Implementation of the Shared Environmental Information System principles and practices in the Eastern Partnership countries

(ENI SEIS II East)

Armenia

Thematic work plan - Water

(2017-2019)

Prepared for consultation

by ENI SEIS II East Project Team

European Environment Agency

2017

This project is funded by the European Union and is implemented by the European Environment Agency

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1. Context

1.1 Overall context

The ENI-SEIS II East project ([1]) primarily aims at helping Armenia to better respond to regional/international commitments related to environmental reporting as well as to improve its capacities to manage and use environmental statistics, data and information in support to decision-making. The final goal is to support Armenia in using the available data and information for developing indicator based assessment and producing regular State of the Environment Report (SoER).

The thematic work plan for freshwater outlines actions in line with above defined objectives by supporting Armenia in implementing respective indicators and assessment proposed by the UNECE Working Group on Environmental Monitoring and Assessment (WGEMA) and Joint Task Force of Indicators.

The overall objective is to support the SEIS implementation at the country and regional level.

In addition to this thematic work plan, a regional work plan has also been developed separately in order to design the actions which are thematically and spatially common to all ENI East countries including supporting the establishment of the Emerald networks as biodiversity component.

1.2 Link to the European Environment Agency Work Programme - 2017

Water quality : 1.5.1 WFD and water ecosystem-based management
Water quantity : 1.5.4 Water resources & efficiency/water accounts
WISE : 1.5.5 WISE - data flows and information structure

1.3 Thematic context

Expected main outputs

a) Production of regionally comparable indicators in accordance witt EEA and UNECE implementations
b) Supporting further development of national portal of water information system for promoting SEIS principles

The first phase of the ENI East project was resulted with development of the portal for Lake Sevan ([2]). The portal is providing the data and statistics on different water quality and quantity variables including indicators proposed by WGEMA.

[1] http://eni-seis.eionet.europa.eu/east
[2] http://www.seis-sevan.am/

Armenia is one of those countries in the Caucasus that has already made all UNECE WGEMA water indicators publicly available at the country level. However, no indicator based assessment is available which would underpin the knowledge-based policy implementation at the local and national scale.

Development of the State of water cadastre information system ([3]) was initiated by USAID in 2008 and further improvements focused on compiling the spatial data has resulted with also delineating six river basin districts in Armenia ([4]). Further river basin management plans for Kura-Aras and Akhuryan (Akhuryan and Metsamor) had been developed by the EPIRB project ([5]) funded by the EU.

The EU Water Initiative Plus for the Eastern Partnership ([6]) is currently being implemented as complementary actions of EPIRB project to implement the river basin management plans in Armenia, together with strengthening monitoring systems and improvements with policy development in line with the EU Water Framework Directive.

However, still some challenges for application of the SEIS principles for Armenia include as follows ([7]);

Cooperation

- legal gaps in inter-institutional data exchange and sharing

Content

- incompleteness of sectoral/institutional databases/registers
- insufficient frequency of monitoring for certain indicators
- absence of biological monitoring
- lack of reliability, accessibility, availability and update of information in the existing databases

Infrastructure

- incompatibility of existing datasets, incompatible computer software for administrative data processing, provision and exchange
- insufficient staff capacity in data collection, input and computer processing

In line with above defined challenges, this work plan will support Armenia in;

- operationalizing inter-institutional protocol for data exchange and sharing
- implementing standard data dictionaries of State of Environmental Reporting of the Water Information System of Europe with the aim of harmonizing water quantity and quality data in line with the EU water framework directive
- improving the IT capacities for evolving Lake Sevan Portal to be national portal for the water data and information
- developing indicator-based assessment to underpin the knowledge-based policy implementation and further to provide inputs to the regular production of National SoER

[3] http://www.mnp.am
[4] www.kura-aras.org
[5] http://blacksea-riverbasins.net/
[6] http://www.euneighbours.eu/en/east/eu-in-action/projects/european-union-water-initiative-plus-eastern-partnership-euwi-4-eap
[7] http://enpi-seis.pbe.eea.europa.eu/east/armenia/pilot-project-seis-lake-sevan/final-report-seis-lake-sevan-eng-updated-july-2015/download/en/1/Final%20report%20SEIS%20Lake%20Sevan%20ENG%20July%202015.pdf

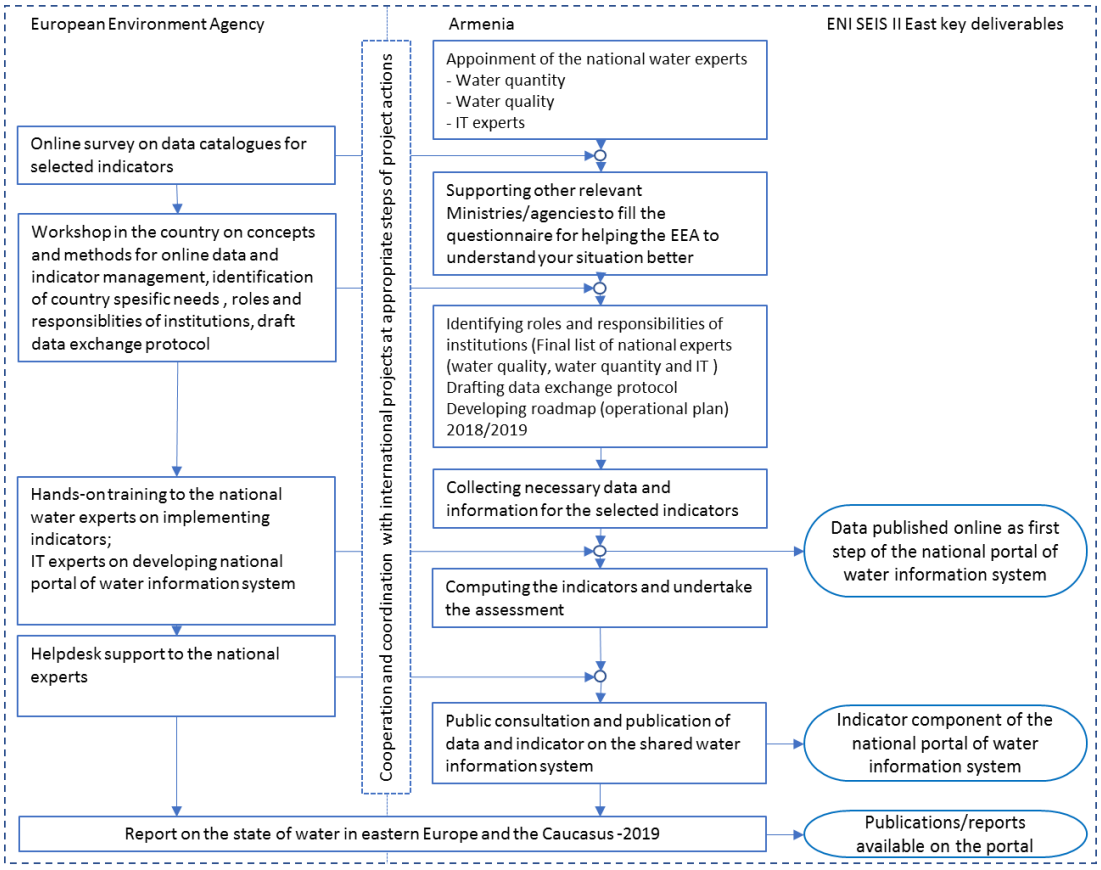
2. Description of actions

A service contract has been established with the European Topic Centre on Inland, Coastal and Marine waters to provide expertise on data harmonization, indicator implementation and conducting indicator-based assessment as well as IT aspects of national portal of water information system.

Developing the national portal of water information system will be implemented as "National Pilot". Depending on further needs during its development, complementary supports would also be provided from the EIONET when needed (see Chapter 2.4 for further clarifications on the National Pilot).

"Learning by doing" will be used as modality for implementing the tasks. EEA will provide necessary expertise from its internal and EIONET pool. It is supposed Armenia will make necessary commitments needed in the implementation of the actions. The below figure (Figure 1) is illustrating workflow together with the overall share of roles and responsibilities between European Environment Agency and Armenia during the implementation of the actions.

Figure 1: Workflow of implementation of actions



2.1 Appointment of national water experts

The project actions will be mainly provided in the form of expert support (except "National Pilot") as well as capacity building via training the national experts. The national experts are also supposed to ensure the institutional memory on the content. In addition, they will play key role of being national reference centres as in the EIONET. Armenia has already appointed the following experts to be involved in the implementation of the water related actions (Table 1);

Table 1: List of national water experts appointed by Armenia

IT expert	Naira Mandalyan	Department of Social sphere and Environmental Statistics	Leading specialist	+374 11 524620	naira_mandalyan@armstat.am
				+374 55 00 32 93	nairam67@gmail.com
Water quantity	Gayane Hovsepyan	Water Resource Cadastre and Monitoring Division of Water Resources Management Agency of the Ministry of Nature Protection	Deputy Head	37491594401	hovgayush@list.ru
Water quality	Gohar Harutyunyan			+374 94 242649	gohar-harutunyan@mail.ru

Task descriptions for the national water experts;

- National experts on water quantity; Water quantity experts will be involved in developing water quantity accounts in line with the United Nations System of Economic and Environmental Accounting for Water ([8]) as well as implementing water quantity indicators. They will also ensure the collaboration with other water institutions and experts
- National experts on water quality; they will be involved in implementing water quality indicators. The number of national experts on water quality will be identify together with the National Focal Points of Armenia. Water quality experts will be in close cooperation and collaboration particularly with the IT experts for developing the national portal of water information system.
- National IT experts; National IT expert will play important role in ensuring the development of the national portal of water information system. They should work closely with the water quality experts as well as IT experts from the EEA topic centre of Inland, Coastal and Marine Waters.

The list of national water experts with their national institutions will be finalized during the workshop which will be held in December 2017 in Yerevan.

The communication with the national water experts will be conducted mainly in English.

Deliverables

- National water and IT experts identified and thematic expert networks developed

2.2 Online survey on data catalogues for water indicators

Based on EEA data policy document ([9]) and the European interoperability framework for European Public Services ([10]) as well as in line with the SEIS components (cooperation, content and infrastructure) an online survey will be performed with the Ministry of Nature Protection of the

[8] https://unstats.un.org/unsd/envaccounting/seeaw/seeawaterwebversion.pdf
[9] http://www.eea.europa.eu/legal/eea-data-policy
[10] https://ec.europa.eu/isa2/eif

Republic of Armenia and National Statistical Office of the Republic of Armenia with further circulation to other relevant national agencies for the following purposes;

- to develop the metadata catalogue of the selected indicators
- to further elaborate quantitative and qualitative aspects of organizational and data capacities of relevant national institutions in sharing the data and information (cooperation- institutional dimension of the data management) as building block of the ENI SEIS 1st phase
- to update information on data availability for each of the water quantity and quality indicator as well as operational tools and procedures (infrastructure) for sharing the water data and information at the national scale

A close consultation and cooperation will be ensured with Armenia as well as with EU WI+, UNECE, and UNEP in order to avoid from possible duplication of similar surveys. For instance, a survey is planned to be conducted by UNECE with ECCAA on the indicators of the Sustainable Development Goals.

European Topic Centre on Inland, Coastal and Marine waters (ETC/ICM) on behalf of the European Environment Agency will conduct the online survey with Armenian national institutions.

Deliverables

- Metadata catalogue on available data for the respective indicators
- Progress report on current institutional, technological and regulatory dimensions of the online data and indicator management (systems) in Armenia

2.3 Technical workshop on online data and indicator management

UNECE Joint Task Force on Environmental Statistics and Indicators has proposed 16 water related indicators ([11]) to be implemented as response to the international reporting obligations. Armenia has already developed the indicators of C1-C7 at the national level and C11 at the river basin level which is corresponding to full set of proposed indicators. The data underpinning the indicators is available for the years 1990, 1995 and between 2000 and 2015 ([12]). However, the indicators are available as a set of statistical tables rather than providing the assessment with a view of supporting national environmental policy processes. Therefore, the current set of indicators will be further improved in line with the EEA indicator guideline for supporting the national policy processes.

For that purposes, a two-day workshop will be organized by EEA in Yerevan in December 2017 to align common conceptual understanding on developing the national portal of water information system and implementation of regionally comparable indicators.

Eventually two different options need to be discussed during the workshop regarding the feasibility of the development of the national portal of water information system;

- Expansion of Lake Sevan information portal to the national scale, or

[11] www.unece.org/env./indicators.html
[12] www.armstatbank.am

- Further improvements with e-Water component of the web-portal of the Ministry of Nature Protection of the Republic of Armenia.

The workshop will also elaborate different aspects of the three SEIS components i.e. institutional *cooperation* for data and information sharing, prioritisation of the *content* of data and information in line with the selected indicators as well as designing IT *infrastructure (*tools and application) for the data exchange.

Various national institutions are involved in monitoring and management of water resources in Armenia. For instance, the below table is illustrating the involvement of different agencies in water monitoring and collecting the data (Table 2)

Table 2: Water monitoring institutions in Armenia ([13])

Monitoring function	**Responsible agency**	**Ministry**
Surface water quantity	State Hydrometeorological and Monitoring Service	Territorial Administration and Emergency Situations
Surface water quality	Environmental Impact Monitoring Center	Nature Protection
Groundwater quantity and quality	Hydrogeological Monitoring Center	Nature Protection
Drinking water sources and quality	State Health Inspectorate	Health Care
Water use and pollution discharge	State Environmental Inspectorate	Nature Protection

In order to ensure the involvement of relevant institutions and experts, in addition to the national water experts, other participants to the workshop will be identified in close cooperation with Armenian NFPs and National Implementation Team.

By taking into account the SEIS components already developed in Armenia, the following agenda is proposed for the workshop subject for further revisions with Armenian NFPs;

Introduction of conceptual and methodological frames on the international standards and guidelines

- Communication on the results from the online survey
- Introduction of selected indicators
- International indicator guidelines i.e. EEA Indicator guideline and UNECE online indicator guideline
- Overall introduction of the UN SEEA Water framework with a particular focus on flow and assets accounts and case study from the EEA/EIONET - *optional*
- Mapping the selected indicators with the International reporting streams, policies and assessments (Reporting to the conventions, SDGs, Green growth, Resource efficiency)

Development of the national portal of water information system as National pilot

- Data harmonization- implementation of WISE SoE water quantity and water quality data dictionaries
- Conceptual approach for the support of development the national portal of water information system
- Institutional roles and responsibilities in developing/further improving the portal
- Examples of data exchange protocols among the national institutions

Operationalize the implementation of the indicators

- Identifying national water quality and IT experts
- Identifying national water quantity experts
- Defining the data sets for the water quantity and water quality
- Operational plan (Roadmap) of implementation the national portal of water information system (SWISE) and water indicators

[13] http://enpi-seis.pbe.eea.europa.eu/east/armenia/pilot-project-seis-lake-sevan/final-report-seis-lake-sevan-arm-updated-july-2015

Based on the outputs from the online survey as well as the workshop in Yerevan, further elaboration will be conducted together with Ministry of Natural Resources and National Statistical Service regarding the prioritization of indicators. As a first step the below table (Table 3) is tentatively illustrating possible prioritisation of the implementation of the UNECE water indicators in Armenia.

Table 3: Implementation phases of the UNECE environmental indicators in Armenia

C. Water	Indicator description	Data production	Glossary of terms	Implementation year by the ENI SEIS II project	Context
C1. Renewable freshwater	PDF	XLS	PDF	2017/2018	e.g. SDG-6
C2. Freshwater abstraction	PDF	XLS	PDF	2017/2018	e.g. SDG-6
C3. Total water use	PDF	XLS	PDF	2017/2018	e.g. SDG-6
C4. Household water use per	PDF	XLS	PDF	2017/2018	e.g. SDG-6
C5. Water supply industry	PDF	XLS	PDF	2017/2018	e.g. SDG-6
C7. Water losses	PDF	XLS	PDF	2019	e.g. SDG-6
C8. Reuse and recycling of	PDF	XLS	PDF	2019	e.g. SDG-6
C9. Drinking water quality	PDF	XLS	PDF	2019	e.g. SDG-6
C10. BOD and concentration	PDF	XLS	PDF	2017/2018	National pilot
C11. Nutrients in freshwater	PDF	XLS	PDF	2017/2018	National pilot

In addition, close coordination should be ensured between the ENI SEIS II East project and EU WI+ at the overall project implementation level so as to mobilize the national policy dialogue for facilitating the establishment of regulatory process for data sharing. The cooperation is also essential between the both projects to avoid from possible duplication in terms of training the experts on data management and IT development.

Deliverables

- Roles and responsibilities of the institutions in developing the national portal
- Final list of national experts on water quantity, quality and IT
- Draft data exchange protocols among the national water quality related institutions
- Roadmap (Operational plan 2018/2019 and updating the indicator table)

2.4 National pilot; supporting the development of the national portal of water information system

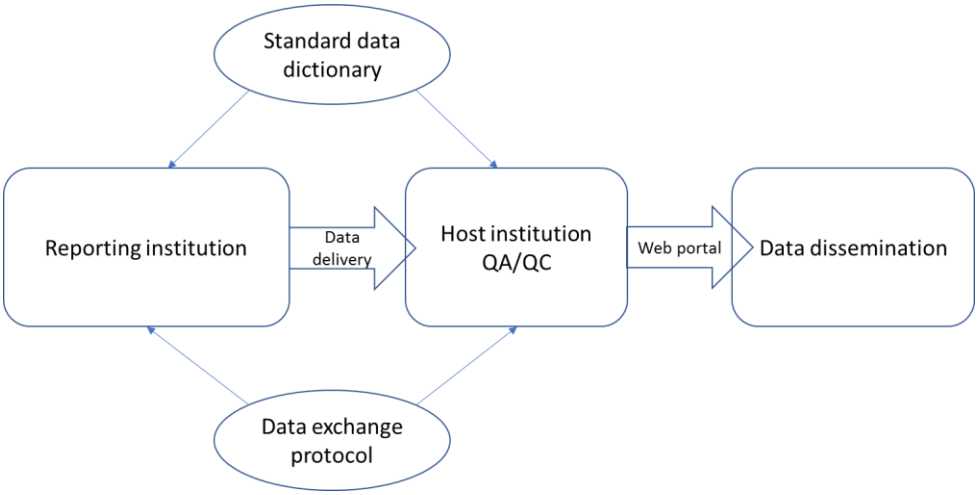
One of the key objectives of this work plan is to support Armenia in expanding Lake Sevan water information portal to the national level so as to improve their capacity in meeting the commitments towards the regional/international reporting obligations.

The national pilot will focus on the experimental implementation of online data sharing among those institutions responsible either for monitoring of water quality or managing the water resources e.g. Environmental Impact Monitoring Center, Hydrogeological Monitoring Center of the Geological Agency etc.

The pilot will use the development of two water quality indicators (C-10 and C-11) as testing the implementation of standard data dictionaries of the State of Environment Reporting of the Water

Information System for Europe. In addition, it will support developing and operationalising data exchange protocol among the related national institutions for online data collection and processing (Figure 2). EIONET and WISE ([14]) experiences on quality check and assurance together with dissemination and visualisation of outputs will also be shared with national institutions and capacity of the national experts.

Figure 2: Simplified model of the national portal of water information system



EEA/ETC will provide a five-days hands-on training to the Armenian IT experts working in the water area. The main focus will be given to tools and applications for online data management (data preparation, data collection, QA and QC and data dissemination) and also to the procedure for manual and predefined quality check and assurance.

Similar hands-on training will also be provided to the water quality experts to collaborate with the IT experts on implementation of the WISE SoE water quality data dictionary, QA/QC and data dissemination. In addition, the hands-on training for the water quality expert will cover the implementation of the water quality indicators including indicator-based assessment.

Deliverables

- 3 IT experts trained
- 3 water quality experts trained

2.5 Capacity building in the implementation of the UNECE water indicators

A component of the hands-on training will be focused on improving the capacities of the national content experts in carrying out the implementation of selected indicators and assessment on water resources management.

National water quantity experts will be trained on;

- Implementation of the asset accounts in line with the UN SEEA Water conceptual framework. This component is optional as Armenia has already developed the water quantity accounts

[14] http://water.europa.eu/data-and-themes

([15]). However, final consistency check is needed to see the potential use of the water accounts outputs in implementing the indicators.

- Data harmonization, integration and gap fillings
- Implementation of C1-C5 indicators in line with the EEA indicator guideline
- DPSIR framework for carrying out the assessment

National water quality experts will be trained on;

- Data harmonization, integration and gap fillings
- Implementation of C10-C11 indicators in line with the EEA indicator guideline
- DPSIR framework for carrying out the assessment

Deliverables

- Between 2-4 national water quantity experts trained
- Between 2-4 national water quality experts trained

2.6 Helpdesk support

It is envisaged that once the workshop and the hands-on training have been completed, the respective institutions and national experts will have sufficient level of capacity for carrying out the necessary implementation towards the establishment of the national portal of water information system as well as implementation of indicators. However, during the implementation, they would need some ad-hoc supports around online data management or the indicator implementation. In addition, the EEA experiences on the EIONET consultation would be provided to the respective institutions in carrying out the consultation with the respective stakeholders (public or civil society organizations) on the indicators and their publications.

Helpdesk support will ensure the continuation of the works in Armenia on the following areas;

- Establishment of the national portal of water information system and on-line data management for water quality data indicators
- Computation of water accounts (asset and physical supply and use) - *optional*
- Implementation of water quantity indicators (given priority to C1-C5)
- Implementation of water quality indicators (given priority to C10 and C11)
- Public consultation for the indicators
- Publication of the indicators on the national portal

Deliverables

- Water asset accounts available – *depends on the outcomes from the workshop*
- C1-C5 are available at the national level
- C10 and C11 are at the national level

2.7 Report on the state of water in Armenia

ENI SEIS II East aims to provide overview water resources management at the regional scale. For that purpose, based on the available data and information gained from the implementation of indicators, the project will develop a report on the state of water resources in Eastern Europe and the Caucasus.

[15] http://www.dst.dk/ext/7680747903/0/armenia/6-4-Study-visit-report-(Water-Accounts)-ENG--pdf

Armenia is encouraged to work collaboratively with the ENI SEIS II East Project team for developing similar report with a view of supporting the knowledge-based policy implementation at the national level. If such report would be available at the national level, then it might be used as main input into the regional report. The regional report will be developed by the European Environment Agency.

Deliverables

- Report on the state of water in Armenia

3 Cooperation and coordination

3.1 Coordination between EEA and National Implementation Team

The overall coordination between EEA and Armenia is going to be ensured by ENI SEIS II East Project team and the National focal points from the Ministry of Nature Protection and the National Statistical Service of the Republic of Armenia. The inter-institutional coordination will be conducted by the National Implementation Team. In addition, day-to-day communication with the members of the NIT as well as with the NFPs will be kept by the National Assistant of the ENI SEIS II East Project, in Yerevan.

A detailed list of project team members is provided under the chapter 5.

3.2 Coordination with other international institutions and projects

In many cases, outputs of ongoing regional and bilateral projects will be used as input for enhancing data availability on water quality and quantity in the ENI SEIS II East project. The EU Water Initiative Plus (EU WI+) (supporting the transboundary water resources management in the Caucasus), is one of the international projects running on the water area in the region. A regular contact with this project at appropriate levels (national and international) will be ensured so as to mobilize available data, information and resources to be used efficiently for the purposes of the ENI SEIS II East project.

4 Implementation phase

As for the time table, the plan is covering the years 2017 and 2019 with possible revisions during the national workshop in Yerevan as well as based on the level of advancement in terms of implementation of SEIS principles for the data collection and sharing in Armenia (Figure 3).

Figure 3: Implementation phases of the work plan

Armenia - Project activities- Water (2017-2019)	2017									2018												2019											
	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
Development of country and regional work plans together with ETC/ICM contracting	■	■	■	■	■																											
Appointment of national freshwater experts (1 week after the workshop)	■	■	■																													
Online survey on data catalogues for selected indicators (1 week after the workshop)						■	■																									
Workshop on online data, water quantity accounts and indicator management								■																								
Collecting data and information for selected freshwater indicators									■	■																						
Hands-on training on online data management and implementation of the indicators (22 Feb - 6 Mar, TBC)											■																					
Implementing selected indicators and undertake the assessment												■	■	■																		
Public consultation for the freshwater indicators															■	■																
Publication of data on the national portal of water information system																	■	■	■													
Publishing indicators and visualising the CSI 018 on the national portal																				■	■											
Helpdesk support						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■											
National report on the state of freshwater																						■	■	■	■							
Report on the s t ate of water in Eastern Europe and Caucasus																						■	■	■	■	■	■	■	■	■	■	■

This project is funded by the European Union and is implemented by the European Environment Agency

4.1 Deliverables

4.1.1 Main deliverables

No.	Description	NFPs	ETC task manager	EEA responsible	Date
21/1	National water and IT experts identified and thematic expert networks developed	Julieta Ghlichyan Yurik Poghosyan		Nihat Zal	28/10/2017
22/2	Metadata catalogue on available data for the respective indicators		Lidija Globevnik	Nihat Zal	30/11/2017
23/3	Revision of the work plan	Julieta Ghlichyan Yurik Poghosyan	Lidija Globevnik	Nihat Zal	30/11/2017
23/4	Data exchange protocol	Julieta Ghlichyan Yurik Poghosyan		Nihat Zal	29/12/2017
24/5	Training of national experts	Julieta Ghlichyan Yurik Poghosyan	Lidija Globevnik	Nihat Zal	28/02/2018

4.1.2 Key deliverables

No.	Description	NFPs	ETC task manager	EEA responsible	Date
25/6	Data published online as first step of the national portal of water information system	Julieta Ghlichyan Yurik Poghosyan	Lidija Globevnik	Nihat Zal	31/08/2018
25/7	Indicators are available on the national portal	Julieta Ghlichyan Yurik Poghosyan	Lidija Globevnik (until the end of 2018)	Nihat Zal	30/11/2018
26/8	Report on state of water in Armenia – Optional (depending on the country commitments)	Julieta Ghlichyan Yurik Poghosyan		Nihat Zal	30/04/2019

5. Project team members

Partner	Name and title	Role in the project
EEA	Galina H. Georgieva, Head of Group - European neighbourhood policy activities	Overall execution of the ENI SEISII East Project
	Jean-Nicolas Poussart, ENI East project coordinator	Coordination of the ENI SEIS II East
	Nihat Zal, Project manager – water, biodiversity, land	Responsible for the overall implementation of this work plan
	Victoria Goncharova, Project officer-Networking and communication	Contact point for the visiblity of project activities
	Yurik Poghosyan , National assistance	Day-to-day execution of the communication with partners
Armenia	Julieta Ghlichyan, National Focal Point - Ministry of Nature Protection	Inter-institutional coordination for the project actions- Report on the state of water in Armenia
		Inter-institutional coordination for the project actions – report on the State of water in Armenia
	Naira Mandalyan, IT expert, Statistical Service	Responsible for National Pilot- improvements with national portal of water information system - eWater
	Gayane Hovsepyan, Water expert, Ministry of Nature Protection	Responsible for implementing the UNECE indicators of C1-C8 including the report on the state of water in Armenia
	Gohar Harutyunyan, Ministry of Nature protection	Responsible for implementing the UNECE indicators of C9-C11 including the report on the state of water in Armenia
ETC	Dr. Anita Künitzer (UFZ), ETC/ICM manager	Administration of the contract with EEA
	Dr. Lidija Globevnik (TC Vode), task leader	Coordination of a ETC/ICM team, content expert on C10
	Kari Austnes (NIVA), Water expert	C11 content expert (data sources, data extraction, QA/QC, data analysis and visualisation, assessment)
	Gašper Šubelj (TC Vode), IT expert	Hands-on training on IT, helpdesk support, QA/QC
	Luka Snoj (TC Vode), Water informatics (IT)	Online survey, hands-on training on IT, organization of the workshop
	Miroslav Fanta (CENIA), IT expert	WISE data flow, hands-on training on IT, help desk support on IT/data preparation, handling , reporting and quality control issues, support on web map production
	Dr. Maria Mimikou (NTUA), Water expert	Context expert on C1-C5 including UN SEEA Water accounts
	Alexandros Psomas (NTUA), Water expert	Content expert on water quantity and efficiency – hands-on training on C1-C5
	Dr. Evangelos Baltas (NTUA), Water expert	Content expert on water quantity and water scarcity indicators – Hands-on training on C1-C5
	George Bariamis (NTUA), water expert	Content expert on C1-C5, hands-on training on UNSEEA Water and indicator computation

6. Assumptions and risks

The deliverables and key deliverables are very much depending on commitments of Armenia as well as efficiency of collaboration and cooperation between the EEA and the respective national institutions. In the case of low level institutional commitments to the project activities during the implementation phase, there would be a high risk of failure to achieve the key deliverables. Moreover, unstable political and economic situation in Armenia would also pose an additional risk with frequent and sometimes rather extensive changes in the national administrations. The EEA will take necessary dialogue and communication with the National Implementation Team as well as mobilize the Project Assistant to mitigate the impacts of such risks over the key deliverables.