Strategy for micro-pollutants

- Strategy for municipal

and industrial wastewater -

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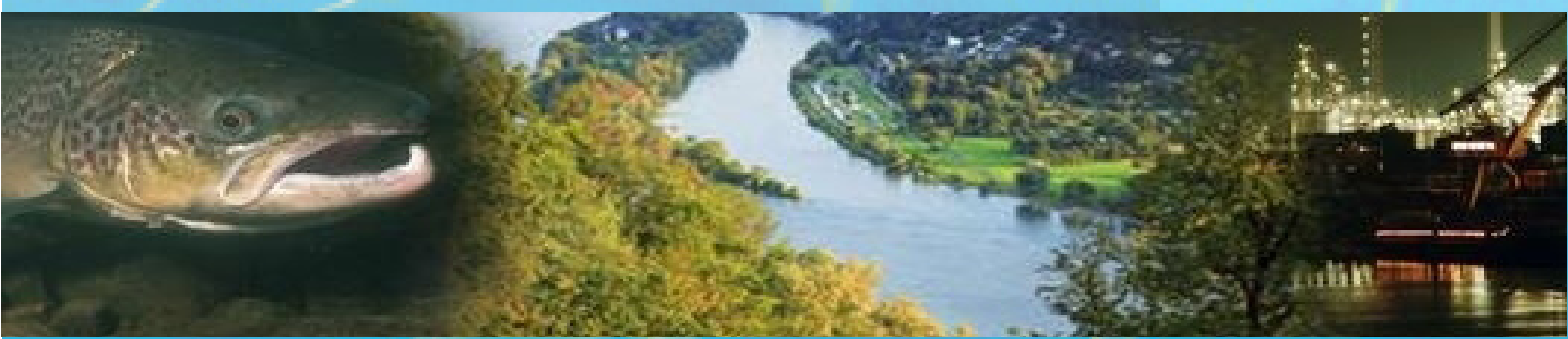

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1. Taking into account the mandate of the project group MIKRO (PLEN-CC09-02, annex 11) the following main elements have been determined for a strategy:

I. Target

II. Definitions

III. Problem analysis

IV. Basis for possible measures

V. Strategy for the implementation of measures

I. Target

2. Substances in Rhine water may neither individually, nor in mutual interaction have detrimental impacts on the biocoenosis of flora, fauna and micro-organisms and water quality must be such that drinking water production is possible with simple, natural treatment methods.

3. This means to avoid pollutions by reducing discharges, emissions and losses of micro-pollutants with detrimental effects (corresponding to paragraph 2) in order to achieve concentrations near the background values for naturally occurring substances and to achieve concentrations near zero for synthetic substances.

Explanation: According to the mandate of the PG MIKRO this objective is mainly oriented towards the Programme Rhine 2020 but also towards objectives and approaches of the OSPAR Commission, the Commission for the Protection of the North Sea and the EU-WFD and is prepared to accept further substances so that new developments can be taken into account (annex 4).

II. Definitions of Organic Micro-pollutants

4. Micro-pollutants are synthetic organic substances occurring in waters in concentrations of nanogrammes and microgrammes per litre and in even lower concentrations.

Explanation: Already very low concentrations of some of these substances may have a detrimental impact on aquatic ecosystems and/or detrimentally impact drinking water production from raw water. In particular, some substances are transported across long stretches of the Rhine and are also detectable in the groundwater. The substances in question are residues of plant protection agents, pharmaceuticals and personal care products.

5. Annex 1 gives a survey over pathways of input for micro—pollutants into waters passing by municipal wastewater discharge, industry, trade, agriculture and other sources.

III. Problem analysis

III.1 General remarks

6. The PG MIKRO has carried out a problem analysis according to a scheme of flow for substances analysing substance flow from production and application via emission

pathways (canalization, wastewater treatment plant, diffuse inputs) to surface waters and groundwater for a variety of chosen substance groups and indicator substances.

7. The most important basis for the problem analysis is an inventory of available information on occurrence of micro-pollutions in the main stream of the Rhine and its tributaries and of the behaviour of these substances in the environment (survey of the actual state). As far as the increased occurrence of substance in the longitudinal profile of the main stream of the Rhine is concerned, the following 3 cases are differentiated: (i) polar and not degradable, (ii) polar and degradable, (iii) not polar and liable to accumulate in suspended matter and/or organisms. In tributaries, problems with higher concentrations of micro-pollutions may locally occur.

III.2 Choice of substance groups and indicator substances

8. Among the tremendous variety of chemicals used along the Rhine and its tributaries, the choice of the most important groups of substances was based on present knowledge and a pragmatic approach. Within the framework of municipal and industrial wastewater, the following groups of substances were chosen for further treatment:

> Radio-opaque substances, medicinal products for human use, animal health products, biocides/anti-oxidizing agents, pesticides, industrial chemicals, complexing agents, cleaning and detergent agents, personal hygiene products/odiferous substances

9. Taking into account different criteria of relevance, substances occurring in the environment, and important input pathways into water bodies, indicator substances representing individual of the 10 groups of substances (annex 2) were identified through a qualitative analysis and are submitted to a closer analysis.

Remark: Substances were chosen in a pragmatic approach. The group of substances belonging to animal health products is treated within the strategy concerning diffuse inputs.

III.3 Inventory

10. For each of the 10 groups of substances mentioned, the available information on production, application, emission pathways, and occurrence and effect in surface water bodies was gathered with the help of a standardised form and a common data mask. The main attention was paid to the indicator substances designated. Additional relevant data and information (e.g. regarding use, sources of emission, input pathways, occurrence in the Rhine catchment, toxicity) were collected for these indicator substances, and eventually represented together with a simple substance balance for the Rhine catchment.

11. As far as possible, the following information was gathered:

- Scheme on substance flow analysing substance flow from production and application via emission pathways (canalisation, wastewater treatment plant, diffuse inputs) to surface water bodies and groundwater as well as a scheme presenting the identified main input pathways (see annex 1).
- Substance quantities produced, used and discharged.
- General substance data (CAS no., trade name, persistence according to REACH definition, biological degradability, human toxicity (acute and chronic), acute and chronic toxicity, e.g. for fish, crustaceans, daphnia, algae).
- Applicable national legal and international limit values and quality criteria for surface waters and drinking water.

- Monitoring data starting with 2000 (groundwater, surface waters, outflow of wastewater treatment plants).
- As far as possible, estimations of substance quantities and concentrations discharged into waters will be used, based on existing models for problem analysis.

III.4 Evaluation reports

12. The most important information of the substance data sheets is gathered in short evaluation reports following to a uniform structure. These short reports consist of a short description of the problem, an analysis of input pathways of substances into waters and potential measures aimed at reducing inputs.

13. The evaluation reports are built up as follows:

a. Introduction

Short description and characterization of the group of substances; designation of the indicator substance(s). Use today and prognosis for future development.

b. Analysis of the data situation and description of the problem

The assessment of data and the description of the problem may lead to three different procedures:

1. No or individual monitoring values of the substances in the Rhine and its tributaries as well as groundwater and drinking water available, but substance characteristics and/or results of an analysis for substance flow require an assessment of relevance for waters. In this case an adaptation of monitoring programmes is recommended.
2. If sufficient water quality data are available (point 1), a comparison is made with existing quality criteria. If these values are exceeded, input quantities and pathways are analysed and further need for action is indicated. This means that areas for action and the basis for possible measures are defined.
3. If no quality criteria are available (point 2.) and monitoring values in the Rhine or its tributaries are in excess of a certain threshold value (e.g. standards for environmental quality, IAWR values or other numerical values, such as health orientation values) a need for deriving corresponding quality criteria is expressed. Furthermore, input quantities and pathways are analysed and further need for action is indicated. This means that areas for action and the basis for possible measures are defined.

c. Analysis of input pathways and quantities and of sources

Indication of the most important input pathways and assessment with respect to key pathways for effective reduction measures.

d. Potential measures

The basis for possible measures aimed at reducing and avoiding micro-pollution inputs into the main stream of the Rhine and its tributaries were elaborated on the basis of an assessment of substance data sheets on the 10 groups of substances. The strategy comprises the following possible types of measures:

- Measures at the source (licensing, restriction of the use of substances, production processes, prescription for disposal);
- Treatment of split wastewater streams (measures at input pathway)

- Centralized measures in municipal wastewater treatment plants (implementation of further measures aimed at removing micro-pollutions from wastewater);
- Adaptation of monitoring and investigation programmes (complementation of surveillance concepts and monitoring programmes, include new substances when assessing the ecological state of waters, derive requirement values);
- Information of the public (on environmental relevance and recommended change of application and disposal of substances).

e. Conclusion

Assessment of available information on the need for action, available knowledge on measures and their effects, and obvious gaps of information.

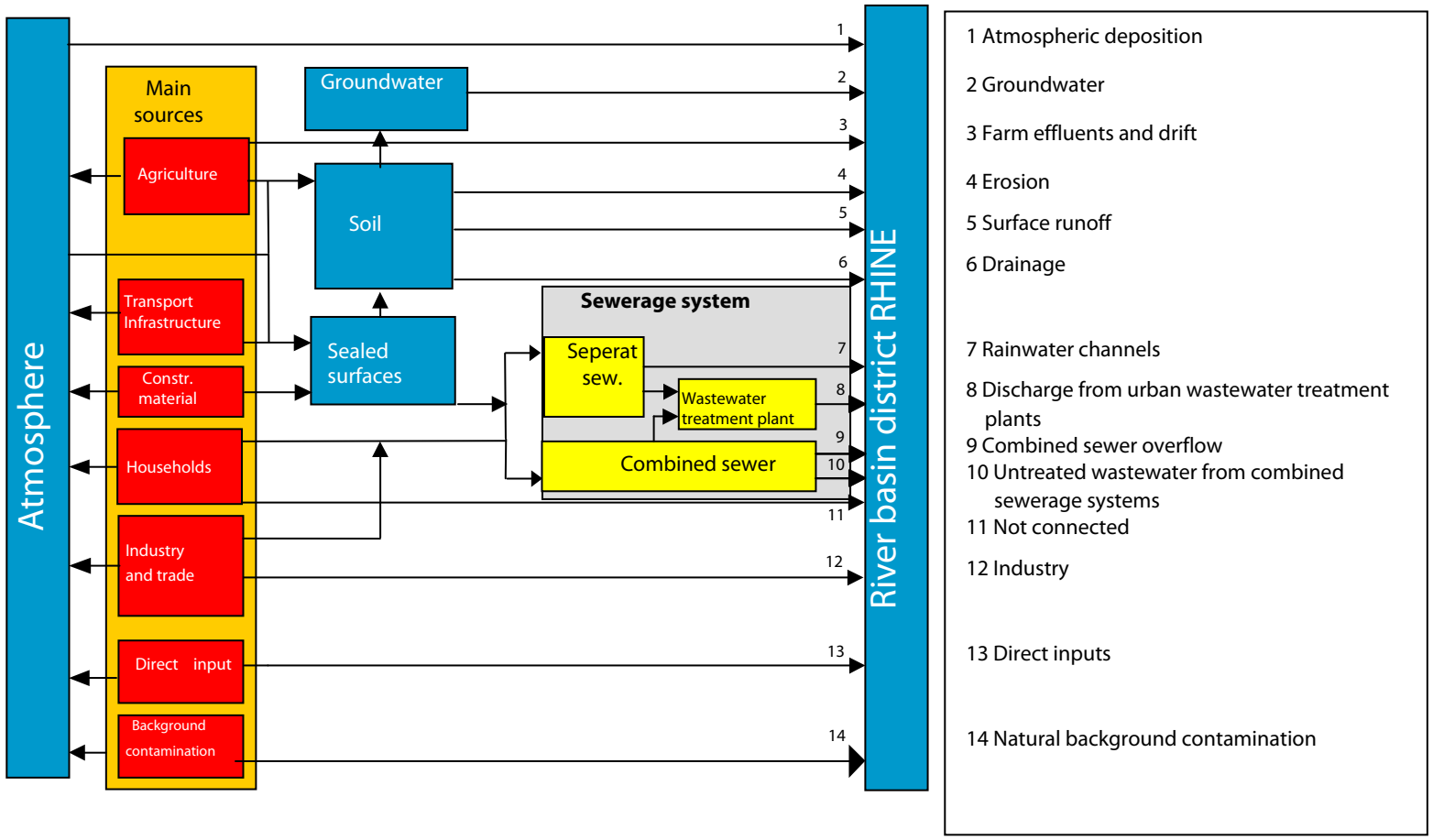
IV. Further steps

Based on the conclusion of the assessment documents, the following 4 steps will be elaborated:

1. Complete examination of the most efficient measures for all groups of substances with respect to the targets in chapter I.
2. Definition of ICPR recommendations for measures and/or other ICPR-activities (e.g. introduce recommendations into the discussion on EU level).
3. Implementation of recommendations of ICPR Member States and/or other activities by the Member States or the ICPR.
4. Periodical report on the implementation of recommendations and/or other activities (success control).

Annex 1

Figure 1: Input pathways into surface waters



Annex 2

Table 1: First qualitative assessement of substance groups. The list of substances may still be completed

	Group of substances	Name of the substance	Emission pathway			Criteria of relevance						Reason for eliminating substances
			Diffuse	Point	Number of pathway/ Comment	Measured in Rhine catchment area: Surface water	Measured in Rhine catchment area: Bank filtration	Emission	Persistent*	Ecotoxicological	Relevant for drinking water	
1	Radio-opaque substance	**amidotrizoe acid**		X	8 (hospital, households)	X	X	X	X		X	
		iopamidole		X		X	X	X			X	
		iopromide		X		X	X	X			X	
2	Medicinal products for human use	**bezafibrate**		X	8 (households, hospital)	X	X	X		X	X	
		carbamazepine		X	8 (households, hospital)	X	X	X	X		X	
		diclophenac		X	8 (households, hospital)	X	X	X		X	X	
		sulfamethoxazole		X	5,6 also as animal health product	X	X	X	X	X	X	
3	Animal health product	cyprofloxazine	X									This group of substances will be treated within the 2nd strategy for diffuse sources.
		oxytetracycline	X									
		sulfamethazine	X									
		sulfadiazine	X		Equally medicinal product for human use							
4	Biocides Anti-oxidating agents	BHT (butyl-hydroxytoluene)		X	8 (households, Industry)	X			X	X		
		benzotriazole		X	8 (households, industry)	X	X	X	X		X	
		carbendazime	X	X	8 (households,	X			X	X		

	Group of substances	Name of the substance	Emission pathway			Criteria of relevance						Reason for eliminating substances
			Diffuse	Point	Number of pathway/ Comment	Measured in Rhine catchment area: Surface water	Measured in Rhine catchment area: Bank filtration	Emission	Persistent*	Ecotoxicological	Relevant for drinking water	
					industry) 5,6,13 (agriculture)							
		DEET	X	X	8 (households)	X			X			
		irgarol	X	X	13 (passenger navigation)	X				X		
		mecoprop	X	X	8 (when used as biocide) 5,6,13 (as plant protection agent)	X	X		X		X	
		triclosan		X	8 (households, industry)	X						
5	Pesticides	**AMPA**	X	X	8 (sealed surfaces) 5,6,13 (agriculture)	X	X	X		X	X	
		diuron	X	X	8 (sealed surfaces); 13 (passenger navigation)	X				X	X	
		glyphosate	X	X	8 (sealed surfaces); 5,6,13 (agriculture)	X		X		X	X	
		isoproturon	X		5, 6, 13 (agriculture)	X		X		X		
		mecoprop	X	X	5, 6, 13 (agriculture)	X		X		X		

	Group of substances	Name of the substance	Emission pathway			Criteria of relevance						Reason for eliminating substances
			Diffuse	Point	Number of pathway/ Comment	Measured in Rhine catchment area: Surface water	Measured in Rhine catchment area: Bank filtration	Emission	Persistent*	Ecotoxicological	Relevant for drinking water	
6	Industrial chemical agents	bisphenol A		X	8 (industry, households)	X				X		
		diglyme		X	8 (industry)	X			X		X	
		~~**Dioxine**~~	X						X			Measures have already been decided on in other international fora. In particular, reference is made to the EU dioxins strategy.
		~~**HCB**~~			Only historic sediment pollution				X			Sediment management plan recommends clean-up measures.
		Flameproofing agent		X	8 (industry, households)	X			X			
		MTBE/ETBE	X		13 (navigation)	X		X	X		X	
		nonylphenol		X	8, 23 (industry)	X			X	X		
		~~**PCB**~~	X		Only historic sediment pollution				X	X		Rules exist on EU level for this group of substances. The use of the group of substances and their discharges into the have been stopped. Measures aimed at cleaning up historic pollution are recommended in the Sediment Management Plan
		perfluoroctan sulphonic acid (PFOS)		X		X			X		X	

	Group of substances	Name of the substance	Emission pathway			Criteria of relevance						Reason for eliminating substances
			Diffuse	Point	Number of pathway/ Comment	Measured in Rhine catchment area: Surface water	Measured in Rhine catchment area: Bank filtration	Emission	Persistent*	Ecotoxicological	Relevant for drinking water	
		PFT ~~**PAK**~~	X	X	1 (Combustion processes) 13 (Navigation, coating, wood conservation)	X X			X X	X		Since these substances mainly get into the Rhine via the atmosphere, only a pan-European strategy aimed at improving air quality will achieve the target.
7	Complexing agents	**DTPA** **EDTA** ~~NTA~~		X X X	12 (industry) 8, 12 (industry, households) Industry, households	X X X		 X 	X X 	X X X		 Not representative for the pollution by complexing agents
8	Oestrogens	17-alpha-ethinylestradiole 17-beta-estradiole estron	 X X	X X X	8 (households) 8 (households) 5,6 (agriculture, stock breeding) 8 (households) 5,6 (agriculture, stock breeding)	X X X		 X X	 	X X X		
9	Cleaning agents Detergent agents											

	Group of substances	Name of the substance	Emission pathway			Criteria of relevance						Reason for eliminating substances
			Diffuse	Point	Number of pathway/ Comment	Measured in Rhine catchment area		Emission	Persistent*	Ecotoxicological	Relevant for drinking water	
						Surface water	Bank filtration					
10	Personal care products, odiferous substances	AHTN (tonalid) HHCB (galaxolid) ~~Moschus Xylol~~ ~~Moschus Ketone~~			8 (households) 8 (households)	X X		X X	X X	X X		This substance is very well eliminated in biological wastewater treatment plants. Due to voluntary commitment of industry the contents in surface waters regress. Idem

Legend:

Substance name = substance figuring on the list of Rhine substances

* = persistence according to REACH

Annex 3

Procedure of choice of substances on the list of Rhine substances

The following lists of substances were taken into account when choosing substances for the list of Rhine substances 2007 (see ICPR report no. 161):

1. Substances from the "RAP 1987-2000" and from the programme "Rhine 2020"
2. Substances relevant for the Rhine (WFD annex VIII, 1-9) (see decision CC2003)
3. Substances of the European directive 76/464/EEC, eventually 2006/11/EEC and substances of annex IX of WFD.
4. Priority or priority hazardous substances (WFD Annex X)
5. OSPAR list of substances for priority measures
6. IAWR list of substances relevant for drinking water

Substances, for which target values or the quality standard have been achieved and which are detected at too few monitoring stations in the Rhine catchment for making statements have been removed from these lists.

For a more precise choice of OSPAR substances for priority action please refer to the document S(3)08-04-03; for the choice of substances relevant for drinking water please refer to SG 09-07 rev. 06.02.07.

List of substances for the Rhine 2007

1,4 dichlorobenzene (1)	endosulfane / alpha-endosulphane (1,4,5)
2,4-dichlorphenoxyacetic acid (2,4-D)(1)	ETBE (6)
3-chloroaniline (1)	fenitrothion (1)
4-chloroaniline (1.2)	fenthion (1)
alachlor (4)	fluoranthene (4)
Amidotrizoe acid (6) or amidotrizoate	brominated diphenyl ethers (4)
ammonium-N (1,2)	glyphosate (6)
AMPA (6)	HCH / HCH / γ-HCH (lindane) (1,4)
anthracene (4)	hexachlorobenzene (1,3,4)
arsenic (1,2)	Iopamidol (6)
atrazine (1,4)	iopromide (6)
azinphos-methyl (1)	isoproturone (1,4,6)
bentazone (1,2)	copper (1,2)
bezafibrate (6)	mercury and compounds (1, 3, 4, 5)
C10-13-chloroalkane (SCCP) (4,5)	lead and compounds (1, 4, 5)
cadmium and compounds (1, 3, 4, 5)	MCPA (2)
carbamazepine (6)	mecoprop (2)
chloroform (trichloromethane) (1,3,4)	MTBE (6)
chlorphenvinphos (4)	naphthalene (4)
chlorotolurone (2)	nickel and compounds (1,4)

chloropyriphos (4)	nonylphenoles / 4-(para)-n-nonylphenol (4)
chromium (1,2)	octylphenols / 4-tert-octylphenol (4)
dibutyltin (2)	PAH / PAH (sum of) benzo(b)fluoranthene, benzo(k)fluoranthene benzo(ghi)perylene + Indeno(1,2,3-cd)pyrene) /(benzo(a)pyrene) (1,4,5)
dichloromethane (methylene chloride) (4)	ethyl parathion (1)
dichloroprop (2)	methyl parathion (1)
dichlorvos (1,2)	PCB (1,2,5)
diclophenac (6)	pentachlorobenzene (4)
di-2-ethyl hexyl phthalate (DEHP) (4,5)	(PFT) (6)
diglyme (6)	tributyltin-cation / tributyltin compounds (1,4)
dimethoate (2)	trichlorobenzene (TCB) (3,4)
diurone (1,4,6)	trifluralin (1,4,5)
DTPA (6)	zinc (1,2)
EDTA (6)	

1) Rhine Action Programme (APR) 1987-2000 / Programme Rhine 2020

2) Substances relevant for the Rhine (annex VIII WFD, 1-9)

3) Substances of the daughter directive to the directive 2006/11/EEC (previously 76/464/EEC) (WFD, annex IX)

4) Priority (hazardous) substances (WFD, annex X)

5) OSPAR substances

6) Substances relevant for drinking water production

Annex 4

Short description of the objectives of existing international regulations

Target of the strategy to be developed by the PG MIKRO (mandate point 3.1)

Definition of the objective for micropollutions in the Rhine catchment taking into account the regulations of the EU WFD, Rhine 2020, EU framework directive for the marine environment, OSPAR, the Conference for the Protection of the North Sea and national regulations.

Targets of the Programme Rhine 2020

In the field of water quality, the programme 2020 lists the following targets:

Water quality is to be such that

- drinking water production will be possible using simple, nature-near treatment procedures
- Water quality constituants must neither alone nor in interaction have negative impact on the biocoenosis of plants, animals and micro-organisms,
- fish in the Rhine, mussles and crustaceans are apt for human consumption without any restriction whatsoever,
- Discharges, emissions and losses of priority substances according to WFD must be terminated or gradually phased out.
- Discharges, emissions and losses of priority substances according to WFD must be gradually reduced.
- The North Sea will be further depolluted
- Discharges, emissions and losses of priority OSPAR substances will be reduced such that, for natural substances, the background values and for synthetic substances concentrations near zero will be achieved.

Objectives of the EU WFD for priority and priority hazardous substances

The EU WFD provides for:

- Discharges, emissions and losses of priority hazardous substances to be stopped or gradually phased out.
- Discharges, emissions and losses of priority substances to be gradually phased out.

Targets of the OSPAR strategy for substances with priority need for action

Mainly, the OSPAR strategy implies:

- To avoid pollution by reducing the emissions and losses of micro-pollutants;
- For naturally occurring substances the target to achieve concentrations near the background values of substances
- And for man made synthetic substances the target, to achieve concentrations near zero.