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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

Mission Report

For Third Mission of the KE3 Ecology and Biology Expert
3rd to 16th December 2012

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Introduction

The objective of this mission was to address the concerns about the capacities of the laboratories in Belarus, it was agreed that this second mission would cover activities 1.5 and 1.6 to review the capacities and quality controls of the water quality laboratories in Belarus. The mission starting on 4th December and was completed on 16h December, This included the following tasks:

1) Visit the water laboratories in Belarus to review of 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) Finalise the Checklist and Worklist.
4) To present & lecture at the Laboratory Quality Control Workshop in Minsk.

Background

Monitoring of physico-chemical parameters has been recently transferred to the Republican Centre of Analytical Control in the Field of Environmental Protection (RCACFEP) under the Ministry of Natural Resources and Environmental Protection. 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.

The Republican Centre of Analytical Control in the Field of Environmental Protection (RCACFEP) - Ministry of Natural Resources & Environmental Protection (5th December 2012)

Present

i. Vladimir V Antsukevich, Head of Centre
ii. Svetlana P Utochkina, Deputy Head Centre
iii. Zmitrovich Viktoryia , Head of Laboratory of Physical Chemical Analysis
iv. Belkevich Liliya, Deputy Head of Laboratory of Physical Chemical Analysis
v. Shcheholeva Natalya, Head of Dept for Analytical Control
vi. Antsukevich Vladimir, The Chief of the Republican Centre for Analytical Control & Environmental Protection
vii. Utochkina Svietlana, The Deputy Chief of the Republican Centre for Analytical Control & Environmental Protection

The 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 analyse the other basic physico-chemical parameters.

Laboratory Capacity

The laboratory has the following advanced equipment:

i. Agilent Quaternary HPLC with Fluorescent Detector (FLD) & Diode Array Detector (DAT), which are used for the analysis of PAH and Oil parameters.
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.
iv. An ICP/MS which can simultaneous analysis of 62 parameters but is routinely used for analysing 6 to 16 parameters, but does not include mercury. However it is expensive to operate - 16 argon cylinders/6 months.
v. A Perkin Elmer AAS (600 Zeeman) but has currently a power fault but it will be repaired when centre moves to a proposed new laboratory.
vi. The Kuderna Danish concentration technique is used for liquid extraction from soils for the analysis of micro-pollutants.
vii. There are a number of ultra pure water systems (Specifications: TOC<1ppb 18 MΩ).

For processing the data, customised software developed by the Ministry is applied, but is not networked directly to laboratory instruments.

Quality Control

For the analysis using chromatographic and concentration techniques deuterated organics analogues are used as internal standards, which are excellent analytically but also very expensive.

The laboratory also use excellent internal analytical quality controls and apply Shewhart charts, the department has also participated with inter-laboratory exercises such as Aquacheck.

The laboratories are nationally but not internationally accredited. The Department maintains that as the national accreditation complies with ISO 17025 then international accreditation is not currently required.
There are internal quality controls in place but with limited method validations. The Department is keen to upgrade the method validations. The KE3 submitted an extra training course on method validation with the application of the UK software to Veronika Selitskay, and Tischikov Igor, to be trainers and have agreed to train the chemical laboratory staff.

Regional Centre (Minsk) of Analytical Control of Environmental Protection (12th November 2012)

Present

Svetlana Utochkina – Deputy Head of the Republican centre
Svetlana Hlistovskaya -Head of Analytical Laboratory (RCACEP
Alexandr Stankevich

Laboratory Capacity

There are 26 similar regional laboratories that can analyse 35 physico/chemical parameters. The micropollutants are normally sampled and analysed by the RCACFEP.

Despite the fact that the laboratory analyse the basic chemical parameters their equipment is fairly extensive with an AAS that has a furnace and hydride facilities. Therefore the laboratory can analyse most trace metals including mercury. In addition IC is used for the main anions and capillary electrophoresis is used for the main cations. All the equipment seems to be well maintained. The quality controls are good and similar to the RCRCEM.

RCACFEP Requirements

The Department is keen to upgrade their method validations. The KE3 submitted an extra training course on method validation with the application of the UK software to Veronika Selitskay, and Tischikov Igor, to be trainers. They have agreed to train the chemical laboratory staff on this.
The Department has requested that to improve their analytical methods they would like the project to fund training at European Centres of excellence such as in Slovakia. Furthermore they would like to participate in international laboratory intercalibration exercises.

Republican Centre for Radiation Control and Environmental Monitoring (RCRCEM) under the Department of the Hydrometeorology of the Ministry of Natural Resources and Environmental Protection 5th to 11th December 2012

Present

i. Alexandr Stankevich, Head of RCRCEM
ii. Veronika Selitskaya, Data Processing Engineer
iii. Gennady Tischikov, Head of Hydrobiology
iv. Tischikov Igor, Principal Engineer Chemist Dept for Surface Water Monitoring
v. Kalytskaya Natalya, Head of Dept for Surface Water Monitoring

Laboratory Capacity

The Centre started Hydrology Analysis in 1973 with at least 7 hydrobiological experts who can analyse Phytoplankton, zooplankton (2 staff) now about to include chlorophyll A analysis, Benthic macro invertebrates, and Phytobentos (periphyton)). The Department processes the results to calculate the biotic and saprobic indices and believe that these results can be converted into EQRs, which needs further development.
Macrophytes analysis was undertaken for about 5 years about 20 years ago and this information could be difficult to retrieve. The Centre would like to re-introduce this analysis but requires support from the project to achieve this.
The Centre requires a number of western benthic macro-invertebrate keys for specific taxa which are noted in appendix 5.
Advice and training on river basin Typology is require especially linking with the reference sites.
The Centre does not undertake fish monitoring which is undertaken by other agencies such as the Ministry of Fisheries and the Institute of Fisheries at the Academy of Sciences in Minsk.

Water sampling

There are 250 sampling points taking over 900 samples/year. The Dnieper river basin accounts for 57% of the whole of Belarus with 58 sampling points in the pilot site. Regional sampling in Oblasts is undertaken by local technicians who have been trained by the Centre.
The Sampling Procedure differs from the EU method because the rivers are larger in Belarus and alternative methods are used. They have been trained by Finnish and Slovakian institutions and also co-operate with The Science Academy in Ukraine.

RCRCEM Requirements

Mr Stankevich has submitted a list of the requirements for the RCRCEM, which is noted in Appendix 4.
In summary this states that the following support is required:

i. Training on Typology especially in the reference sites
ii. Facilitating a common approach for hydrobiological sampling with Moldova and Ukraine using the same type of equipment and methods.
iii. Assisting with hydrobiological intercalibrations.
iv. Providing training and western keys for better identification of biological elements- a list of suggested keys was submitted by RCRCEM and is shown in appendix 5.
v. Guidelines on the above monitoring would be appreciated.
vi. Training on the analysis of Macrophytes was also requested.

Quality Control Workshop

The concept note for the provisional quality control workshop is detailed in appendix 3. It was recommended by KE3 that this provisional workshop and draft agenda should firstly be discussed with the beneficiaries on-site during the mission of KE3 to clarify the objectives and agenda. Following these discussions, if the beneficiaries agreed to the concept of the workshop, then the agenda could be customised to accommodate their requirements.

Therefore the initial draft agenda was amended as shown in appendix 2.

In summary, the objective was to train staff on important aspects of quality control and to introduce the AQC and method validation software to the Belarus laboratory staff. In addition this was also an excellent opportunity to develop co-operation between the other Eastern European Project member countries especially in encouraging them to cooperate together in the transboundary pilot studies.

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, Moldova
vi. Validation of Analytical Methods.
vii. Practical Demonstration of Method Validation Software used by Hydromet Moldova

viii. An introduction to the processing techniques and quality assurance used for Hydrobiological analysis at the Academy of Sciences in Ukraine
ix. An introduction to hydrobiological software (ASTERIX and AQUA BIOBASE), which are used at the Academy of Sciences in Ukraine for improving quality assurance.

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 workshop was attended by representatives from each of the three Eastern European Project member countries with a total of 19 delegates and is listed in appendix 1. The training workshop was interactive indicating that the delegates understood the concepts and were keen to develop and improve their AQC systems. Extra training was also submitted by KE3 on method validation with the application of the UK software (AQC99) to Veronika Selitskay, and Tischikov Igor, to be trainers. The software has been transferred to their computers and appears to operate. They have agreed to train the chemical laboratory staff on this.

The Project Team Leader was also encouraged the delegates to consider the options that were presented in the workshop and to also consider other requirements that the Project could provide especially to support the pilot field studies next year.

Summary & Conclusions

Belarus was the final project member country to be visited by the KE3 and two national water laboratories and one regional laboratory was reviewed. The chemical laboratories in the RCACFEP maintained that that as the national accreditation complies with ISO 17025 then international accreditation is not currently required, which is differs from the views of most other member states. However, the centre is keen to upgrade the method validations.
The RCRCEM has been very detailed in highlighting its requirements for support and identification keys and the requirements as shown in appendices 4 & 5.

As this mission was longer in Belarus than the other countries it was possible for the Project to submit an intensive Laboratory Quality Control Workshop, which was held in Minsk RCRCEM. The delegates found this to be useful in improving their AQC systems, and was much appreciated. Owing to the increase in the available time, the KE3 was able to submit extra training of trainers regarding the method validation software.

Following the laboratory reviews, requirements have been submitted for Belarus. 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.

Finally, it is proposed for the KE3 to draft a programme and a strategy on how and when the Project can address these issues.

Appendix 1 - List of Delegates Attending Workshop in Minsk for Laboratory Accreditation and Quality Control

List of Delegates at the Laboratory Accreditation & Quality Control Training Workshop in Minsk on 11 December 2012

Ukraine

1. Andriy Demydenko – Team Leader of the Project "Environmental Protection of International River Basins"
2. Nataliia Zakorchevna – River Basin Management Expert (Ukraine)
3. Olha Kravtsova – Head of Laboratory, Dnieper Basin Division of the water resources
4. Lyudmyla Gavrylenko – Head of Laboratory, Desna River Basin
5. Teofila Pleshko – Head of Laboratory, Dniester-Prut Basin Division of the water resources
6. Olena Lietytska – Leading Engineer, Division of the ichthyology and river systems ecology, Institute of Hydrobiology, NAS of Ukraine

Moldova

1) Tatiana Gudzi – Engineer-hydrobiologist, State Hydrometeorological Service (Moldova)
2) Domnichia Jeleva – Engineer-chemist, State Hydrometeorological Service (Moldova)

Belarus

1) Gennadij Tischikov – Head of the Ecological Control Service of the Republican Centre of the Radiation Control and Environmental Monitoring (RCRCEM)
2) Natalia Kalickaya – Head of the Division of the surface water monitoring (RCRCEM)
3) Igor Tischikov – Leading Engineer-chemist of the Division of the surface water monitoring (RCRCEM)
4) Svetlana Veremchuk – Head of the Information-analytical Division of the surface water monitoring (RCRCEM)
5) Konstantin Titov – Consultant of the Joint European Union and United Nations Development Programme Project "Support to the Development of a Comprehensive Framework for International Environmental Cooperation in the Republic of Belarus"
6) Aliaksandr Stankevich – Head of the Centre (RCRCEM), Country Water Manager of the Project "Environmental Protection of International River Basins"
7) Svetlana Utochkina – Deputy Head of the Republican Centre of the Analytical Control in the Field of the Environmental Protection (RCACEP)
8) Natalia Schegoleva – Head of the Division (RCACEP)
9) Ludmila Nuprienok – Head of the Division (RCACEP)
10) Victoria Zmitrovich – Head of Analytical Laboratory (RCACEP)
11) Svetlana Hlistovskaya – Head of Analytical Laboratory (RCACEP)

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

Final Agenda for the Workshop for Laboratory Accreditation and Quality Control

Technical Assistance & Capacity Building	
Course	**Laboratory Accreditation and Quality Control**
Date	11th December 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, Minsk, Belarus

DAY 1			
Time	**Method**	**Content**	**Lecturer**
9.00 -9.15		Welcome to delegates	Oleg Maksuta, Director Departament of hydometeorology
9.15-9.45		Introduction to the Project and the Training Workshop	Andriy Demydenko, Team Leader Project "Environmental Protection of International River Basins"
9.45 –10.30	Lecture 1	Introduction to Laboratory Accreditation 17025	Michael Jackman, Project Biology & Ecology Expert
10.30–10.45		*Coffee Break*	
10.45-11.45	Lecture 2	Production of Standard Operating Procedures (SOPs) & Laboratory Information Management Systems (LIMS) Introduction to Analytical Quality Control, Precision and Accuracy	Michael Jackman, Project Biology & Ecology Expert
11.45-12.30		Questions and Discussions	Alexandr Stankevich
12.30 – 13.30		*Lunch*	
13.30 – 14.30	Lecture 3	Validation of Analytical Methods & Associated Software	Michael Jackman, Project Biology & Ecology Expert
14.30 – 15.00	Lecture 4	Guidance on the classification Benthic Macro Invertebrate by applying customised software	OLena Leititske, Expert Hydrobiologist
16.00 – 16.15		*Coffee Break*	
16.15 – 16.45	Lecture 5	Sampling Benthic Macro Invertebrates & associated software	OLena Leititske, Expert Hydrobiologist
16.45 – 17.30		Questions and Discussions	Alexandr Stankevich

Appendix 3 - Draft Concept Note for Provisional Workshop in Minsk for Laboratory Accreditation and Quality Control

Draft Concept Note for Provisional Quality Control Workshop

"Introduction to the procedures and techniques required for international accreditation and quality control for water laboratories"

Minsk, Belarus December 11, 2012 (Tentative)

1. Background and objectives of the proposed workshop

As water quality data is only as good as the reliability of the analytical procedures, it is important to ensure that the national laboratories have adequate QA/QC procedures in place and are producing reliable and credible results. It has been noted that so far all the member countries requested further training on quality control and international accreditation.

A previous similar workshop was held recently in Moldova which the delegates found to be very useful in improving their AQC systems and was much appreciated. Therefore it is proposed to offer such a workshop in Belarus when the Key Expert 3 visits the beneficiaries.

As this is the first time the Key Expert 3 will visit Belarus, it is proposed he will review the capacities of the laboratories and then discuss the details of the possible workshop with the beneficiaries in order to tailor it to their needs. Therefore the details and content on the proposed workshop may change according to the needs of the stakeholders.

The objective of the workshop is to assist the beneficiaries in improving their laboratory quality control procedures, to be compliant with the WFD.

2. Possible Agenda of the workshop

Venue: TBA

Proposed Agenda for the Workshop for Laboratory Accreditation and Quality Control

Technical Assistance & Capacity Building	
Course	**Laboratory Accreditation and Quality Control**
Date	11th December 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	TBA Minsk , Belarus

DAY 1			
Time	**Method**	**Content**	**Lecturer**
9.00 -9.15		Welcome to delegates	TBA
9.15-9.45		Introduction to the Project and the Training Workshop	TBA
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 Moldova	TBA
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 in Moldova	TBA

3. Participating Institutions and Agencies

All beneficiary staff involved in water analysis

4. Support Required

Head Office (KIEV) to determine:

1) What is the maximum number of delegates that can be invited according to the budget?
2) Is there enough in the budget to invite Svetlana Stirbu, as I know she was disappointed at not being able to attend the previous workshop, and Leititske Olena, as maybe she could agree to make additional presentations, on her software, which would be an excellent addition?

If there are enough funds, please alert them to this possible workshop?

3) Suggest other possible candidates from other transboundary countries who would benefit from the workshop.

4) Budget for an interpreter, the Key Expert 3 will try to arrange this when in country.

Appendix 4 - List of requirements submitted by Alexandr Stankevich Head of RCRCEM

Requirements for Republican Center for Radiation Control and Environmental Monitoring

Requirements proposed to the EU Project: Environmental protection of the international river basins» (contract ENPI/2011/279-666).

i. Actualization of the pilot project concerning water objects typification, establishment of reference conditions and assessment of ecological and chemical status of water objects, including field investigations of typical sub-basins.
ii. Getting the equipment for field hydrobiological sampling and analyzing in the frame of pilot projects.
iii. Preparing projects of technical normative documents and practical guidances concerning the technology of carrying out hydrobiological, hydrochemical and hydromorphological supervision in the system of surface water monitoring.
iv. Implementation in the surface water monitoring network the processes of intercalibration for the purpose of assessment water objects ecological status in bordering countries.
v. Arranging the trainings devoted to the methods of monitoring and quality of hydrobiological and hydrochemical measurements.
vi. Providing technical assistance concerning harmonization of the procedure of hydrobiological taxonomic definitions, including the development of an agreed set of determinants of the main groups of aquatic organisms and providing this set to the laboratories of the participating countries.
vii. Providing technical assistance in spreading among the participating countries the software connected with the procedure of statistical processing, analytical quality control and assessment of water ecosystems ecological status.
viii. Preparing guidances concerning taxonomic content of bottom macro vertebrates in typified lake ecotopes for definition of reference conditions.

Appendix 5 - List of Hydrobiological Identification Keys Requested by RCRCEM

1. Aquatic Plants in Britain and Ireland
CD Preston and Jane Croft
365 pages, 72 line illus, 200 distribution maps
Apollo Books (€48)

2. Distribution and Ecological Preferences of European Freshwater Organisms, Volume 1: Trichoptera
Series: Distribution and Ecological Preferences of European Freshwater Organisms 1
W Graf, J Murphy, J Dahl, C Zamora-Munoz and MJ Lopez-Rodriguez
388 pages, Pensoft Publishers, Distributed by NHBS (€108)

3. Distribution and Ecological Preferences of European Freshwater Organisms, Volume 2: Plecoptera
W Graf, AW Lorenz, JM Tierno de Figueroa, S Lucke and MJ Lopez-Rodriguez
(€65)

4. Distribution and Ecological Preferences of European Freshwater Organisms, Volume 3: Ephemeroptera
A Buffagni, M Cazzola and MJ Lopez-Rodriguez
Paperback | Sep 2009 | #182588 | ISBN-13: 9789546425089
($85/€66).

5. Chironomidae Larvae, Volume 1 General Ecology and Tanypodinae
Henk J Vallenduuk and Henk K M Moller Pillot
Hardback | Jul 2007 | #169169 | ISBN-13: 9789050112598
(€78)

6. Irudinei (Hirudinea) Alessandro Minelli
Paperback | Dec 1977 | #71523
(€16)

7. Chironomidae: The Biology and Ecology of Non-Biting Midges
P Armitage, PS Cranston and PSL Pinder
Paperback | Dec 1994 | #32905 | ISBN: 041245260X
(€491)

8. Ephemeroptera and Plecoptera Biology-Ecology-Systematics
Peter Landolt and Michel Sartori
Hardback | Dec 1997 | #68986 | ISBN: 2940187010
(€58)

9. British Fresh-Water Copepoda, Volumes I-III
Robert Gurney
Compact Disc | Dec 2005 | #157032 | ISBN: 1904690335
(€84)

10. A Key to the Case-bearing Caddis Larvae of Britain and Ireland

FBA Scientific Publication No. 61
I D/ Wallace B Wallace and G N Philipson
Paperback | Dec 2003 | #144636 | ISBN: 0900386703
(€36)

11. Field Guide to the Dragonflies of Britain and Europe
Klaas-Douwe B Dijkstra and Richard Lewington
Paperback | Dec 2006 | #159516 | ISBN: 0953139948
(€27)

12. Britain's Dragonflies: A Field Guide to the Damselflies and Dragonflies of Britain and Ireland
Dave Smallshire and Andy Swash
Paperback | Nov 2009 | #180949 | ISBN-13: 9781903657294
(€22)

Requested Keys for Phytoplankton

1) Süsswasserflora von Mitteleuropa, Bd 19/1: Cyanoprokaryota: Chroococcales. (120 Euro)
http://www.nhbs.com/susswasserflora_von_mitteleuropa_bd_191_cyanoprokaryota_tefno_32955.html
2) Süsswasserflora von Mitteleuropa, Bd 19/2: Cyanoprokaryota: 2.Teil: Oscillatoriales. (136 euro)
http://www.nhbs.com/susswasserflora_von_mitteleuropa_bd_192_cyanoprokaryota_tefno_128079.html
3) Süsswasserflora von Mitteleuropa, Bd 6: Dinophyceae (Dinoflagellida).(89 Euro)
http://www.nhbs.com/susswasserflora_von_mitteleuropa_bd_6_dinophyceae_dinoflagellida_tefno_32969.html
4) Süsswasserflora von Mitteleuropa, Bd 18: Charales (Charophyceae). (84 Euro)
http://www.nhbs.com/susswasserflora_von_mitteleuropa_bd_18_charales_charophyceae_tefno_32954.html
5) Süsswasserflora von Mitteleuropa, Bd 3: Xanthophyceae 1. (125 Euro)

Appendix 6 - Updates 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**
	OTHER PARAMETERS						
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	No	Yes	Yes	Yes
20	Colour	Yes	Yes	No	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
26	Copper (Cu)	Yes	Yes	Yes	Yes	Yes	Yes

	PARAMETERS	AM	AZ	BY	G	MD	UA
		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
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	R	R	R	No
29	Alachlor	R	No	R	R	R	No
30	Aldrin	R	No	Yes	R	Yes	No
31	Anthracene	R	No	Yes	R	Yes	No
32	Atrazine	R	No	Yes	R	Yes	No
33	Benzene	R	No	Yes	R	Yes	No
34	Benzo(a)pyrene)	R	R	Yes	Yes	Yes	No
35	Benzo(b)fluoranthene	R	R	Yes	Yes	Yes	No
36	Benzo(g,h,i)perylene	R	R	Yes	Yes	Yes	No
37	Benzo(k)fluoranthene	R	R	Yes	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
44	Dichloromethane	R	R	No	R	R	No
45	Dieldrin	R	R	R	R	Yes	No

	PARAMETERS	AM	AZ	BY	G	MD	UA
		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
46	Diuron	R	No	No	R	No	No
47	Endosulfan	R	R	R	R	Yes	No
48	Endrin	R	R	R	R	Yes	No
49	Fluoranthene	R	R	Yes	R	No	No
51	Hexachlorobenzene	R	R	R	R	No	No
52	Hexachlorobutadiene	R	R	No	R	No	No
53	Hexachlorocyclohexane	R	R	R	R	Yes	No
54	Indeno(1,2,3-cd)pyrene	R	R	Yes	R	Yes	No
55	Isodrin	R	R	No	R	No	No
56	Isoproturon	R	R	No	R	No	No
57	Naphthalene	R	R	Yes	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	Yes	Yes	R	No
61	Pentabromodiphenylether	No	R	No	No	No	No
62	Pentachlorobenzene	R	R	R	R	No	No
63	Pentachlorophenol	R	R	No	R	No	No
64	Simazine	No	No	Yes	No	Yes	No
65	Tetrachloroethylene	R	R	R	R	No	No
66	Tributyltin compounds	R	R	R	R	No	No
67	Trichlorobenzenes (all isomers)	R	R	R	R	No	No
68	Trichloroethylene	R	R	R	R	No	No

	PARAMETERS	AM	AZ	BY	G	MD	UA
		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
69	Trichloromethane (Chloroform)	R	R	R	R	No	No
70	Trifluralin	No	No	No	No	No	No
	SUB TOTAL	**2**	**0**	13	**6**	**15**	**0**
	MORE PARAMETERS						
	Total oil and oil poduc.	Yes	Yes	Yes	Yes	Yes	Yes
	Detergents	Yes	Yes	Yes	Yes	Yes	Yes
	Transparency	Yes		Yes	Yes		
	Total suspended solids	Yes	Yes	Yes	Yes	Yes	Yes
	Hardness	Yes	Yes	Yes	Yes	Yes	Yes
	Calcium	Yes	Yes	Yes	Yes	Yes	Yes
	Alkalinity	Yes	Yes	No	Yes	Yes	Yes
	TOC	Yes		No			
	Arsenic	Yes	Yes	Yes			
	Selenium	Yes	Yes	Yes			
	Lithium	Yes		Yes			
	Berilium	Yes		Yes			
	Strontium	Yes		Yes			
	Barium	Yes		Yes			
	Boron	Yes		Yes			
	Aluminium	Yes		Yes			
	Molybdonim	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**
	Vanadium	Yes		Yes			
	Titanium	Yes		Yes			
	Chromium	Yes		Yes			
	Tin	Yes		Yes			
	Potassium	Yes		Yes	Yes	Yes	
	Silver	Yes		Yes			
	SUB TOTAL	**23**	**8**	**21**	**8**	**7**	**6**
	GRAND TOTAL	**49**	**31**	**49**	**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

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

		AM				AZ				BY				G				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	Y	F	Y	Y	R	R	Y	Y	Y	R	R	R	R	R
2	phytoplankton	R	R	R	R	R	R	R	R	Y	Y	Y	F	Y	R	R	R	Y	Y	Y	R	N	N	N	N
3	phytobenthos	R	R	R	R	R	R	R	R	Y	Y	Y	F	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
F= It is feasible that this analysis and monitoring could be undertaken