Water Quality in the Danube River Basin – 2005

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International Commission for the Protection of the Danube River

Internationale Kommission zum Schutz der Donau

TNMN – Yearbook 2005

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The printed version of TNMN Yearbook 2005 contains only the essential background information on TNMN and a basic overview of the water quality status in the Danube River Basin. The full version of the TNMN Yearbook 2005 including all figures and data is available on the attached CD-ROM.

1. Introduction

1.1. History of the TNMN

In June 1994, the Convention on Cooperation for the Protection and Sustainable Use of the Danube River (DRPC) was signed in Sofia, coming into force in October 1998 with the objective of achieving sustainable and equitable water management of surface and ground waters in the Danube catchment area. Provisions of DRPC include the need of cooperation in the field of monitoring and assessment, which is accomplished through the operation of the Trans National Monitoring Network (TNMN) in the Danube River Basin. This Yearbook reports on results of the ICPDR basin-wide monitoring programme and presents TNMN data for 2005.

The TNMN has been in the operation since 1996, but the first steps towards it were taken ten years earlier under the Bucharest Declaration when a monitoring programme containing 11 transboundary cross sections on the Danube River was established.

1.2. Objectives of the TNMN

The original objective of the TNMN was to strengthen the existing network set up by the Bucharest Declaration, to enable a reliable and consistent trend analysis for concentrations and loads of priority pollutants, to support the assessment of water quality for water use and to assist in the identification of major pollution sources.

In 2000, having the experience of the TNMN operation, the main objective of the TNMN was reformulated: to provide a structured and well balanced overall view of the status and long-term development of quality and loads in terms of relevant constituents in the major rivers of the Danube Basin in an international context.

Implementation of the EU Water Framework Directive (2000/60/EC, WFD) after 2000 necessitated the revision of the TNMN in the Danube River Basin District; in line with the WFD implementation timeline the revised TNMN is under operation as of 2007.

2. Description of the TNMN

2.1. Monitoring stations network

The TNMN builds on the national surface water monitoring networks. Following criteria for selection of TNMN monitoring sites were applied:

- *located just upstream/downstream of an international border*
- *located upstream of confluences between Danube and main tributaries or main tributaries and larger sub-tributaries (mass balances)*
- *located downstream of the biggest point sources*

- *located according to control of water use for drinking water supply*

Monitoring location included in TNMN should meet at least one of the selection criteria.

Current TNMN network contains 78 sampling points. The monitoring locations can have up to three sampling points, located on the left side, right side or in the middle of a river. More than one sampling point was proposed for the selected monitoring locations in the middle and lower part of the Danube River and for the large tributaries such as Tisza and Prut Rivers.
In year 2005 the Danube countries provided data from 77 monitoring locations, including 107 sampling sites. Samples were taken from 40 monitoring stations (68 sampling sites) located in the Danube River itself and from 39 monitoring station in tributaries.
In year 2005 monitoring point Drava - Varazdin was moved two km to monitoring point Drava - Ormoz (L1300), which is a transnational Slovenian - Croatian point.

Table 1: List of monitoring sites

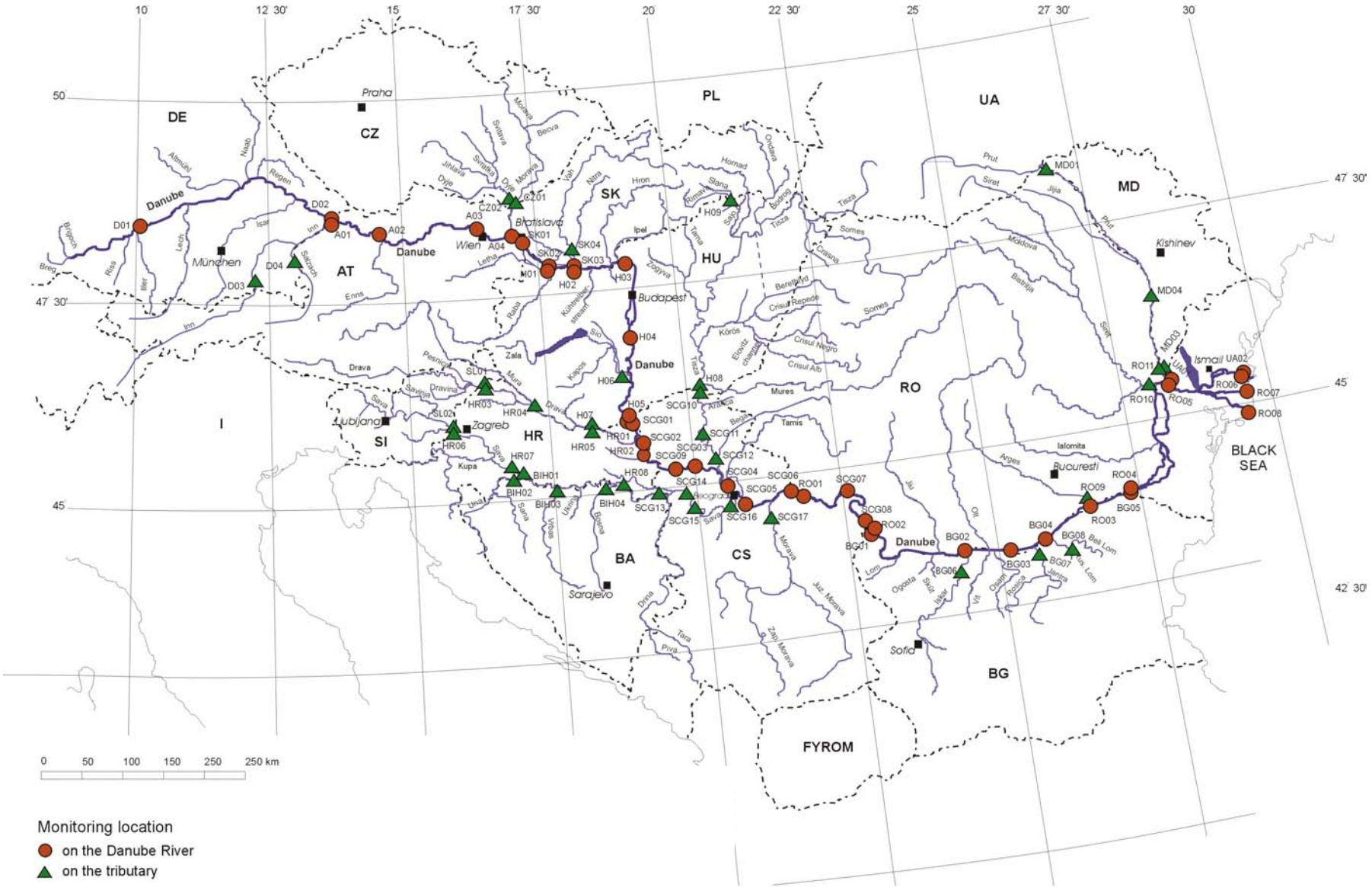
Country Code	River Name	Town/Location Name	Latitude d. m. s.	Longitude d. m. s.	Distance [km]	Altitude [m]	Catch-ment [km²]	DEFF Code	Profile location
D01	Danube	Neu-Ulm	48 25 31	10 1 39	2581	460	8107	L2140	L
D02	Danube	Jochenstein	48 31 16	13 42 14	2204	290	77086	L2130	M
D03	/Inn	Kirchdorf	47 46 58	12 7 39	195	452	9905	L2150	M
D04	/Inn/Salzach	Laufen	47 56 26	12 56 4	47	390	6113	L2160	L
A01	Danube	Jochenstein	48 31 16	13 42 14	2204	290	77086	L2220	M
A02	Danube	Abwinden-Asten	48 15 21	14 25 19	2120	251	83992	L2200	R
A03	Danube	Wien-Nussdorf	48 15 45	16 22 15	1935	159	101700	L2180	R
A04	Danube	Wolfsthal	48 8 30	17 3 13	1874	140	131411	L2170	R
CZ01	/Morava	Lanzhot	48 41 12	16 59 20	79	150	9725	L2100	M
CZ02	/Morava/Dyje	Pohansko	48 48 12	16 51 20	17	155	12540	L2120	M
SK01	Danube	Bratislava	48 8 10	17 7 40	1869	128	131329	L1840	M
SK02	Danube	Medvedov/Medve	47 47 31	17 39 6	1806	108	132168	L1860	M
SK03	Danube	Komarno/Komarom	47 45 17	18 7 40	1768	103	151961	L1870	M
SK04	/Váh	Komarno	47 46 41	18 8 20	1	106	19661	L1960	M
H01	Danube	Medve/Medvedov	47 47 31	17 39 6	1806	108	131605	L1470	M
H02	Danube	Komarom/Komarno	47 45 17	18 7 40	1768	101	150820	L1475	LMR
H03	Danube	Szob	47 48 44	18 51 42	1708	100	183350	L1490	LMR
H04	Danube	Dunafoldvar	46 48 34	18 56 2	1560	89	188700	L1520	LMR
H05	Danube	Hercegszanto	45 55 14	18 47 45	1435	79	211503	L1540	LMR
H06	/Sio	Szekszard-Palank	46 22 42	18 43 19	13	85	14693	L1604	M
H07	/Drava	Dravaszabolcs	45 47 00	18 12 22	78	92	35764	L1610	M
H08	/Tisza	Tiszasziget	46 9 51	20 5 4	163	74	138498	L1700	LMR
H09	/Tisza/Sajo	Sajopuspoki	48 16 55	20 20 27	124	148	3224	L1770	M
SI01	/Drava	Ormoz	46 24 12	16 9 36	300	192	15356	L1390	L
SI02	/Sava	Jesenice	45 51 41	15 41 47	729	135	10878	L1330	R
HR01	Danube	Batina	45 52 27	18 50 03	1429	86	210250	L1315	M
HR02	Danube	Borovo	45 22 51	18 58 22	1337	89	243147	L1320	R
HR03	/Drava	Varazdin	46 19 21	16 21 46	288	169	15616	L1290	M
HR03	/Drava	Ormoz	46 24 12	16 9 36	300	192	15356	L1300	L
HR04	/Drava	Botovo	46 14 27	16 56 37	227	123	31038	L1240	M
HR05	/Drava	D.Miholjac	45 46 58	18 12 20	78	92	37142	L1250	R
HR06	/Sava	Jesenice	45 51 40	15 41 48	729	135	10834	L1220	L
HR07	/Sava	us. Una Jasenovac	45 16 02	16 54 52	525	87	30953	L1150	L
HR08	/Sava	ds. Zupanja	45 02 17	18 42 29	254	85	62890	L1060	MR
BIH01	/Sava	Jasenovac	45 16 0	16 54 36	500	87	38953	L2280	M
BIH02	/Sava/Una	Kozarska Dubica	45 11 6	16 48 42	16	94	9130	L2290	M

Country Code	River Name	Town/Location Name	Latitude d. m. s.	Longitude d. m. s.	Distance [km]	Altitude [m]	Catch-ment [km²]	DEFF Code	Profile location
BIH03	/Sava/Vrbas	Razboj	45 3 36	17 27 30	12	100	6023	L2300	M
BIH04	/Sava/Bosna	Modrica	44 58 17	18 17 40	24	99	10308	L2310	M
SCG01	Danube	Bezdan	45 51 15	18 51 51	1427	83,15	210250	L2350	L
SCG02	Danube	Bogojevo	45 31 49	19 5 2	1367	80,41	251253	L2360	L
SCG03	Danube	Novi Sad	40 15 3	19 51 40	1258	74,52	254085	L2370	R
SCG04	Danube	Zemun	44 50 56	20 25 2	1174	70,76	412762	L2380	R
SCG05	Danube	Pancevo	44 51 25	20 36 28	1154,8	70,14	525009	L2390	L
SCG06	Danube	Banatska	44 49 6	21 20 4	1076,6	68,58	568648	L2400	M
SCG07	Danube	Tekija	44 41 56	22 25 24	954,6		574307	L2410	R
SCG08	Danube	Radujevac	44 15 50	22 41 9	851	32,45	577085	L2420	R
SCG09	Danube	Backa Pal	45 15 13	19 31 35	1287		253737	L2430	L
SCG10	/Tisza	Martonos	46 5 59	20 3 50	152	75,54	140130	L2440	R
SCG11	/Tisza	Novi Becej	45 35 9	20 8 23	66	74,03	145415	L2450	L
SCG12	/Tisza	Titel	45 11 52	20 19 9	8,9	72,55	157147	L2460	M
SCG13	/Sava	Jamena	44 52 40	19 5 21	195	77,67	64073	L2470	L
SCG14	/Sava	Sremska	44 58 1	19 36 26	136,4	75,24	87996	L2480	L
SCG15	/Sava	Sabac	44 46 12	19 42 17	103,6	74,22	89490	L2490	R
SCG16	/Sava	Ostruznica	44 43 17	20 18 51	17		37320	L2500	R
SCG17	/Velika Morava	Ljubicevska	44 35 6	21 8 15	34,8	75,09	37320	L2510	R
RO01	Danube	Bazias	44 47 55 ,57,58	21 23 24,40,54	1071	70	570896	L0020	LMR
RO02	Danube	Pristol/Novo Selo Harbour	44 11 18,23,29	22 45 57,64,69	834	31	580100	L0090	LMR
RO03	Danube	us. Arges	44 4 25	26 36 35	432	16	676150	L0240	LMR
RO04	Danube	Chiciu/Silistra	44 7 18	27 14 38	375	13	698600	L0280	LMR
RO05	Danube	Reni-Chilia/Kilia arm	45 28 50	28 13 34	132	4	805700	L0430	LMR
RO06	Danube	Vilkova-Chilia arm/Kilia arm	45 24 42	29 36 31	18	1	817000	L0450	LMR
RO07	Danube	Sulina - Sulina arm	45 9 41	29 40 25	0	1	817000	L0480	LMR
RO08	Danube	Sf.Gheorghe-Ghorghe arm	44 53 10	29 37 5	0	1	817000	L0490	LMR
RO09	/Arges	Conf. Danube	44 4 35	26 37 4	0	14	12550	L0250	M
RO10	/Siret	Conf. Danube Sendreni	45 24 10	28 1 32	0	4	42890	L0380	M
RO11	/Prut	Conf.Danube Giurgiulesti	45 28 10	28 12 36	0	5	27480	L0420	M
BG01	Danube	Novo Selo Harbour/Pristol	44 09 50,58,66	22 47 36,47,58	834	35	580100	L0730	LMR
BG02	Danube	us. Iskar - Bajkal	43 42 58	24 24 45	641	20	608820	L0780	R
BG03	Danube	Downstream Svishtov	43 37 50	25 21 11	554	16	650340	L0810	MR
BG04	Danube	us. Russe	43 48 06	25 54 45	503	12	669900	L0820	MR
BG05	Danube	Silistra/Chiciu	44 7 02	27 15 45	375	7	698600	L0850	LMR
BG06	/Iskar	Orechovitza	43 35 57	24 21 56	28	31	8370	L0930	M
BG07	/Jantra	Karantzi	43 22 42	25 40 08	12	32	6860	L0990	M
BG08	/Russ.Lom	Basarbovo	43 46 13	25 57 34	13	22	2800	L1010	M
MD01	/Prut	Lipcani	48 16 0	26 50 0	658	100	8750	L2230	L
MD03	/Prut	Conf. Danube-Giurgiulesti	45 28 10	28 12 36	0	5	27480	L2270	LMR
MD04*	/Prut	Leova	46 20 0	28 10 0	216	14	23400	L2240	L
UA01	Danube	Reni - Kilia arm/Chilia arm	45 28 50	28 13 34	132	4	805700	L0630	M
UA02	Danube	Vilkova-Kilia arm/Chilia arm	45 24 42	29 36 31	18	1	817000	L0690	M

Distance: The distance in km from the mouth of the mentioned river
Altitude: The mean surface water level in meters above sea level
Catchment: The area in square km, from which water is drains through the station
ds. Downstream of
us. Upstream of
Conf. Confluence tributary/main river
/ Indicates tributary to river in front of the slash. No name in front of the slash means Danube
* Monitoring site MD04 replaces the site MD02 that was originally selected for TNMN.

Sampling location in profile:
L: Left bank
M: Middle of river
R: Right bank

Figure 1: The Danube Stationmap TNMN



2.2. Determinands

The list of TNMN determinands for water is presented in Table 2. The minimum sampling frequency is 12 times per year (twice a year for biological parameters). The definitions of levels of interest and analytical accuracy targets are given on the attached CD-ROM.

Table 2: Determinand list for water for TNMN

Determinands in Water	Unit	Minimum likely level of interest	Principal level of interest	Target Limit of Detection	Tolerance
Flow	m^3/s	-	-	-	-
Temperature	°C	-	0-25	-	0.1
Suspended Solids	mg/l	1	10	1	1 or 20%
Dissolved Oxygen	mg/l	0.5	5	0.2	0.2 or 10%
pH	-	-	7.5	-	0.1
Conductivity @ 20 °C	µS/cm	30	300	5	5 or 10%
Alkalinity	mmol/l	1	10	0.1	0.1
Ammonium (NH_4^+-N)	mg/l	0.05	0.5	0.02	0.02 or 20%
Nitrite (NO_2^--N)	mg/l	0.005	0.02	0.005	0.005 or 20%
Nitrate (NO_3^--N)	mg/l	0.2	1	0.1	0.1 or 20%
Organic Nitrogen	mg/l	0.2	2	0.1	0.1 or 20%
Ortho- Phosphate (PO_4^{3-}-P)	mg/l	0.02	0.2	0.005	0.005 or 20%
Total Phosphorus	mg/l	0.05	0.5	0.01	0.01 or 20%
Sodium (Na^+)	mg/l	1	10	0.1	0.1 or 10%
Potassium (K^+)	mg/l	0.5	5	0.1	0.1 or 10%
Calcium (Ca^{2+})	mg/l	2	20	0.2	0.1 or 10%
Magnesium (Mg^{2+})	mg/l	0.5	5	0.1	0.2 or 10%
Chloride (Cl^-)	mg/l	5	50	1	1 or 10%
Sulphate (SO_4^{2-})	mg/l	5	50	5	5 or 20%
Iron (Fe)	mg/l	0.05	0.5	0.02	0.02 or 20%
Manganese (Mn)	mg/l	0.05	0.5	0.01	0.01 or 20%
Zinc (Zn)	µg/l	10	100	3	3 or 20%
Copper (Cu)	µg/l	10	100	3	3 or 20%
Chromium (Cr) - total	µg/l	10	100	3	3 or 20%
Lead (Pb)	µg/l	10	100	3	3 or 20%
Cadmium (Cd)	µg/l	1	10	0.5	0.5 or 20%
Mercury (Hg)	µg/l	1	10	0.3	0.3 or 20%
Nickel (Ni)	µg/l	10	100	3	3 or 20%
Arsenic (As)	µg/l	10	100	3	3 or 20%
Aluminium (Al)	µg/l	10	100	10	10 or 20%
BOD_5	mg/l	0.5	5	0.5	0.5 or 20%
COD_{Cr}	mg/l	10	50	10	10 or 20%
COD_{Mn}	mg/l	1	10	0.3	0.3 or 20%
DOC	mg/l	0.3	1	0.3	0.3 or 20%
Phenol index	mg/l	0.005	0.05	0.005	0.005 or 20%
Anionic active surfactants	mg/l	0.1	1	0.03	0.03 or 20%
Petroleum hydrocarbons	mg/l	0.02	0.2	0.05	0.05 or 20%
AOX	µg/l	10	100	10	10 or 20%
Lindane	µg/l	0.05	0.5	0.01	0.01 or 30%
pp'DDT	µg/l	0.05	0.5	0.01	0.01 or 30%
Atrazine	µg/l	0.1	1	0.02	0.02 or 30%
Chloroform	µg/l	0.1	1	0.02	0.02 or 30%
Carbon tetrachloride	µg/l	0.1	1	0.02	0.02 or 30%
Trichloroethylene	µg/l	0.1	1	0.02	0.02 or 30%
Tetrachloroethylene	µg/l	0.1	1	0.02	0.02 or 30%
Total Coliforms (37 °C)	10^3 CFU/100 ml	-	-	-	-
Faecal Coliforms (44 °C)	10^3 CFU/100 ml	-	-	-	-
Faecal Streptococci	10^3 CFU/100 ml	-	-	-	-

Determinands in Water	Unit	Minimum likely level of interest	Principal level of interest	Target Limit of Detection	Tolerance
Salmonella sp.	in 1 litre	-	-	-	-
Macrozoobenthos - no. of taxa	-	-	-	-	-
Macrozoobenthos - Saprobic index	-	-	-	-	-
Chlorophyll - a	µg/l	-	-	-	-

2.3. Analytical Quality Control (AQC)

The TNMN laboratories have a free choice of an analytical method, providing they are able to demonstrate that the method in use meets the required performance criteria. Therefore, the relevant concentrations levels and the tolerance were set for each measurand (Table 2). To check the real performance of TNMN labs a basin-wide AQC programme is regularly organized by the ICPDR.

In 2005 the AQC programme for the Danube River Basin was organized by the Institute for Water Pollution Control of VITUKI, Budapest, Hungary (QualcoDanube AQC programme) for 37 Danube laboratories. A revision of the previous set-up was agreed suggesting that all measurands shall be covered within three quarterly distributions while the fourth distribution shall be reserved for those measurands showing more than 30% flagged results. The results of the AQC programme showed no significant problems in determining the basic physico-chemical parameters. Among analyses of nutrients good results were obtained for P-compounds while for most of the N- compounds a systematic error was observed. For metals the quality check for cadmium, copper, nickel, aluminium and arsenic had to be repeated in the fourth distribution showing an improvement of results. Similarly to previous years performance of analysis of organic micropollutants is still not satisfactory. The results and evaluation of 2005 distributions have been published in the QualcoDanube Summary Report 2005.

2.4. TNMN Data Management

The procedure of TNMN data collection is organized at a national level. The National Data Managers (NDMs) are responsible for data acquisition from TNMN laboratories as well as for data checking, conversion into an agreed data exchange file format (DEFF) and sending it to the TNMN data management centre in the Slovak Hydrometeorological Institute in Bratislava. This centre performs a secondary check of the data and uploads them into the central TNMN database. In cooperation with the ICPDR Secretariat the TNMN data are uploaded into the ICPDR website (www.icpdr.org).

2.5. Water Quality Classification

To enable evaluation of the TNMN data an interim water quality classification scheme was developed that serves exclusively for the presentation of current status and assessment of trends of the Danube River water quality (i.e., it is not considered as a tool for the implementation of national water policies) (Table 3).

In this classification scheme five classes are used for the assessment, with target value being the limit value of class II. The class I should represent reference conditions or background concentrations. For number of determinands it was not possible to establish real reference values due to existence of many types of water bodies in Danube river basin differing in physico-chemical characteristics naturally. For synthetic substances the detection limit or minimal likely level of interest was chosen as limit value for class I. The classes III – V are on the “non-complying“ side of the classification scheme and their limit values are usually 2 to5-times the target values. They should indicate the extent of the exceedence of the target

value and help to recognise the positive tendency in water quality development. For compliance testing the 90-percentile value of at least 11 measurements in a particular year should be used.

Table 3: Water Quality Classification used for TNMN purposes

Determinand	Unit	Class				
		I	II TV	III	IV	V
		Class limit values				
Oxygen/Nutrient regime						
Dissolved oxygen*	$mg.l^{-1}$	7	6	5	4	< 4
BOD_5	$mg.l^{-1}$	3	5	10	25	> 25
COD_{Mn}	$mg.l^{-1}$	5	10	20	50	> 50
COD_{Cr}	$mg.l^{-1}$	10	25	50	125	> 125
pH	-		> 6.5* and < 8.5			
Ammonium-N	$mg.l^{-1}$	0.2	0.3	0.6	1.5	> 1.5
Nitrite-N	$mg.l^{-1}$	0.01	0.06	0.12	0.3	> 0.3
Nitrate-N	$mg.l^{-1}$	1	3	6	15	> 15
Total-N	$mg.l^{-1}$	1.5	4	8	20	> 20
Ortho-phosphate-P	$mg.l^{-1}$	0.05	0.1	0.2	0.5	> 0.5
Total-P	$mg.l^{-1}$	0.1	0.2	0.4	1	> 1
Chlorophyll-a	$\mu g.l^{-1}$	25	50	100	250	> 250
Metals (dissolved) **						
Zinc	$\mu g.l^{-1}$	-	5	-	-	-
Copper	$\mu g.l^{-1}$	-	2	-	-	-
Chromium (Cr-III+VI)	$\mu g.l^{-1}$	-	2	-	-	-
Lead	$\mu g.l^{-1}$	-	1	-	-	-
Cadmium	$\mu g.l^{-1}$	-	0.1	-	-	-
Mercury	$\mu g.l^{-1}$	-	0.1	-	-	-
Nickel	$\mu g.l^{-1}$	-	1	-	-	-
Arsenic	$\mu g.l^{-1}$	-	1	-	-	-
Metals (total)						
Zinc	$\mu g.l^{-1}$	bg	100	200	500	> 500
Copper	$\mu g.l^{-1}$	bg	20	40	100	> 100
Chromium (Cr-III+VI)	$\mu g.l^{-1}$	bg	50	100	250	> 250
Lead	$\mu g.l^{-1}$	bg	5	10	25	> 25
Cadmium	$\mu g.l^{-1}$	bg	1	2	5	> 5
Mercury	$\mu g.l^{-1}$	bg	0.1	0.2	0.5	> 0.5
Nickel	$\mu g.l^{-1}$	bg	50	100	250	> 250
Arsenic	$\mu g.l^{-1}$	bg	5	10	25	> 25
Toxic substances						
AOX	$\mu g.l^{-1}$	10	50	100	250	> 250
Lindane	$\mu g.l^{-1}$	0.05	0.1	0.2	0.5	> 0.5
p,p´-DDT	$\mu g.l^{-1}$	0.001	0.01	0.02	0.05	> 0.05
Atrazine	$\mu g.l^{-1}$	0.02	0.1	0.2	0.5	> 0.5
Trichloromethane	$\mu g.l^{-1}$	0.02	0.6	1.2	1.8	> 1.8
Tetrachloromethane	$\mu g.l^{-1}$	0.02	1	2	5	> 5
Trichloroethene	$\mu g.l^{-1}$	0.02	1	2	5	> 5
Tetrachloroethene	$\mu g.l^{-1}$	0.02	1	2	5	> 5
Biology						
Saprobic index of macrozoobenthos	-	≤ 1.8	1.81 – 2.3	2.31 – 2.7	2.71 – 3.2	> 3.2

* values concern 10-percentile value
bg background values
** for dissolved metals only guideline values are indicated
TV target value

3. Results of basic statistical processing

77 TNMN monitoring stations had been monitored in the Danube River Basin in 2005. Because some monitoring stations contain more sampling sites (usually left, middle and right side of the river), data had been collected from altogether 107 sampling sites, out of which 68 are located on the Danube River and 39 on the tributaries.
The basic processing of the TNMN data includes calculation of selected statistical characteristics and water quality classification for each determinand / monitoring site. Results are presented in tables in the Annex (see the attached CD-ROM) using the following format:

Term used	Explanation
Determinand name	name of the determinand measured according to the agreed method
Unit	unit of the determinand measured
N	number of measurements
Min	minimum value of the measurements done in the year 2004
Mean	arithmetical mean of the measurements done in the year 2004
Max	maximum value of the measurements done in the year 2004
C50	50 percentile of the measurements done in the year 2004
C90	90 percentile of the measurements done in the year 2004
Class	result of classification of the determinand

When processing the TNMN data and presenting them in the tables of the Annex, the following rules have been applied:

- *If "less than the detection limit" values were present in the dataset for a given determinand, the value of detection limit was used in statistical processing of the data.*
- *If number of measurements for a particular determinand was lower than four, only minimum, maximum and mean are reported in the tables of the Annex.*
- *For the purposes of classification, testing value has been calculated for each determinand, which was further compared to limit values for water quality classes given in Chapter 2.5 and a corresponding class was assigned to the determinand. The testing value is equal to 90 percentile (10 percentile for dissolved oxygen and lower limit of pH value) if number of measurements in a year was at least eleven. If number of measurements in a year was lower than eleven, the testing value is represented by a maximum value from a data set (a minimum value for dissolved oxygen and lower limit of pH value).*
- *It happened in some cases that limit of detection used by a country was higher than limit value for class II, representing the target value. In these cases only statistics was calculated and presented in a table, but classification has not been done.*

An indication of water quality class for each determinand in the tables of the Annex is presented by the respective class number and highlighted by using colouring of the respective field of the table, using the colours given below:

blue	class I
green	class II
yellow	class III
orange	class IV
red	class V

- *If number of measurements for classified water quality determinand was lower than four in sampling site, the result of classification was presented in tables by light blue colour to indicate lower reliability of such results (with an exception of saprobic index).*

As regards the agreed monitoring frequencies (12 times per year) a major discrepancy existed in 2005 only for monitoring sites in Bosnia and Herzegovina (4 times per year) and Ukraine (site UA01 - 8 times per year). But there are also differences in measurement frequency of individual measurands such as dissolved phosphorus, biological determinands, heavy metals and specific organic micropollutants, especially in the lower part of the Danube River Basin. Table 4, created on the basis of data in tables in the Annex (see attached CD-ROM), shows in aggregated way the concentration ranges and mean annual concentrations of selected determinands representing group of oxygen regime, nutrient status, heavy metals, group of biological determinands and organic micropollutants in the Danube River and its tributaries in 2005. Information on number of monitoring locations and sampling sites, for which data are provided, is also given there.

Table 4: Concentration ranges and mean annual concentrations of selected determinands in Danube River and its tributaries in 2005

Determinand name	Unit	Danube					Tributaries				
		No.of monitoring locations / No. of monitoring sites with measurements	Range of values		Mean		No.of monitoring locations / No. of monitoring sites with measurements	Range of values		Mean	
			Min	Max	Min_{avg}	Max_{avg}		Min	Max	Min_{avg}	Max_{avg}
Temperature	°C	40/68	0.2	**30.0**	**9.2**	**17.2**	37/39	0.1	28.0	5.8	14.7
Suspended Solids	mg/l	38/60	< 0.5	**1413.0**	**6.1**	**171.5**	37/39	< 1	242.9	8.3	2110.0
Dissolved Oxygen	mg/l	40/68	**2.3**	**15.1**	**5.7**	**11.4**	37/39	4.1	16.4	7.1	12.2
BOD_5	mg/l	40/68	0.1	13.7	1.3	6.3	37/39	< 0.2	16.4	1.2	8.8
COD_{Mn}	mg/l	40/68	< 0.2	27.8	1.9	12.1	30/32	0.7	30.3	0.7	11.9
COD_{Cr}	mg/l	37/65	2.9	203.0	7.1	31.3	35/37	< 1	73.6	5.0	44.7
TOC	mg/l	14/16	0.7	9.8	2.1	4.8	13/13	0.9	11.0	1.4	7.2
DOC	mg/l	5/5	0.5	4.0	1.8	2.2	7/7	0.8	9.5	1.5	6.7
pH		40/68	6.2	8.8	7.4	8.3	37/39	6.8	8.8	6.8	8.2
Alkalinity	mmol/l	36/64	< 0.1	9.4	2.7	5.4	30/32	0.8	9.4	1.9	8.0
Ammonium-N	mg/l	40/68	< 0.004	3.900	0.015	0.519	37/39	< 0.004	2.400	0.010	1.211
Nitrite-N	mg/l	40/68	< 0.002	0.225	0.012	0.039	36/38	0.001	0.570	0.003	0.069
Nitrate-N	mg/l	40/68	< 0.1	4.700	0.600	3.400	38/40	0.02	8.59	0.59	6.95
Total Nitrogen	mg/l	22/34	0.60	4.90	1.40	2.90	24/24	0.40	10.60	0.80	9.10
Organic Nitrogen	mg/l	22/27	< 0.01	2.30	0.05	1.20	24/26	0.01	4.55	0.25	2.00
Ortho-Phosphate-P	mg/l	40/68	0.001	0.820	0.025	0.177	36/38	< 0.002	0.440	0.008	0.309
Total Phosphorus	mg/l	40/68	0.01	0.14	0.03	0.05	34/36	0.01	1.60	0.04	0.59
Total Phosphorus - Dissolved	mg/l	9/9	0.01	0.14	0.03	0.05	10/10	0.01	0.19	0.01	0.12
Chlorophyll-a	µg/l	30/51	< 0.1	7400.0	0.4	3081.8	15/17	< 1	214.0	1.8	66.4
Conductivity @ 20°C	µS/cm	38/66	222	790	339	622	37/39	< 20	1110	233	905
Calcium	mg/l	40/68	27.4	135.0	48.7	86.7	36/38	< 1	116.0	35.7	103.8
Sulphates	mg/l	38/66	4.5	108.0	17.3	86.7	33/35	5	187	14	152
Magnesium	mg/l	40/68	4.9	84.0	10.0	29.6	37/39	4.0	69.0	9.1	62.8
Potassium	mg/l	37/65	0.6	24.0	1.5	4.6	31/33	0.3	10.0	1.2	8.1
Sodium	mg/l	39/67	3.5	52.2	10.3	31.0	31/33	1.1	80.2	4.7	61.6
Manganese	mg/l	24/46	< 0.001	0.997	0.005	0.157	25/25	< 0.001	1.990	0.002	0.382
Iron	mg/l	26/50	< 0.010	12.800	0.048	1.368	20/20	0.004	61.000	0.004	3.170
Chlorides	mg/l	38/66	5.3	53.0	17.2	33.8	33/35	2.0	117.0	5.8	75.0
Macrozoobenthos- saprobic index		12/12	2.0	2.6	2.0	2.4	6/6	1.0	37.0	2.0	37.0
Macrozoobenthos - no.of taxa		4/4	15	42	15	42	13/13	2	3	2	3

Table 4: Concentration ranges and mean annual concentrations of selected determinands in Danube River and its tributaries in 2005 (cont.)

Determinand name	Unit	Danube					Tributaries				
		No.of monitoring locations / No. of monitoring sites with measurements	Range of values		Mean		No.of monitoring locations / No. of monitoring sites with measurements	Range of values		Mean	
			Min	Max	Min_{avg}	Max_{avg}		Min	Max	Min_{avg}	Max_{avg}
Zinc - Dissolved	µg/l	26/29	< 0.8	124.0	1.7	36.0	16/16	< 1.6	68.0	2.8	33.3
Copper - Dissolved	µg/l	34/38	< 0.05	82.00	1.10	27.10	25/25	< 0.046	53.00	0.70	26.40
Chromium - Dissolved	µg/l	31/39	< 0.05	42.00	0.20	7.10	25/25	< 0.056	48.00	0.20	9.20
Lead - Dissolved	µg/l	32/40	< 0.05	6.60	0.20	2.10	25/25	0.05	21.00	0.20	< 3
Cadmium - Dissolved	µg/l	29/38	< 0.02	8.20	0.02	1.49	25/25	< 0.02	1.00	< 0.02	< 0.5
Mercury - Dissolved	µg/l	23/23	< 0,050	0.325	0.078	1.800	18/18	< 0.030	1.200	0.032	0.625
Nickel - Dissolved	µg/l	31/39	0.05	30.00	0.70	4.70	25/25	< 0.045	60.00	1.00	6.13
Arsenic - Dissolved	µg/l	23/23	0.41	11.10	0.70	2.10	19/19	< 0.05	6.40	0.43	3.10
Aluminium - Dissolved	µg/l	12/12	2.7	223.0	15.3	63.5	9/9	< 0,8	1660.0	5.5	188.5
Zinc	µg/l	29/51	< 1	374.0	6.4	80.0	19/19	< 1	271.0	3.5	78.2
Copper	µg/l	29/51	0.37	70.00	1.00	17.50	23/23	< 0.046	69.00	0.88	18.70
Chromium - total	µg/l	26/48	0.09	52.50	0.33	< 10	22/22	< 0.004	48.70	< 0.004	< 10
Lead	µg/l	27/49	< 0.05	29.60	0.94	5.33	19/19	< 0.05	26.30	0.69	6.71
Cadmium	µg/l	27/50	< 0.02	148.30	0.04	9.73	19/19	< 0.01	18.20	0.02	2.60
Mercury	µg/l	22/39	< 0.025	21.000	0.200	1.300	18/18	< 0.030	1.100	< 0.030	0.218
Nickel	µg/l	27/49	0.16	37.42	1.00	8.18	23/23	< 0.004	70.00	< 0.004	11.58
Arsenic	µg/l	17/21	0.45	9.00	0.90	2.69	12/12	0.30	25.30	0.57	0.44
Aluminium	µg/l	14/18	< 20,0	4640.0	67.7	1278.8	10/10	3.7	36500.0	85.9	4731.0
Phenol index	mg/l	38/66	< 0.001	0.117	< 0.001	< 0.020	30/32	< 0.001	0.400	< 0.001	0.049
Anionic active surfactants	mg/l	38/66	< 0.006	0.875	< 0.010	0.127	28/30	< 0.006	0.315	< 0.010	0.133
AOX	µg/l	9/11	5.4	58.0	8.8	26.5	7/7	3.0	130.0	8.5	78.8
Petroleum hydrocarbons	mg/l	34/54	< 0.002	24.700	< 0,005	5.490	27/27	< 0.002	11.760	< 0.005	2.989
PAH (sum of 6)	µg/l	3/3	< 0.1	< 0.1	< 0.1	< 0.1	2/2	< 0.005	0.174	< 0.005	0.174
PCB (sum of 7)	µg/l	0/0					2/2	< 0.002	< 0.002	< 0.002	< 0.002
Lindane	µg/l	28/46	< 0.001	0.113	< 0.001	< 0.1	25/25	< 0.001	0.064	< 0.002	< 0.1
pp´DDT	µg/l	29/49	< 0.001	0.190	< 0.001	< 0.1	24/24	< 0.0001	0.106	< 0.002	0.078
Atrazine	µg/l	29/47	< 0.001	0.524	0.009	0.093	20/20	< 0.001	0.532	0.009	0.175
Chloroform	µg/l	18/20	< 0.01	9.30	0.01	5.55	12/12	< 0.01	13.20	< 0.01	7.50
Carbon tetrachloride	µg/l	16/19	< 0.01	1.20	0.01	0.01	12/12	< 0.01	1.20	< 0.01	1.20
Trichloroethylene	µg/l	17/19	< 0.01	3.20	< 0.02	1.70	11/11	< 0.01	5.10	< 0.01	1.70
Tetrachloroethylene	µg/l	17/19	< 0.01	2.10	< 0.02	2.10	12/12	< 0.01	2.20	< 0.02	< 2.1
Total Coliforms (37°C)	10^3 CFU/ 100 ml	30/53	0.01	2250.00	0.68	538.40	18/20	0.02	7200.00	1.96	1304.80
Faecal Coliforms (44°C)	10^3 CFU/ 100 ml	20/42	0.004	70.00	0.19	36.10	14/16	0.04	4500.00	0.14	912.20
Faecal Streptococci	10^3 CFU/ 100 ml	22/48	0.003	80.00	0.006	15.20	12/14	0.01	180.00	0.12	47.23

4. Presentation of classification results

The maps presented on Figures 2 – 12 show water quality classes in TNMN monitoring locations. The locations in the Danube River and those located in tributaries are differentiated by various marks. The spot indicating water quality class on a map is of a smaller size in case the classification result in location is based on lower number of measurements than eleven. If there were data from more sampling sites (left, middle, right) at one monitoring location, only the data from the middle of a river are presented in the maps.
From this classification following conclusions may be drawn:
Dissolved oxygen content in water (*its decrease is a result of pollution by degradable organic matter, its increase from normal level can be associated with eutrophication processes*) complied with the target value in 85% of locations in the Danube River what is a decrease when compared to 2004 (95% compliance). In tributaries, 79% sites belonged into classes I and II what is a very slight decrease against 2004.
A deterioration against the previous year was also observed for BOD_5 *(an indicator of biodegradable organic pollution in waters)* in the Danube River with 83% compliance (100% in 2004). An opposite inter-annual trend was observed in tributaries, in which compliance at 84% sites was recorded (65% in 2004).
For COD_{Cr} *(characterizes the presence of oxidizable organic compounds in waters)* 73% of sites on the Danube River and 58% of the sites on tributaries achieved compliance with the target, which was similar to the previous year. However, for 15% of the monitoring locations still no COD_{Cr} data were available.
Situation similar to the previous year was also observed for ammonium-N corresponding in 2005 to classes I and II in 68% of locations in the Danube River and 63% of locations in tributaries.
In general, pollution of the Danube river by nitrate-N decreased in the Danube river as compliance with the target value was observed at 73% of sites (63% in 2004) No Danube site achieved class I in 2005 but also no results for classes IV and V were observed. In the tributaries 87% compliance with the nitrate-N target value was achieved (84% in 2004).
Slight improvement in site compliance against the previous year was observed in the Danube (75% in 2005 *vs.* 68% in 2004) and its tributaries (50% in 2005 *vs.* 42% in 2004) for ortho-phosphate-P, an opposite situation was the case for total P both for the Danube (68% in 2005 *vs.* 75% in 2004) and the tributaries (37% in 2005 *vs.* 42% in 2004).
Content of chlorophyll-a as an indicator of primary production is closely connected to the nutrient content and it is important especially in slow-flowing lowland rivers. These parameter however is still not fully incorporated into the national monitoring schemes and similarly to the previous years in 2005 it was reported for les than 50% of the sites. For the available results, class I and II was reached in 55% of locations in the Danube River and 24% of locations in the tributaries.
A basin-wide classification of heavy metals is also affected by a relatively high proportion of missing data. In Danube River, the data on mercury and arsenic were missing for 48% and 58% of sites, respectively, information on cadmium, chromium, copper, zinc, nickel and lead content was not available for about one third of the sites. Similar negative situation appeared also for the tributaries.

Among the available data on heavy metals for the Danube River class II was achieved for following percentage of the monitoring sites: 55% for cadmium, 58% for copper, 70% for zinc, 35% for mercury, 43% for arsenic, 43% for lead, 65% for chromium and 68% for nickel. An even lower compliance with the class II target values was reported for tributaries.

Similarly to heavy metals a substantial data gap persists also for the monitored organic micropollutants. Out of the available results, the target value set up for p,p-DDT was achieved at 43% of locations in the Danube river and at 42% of location in the tributaries. In case of atrazine, 55% of the sites on the Danube river were classified as Class I or Class II while for the tributaries the compliance rate was 45%.
More detailed results of classification of TNMN data in 2005 are shown in the full version of the TNMN Yearbook on the attached CD-ROM.

Figure 2: The classification of Dissolved Oxygen in 2005

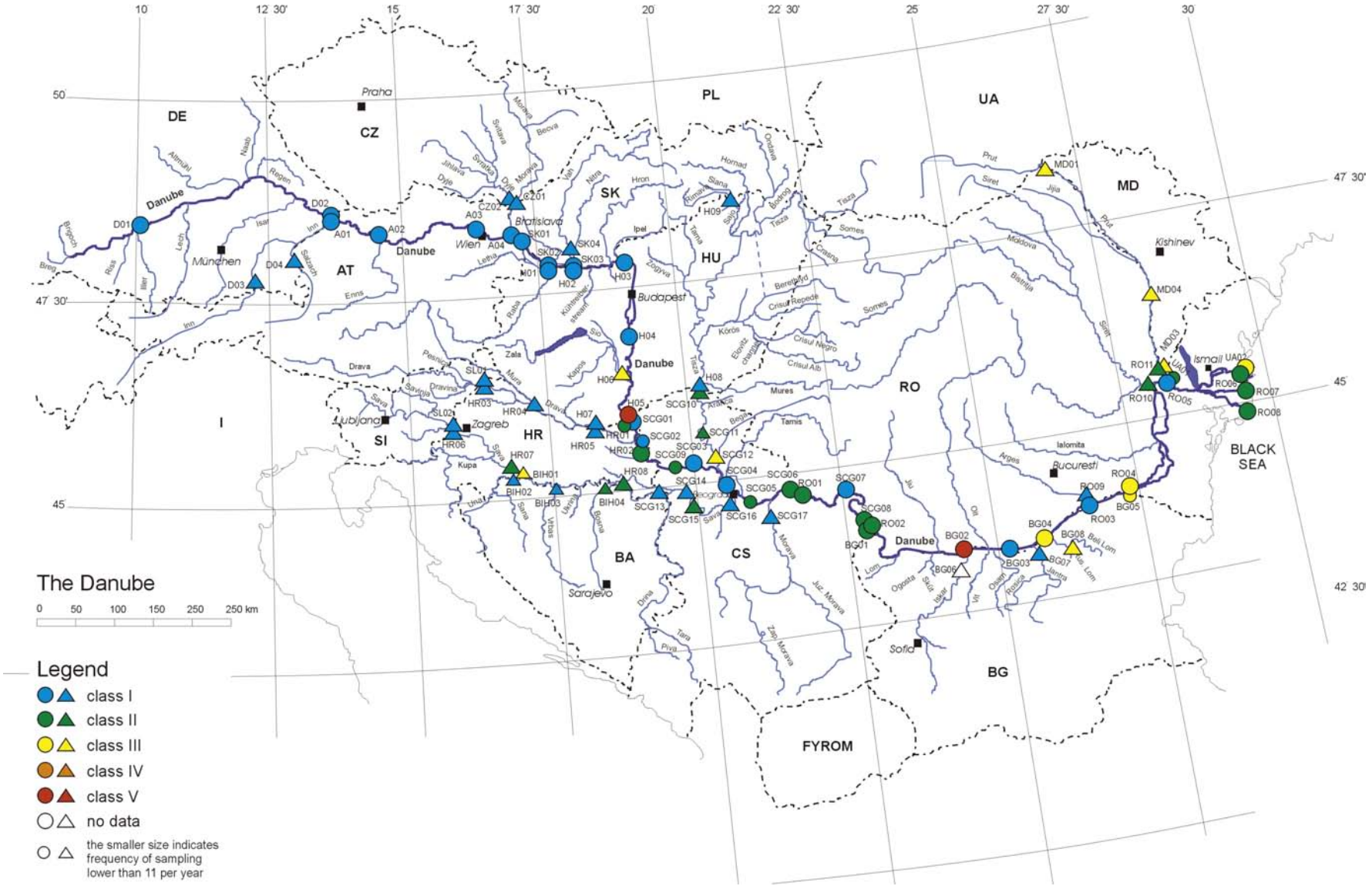


Figure 3: The classification of BOD_5 in 2005

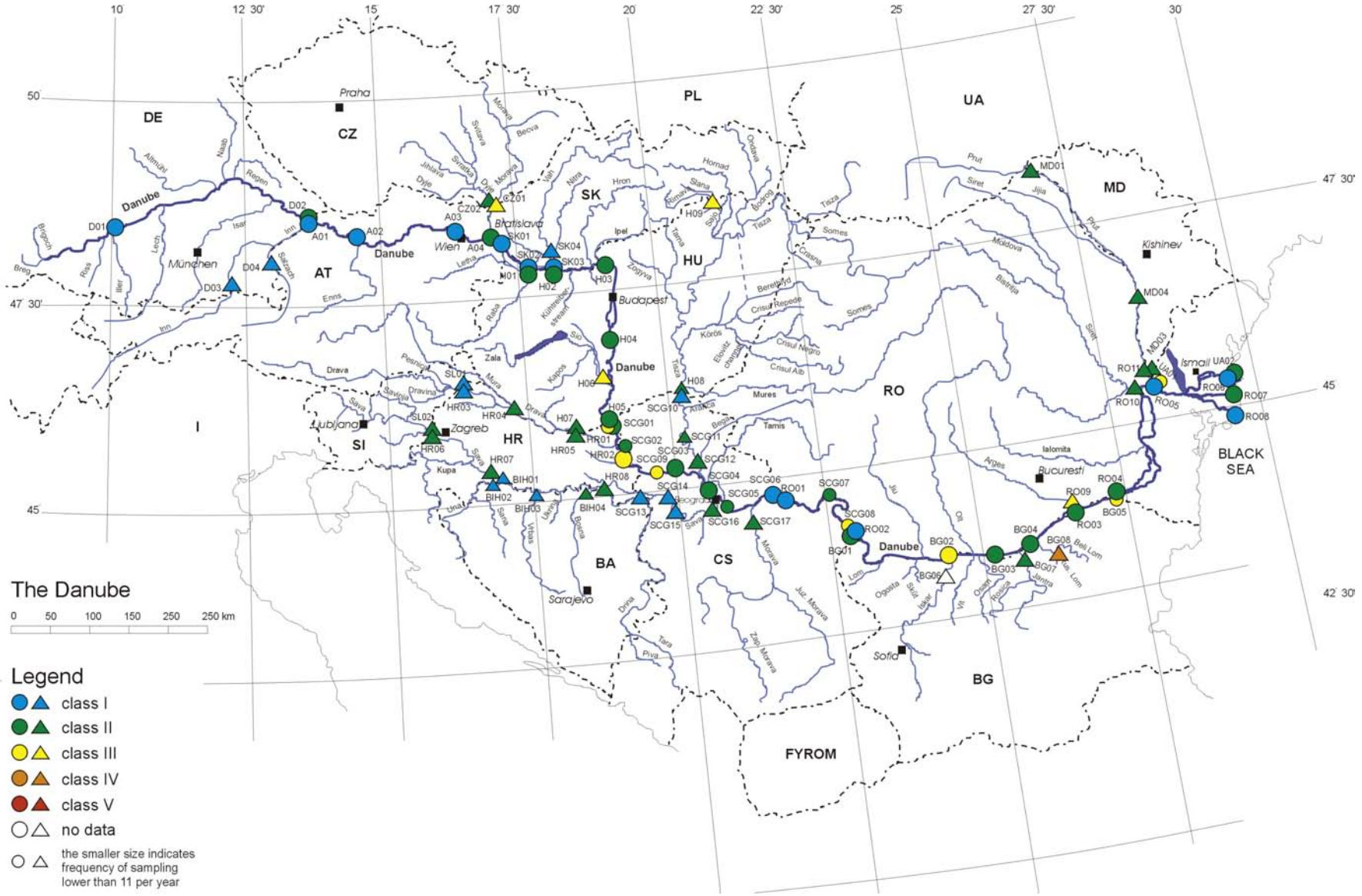


Figure 4: The classification of COD_{Cr} in 2005

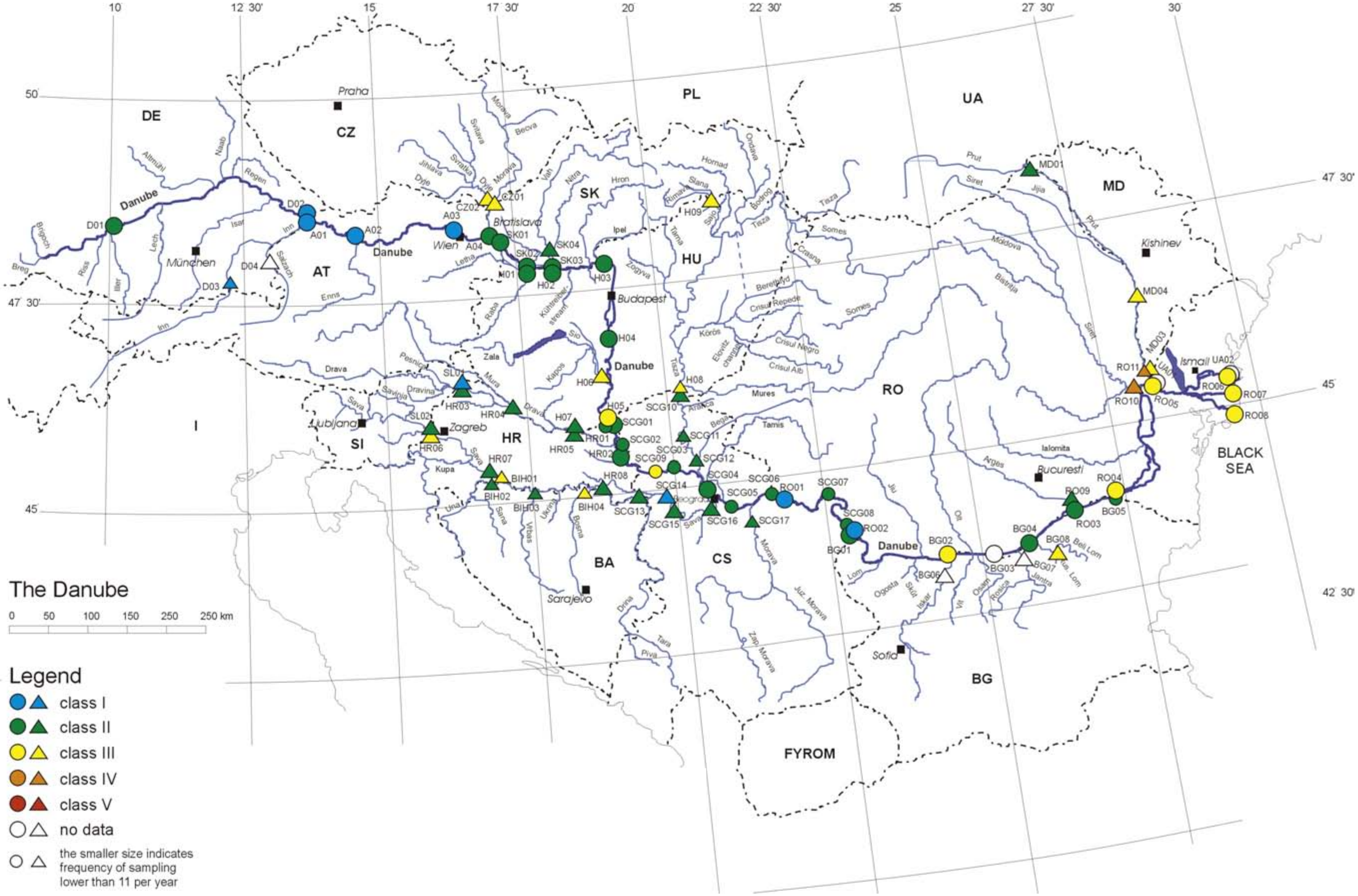


Figure 5: The classification of NH^{+}_{4}-N in 2005

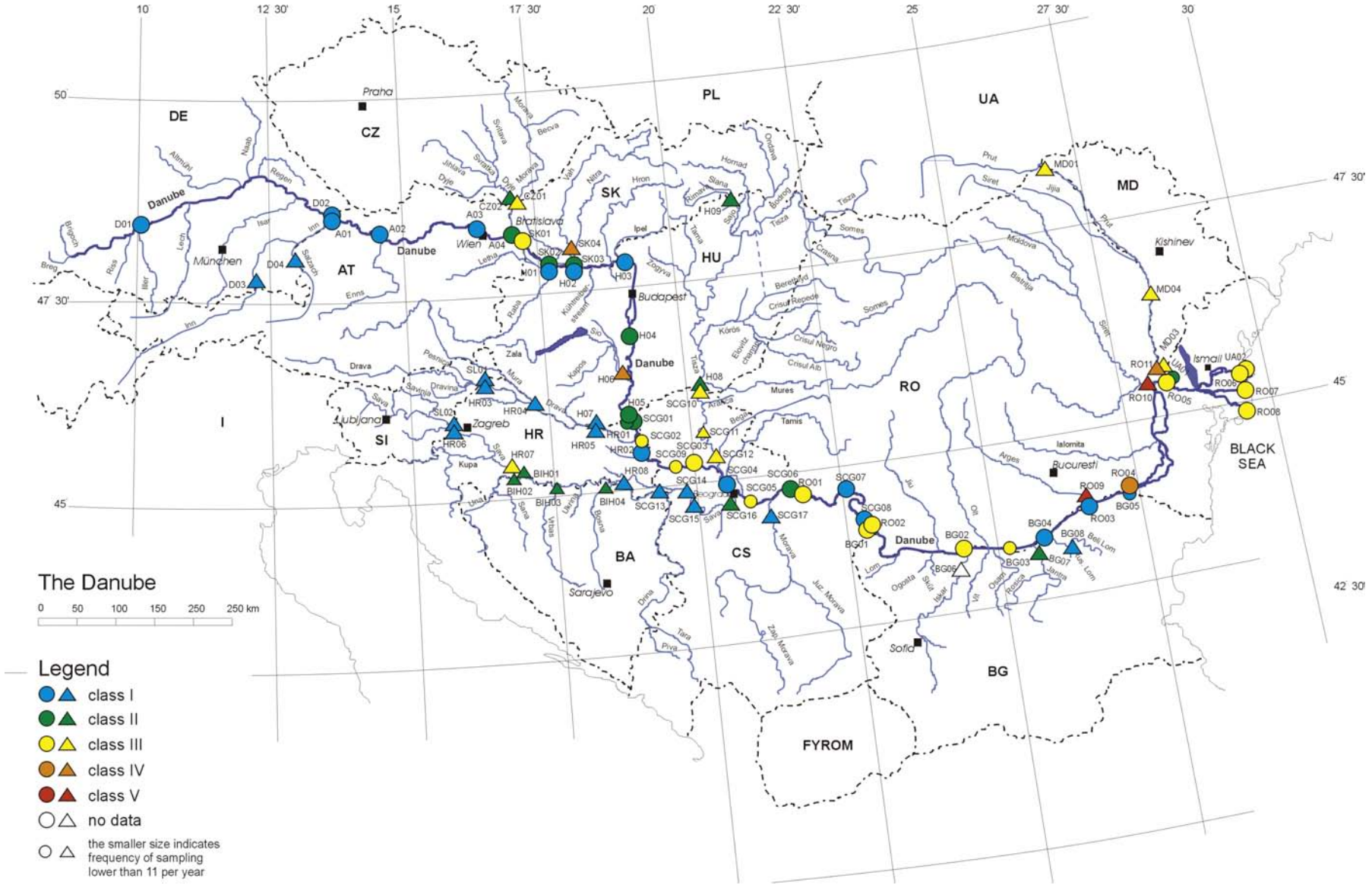


Figure 6: The classification of NO_3^--N in 2005

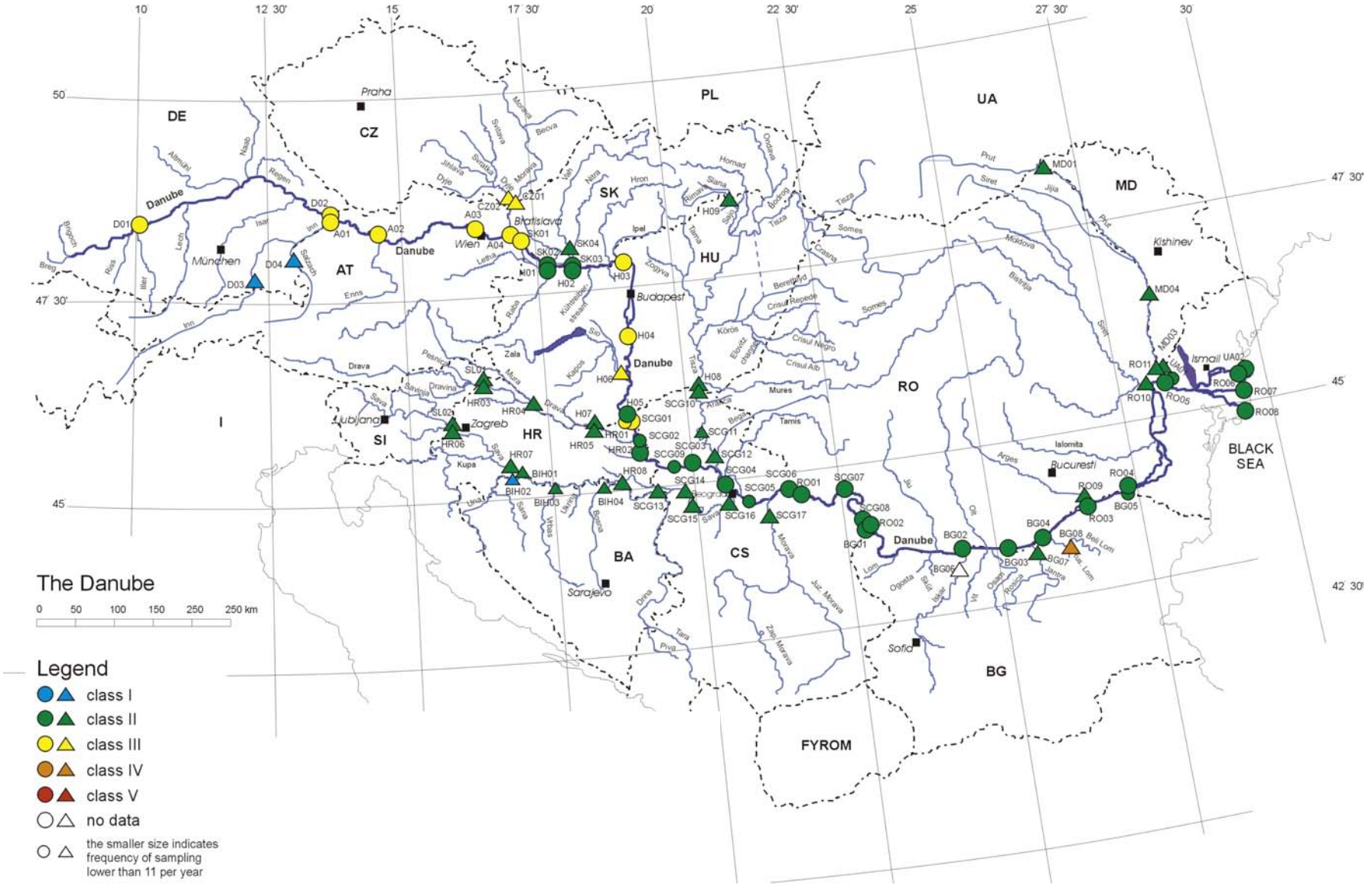


Figure 7: The classification of Ortho-Phosphate-P in 2005

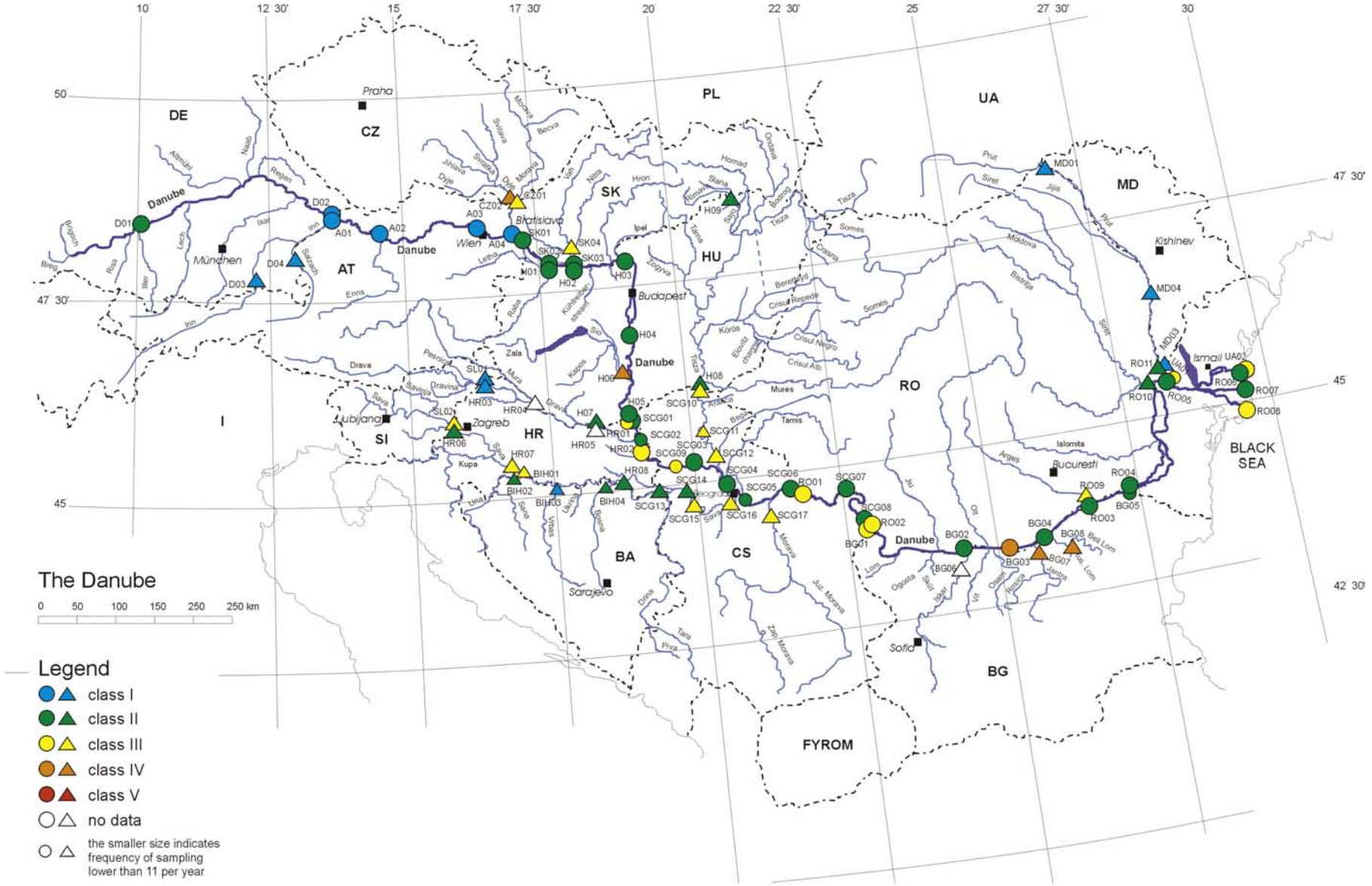


Figure 8: The classification of Total Phosphorus in 2005

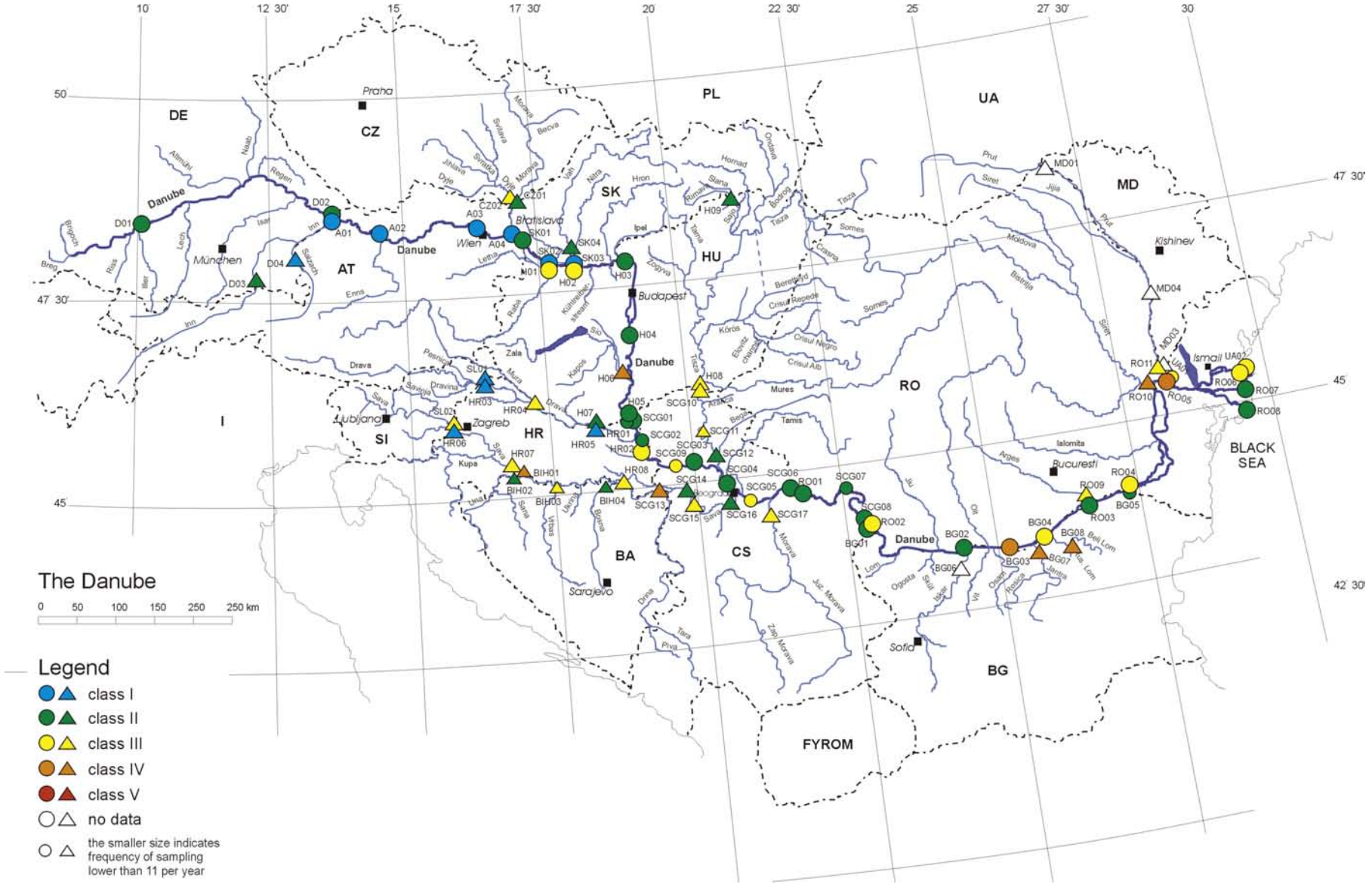


Figure 9: The classification of Chlorophyll-a in 2005

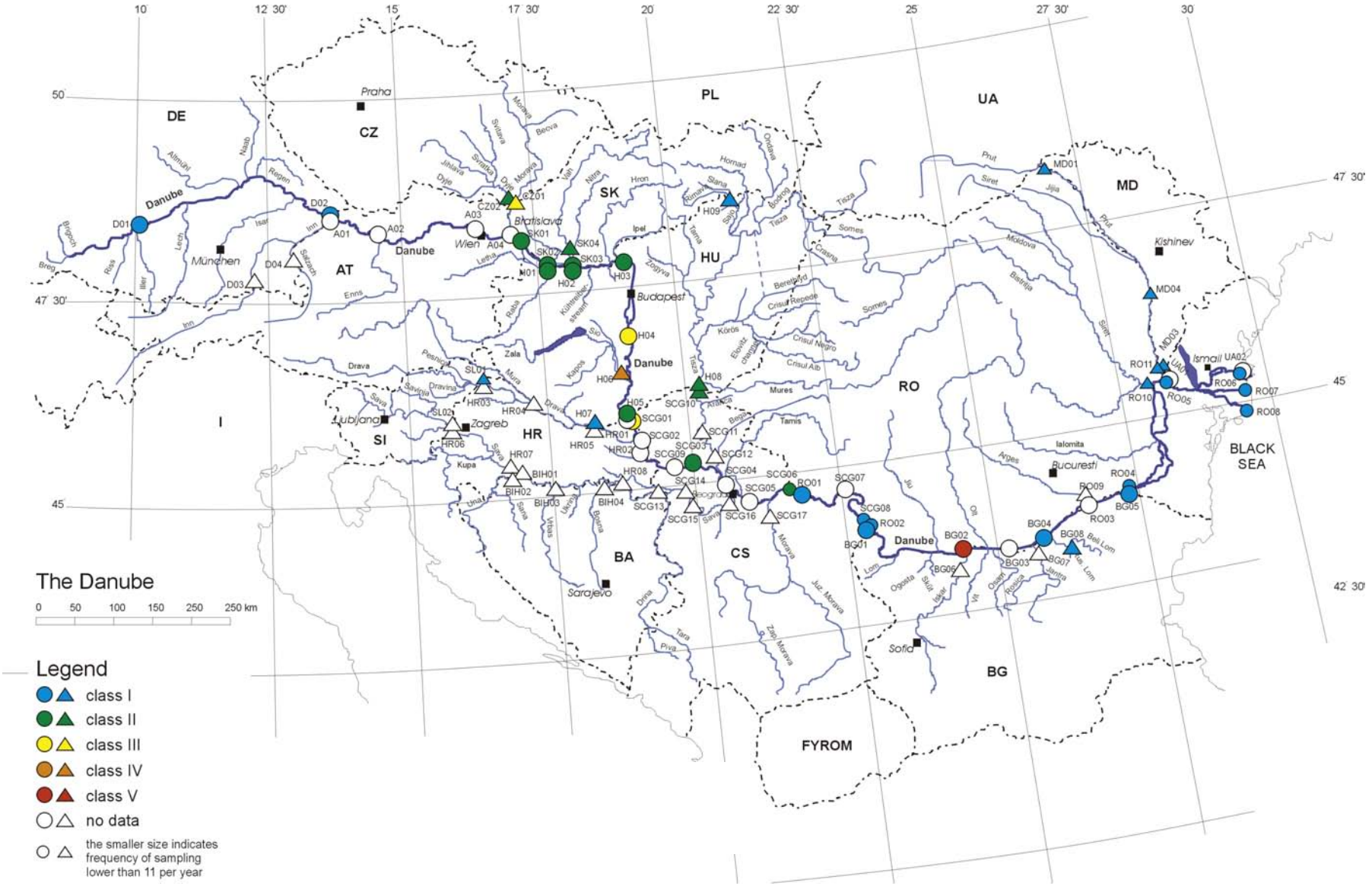


Figure 10: The classification of Cd in 2005

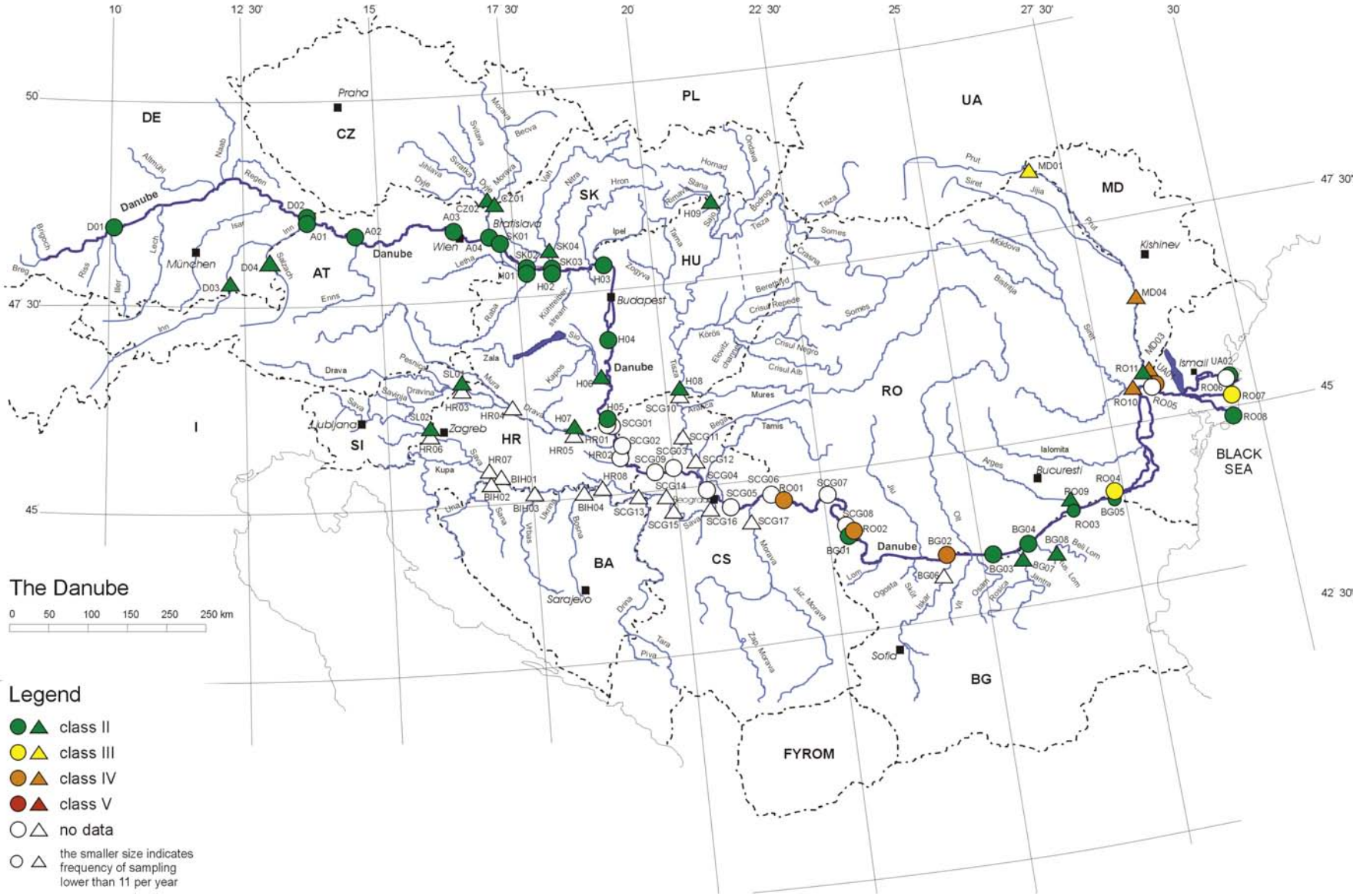


Figure 11: The classification of p,p' DDT in 2005

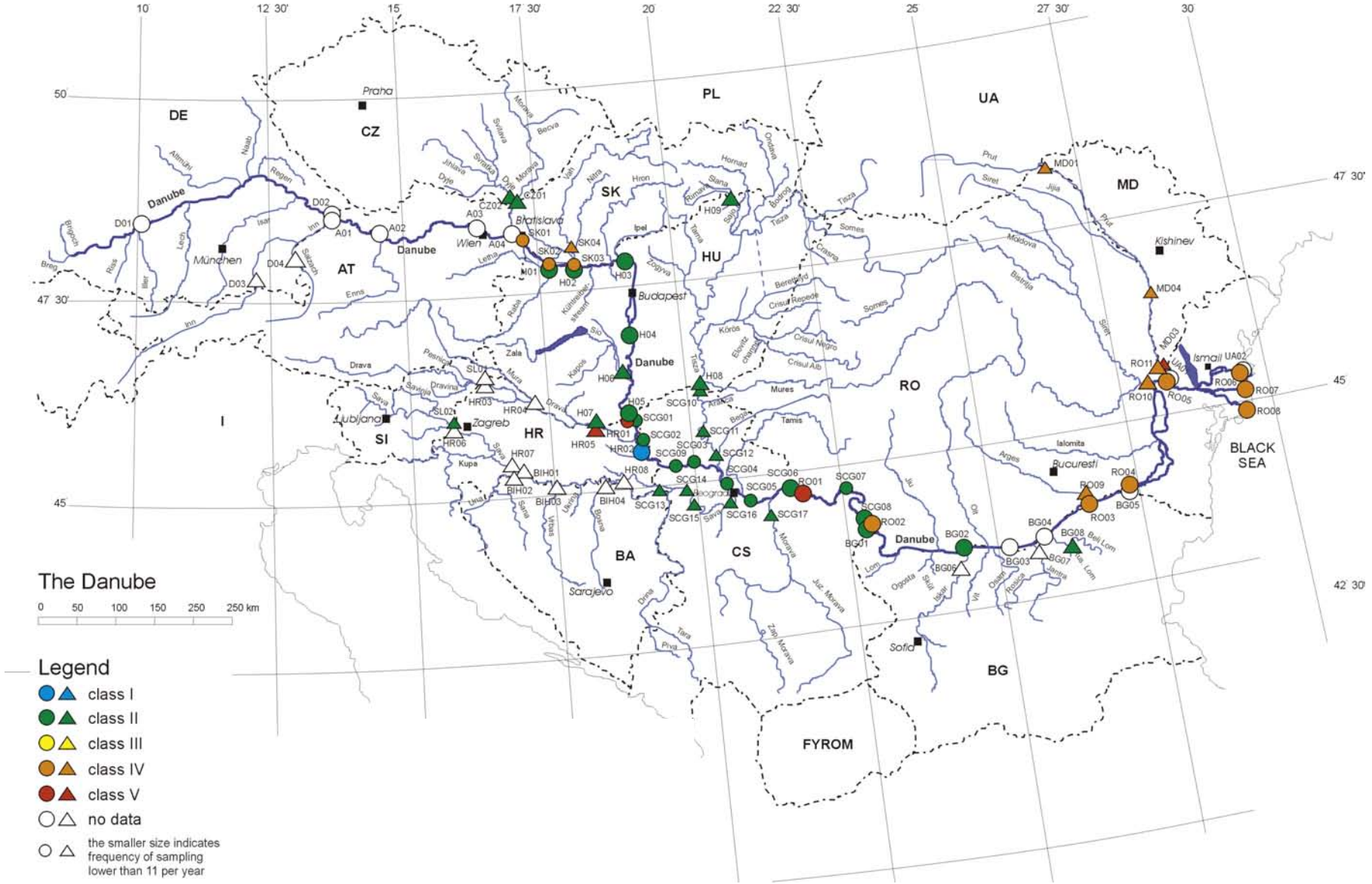
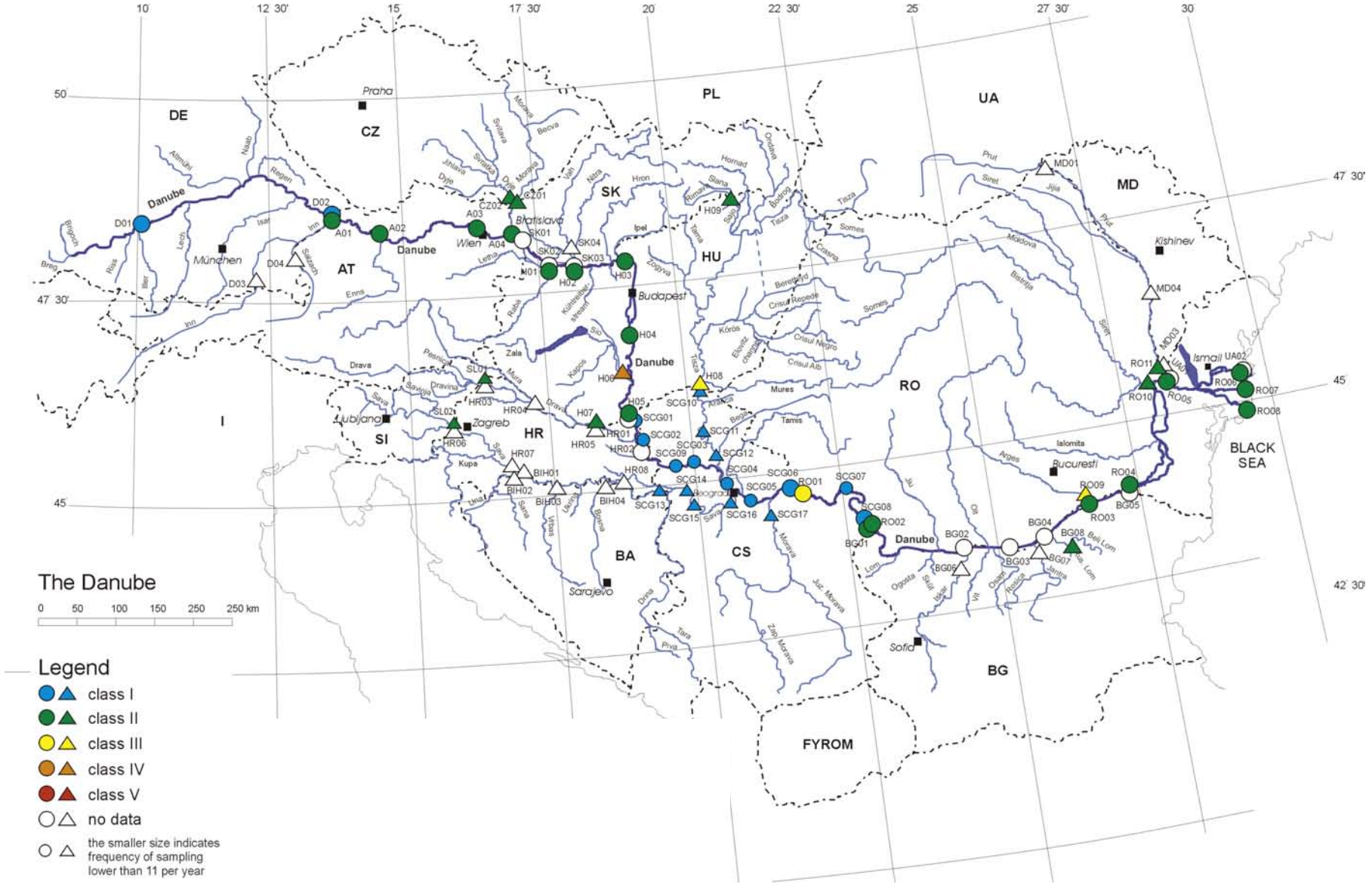


Figure 12: The classification of Atrazine in 2005



5. Profiles and trend assessment of selected determinands

In 2005, the highest levels of biodegradable organic matter were observed in the middle reach of the Danube, whilst ammonium-N, ortho-phosphate P, total P and cadmium reached the highest values in the lower Danube. Concentration of nitrate-N reached its maxima in the upper part of the river.
The tributaries with the highest levels of the biodegradable organic matter in 2005 were Russenski Lom, Sio, Arges and Jantra. The highest concentrations of nutrients were detected in following tributaries – Prut, Arges, Russenski Lom, Sio, Vah, Morava and Dyje.
A decrease of biodegradable organic pollution is continuously detected in the Austrian and Slovak Danube, and in some parts of lower Danube (Bazias, Pristol, Reni and the delta). Among the tributaries, Dyje shows an overall decreasing tendency, while Inn, Drava and Arges showed a slight increase in 2005.
As for the nutrients, decreasing levels of ammonium-N were recorded in the upper and middle part of the Danube River in Germany, Austria and Slovakia down to the site (H04). In the upper Danube tributaries (Inn, Salzach, Morava, Dyje) and also in Sava, Arges and Siret a general long-term trend of ammonium decrease has been recorded.
Slight decreases in Nitrate-N content were observed at several sites in German, Austrian and Slovakian part of the Danube River and at Danube-upstream Arges (RO3). Positive trends in Nitrate-N content were observed in tributaries Morava, Dyje, Vah, Sio and in some parts of the Drava.
A relative stable state of ortho-phosphate-P is observed at Slovak-Hungarian section of the Danube River and further in Danube at Silistra/Chiciu, downstream Svishtov and us. Russe. An improvement can be seen also in tributaries like Iskar, Morava, Dyje, Jantra, Russenski Lom, Arges and Siret.
An overall decreasing trend of P total is apparent in the upper part of Danube River. P total decreased also in tributaries Morava, Dyje, Arges, Russenski Lom. However, at several sites such as Borovo, Pancevo and Downstream Svishtov, P_{tot} concentration increased in 2005.

6. Load Assessment

6.1. Introduction

A view of a long-term development of loads of relevant determinands in the selected rivers of the Danube Basin is one of the major objectives of the TNMN. The load assessment programme has been under operation since 2000. For calculation of loads an agreed standard operational procedure is used.

6.2. Load assessment monitoring network

Load is calculated for the following determinands: BOD_5, inorganic nitrogen, ortho-phosphate-phosphorus, dissolved phosphorus, total phosphorus, suspended solids and - on voluntary basis – chlorides. Based on the agreement with the Black Sea Commission the silicates are measured in the Romanian load assessment sites since 2004 and nitrogen forms and selected heavy metals are measured at Reni since 2005;

The minimum sampling frequency in sampling sites selected for load calculation is set at 24 per year. Table 5 shows TNMN monitoring locations selected for load assessment programme with information on hydrological stations used for obtaining flow data needed for load assessment in respective locations. Altogether 21 monitoring locations from 8 countries are included in the list. Two locations – Danube-Jochenstein and Sava –Jesenice – have been included by two neighbouring countries, therefore actual number of locations is 19, with 10 locations on the Danube River itself and 9 locations on the tributaries.

6.3. Monitoring Data in 2005

Table 6 shows the number of flow and water quality measurements at load assessment sites in 2005. Despite the availability of water quality data from Ukraine the absence of flow data did not enable load calculation. Flow data are missing also at two Croatian monitoring locations and one Hungarian site. For most of monitoring sites more than 20 values were collected in 2005; a frequency of 12 times per year is available for Morava, Dyje, Danube-Jochenstein (A01) and for Hungarian Tizsa. However, Jochenstein station is assessed on the basis of combined data from Austria and Germany, so the measurement frequency is sufficient. Another candidate location for such a combined approach is Sava –Jesenice, but for the moment it is not possible to use it due to different measuring methods applied for some determinands, leading to differences in results. In addition, Croatia does not have flow data for this monitoring site.

There is still lack of data on dissolved phosphorus (it was measured in five locations only).

Table 5: List of TNMN locations selected for load assessment program

Country	River	Water quality monitoring location			Hydrological station	
		Country Code	Location	Distance from mouth (Km)	Location	Distance from mouth (Km)
Germany	Danube	D02	Jochenstein	2204	Achleiten	2223
Germany	Inn	D03	Kirchdorf	195	Oberaudorf	211
Germany	Inn/Salzach	D04	Laufen	47	Laufen	47
Austria	Danube	A01	Jochenstein	2204	Aschach	2163
Austria	Danube	A04	Wolfsthal	1874	Hainburg (Danube) Angern (March)	1884 32
Czech	Morava	CZ01	Lanzhot	79	Lanzhot	79

Republic						
Czech Republic	Morava/Dyje	CZ02	Pohansko	17	Breclav-Ladná	32,3
Slovak Republic	Danube	SK01	Bratislava	1869	Bratislava	1869
Hungary	Danube	H03	Szob	1708	Nagymaros	1695
Hungary	Danube	H05	Hercegszántó	1435	Mohács	1447
Hungary	Tisza	H08	Tiszasziget	163	Szeged	174
Croatia	Danube	HR02	Borovo	1337	Borovo	1337
Croatia	Sava	HR06	Jesenice	729	Jesenice	729
Croatia	Sava	HR07	Una Jesenovac	525	Una Jesenovac	525
Croatia	Sava	HR08	Zupanja	254	Zupanja	254
Slovenia	Drava	SI01	Ormoz	300	Borl HE Formin Pesnica-Zamusani	325 311 10.1(to the Drava)
Slovenia	Sava	SI02	Jesenice	729	Catez Sotla -Rakovec	737 8.1 (to the Sotla)
Romania	Danube	RO 02	Pristol-Novo Selo	834	Gruia	858
Romania	Danube	RO 04	Chiciu-Silistra	375	Chiciu	379
Romania	Danube	RO 05	Reni-Chilia arm	132	Isaccea	101
Ukraine	Danube	UA02	Vilkova-Kilia arm	18		

6.4. Calculation Procedure

In case of several sampling sites in the profile, the average concentration at a site is calculated for each sampling day. In case of values "below limit of detection", value of limit of detection is used in the further calculation. The average monthly concentrations is calculated according to the formula:

$$C_m\ [mg.l^{-1}] = \frac{\sum_{i \in m} C_i\ [mg.l^{-1}] \cdot Q_i\ [m^3.s^{-1}]}{\sum_{i \in m} Q_i\ [m^3.s^{-1}]}$$

where C_m average monthly concentrations
C_i concentrations in the sampling days of each month
Q_i discharges in the sampling days of each month

Table 6: Number of measurements in TNMN locations selected for assessment of pollution load in 2005

Country Code	River	Location	Location in profile	River Km	Number of meausrements in 2005								
					Q	SS	N_{inorg}	$P\text{-}PO_4$	P_{total}	BOD_5	Cl	P_{diss}	SiO_2
D02	Danube	Jochenstein	M	2204	304	26	26	26	26	24	26	11	0
D03	Inn	Kirchdorf	M	195	365	23	24	23	25	24	24	11	0
D04	Inn/Salzach	Laufen	L	47	365	24	25	25	25	25	25	25	0
A01	Danube	Jochenstein	M	2204	365	12	12	12	12	12	12	12	0
A04	Danube	Wolfsthal	R	1874	365	24	24	24	24	24	24	24	0
CZ01	Morava	Lanzhot	M	79	365	12	12	12	12	12	12	0	0
CZ02	Morava/Dyje	Pohansko	M	17	365	12	12	12	12	12	12	0	0
SK01	Danube	Bratislava	M	1869	365	25	25	12	25	25	25	12	0
H03	Danube	Szob	L	1708		24	24	24	24	24	24	0	0
			M	1708	365	18	18	18	16	18	18	0	0
			R	1708		24	24	24	24	24	24	0	0
H05	Danube	Hercegszántó	M	1435	0	12	14	14	14	14	12	0	0
H08	Tisza	Tiszasziget	L	163		11	15	15	14	11	12	0	0
			M	163	365	10	13	12	12	10	11	0	0
			R	163		11	15	15	14	12	12	0	0
HR02	Danube	Borovo	R	1337	0	26	26	26	26	26	0	0	0
HR06	Sava	Jesenice/D	L	729	0	26	26	26	26	26	12	0	0
HR07	Sava	us Una Jesenovac	L	525	365	26	26	26	26	26	12	0	0
HR08	Sava	ds Zupanja	R	254	365	24	24	24	24	24	11	0	0
SI01	Drava	Ormoz	L	300	365	24	24	24	24	24	24	0	0
SI02	Sava	Jesenice	R	729	365	24	24	24	24	24	24	0	0
RO02	Danube	Pristol-Novo Selo	L	834	0	23	23	23	23	14	23	0	24
			M	834	0	21	21	21	21	14	21	0	21
			R	834	0	20	20	20	20	14	20	0	20
RO04	Danube	Chiciu-Silistra	L	375		22	23	23	21	12	18	0	21
			M	375	365	22	23	23	22	24	22	0	21
			R	375		24	24	24	22	12	18	0	21
RO05	Danube	Reni	L	132		20	22	22	20	22	17	0	21
			M	132	365	20	22	22	20	22	17	0	21
			R	132		20	22	22	20	22	17	0	21
UA02	Danube	Vilkova-Kilia arm	M	18	0	11	11	11	11	11	11	0	0

The monthly load is calculated by using the formula:
L_m [tones] = C_m [mg.l^{-1}] . Q_m [m^3.s^{-1}] . days (m) . 0,0864

where L_m monthly load
Q_m average monthly discharge

- *If discharges are available only for the sampling days, Q_m is calculated from those discharges.*
- *In case of months without measured values the average of the products $C_m.Q_m$ in the months with sampling days is used.*

The annual load is calculated as the sum of the monthly loads:

$$L_a \text{ [tones]} = \sum_{m=1}^{12} L_m \text{ [tones]}$$

6.5. Results

The mean annual concentrations and annual loads of suspended solids, inorganic nitrogen, ortho-phosphate-phosphorus, total phosphorus, BOD_5, chlorides and – where available – dissolved phosphorus and silicates - are presented in tables 7 to 10, separately for monitoring locations on the Danube River and monitoring locations on tributaries. Explanation of terms used in the tables 7 to 10 is as follows. Table 11 shows loads of other determinands (nitrogen forms and heavy metals) at the profile Reni, which are monitored since 2005 based on the agreement with the Black Sea Commission.

Term used	Explanation
Station Code	TNMN monitoring location code
Profile	location of sampling site in profile (L-left, M-middle, R-right)
River Name	name of river
Location	name of monitoring location
River km	distance to mouth of the river
Q_a	mean annual discharge in the year 2005
c_{mean}	arithmetical mean of the concentrations in the year 2005
Annual Load	annual load of given determinand in the year 2005

In 2005, the mean annual discharge was higher when compared to the previous year, with an average flow being about 30% higher than in 2004. This influenced (increased) concentrations of suspended solids as they are sensitive to flow conditions.
Significantly higher concentrations of suspended solids and inorganic nitrogen comparison to 2004 were observed at Reni-RO05 and Chiciu RO04. In tributaries, a significant increase was recorded for suspended solids, $P\text{-}PO_4$, inorganic nitrogen and BOD_5in Sava-SI02. A maximum of load of ortho-phosphate phosphorus was observed in Danube- Pristol-Novo Selo RO02.

Table 7: Mean annual concentrations in monitoring locations selected for load assessment on the Danube River in 2005

Station Code	Profile	River Name	Location	River km	Q_a	c_{mean}							
						Suspended Solids	Inorganic Nitrogen	Ortho-Phosphate Phosphorus	Total Phosphorus	BOD_5	Chlorides	Phosphorus - dissolved	Silicates
					($m^3.s^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)
D02 +A01	M	Danube	Jochenstein	2204	1359	11.01	2.17	0.03	0.10	2.28	18.50	0.03	
A04	R	Danube	Wolfsthal	1874	2069	31.28	2.29	0.02	0.05	1.81	19.80	0.04	
SK01	M	Danube	Bratislava	1869	2115	53.68	2.26	0.04	0.09	1.69	19.09	0.05	
H03	LMR	Danube	Szob	1708	2329	24.40	2.02	0.05	0.08	3.47	24.27		
H05	M	Danube	Hercegszántó	1435		6.08	1.24	0.03	0.09	3.66	20.00		
HR02	R	Danube	Borovo	1337		42.73	2.35	0.10	0.22	3.36			
RO02	LMR	Danube	Pristol-Novo Selo	834	6396	24.55	1.02	0.11	0.23	1.87	19.81		7.59
RO04	LMR	Danube	Chiciu-Silistra	375	7659	86.55	2.32	0.04	0.14	2.61	29.77		8.55
RO05	LMR	Danube	Reni	132	8711	68.65	1.83	0.04	0.31	1.75	28.36		9.42
UA02	M	Danube	Vilkova-Kilia arm	18		158.636	1.697	0.094	0.152	2.285	32.173		

Table 8: Mean annual concentrations in monitoring locations selected for load assessment in tributaries in 2005

Station Code	Profile	River Name	Location	River km	Q_a	c_{mean}						
						Suspended Solids	Inorganic Nitrogen	Ortho-Phosphate Phosphorus	Total Phosphorus	BOD_5	Chlorides	Phosphorus - dissolved
					($m^3.s^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)
D03	M	Inn	Kirchdorf	195	333	36.48	0.64	0.01	0.07	1.25	5.77	0.01
D04	L	Inn/Salzach	Laufen	47	265	38.75	0.73	0.01	0.04	2.13	9.18	0.01
CZ01	M	Morava	Lanzhot	79	54	45.89	2.53	0.07	0.14	4.40	30.80	
CZ02	L	Morava/Dy	Pohansko	17.00	39	49.15	2.77	0.19	0.25	3.68	41.28	
H08	LMR	Tisza	Tiszasziget	163	1099	87.42	1.48	0.06	0.20	2.55	43.87	
SI01	L	Drava	Ormoz	300	283	16.99	1.18	0.01	0.04	2.15	6.36	
SI02	R	Sava	Jesenice	729	265	18.42	1.76	0.09	0.13	2.58	8.90	
HR06	L	Sava	Jesenice	729		25.62	1.84	0.07	0.17	2.58	9.24	
HR07	L	Sava	us. Una Jasenovac	525	637	21.85	1.61	0.09	0.19	2.76	8.38	
HR08	R	Sava	ds. Zupanja	254	1190	22.63	1.31	0.05	0.17	2.61	12.35	

Table 9: Annual loads in selected monitoring locations on the Danube River in 2005

Station Code	Profile	River Name	Location	River km	Annual Load in 2005							
					Suspended Solids	Inorganic Nitrogen	Ortho-Phosphate Phosphorus	Total Phosphorus	BOD_5	Chlorides	Phosphorus - dissolved	Silicates
					($x10^6$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^6$tonns)	($x10^3$tonns)	($x10^6$tonns)
D02 +A01	M	Danube	Jochenstein	2204	0.499	91.819	1.224	4.803	102.927	1.032	1.794	
A04	R	Danube	Wolfsthal	1874	3.370	147.014	1.610	3.607	138.340	1.234	2.510	
SK01	M	Danube	Bratislava	1869	5.401	147.427	2.593	7.292	113.612	1.475	3.977	
H03	LMR	Danube	Szob	1708	1.628	122.061	3.016	4.831	218.152	1.498		
H05	M	Danube	Hercegszántó	1435								
HR02	R	Danube	Borovo	1337								
RO02	LMR	Danube	Pristol-Novo Selo	834	5.073	198.966	23.603	46.499	383.312	3.821		1.509
RO04	LMR	Danube	Chiciu-Silistra	375	20.094	537.173	9.515	31.982	589.736	7.000		1.882
RO05	LMR	Danube	Reni	132	17.985	493.928	10.184	71.611	486.580	7.605		2.309
UA02	M	Danube	Vilkova-Kilia arm	18								

Table 10: Annual loads in selected monitoring locations in tributaries in 2005

Station Code	Profile	River Name	Location	River km	Annual Load in 2005						
					Suspended Solids	Inorganic Nitrogen	Ortho-Phosphate Phosphorus	Total Phosphorus	BOD_5	Chlorides	Phosphorus - dissolved
					($x10^6$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^6$tonns)	($x10^3$tonns)
D03	M	Inn	Kirchdorf	195	0.523	6.622	0.084	0.754	12.468	0.054	0.111
D04	L	Inn/Salzach	Laufen	47	0.588	5.486	0.074	0.369	17.470	0.058	0.090
CZ01	M	Morava	Lanzhot	79	0.049	4.460	0.117	0.273	6.445	0.049	
CZ02	L	Morava/Dyje	Pohansko	17	0.050	4.485	0.193	0.282	4.467	0.052	
H08	LMR	Tisza	Tiszasziget	163	3.118	39.641	1.944	6.633	53.086	1.102	
SI01	L	Drava	Ormoz	300	0.240	10.032	0.094	0.450	18.194	0.051	
SI02	R	Sava	Jesenice	729	0.189	14.232	0.571	0.896	20.018	0.066	
HR06	L	Sava	Jesenice	729							
HR07	L	Sava	us. Una Jasenovac	525	0.445	29.485	1.345	3.549	52.126	0.151	
HR08	R	Sava	ds. Zupanja	254	0.838	49.149	1.704	6.237	91.080	0.373	

Table 11: Additional annual load data at Reni for reporting to the Black Sea Commission.

Country Code	River	Location	Location in profile	River km	Number of measurements in 2005											
					Q	$N\text{-}NH_4$	$N\text{-}NO_2$	$N\text{-}NO_3$	N_{total}	Cu	$Cu_{diss.}$	Pb	$Pb_{diss.}$	Cd	$Cd_{diss.}$	Hg
RO05	Danube	Reni	LMR	132	365	21	21	21	20	23	23	23	23	23	23	21
Country Code	**River**	**Location**	**Location in profile**	**River km**	c_{mean}											
					Q_a	$N\text{-}NH_4$	$N\text{-}NO_2$	$N\text{-}NO_3$	N_{total}	Cu	$Cu_{diss.}$	Pb	$Pb_{diss.}$	Cd	$Cd_{diss.}$	Hg
					($m^3.s^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($mg.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)	($\mu g.l^{-1}$)
RO05	Danube	Reni	LMR	132	8711	0.21	0.04	1.62	2.32	13.002	4.129	3.509	0.982	0.736	0.113	0.032
Country Code	**River**	**Location**	**Location in profile**	**River km**	**Annual Load in 2005**											
						$N\text{-}NH_4$	$N\text{-}NO_2$	$N\text{-}NO_3$	N_{total}	Cu	$Cu_{diss.}$	Pb	$Pb_{diss.}$	Cd	$Cd_{diss.}$	Hg
						($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	($x10^3$tonns)	(tonns)	(tonns)	(tonns)	(tonns)	(tonns)
RO05	Danube	Reni	LMR	132		49.79	9.10	407.67	610.80	3.50	1.10	943.28	215.83	167.72	26.22	7.63

7. Abbreviations

Abbreviation	Explanation
AQC	Analytical Quality Control
BSC	Black Sea Commission
DEFF	Data Exchange File Format
DRPC	Convention on Cooperation for the Protection and Sustainable Use of the Danube River (short: Danube River Protection Convention)
ICPDR	International Commission for the Protection of the Danube River
LOD	Limit of Detection
MA EG	Monitoring and Assessment Expert Group (former MLIM EG)
MLIM EG	Monitoring, Laboratory and Information Management Expert Group
NRL	National Reference Laboratory
SOP	Standard Operational Procedure
TNMN	Trans National Monitoring Network
WFD	EU Water Framework Directive

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