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PREPARATION OF THE GUIDELINES ON THE APPLICATION
OF THE CORE SET OF ENVIRONMENTAL INDICATORS
FOR EASTERN EUROPE, THE CAUCASUS AND CENTRAL ASIA

Working Paper 6¹

WATER WHS HAZARDOUS SUBSTANCES IN WATER

¹ Informal translation from Russian. Descriptions of indicators were prepared by Mr. Gennadiy Tishchikov (Belarus) at the request by the UNECE Secretariat. Please send your comments to the author (us212@by.mecom.ru) and the Secretariat (mikhail.kokine@unece.org).

EMISSIONS OF HAZARDOUS SUBSTANCES FROM INDUSTRY

1. General description

- (a) **Subcode:** WHS8
- (b) **Brief definition:** The indicator serves to define emissions of hazardous substances as part of industrial waste waters.
- (c) **Unit of measurement:** Emissions of the individual hazardous substances as part of industrial waste waters is defined in tons or in thousand tons per time unity (as a rule, per year).
- (d) **Presence in the UNCSD indicator list:** Not in the list.
- (e) **Use in the Kiev Assessment:** Not used.

2. Environmental policy relevance

- (a) **Purpose:** To define the load onto surface and groundwater as a result of hazardous substances discharged as part of industrial waste waters with the scope of obtaining source data for designing nature conservation arrangements and monitoring efficiency of such.
- (b) **International agreements:** None.
- (c) **International targets, standards or guidelines:** Established for certain hazardous substances. For instance, in the Directive of EC Council 86/280/EEC dated 12.06.1986 concerning maximum values and quality targets set for emission of certain hazardous substances it has been prescribed to substantially reduce emission of carbonic tetrachloride, DDT, and pentachlorophenol.
- (d) **Linkages to other indicators:** This indicator is linked to other indicators characterizing content of hazardous substances in the environmental bodies (WHS2 rev, WHS3 rev, WHS4 rev), as well as with quality of environment indicators (WEC4e rev, WEC5e rev).

3. Methodological description

- (a) **Underlying definitions and concepts:** The problem of industrial waste waters requires to be treated with special attention since the industrial effluents contain toxic organic compounds and heavy metals separation of which has not been envisaged by the technological capacities featured by the municipal water treatment plants. Insufficiently treated industrial effluents distort operation of waste water treatment plants and, as a result, such are rejected into the environment.
- (b) **Measurement methods:** This indicator is computed as a product of mean concentrations of individual hazardous substances arising from the generalized source data accounting for the quantity and quality of discharged effluents multiplied by the quantity of industrial effluents discharged during certain time period.
- (c) **Availability of internationally-agreed methodology:** None.

4. Primary data

- (a) **Requirements to monitoring and data collection:** Monitoring of industrial hazardous substances should serve to ensure collection of representative information on the quantities of discharged effluents as well as on their qualitative composition. Required frequency of sampling shall be ensured in conducting primary metering of drain by the users. In metering sewage drain it is necessary to make use of hydrometrical equipment certified and verified by the State Standard bodies. Analytical control of the quality of waste waters shall be done making use of such services as rendered by duly accredited laboratories disposing of a system of measurements quality control. Exercised by nature conservation agencies shall be effective control over the quality and authenticity of primary metering. Processing source data and including such into database shall be done through the use of advanced informational technologies.
- (b) **Difficulties and limitations:** Major difficulties in getting representative information on the qualitative and quantitative composition of industrial discharges of hazardous substances are con-

fined to low frequency of primary metering as well as to lack of sophisticated highly selective equipment capable of conducting analysis over wide spectrum of hazardous substances.

(c) **Reference to international databases:** EECCA countries dispose of some departmental and national databases concerning quantities of discharged hazardous substances. Respective information is entered into the state water cadastres.

5. *International bodies*

(a) **Lead institution:**

- UN Economic Commission for Europe (UN ECE).

(b) **Other organizations and agencies:**

- World Health Organization (WHO).
- United Nations Human Settlements Programme (UN-HABITAT).
- UN Food and Agricultural Organization (FAO)
- International Bank for Reconstruction and Development (IBRD).

6. *References*

(a) **Readings:**

- Guidance for monitoring water quality in transboundary rivers. In: Protection of transboundary waters; guidance for policy –and decision-making. Water Series №. 3. ECE/CEP/11. United Nations Economic Commission for Europe. United Nations. New York and Geneva, 1996.
- Standard Methods for the Examination of Water and Wastewater/ 19th ed. – American Public Human health Association: Washington, DC, 1992.
- GEMS/WATER Operational Guide. Third Edition. WHO, 1992.

(b) **Internet sites:**

- <http://www.unece.org/env/water/welcome.html>
- http://themes.eea.eu.int/Specific_media/water/indicators
- <http://www.unep.org>.
- <http://www.raceagainstwaste.com/prod.htm>
- <http://www.unhabitat.org>
- <http://www.who.int/>

HAZARDOUS SUBSTANCES IN RIVERS (ACCORDING TO UNECE CONVENTION ON TRANSBOUNDARY WATERS)

1. General description

- (a) **Subcode:** WHS2 rev
- (b) **Brief definition:** The indicator defines content of toxic, cancerogenic, mutagenic, teratogenic and bioaccumulated substances the transboundary watercourses.
- (c) **Unit of measurement:** Concentration of hazardous substances is expressed in $\mu\text{g}/\text{dm}^3$ and mg/dm^3 .
- (d) **Presence in the UNCSD indicator list:** Not in the list.
- (e) **Use in the Kiev Assessment:** Not used.

2. Environmental policy relevance

- (a) **Purpose:** To define contents of hazardous substances in the transboundary watercourses with the scope of identifying the load, reasons and sources of pollution so as to prevent, limit or reduce transboundary exposure within the framework of complex systems of water economy management.
- (b) **International agreements:** Convention on the protection and use of transboundary watercourses and international lakes (Helsinki, 17.03.1992); Protocol on water and health to the 1992 Convention on the protection and use of transboundary watercourses and international lakes (London, 17.06.1999).
- (c) **International targets, standards or guidelines:** There are no internationally-agreed targets, standards or guidelines. Each party sets and publishes national and/or local targets and approves water quality criteria in order to prevent, limit and decrease transboundary impact.
- (d) **Linkages to other indicators:** This indicator is linked to such characterizing emission of hazardous substances into transboundary watercourses from groundwater (WHS1a, WHS1b), from spot (WHS8, WHS9) and diffuse (TEP3, AGR18a) sources, as well as to the indicator of environment quality (WEC 4e rev).

3. Methodological description

- (a) **Underlying definitions and concepts:** Assessment of water quality with the scope of its sustainable use and ensuring protection of human health and safety shall be based on information and compliance with the standard requirements to the rates of especially hazardous chemical substances (heavy metals, pesticides, radionuclides, etc.). Serving as criteria in selecting pollutants for sampling shall be such as their durability, toxicity, intermedium migration, ways of conveyance through trophic chains and bioaccumulation. Besides, accounted for and used in selecting parameters of monitoring should be nationally and internationally recognized lists of hazardous substances.
- (b) **Measurement methods:** Actually used are the individual standardized methods of measuring concentration of chemical ingredients in compliance with the lists of hazardous substances agreed upon by the Parties.
- (c) **Availability of internationally-agreed methodology:** Use has been made of the individual methods of measuring concentration of chemical ingredients pursuant to the international standard ISO.

5. Primary data

- (a) **Requirements to monitoring and data collection:** The program for monitoring hazardous substances in transboundary watercourses shall be made up with due account for the nature of spatial and time dynamics of sampled pollutants. It is necessary to define optimal time parameters and frequency of sampling while taking into account seasonal emission of certain ingredients (for example, pesticides) and providing for well-coordinated hydrological surveillance to estimate trans-

boundary migration of pollutants. It is necessary to identify the controlled media (water, bottom deposits, arborvitae). Sampling and conducting chemical and analytical tests shall be done by the accredited laboratories equipped with adequate rigging and disposing of measurements quality control systems.

(b) **Difficulties and limitations:** Major difficulties in monitoring hazardous substances in transboundary watercourse are basically due to insufficient logistics provisions. These are mainly confined to low frequency of sampling and lack of coordinated hydrological sampling on certain shore ranges; there are practically no standards on the content of hazardous substances in bottom deposits and arborvitae; the majority of laboratories are insufficiently equipped with sophisticated highly selective rigging allowing to conduct screening and analytical determination of the required list of hazardous substances.

(c) **Reference to international databases:** EECCA countries dispose of departmental and in some cases national databases on certain hazardous substances. At the international level information concerning hazardous substances in certain basins is stored in databases maintained by the International commissions.

6. *International bodies*

(a) **Lead institution:**

- International Environment Agency (IEA).

(b) **Other organizations and agencies:**

- Organization for Economic Cooperation and Development (OECD).
- UN Economic Commission for Europe (UN ECE).
- United Nations Environment Programme (UNEP)
- World Health Organization (WHO).
- World Meteorological Organization (WMO).

7. *References*

(a) **Readings:**

- Guidance on chemical analysis of dry land surface waters / edited by A.D. Semenov. – L. Hydrometeoizdat.1977.
- Fomin G.S. Water. Control of chemical, bacterial and radiation safety according to international standards. Encyclopedia Reference Book. M., Protector, 1995. – 624 p.
- Guidance for monitoring water quality in transboundary rivers. In: Protection of transboundary waters; guidance for policy –and decision-making. Water Series №. 3. ECE/CEP/11. United Nations Economic Commission for Europe. United Nations. New York and Geneva, 1996.
- Convention on the protection and use of transboundary watercourses and international lakes. Done at Helsinki, on 17 March 1992. United Nations. New York and Geneva, 1994.
- Protocol on water and health to the Convention on the protection and use of transboundary watercourses and international lakes. Done in London, on 17 June 1999. MP.WAT/2000/1 – EUR/ICP/EHCO020205/8Fin. United Nations. Geneva and Copenhagen.

(b) **Internet sites:**

- <http://europa.eu.int/comm/eurostat/>
- http://themes.eea.eu.int/Specific_media/water/indicators
- <http://www.unece.org/env/water/welcome.html>
- http://themes.eea.eu.int/Specific_media/water/indicators
- <http://www.unep.org>
- <http://www.icpdr.org/pls/danubis/DANUBIS.navigator>
- <http://www.iksr.org/>
- http://www.iksemkol.de/html/ikse/ikse/deutsch/index_d.htm
- <http://www.greenfield.fortunecity.com/hunters/228/toppage1.htm>

EMISSIONS TO WATER OF HAZARDOUS SUBSTANCES FROM URBAN WASTE WATER TREATMENT PLANT

1. General description

- (a) **Subcode:** WHS9
- (b) **Brief definition:** The indicator defines emission to natural waters of hazardous substances discharged from the urban waste water treatment plants.
- (c) **Unit of measurement:** Emission of the individual hazardous substances from urban waste water treatment plants is being defined in tons per unity of time (as a rule, per year).
- (d) **Presence in the UNCSD indicator list:** Not in the list.
- (e) **Use in the Kiev Assessment:** Not used.

2. Environmental policy relevance

- (a) **Purpose:** To define the load onto water bodies resulting from the emission of hazardous substances from urban waste water treatment plants causing pollution of natural and to obtain source data for designing nature conservation arrangements.
- (b) **International agreements:** None.
- (c) **International targets, standards or guidelines:** Established for certain hazardous substances. For instance, in the Directive of EC Council 86/280/EEC dated 12.06.1986 concerning maximum values and quality targets set for emission of certain hazardous substances it has been prescribed to substantially reduce emission of carbonic tetrachloride, DDT, and pentachlorophenol.
- (d) **Linkages to other indicators:** This indicator is linked to other indicators characterizing content of hazardous substances in the environmental bodies (WHS2 rev, WHS3 rev, WHS4 rev), as well as with quality of environment indicators (WEC4e rev, WEC5e rev).

3. Methodological description

- (a) **Underlying definitions and concepts:** Hazardous substances (primarily, toxic organic compounds and heavy metals) are discharged into urban waste water treatment plants as part of household waste waters and insufficiently treated industrial effluents. In the majority of cases technological capacities featured by urban waste water treatment plants do not provide for the adequate utilization of these compounds and as a result they are discharged into natural waters. Taking into account cancerogenic, mutagenic and teratogenic nature of hazardous substances and their metabolites as well as their bioaccumulative capacity, this group of substances is setting major hazard for the normal functioning of water ecosystems and human health of the population.
- (b) **Measurement methods:** This indicator is computed as a product of mean concentrations of individual hazardous substances multiplied by the quantity of urban waste water treatment plants discharged during certain time period.
- (c) **Availability of internationally-agreed methodology:** None

4. Primary data

- (a) **Requirements to monitoring and data collection:** Monitoring of industrial hazardous substances should serve to ensure collection of representative information on the quantities of discharged effluents as well as on their qualitative composition. Required frequency of sampling shall be ensured in conducting primary metering of drain. In metering sewage drain it is necessary to make use of hydrometrical equipment certified and verified by the State Standardization bodies. Analytical control of the quality of waste waters shall be done making use of such services as rendered by duly accredited laboratories disposing of a system of measurements quality control. Exercised by nature conservation agencies shall be effective control over the quality and authenticity of

primary metering. Processing source data and including such into database shall be done through the use of advanced informational technologies.

(b) **Difficulties and limitation:** Major difficulties in getting representative information on the qualitative and quantitative composition of emissions of hazardous substances from urban waste water treatment plants are confined to lack of sophisticated highly selective equipment capable of conducting analysis over wide spectrum of hazardous substances.

(c) **Reference to international databases:** EECCA countries dispose of departmental and national databases concerning quantities of hazardous substances discharged from urban waste water treatment plants. Respective information is entered into the state water cadastres.

5. *International bodies*

(a) **Lead institution:**

- UN Economical Commission for Europe (UNECE).

(b) **Other organizations and agencies:**

- World Health Organization (WHO).
- United Nations Human Settlements Programme (UN-HABITAT).
- UN Food and Agricultural Organization (FAO)
- International Bank for Reconstruction and Development (IBRD).

6. *References*

(a) **Readings:**

1. Guidance for monitoring water quality in transboundary rivers. In: Protection of transboundary waters; guidance for policy –and decision-making. Water Series №. 3. ECE/CEP/11. United Nations Economic Commission for Europe. United Nations. New York and Geneva, 1996.

2. Standard Methods for the Examination of Water and Wastewater/ 19th ed. – American Public Health Association: Washington, DC, 1992.

3. GEMS/WATER Operational Guide. Third Edition. WHO, 1992.

(b) **Internet sites:**

- http://themes.eea.eu.int/Specific_media/water/indicators
- <http://www.unece.org/env/water/welcome.html>
- <http://www.unep.org>
- <http://www.raceagainstwaste.com/prod.htm>
- <http://www.unhabitat.org>.
- <http://www.who.int/>

HAZARDOUS SUBSTANCES IN LAKES (ACCORDING TO UNECE CONVENTION ON TRANSBOUNDARY WATERS)

1. General description

- (a) **Subcode:** WHS3 rev
- (b) **Brief definition:** The indicator defines content of toxic, cancerogenic, mutagenic, teratogenic or bioaccumulated substances the water of international lakes.
- (c) **Unit of measurement:** Concentration of hazardous substances is expressed in in $\mu\text{g}/\text{dm}^3$ and mg/dm^3 .
- (d) **Presence in the UNCSD indicator list:** Not in the list.
- (e) **Use in the Kiev Assessment:** Used.

2. Environmental policy relevance

- (a) **Purpose:** To define contents of hazardous substances in the water of international lakes with the scope of identifying the load, reasons and sources of pollution so as to prevent, limit or reduce transboundary impact within the framework of complex systems of water economy management.
- (b) **International agreements:** Convention on the protection and use of transboundary watercourses and international lakes (Helsinki, 17.03.1992); Protocol on water and health to the 1992 Convention on the protection and use of transboundary watercourses and international lakes (London, 17.06.1999).
- (c) **International targets, standards or guidelines:** There are no internationally-agreed targets, standards or guidelines. Each party sets and publishes national and/or local targets and approves water quality criteria in order to prevent, limit and decrease transboundary impact.
- (d) **Linkages to other indicators:** This indicator is linked to such characterizing emission of hazardous substances into transboundary watercourses from groundwater (WHS1a, WHS1b), from spot (WHS8, WHS9) and diffuse (TEP3, AGR18a) sources, as well as to the indicator of environment quality (WEC 4e rev).

3. Methodological description

- (a) **Underlying definitions and concepts:** Assessment of water quality with the scope of its sustainable use and ensuring protection of human health and safety shall be based on information and compliance with the standard requirements to the rates of especially hazardous chemical substances (heavy metals, pesticides, radionuclides, etc.). Serving as criteria in selecting pollutants for sampling shall be such as their durability, toxicity, intermedium migration, ways of conveyance through trophic chains and bioaccumulation. Besides, accounted for and used in selecting parameters of monitoring should be nationally and internationally recognized lists of hazardous substances
- (b) **Measurement methods:** Actually used are the individual standardized methods of measuring concentration of chemical ingredients in compliance with the lists of hazardous substances agreed upon by the Parties.
- (c) **Availability of internationally-agreed methodology:** Use has been made of the individual methods of measuring concentration of chemical ingredients recommended by the international standard ISO.

4. Primary data

- (a) **Requirements to monitoring and data collection:** The program for monitoring hazardous substances in the water of international lakes shall be made up with due account for the nature of spatial and temporal dynamics of sampled pollutants. It is necessary to define optimal temporal parameters and frequency of sampling while taking into account seasonal emission of certain ingredients (for example, pesticides) and providing for well-coordinated hydrological surveillance to estimate transboundary migration of pollutants. It is necessary to identify the controlled media (water,

bottom deposits, arborvitae). Sampling and conducting chemical and analytical tests shall be done by the accredited laboratories equipped with adequate rigging and disposing of measurements quality control systems.

(b) **Difficulties and limitations** : Major difficulties in monitoring hazardous substances in international lakes are basically due to insufficient logistics provisions. These are mainly confined to low frequency of sampling and lack of coordinated hydrological sampling on certain shore ranges; there are practically no standards on the content of hazardous substances in bottom deposits and arborvitae; the majority of laboratories are insufficiently equipped with sophisticated highly selective rigging allowing to conduct screening and analytical determination of the required list of hazardous substances.

(c) **Reference to international databases:** EECCA countries dispose of departmental and in some cases national databases on certain hazardous substances. At the international level information concerning hazardous substances in certain basins is stored in databases maintained by the International commissions.

5. *International bodies*

(a) **Lead institution:**

- International Environmental Agency (IEA).

(b) **Other organizations and agencies:**

- Organization for Economic Cooperation and Development (OECD).
- UN Economical Commission for Europe (UNECE).
- United Nations Environment Programme (UNEP).
- World Health Organization (WHO).
- World Meteorological Organization (WMO).

6. *References*

(a) **Readings:**

- Guidance on chemical analysis of dry land surface waters / edited by A.D. Semenov. – L. Hydrometeoizdat.1977.
- Fomin G.S. Water. Control of chemical, bacterial and radiation safety according to international standards. Encyclopedia Reference Book. M., Protector, 1995. – 624 p.
- Convention on the protection and use of transboundary watercourses and international lakes. Done at Helsinki, on 17 March 1992. United Nations. New York and Geneva, 1994.
- Protocol on water and health to the Convention on the protection and use of transboundary watercourses and international lakes. Done in London, on 17 June 1999. MP.WAT/2000/1 – EUR/ICP/EHCO020205/8Fin. United Nations. Geneva and Copenhagen.

(d) **Internet sites:**

- <http://europa.eu.int/comm/eurostat/>
- http://themes.eea.eu.int/Specific_media/water/indicators
- <http://www.unece.org/env/water/welcome.html>
- <http://www.unep.org>.
- <http://www.greenfield.fortunecity.com/hunters/228/toppage1.htm>
- <http://www.igkb.de>
- <http://www.cipel.org>

PESTICIDES IN GROUNDWATER

1. General description

- (a) **Subcode:** WHS1a
- (b) **Brief definition:** The indicator defined content of pesticides in groundwater.
- (c) **Unit of measurement:** Concentration of pesticides is expressed in $\mu\text{g}/\text{dm}^3$.
- (d) **Presence in the UNCSD indicator list:** Not in the list.
- (e) **Use in the Kiev Assessment:** Used.

2. Environmental policy relevance

- (a) **Purpose:** To determine content of pesticides in groundwater both in the territory of the State as well as for certain regions with the scope of identifying load, reasons and sources of pollution as well as to supply source data for projections and developing nature conservation arrangements.
- (b) **International agreements:** None.
- (c) **International targets, standards or guidelines:** Maximum permissible values of pesticide content as per EC regulatory act "Resolution on preparation, treatment and use of drinking water" of 05.12.1990 constitute from $0,1 \mu\text{g}/\text{dm}^3$ (for separate substance) up to $0,5 \mu\text{g}/\text{dm}^3$ (for total pesticides).
- (d) **Linkages to other indicators:** This indicator is linked to the ones characterizing discharges of pesticides into the environment or their content in contact media (WHS8, WHS2 rev, WHS9, WHS3 rev, TEP3, AGR18a, WMF13), as well as with the indicator characterizing drinking water quality (WEU10 rev).

3. Methodological description

- (a) **Underlying definitions and concepts:** Pesticides are the synthetic organic substances featuring toxic and cancerogenic properties and capable of bioaccumulation and deposition in the environmental components. Many of the pesticides are extremely resistant against the impact of external factors withstanding decomposition for years. This poses a serious threat in both pesticides and their metabolite for natural ecosystems and human health of the population. Presence of pesticides in groundwater – major source of drinking water supply and frequently one of the basic factors of feeding surface water bodies - poses another substantive problem.
- (b) **Measurement methods:** Used in the majority of EECCA countries are methods of measuring pesticides concentration based on extraction of water samples by mixed solvent followed by gas-fluid chromatography using electronic capture or thermo-ionic detectors.
- (c) **Availability of internationally-agreed methodology:** Use has been made of the international standard ISO.

6. Primary data

- (a) **Requirements to monitoring and data collection:** The core program of groundwater monitoring shall include pesticides into the list of measured indicators. The quantity of surveillance outlets and their spatial location shall be such as to ensure receipt of information on the background (conditioned by transboundary migration) of pesticide content in basic types of environmental complexes and in the areas (predominantly agricultural) subject to anthropogenic load. Time related parameters of surveillance shall comply with the time variability of pesticides content in groundwater. Envisaged thereat shall be methodological and metrological uniformity of surveillance and data processing; chemical and analytical works shall be conducted by the accredited laboratories disposing of measurements quality control system.

- (b) **Difficulties and limitations:** Major difficulties experienced in obtaining representative data on pesticides content in groundwater are due to low specialization of the spatial surveillance network, especially in what refers to encompassing “hot” spots and unavailability of sophisticated highly selective equipment to conduct analysis of pesticides content in groundwater.
- (c) **Reference to international databases:** EECCA countries dispose of long-term departmental and certain national databases on the content of pesticides in groundwater.

7. *International bodies*

- (a) **Lead institution:**
- World Health Organization (WHO).
- (b) **Other organizations and agencies:**
- United Nations Environment Programme (UNEP).
 - United Nations Human Settlements Programme (UN-HABITAT).
 - International Bank for Reconstruction and Development (IBRD).

8. *References*

- (a) **Readings:**
- Guidelines for Drinking Water Quality. Volumes 1,2 and 3. WHO, Geneva, 1984.
 - GEMS/WATER Operational Guide. Third Edition. WHO, 1992.
 - Methods of defining micro-quantities of pesticides in foods, forage and environment./ Compiled by M.A. Klisenko, A.A. Kalinina. Reference Book in 2 volumes. – M.: VO "Kolos", 1992.
 - EUROWATERNET. The Environment Agency's Monitoring and Information. Network for Inland Water Resources. Technical Guidelines for Implementation. Technical Report № 7. Copenhagen, 1998.
- (b) **Internet sites:**
- <http://www.who.int/>
 - http://themes.eea.eu.int/Specific_media/water/indicators
 - <http://www.unece.org/env/water/welcome.html>
 - <http://www.unep.org>.
 - <http://www.unhabitat.org>
 - <http://www.fao.org>
 - <http://www.europa.eu.int/comm/eurostat/>

OTHER HAZARDOUS SUBSTANCES IN GROUNDWATER

1. General description

- (a) **Subcode:** WHS1 b
- (b) **Brief definition:** The indicator defines content of hazardous substances, included in core lists I and II of the Directive 80/68/EEC, in groundwater.
- (c) **Unit of measurement:** Concentration of hazardous substances is expressed in $\mu\text{g}/\text{dm}^3$ and mg/dm^3 .
- (d) **Presence in the UNCSO indicator list:** Not in the list.
- (e) **Use in the Kiev Assessment:** Used.

2. Environmental policy relevance

- (a) **Purpose:** To define content of hazardous substances, included in core lists I and II of the Directive 80/68/EEC, in groundwater both in the territory of the state and in separate regions with the scope of identifying load, reasons and sources of pollution, establishing correlation between their content in groundwater and morbidity rate amongst the population and compiling source information for the purpose of projecting situation and developing nature conservation arrangements.
- (b) **International agreements:** None.
- (c) **International targets, standards or guidelines:** Maximum permissible and standard values are governed by EC regulatory acts for individual hazardous substances.
- (d) **Linkages to other indicators:** This indicator is linked to other indicators defining formation of rejects containing hazardous substances (WMF7, WMF13 rev) and to the drinking water quality indicator (WEU10 rev).

3. Methodological description

- (a) **Underlying definitions and concepts:** Hazardous substances, featuring toxic and cancerogenic properties and capable of deposition into the environmental components, migration by trophic chains and bioaccumulation are posing serious threat for the natural ecosystems and human health of the population. n both pesticides and their metabolite for natural ecosystems and human health of the population. Their presence in groundwater – major source of drinking water supply - poses another substantive problem.
- (b) **Measurement methods:** Use has been made of the individual standardized methods of measuring concentration of hazardous substances included in the core list I and II of the Directive 80/68/EEC.
- (c) **Availability of internationally-agreed methodology:** Use has been made of the individual methods of measuring concentration of hazardous substances pursuant to the international standard ISO.

4. Primary data

- (a) **Requirements to monitoring and data collection:** The core program of groundwater monitoring shall include pesticides into the list of measured indicators. The number of surveillance outlets and their spatial location shall be such as to ensure receipt of information on the background (conditioned by transboundary migration) of hazardous substances content in basic types of environmental complexes and in the areas subject to anthropogenic load. Time related parameters of surveillance (especially in the area of technogenic load) shall comply with the time variability of hazardous substances content in groundwater. Envisaged thereat shall be methodological and metrological uniformity of surveillance and data processing; chemical and analytical works shall be conducted by the accredited laboratories disposing of measurements quality control system.

- (b) **Difficulties and limitations:** Major difficulties experienced in obtaining representative data on hazardous substances content in groundwater are due to low specialization of the spatial surveillance network, especially in what refers to encompassing “hot” spots and unavailability of sophisticated highly selective equipment to conduct analysis of hazardous substances content in groundwater.
- (c) **Reference to international databases:** EECCA countries dispose of long-term departmental and in some cases national databases on the content of hazardous substances in groundwater.

5. *International bodies*

- (a) **Lead institution:**
- World Human health Organization (WHO).
- (b) **Other organizations and agencies:**
- United Nations Environment Programme (UNEP).
 - United Nations Human Settlements Programme (UN-HABITAT).
 - International Bank for Reconstruction and Development (IBRD).

6. *References*

- (a) **Readings:**
- Guidelines for Drinking Water Quality. Volumes 1,2 and 3. WHO, Geneva, 1984.
 - GEMS/WATER Operational Guide. Third Edition. WHO, 1992.
 - Methods of defining micro-quantities of pesticides in foods, forage and environment./ Compiled by M.A. Klisenko, A.A. Kalinina. Reference Book in 2 volumes. – M.: VO "Kolos", 1992.
 - EUROWATERNET. The Environment Agency’s Monitoring and Information. Network for Inland Water Resources. Technical Guidelines for Implementation. Technical Report № 7. Copenhagen, 1998.
- (b) **Internet sites:**
- <http://www.who.int/>
 - http://themes.eea.eu.int/Specific_media/water/indicators
 - <http://www.unece.org/env/water/welcome.html>
 - <http://www.unep.org>
 - <http://www.unhabitat.org>
 - <http://www.fao.org>
 - <http://www.europa.eu.int/comm/eurostat/>