang at 8:20 pm
17. Nov	**Travel day:** KE3 travels to homebase

Appendix 4 - Summaries of Checklists and Wish lists

Summary of Physical Chemical Check lists & Wishlist

		AM	AZ	BY	G	MD	UA
	PARAMETERS	Can be analysed	Can be analysed	Can be analysed	Can be analysed	Can be analysed	Can be analysed
№	Parameter (group)	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R
	GENERAL CONDITIONS						
	Thermal conditions						
1	Water temperature	Yes	Yes	Yes	Yes	Yes	Yes
	Oxygenation conditions						
2	Dissolved oxygen (O_2)	Yes	Yes	Yes	Yes	Yes	Yes
	Nutrient conditions						
3	Kjeldahl nitrogen / organic nitrogen	No	No	No	No	No	R
4	Nitrite (NO_2)	Yes	Yes	Yes	Yes	Yes	Yes
5	Nitrate (NO_3)	Yes	Yes	Yes	Yes	Yes	Yes
6	Ammonium (NH_4)	Yes	Yes	Yes	Yes	Yes	Yes
7	Total phosphorus	Yes	No	Yes	No	Yes	Yes
8	Ortho-phosphates (PO_4)	Yes	Yes	Yes	Yes	Yes	No
	Salinity						
9	Total mineralization	Yes	Yes	Yes	Yes	Yes	Yes
10	Chloride (Cl)	Yes	Yes	Yes	Yes	Yes	Yes
11	Sulphates (SO_4)	Yes	Yes	Yes	Yes	Yes	Yes
12	Conductivity	Yes	Yes	Yes	Yes	Yes	No

		AM	AZ	BY	G	MD	UA
	PARAMETERS	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**
№	**Parameter (group)**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**
	Acidification status						
13	pH	Yes	Yes	Yes	Yes	Yes	Yes
	SUB-TOTAL	**12**	**11**	**12**	**11**	**12**	**10**
14	Biochemical oxygen demand (5 days, BOD_5)	Yes	yes	Yes	Yes	Yes	Yes
15	Chemical oxygen demand (COD), permanganate	No	No	No	No	No	No
16	Chemical oxygen demand, potassium dichromate	Yes	yes	Yes	yes	Yes	Yes
17	Total iron (Fe^{2+} and Fe^{3+})	Yes	Yes	Yes	Yes	Yes	Yes
18	Manganese	Yes	YES	Yes	YES	Yes	Yes
19	Odour (20 ^{o}C and 60 ^{o}C)	Yes	Yes	Yes	Yes	Yes	Yes
20	Colour	Yes	Yes	Yes	Yes	Yes	Yes
21	Phenols	Yes	Yes	Yes	No	Yes	Yes
	SUB TOTAL	**7**	**7**	**7**	**7**	**7**	**7**
	TRACE METALS						
22	Cadmium (Cd)	Yes	Yes	Yes	Yes	Yes	No
23	Lead (Pb)	Yes	Yes	Yes	Yes	Yes	Yes
24	Mercury (Hg)	R	No	Yes	No	R	No
25	Nickel (Ni)	Yes	Yes	Yes	Yes	Yes	Yes

		AM	AZ	BY	G	MD	UA
	PARAMETERS	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**
№	**Parameter (group)**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**
26	Copper (Cu)	Yes	Yes	Yes	Yes	Yes	Yes
27	Zinc (Zn)	Yes	Yes	Yes	Yes	Yes	Yes
	SUB TOTAL	**5**	**5**	**6**	**5**	**5**	**4**
	ORGANIC MICROPOLLUTANTS						
28	1,2-Dichloroethane	R	No	No	R	R	No
29	Alachlor	R	No	No	R	R	No
30	Aldrin	R	No	No	R	Yes	No
31	Anthracene	R	No	No	R	Yes	No
32	Atrazine	R	No	No	R	Yes	No
33	Benzene	R	No	No	R	Yes	No
34	Benzo(a)pyrene)	R	R	No	Yes	Yes	No
35	Benzo(b)fluoranthene	R	R	No	Yes	Yes	No
36	Benzo(g,h,i)perylene	R	R	No	Yes	Yes	No
37	Benzo(k)fluoranthene	R	R	No	Yes	Yes	No
38	C10-13-chloroalkanes	R	R	No	R	No	No
39	Carbontetrachloride	R	R	No	R	R	No
40	Chlorfenvinphos	R	R	No	R	R	No
41	Chlorpyrifos	R	R	No	R	R	No
42	DDT total	Yes	R	No	Yes	Yes	Yes
43	Di(2-ethylhexyl)phthalate	No	R	No	No	No	No

		AM	AZ	BY	G	MD	UA
	PARAMETERS	Can be analysed	Can be analysed	Can be analysed	Can be analysed	Can be analysed	Can be analysed
№	Parameter (group)	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R
44	Dichloromethane	R	R	No	R	R	No
45	Dieldrin	R	R	No	R	Yes	No
46	Diuron	R	No	No	R	No	No
47	Endosulfan	R	R	No	R	Yes	No
48	Endrin	R	R	No	R	Yes	No
49	Fluoranthene	R	R	No	R	No	No
51	Hexachlorobenzene	R	R	No	R	No	No
52	Hexachlorobutadiene	R	R	No	R	No	No
53	Hexachlorocyclohexane	R	R	No	R	Yes	No
54	Indeno(1,2,3-cd)pyrene	R	R	No	R	Yes	No
55	Isodrin	R	R	No	R	No	No
56	Isoproturon	R	R	No	R	No	No
57	Naphthalene	R	R	No	R	R	No
58	Nonylphenol	R	R	No	R	Ro	No
59	Octylphenol	R	R	No	R	R	No
60	para-para-DDT	Yes	R	No	Yes	R	No
61	Pentabromodiphenylether	No	R	No	No	No	No
62	Pentachlorobenzene	R	R	No	R	No	No
63	Pentachlorophenol	R	R	No	R	No	No
64	Simazine	No	No	No	No	Yes	No
65	Tetrachloroethylene	R	R	No	R	No	No

		AM	AZ	BY	G	MD	UA
	PARAMETERS	Can be analysed	Can be analysed	Can be analysed	Can be analysed	Can be analysed	Can be analysed
№	Parameter (group)	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R	Yes/No/R
66	Tributyltin compounds	R	R	No	R	No	No
67	Trichlorobenzenes (all isomers)	R	R	No	R	No	No
68	Trichloroethylene	R	R	No	R	No	No
69	Trichloromethane (Chloroform)	R	R	No	R	No	No
70	Trifluralin	No	No	No	No	No	No
	SUB TOTAL	**2**	**0**	**0**	**6**	**15**	**0**
	Total oil and oil poduc.	Yes	Yes		Yes	Yes	Yes
	Detergents	Yes	Yes		Yes	Yes	Yes
	Transparency	Yes			Yes		
	Total suspended solids	Yes	Yes		Yes	Yes	Yes
	Hardiness	Yes	Yes		Yes	Yes	Yes
	Calcium	Yes	Yes		Yes	Yes	Yes
	Alkalinity	Yes	Yes		Yes	Yes	Yes
	TOC	Yes					
	Arsenic	Yes	Yes				
	Selenium	Yes	Yes				
	Lithium	Yes					
	Berilium	Yes					
	Strontium	Yes					
	Barium	Yes					

		AM	AZ	BY	G	MD	UA
	PARAMETERS	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**	**Can be analysed**
№	**Parameter (group)**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**	**Yes/No/R**
	Boron	Yes					
	Aluminium	Yes					
	Molybdonim	Yes					
	Vanadium	Yes					
	Titanium	Yes					
	Chromium	Yes					
	Tin	Yes					
	Potassium	Yes			Yes	Yes	
	Silver	Yes					
	SUB TOTAL	**23**	**8**	**?**	**8**	**7**	**6**
	GRAND TOTAL	**49**	**31**	**25(?)**	**37**	**46**	**27**

Yes= Yes this analysis and monitoring is currently undertaken
No= No this analysis and monitoring is not currently undertaken and is not feasible
R= Training for this analysis and monitoring has been requested and is feasible

This project is funded by
The European Union

Environmental Protection of
International River Basins Project
Contract No. 2011/279-666

A project implemented by a Consortium
led by Hulla & Co. Human Dynamics KG

Summary of Checklist/ Wish List for Hydrobiological Analysis for the Six Countries

		AM				AZ				BY				GE				M				UA			
	PARAMETERS	C	A	Bio	EQR	C	A	Bio	EQR	C	A	Bio	EQR	C	A	Bio	EQR	C	A	Bio	EQR	C	A	Bio	EQR
1	benthic invertebrates	Y	Y	R	R	Y	Y	R	R	Y	Y	R	R	Y	Y	R	R	Y	Y	Y	R	R	R	R	R
2	phytoplankton	R	R	R	R	R	R	R	R	Y	Y	R	R	Y	R	R	R	Y	Y	Y	R	N	N	N	N
3	phytobenthos	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	Y	R	R	N	N	N	N
4	macrophytes	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y	R	R	R	N	N	N	N
5	fish fauna	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

C= Composition
A= Amount
Bio= Biomass
Y= Yes this analysis and monitoring is currently undertaken
N= No this analysis and monitoring is not currently undertaken and not feasible
R= Training for this analysis and monitoring has been requested and is feasible