Contents

Annex A.4.1.2

Variations of the Danube water monthly average temperatures at Cernavoda HS

(Annex to Chapter 4.1.2)

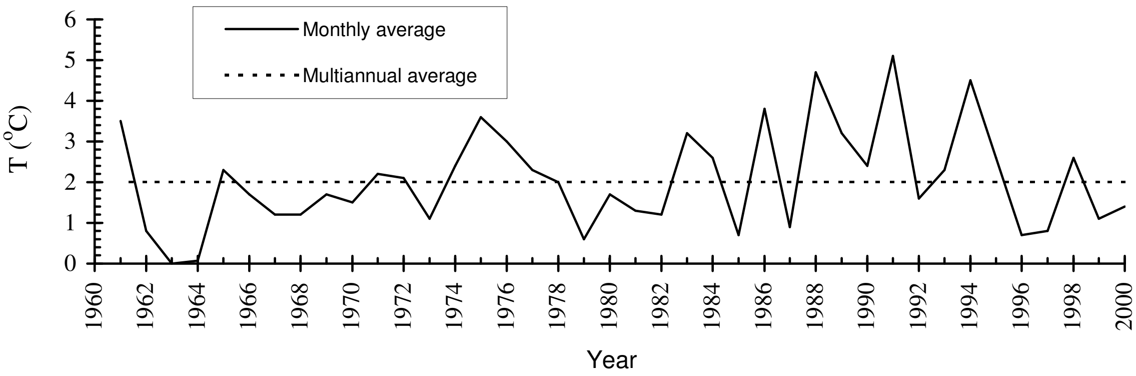
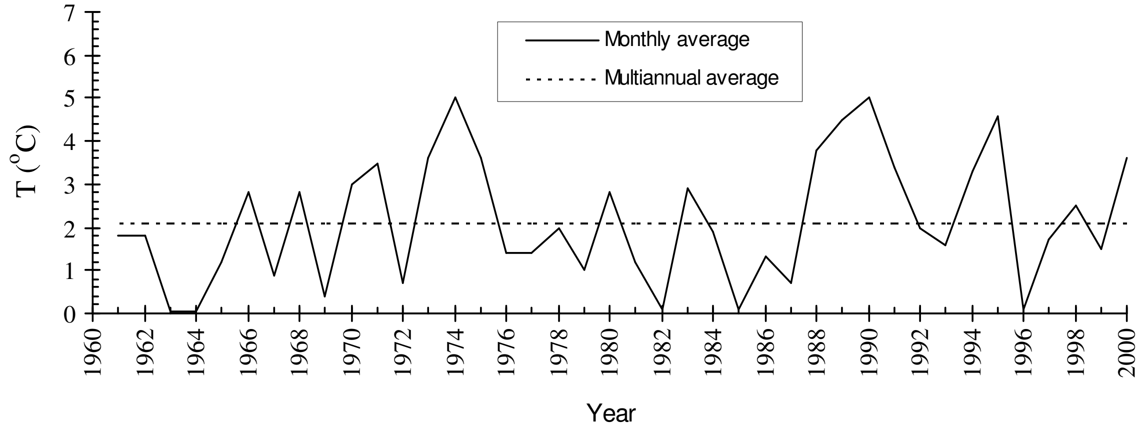


Figure A.4.1.2-1. Average water temperatures in January.



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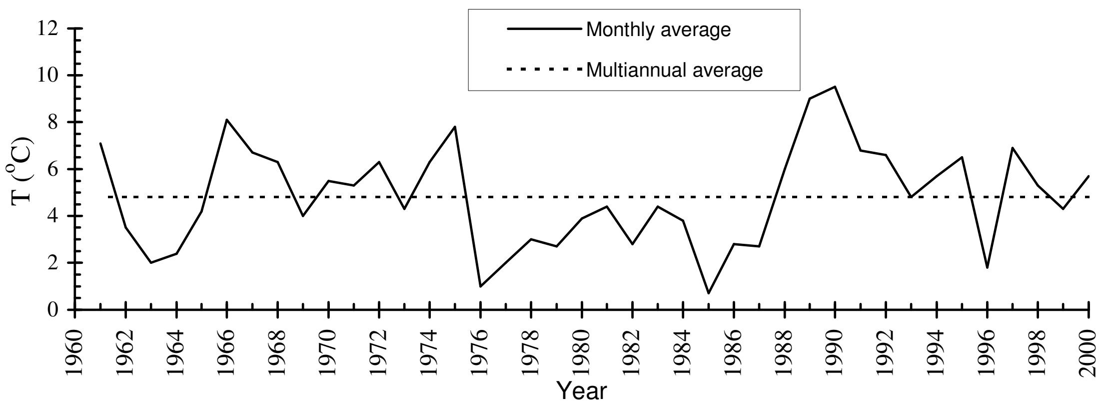

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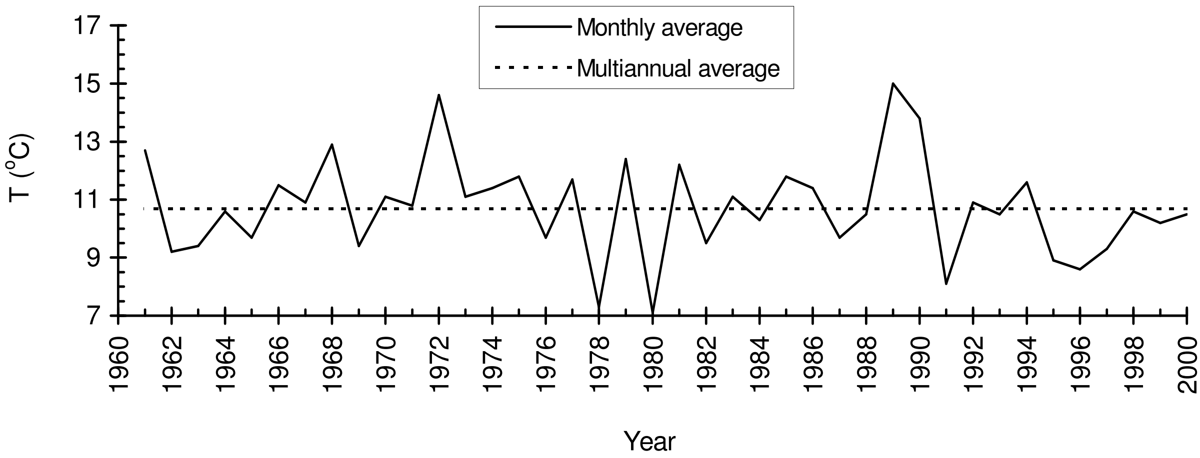

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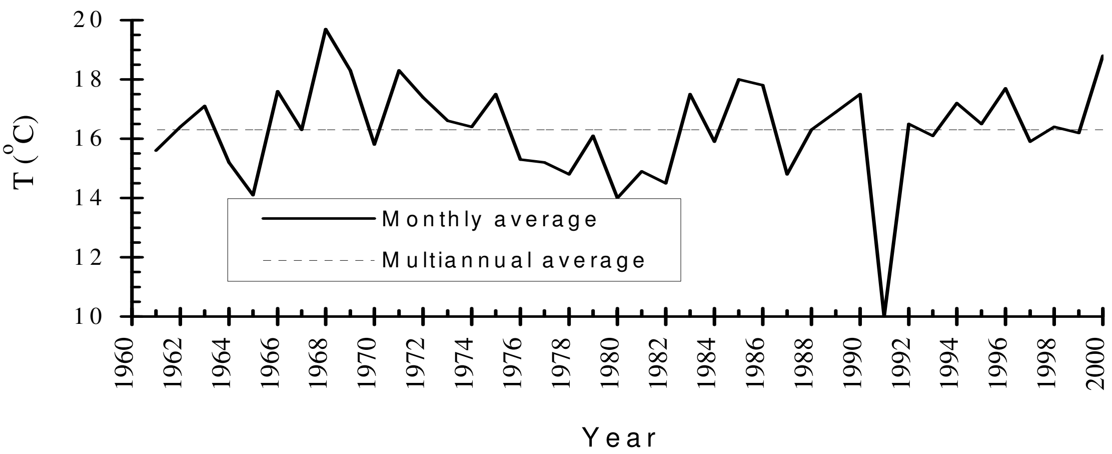
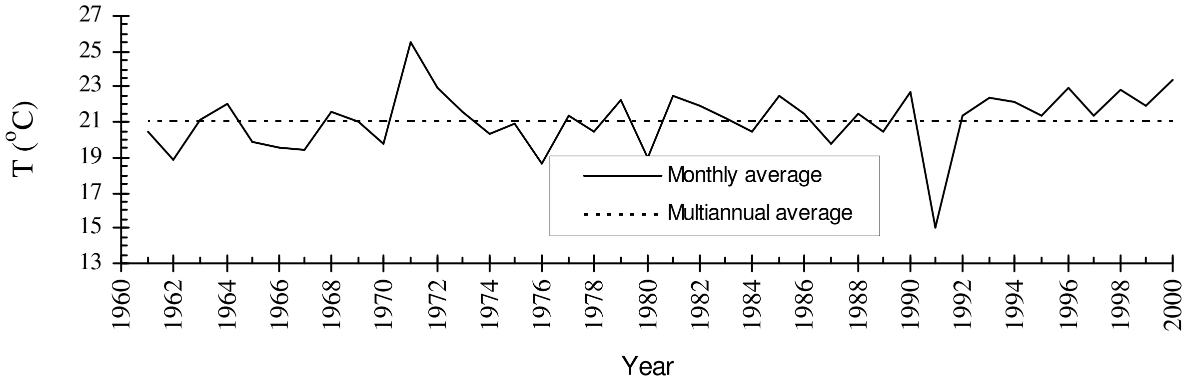


Figure A.4.1.2-5. Average water temperatures in May.



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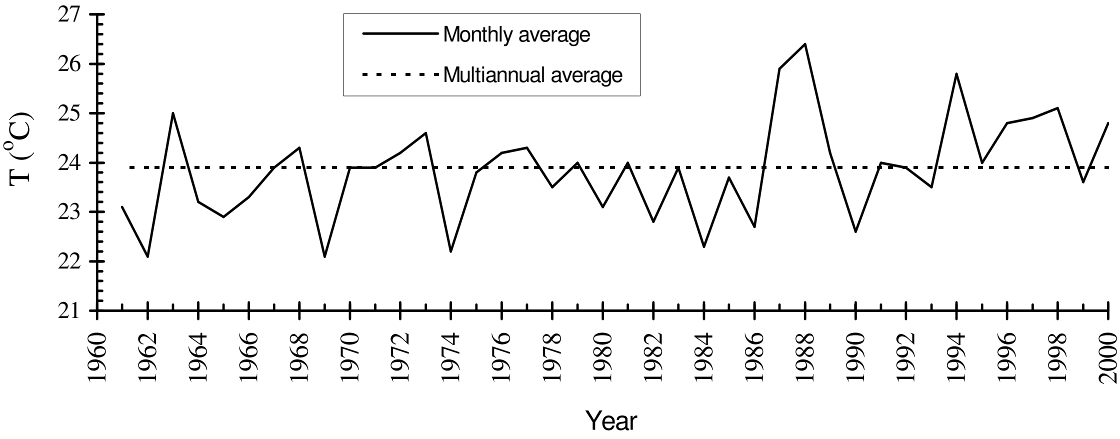

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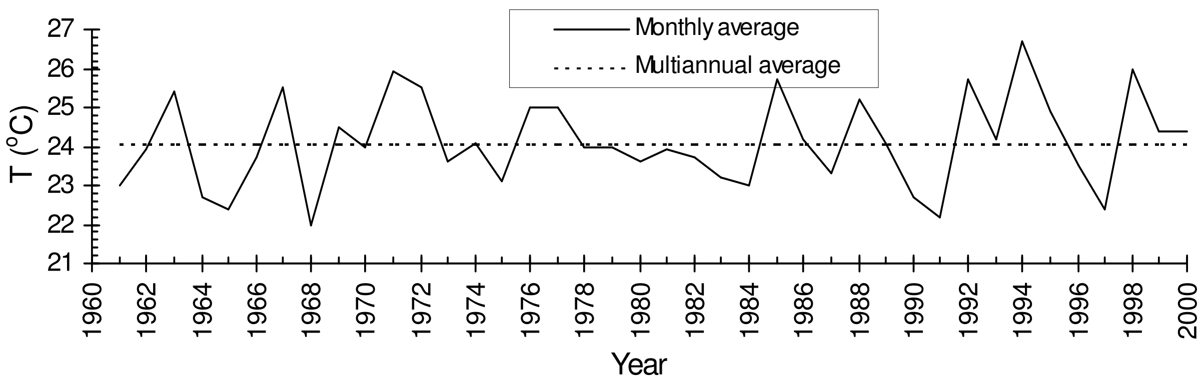

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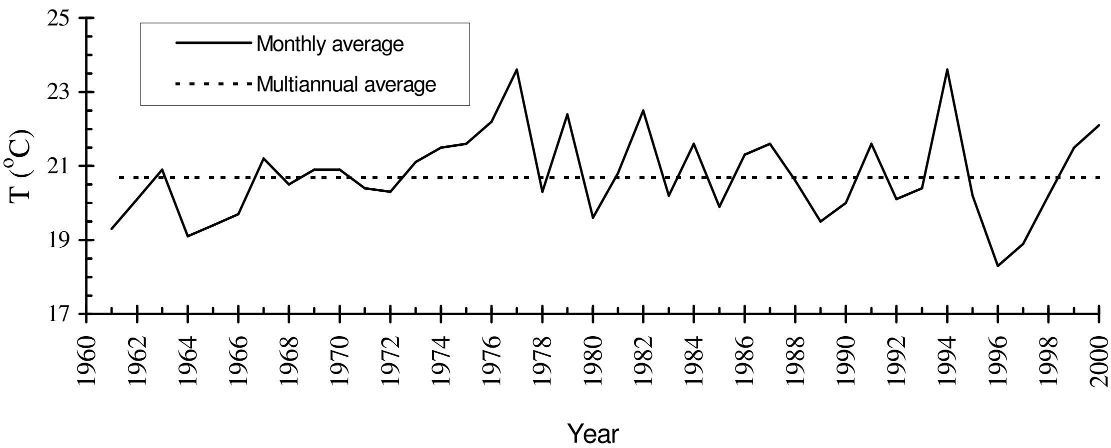

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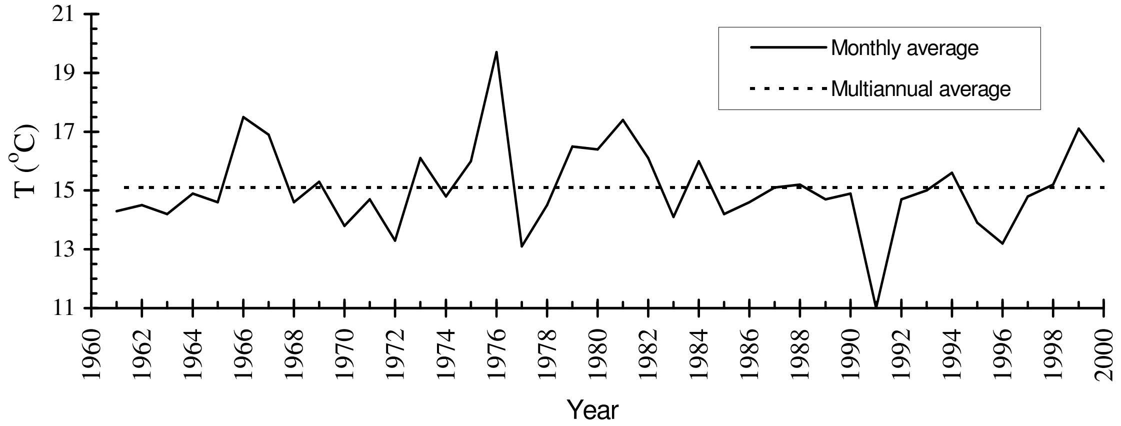

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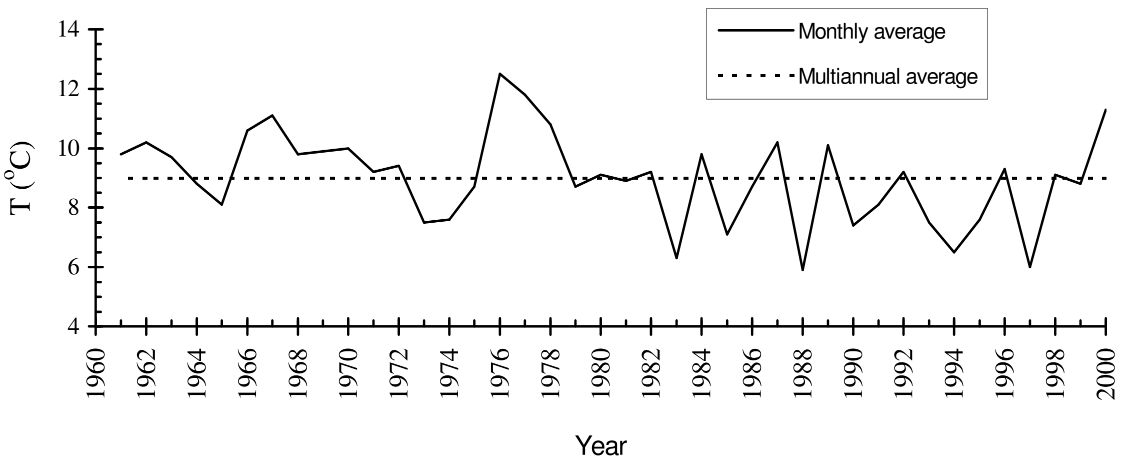

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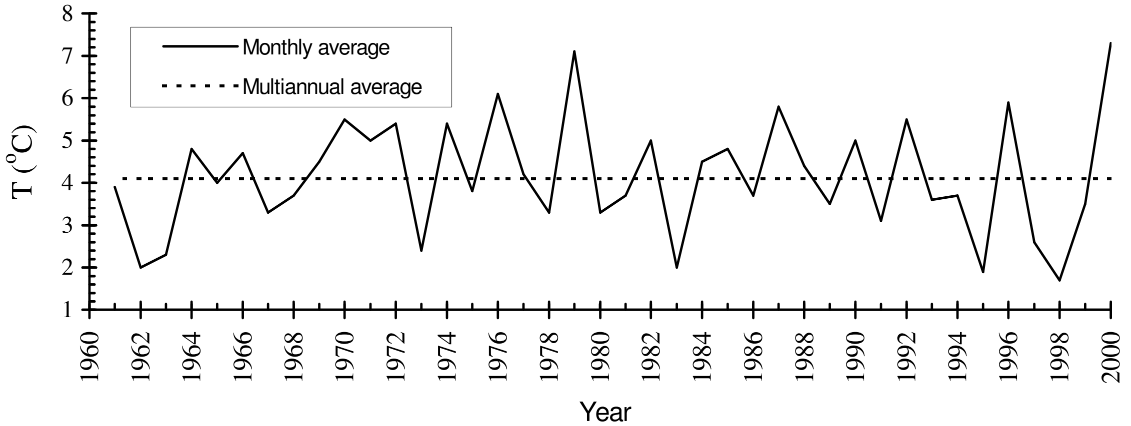

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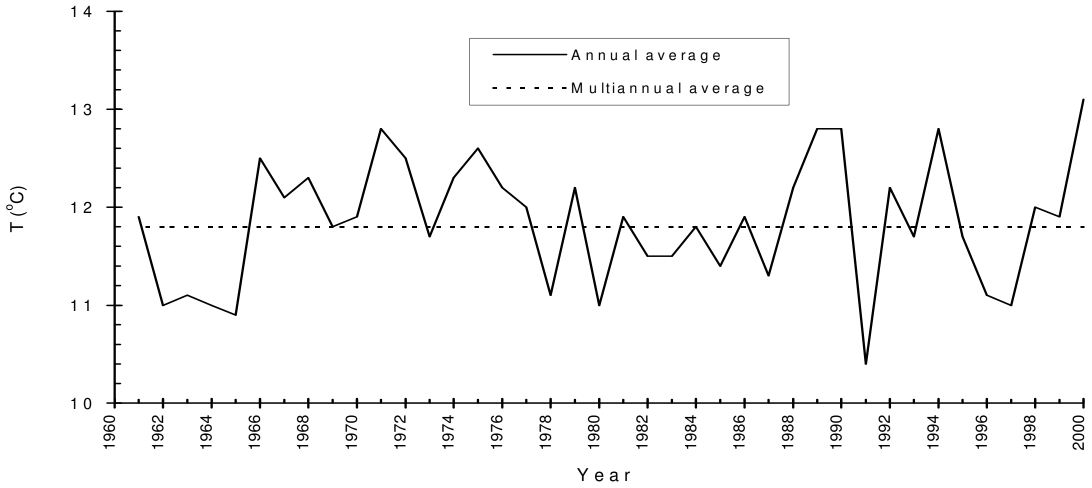


Figure A.4.1.2-13. Annual average water temperatures at Cernavoda HS

Annex A.4.1.3

Values of physical, chemical and microbiological indicators in the Danube

(Annex to Chapter 4.1.3)

Table A.4.1.3-1. Values of physical and chemical indicators in the Danube water, July 2001

Indicator	Unit	Section							
		C3	C10	C7	C7'	C11	C11'	C12	C13
Temperature	^{0}C	26.1	26.2	33.7	33.7	29.8	26.7	27.8	26.8
Odour (ambiental temperature)	gr	0	0	0	0	0	0	0	0
Odour at 60^0	gr	0	0	0	0	0	0	0	0
pH	-	8.0	8.1	8.0	8.0	8.1	8.1	8.0	8.0
Dissolved O_2	mgO_2/l	11.5	13.2	13.6	11.5	10.8	11.0	10.6	11.5
Saturation of O_2	%	140.0	161.1	189.0	162.5	140.9	136.5	134.0	142.5
BOD_5	mgO_2/l	4.9	5.2	4.8	4.9	3.7	6.1	6.0	6.9
COD-Mn	mgO_2/l	6.4	4.5	4.9	4.8	4.8	6.4	5.0	5.0
NH_4^+ (N-NH_4^+)	mgN/l	0.017	0.013	0.026	0.025	0.013	0.015	0.014	0.016
NO_2^- (N-NO_2^-)	mgN/l	0.008	0.010	0.009	0.003	0.008	0.003	0.002	0.025
NO_3^- (N-NO_3^-)	mgN/l	0.700	0.939	0.490	0.490	0.957	1.000	0.391	0.481
Total mineral N	mgN/l	0.725	0.962	0.525	0.518	0.978	1.018	0.407	0.522
PO_4^{3-} (P-PO_4^{3-})	mgP/l	0.007	0.006	0.014	0.025	0.009	0.045	0.031	0.015
Total P	mgP/l	0.012	0.011	0.019	0.019	0.012	0.011	0.012	0.011
Conductivity at 25 ^{0}C	µS/cm	388	350	355	360	396	396	326	346
Total dissolved salts	mg/l	275.1	248.5	252.3	255.6	281.0	281.0	231.3	245.4
Cl^-	mg/l	28.4	28.4	28.4	24.9	24.9	32.0	24.9	24.9
SO_4^{2-}	mg/l	15.0	14.5	15.0	15.0	22.5	22.5	14.5	14.5
Ca^{2+}	mg/l	24.5	24.9	24.5	24.5	24.9	25.3	24.5	24.1
Mg^{2+}	mg/l	12.2	11.7	12.2	12.2	9.2	8.3	10.2	11.2
CO_3^{2-}	mg/l	18.0	15.6	6.0	6.0	10.8	3.6	9.6	6.0
m-Alkalinity	mval/l	3.00	2.95	3.00	2.85	2.80	2.75	2.85	2.85
p-Alkalinity	mval/l	0.30	0.26	0.10	0.12	0.18	0.06	0.16	0.10
HCO_3^-	mg/l	146.4	132.4	170.8	170.8	148.8	160.4	154.3	161.7
Permanent hardness	^{0}G	2.8	3.6	1.9	1.9	2.3	1.6	2.1	1.9
Temporary hardness	^{0}G	6.9	6.1	7.8	7.8	6.8	7.4	7.1	7.4
Total hardness	^{0}G	9.7	9.7	9.7	9.7	9.1	9.0	9.2	9.3

Table A.4.1.3-2. Values of physical and chemical indicators in the Danube water, August 2001

Indicator	Unit	Section							
		C 3	C 10	C 7	C 7‘	C 11	C 11‘	C 12	C 13
Temperature	^0C	26.0	26.0	34.2	34.2	32.3	26.4	27.7	26.4
Odour (ambiental temperature)	gr	0	0	0	0	0	0	0	0
Odour at 60^0	gr	0	0	0	0	0	0	0	0
pH	-	8.1	8.0	8.1	8.1	8.2	8.1	8.1	8.0
Dissolved O2	mgO_2/l	7.6	7.8	9.1	11.0	7.7	8.6	7.5	11.8
Saturation of O2	%	92.0	95.3	126.9	148.9	115.7	106.2	94.8	144.3
BOD_5	mgO_2/l	3.0	2.9	3.2	6.0	3.4	3.0	2.8	5.7
COD-Mn	mgO_2/l	7.7	6.1	5.4	7.4	7.7	5.1	8.0	5.8
NH_4^+ ($N-NH_4^+$)	mgN/l	0.047	0.070	0.031	0.023	0.163	0.163	0.016	0.019
NO_2^- ($N-NO_2^-$)	mgN/l	0.014	0.043	0.011	0.018	0.097	0.097	0.008	0.016
NO_3^- ($N-NO_3^-$)	mgN/l	0.741	0.639	1.109	1.100	1.100	1.100	0.650	0.759
Total mineral N	mgN/l	0.802	0.752	1.151	1.141	1.360	1.360	0.674	0.794
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.007	0.098	0.022	0.013	0.154	0.154	0.028	0.023
Total P	mgP/l	0.012	0.137	0.038	0.023	0.260	0.260	0.050	0.043
Conductivity at 25^0 C	µS/cm	352	283	353	352	401	401	304	333
Total dissolved salts	mg/l	250.2	201.6	250.4	250.2	285.0	285.0	215.5	236.3
Cl^-	mg/l	28.4	24.9	24.9	24.9	35.5	31.9	24.9	28.4
SO_4^{2-}	mg/l	13.5	15.0	12.5	13.5	21.0	22.5	15.5	16.0
Ca^{2+}	mg/l	40.9	43.3	52.1	52.1	52.9	50.5	39.3	36.1
Mg^{2+}	mg/l	18.0	10.7	11.1	13.1	14.6	16.5	14.1	20.4
m-Alkalinity	mval/l	3.0	2.5	2.9	3.1	3.1	3.1	2.8	3.2
p-Alkalinity	mval/l	0.18	0.06	0.16	0.12	0.18	0.10	0.16	0.28
HCO_3^-	mg/l	164.0	141.5	157.4	174.5	167.1	176.9	151.3	161.0
CO_3^{-2}	mg/l	10.8	3.6	9.6	7.2	10.8	6.0	9.6	16.8
Permanent hardness	^0G	2.48	2.04	2.29	2.32	3.10	2.76	1.81	2.39
Temporary hardness	^0G	7.39	6.49	7.58	8.00	7.67	8.12	6.94	7.39
Total hardness	^0G	9.87	8.53	9.87	10.32	10.77	10.88	8.75	9.78

Table A.4.1.3-3. Values of physical and chemical indicators in the Danube water, April 2003

Indicator	Unit	Sections								
		C3	C10	C7	C7'	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	9.1	9.5	20.2	18.2	16.9	9.5	11.4	10.2	9.9
pH	-	8.2	8.4	8.3	8.3	8.5	8.4	8.5	8.5	8.4
Dissolved O_2	mgO_2/l	8.9	9.0	8.7	7.6	8.5	9.2	8.9	9.0	8.6
Saturation of O_2	%	77.2	78.8	96.8	77.3	88.2	80.0	81.6	76.4	76.1
BOD_5	mgO_2/l	2.4	3.2	1.9	1.5	2.3	2.7	2.6	2.4	1.8
COD-Mn	mgO_2/l	3.4	3.6	3.5	3.4	3.4	3.4	3.6	3.0	3.7
NH_4^+ ($N-NH_4^+$)	mgN/l	0.031	0.170	0.250	0.430	0.230	0.190	0.076	0.008	0.120
NO_2^- ($N-NO_2^-$)	mgN/l	0.009	0.011	0.018	0.013	0.013	0.012	0.012	0.011	0.016
NO_3^- ($N-NO_3^-$)	mgN/l	1.450	2.540	2.930	2.990	3.050	1.550	2.260	1.530	2.500
Total mineral N	mgN/l	1.490	2.721	3.198	3.433	3.293	1.752	2.348	1.549	2.636
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.020	0.035	0.037	0.050	0.034	0.025	0.027	0.013	0.032
Total P	mgP/l	0.045	0.085	0.065	0.110	0.116	0.061	0.057	0.029	0.056
Conductivity at 25^0C	µS/cm	484	487	487	498	498	494	487	487	487
Cl^-	mg/l	28.3	14.2	21.2	21.2	28.3	21.2	28.3	14.2	21.2
Ca^{2+}	mg/l	60.1	60.1	66.1	66.1	60.1	60.1	85.1	62.1	62.1
Mg^{2+}	mg/l	14.6	17.0	13.4	13.4	14.6	14.6	15.8	14.6	14.6
m-Alkalinity	mval/l	3.0	2.8	3.2	2.8	3.0	2.6	3.0	3.0	2.8
HCO_3^-	mg/l	183.0	170.8	195.2	170.8	183.0	158.6	183.0	183.0	170.8
Permanent hardness	^0G	3.4	4.5	3.4	4.3	3.4	4.5	3.4	3.7	4.3
Temporary hardness	^0G	8.4	7.8	8.9	7.8	8.4	7.3	8.4	8.4	7.8
Total hardness	^0G	11.8	12.3	12.3	12.1	11.8	11.8	11.8	12.1	12.1

Table A.4.1.3-4. Values of physical and chemical indicators in the Danube water, May 2003

Indicator	Unit	Sections								
		C3	C10	C7	C7'	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	20.6	21.2	28.7	29.1	28.4	21.1	22.8	21.5	21.4
pH	-	8.3	8.3	8.0	8.2	8.3	8.3	8.2	8.1	8.3
Dissolved O_2	mgO_2/l	11.2	11.6	8.0	8.2	8.3	11.2	10.6	11.3	11.5
Saturation of O_2	%	126.4	132.5	105.9	108.1	107.9	127.7	125.7	129.5	131.4
BOD_5	mgO_2/l	4.9	5.3	3.1	3.5	3.4	5.0	4.9	5.4	5.4
COD-Mn	mgO_2/l	7.8	6.6	6.8	6.8	6.7	6.8	6.8	7.7	8.4
NH_4^+ ($N-NH_4^+$)	mgN/l	0.110	0.060	0.100	0.060	0.042	0.150	0.120	0.063	0.055
NO_2^- ($N-NO_2^-$)	mgN/l	0.430	0.022	0.018	0.020	0.035	0.051	0.020	0.019	0.023
NO_3^- ($N-NO_3^-$)	mgN/l	0.120	1.100	1.350	1.290	1.310	1.370	1.320	1.180	1.210
Total mineral N	mgN/l	0.660	1.182	1.468	1.370	1.387	1.571	1.460	1.262	1.288
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.099	0.099	0.021	0.143	0.069	0.071	0.165	0.162	0.110
Total P	mgP/l	0.188	0.163	0.037	0.250	0.121	0.127	0.273	0.286	0.195
Conductivity at 25^0C	µS/cm	423	420	423	410	418	417	414	470	424
Cl^-	mg/l	21.2	28.3	24.2	21.2	28.3	21.2	24.2	28.3	21.2
Ca^{2+}	mg/l	42.1	36.0	42.1	38.1	30.0	36.0	50.0	48.0	52.1
Mg^{2+}	mg/l	20.6	23.1	18.2	20.6	25.4	21.8	12.1	19.4	13.3
m-Alkalinity	mval/l	3.2	2.6	2.8	2.6	2.8	2.6	2.8	2.8	2.8
HCO_3^-	mg/l	195.2	158.6	170.8	158.6	170.8	158.6	170.8	170.8	170.8
Permanent hardness	^0G	1.8	3.2	2.3	2.9	2.3	2.9	2.0	3.4	2.6
Temporary hardness	^0G	8.9	7.2	7.8	7.2	7.8	7.2	7.8	7.8	7.8
Total hardness	^0G	10.7	10.4	10.1	10.1	10.1	10.1	9.8	11.2	10.4

Table A.4.1.3-5. Values of physical and chemical indicators in the Danube water, June 2003

Indicator	Unit	Section							
		C3	C10	C7	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	26.4	26.7	27.9	27.0	26.7	27.0	26.7	26.7
pH	-	8.2	8.2	8.0	8.0	8.0	8.1	8.1	8.2
Dissolved O_2	mgO_2/l	10.2	10.0	9.6	10.0	10.2	9.6	10.3	10.5
Saturation of O_2	%	128.1	126.8	122.9	127.6	128.6	121.7	130.1	132.4
BOD_5	mgO_2/l	4.9	4.5	4.1	4.8	5.0	4.9	5.4	5.4
COD-Mn	mgO_2/l	7.8	7.6	6.8	7.7	7.8	7.8	7.7	8.4
NH_4^+ ($N-NH_4^+$)	mgN/l	0.150	0.080	0.110	0.120	0.150	0.120	0.083	0.110
NO_2^- ($N-NO_2^-$)	mgN/l	0.051	0.049	0.550	0.043	0.050	0.047	0.037	0.047
NO_3^- ($N-NO_3^-$)	mgN/l	1.578	1.785	1.742	1.686	1.726	1.685	1.674	1.643
Total mineral N	mgN/l	1.779	1.914	2.402	1.849	1.926	1.852	1.794	1.800
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.097	0.086	0.099	0.073	0.068	0.086	0.071	0.082
Total P	mgP/l	0.168	0.276	0.163	0.215	0.186	0.173	0.178	0.154
Conductivity at 25^0C	µS/cm	423	420	423	418	417	414	470	424
Cl^-	mg/l	28.4	28.3	24.9	28.3	28.4	28.4	24.9	28.3
Ca^{2+}	mg/l	42.1	42.1	42.1	44.0	46.0	46.0	48.0	52.1
Mg^{2+}	mg/l	20.6	21.8	18.2	19.4	21.8	18.2	19.4	14.1
m-Alkalinity	mval/l	3.2	2.8	2.8	2.8	2.6	2.8	2.8	2.8
HCO_3^-	mg/l	195.2	170.8	170.8	170.8	158.6	170.8	170.8	170.8
Permanent hardness	^0G	1.8	1,5	2.3	2.3	2.9	2.0	3.4	2.5
Temporary hardness	^0G	8.9	7.8	7.8	7.8	7.2	7.8	7.8	7.8
Total hardness	^0G	10.7	9.3	10.1	10.1	10.1	9.8	11.2	10.3

Table A.4.1.3-6. Values of physical and chemical indicators in the Danube water, July 2003

Indicator	Unit	Sections						
		C3	C10	C7	C7'	C11	C11'	**C12**
Temperature	^0C	24.6	24.5	32.8	32.5	32.4	24.4	-
pH	-	7.5	7.5	7.0	7.5	8.0	8.0	8.0
Dissolved O_2	mgO_2/l	10.0	10.7	8.0	8.1	9.1	10.3	10.0
Saturation of O_2	%	121.8	129.4	107.6	109.2	122.7	124.8	-
BOD_5	mgO_2/l	4.1	4.4	4.8	6.0	4.2	5.2	3.7
COD-Mn	mgO_2/l	6.6	6.7	7.2	6.5	11.6	12.2	6.4
NH_4^+ ($N-NH_4^+$)	mgN/l	0.044	0.078	0.163	0.069	0.088	0.075	0.088
NO_2^- ($N-NO_2^-$)	mgN/l	0.013	0.014	0.021	0.019	0.021	0.016	0.019
NO_3^- ($N-NO_3^-$)	mgN/l	0.320	0.730	0.720	0.720	0.770	0.750	0.680
Total mineral N	mgN/l	0.377	0.822	0.904	0.808	0.771	0.841	0.787
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.548	0.552	0.902	0.224	0.579	0.532	0.356
Total P	mgP/l	0.622	0.601	0.935	0.304	0.632	0.599	0.410
Conductivity at 25^0C	µS/cm	381	377	381	384	379	378	381
Cl^-	mg/l	42.5	49.6	49.6	42.5	4.6	42.5	35.4
SO_4^{2-}	mg/l	23.50	26.88	28.01	26.88	26.88	28.01	25.76
Ca^{2+}	mg/l	44.0	46.0	46.0	42.0	44.0	44.0	46.0
Mg^{2+}	mg/l	12.2	10.9	10.9	13.4	10.9	13.3	10.9
m-Alkalinity	mval/l	2.4	2.4	2.6	2.8	2.6	2.4	2.6
HCO_3^-	mg/l	146.4	146.4	158.6	170.8	158.6	146.4	158.6
Permanent hardness	^0G	2.6	2.3	1.7	1.1	1.4	2.6	2.0
Temporary hardness	^0G	6.7	6.7	7.3	7.8	7.3	6.7	7.3
Total hardness	^0G	9.3	9.0	9.0	8.9	8.7	9.3	9.3

Table A.4.1.3-7. Values of physical and chemical indicators in the Danube water, October 2003

Indicator	Unit	Section							
		C3	C10	C7	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	15.0	15.1	23.7	23.5	15.1	16.6	16.7	16.4
pH	-	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Dissolved O_2	mgO_2/l	9.4	8.8	6.2	8.5	8.9	8.8	8.7	8.7
Saturation of O_2	%	93.7	87.9	73.9	103.6	88.9	90.8	89.9	89.4
BOD_5	mgO_2/l	1.6	1.1	1.2	1.5	1.6	1.7	1.3	1.7
COD-Mn	mgO_2/l	2.7	2.6	2.6	2.5	2.5	2.1	2.6	2.7
NH_4^+ ($N-NH_4^+$)	mgN/l	0.110	0.090	0.120	0.095	0.080	0.080	0.070	0.050
NO_2^- ($N-NO_2^-$)	mgN/l	0.016	0.014	0.018	0.019	0.017	0.017	0.015	0.016
NO_3^- ($N-NO_3^-$)	mgN/l	1.340	1.190	1.290	1.220	1.260	1.290	1.260	1.370
Total mineral N	mgN/l	1.466	1.294	1.428	1.334	1.357	1.387	1.345	1.436
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.089	0.093	0.098	0.088	0.100	0.091	0.094	0.098
Total P	mgP/l	0.179	0.193	0.192	0.154	0.214	0.196	0.188	0.193
Cl^-	mg/l	70.9	63.8	56.8	56.7	63.8	63.8	56.7	63.8
Ca^{2+}	mg/l	102.2	100.2	98.2	96.2	102.2	94.2	98.2	96.2
Mg^{2+}	mg/l	30.4	29.2	30.4	32.8	29.2	32.8	30.4	32.8
m-Alkalinity	mval/l	2.8	2.6	2.8	2.6	3.0	2.8	2.6	2.6
HCO_3^-	mg/l	170.8	158.6	170.8	158.6	183.0	170.8	158.6	158.6
Permanent hardness	^0G	13.5	13.4	12.9	13.7	12.6	12.9	13.4	13.7
Temporary hardness	^0G	7.8	7.3	7.8	7.3	8.4	7.8	7.3	7.3
Total hardness	^0G	21.3	20.7	20.7	21.0	21.0	20.7	20.7	21.0

Table A.4.1.3-8. Values of physical and chemical indicators in the Danube water, January 2004

Indicator	Unit	Section							
		C3	C10	C7	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	0.1	0.2	22.0	7.5	0.2	3.5	2.1	0.1
Dissolved O_2	mgO_2/l	12.2	12.4	9.0	11.0	12.4	10.3	12.1	12.4
Saturation of O_2	%	83.5	85.1	103.8	91.7	85.1	92.7	89.8	84.8
BOD_5	mgO_2/l	1.2	1.2	1.1	1.8	3.6	1.7	4.0	4.4
COD-Mn	mgO_2/l	3.7	19.5	3.2	3.2	3.1	3.0	3.2	3.1
NH_4^+ ($N-NH_4^+$)	mgN/l	0.326	0.022	0.234	0.234	0.272	0.243	0.276	0.416
NO_2^- ($N-NO_2^-$)	mgN/l	0.009	0.076	0.019	0.022	0.015	0.019	0.015	0.016
NO_3^- ($N-NO_3^-$)	mgN/l	1.750	1.270	1.700	1.680	1.510	1.720	1.820	1.770
Total mineral N	mgN/l	2.085	1.368	1.953	1.936	1.797	1.982	2.111	2.202
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.056	0.017	0.099	0.067	0.063	0.087	0.084	0.082
Total P	mgP/l	0.110	0.031	0.202	0.127	0.117	0.170	0.172	0.161
Cl^-	mg/l	77.9	70.9	63.8	63.8	63.8	70.9	63.8	70.9
SO_4^{2-}	mg/l	26.88	28.20	26.88	23.50	25.75	25.75	24.62	24.62
Ca^{2+}	mg/l	152.3	158.3	154.3	152.3	140.3	104.3	14.2	140.3
Mg^{2+}	mg/l	24.3	58.36	17.0	19.4	29.2	24.3	31.6	26.7
m-Alkalinity	mval/l	3.4	3.2	3.4	3.4	3.2	3.2	3.2	3.0
HCO_3^-	mg/l	207.4	195.2	207.4	207.4	195.2	195.2	195.2	183.0
Permanent hardness	^0G	17.4	26.7	16.0	16.3	17.5	16.3	18.3	17.4
Temporary hardness	^0G	9.5	8.9	9.5	9.5	8.9	8.9	8.9	8.4
Total hardness	^0G	36.9	35.6	25.5	25.8	26.4	25.2	27.2	25.8

Table A.4.1.3-9. Values of physical and chemical indicators in the Danube water, February 2004

Indicator	Unit	**Section**								
		C3	C10	C7	C7'	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	1.4	1.7	20.8	20.1	13.0	1.8	5.2	2.6	3.7
Dissolved O_2	mgO_2/l	10.6	10.8	8.4	8.1	9.0	10.8	10.1	10.5	10.3
Saturation of O_2	%	71.1	77.2	84.5	88.1	85.7	77.4	79.4	77.2	77.9
BOD_5	mgO_2/l	2.1	1.9	1.6	1.2	2.1	2.0	1.7	1.8	1.4
COD-Mn	mgO_2/l	3.4	3.5	3.0	2.7	1.9	2.5	2.7	4.4	3.5
NH_4^+ ($N-NH_4^+$)	mgN/l	0.290	0.310	0.260	0.199	0.330	0.210	0.260	0.210	0.200
NO_2^- ($N-NO_2^-$)	mgN/l	0.020	0.019	0.040	0.041	0.031	0.020	0.020	0.019	0.019
NO_3^- ($N-NO_3^-$)	mgN/l	1.520	1.140	1.360	1.490	1.790	1.500	1.580	1.570	1.620
Total mineral N	mgN/l	1.830	1.469	1.660	1.730	2.151	1.730	1.860	1.799	1.839
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.073	0.071	0.072	0.084	0.089	0.074	0.079	0.083	0.076
Total P	mgP/l	0.120	0.117	0.129	0.138	0.149	0.123	0.134	0.141	0.143
Cl^-	mg/l	70.9	63.9	56.7	70.9	56.7	63.9	77.9	70.9	63.9
SO_4^{2-}	mg/l	26.9	24.6	24.6	23.5	23.5	23.5	20.3	21.4	23.5
Ca^{2+}	mg/l	134.2	132.3	134.2	136.2	140.2	138.2	140.2	140.2	138.2
Mg^{2+}	mg/l	37.7	29.2	25.2	24.3	25.5	26.7	23.1	24.3	23.1
m-Alkalinity	mval/l	2.2	2.0	2.4	2.0	2.4	2.2	2.0	2.4	2.2
HCO_3^-	mg/l	134.2	122.0	146.4	122.0	146.4	134.2	122.0	146.4	134.2
Permanent hardness	^0G	21.3	19.8	17.9	19.1	18.7	18.7	18.7	18.4	18.5
Temporary hardness	^0G	6.2	5.6	6.7	5.6	6.7	6.2	5.6	6.7	6.2
Total hardness	^0G	27.5	25.4	24.6	24.7	25.4	24.9	24.3	25.1	24.7

Table A.4.1.3-10. Values of physical and chemical indicators in the Danube water, April 2004

Indicator	Unit	Section								
		C3	C10	C7	C7'	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	10.7	11.0	19.0	20.2	16.1	11.4	12.6	12.0	11.7
Dissolved O_2	mgO_2/l	7.0	7.2	6.7	6.5	6.8	7.2	7.1	7.0	7.0
Saturation of O_2	%	158.3	152.7	137.5	138.1	143.9	151.3	149.3	153.5	154.5
BOD_5	mgO_2/l	1.9	1.7	1.4	1.5	1.6	1.8	1.9	1.8	1.9
COD-Mn	mgO_2/l	2.5	3.3	2.8	2.7	2.5	3.0	2.3	3.0	2.4
NH_4^+ ($N-NH_4^+$)	mgN/l	0.008	0.118	0.000	0.170	0.000	0.000	0.000	0.007	0.008
NO_2^- ($N-NO_2^-$)	mgN/l	0.004	0.003	0.005	0.016	0.005	0.001	0.000	0.001	0.000
NO_3^- ($N-NO_3^-$)	mgN/l	2.100	2.040	1.410	1.870	2.000	2.000	1.730	1.960	1.710
Total mineral N	mgN/l	2.112	2.161	1.415	2.056	2.005	2.001	1.730	1.968	1.718
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.055	0.074	0.020	0.062	0.020	0.039	0.049	0.056	0.019
Total P	mgP/l	0.103	0.141	0.042	0.117	0.038	0.076	0.092	0.108	0.042
Cl^-	mg/l	56.7	56.7	49.7	56.7	56.7	56.7	49.7	49.7	56.7
SO_4^{2-}	mg/l	24.6	18.2	17.3	22.4	20.3	23.5	23.5	24.6	23.5
Ca^{2+}	mg/l	62.1	64.1	62.1	58.1	58.1	60.1	60.1	62.1	60.1
Mg^{2+}	mg/l	14.6	10.9	12.2	14.6	13.4	13.4	10.9	10.9	12.2
m-Alkalinity	mval/l	3.4	3.2	3.2	2.8	3	3	2.8	3.0	2.8
HCO_3^-	mg/l	207.4	195.2	195.2	170.8	183.0	183.0	170.8	183.0	170.8
Permanent hardness	^0G	3.1	2.5	2.5	3.7	2.8	2.8	3.1	2.8	3.4
Temporary hardness	^0G	9.5	9.0	9.0	7.8	8.4	8.4	7.8	8.4	7.8
Total hardness	^0G	12.6	11.5	11.5	11.5	11.2	11.2	10.9	11.2	11.2

Table A.4.1.3-11. Values of physical and chemical indicators in the Danube water, May 2004

Indicator	Unit	Section								
		C3	C10	C7	C7'	C11	C11'	**C12**	C13	**C14**
Temperature	^0C	17.7	18.4	26.0	26.3	24.7	18.3	19.3	18.4	18.1
Dissolved O_2	mgO_2/l	15.6	13.4	10.8	11.9	10.7	10.8	11.8	13.4	15.1
Saturation of O_2	%	164.9	143.7	134.6	149.1	130.1	115.6	128.9	143.7	160.9
COD-Mn	mgO_2/l	3.1	3.8	3.1	3.7	3.4	2.9	3.7	3.3	3.0
NH_4^+ ($N-NH_4^+$)	mgN/l	0.064	0.102	0.113	0.039	0.133	0.096	0.021	0.192	0.009
NO_2^- ($N-NO_2^-$)	mgN/l	0.140	0.078	0.010	0.060	0.063	0.066	0.022	0.028	0.075
NO_3^- ($N-NO_3^-$)	mgN/l	2.140	2.110	1.570	1.900	2.070	2.130	1.950	2.020	1.860
Total mineral N	mgN/l	2.344	2.290	1.693	1.999	2.266	2.292	1.993	2.240	1.944
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.035	0.039	0.043	0.036	0.014	0.025	0.004	0.017	0.003
Total P	mgP/l	0.068	0.082	0.079	0.075	0.026	0.052	0.010	0.035	0.007
Cl^-	mg/l	49.6	63.8	56.7	49.6	63.8	56.7	49.6	56.7	56.7
SO_4^{2-}	mg/l	22.4	24.5	24.6	22.4	22.4	23.5	20.3	21.4	20.3
Ca^{2+}	mg/l	54.1	53.1	52.1	54.1	54.1	54.1	52.1	54.1	52.1
Mg^{2+}	mg/l	9.7	10.3	13.4	10.9	12.2	12.2	12.2	12.2	12.2
m-Alkalinity	mval/l	2.8	2.8	2.6	2.8	2.6	2.8	2.6	2.8	2.6
HCO_3^-	mg/l	170.8	170.8	158.6	170.8	158.6	170.8	158.6	170.8	158.6
Permanent hardness	^0G	2.0	2.0	3.1	2.3	3.1	2.5	2.8	2.5	2.8
Temporary hardness	^0G	7.8	7.8	7.3	7.8	7.3	7.8	7.3	7.8	7.3
Total hardness	^0G	9.8	9.8	10.4	10.1	10.4	10.5	10.1	10.3	10.1

Table A.4.1.3-12. Values of physical and chemical indicators in the Danube water, October 2004

Indicator	Unit	Section						
		C3	C7	C7'	C11	C11'	C12	C14
Temperature	^0C	14.4	23.1	21.8	17	14.8	15.3	15.4
Dissolved O_2	mgO_2/l	9.1	8.8	8.5	8.9	9.1	8.8	9.0
Saturation of O_2	%	89	103	97	92	84	88	90
BOD_5	mgO_2/l	5.40	5.64	5.52	5.44	6.04	7.59	5.98
COD-Mn	mgO_2/l	3.2	3.1	2.8	2.5	2.9	2.7	2.7
NH_4^+ ($N-NH_4^+$)	mgN/l	0.088	0.091	0.085	0.290	0.137	0.237	0.060
NO_2^- ($N-NO_2^-$)	mgN/l	0.008	0.008	0.019	0.096	0.010	0.012	0.006
NO_3^- ($N-NO_3^-$)	mgN/l	2.036	1.372	1.705	1.821	1.935	1.613	1.532
Total mineral N	mgN/l	2.131	1.471	1.809	2.207	2.087	1.862	1.598
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.092	0.074	0.071	0.102	0.083	0.087	0.061
Total P	mgP/l	0.172	0.139	0.117	0.191	0.156	0.144	0.114
SO_4^{2-}	mg/l	23.5	22.4	21.4	23.5	23.5	24.6	23.5
Ca^{2+}	mg/l	50.1	50.1	52.0	52.1	52.1	50.1	48.1
Mg^{2+}	mg/l	12.6	12.6	10.9	9.7	10.9	12.6	13.4
m-Alkalinity	mval/l	3.0	3.0	2.8	2.8	3.0	2.8	3.0
HCO_3^-	mg/l	183.0	183.0	170.8	170.8	183.0	170.0	183.0
Permanent hardness	^0G	1.13	1.41	1.97	1.69	1.41	2.25	1.41
Temporary hardness	^0G	8.40	8.40	7.84	7.84	8.40	7.84	8.40
Total hardness	^0G	9.53	9.81	9.81	9.53	9.81	10.09	9.81

Table A.4.1.3-13. Values of physical and chemical indicators in the Danube water, November 2004

Indicator	Unit	Section						
		C3	C7	C7'	C11	C11'	C12	C14
Temperature	^0C	8.1	15.8	15.8	14.8	8.3	10.3	8.1
Dissolved O_2	mgO_2/l	8.8	8.2	8.1	8.2	8.8	8.6	8.8
Saturation of O_2	%	74	83	82	81	74	76	108
BOD_5	mgO_2/l	2.68	1.84	1.14	1.84	1.76	1.32	1.76
COD-Mn	mgO_2/l	3.4	2.8	2.1	2.1	2.5	2.5	2.7
NH_4^+ ($N-NH_4^+$)	mgN/l	0.079	0.079	0.070	0.050	0.044	0.045	0.034
NO_2^- ($N-NO_2^-$)	mgN/l	0.019	0.012	0.016	0.026	0.018	0.018	0.021
NO_3^- ($N-NO_3^-$)	mgN/l	1.41	1.47	1.31	1.37	1.36	1.37	1.40
Total mineral N	mgN/l	1.50	1.56	1.39	1.44	1.42	1.43	1.45
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.081	0.089	0.081	0.091	0.069	0.092	0.068
Total P	mgP/l	0.174	0.192	0.179	0.196	0.145	0.198	0.146
Conductivity at 20^0C	µS/cm	90.3	89.8	89.9	89.7	88.8	89.3	89.2
Cl^-	mg/l	49.63	42.54	42.54	42.54	49.63	49.63	42.54
SO_4^{2-}	mg/l	25.76	24.63	26.88	24.63	22.37	24.63	23.50
Ca^{2+}	mg/l	54.10	52.10	50.10	52.11	54.10	52.10	50.10
Mg^{2+}	mg/l	17.24	18.24	20.67	20.67	17.02	18.72	17.02
m-Alkalinity	mval/l	2.8	3.0	3.2	2.8	3.0	2.8	3.0
HCO_3^-	mg/l	170.8	183.0	195.2	170.8	183.0	170.8	183.0
Permanent hardness	^0G	3.66	3.66	3.38	3.38	3.10	3.38	2.50
Temporary hardness	^0G	7.84	8.40	8.96	7.84	8.40	7.84	8.40
Total hardness	^0G	11.50	12.06	12.34	11.22	11.50	11.22	10.90

Table A.4.1.3-14. Values of physical and chemical indicators in the Danube water, August 2006

Saligny bridge (C3) control section		
Indicator	Unit	Concentration
N-NH_4	mg/l N	0.035
N-NO_2	mg/l N	0.0075
N-NO_3	mg/l N	0.758
P-PO_4	mg/l P	0.089
Total P	mg/l P	0.172
COD-Mn	mg/l O_2	4.04
Seimeni canal (C7) control section		
Indicator	Unit	Concentration
N-NH_4	mg/l N	0.049
N-NO_2	mg/lN	0.019
N-NO_3	mg/l N	0.822
P-PO_4	mg/l P	0.090
Total P	mg/l P	0.436
COD-Mn	mg/l O_2	3.15
Danube km 293 + 500 (C12) control section		
Indicator	Unit	Concentration
N-NH_4	mg/l N	0.013
N-NO_2	mg/lN	0.0024
N-NO_3	mg/l N	0.774
P-PO_4	mg/l P	0.062
Total P	mg/l P	0.340
COD-Mn	mg/l O_2	3.01

Table A.4.1.3-15. Values of microbiological indicators in the Danube water in 2001

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^0C No. UFC/cm^3
C3	July	95	60	absent	1300
	August	41	34	absent	1080
	Average	*68*	*47*	absent	*1190*
C10	July	350	6	absent	530
	August	700	210	absent	1500
	Average	*525*	*108*	absent	*1015*
C7'	July	10 200	330	absent	850
	August	40	40	absent	500
	Average	*5120*	*185*	absent	*675*
C7	July	700	6	absent	1000
	August	40	40	absent	2000
	Average	*370*	*23*	absent	*1500*
C11	July	3500	3500	absent	800
	August	10200	4300	absent	2700
	Average	*6850*	*3900*	absent	*1750*
C11'	July	240	14	absent	600
	August	56	20	absent	1700
	Average	*148*	*17*	absent	*1150*
C12	July	350	48	absent	400
	August	12	12	absent	400
	Average	*181*	*30*	absent	*400*
C13	July	350	170	absent	530
	August	9200	430	absent	1500
	Average	*4775*	*300*	absent	*1015*

Table A.4.1.3-16. Values of microbiological indicators in the Danube water in April, May, June, July, October 2003 and January, February 2004

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^0C No. UFC/cm^3
C3	April 2003	82	4	absent	290
	May 2003	130	11	absent	250
	June 2003	49	4	absent	850
	July 2003	22	2	absent	820
	October 2003	70	11	absent	790
	January 2004	49	230	78	420
	February 2004	70	9	7	650
	Average	*67*	*39*	*absent*	*580*
C10	April 2003	23	2	absent	30
	May 2003	350	110	absent	80
	June 2003	49	11	absent	210
	July 2003	6	4	absent	60
	October 2003	95	14	absent	190
	January 2004	330	170	78	210
	February 2004	95	6	absent	70
	Average	*136*	*45*	*absent*	*120*
C7	April 2003	70	14	absent	150
	May 2003	540	46	absent	330
	July 2003	170	9	absent	330
	October 2003	350	33	absent	270
	January 2004	1100	110	4	280
	February 2004	70	4	2	130
	Average	*380*	*25*	*absent*	*250*
C7’	April 2003	70	11	absent	100
	May 2003	540	110	absent	380
	June 2003	130	14	absent	210
	July 2003	140	6	absent	290
	October 2003	70	11	absent	790
	February 2004	46	4	absent	350
	Average	*166*	*26*	*absent*	*350*

Table A.4.1.3-16. (continued)

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^{0}C No. UFC/cm^3
C11	April 2003	70	11	absent	200
	May 2003	350	33	absent	310
	June 2003	23	7	absent	180
	July 2003	110	22	absent	230
	October 2003	130	24	absent	240
	January 2004	3500	220	20	220
	February 2004	11	9	absent	180
	Average	599	326	absent	220
C11’	April 2003	49	4	2	30
	May 2003	240	130	absent	80
	June 2003	49	7	absent	210
	July 2003	23	absent	absent	60
	October 2003	140	21	absent	190
	January 2004	3500	140	20	210
	February 2004	11	2	absent	70
	Average	570	29	absent	120
C12	April 2003	700	45	absent	1800
	May 2003	2400	60	absent	2350
	June 2003	700	140	absent	4800
	July 2003	700	60	absent	6000
	October 2003	950	130	absent	3900
	January 2004	13000	780	200	1600
	February 2004	1400	140	20	1100
	Average	2800	190	absent	3070
C13	April 2003	330	78	absent	1840
	May 2003	1700	110	absent	2190
	June 2003	2400	170	absent	1680
	October 2003	1500	170	absent	1900
	January 2004	7000	1400	400	3500
	February 2004	460	78	45	1450
	Average	2230	330	absent	2000

Table A.4.1.3-16. (continued)

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^0C No. UFC/cm^3
C14	April 2003	490	130	20	1500
	May 2003	2400	140	absent	2850
	June 2003	1300	140	absent	3500
	July 2003	-	-	-	-
	October 2003	1700	230	absent	3100
	January 2004	35000	2700	450	1600
	February 2004	1100	60	20	nedeterminat
	Average	*8500*	*560*	*>100*	*2500*

Table A.4.1.3-17. Values of microbiological indicators in the Danube water in April and May 2004

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^0C No. UFC/cm^3
C3	April	1600	26	absent	280
	May	540	33	2	140
	Average	*1000*	*30*	*2*	*210*
C10	April	140	26	absent	280
	May	350	22	absent	130
	Average	*250*	*24*	absent	*200*
C7’	April	3500	26	2	220
	May	920	6	absent	170
	Average	*2200*	*16*	2	*195*
C7	May	1600	40	2	250
	Average	*1600*	*40*	*2*	*250*
C11	April	540	110	2	230
	May	1600	220	2	290
	Average	*1070*	*165*	*2*	*260*
C11’	April	70	11	absent	190
	May	1600	47	absent	220
	Average	*835*	*30*	*absent*	*205*
C12	April	9200	330	absent	290
	May	350	27	2	80
	Average	*5000*	*180*	*2*	*185*
C13	April	1400	11	absent	190
	May	490	13	absent	100
	Average	*950*	*12*	*absent*	*145*
C14	April	9200	330	absent	300
	May	240	22	absent	120
	Average	*4700*	*180*	*absent*	*210*

Annex A.4.1.4

Results of biological analyses of water samples from the Danube

(Annex to Chapter 4.1.4)

Table A.4.1.4-1. Structure of communities of benthonic macro-inevertebrates in sections along the Lower Danube, in 1996 - 1997

Identified taxons	Km 1071	Km 945	Km 859	Km 836	Km 435	Km 244	Km 157	Mile 71
Porifera	-	-	-	-	-	1	1	-
Gasteropoda	14	8	6	4	7	6	3	5
Bivalvia	3	2	2	1	2	3	2	2
Oligochaeta	2	2	1	2	1	3	2	2
Polychaeta	-	-	-	-	-	1	1	-
Hirudinea	2	2	1	-	1	2	-	2
Amphipoda	2	1	2	3	1	2	1	1
Decapoda	1	-	-	-	1	-	-	-
Ephemeroptera	-	-	-	-	-	1	-	-
Odonata	-	-	-	-	-	2	1	-
Coleoptera	-	-	-	-	-	1	1	-
Trichoptera	1	-	-	-	1	-	1	-
Diptera	2	1	1	1	1	1	1	2
Total number of taxons	27	16	13	11	15	23	14	14

Table A.4.1.4-2. Structure of communities of benthonic macro-inevertebrates in sections along the Lower Danube, in July - August 1999

Identified taxons	Km 1071	Km 945	Km 867	Km 859	Km 836	Km 435	Km 244	Km 157	Mile 71
Gasteropoda	11	6	12	6	4	5	9	7	3
Bivalvia	3	4	3	2	3	2	1	2	3
Nematoda	-	-	-	-	-	-	1	1	-
Oligochaeta	1	2	2	3	1	4	2	1	2
Hirudinea	2	-	-	-	-	1	-	1	-
Amphipoda	1	1	1	1	1	3	1	1	1
Decapoda	1	-	-	-	-	-	-	-	-
Mysidacea	1	-	-	-	-	-	-	-	-
Ephemeroptera	1	-	1	-	-	-	1	-	-
Odonata	1	-	1	-	-	-	1	-	-
Heteroptera	1	-	-	-	-	-	1	-	-
Coleoptera	-	-	-	-	-	-	-	1	-
Trichoptera	-	-	1	-	-	-	-	1	-
Diptera	2	2	2	1	1	1	2	1	1
Bryozoa	-	-	-	-	-	-	1	-	-
Total number of taxons	25	15	23	13	10	16	20	16	10

Table A.4.1.4-3. Phytoplankton numerical density (thousand cell/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in the summer of 2001

Section	Total density (thousand cell/l)	Systematic groups									
		Cyanophyta		*Bacillariophyta*		*Euglenophyta*		*Pyrrophyta*		*Chlorophyta*	
		Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%
C3-July	5 000	0	0	3 200	64.0	0	0	0	0	1 800	36.0
C10-July	5 000	0	0	1 200	24 .0	0	0	0	0	3 800	76.0
C7-July	7 000	5 000	71.43	1 000	14.29	0	0	0	0	1 000	14.29
C7-August	1 800	0	0	1 200	66.67	0	0	0	0	600	33.33
C 7'- July	1 000	0	0	1 000	100.0	0	0	0	0	0	0
C7'¯August	7 167	0	0	2 834	39.54	0	0	0	0	4 333	60.46
C11-July	8 250`	0	0	8 250	100.0	0	0	0	0	0	0
C11.August	2 200	0	0	2 200	100.0	0	0	0	0	0	0
C11'-July	4 750	1 750	36.84	875	18.42	0	0	0	0	2 125	44.74
C11'-August	9 833	5 333	54.24	2 500	25.42	0	0	0	0	2 000	20.34
C12-July	2 857	1 714	59.99	857	29.99	0	0	143	5.01	143	5.01
C13-July	6 500	1 333	20.51	2 333	35.89	0	0	0	0	2.834	43.6

Table A.4.1.4-4. **Phytoplankton biomass (mg/l) and biomass abundance (%) in the Danube, in the summer of 2001**

Section	Total biomass (mg/l)	Systematic groups									
		Cyanophyta		*Bacillariophyta*		*Euglenophyta*		*Pyrrophyta*		*Chlorophyta*	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3-July	4.36	0	0	2.7	61.93	0	0	0	0	1.66	38.07
C10-July	3	0	0	0.9	42.86	0	0	0	0	1.2	57.14
C7-July	1.3	0.3	23.08	0.7	53.85	0	0	0	0	0.3	23.03
C7-August	1.7	0	0	1.0	58.82	0	0	0	0	0.7	41.18
C7'-July	0.8	0	0	0.8	100.0	0	0	0	0	0	0
C7'-August	5.2	0	0	2.1	40.3	0	0	0	0	3.1	59.62
C11-July	6.1	0	0	6.1	100.0	0	0	0	0	0	0
C11-August	1.6	0	0	1.6	100.0	0	0	0	0	0	0
C11'-July	2.34	0.09	3.85	0.7	29.91	0	0	0	0	1.55	66.24
C11'-August	3.3	0.3	9.09	1.8	54.55	0	0	0	0	1.2	36.36
C12-July	3.6	0.09	2.5	0.6	16.67	0	0	2.9	80.56	0.01	0.27
C13-July	2.77	0.07	2.53	1.68	60.65	0	0	0	0	1.02	36.82

Table A.4.1.4-5. Zooplankton numerical density (number/l) and density abundance (%) in the Danube, in the summer of 2001

Section	Total density (no./l)	Systematic groups							
		Rotatoria		*Copepoda*		*Cladocera*		*Lamelibranchiata*	
		no./l	%	no./l	%	no./l	%	no./l	%
C3-July	44	3	6.7	20	46.1	1	2.32	19	44.18
C10-July	19	5	26.1	2	10.2	2	10..52	10	52.63
C7-July	51	15	29.1	7	13.2	4	7.84	25	49.01
C7-August	17	3	17.4	2	11.7	4	23.53	8	47.06
C7'-July	10	1	10.0	4	40.0	0	0	5	50.0
C7'-August	22	5	22.2	2	9.o9	2	9.09	13	59.09
C11-July	19	2	10.3	3	15.8	3	15.79	11	57.89
C11-August	12	3	25.0	1	8.33	3	25.0	5	41.66
C11'-July	23	2	8.7	2	8.7	5	21.73	14	60.86
C11'-August	26	5	19.3	0	0	3	11.53	18	69.23
C12-July	36	0	0	8	22.22	0	0	28	77.77
C13-July	26	1	3.4	5	19.23	2	7.69	18	69.23

Table A.4.1.4-6. Zooplankton biomass (mg/l) and biomass abundance (%) in the Danube, in the summer of 2001

Section	Total biomass (mg/l)	Systematic groups							
		Rotatoria		*Copepoda*		*Cladocera*		*Lamelibranchiata*	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3 July	1.01	0.004	0.4	1	9.9	0.01	0.99	0.004	0.4
C10 July	0.142	0.01	7.04	0.1	70.42	0.03	21.13	0.002	1.4
C7-July	0.57	0.02	3.5	0.5	87.71	0.05	9.8	0.005	0.1
C7-August	0.15	0.006	0.01	0.01	66.66	0.05	33.33	0.002	0
C7'-July	0.3	0.0003	0.1	0.3	99.66	0	0	0.001	0.33
C7'-August	0.9	0.009	0	0.1	11.11	0.8	88.88	0.006	0
C11-July	0.246	0.004	1.62	0.2	81.3	0.04	16.26	0.002	0.81
C11-August	0.887	0.006	0.68	0.7	7.89	0.81	91.31	0.001	011
C11'-July	0.584	0.004	0.68	0.45	77.05	0.1	17.12	0.03	5.14
C11'-August	0.054	0.01	18.52	0	0	0.04	74.04	0.004	7.4
C12 July	0.506	0	0	0.5	98.81	0	0	0.006	1.18
C13 July	0.336	0.002	0.6	0.3	89.28	0.03	8.92	0.004	1.19

Table A.4.1.4-7. List of phytoplankton taxons in the Danube, in the summer of 2001

Systematic groups/ species	Saprobe category	Dominant forms	Section							
			C3	C10	C7	C7’	C11	C11’	C12	C13
Cyanophyta										
Dacylococcopsis irregularis								+		
Lyngbia sp.								+		
Oscillatoria tenuissima	β - mezo						+			
Microcystis sp.								+		
Merismopedia glauca										+
Bacillariophyta										
Cyclotella glomerata		*Cyclotella glomerata*	+	+	+	+	+	+	+	+
Cyclotella meneghiniana	α - mezo	*Cyclotella meneghiniana*		+	+	+	+	+		+
Cymbella sp.			+							
Fragilaria crotonensis	β - mezo			+						
Gomphonema acuminatum	o						+			
Gomphonema olivaceum									+	
Melosira granulate	β - mezo					+				
Navicula sp.		*Navicula sp.*	+		+	+	+	+	+	+
Nitzschia actinastroides				+			+			
Nityscha sigmoidea	β - mezo		+	+			+			
Pinnularia nobilis	o			+						
Pleurosygma sp.							+			
Rhoicosphaenia curvata										+
Euglenophyta										
Chlamydomonas simplex	β - mezo α - mezo						+			
Chlamydomonas globosa								+		
Trachelomonas varians										+

Table A.4.1.4-7. **List of phytoplankton taxons in the Danube, in the summer of 2001 (continued)**

Systematic groups/ species	Saprobe category	Dominant forms	Section							
			C3	C10	C7	C7’	C11	C11’	C12	C13
Pyrrophyta										
Peridinium sp.									+	
Chlorophyta										
Actinastrum hantzschii				+				+	+	
Ankistrodesmus falcatus				+				+	+	
Chlorella vulgaris		*Chlorella vulgaris*	+	+			+		+	+
Cladophora glomerata					+					
Closterium sp.					+			+		
Coelastrum sp.						+				
Eudorina elegans				+						
Golenkinia sp.					+					
Oocystis eliptica				+						
Pandorina morum				+						
Pediastrum boryanum	β- mezo							+		
Scenedesmus dimorphus								+		
Scenedesmus intermedius		*Scenedesmu s intermedius*			+	+			+	+
Scenedesmus quadricauda			+		+					
Spirogyra sp.								+		
Ulothrix sp.							+		+	
Volvox aureus				+						

Table A.4.1.4-8. Phytoplankton numerical density (thousand cell/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in May 2003

Section	Total density (thousand cell/l)	Systematic groups									
		Cyanophyta		Bacillariophyta		Euglenophyta		Pyrrophhyta		Chlorophyta	
		Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%
C3	2000	0	0	2000	100.0	0	0	0	0	0	0
C10	2200	0	0	2000	91.0	0	0	0	0	200	9.0
C7	1400	0	0	1400	100.0	0	0	0	0	0	0
C7’	1400	0	0	1400	100.0	0	0	0	0	0	0
C11	1000	0	0	1000	100.0	0	0	0	0	0	0
C11’	2800	0	0	1400	50.0	0	0	0	0	1400	50.0
C12	1800	0	0	800	28.58	0	0	0	0	1000	71.42
C13	2100	0	0	2100	100.0	0	0	0	0	0	0
C14	1600	0	0	1600	100.0	0	0	0	0	0	0

Table A.4.1.4-9. Phytoplankton biomass (mg/l) and biomass abundance (%) in the Danube, in May 2003

Section	Total biomass (mg/l)	Systematic groups									
		Cyanophyta		Bacillariophyta		Euglenophyta		Pyrrophhyta		Chlorophyta	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	2.04	0	0	2.04	100.0	0	0	0	0	0	0
C10	1.82	0	0	1.81	99.45	0	0	0	0	0.01	0.55
C7	1.22	0	0	1.22	100.0	0	0	0	0	0	0
C7’	1.9	0	0	1.9	100.0	0	0	0	0	0	0
C11	3.56	0	0	3.56	100.0	0	0	0	0	0	0
C11’	2.62	0	0	2.28	87.02	0	0	0	0	0.34	12.97
C12	1.21	0	0	1.20	99.17	0	0	0	0	0.01	0.82
C13	1.5	0	0	1.5	100.0	0	0	0	0	0	0
C14	1.1	0	0	1.1	100.0	0	0	0	0	0	0

Table A.4.1.4-10. Phytoplankton numerical density (thousand cell/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in June 2003

Section	Total density (tho. cell/l)	Systematic groups									
		Cyanophyta		Bacillariophyta		Euglenophyta		Pyrrophhyta		Chlorophyta	
		Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%	Tho. cell/l	%
C3	9 250	0	0	4 000	43.24	0	0	0	0	5 250	56.75
C10	9 000	4 000	44.44	2 500	27.78	0	0	0	0	2 500	27.78
C7	-	-	-	-	-	-	-	-	-	-	-
C7’	9 000	0	0	1 200	13.33	0	0	0	0	0.9	50.0
C11	6 800	0	0	1 200	17.64	0	0	0	0	1.2	54.54
C11’	10 600	0	0	4 600	43.39	0	0	0	0	0.7	15.90
C12	5 000	0	0	2 200	44.00	0	0	0	0	0.3	15.00
C13	3 800	0	0	3 800	100.0	0	0	0	0	0	0
C14	5 000	0	0	1 000	20.0	0	0	0	0	2.9	78.37

Table A.4.1.4-11. Phytoplankton biomass (mg/l) and biomass abundance (%) in the Danube, in June 2003

Section	Total biomass (mg/l)	Systematic groups									
		Cyanophyta		Bacillariophyta		Euglenophyta		Pyrrophhyta		Chlorophyta	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	3.91	0	0	3.1	79.28	0	0	0	0	0.81	79.28
C10	2.75	0.3	10.9	1.9	69.09	0	0	0	0	0.55	20.0
C7	-	-	-	-	-	-	-	-	-	-	-
C7’	1.8	0	0	0.9	50.0	0	0	0	0	0.9	50.0
C11	2.2	0	0	1.0	45.45	0	0	0	0	1.2	54.54
C11’	4.4	0	0	3.7	84.09	0	0	0	0	0.7	15.90
C12	2.04	0	0	1.7	85.00	0	0	0	0	0.3	15.0
C13	2.9	0	0	2.9	100.0	0	0	0	0	0	0
C14	3.7	0	0	0.8	22.62	0	0	0	0	2.9	78.37

Table A.4.1.4-12. Phytoplankton numerical density (thousand cell/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in July 2003

Section	Total density (tho. cell/l)	Systematic groups									
		Cyanophyta		Bacillariophyta		Euglenophyta		Pyrrophhyta		Chlorophyta	
		mii cel/l	%	mii cel/l	%	mii cel/l	%	mii cel/l	%	mii cel/l	%
C3	2250	0	0	2250	100.0	0	0	0	0	0	0
C10	4400	0	0	1200	27.28	0	0	0	0	3 000	72.72
C7	0	0	0	0	0	0	0	0	0	0	0
C7’	3400	0	0	1800	52.94	0	0	0	0	1 600	47.05
C11	1000	0	0	800	80.0	0	0	0	0	200	20.0
C11’	3000	0	0	1800	60.0	0	0	0	0	1 200	40.0
C12	2 334	0	0	1667	71.42	0	0	0	0	667	28.57
C13	-	-	-	-	-	-	-	-	-	-	-
C14	-	-	-	-	-	-	-	-	-	-	-

Table A.4.1.4-13. Phytoplankton biomass (mg/l) and biomass abundance (%) in the Danube, in July 2003

Section	Total biomass (mg/l)	Systematic groups									
		Cyanophyta		Bacillariophyta		Euglenophyta		Pyrrophhyta		Chlorophyta	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	1.6	0	0	1.6	100.0	0	0	0	0	0	0
C10	3.3	0	0	0.9	27.28	0	0	0	0	2.4	72.72
C7	0	0	0	0	0	0	0	0	0	0	0
C7’	3.0	0	0	1.9	63.33	0	0	0	0	1.1	36.67
C11	0.72	0	0	0.7	97.22	0	0	0	0	0.02	2.78
C11’	2.0	0	0	1.4	70.0	0	0	0	0	0.6	30.0
C12	1.4	0	0	1.2	85.71	0	0	0	0	0.2	14.28
C13	-	-	-	-	-	-	-	-	-	-	-
C14	-	-	-	-	-	-	-	-	-	-	-

Table A.4.1.4-14. Zooplankton numerical density (number/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in May 2003

Section	Total density (no./l)	Systematic groups									
		Ciliata		Rotatoria		Copepoda		Cladocera		Lameli-branchiata	
		no./l	%	no./l	%	no./l	%	no./l	%	no./l	%
C3	3	0	0	3	100.0	0	0	0	0	0	0
C10	4	0	0	3	75.0	1	25.0	0	0	0	0
C7	-	-	-	-	-	-	-	-	-	-	-
C7'	4	0	0	2	50.0	1	25.0	1	25.0	0	0
C11	0	0	0	0	0	0	0	0	0	0	0
C11'	1	0	0	1	100.0	0	0	0	0	0	0
C12	2	0	0	2	100.0	0	0	0	0	0	0
C13	7	0	0	6	85.71	0	0	1	14.28	0	0
C14	3	0	0	3	100.0	0	0	0	0	0	0

Table A.4.1.4-15. Zooplankton biomass (mg/l) and biomass abundance (%) in the Danube, in May 2003

Section	Total biomass (mg/l)	Systematic groups									
		Ciliata		Rotatoria		Copepoda		Cladocera		Lameli-branchiata	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	0.008	0	0	0.008	100.0	0	0	0	0	0	0
C10	0.075	0	0	0.013	17.0	0.062	83.0	0	0	0	0
C7	-	-	-	-	-	-	-	-	-	-	-
C7'	0.072	0	0	0.004	6.0	0.062	86.0	0.006	8.0	0	0
C11	0	0	0	0	0	0	0	0	0	0	0
C11'	0.001	0	0	0.001	100.0	0	0	0	0	0	0
C12	0.02	0	0	0.02	100.0	0	0	0	0	0	0
C13	0.031	0	0	0.025	81.0	0	0	0.006	19.0	0	0
C14	0.028	0	0	0.028	100.0	0	0	0	0	0	0

Table A.4.1.4-16. Zooplankton numerical density (number/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in June 2003

Section	Total density (no./l)	Systematic groups									
		Ciliata		Rotatoria		Copepoda		Cladocera		Lameli-branchiata	
		no./l	%	no./l	%	no./l	%	no./l	%	no./l	%
C3	7	0	0	2	28.57	2	28.57	1	14.28	2	28.57
C10	26	12	46.15	3	11.53	0	0	6	23.08	5	19.23
C7	-	-	-	-	-	-	-	-	-	-	-
C7’	0	0	0	0	0	0	0	0	0	0	0
C11	0	0	0	0	0	0	0	0	0	0	0
C11’	0	0	0	0	0	0	0	0	0	0	0
C12	27	0	0	16	59.26	1	3.70	0	0	10	37.03
C13	0	0	0	0	0	0	0	0	0	0	0
C14	0	0	0	0	0	0	0	0	0	0	0

Table A.4.1.4-17. Zooplankton biomass (mg/l) and biomass abundance (%) in the Danube, in June 2003

Section	Total biomass (mg/l)	Systematic groups									
		Ciliata		Rotatoria		Copepoda		Cladocera		Lameli-branchiata	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	0.5	0	0	0	0	2	28.57	1	14.28	2	28.57
C10	0.08	0	0	0	0	0	0	6	23.08	5	19.23
C7	-	-	-	-	-	-	-	-	-	-	-
C7’	0	0	0	0	0	0	0	0	0	0	0
C11	0	0	0	0	0	0	0	0	0	0	0
C11’	0	0	0	0	0	0	0	0	0	0	0
C12	0.05	0	0	0.04	88.67	0.004	7.55	0	0	0.002	3.77
C13	0	0	0	0	0	0	0	0	0	0	0
C14	0	0	0	0	0	0	0	0	0	0	0

Table A.4.1.4-18. Zooplankton numerical density (number/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in July 2003

Section	Total density (no./)l	Systematic groups									
		Ciliata		Rotatoria		Copepoda		Cladocera		Lameli-branchiata	
		no./l	%	no./l	%	no./l	%	no./l	%	no./l	%
C3	76	65	85.52	9	11.84	2	2.63	0	0	0	0
C10	15	0	0	5	33.33	1	6.67	4	26.67	5	33.33
C7	0	0	0	0	0	0	0	0	0	0	0
C7’	7	0	0	0	0	2	28.57	3	42.85	2	28.57
C11	6	0	0	3	50.0	1	16.67	2	33.33	0	0
C11’	8	0	0	0	0	2	25.0	2	25.0	4	50.0
C12	18	13	72.22	3	16.67	0	0	0	0	2	11.11
C13	-	-	-	-	-	-	-	-	-	-	-
C14	-	-	-	-	-	-	-	-	-	-	-

Table A.4.1.4-19. Zooplankton biomass (mg/l) and biomass abundance (%) in the Danube, in July 2003

Section	Total biomass (mg/l)	Systematic groups									
		Ciliata		Rotatoria		Copepoda		Cladocera		Lameli-branchiata	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	0.2	0	0	0	0	2	28.57	1	14.28	2	28.57
C10	0.13	0	0	0.02	6.92	0.07	53.84	0.05	38.47	0.001	0.76
C7	0	0	0	0	0	0	0	0	0	0	0
C7’	0.14	0	0	0	0	0.1	71.42	0.04	28.57	0	0
C11	0.1	0	0	0	0	0.07	70.0	0.03	30.0	0	0
C11’	0.13	0	0	0	0	0.1	76.92	0.03	23.07	0	0
C12	0.006	0	0	0.006	100.0	0	0	0	0	0	0
C13	-	-	-	-	-	-	-	-	-	-	-
C14	-	-	-	-	-	-	-	-	-	-	-

Table A.4.1.4-20. Values of phytoplanktonic density and biomass în May, June, July 2003

Section	Month					
	May		June		July	
	densitaty (tho. cell/l)	biomass (mg/l)	densitaty (tho. cell/l)	biomass (mg/l)	densitaty (tho. cell/l)	biomass (mg/l)
C3	2.0	2.04	9.2	3.91	2.25	1.6
C10	2.2	1.82	9.0	2.75	4.4	3.3
C7	1.4	1.22	-	-	-	-
C7'	1.4	1.9	9.0	1.8	3.4	3.0
C11	1.0	3.56	6.8	2.2	1.0	0.7
C11'	2.8	2.62	10.6	4.4	3.0	2.0
C12	1.8	1.21	5.0	2.04	2.3	1.4
C13	2.1	1.5	3.8	2.9	-	-
C14	1.6	1.1	5.0	3.7	-	-

Table A.4.1.4-21. List of phytoplankton species in the Danube stretch downstream Cernavoda in 2003

Systematic groups/species	Section								
	C3	C10	C7	C7'	C11	C11'	C12	C13	C14
Cyanophyta									
Lyngbia sp.					+	+			
Merismopedia glauca		+							
Merismopedia tetrapedia		+				+			
Nostoc sp.						+			
Oscillatoria subtilissima			+		+		+		
Oscillatoria sp.	+					+			
Bacillariophyta									
Achnanthes brevipes			+			+		+	
Amphora ovalis			+				+		
Asterionella formosa	+	+	+	+	+	+	+	+	+
Caloneis amphisbaena					+				
Cyclotella glomerata	+	+			+		+	+	
Cyclotella meneghiniana	+						+	+	+
Cymatopleura solea	+		+		+		+		+
Cymbella sp.						+	+		
Diatoma elongatum			+		+	+	+	+	
Diatoma hiemale						+			
Diatoma vulgare	+			+	+				
Fragilaria capuccina					+				
Fragilaria crotonensis	+					+			
Gyrosigma kutzingii			+			+	+		
Melosira granulata	+	+	+	+	+	+	+	+	+
Navicula sp.	+	+				+		+	
Navicula gastrum					+				
Nitzschia linearis	+				+			+	
Nitzschia paradoxa					+	+		+	+
Nitzschia sigmoidea	+	+	+		+	+	+		+
Stephanodiscus sp.		+			+				
Surirella ovalis						+			+
Synedra acus	+	+		+	+				

Synedra ulna			+				+		+
Tabellaria fenestrata								+	
Euglenophyta									
Euglena sp.	+					+			
Pyrrophyta									
Peridinium sp.	+	+							
Chrysophyta									
Dinobryon sp.			+			+			
Chlorophyta									
Actinastrum hansztchii		+				+	+	+	+
Ankistrodesmus falcatus						+			
Chlorella vulgaris	+	+		+	+	+	+	+	+
Closterium sp.								+	
Coelastrum reticulatum		+				+	+	+	
Coelastrum sp.									+
Crucigenia tetrapedia						+		+	
Eudorina elegans	+				+	+	+		
Micractinium pusillum		+				+	+		+
Microspora sp.						+			
Oocystis sp.						+			
Pandorina morum						+			+
Pediastrum boryanum		+				+	+		
Pediastrum chlathratum						+			
Pediastrum duplex		+						+	+
Pediastrum simplex	+								
Scenedesmus acutus		+						+	
Scenedesmus quadricauda	+	+	+			+	+		+
Sphaerocystis schrooeteri									+
Stigeoclonium sp.					+	+			
Ulothrix sp.				+					

Table A.4.1.4-22. Total number of algal taxons in the Danube stretch downstream Cernavoda, in April 2004

Section	Total number of taxons	Systematic groups			
		Cyanophyta	Bacillariophyta	Euglenophyta	Chlorophyta
C3	15	1	13	0	1
C10	15	1	10	1	3
C7	0	0	0	0	0
C7’	13	0	10	0	3
C11	8	1	6	0	1
C11’	11	1	8	0	2
C12	19	2	13	1	3
C13	13	1	10	0	2
C14	12	0	10	1	1

Table A.4.1.4-23. Total number of algal taxons in the Danube stretch downstream Cernavoda, in May 2004

Section	Total number of taxons	Systematic groups			
		Cyanophyta	Bacillariophyta	Euglenophyta	Chlorophyta
C3	13	0	7	0	6
C10	16	0	13	0	3
C7	0	0	0	0	0
C7’	21	0	14	1	6
C11	24	2	11	0	11
C11’	15	0	10	0	5
C12	17	1	11	0	5
C13	15	0	10	0	5
C14	14	1	9	0	4

Table A.4.1.4-24. Total number of zooplankton taxons in the Danube stretch downstream Cernavoda, in April 2004

Section	Total number of taxons	Zooplankton groups			
		Rotatoria	*Copepoda*	*Cladocera*	*Bivalvia*
C3	5	3	0	0	2
C10	4	4	0	0	0
C7	0	0	0	0	0
C7’	5	2	0	0	3
C11	3	1	0	0	2
C11’	7	4	1	1	1
C12	0	0	0	0	0
C13	2	2	0	0	0
C14	2	0	0	0	2

Table A.4.1.4-25. Zooplankton numerical density (number/l) and density abundance (%) in the Danube stretch downstream Cernavoda, in May 2004

Section	Total density (no./l)	Systematic groups							
		Rotatoria		*Copepoda*		*Cladocera*		*Bivalvia*	
		no./l	%	no./l	%	no./l	%	no./l	%
C3	26	12	46.15	5	19.24	1	3.85	8	30.76
C10	20	11	55.0	0	0	7	35.0	2	10.0
C7	0	0	0	0	0	0	0	0	0
C7'	0	0	0	0	0	0	0	0	0
C11	56	34	60.71	2	3.57	2	3.57	18	32.14
C11'	32	27	84.37	0	0	0	0	5	15.62
C12	0	0	0	0	0	0	0	0	0
C13	0	0	0	0	0	0	0	0	0
C14	0	0	0	0	0	0	0	0	0

Table A.4.1.4-26. Zooplankton biomass (mg/l) and biomass abundance (%) in the Danube, in May 2004

Section	Total biomass (mg/l)	Systematic groups							
		Rotatoria		*Copepoda*		*Cladocera*		*Bivalvia*	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	0.036	0.004	11.11	0.02	55.55	0.01	27.77	0.002	5.55
C10	0.034	0.003	8.82	0	0	0.03	88.23	0.001	2.94
C7	0	0	0	0	0	0	0	0	0
C7'	0	0	0	0	0	0	0	0	0
C11	0.93	0.027	2.90	0.11	11.81	0.8	86.02	0.004	0.42
C11'	0.019	0.018	94.73	0	0	0	0	0.001	5.26
C12	0	0	0	0	0	0	0	0	0
C13	0	0	0	0	0	0	0	0	0
C14	0	0	0	0	0	0	0	0	0

Table A.4.1.4-27. Number of zooplankton taxons in the Danube stretch downstream Cernavoda, in May 2004

Section	Total number of taxons	Zooplancton groups			
		Rotatoria	Copepoda	Cladocera	Bivalvia
C3	22	10	3	1	8
C10	20	11	0	2	7
C7	0	0	0	0	0
C7'	5	3	0	0	2
C11	47	28	2	2	15
C11'	28	24	0	0	4
C12	9	6	1	0	2
C13	12	9	0	0	3
C14	7	4	1	0	2

Table A.4.1.4-28. List of phytoplankton species in the Danube stretch downstream Cernavoda, in 2004

Systematic groups/ species	Section								
	C3	C10	C7	C7'	C11	C11'	C12	C13	C14
***Cyanophyt**a*									
Lyngbia sp.	+					+	+	+	+
Merismopedia glauca					+				
Merismopedia tetrapedia								+	
Microcystis aeruginosa							+		
Oscillatoria sp.					+				
Bacillariophyta									
Achnanthes brevipes	+								
Amphora ovalis					+		+		
Anomeoneis sp.					+				
Asterionella formosa	+	+	+	+	+	+	+	+	+
Cyclotella glomerata								+	
Cyclotella meneghiniana	+	+		+	+	+	+	+	+
Cymatopleura eliptica				+	+	+	+		
Cymatopleura solea	+	+			+	+	+		+
Cymbella sp.		+		+	+		+	+	+
Diatoma elongatum									
Diatoma vulgare	+				+	+	+		+
Fragilaria capuccina					+				
Fragilaria crotonensis	+	+	+		+	+	+	+	+
Gomphonema olivaceum	+			+	+	+			
Mastogloia brownii		+							
Melosira angustissima		+						+	+
Melosira granulata		+		+	+	+	+	+	+
Navicula sp.	+	+		+	+	+	+	+	+

Nitzschia linearis		+	+			+	+		+
Nitzschia paradoxa									
Nitzschia sigmoidea	+	+		+	+	+	+		+
Pinnularia sp.						+			
Pleurosygma sp.				+	+		+		+
Stephanodiscus astrea							+		
Synedra acus		+		+		+	+	+	+
Synedra ulna	+	+			+		+		+
Surirella ovata	+								
Euglenophyta									
Trachelomonas sp.							+		+
Clorophyta									
Ankistrodesmus falcatus									+
Actinastrum hantzschii	+	+		+	+	+			+
Chroococcus turgidus	+	+		+		+	+		
Closterium sp.				+	+				
Coelosphaerium sp.	+								
Coenococcus fittii					+				
Micractinium pussillum	+				+				
Microspora sp.					+				
Pandorina morum					+		+		
Pediasrtum duplex				+	+		+	+	
Pediastrum simplex					+	+	+		+
Scenedesmus acutus							+		
Scenedesmus arcuatus					+	+	+		+
Scenedesmus opoliensis	+								
Scenedesmus quardicauda	+	+		+	+	+	+	+	

Table A.4.1.4-29. List of zooplankton species in the Danube stretch downstream Cernavoda, in 2004

Systematic groups/ species	Section								
	C3	C10	C7	C7’	C11	C11’	C12	C13	C14
Ciliata									
Vorticella sp.		+		+	+	+	+	+	+
Rotatoria									
Ascomorpha minima						+			+
Ascomorpha ecaudis							+		
Asplanchna priodonta			+				+	+	
Brachionus angularis						+			
Brachionus calyciflorus	+	+			+		+		
Brachionus leydigi		+					+		
Brachionus quadridentatus							+		
Keratella cochlearis	+			+	+		+		
Keratella quadrata							+	+	
Polyarthra remata			+						
Copepode									
Cyclops strenuous	+			+	+		+		
Eucyclops sp.	+		+						
Cladocera		+							
Bosmina longirostris	+		+	+	+		+		
Daphnia magna	+								
Bivalvia									
Dreissena polymorpha	+	+			+		+	+	+

Table A.4.1.4-30. Results of biological analyses in August 2006

Control section	Density cell/l	Biomass mg/l
C3	4 800 000	11.5
C7	8 000 000	10.4
C12	4 200 000	2.4

Table A.4.1.4-31. List of algal organisms identified in the Danube in August 2006

Systematic groups/taxons
Cyanophyta
Dactylococcopsis irregularis
Gomphosphaeria lacustris
Lyngbia sp.
Oscillatoria limnetiea
Bacillariophyta
Cyclotella glomerata
Cyclotella meneghiniana
Melosira granulata var. angustissima
Nitzschia paradoxa
Nitzschia holsatica
Pleurosigma sp.
Synedra acus
Euglenophyta
Euglena viridis
Trachelomonas stokesiana
Trachelomonas verrucosa
Pyrrophyta
Peridinium cinctum
Chlorophyta
Actinastrum hantzschii
Chlamydomonas simplex
Coelastrum microporum
Crucigenia tetrapedia
Pediastrum biradiatum
Scenedesmus bijuga var. ovaltemus
Schroederia setigera

Annex A.4.1.6

Values of physical, chemical and microbiological indicators in the DBSC

(Annex to Chapter 4.1.6)

Table A.4.1.6-1. Values of physical and chemical indicators in DBSC and PAMNC, in March 1999

Indicator	Unit	Sections					
		Race 1			Race 2		
		C1	C2	C3	C4	C5	C6
Temperature	^0C	11.5	7.0	6.3	6.4	6.4	7.0
Odour (ambiental temperature)	gr	0	0	0	0	0	0
Odour at 60^0	gr	1	0	0	1	0	1
pH	-	8.0	7.9	8.0	8.6	8.5	8.5
Dissolved O_2	mgO_2/l	12.2	11.9	11.5	13.0	12.4	12.7
Saturation of O_2	%	109.1	93.0	90.8	105.7	102.9	104.4
BOD_5	mgO_2/l	4.0	3.5	3.7	4.5	4.2	4.4
COD-Mn	mgO_2/l	4.8	5.6	4.9	5.0	6.0	6.2
NH_4^+ ($N-NH_4^+$)	mgN/l	0.263	0.180	0.210	0.263	0.263	0.210
NO_2^- ($N-NO_2^-$)	mgN/l	0.085	0.019	0.019	0.016	0.035	0.022
NO_3^- ($N-NO_3^-$)	mgN/l	1.754	1.974	1.794	1.704	2.872	2.952
Total mineral N	mgN/l	2.102	2.173	2.023	1.983	3.170	3.184
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.020	0.041	0.025	0.030	0.059	0.066
Total P	mgP/l	0.110	0.120	0.120	0.100	0.150	0.140
Conductivity at 20 ^0C	µS/cm	430	425	433	479	733	714
Total dissolved salts	mg/l	307	304	310	342	524	510
Cl^-	mg/l	27.6	26.9	26.9	37.6	74.4	71.6
SO_4^{2-}	mg/l	47.7	51.8	53.0	70.3	125.9	124.2
Ca^{2+}	mg/l	62.0	62.0	62.0	66.0	72.0	70.0
Mg^{2+}	mg/l	18.0	15.6	15.6	13.2	33.6	32.4
Na^+	mg/l	15.3	15.8	15.8	21.1	59.0	57.0
K^+	mg/l	2.8	2.8	2.8	2.8	3.6	3.7
CO_3^{2-}	mg/l	0.0	0.0	0.0	12.0	15.0	12.0
m-Alkalinity	mval/l	2.80	2.90	2.90	2.80	3.40	3.40
p-Alkalinity	mval/l	0.00	0.00	0.00	0.20	0.25	0.20
HCO_3^-	mg/l	170.8	176.9	176.9	146.4	176.9	183.1
Permanent hardness	^0G	5.0	4.2	4.2	5.6	9.8	9.1
Temporary hardness	^0G	7.8	8.1	8.1	6.7	8.1	8.4
Total hardness	^0G	12.8	12.3	12.3	12.3	17.9	17.5

Table A.4.1.6-2. Values of physical and chemical indicators in DBSC and PAMNC, in May 1999

Indicator	Unit	Sections					
		Race 1			Race 2		
		C1	C2	C3	C4	C5	C6
Temperature	^0C	18.1	18.5	18.6	22.8	20.9	21.7
Odour (ambiental temperature)	gr	1	1	1	0	0	0
Odour at 60^0	gr	nedef.	0	nedef.	1	0	2
pH	-	7.9	7.9	7.9	8.0	7.9	7.9
Dissolved O_2	mgO_2/l	9.9	10.6	9.8	9.5	8.6	9.0
Saturation of O_2	%	104.0	112.5	102.9	110.9	96.2	101.8
BOD_5	mgO_2/l	4.9	4.6	4.0	4.6	4.2	4.3
COD-Mn	mgO_2/l	2.2	2.5	1.7	2.0	2.2	2.0
NH_4^+ ($N-NH_4^+$)	mgN/l	0.285	0.338	0.308	0.323	0.300	0.345
NO_2^- ($N-NO_2^-$)	mgN/l	0.025	0.000	0.000	0.082	0.022	0.218
NO_3^- ($N-NO_3^-$)	mgN/l	0.888	0.788	0.730	1.010	1.070	0.734
Total mineral N	mgN/l	1.198	1.126	1.038	1.415	1.392	1.297
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.000	0.000	0.000	0.000	0.000	0.000
P total	mgP/l	0.050	0.060	0.040	0.050	0.060	0.090
Conductivity at 20 ^0C	µS/cm	346	348	348	348	393	375
Total dissolved solids	mg/l	247	248	248	249	281	268
Cl^-	mg/l	27.2	27.2	27.2	27.2	33.2	28.5
SO_4^{2-}	mg/l	35.0	33.0	33.0	33.0	37.2	34.2
Ca^{2+}	mg/l	50.0	52.0	50.0	50.0	52.0	52.0
Mg^{2+}	mg/l	13.2	12.0	13.2	13.2	14.4	12.0
Na^+	mg/l	11.3	8.5	9.7	9.8	17.8	13.2
K^+	mg/l	2.9	3.2	3.0	3.2	3.4	3.9
CO_3^{2-}	mg/l	0.0	0.0	0.0	0.0	0.0	0.0
m-Alkalinity	mval/l	2.2	2.3	2.3	2.3	2.3	2.3
p-Alkalinity	mval/l	0.0	0.0	0.0	0.0	0.0	0.0
HCO_3^-	mg/l	134.2	140.3	140.3	140.3	140.3	140.3
Permanent hardness	^0G	3.9	3.6	3.6	3.6	4.2	3.6
Temporary hardness	^0G	6.2	6.4	6.4	6.4	6.4	6.4
Total hardness	^0G	10.1	10.0	10.0	10.0	10.6	10.0

Table A.4.1.6-3. Values of physical and chemical indicators in DBSC and PAMNC, in September 1999

Indicator	Unit	Control sections					
		Race 1			Race 2		
		C1	C2	C3	C4	C5	C6
Temperature	^0C	23.6	23.9	23.6	23.9	23.8	23.7
Odour (ambiental temperature)	gr	0	1	1	2	2	4
Odour at 60^0	gr	1	1	1	2	2	4
pH	-	8.0	8.1	7.9	8.6	8.0	8.1
Dissolved O_2	mgO_2/l	9.4	10.1	9.8	10.5	11.0	10.6
Saturation of O_2	%	112.4	120.7	117.1	125.5	130.9	127.0
BOD_5	mgO_2/l	4.9	5.0	5.1	5.6	5.9	5.9
COD-Mn	mgO_2/l	10.5	4.9	4.8	5.7	4.9	5.8
NH_4^+ ($N-NH_4^+$)	mgN/l	0.338	0.285	0.353	0.615	0.495	0.360
NO_2^- ($N-NO_2^-$)	mgN/l	0.153	0.161	0.197	0.011	0.057	0.016
NO_3^- ($N-NO_3^-$)	mgN/l	0.000	0.000	0.000	0.618	1.700	1.324
Total mineral N	mgN/l	0.491	0.446	0.550	1.244	2.252	1.700
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.000	0.000	0.000	0.036	0.100	0.070
Total P	mgP/l	0.160	0.140	0.170	0.160	0.270	0.380
Conductivity at 20 ^0C	µS/cm	385	385	385	358	615	550
Total dissolved salts	mg/l	275	275	275	249	428	383
Cl^-	mg/l	24.8	24.8	23.4	23.4	58.8	57.4
SO_4^{2-}	mg/l	30.5	38.5	38.5	56.2	72.5	50.5
Ca^{2+}	mg/l	54.0	54.0	52.0	50.0	60.0	54.0
Mg^{2+}	mg/l	14.6	14.6	15.8	14.6	26.7	25.5
Na^+	mg/l	15.6	16.7	17.7	15.7	46.2	36.9
K^+	mg/l	4.0	3.8	3.8	4.1	5.5	4.8
CO_3^{2-}	mg/l	0.0	0.0	0.0	0.0	0.0	0.0
m-Alkalinity	mval/l	2.70	2.50	2.50	2.20	3.00	2.80
p-Alkalinity	mval/l	0.00	0.00	0.00	0.32	0.00	0.00
HCO_3^-	mg/l	164.7	152.5	152.5	95.2	183.1	170.0
Permanent hardness	^0G	3.4	3.9	3.9	6.0	5.6	5.3
Temporary hardness	^0G	7.6	7.0	7.0	4.4	8.4	7.8
Total hardness	^0G	11.0	10.9	10.9	10.4	14.0	13.1
Total iron	mg/l	0.25	0.28	0.23	0.16	0.06	0.07
Mn	mg/l	0.02	0.02	0.02	0.02	0.01	0.01
Cu	µg/l	9.2	9.1	9.0	10.7	8.6	5.7
Pb	µg/l	13.0	8.5	7.2	20.0	20.0	13.0
Zn	µg/l	72.0	22.0	15.0	20.0	12.0	11.0
Cd	µg/l	1.0	1.5	1.4	1.2	2.2	1.1

Table A.4.1.6-4. **Values of physical and chemical indicators in DBSC and PAMNC, in July 2001**

Indicator	Unit	Section								
		C1	C3	C2	C9	C4	C6	C5	C8	C7
Temperature	^0C	26.5	26.1	26.4	26.4	26.4	27.6	26.9	27.1	33.7
Odour (ambiental temperature)	gr	0	0	0	0	0	0	0	0	0
Odour at 60^0	gr	0	0	1	0	0	0	0	2	0
pH	-	8.0	8.0	8.1	8.0	8.2	8.5	8.2	8.0	8.0
Dissolved O_2	mgO_2/l	14.0	11.5	9.6	7.4	10.7	8.8	6.7	9.6	13.6
Saturation of O_2	%	172.0	139.9	118.4	90.5	131.1	110.4	83.3	119.5	189.0
BOD_5	mgO_2/l	7.2	4.9	3.5	2.1	4.6	6.3	2.7	5.9	4.8
COD-Mn	mgO_2/l	6.1	6.4	7.0	5.4	6.4	5.8	7.0	6.1	4.9
NH_4^+ ($N-NH_4^+$)	mgN/l	0.014	0.017	0.014	0.011	0.014	0.020	0.020	0.017	0.025
NO_2^- ($N-NO_2^-$)	mgN/l	0.004	0.007	0.007	0.004	0.006	0.002	0.085	0.009	0.008
NO_3^- ($N-NO_3^-$)	mgN/l	0.576	0.620	0.798	0.762	0.690	0.576	1.204	2.480	0.434
Total mineral N	mgN/l	0.594	0.644	0.819	0.777	0.710	0.598	1.309	2.506	0.467
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.006	0.004	0.006	0.014	0.021	0.029	0.045	0.034	0.008
P total	mgP/l	0.016	0.012	0.016	0.045	0.058	0.093	0.102	0.103	0.019
Conductivity at 20 ^0C	µS/cm	360	388	350	360	360	420	360	700	355
Total dissolved salts	mg/l	256	275	249	256	256	298	256	497	252
Cl^-	mg/l	24.9	28.4	28.4	24.9	42.6	46.2	32.0	71.0	28.4
SO_4^{2-}	mg/l	38.5	15.0	22.5	15.0	14.5	14.5	13.5	12.5	15.0
Ca^{2+}	mg/l	23.7	24.5	25.7	24.1	25.7	26.1	24.5	28.5	24.5
Mg^{2+}	mg/l	10.7	12.2	10.2	11.2	15.6	17.5	10.7	15.1	12.2
CO_3^{2-}	mg/l	6.0	18.0	3.6	7.2	6.0	6.0	3.6	9.6	6.0
m-Alkalinity	mval/l	2.80	3.00	2.80	2.85	3.20	3.10	2.85	3.85	3.00
p-Alkalinity	mval/l	0.10	0.30	0.06	0.12	0.10	0.10	0.06	0.16	0.10
HCO_3^-	mg/l	158.6	146.4	163.5	159.2	183.0	176.9	166.5	215.3	170.8
Permanent hardness	^0G	1.8	2.8	2.0	2.0	2.4	3.2	1.7	5.0	1.8
Temporary hardness	^0G	7.3	6.9	7.5	7.3	8.4	8.1	7.6	9.9	7.8
Total hardness	^0G	9.1	9.7	9.5	9.3	10.8	11.3	9.3	14.9	9.6

Table A.4.1.6-5. **Values of physical and chemical indicators in DBSC and PAMNC, in August 2001**

Indicator	Unit	Section								
		C1	C3	C2	C9	C4	C6	C5	C8	C7
Temperature	^0C	26.3	26.0	26.8	26.8	26.8	27.4	26.9	27	34.2
Odour (ambiental temperature)	gr	0	0	0	0	0	0	0	0	0
Odour at 60^0	gr	0	0	0	0	0	0	0	0	0
pH	-	8.3	8.1	8.2	8.2	8.3	8.2	8.1	8.1	8.1
Dissolved O_2	mgO_2/l	7.3	7.6	7.8	6.2	7.5	7.7	8.6	6.0	11.0
Saturation of O_2	%	88.3	92.7	97.2	76.8	93.1	95.9	106.1	74.9	148.9
BOD_5	mgO_2/l	3.0	3.0	2.9	2.6	2.8	3.0	3.4	2.6	6.0
COD-Mn	mgO_2/l	5.4	7.7	6.1	4.5	6.4	5.4	6.1	5.4	7.4
NH_4^+ ($N-NH_4^+$)	mgN/l	0.017	0.041	0.018	0.015	0.018	0.022	0.025	0.011	0.024
NO_2^- ($N-NO_2^-$)	mgN/l	0.019	0.012	0.004	0.052	0.052	0.009	0.013	0.057	0.016
NO_3^- ($N-NO_3^-$)	mgN/l	1.930	0.656	1.072	0.412	0.388	0.632	0.492	0.528	0.974
Total mineral N	mgN/l	1.966	0.709	1.094	0.479	0.458	0.663	0.530	0.596	1.014
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.038	0.004	0.038	0.003	0.025	0.023	0.007	0.018	0.007
P total	mgP/l	0.116	0.012	0.111	0.011	0.071	0.075	0.022	0.063	0.023
Conductivity at 20 ^0C	µS/cm	587	352	323	313	323	303	343	318	352
Total dissolved salts	mg/l	417	250	229	222	229	215	231	226	250
Cl^-	mg/l	63.9	28.4	24.9	28.4	24.9	28.4	24.9	21.3	24.9
SO_4^{2-}	mg/l	38.5	13.5	13.5	13.5	17.5	16,0	20,0	19,0	13.5
Ca^{2+}	mg/l	28.1	40.9	23.7	21.2	23.3	24.1	25.7	24.1	52.1
Mg^{2+}	mg/l	12.6	18.0	6.1	6.8	6.3	5.1	6.6	6.1	13.1
CO_3^{2-}	mg/l	6,0	10.8	7.2	6,0	6,0	5.4	9.6	5.4	7.2
m-Alkalinity	mval/l	3.60	3,00	2.60	2.80	2.90	2.60	3,00	2.80	3.10
p-Alkalinity	mval/l	0.10	0.18	0.12	0.10	0.10	0.09	0.16	0.09	0.12
HCO_3^-	mg/l	207.4	164.0	144.0	158.6	164.7	147.6	163.5	159.8	174.5
Permanent hardness	^0G	4.2	2.5	2.8	1.8	1.9	2.3	2.7	2.2	2.3
Temporary hardness	^0G	9.5	7.4	6.6	7.3	7.6	6.8	7.5	7.3	8,0
Total hardness	^0G	13.7	9.9	9.4	9.1	9.5	9.1	10.2	9.5	10.3

Table A.4.1.6-6. Values of physical and chemical indicators in DBSC and PAMNC, in April 2004

Indicator	Unit	Section				
		C9	C4	C5	C8	C6
Water temperature	^0C	12.3	11.8	12.4	12.6	12.3
Dissolved O_2	mgO_2/l	7.4	7.5	10.7	9.7	10.7
Saturation of O_2	%	144.2	144.1	99.5	109.3	99.7
BOD_5	mgO_2/l	1.5	1.4	2.6	2.7	2.9
COD-Mn	mgO_2/l	2.9	2.2	3.0	3.0	2.9
NH_4^+ ($N-NH_4^+$)	mgN/l	0.074	0.014	0.127	0.240	0.472
NO_2^- ($N-NO_2^-$)	mgN/l	0.015	0.064	0.117	0.032	0.213
NO_3^- ($N-NO_3^-$)	mgN/l	1.710	1.940	2.960	3.610	3.360
N tot mineral	mgN/l	1.799	2.018	3.204	3.882	4.045
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.022	0.046	0.164	0.020	0.068
Total P	mgP/l	0.040	0.087	0.344	0.379	0.131
Cl^-	mg/l	56.7	42.5	99.3	134.7	99.3
SO_4^{2-}	mg/l	23.5	24.6	54.9	83.5	67.1
Ca^{2+}	mg/l	60.1	60.1	74.1	68.1	72.1
Mg^{2+}	mg/l	10.9	10.9	32.8	51.0	36.4
m-alkalinity	mval/l	3.0	2.8	4.0	4.4	3.8
HCO_3^-	mg/l	183.0	170.8	244.0	268.4	231.8
Permanent hardness	^0G	1.4	2.0	9.0	13.5	10.1
Temporary hardness	^0G	9.5	9.0	9.0	7.8	8.4
Total hardness	^0G	10.9	11.0	18.0	21.3	18.5

Table A.4.1.6-7. Values of physical and chemical indicators in DBSC and PAMNC, in May 2004

Indicator	Unit	Section					
		C9	C4	C5	C8	C6	**C1**
Water temperature	^0C	24.9	23.5	19.6	18.0	20.7	-
Dissolved O_2	mgO_2/l	10.5	10.9	11.9	12.1	10.7	-
Saturation of O_2	%	128.2	129.4	130.7	128.7	120.2	-
COD-Mn	mgO_2/l	2.6	3.7	3.3	4.1	4.9	-
NH_4^+ ($N-NH_4^+$)	mgN/l	0.017	0.002	0.210	0.168	0.110	0.000
NO_2^- ($N-NO_2^-$)	mgN/l	0.020	0.006	0.068	0.024	0.107	0.400
NO_3^- ($N-NO_3^-$)	mgN/l	1.830	2.080	2.730	3.300	3.150	2.380
Total mineral N	mgN/l	1.867	2.088	3.008	3.492	3.367	2.780
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.038	0.002	0.082	0.002	0.057	0.012
Total P	mgP/l	0.057	0.005	0.151	0.005	0.108	0.027
Cl^-	mg/l	58.7	49.6	56.7	106.4	58.7	63.8
SO_4^{2-}	mg/l	24.6	25.8	32.7	70.8	29.4	23.5
Ca^{2+}	mg/l	54.1	56.1	56.1	60.1	55.1	50.1
Mg^{2+}	mg/l	12.2	12.2	10.9	7.3	7.9	13.3
m-alkalinity	mval/l	3.0	3.2	3.0	2.8	2.6	2.6
HCO_3^-	mg/l	183.0	195.2	183.0	231.8	158.6	158.6
Permanent hardness	^0G	2.0	1.8	2.0	2.3	2.3	2.9
Temporary hardness	^0G	8.4	8.9	8.4	7.8	7.2	7.2
Total hardness	^0G	10.4	10.7	10.4	10.1	9.5	10.1

Table A.4.1.6-8. Values of physical and chemical indicators in DBSC and PAMNC, in October 2004

Indicator	Unit	Sections				
		C9	C4	C5	C8	**C6**
Temperature	^0C	14.7	15.6	15.8	15.1	15.7
Dissolved O_2	mgO_2/l	8.6	8.9	8.2	9.3	9.0
O_2 Saturation	%	85	89	83	92	91
BOD_5	mgO_2/l	4.88	4.92	4.64	5.02	4.94
COD-Mn	mgO_2/l	2.8	2.8	3.2	3.1	4.0
NH_4^+ ($N\text{-}NH_4^+$)	mgN/l	0.340	0.275	0.400	0.283	0.230
NO_2^- ($N\text{-}NO_2^-$)	mgN/l	0.008	0.007	0.009	0.010	0.012
NO_3^- ($N\text{-}NO_3^-$)	mgN/l	1.539	1.797	2.440	3.251	3.352
Total mineral N	mgN/l	1.887	2.079	2.849	3.544	3.594
PO_4^{3-} ($P\text{-}PO_4^{3-}$)	mgP/l	0.078	0.045	0.135	0.091	0.118
Total P	mgP/l	0.146	0.072	0.253	0.171	0.221
SO_4^{2-}	mg/l	25.8	26.9	61.7	74.8	54.9
Ca^{2+}	mg/l	46.1	38.1	50.1	52.1	52.1
Mg^{2+}	mg/l	15.8	23.1	35.3	43.8	13.4
m-alkalinity	mval/l	2.8	2.6	4.6	6.0	3.0
HCO_3^-	mg/l	170.0	158.0	280.6	366.0	183.0
Permanent hardness	^0G	2.25	1.97	2.34	0.31	1.69
Temporary hardness	^0G	7.84	7.22	12.8	16.8	8.4
Total hardness	^0G	10.09	9.25	15.14	17.11	10.09

Table A.4.1.6-9. Values of physical and chemical indicators in DBSC and PAMNC, in November 2004

Indicator	Unit	Sections				
		C9	C4	C5	C8	**C6**
Temperature	^0C	18.4	17.2	14.5	14.6	15.5
Dissolved O_2	mgO_2/l	8.7	8.9	8.4	9.1	8.9
O_2 Saturation	%	95	93	82	89	89
BOD_5	mgO_2/l	1.82	1.38	1.20	1.66	1.02
COD-Mn	mgO_2/l	2.0	2.1	1.6	2.6	1.6
NH_4^+ ($N-NH_4^+$)	mgN/l	0.054	0.057	0.053	0.067	0.031
NO_2^- ($N-NO_2^-$)	mgN/l	0.047	0.069	0.013	0.014	0.048
NO_3^- ($N-NO_3^-$)	mgN/l	1.54	1.57	2.05	1.49	1.62
Total mineral N	mgN/l	1.64	1.69	2.11	1.57	1.69
PO_4^{3-} ($P-PO_4^{3-}$)	mgP/l	0.114	0.117	0.128	0.128	0.132
Total P	mgP/l	0.232	0.246	0.286	0.277	0.285
Conductivity at 20^0C	µS/cm	95.8	98.2	117.2	126.3	104.3
Cl^-	mg/l	49.63	42.54	49.63	42.54	42.54
SO_4^{2-}	mg/l	24.63	25.76	35.16	33.84	28.01
Ca^{2+}	mg/l	54.10	52.11	54.10	52.11	52.00
Mg^{2+}	mg/l	18.24	18.24	20.67	21.88	19.45
m-alkalinity	mval/l	2.4	2.2	2.8	3.2	3.2
HCO_3^-	mg/l	146.4	134.2	170.8	195.2	195.2
Permanent hardness	^0G	5.06	5.34	4.50	3.34	2.82
Temporary hardness	^0G	6.72	6.16	7.84	8.96	8.96
Total hardness	^0G	11.78	11.50	12.34	12.30	11.78

Table A.4.1.6-10. Values of physical and chemical indicators in DBSC and PAMNC, in May 2005

Indicator	Unit	Section				
		C 9	C4	C5	C8	C6
pH	-	7.2	7.3	7.2	7.9	6.8
Conductivity	µS/cm	365	358	422	688	372
COD- Mn	mgO_2/dm^3	2.6	3.5	3.1	2.9	3.1
Ammonia ($N\text{-}NH_4^+$)	mgN/dm^3	0.02	0.03	0.03	0.03	0.04
Nitrites ($N\text{-}NO_3^-$)	mgN/dm^3	0.44	0.65	1.2	1.5	0.81
Nitrates ($N\text{-}NO_2^-$)	mgN/dm^3	0.006	0.003	0.003	0.11	0.001
Orthophosphates ($P\text{-}P0_4^{3-}$)	mgP/dm^3	0.05	0.05	0.05	0.03	0.04
Bicarbonates (HCO_3^-)	mg/dm^3	179	170	186	232	177
Carbonates (CO_3^{2-})	mg/dm^3	0	0	0	0	0
Calcium (Ca^{2+})	mg/dm^3	42.5	50.6	50.6	38.4	51.3
Magnesium (Mg^{2+})	mg/dm^3	18.5	13.1	12.2	42.7	11.7
Total hardness	°G	10.2	10.1	9.9	15.2	9.9
Iron (Fe^{2+3})	$\mu g/dm^3$	12	33	15	9	11
Manganese (Mn^{2+3})	$\mu g/dm^3$	8.2	18	8.1	5.2	6.2
Chloride (Cl^-)	mg/dm^3	19.1	17	22	63.8	22
Sulphates (SO_4^{2-})	mg/dm^3	27.5	27.5	35.6	89	29.5
Suspension	mg/dm^3	12	18	28	14	26
Total dissolved salts	mg/dm^3	230	225	260	430	230

Table A.4.1.6-11. Values of chemical indicators in DBSC and PAMNC, in August 2006

DBSC control section Mircea Voda (C4)		
Indicator	Unit	Concentration
$N-NH_4$	mg/l N	0.015
$N-NO_2$	mg/l N	0.0045
$N-NO_3$	mg/l N	0.313
$P-PO_4$	mg/l P	0.031
Total P	mg/l P	0.149
COD-Mn	mg/l O_2	3.59
PAMNC control section Galesu (C5)		
Indicator	Unit	Concentration
$N-NH_4$	mg/l N	0.019
$N-NO_2$	mg/l N	0.0033
$N-NO_3$	mg/l N	2.183
$P-PO_4$	mg/l P	0.399
Total P	mg/l P	0.524
COD-Mn	mg/l O_2	3.59
DBSC control section Basarabi (C6)		
Indicator	Unit	Concentration
$N-NH_4$	mg/l N	0.014
$N-NO_2$	mg/l N	0.186
$N-NO_3$	mg/l N	1.245
$P-PO_4$	mg/l P	0.252
Total P	mg/l P	0.371
COD-Mn	mg/l O_2	3.79

Table A.4.1.6-12. Microbiological indicators values in DBSC and PAMNC, in 1999

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^0C No. UFC/cm^3
C1	**March**	240	240	5	360
	May	absent	absent	absent	<10
	August	320	180	2	900
	Mean	*280*	*210*	*3*	*630*
C2	March	220	49	absent	300
	May	540	2	absent	450
	August	540	320	absent	1500
	Mean	*433*	*124*	absent	*750*
C3	March	460	350	absent	390
	May	140	4	absent	630
	August	22	2	absent	>300
	Mean	*207*	*118*	absent	*510*
C4	March	23	5	absent	560
	May	40	absent	absent	1200
	August	8	absent	absent	270
	Mean	*24*	*5*	absent	*676*
C5	March	10	absent	absent	570
	May	5	absent	absent	360
	August	72	54	absent	870
	Mean	*29*	*18*	absent	*600*
C6	March	95	2	absent	500
	May	700	absent	absent	1420
	August	2	absent	absent	280
	Mean	*265*	*2*	*absent*	*730*

Table A.4.1.6-13. Microbiological indicators values in DBSC and PAMNC, in the summer of 2001

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^0C No. UFC/cm^3
C3	July	95	60	Absent	1300
	August	41	34	Absent	1080
	Mean	*68*	*47*	*Absent*	*1190*
C2	July	1800	17	Absent	1300
	August	560	210	Absent	2000
	Mean	*1180*	*114*	*Absent*	*1650*
C1	July	240	17	Absent	500
	August	1200	4	Absent	1700
	Mean	*720*	*11*	*Absent*	*1100*
C9	July	920	920	Absent	1500
	August	1600	14	Absent	1400
	Mean	*1260*	*467*	*Absent*	*1450*
C4	July	33	2	Absent	730
	August	3500	700	Absent	800
	Mean	*1766*	*350*	*Absent*	*765*
C5	July	33	5	Absent	630
	August	330	12	Absent	700
	Mean	*181*	*130*	*Absent*	*665*
C8	July	33	11	Absent	2000
	August	700	68	Absent	700
	Mean	*366*	*46*	*Absent*	*1350*
C6	July	12	2	Absent	500
	August	21	17	Absent	950
	Mean	*17*	*10*	*Absent*	*725*

Table A.4.1.6-14. Microbiological indicators values in DBSC and PAMNC, in April and May 2004

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs at 37 ^{0}C No. UFC/cm^3
C1	April	-	-	-	-
	May	62	5	absent	160
	Mean	62	5	absent	160
C9	April	950	11	2	120
	May	1600	10	absent	340
	Mean	*1275*	*10*	*2*	*230*
C4	April	22	5	absent	20
	May	1600	2	absent	270
	Mean	800	3	absent	145
C5	April	49	2	absent	40
	May	350	2	absent	230
	Mean	*200*	*2*	absent	*250*
C8	April	14	absent	absent	70
	May	11	60	absent	50
	Mean	*8*	*60*	absent	*60*
C6	April	6	absent	absent	30
	May	70	5	absent	110
	Mean	*38*	*5*	absent	*70*

Table A.4.1.6-15. Microbiological indicators values in DBSC and PAMNC, in October and November 2004

Section	Month	Total coliforme bacteria Prob. no./100 cm^3	Fecal coliforme bacteria Prob. no./100cm^3	Fecal streptococci Prob. no./100 cm^3	Heterotrophic germs UFC/cm^3
C9	October	9200	330	absent	1050
	November	1700	220	22	1200
	Mean	*5450*	*275*	*22*	*1125*
C4	October	540	5	absent	420
	November	1100	130	5	100
	Mean	*820*	*68*	5	*260*
C5	October	1700	10	absent	830
	November	1700	60	absent	200
	Mean	*1700*	*30*	*absent*	*513*
C8	October	9200	17	absent	600
	November	170	60	2	400
	Mean	*4680*	*39*	*2*	*500*
C6	October	16000	240	absent	980
	November	110	40	5	500
	Mean	*8055*	*140*	*5*	*740*

Annex A.4.1.7

Results of biological analyses of water samples from the DBSC

(Annex to Chapter 4.1.7)

Table A.4.1.7-1. Phytoplankton density and biomass in the DBSC, in 1999

Sections	Month	Density (thousand cell/l)					Biomass (mg/l)				
		Cyano-phyta	*Bacillario-phyta*	*Pyrro-phyta*	*Chloro-phyta*	Total density	*Cyano-phyta*	*Bacillario-phyta*	*Pyrro-phyta*	*Chloro-phyta*	Total biomass
C 1	III	0	1 666	0	667	3 600	0	3,4	0	0,2	3,6
	V	0	1 286	571	1 143	3 000	0	1,2	8,0	0,3	9,5
	VIII-IX	0	2 500	0	2 166	4 666	0	4,48	0	0,38	4,86
C 2	III	0	4 000	0	0	4 000	0	7,7	0	0	7,7
	V	0	2 167	500	0	2 067	0	1,89	4,0	0	5,9
	VIII-IX	200	3 600	0	600	4 400	0,02	5,3	0	0,06	5,38
C 3	III	0	3 500	0	0	3 500	0	6,6	0	0	6,6
	V	0	3 166	0	667	3 833	0	5,1	0	0,07	5,17
	VIII-IX	0	2 167	0	667	2 834	0	1,16	0	0,5	1,66
C 4	III	0	2 000	0	0	2 000	0	2,6	0	0	2,6
	V	0	1 834	0	667	2 500	0	3,8	0	0,07	3,87
	VIII-IX	0	4 333	167	5 999	10 499	0	6,7	1,3	1,88	9,88
C 5	III	5 000	1 000	0	500	6 500	0,1	2,8	0	0,05	2,95
	V	0	1 167	0	1 666	2 833	0	3,0	0	0,33	3,33
	VIII-IX	0	1 000	571	8 857	10 428	0	2,8	4,6	0,43	7,83
C 6	III	0	0	0	0	0	0	0	0	0	0
	V	0	167	333	0	500	0	0,9	1,3	0	2,2
	VIII-IX	178 571	0	0	2 428	180 999	8,9	0	0	0,3	9,2

Table A.4.1.7-2. **Phytoplankton density and density abundance in the DBSC, in the summer of 2001**

Sections	Total density (thousand cell/l)	Systematic groups									
		Cyano-phyta		*Bacillario-phyta*		*Eugleno-phyta*		*Pirro-phyta*		*Chloro-phyta*	
		tho. cell/l	%	tho. cell/l	%	tho. cell/l	%	tho. cell/l	%	tho. cell/l	%
C3	5000	0	0	3200	64.0	0	0	0	0	1800	36.0
C2	10400	0	0	1800	17.31	2800	26.92	0	0	5800	55.77
C1	4000	0	0	0	0	0	0	0	0	4000	100.0
C9	4600	0	0	1800	39.13	0	0	0	0	2800	60.87
C4	4200	200	4.76	1200	28.57	0	0	0	0	2800	66.67
C6	11166	0	0	2166	19.4	2167	19.4	0	0	6833	61.19
C5	5000	0	0	1000	20.0	400	8.0	200	4,0	3400	4.0
C8	2000	0	0	1000	50.0	600	30.0	0	0	400	20.0

Table A.4.1.7-3. **Phytoplankton biomass (mg/l) and biomass abundance (%) in the DBSC, in the summer of 2001**

Sections	Total biomass (mg/l)	Systematic groups									
		Cyano-phyta		*Bacillario-phyta*		*Eugleno-phyta*		*Pirro-phyta*		*Chloro-phyta*	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%	mg/l	%
C3	4,36	0	0	2.7	61.93	0	0	0	0	1.66	38.07
C2	6.8	0	0	1.3	19.12	2.5	36.76	0	0	3.8	44.12
C1	0.85	0	0	0	0	0	0	0	0	0.85	100.0
C9	2.5	0	0	1.4	56.0	0	0	0	0	1.1	44.0
C4	1.7	0.02	1.18	1.0	58.82	0	0	0	0	0.68	40.0
C6	9.6	0	0	1.6	16.67	1.2	20.83	0	0	6.0	62.50
C5	5.1	0	0	0.7	13.83	0.4	7.9	1.4	27.67	2.56	50.59
C8	1.34	0	0	0.8	59.70	0.5	37.31	0	0	0.04	44.0

Table A.4.1.7-4. List of phytoplankton species in the Danube, in the summer of 2001

Systematic groups / Species	Saprobe category	Dominant forms	Sections							
			C3	C2	C1	C9	C4	C6	C5	C8
Cyanophyta										
Dacylococcopsis Irregularis							+			
Bacillariophyta										
Cyclotella glomerata		Cyclotella glomerata	+	+		+	+	+		
Cyclotella meneghiniana	α - mezo	Cyclotella meneghiniana		+		+		+		+
Melosira granulata	β - mezo								+	‘
Navicula sp.		Navicula sp.	+							
Nitzschia actinastroides						+				
Nitzscha sigmoidea	β - mezo		+							
Chlorophyta										
Chlamydomonas simplex	β - mezo α - mezo						+			
Trachelomonas varians				+				+	+	+
Ankistrodesmus falcatus			+							
Chlorella vulgaris		Chlorella vulgaris			+		+		+	+
Pandorina morum				+		+		+	+	
Scenedesmus intermedius		Scenedesmus intermedius		+	+	+	+			
Scenedesmus quadricauda			+							
Volvox aureus							+			+

Table A.4.1.7-5. Total number of algal taxons in the DBSC, in May 2004

Sections	Total number of taxons	Systematic groups			
		Cyanophyta	Bacillariophyta	Pyrrophyta	Chlorophyta
C9	22	1	11	1	9
C4	24	1	14	0	9
C6	17	2	12	1	2
C5	26	2	19	0	5
C8	22	0	17	1	4
C1	24	3	12	0	9

Table A.4.1.7-6. Phytoplankton density (thousand cell/l) and density abundance (%) in the DBSC, in May 2004

Sections	Total density (tho. cell/l)	Systematic groups							
		Cyanophyta		Bacillariophyta		Pyrrophyta		Chlorophyta	
		tho. cell/l	%	tho. cell/l	%	tho. cell/l	%	tho. cell/l	%
C9	26 000	0	0	1 800	69.23	200	7.69	600	23.07
C4	1 835	0	0	1 001	54.55	0	0	834	45.44
C6	3 600	0	0	3 600	100.0	0	0	0	0
C5	18 667	16 666	89.28	1 167	6.250	0	0	833	4.46
C8	2 200	0	0	400	18.18	200	9.09	1 600	72.72
C1	12 200	10 600	86.88	1 600	13.11	0	0	0	0

Table A.4.1.7-7. List of phytoplankton species in the DBSC, in 2004

Systematic groups / Species	Section					
	C9	C4	C6	C5	C8	C1
Cyanophyta						
Coelosphaerium kutzingianum		+				
Lyngbia sp.	+		+		+	+
Microcystis aeruginosa		+	+	+		+
Oscillatoria sp.		+		+		+
Bacillariophyta						
Achnanthes brevipes	+					
Amphora ovalis				+	+	+
Asterionella Formosa	+	+	+	+	+	+
Caloneis amphisbaena						+
Champilodiscus clypeus					+	
Cocconeis placentula	+		+	+		+
Coscinodiscus sp.					+	
Cyclotella glomerata					+	
Cyclotella meneghiniana	+	+	+		+	+
Cymatopleura eliptica					+	+
Cymatopleura solea	+	+		+	+	+
Cymbella sp.		+		+	+	
Diatoma elongatum	+					
Diatoma vulgare	+	+	+		+	+
Fragilaria capuccina		+				
Fragilaria crotonensis	+		+	+	+	+
Gomphonema olivaceum	+					
Mastogloia brownie						
Melosira angustissima	+	+	+			
Melosira granulate	+		+	+		+
Navicula sp.	+	+	+	+	+	
Navicula cryptocephala						+
Nitzschia linearis	+	+	+		+	

Nitzschia paradoxa	+					
Nitzschia sigmoidea	+	+	+	+	+	+
Pinnularia sp.	+					
Pleurosygma sp.		+	+		+	
Synedra acus	+	+	+		+	+
Synedra ulna		+	+			+
Surirella ovata				+		
Surirella biseriata						+
Euglenophyta						
Trachelomonas sp.	+		+		+	
Pyrrophyta						
Peridinium sp.	+				+	
Clorophyta						
Ankistrodesmus falcatus	+					
Actinastrum hantzschii	+	+				+
Chroococcus turgidus	+					
Closterium sp.	+	+		+	+	
Coelosphaerium sp.		+				
Coenococcus fittii		+				
Eudorina sp.	+					
Micractinium pussillum						+
Microspora sp.		+	+	+	+	
Pandorina morum	+					+
Pediasrtum duplex	+			+	+	+
Pediastrum simplex	+		+			+
Scenedesmus acutus						+
Scenedesmus arcuatus	+	+	+		+	
Scenedesmus bijuga	+					
Scenedesmus quardicauda	+	+		+		
Spyrogira sp.	+	+	+	+		
Ulothrix				+		

Table A.4.1.7-8. Structure of algal taxons in DBSC in May 2005

Section	Total number of taxons	Systematic groups			
		Cyanophyta	Bacillariophyta	Pyrrophyta	Chlorophyta
C9	7	1	3	-	3
C4	5	1	1	-	3
C5	7	1	5	-	1
C8	5	1	1	1	2
C6	4	1	2	-	1

Table A.4.1.7-9. Phytoplankton density in DBSC in May 2005

Section	Total density (no. cell/l)	Systematic groups							
		Cyanophyta		Bacillariophyta		Pyrrophyta		Chlorophyta	
		no. /l	%	no. /l	%	no. /l	%	no. /l	%
C9	210000	60000	28.57	50000	23.81	-	-	100000	47.62
C4	110000	70000	63.64	10000	9.09	-	-	30000	27.27
C5	170.000	70.000	41.18	80000	47.06	-	-	20000	11.76
C8	120000	10000	8.34	10000	8.34	20000	16.65	80000	66.67
C6	80000	30000	37.50	40000	50.0	-	-	10000	12.50

Table A.4.1.7-10. Phytoplankton biomass in DBSC in May 2005

Section	Total biomass (mg/l)	Systematic groups							
		Cyanophyta		Bacillariophyta		Pyrrophyta		Chlorophyta	
		mg/l	%	mg/l	%	mg/l	%	mg/l	%
C9	1.535	0.960	62.54	0.430	28.01	-		0.145	9.45
C4	0.862	0.112	12.30	0.380	44.08	-		0.370	42.92
C5	2.532	0.112	4.42	2.100	82.94	-		0.320	12.64
C8	3.196	0.230	7.19	1.000	31.29	0.960	30.04	1.006	31.48
C6	1.300	0.480	36.92	0.620	47.70	-		0.200	15.38

Table A.4.1.7-11. Qualitative structure of phytoplankton in DBSC sections in May 2005

Systematic group	C9	C4	C5	C8	C6	Bioindicator (Saprobity)
Cyanophyta						
Microcystis flos-aquae	+	+	+		+	α-m
Oscillatoria sp.				+		
Bacillariophyta						
Amphora ovalis			+			
Cyclotella menenghiniana	+				+	α-m
Diatoma vulgare	+					β-m
Fragillaria capucina			+			
Fragillaria construens			+			β-m
Nitzschia palea	+		+			α-m
Nitzschia sigmoidea				+		β-m
Synedra actinastroides		+	+		+	
Pyrrophyta						
Peridinium sp.				+		
Chlorophyta						
Chlorella vulgaris	+	+		+		
Hormidium rivulare	+	+			+	
Pandorina morum				+		
Ulotrix tenuissima	+	+	+			

Table A.4.1.7-12. Results of biological analyses in August 2006

DBSC control sections	**Density cell/l**	**Biomass mg/l**
Mircea Vodă	3 600 000	13.4
CPAMN - Galeşu	6 000 000	15.3
Basarabi	17 800 000	13.3

Table A.4.1.7-13. List of algal organisms identified in the DBSC water, August 2006

Sistematic groups/taxons
Cyanophyta
Lyngbia sp.
Microcystis pulverea
Microcystis viridis
Bacillariophyta
Anomeoneis sphaerophora
Cyclotella glomerata
Cyclotella meneghiniana
Cymbella tumida
Diatoma vulgare
Gomphonema olivaceum
Gyrosigma sp.
Melosira granulata
Melosira granulata var. angustissima
Navicula sp.
Nitzschia linearis
Nitzschia palea
Nitzschia paradoxa
Nitzschia holsatica
Nitzschia sigmoidea
Pleurosigma sp.
Pleurosigma delicatum
Synedra acus
Rhoicosphaenia curvata
Euglenophyta
Euglena viridis
Trachelomonas planctonica
Trachelomonas stokesiana
Trachelomonas verrucosa
Pyrrophyta
Criptomonas ovata
Katodinium vorticella
Peridinium cinctum
Chlorophyta
Actinastrum hantzschii
Ankistrodesmus falcatus
Chlamydomonas simplex
Coelastrum microporum
Chlorella vulgaris
Eudorina elegans
Oocystis borgei
Pandorina morum
Sphaerocystis schroeteri
Scenedesmus carinatus
Scenedesmus bijuga var. ovaltemus
Scenedesmus quadricauda

ANNEX B

Answers
To Mr. Jan Howerkamp questions

1 Procedural issues

According to Romanian regulations the application for environmental permit should be accompanied by a **Project Presentation**. The document posted on internet: http//www.mmediu.ro/dep_mediu/cernavoda.htm is a Project Presentation and not an EIA report.

1.1 Referring to MR. Howerkamp comments on the adequacy of nuclear power for Romania and Southern Balkans we quote from Communication from the Commission to the European Council and the European Parliament (2007): "*Currently around one third of the electricity and 15% of the energy consumed in the EU comes from nuclear which is one of the largest sources of carbon dioxide (CO_2) free energy in Europe. Nuclear power has been one of the ways of limiting CO_2 emissions within the EU and, for those Member States that wish, is also likely to form part* *of an energy scenario where significant emission reductions are going to be required in the coming decades. Nuclear power is less vulnerable to fuel price changes than coal or gas-fired generation, as uranium represents a limited part of the total cost of generating nuclear electricity and is based on sources which are sufficient for many decades and widely distributed around the globe. It is for each Member State to decide whether or not to rely on nuclear electricity*".

1.2 Referring to Mr. Howerkamp comments under paragraph 1.2 we mention the followings:

As concerns the Romanian public participation in the environmental licensing process, as per the Aarhus Convention, the process is conducted in Romanian language. There is no obligation to provide English translation of any document.
We do not agree with the comments on the quality of English translations our documents. The Espoo Convention do not requires a particular standard on this respect.
The Project Presentation was posted on internet both in Romanian and in English.
Few errors in document editing do not justify the opinion that the English translation is low.

1.3 *A full EIA documentation, in both the Romanian and the English language, will be provided when the Romanian Authority will start the public consultation as per Aarhus and Espoo Conventions.*

2 The EIA Report

2.1 *According to Appendix II to Espoo Convention the information to be included in the environmental impact assessment documentation shall, as a minimum, contain, in accordance with Article 4:*

- A description of the proposed activity and its purpose;
- A description, where appropriate, of reasonable alternatives (for example, locational or technological) to the proposed activity and also the no-action alternative;
- A description of the environment likely to be significantly affected by the proposed activity and its alternatives;
- A description of the potential environmental impact of the proposed activity and its alternatives and an estimation of its significance;
- A description of mitigation measures to keep adverse environmental impact to a minimum;
- An explicit indication of predictive methods and underlying assumptions as well as the relevant environmental data used;
- An identification of gaps in knowledge and uncertainties encountered in compiling the required information;
- Where appropriate, an outline for monitoring and management programmes and any plans for post-project analysis; and
- A non-technical summary including a visual presentation as appropriate (maps, graphs, etc.).

2.2 Reactor security

2.2.1 Physical protection against the theft or other unlawful taking of nuclear materials and against the sabotage of nuclear material and facilities by individuals or groups has long been a matter of national and international concern. Although responsibility for establishing and operating a comprehensive physical protection system for nuclear materials and facilities within a State rests entirely with the Government of that State, the need for international co-operation becomes particularly evident in situations where the effectiveness of physical protection in one State depends on other States taking, as appropriate, adequate measures to deter or defeat hostile actions against nuclear facilities and materials when such materials are transported across national frontiers. The physical protection objectives are to establish and to maintain conditions to:

- *protect against unauthorized removal of nuclear material in use and storage, and during transport;*
- *ensure the implementation of rapid and comprehensive measures by the State to locate and recover missing or stolen nuclear material;*
- *protect against sabotage of nuclear facilities and sabotage of nuclear material in use and storage and during transport; and*
- *mitigate or minimize the radiological consequences of sabotage.*

2.2.2 Multiple Safety Systems and Physical Protection

The “defense-in-depth” strategy that protects the public from radiological hazard in the event of a reactor malfunction also protects the reactor’s fuel and safety systems from attempted sabotage. The design of each plant emphasizes the reliability of plant systems, redundancy and diversity of key safety systems, and strong physical barriers to prevent incidents that could pose a threat to public health and safety.

Reactor containment buildings designed to be impervious to catastrophes. Nuclear power plants containment buildings, in which the reactors are located, are extremely robust. Steel reinforced concrete containment structures, coupled with multiple, redundant safety and plant shutdown systems, have been designed to withstand the impact of hurricanes, tornadoes, floods, and airborne objects with a very substantial force.

Fortified physical barriers at nuclear plants resist penetration. For a release of radiation to occur, several strong layers of protection must be penetrated, including the containment structure, which is typically protected by about four feet of reinforced concrete with a thick steel liner, and the reactor vessel, which is made of steel that is about six inches thick.

An independent study confirms that the primary structures of a nuclear plant would withstand the impact of a commercial airliner. Areas of the plant that house the reactor and used reactor fuel would withstand the impact of a widebody commercial aircraft, according to peer-reviewed analyses by EPRI, a Palo Alto, Calif.-based research organization.

Reactor operators act in concert with plant security systems to maintain safety. Reactor operators train frequently to be sure they can respond to a range of unusual events. Plant operators have emergency procedures in place specifically for security situations, including automatic shutdown of the reactor in the event of an attack.

Emergency planning and public notification systems are coordinated with plant security procedures to protect public health and safety. The Regulatory Body periodically evaluates emergency response plans during exercises or drills, which may also involve local police, fire and emergency management organizations.

2.2.3 Site Security

All commercial nuclear plants have extensive security measures to thwart intruders. Plant operators and the Regulatory Body inspect these measures and test them in drills to uncover any vulnerability. Security measures include:

- well-trained and well-armed security officers;
- surveillance and patrols of the perimeter fence;
- a dedicated contingency response force;
- biometric and other sophisticated plant access equipment;
- physical barriers and illuminated detection zones;
- intrusion detection aids (including several types of detection fields, closed-circuit television systems and alarm/alert devices);
- bullet-resisting barriers at critical areas.

The dedicated, tactically trained, well-equipped security officers will counter all threats—collectively determine the nature of a threat, assessing its magnitude, and taking aggressive steps to deter the threat.

Access to a nuclear plant is controlled through concentric security zones. Three concentric security zones provided increased levels of protection for the reactor and other vital plant equipment. All protective barriers are substantial enough to effectively delay entry in order for an armed response by plant security forces.

The "owner-controlled area" is the largest area of the nuclear plant and encircles the other two areas. Access to a nuclear power plant requires passage through a larger "owner-controlled area."

The "protected area" is an interior fenced area where the reactor building is located. Access to this area is controlled by security officers, physical barriers, intrusion detection equipment, closed-circuit surveillance equipment, a designated isolation zone and exterior lighting. Vehicle barriers and/or other physical boundaries ensure that the protected area of the plant cannot be breached by a direct vehicular assault or by detonation of a vehicle bomb. All vehicles, personnel and material entering the protected area first must be thoroughly inspected by security officers to ensure that no weapons, explosives or other such items are brought onto the plant site.

The "vital area" consists of the buildings that house the reactor and generate the electricity. Access to these inner areas of the plant where vital equipment is located is also controlled through the use of armed guards, physical barriers, locked and alarmed doors, and key-card-reader or hand geometry access control systems. Plant employees must have a documented need prior to gaining access to each vital area and their movements are tracked by key-card access points throughout the vital area.

2.2.4 Aircraft Crashes

EPRI aircraft crash building integrity study uses advanced computer modeling and adverse assumptions. In 2002, the independent research organization EPRI undertook an advanced computer modeling study to determine if buildings at nuclear power plants can withstand the impact of an aircraft crash similar to the Sept. 11 terrorist attacks. A Boeing 767 was selected as the aircraft because its weight is greater than almost all other commercial jet airliners flown in the United States, and because over two-thirds of the commercial aircraft registered in this country are manufactured by Boeing. The location of the buildings and facilities where the aircraft would do the most damage was chosen as the place where the aircraft would strike. The study used the reasonable, controllable aircraft speed for the accuracy of the strike analyzed.

Nuclear plants are much smaller than the World Trade Center or the Pentagon, making them more difficult targets to strike by aircraft. Because nuclear plant structures are smaller than the buildings attacked on Sept. 11, they are more difficult to damage, because it is more difficult to aim the airplane such that it hits the structure at its most damaging point. In addition, used fuel storage pools are either deep within a building or the used fuel is located underground and thus not visible to a pilot from a plant's exterior. Also, intervening structures on the power plant site make it very difficult to reach these areas by plane. Finally, nuclear plant buildings and structures are so low to the ground that the ground begins to affect the wind currents produced by the plane, reducing a pilot's ability to control and maneuver the plane without slowing down.

The EPRI study demonstrates that the critical structures of a nuclear power plant will not be penetrated by a aircraft crash. The results of the EPRI study demonstrate that no parts of a Boeing 767—the engine, the fuselage, or the wings, nor the jet fuel—will enter the containment building, used fuel storage pool, used fuel dry storage facilities, or the used fuel transportation containers. This means that no radiation will leak from these structures even if hit by a Boeing 767 at the maximum plausible force and vulnerability.

2.2.5 Personnel Procedures and Restricted Areas

All nuclear power plants have programs that reduce the potential for threats from plant personnel, or "insiders." These include authorization criteria for those allowed unescorted access to the plant's protected area and "fitness-for-duty" programs to deter drug and alcohol abuse. Strong behavioral observation programs are in place requiring personnel to be trained to observe and handle behavior that may be a potential threat to the normal operation of a nuclear power plant. In addition, many companies provide teamwork development programs that promote commitment and accountability in the work force.

Access authorization. Before new nuclear plant employees or contractor employees are allowed unescorted access to the protected area, they must pass several tests and background checks to determine whether they are trustworthy and reliable. These tests include drug and alcohol screening, psychological evaluations, plus a check of employment records, education records, criminal histories and credit histories.

Fitness-for-duty programs. Companies that operate nuclear power plants ensure that personnel perform their duties in a safe, reliable and trustworthy manner. Employees who have unescorted access to vital areas of the plant must maintain their fitness-for-duty. The Regulatory Body requires companies to conduct random drug and alcohol testing on their employees. At least half of all employees are tested annually.

Behavioral observation. Employees with unescorted plant access are subject to continual behavioral observation programs. Behavioral observation is conducted by supervisory and management personnel trained in behavioral observation. Behavioral observation is designed to detect individual behavioral changes, which, if left unattended, could lead to acts detrimental to public safety. Employees are offered counseling if they have job performance problems or exhibit unusual behavior. Similarly, anyone who appears to be under the influence of drugs or alcohol is immediately removed from the work area for evaluation.

2.2.6 Post-Sept. 11 Security Enhancements

Nuclear plants are the most secure industrial facilities in the world. After Sept. 11, the nuclear energy industry substantially enhanced security at nuclear plants—already the most secure facilities in the industrial infrastructure. Additional security measures include:

- extending and fortifying security perimeters;
- increasing patrols within security zones;
- installing new barriers to protect against vehicle bombs;
- installing additional high-tech surveillance equipment;
- strengthening coordination of security efforts with local, and national agencies to integrate approaches among the entities.

2.3 The risk of earthquake

A full analysis of the geological situation of the Cernavoda site and an in-depth description of possible impacts of seismic activity is given in the EIA Report.

2.4 Meteorological data

A full meteorological survey is given in the EIA report.

3 Analysis of emissions, fuel chain and radioactive waste

3.1 Missing analysis of possible health effects of ongoing radioactive emissions

The analysis of possible health effects of emissions, including cumulative effects is given in the EIA report.

3.2 Radioactive waste and spent fuel management policy

As Romania has decided to use the open fuel cycle, considering spent fuel as radioactive waste, the policy for spent fuel management is included in the policy for radioactive waste.

The objective of Romanian radioactive waste management policy is to assure safe management of radioactive waste, according to the principles stated in IAEA Safety Fundamentals SS No. 111-F "The Principles of Radioactive Waste Management".

The Romanian radioactive waste management policy and strategy are fully taking into account the general and radioactive waste management specific requirements presented in IAEA Requirements No. GS-R-1: Legal and Governmental Infrastructure for Nuclear, Radiation, Radioactive Waste and Transport Safety. The main general aspects of radioactive waste management policy are presented below:

- The radioactive waste management, including the transport, shall be authorized, and shall be performed according to the provisions of the applicable laws and regulations, assuring safety of facilities, protection of human health and environment (including protection of future generations).
- According to the law, the import of radioactive waste is prohibited.
- The Fund for Radioactive Waste Management and for Decommissioning shall be set-up in the next future, and the contributions to the Fund shall start to be collected as soon as the law regarding that fund will be approved by the Parliament.
- According to the Governmental Ordinance no. 11/2003, approved by the Law no. 320/2003 ANDRAD is responsible for the radioactive waste strategy at national level;
- The national strategy for radioactive waste established by ANDRAD shall be approved by AN, which, according to the Governmental Ordinance no.7 approved by the Law no 321/2003, is responsible for elaboration of the Strategy for Developing the Nuclear Field, of Action Plan and of National Nuclear Plan According to the provisions of the Govermental Ordinance no.11/2003 any producer of radioactive waste is responsible for the management of that waste and for the decommissioning of its facility; he shall bear the expenses related the collection, handling, transport, treatment, conditioning, temporary storage and disposal of the waste he has produced, and shall pay the legal contribution to the above mentioned fund.
- In the authorization process, the minimization of radioactive waste shall be required.
- The timing for decommissioning and radioactive waste disposal shall assure, as far as applicable, the requirements for not imposing undue burden on future generations.
- According to international agreements signed with neighbour countries, the protection of human health and environment beyond national borders shall be assured in such a way that the actual and potential health effects will be not more detrimental that those accepted for Romania.
- The discharge of gaseous and liquid radioactive effluents from any nuclear facility shall be limited, according to derived emission limits approved by CNCAN, and further reduced, according to optimization principle.
- By conditions set in the operating authorization, and by regulatory dispositions, the holder of authorization is requested to send the radioactive waste (including the spent sources) for treatment and disposal or long term storage at dedicated facilities.
- Any waste management or spent fuel management facility shall have a decommissioning generic plan; for new facilities, this requirement applies from the design stage, when the application for the sitting authorization is submitted to CNCAN.

According to its tasks, as they are stipulated by the Law 320/2003, ANDRAD has developed, submitted for approval to Nuclear Agency and published in The Official Bulletin No.818 of 6 september 2004, "The National Strategy on Medium and Long Term Management of Spent Nuclear Fuel and Radioactive Waste, Including the Disposal and the Decommissioning of Nuclear and Radiological Facilities" (see http://www.andrad.ro/ro/docs/ord844.pdf).

4 **Economics of Cernavoda units 3 and 4**

In April 2005, the IEA and the NEA of the OECD carried out a study regarding the electricity generation cost of different technologies.
The study took account of data provided for more than 120 power plants. The calculations were based on the reference methodology adopted in other IEA studies, i.e. the levelised lifetime cost approach and electricity generation costs calculated are bus-bar costs, at the station. The results are highlighted in the table below.

Levelised generation costs for various technologies:

Generation technology	Levelised cost in EUR per MWh* at a 5% discount rate	Levelised cost in EUR per MWh* at a 10% discount rate
Coal	19 to 38	27 to 46
Gas	28 to 46	31 to 48
Nuclear	16 to 24	23 to 38
Wind	27 to 73	35 to 108
Hydro	31 to 62	50 to 77
Solar	115+	154+
CHP	19 to 50	23 to 54

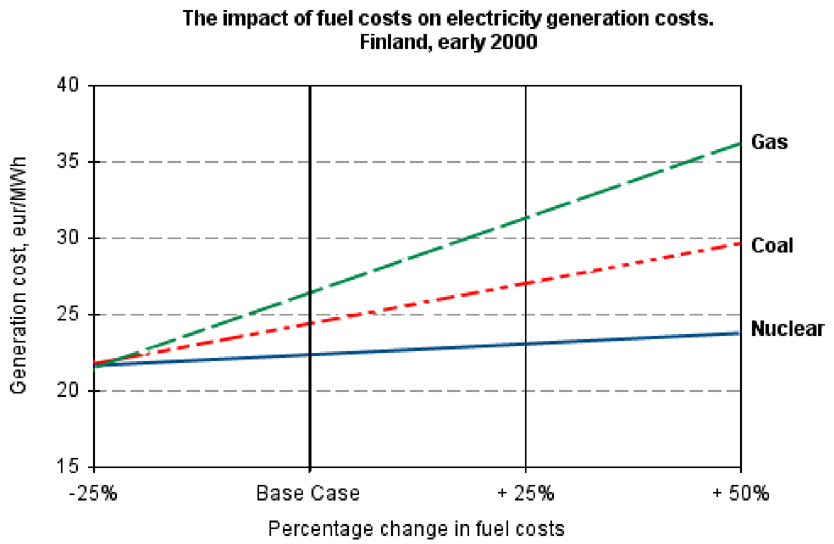
*The study was conducted in USD per MWh and an exchange rate of USD1.3 per EUR was used to convert the numbers to EUR. This exchange rate was the average rate in the month of April 2005. These amounts exclude external costs (such as environmental costs) for all options except nuclear, which reflects waste management and decommissioning and disposal costs as internal costs.

From the above, it should be clear that nuclear technology should have a cost advantage compared to other technologies. However, results may differ from one country to another.

The significant increase in fuel costs in recent years has triggered a substantial rise in the cost of generating electricity from fossil-fuelled power plants, the competitive advantage of nuclear power plants has grown. Due to their low operating costs, nuclear power plants can compete well against any form of power with the exception of hydroelectric utilities, which have no fuel costs.

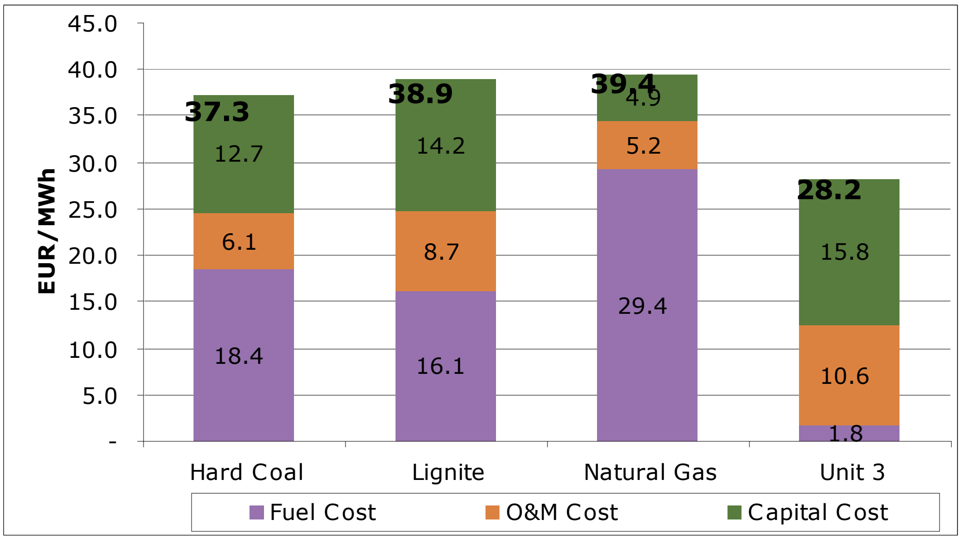
Another study of energy economics in Finland published in mid 2000 shows that nuclear energy would be the least-cost option for new generating capacity. The Finnish study in 2000 also quantified fuel price sensitivity to electricity costs, as depicted in the figure below.

The impact of fuel costs on electricity generation costs



These show that a doubling of fuel prices would result in the electricity cost for nuclear rising about 9%, for coal rising 31% and for gas 66%.
For the specific environment of Romania an analysis has been performed for an imaginary power plant of about 706 MW installed power considering various scenarios regarding the technology employed to produce the electricity as an alternative to the nuclear solution.
The figure below shows the levelised costs at a 5% discount rate.

Levelised generation costs at 5% discount rate



* These costs exclude external costs (such as environmental costs) for all options except nuclear, which reflects waste management and decommissioning and disposal costs as internal costs.
These results underline the electricity generation cost for a power plant using natural gas could be higher than the electricity generation cost for a power plant using lignite or hard coal. The main reason for this is the natural gas price evolution in the last period which has a big impact in the generation cost structure (83% of the generation cost for a power plant using natural gas is represented by fuel cost; comparatively, for a power plant using hard coal the fuel cost accounts for 58% of the generation cost);
The levelized unit electricity cost for a power plant using natural gas is similar to a power plant using hard coal. The main reason for this is the small investment for a power plant using natural gas in comparison with the investment for a power plant using hard coal.
The levelized unit electricity cost for this Project basis is lower than the other forms of electricity generation, illustrating that nuclear generation technology should have a cost advantage (under the same market conditions) as compared to other technologies.
Plant Profile

	Unit 1	Unit 2	Unit 3	Unit 4
Start of Operations	Jan 1997	Oct 2007	May 2013	May 2014
End of Operations	Dec 2026	Sep 2037	April 2043	April 2044
Rated Capacity (MW)	706	706	720	720
Parasitic Load	6.5%	6.5%	5.5%	5.5%
Unplanned Outages (%)	3.0%	3.0%	3.0%	3.0%
Planned Outages (days)	32days (Q2)	32days (Q2)	30days (Q3)	30days (Q2)
Net Power Generated (MW)	653.1	653.1	673.2	673.2
Net Energy Produced (GWh)	5,050	5,050	5,239	5,239

5 The Energy Policy

5.1 EU New Energy Policy

The 2007 Spring European Council demonstrated that the EU is taking the lead in the fight against global warming. EU heads of state and government adopted an energy policy for Europe which doesn't simply aim to boost competitiveness and secure energy supply, but also aspires to save energy and promote climate-friendly energy sources.

The point of departure for a European energy policy is threefold: combating climate change, limiting the EU's external vulnerability to imported hydrocarbons, and promoting growth and jobs, thereby providing secure and affordable energy to consumers.

In the light of the many submissions received during the consultation period on its Green Paper, in this Strategic Energy Review the Commission proposes that the European Energy Policy be underpinned by:

- an EU objective in international negotiations of 30% reduction in greenhouse gas emissions by developed countries by 2020 compared to 1990. In addition, 2050 global GHG emissions must be reduced by up to 50% compared to 1990, implying reductions in industrialised countries of 60-80% by 2050;
- an EU commitment now to achieve, in any event, at least a 20% reduction of greenhouse gases by 2020 compared to 1990.

The Commission proposes to maintain the EU's position as a world leader in renewable energy, by proposing a binding target of 20% of its overall energy mix will be sourced from renewable energy by 2020. This will require a massive growth in all three renewable energy sectors: electricity, biofuels and heating and cooling. This renewables target will be supplemented by a minimum target for biofuels of 10%. In addition, a 2007 renewables legislative package will include specific measures to facilitate the market penetration of both biofuels and heating and cooling.

The Commission reiterates the objective of saving 20% of total primary energy consumption by 2020. If successful, this would mean that by 2020 the EU would use approximately 13% less energy than today, saving 100 billion euro and around 780 tonnes of CO2 each year.

At present, nuclear electricity makes up 14% of EU energy consumption and 30% of EU electricity. The Commission proposals underline that it is for each member state to decide whether or not to rely on nuclear electricity. The Commission recommends that where the level of nuclear energy reduces in the EU this must be offset by the introduction of other low-carbon energy sources otherwise the objective of cutting greenhouse gas emissions will become even more challenging.

It is for each Member State to decide whether or not to rely on nuclear power for the generation of electricity. Decisions to expand nuclear energy were recently taken in Finland and in France. Other EU countries, including the Netherlands, Poland, Sweden, Czech Republic, Lithuania, Estonia, Latvia, Slovakia, the United Kingdom, Bulgaria and Romania have re-launched a debate on their nuclear energy policy. With 152 reactors spread over the EU 27, nuclear power contributes 30% of Europe's electricity today - however, if the planned phase-out policy within some EU Member States continues, this share will be significantly reduced. To meet the expected energy demand and to reduce European dependency on imports, decisions could be made on new investments or on the life extension of some plants.

Reinforcing nuclear power generation could also represent one option for reducing CO_2 emissions and play a major role in addressing global climate change. Nuclear power is essentially carbon emissions-free and forms part of the Commission's carbon reduction scenario including the objective of reducing CO_2 emissions. This could also feature as an important consideration when discussing future emissions trading schemes.

The most crucial factor affecting the prospect of growth of nuclear power is its underlying economics as a nuclear plant involves an up front investment ranging from €2 to €3 billion. Nuclear energy generation incurs higher construction costs in comparison to fossil fuels, yet operating costs are significantly lower following the initial investments. Furthermore, nuclear power generation is largely immune to changes in the cost of raw material supplies, as a modest amount of uranium, which comes largely from stable regions of the world, can keep a reactor running for decades. Therefore, in most industrialised countries new nuclear power plants offer an economic way to generate base-load electricity.

The nuclear industry has made considerable investments since 1997. The EU recognises the importance of maintaining a technological lead in the field of nuclear power and supports the further development of the most advanced framework for nuclear energy, including non-proliferation, waste management and decommissioning. Since the establishment of the Euratom Treaty, nuclear safety and the radiological protection of the public have been one of the main concerns of the European Community and are issues that have gained further importance in view of the past and the present enlargement.

At EU level, the role should be to develop further the most advanced framework for nuclear energy in those Member States that choose nuclear power, in conformity with the highest standards of safety, security and non-proliferation as required by the Euratom Treaty. This should include nuclear waste management and decommissioning.

5.2 Romania's Energy Strategy

Romania is closely observing the energy policy of the European Union, aiming to develop a competitive national energy market, integrated into European internal market. In this context, the Romanian Government approved by Government Decision no. 647/2001 the "National Strategy for Energy Development on Medium term", taking into consideration the energy developments in the European Union as well as the recent developments in the National Energy System (NES). The main objective of the National Energy Strategy on Medium Term aims to the creation of efficient energy markets, whose development could be ensured in a durable way, in high quality and security conditions of the energy supply, observing the EU energy efficiency and environment protection standards.

The energy sector represents a strategic infrastructure of the national economy on which relies the overall development of the country. In the same time the energy represents a public utility with an important social impact.
The energy policy, is approaching this important sector of the Romanian National Economy, as a public utility which needs more commercial mechanisms and competitive environments, where the prices to be formed in a free competition between a diversity of suppliers and customers, which are gradually free to purchase their energy, as well as a transparent and stable market mechanisms surveyed by independent regulating authorities and market operators.
The basic evaluation of the energy is based on the consumption. The consumption projections done, are based on the need of energy:

- to sustain the development trend of the country,
- as well as on the need of improving the energy efficiency, environment protection, optimum utilization of the resources.

Consequently, the consumption projection done is based on following specific vectors:
GDP evolvement.
The Romanian Government policy is to sustain an accelerated growth of the GDP in view of achieving the strategic objective of reduction of the economic discrepancy between Romania and EU countries. Two scenarios of GDP growth, where basically considered for the period till the year 2015:

GDP growth in %	Achieved in the 2000 – 2001	2002 – 2005	2006 – 2010	2011 – 2015	Average value 2002 - 2015
Base scenario	5.2%	5.1%	6.0%	5.2%	5.46%
Alternative scenario		4.4%	5.5%	4.8%	4.90%

The basic scenario is the one the Government is keen to implement, based on accelerated development of the economy, where industry development has a key role, as well as acceleration of the privatization in the electricity gas and oil sectors, but also accomplishment of the privatization in other sectors of the national economy.
The alternative scenario has been considered having in view to the possible negative impact of the trend of the world wide economy on the Romania market which could slow down some economic processes.

Energy intensity.
In the basic scenario as provided in the strategy for energy efficiency, the overall energy intensity has to be reduced by 30-50% till the year 2015, in a complex process which involves replacing of the technologies with high energy consumptions in a structural adjustment of the economy.
The alternative scenario, of 25% is related to the alternative scenario of the GDP. i.e. a slower development due to some unexpected effects.

Energy intensity measured as an amount of primary energy sources per GDP unit (a ton of oil equivalent to US $ 1,000) is one of the key measures of energy efficiency and an important component of a national economy, which has been considered in the energy planning. Energy intensity in Romania measured by this indicator is as follows:

Energy intensity, in t.o.e. /$ 1,000 of GDP

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Romania: a) b)	 1,33 0,66	 1,21 0,61	 1,06 0,53	 1,07 0,41	 1,02 0,39	 0,92 0,35	 0,88 0,34	 0,89 0,34	 0,99 0,38	 0,96	 0,83
UE	0,19	0,19	0,19	0,18	0,19	0,18	0,19	0,18	0,17	0,16	0,15

For Romania: - Source of information ISPE (Institute for Energetic Studies and Engineering)
a) Final energy consumption/GDP97
b) Final energy consumption/GDP - parity purchase power (ppc)
*** - year 1989 has been calculated at the same ppc as in 1990;*
- *For the years 1998 - 1999 b) indicator has not been calculated due to the lake of ppc*

The drop of energy intensity of 3% is mainly due to the structural change of GPO i.e.:
- drop of industry ration in total GDP form 40,5% in 1990 to 33,2% in 1996 and 25,23% in 2000
- increase of the ratio of services

Specific targets to reduce heat emissions and intensity are included in the strategy for energy efficiency. Energy intensity is important for this road map from the point of view of its influence on the determination of the power demand.

In the strategy for energy it is foreseen the following prognosis for energy intensity:

Energy intensity in the period 2000 – 2015

Indicator	**MU**	**Year / Scenario**	**2000**	**2005**	**2010**	**2015**
Final energy consumption/GDP	t.o.e./10^3 $	Optimistic	-	0.522	0.409	0.334
		Optimistic – moderate	-	0.522	0.426	0.352
		Medium	0.835	0.533	0.456	0.410
		Medium – pessimistic	-	0.547	0.482	0.434
		Minimal	-	0.557	0.499	0.451

Source: ISPE. The year 1999 has been considered as basic year

Population and their increasing energy consumption, by using more house appliances. It is foreseen the population of Romania to be of 22,2 to 22,3 million inhabitants in the year 2007 and 22,6 million in the year 2015.

Based on the objectives of:
- GDP growth
- Reduction of the energy intensity by 30-50%
- Population energy demand

It was determined the following need of **energy resources for Romania:**

NEED OF PRIMARY ENERGY RESOURCES

toe /1000$ of GDP (tons of oil equivalent)

	Achieved 2001	**2005**	**2010**	**2015**	**Increase 2015/2001**
Reduction of energy intensity **a) 50%** **b) 40%** c) **30%**	 54.260 	 54.000 57.770 58.300	 54.700 63.800 66.900	 57.300 68.500 74.500	 3000 14.200 20.200

Having in view the Strategy of Energy Efficiency it is considered the alternative of reduction of energy intensity by 40%, a realistic achievable target.
Due to a more efficient energy use the average electricity consumption growth is 2.7% / year at a GDP growth of 4-5%/year.

The electricity demand has been projected (see Appendix nr.1) based on this assumptions, ad correspondingly it has been determined the following the gross electricity production chart for the period 2003-2015:

NEED OF INVESTMENTS

In order to upgrade the national energy system in Romania large-scale investments are needed for upgrading, reconstruction, as well as for expansion of the existing capacities and the construction of green field capacities.

In despite of the efforts done in the generation sector, this sector is and will be the mostly intensive investment sector to cover the target for upgrading as well as for the new projects. It is very significant that for more than 5000MW in the fossil fuel generation, the equipments are very old.

Overall summary picture in the energy sector is the following:

- ***In the electricity generation based on fossil fuel*** more than 32% of the equipments are of more than 30 years of age, and 50% are between 20-30 years old. In this filed only 0, 7% are of less than 10 years old.
- ***In the hydro generation*** 24% of the equipments are of more than 30 years old, 51% of more than 20 years old and only 13% are of more than 10 years old.

The new capacities to be built are determined based on the parallel program of the capacities to be retired, the overall picture is as follows:

In MW

Sector	2003-2005		2006-2010		2011-2015	
	New capacities	Capacities to be retired	New capacities	Capacities to be retired	New capacities	Capacities to be retired
Hydro: -New cap. -Rehabilitation	129Mw: 99Mw 30Mw	-	200Mw: 200Mw -	-	200Mw: 200Mw -	-
Thermal: -New cap. -Rehabilitation	555Mw: - 555Mw	1280Mw	3505Mw: 1445Mw 2060Mw	2185Mw	710Mw: 500Mw 210Mw	0
Nuclear			707Mw		707Mw	-
Total	1284Mw	1280Mw	4412Mw	2185Mw	1617Mw	-

The selection of the power projects to be promoted was done based on the merit principle using the least cost calculation**.**

In the efficiency hierarchy the following power projects should be considered:

- **Nuclear power generation**: power unit nr. 2 (707MW)and later on power unit nr.3 (707 MW) at Cernavoda Power Plant. Nuclear energy is the main sector to cover the future increase of energy demand. The nuclear energy represents one of the most efficient energy and is reducing the dependency of import of energy resources
- **Additional Hydro power** generation capacity, economically feasible, estimated at 500-900 MW
- **Power generation based on lignite and hard coal by rehabilitation of some of the existing power**, where the upgrading costs are less than 50% than for a new capacity **and/or built of new units,** at the following locations: Turceni, Rovinari, Isalnita, Deva-Mintia. The rehabilitation projects could represent 35-45% of the total newly needed power generation capacity
- **Combined cycle gas turbines**. Only 15% of the total power generation will be secured form natural gas.

Hereunder is a brief presentation of the needed investments effort for the whole energy sector, as well as a tentative definition of investment sources:

N.B. In the process of determination of the invesmtent sources it has been firstly considered the private participation to the maximum realistical expectation possible. Only the difference has been considered to be secured from state company resources.

In million US$

Sector	2003-2005		2006-2010		20111-2015		Total
	Total, out	Investment sources	Total. out of	Investment sources	Total, out of	Investment sources	

	of which from:	Private	State owned comp.	which from:	Private	State owned comp.	which from:	Private	State owned comp.	
Thermal generation	1595	400	1195	1588	800	788	300	200	100	3485
Hydro generation	450	100	350	500	150	450	660	300	360	1610
Nuclear generation	480	-	480	1046	400	646	360	100	260	1886
Transmission	491	-	491	234	-	234	341	-	341	1266
Distribution*	628	428	200	727	727	-	885	885	-	2240
Total	3644	928	2716	4095	2077	2018	2764	1485	1261	10485

**Distribution companies will be privatized*

The environment investment cost is estimated at 10% of the total investments effort.
The energy sector needs of investments should be fulfilled through the private equity participation to the maximum extend possible and feasible.

The ongoing reform and restructuring of the energy field has as main target to become attractive and convincing for the private investors, so that most of the necessary capital to flow from the foreign capitals, because of the limited financial capacity within the country.
It is therefore important to promote an appropriate sequence of investments, starting with the **most viable projects**, which could represent a success story and encourage the investors, as well as a stable, and transparent legal and regulatory frame work and appropriate market model and structure.
New contracting mechanisms as described in the attached road map for regulation will be put in place to respond the expectations of the investors and to limit the practice of long-term power purchase agreements which should be promoted on a very selective base and only if they will not break the EU Directives of "stranded cost" or "state aid".
The limited investment capacity of the state companies (direct financing or sovereign guarantees) will be used in the next years only for those projects (natural gas and power production and transmission), important for the national system, but less attractive for foreign investors at this transition stage.

Romania has ratified the UN Framework Convention on Climate Changes. In accordance with the Kyoto Protocol signed, Romania made the commitment to reduce anthropogenic emissions of greenhouse gases by 8% compared to the emissions of 1989 emissions level.
For the implementation of EU Directive 2001/80/Ec, The Romania Government has prepared a draft of Government Decision for the limitation of the emissions in the atmosphere coming from big power units i.e. over 50 MW, at the level of the EU Directives (for solid, SO2 and NOX emissions).
These limits are compulsory for any new unit to be implemented.

For the existing units in operation it is foreseen to achieve the required level of emission in a gradual program so that by the year 2012 to cope with the level of emission provided in the new regulation, by implementing a very important investment program.
For the power plants in the structure of Termoelectrica, the total investment effort for the period 2003 - 2015 is estimated at the level of 1,026 billion $, out of which 28,9% should be spend till the year 2007. The investment for upgrading of the boilers and electro precipitator (solid emission) represents 8% of the total amount, for upgrading of the burners represents 6%, and for desulphurization represents 86% of the total amount.

At this moment Ministry of Economy and Finance is updating the Energy Strategy taking into account the evolution of the Romanian Market and the integrated energy and climate change package to cut emissions for the 21st Century, proposed by the European Commission.

5.3 <u>“Romania's Policy in Nuclear Power Field”</u>

The Cernavoda NPP is located in the Dobrogea region of South-East Romania, near the Danube River – Black Sea river canal. The site is designed for five CANDU 6 reactors, each of which has a

gross installed capacity of about 700 MW. Initial construction on the site commenced in 1982, with the intention of completing all five units.
Work on Units 2 to 5 stopped in 1992 as the Government of Romania focussed its attention on the completion of Unit 1. The core structures of Units 2-4 were left at different stages of completion. As concern the reactors 3 and 4 under preservation at Cernavoda site, the estimated progress is as follows:

Unit 3	14%
Unit 4	5%

The completion percentage of Unit 3 civil works (for nuclear, conventional and hydro parts) is about 50% and for Unit 4 is about 45%, almost all of the existing structures having a good quality status.
Unit 1 of the Cernavoda NPP began commercial operations in December 1996. The average gross capacity factor since in service was 87.13%, with the annual gross capacity factor in 2005 of 90.08%.
In March 2003, AECL and ANSALDO have been appointed to finalize the construction of Unit 2 in order to have it operational in 2007.

In July 2003, the Government released "The Road Map for Energy Sector in Romania", the strategy paper outlining the Government's plans for the development of Romania's energy sector in the period 2004 - 2015.
The Road Map identifies that demand for electricity in Romania will begin to exceed available domestic supply in 2005, with this deficit increasing to 5,498 MW by 2015 if no remedial action is taken. The Government has therefore identified a number of strategic objectives in the energy sector, including the refurbishment of some existing thermal and hydro plants and the construction of new hydro, thermal and nuclear plants. In this context, the Government has announced that it plans to increase nuclear generating capacity to 1,414 MW by 2007 through the commissioning of Unit 2 and to 2854 MW through the commissioning of Units 3 and 4 of the Cernavoda NPP. This will significantly alter the mix of electricity generated in Romania, with nuclear power forecast to generate 1/3 of Romania's electricity production by 2015.

The Government considers this change in the generating mix to be a clear indication of its long-term commitment to nuclear energy. This commitment to nuclear energy is based on:

- Levelized Unit Energy Cost analysis indicates that new nuclear plants are close to new gas fired plants in terms of net cost per MWh (recent significant increases in the price of oil and gas has given nuclear generation a clear advantage);
- Romania has proven expertise in nuclear power generation;
- Romania is self sufficient in uranium and heavy water;
- Nuclear energy does not emit significant levels of green house gases and acid rain pollutants;
- The production of nuclear energy is independent of weather conditions;
- Nuclear power plants have a demonstratable record of cost stability.

Significant investment by Romania in CANDU technology has created a wide range of expertise and resources that could be used in constructing and operating Unit 3 and 4 of the Cernavoda NPP. The following are examples of such expertise:

- FCN-Pitesti, a subsidiary of SNN, has been licensed by AECL to manufacture CANDU natural uranium fuel. Currently it supplies fuel to Cernavoda Unit 1 and is increasing its production capacity to meet the needs of Unit 2 from 2007.

- The heavy water plant at Drobeta - Turnu Severin is able to produce about 170 tones of heavy water per year, giving it the capability to supply one CANDU 6 unit every 2½ years.

- Through involvement in the construction of Units 1 and 2, several Romanian manufacturing and constructing firms have developed expertise allowing them to build the plant and manufacture major components for CANDU 6 reactors.

- Romanian agencies such as the Center for Technological Engineering for Nuclear Objectives ("**CITON**"), the Institute for Research for the Impact on Environment ("**ICIM**") and ISPE have developed extensive expertise in the design and assessment of various aspects of CANDU 6 plants. The expertise such firms have developed from working on Unit 2 will allow them to be more effective in the execution of Unit 3 and future CANDU 6 units in Romania.

- Due to the experience gained during the construction of Units 1 and 2 and the operation of Unit 1, suitably qualified Romanian technical and project management staff exist that could be transferred to Units 3 and 4.
- The performance of Unit 1 indicates that SNN's operating personnel are skilled and knowledgeable in the operation of CANDU 6 reactors. Staff training is performed by SNN using its own full scope CANDU 6 simulator. The training programs are fully compliant with international best practices and standards. As a result, SNN has the technical expertise and infrastructure to train operating personnel and staff for Units 3 and 4.

ANNEX C

ANSWERS

TO BULGARIAN AUTHORITIES OBSERVATIONS

1. Ministry of Economy and Energy

Referring to EIA procedure in trans-boundary context of Cernavoda Unit 3 and 4 Ministry of Economy and Energy has no observation.

2. Ministry of Health – National Centre of Radiobiology and Radiation Protection

a) To assess the radiation and health risk for the population in the special statute zones in the neighbourhood of the nuclear equipment in case of normal operation and in case of emergency.

In chapter 7 of EIA for Cernavoda site are defined, as per Romanian norms, two special statute zones:

- *The exclusion zone having a radius of 1 km*
- *The zone of reduced population having a radius of 2 km*

The estimated doses for a member of the critical group are given in paragraph 4.9.4 of the EIA. The recorded doses at Unit 1 during the period 1997-2003 are also given.
Both estimated doses and recorded doses during operation of Unit 1 are much lower than the limit provided by norms, namely 1 mSv/year. The estimation of radiation dose in emergency situation is given in Chapter 7 of EIA.

b) To examine the health status of the population in the area and to consider with a priority the diseases' groups during the performance of the analysis in the context of a presumable relation with the radioactive impact.

As per Romanian norms for radiological safety (NSR-01) the members of the critical group are the most vulnerable to the radiation impact from a certain source. As we already mentioned in paragraph a) the assessment was done for the critical group and consequently the recommendation of Bulgarian party has been considered.

3. Ministry of Environment and Water – Executive Environment Agency

a) In conformity with the energy strategy of Romania the construction of the Cernavoda new nuclear units is foreseen in several stages. Therefore it has to be performed an assessment to evaluate if the construction site's available potential would be sufficient for the enlargement of the activity after the construction of the new unit.

The Cernavoda site was selected from the beguinning to enable construction of five units CANDU 600. All utilities have been dimensioned accordingly. In our opinion the present assessments prove the site capacity to support operation of four units..

b) Taking into consideration the Cernavoda Nuclear Power Plant (NPP) existing activity and the presumed construction of the two new units on the same site, it has to be considered the cumulative impact on the environment due to the operation of all the units.

In the EIA all categories of radiological and non-radiological impact on environment have been assessed both for Units 3 and 4 as well as the cumulated effect of fours units to be operated on Cernavoda site. In this respect we recommend the information in under-chapters: 4.1.15.1, 4.1.16, 4.1.17, 4.1.19, 4.1.21, 4.1.22, 4.1.24, 4.2.4, 4.2.5, 4.3.6, 4.3.7, 4.4.6, 4.5.4, 4.5.5, 4.6.3, 4.7.4, 4.8.3., 4.9.3. of EIA.

c) Taking into consideration the applied technology, e.g. the use of natural uranium as a fuel and the formation of huge volumes of worked out nuclear fuel waste, it should be necessary to explain the issue concerning its storage from a point of view of the radioactive wastes monitoring and control requirements observation. Is it foreseen or not the construction of new worked out nuclear fuel storage depots, if yes, how many and where?

To store the spent fuel a modular interim storage is in operation on Cernavoda site, which will be gradually expanded to store the spent fuel from Units 3 and 4. The spent fuel interim storage (DICA) construction and operation is described in under-chapter 3.2.1.3 of EIA.

d) Is it foreseen or not the actualization of the special statute zones around the Nuclear Power Plant taking into consideration the impact of all the operating units (total surface and monitoring type)?

As we specified in our answer 2.a before, the special statue zones have been designed since the beguinning for five units CANDU 600. Neither the operation of Unit 1 nor the normative framework made necessary such a reassessment of special statute zones. The monitoring programme is designed for entire Cernavoda site.

e) Is it foreseen or not any change in the environment monitoring systems in a trans-boundary context, and in particular, the monitoring of the tritium as an activation product in the water of the Danube River, respectively in the Black Sea?

The environmental monitoring programme is described in Chapter 6 of EIA. The completion of Units 3 and 4 do not require any changes in this programme. We point out that the effluents discharge is monitored individually for each unit. In Chapter 6 is presented detailed information on environmental monitoring programme including tritium monitoring in Danube water. The tritium controle in Black Sea water is not needed, the control being implemented at discharge in emmisary. The Black Sea water quality is controlled by the Environment Authority.
As concerns the trans-boundary context Romania and Bulgaria signed a convention on early notification of nuclear accidents, and the general emergency planning for Cernavoda NPP includes provisions regarding the trans-boundary emergencies.

4. Ministry of Environment and Water – District Environment and Water Inspection - Ruse

a) On component “Water”: The submitted information is complete: the water, the waste waters, the purification technologies and the monitoring frequency have been described in details;

b) On component “Atmospheric air”: No observations. Pursuant to Art.3, Par.2, It. 1 of the Atmospheric Air Purity Law the requirements do not refer to processes and activities using radioactive materials.

c) On factor “Wastes”: The quantity and the structure of the generated wastes during the pre-operation, the operation and the post-operation period and the waste management, as well as a prognosis for their presumable impact on the environment, have been presented in the offer. The radioactive waste specified in Item III 8.1. are not covered by the Waste Management Law.

The new legal framework on radioactive waste management in Romanian covers all issues.

d) Regarding the biological diversity has:
- to be described and examined the Environmental Impact Amount (EIA) of the newly installed capacity on the protected territory – Srebarna Reservation, Raven (Garvan) Marshes - protected area, the Marsh in the neighbourhood of Malak Preslavets - protected area, “Pozharevo Isle” - protected area – in connection with the

Protected Areas Law; as well as the protected areas under the Habitats Directive – BG 0000241 "Srebarna", BG 0000377 "Kalimok-Brashlen", BG 0000530 "Pozharevo-Raven (Garvan)", BG 0000534 "Sea Gull (Chayka) Isle", and the Birds Directive – BG 0000237 "Pozharevo Isle", BG 0000241 "Srebarna", BG 00002030 "Kalimok Complex", BG 0002064 "Raven (Garvan) Marsh", BG 0002065 "Malak Preslavets Marsh", which are included in the protected areas list based on the Council of Minister Resolution N° 122 dated March 2, 2007.

The impact on the protected areas within the region is presented in Chapter 4.5 of EIA

- to perform an assessment at the moment of the realization of the existing fish migration corridors in the area, making an analysis and an evaluation of the impact during the construction of the facilities and during their operation. The analysis has to be coordinated with the Danube runway too.

  The fish migration corridors are Danube branches, especially Borcea branch. The construction and operation of Units 3 and 4 has no impact on fish migration corridors.
- to submit an Environmental Impact Assessment on the sturgeon fishes in the Danube River during the site construction and the operation.

  The present knowledge on sturgeon migration do not indicate any potential impact due to construction and operation of Units 3 and 4.

5. Ministry of Environment and Water – Black Sea Basin Administration – Varna District Centre

a) Item 1: *Location Description*: It has to be added the distance between the Nuclear Power Plant and the Black Sea.

   To be added the distance between NPP and Black Sea namely 48 Km.

b) Item 7: *Risk Situation Assessment*: It has to be added: the state of the Black Sea in view of risk situations.

   Information regarding the impact in emergency situation at NPP is included in Chapter 7 of EIA.

6. Ministry of Environment and Water – District Environment and Water Inspection - Varna

a) We consider that for the aforementioned proposal a detailed prognosis and assessment of the likely impact on air, water, soil, biodiversity and human health during the normal operation of the Nuclear Power Plant at maximal loading (simultaneous operation of the four units) should be made. The assessment of the potential risk for the humans and the environment in an emergency situation shall include the modelling of the diffraction of the separate emissions under the most severe meteorological conditions on the territory of the Republic of Bulgaria.

See the answer 3.b.
As member state of EU and IAEA both Romania and Bulgaria took part in emergency planning exercises organized in our area. During the international emergency exercise INEX 3 we provided our parners from Bulgaria with all data regarding the trans-boundary impact of a major accident at Cernavoda NPP in different metheorological conditions. Based on the existing conventions between our countries such information exchange will be implemented.

b) During the assessment of the impact on the plants and on the animals in conformity with the legislation of the Republic of Bulgaria shall be taken into consideration the impact on the nearest protected areas – e.g. the protected areas including “Rositsa”, “Loznitsa”, “Bezhanovo”, “Durankulak Lake”, and “Shabla Lake”. In the Nuclear Power Plant neighbourhood are located the Natura 2000 Protected Areas Network too: e.g. “Kardam”, “Rositsa-Loznitsa”, “Izvorovo-Kraishte”, “Durankulak Lake”, “Shabla-Ezerets Lake” and “Suha reka”.

The impact on the protected areas within the region is presented in Chapter 4.5 of EIA

c) Compensatory measures proposals:

Measures aimed at the increase of the control effectiveness of the state of the Cernavoda Nuclear Power Plant during its operation:

- To provide for a regular information exchange system on a professional level of the results from the radiological monitoring carried out in the respective regions in Bulgaria and Rumania.
- The population in the frontier areas has to be acquainted with the Nuclear Power Plant annual report results in connection with the performance of the environment protection activities.

As per provisions of bilateral conventions between Romania and Bulgaria.

7. District Governor of Silistra
District Governor of Dobrich

a) We do believe that much more details and particulars shall be need in order to assess the area seismic risk, bearing in mind that the Vrancha and Shabla-Kaliakra high seismic risk areas are in the neighbourhood too.

The seismnic activity in the area is presented in Chapter 4.4.2 of EIA.

b) We would like to mention that in the part concerning the landmarks and the protected territories, the Rumanian territories included in the Natura 2000 Protected Areas Network have not been described, and respectively their reciprocal relations with the Bulgarian protected nature territories. Therefore there is no information concerning the Nuclear Power Plant (NPP) impact on the Natura 2000 Protected Areas Network. (Harta Retelei Natura 2000); http://maps.biodiversity.ro/natura2000/).

The protected areas within the region are presented in Chapter 4.5 of EIA