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pentru Protecția Mediului

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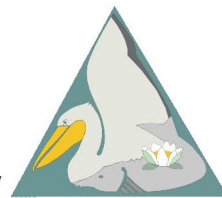
INSTITUTUL NAȚIONAL DE CERCETARE-DEZVOLTARE PENTRU PROTECȚIA MEDIULUI

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INCDD

"Adequate assesment of the environmental impact of Units 3 and 4 of Cernavodă N.P.P." **- Impact on biodiversity - Final report**

SUMMARY



TULCEA
August 2012



CONTRACT 421 / INCDDD / 2010

Title of the research and development contract:

***"Adequate assesment of the environmental
impact of Units 3 and 4 of Cernavodă N.P.P."***

- Impact on biodiversity -

**Final report
SUMMARY**

Beneficiary: S.C. EnergoNuclear S.A.
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Executant: Institutul Național de Cercetare - Dezvoltare "Delta Dunării"
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**TULCEA
August 2012**



Poziția nr. 64
**Registrul Național al
elaboratorilor de
studii pentru
protecția mediului**





A. INTRODUCTION

This document summarizes the Final Report of the study "Adequate evaluation of environmental impacts of Units 3 and 4 of Cernavoda CNE - impact on biodiversity", which includes results, interpretations and conclusions of the analysis and investigations carried out in four seasons from 2010 to 2011 (summer 2010, autumn 2010, winter 2010-2011 and spring 2011). Both Summary and Final Report were developed by the "Danube Delta" National Institute for Research and Development, Tulcea, hereinafter called INCDDD-Tulcea.

We mention that the Final Report updates the study "Report on the study of environmental impact assessment for Cernavoda CNE Units 3 and 4", executed by the National Institute for Environmental Protection - ICIM Bucharest, developing in principal chapter 4.5. "The potential impact on biodiversity", in accordance with national and European requirements mentioned in the request formulated by the Ministry of Environment and Forests - letter no. 28169/EP/01.06. 2010, as amended by letter of the Ministry of Environment and Forest 10124/MA/02.03.2011.

The field investigation programme was as follows:

- Summer 2010: July 27-August 4, 2010 – The first phase of field investigations. This phase was marked by extreme weather events represented by heavy rains that caused massive increases of Danube flows (peak period was marked by flooding the town Cernavoda).
- Autumn 2010: 9 to 12 November 2010 - The second phase of the study;
- In winter and early spring 2011: January 18 to 21, 2011 and March 16, 2011 - The third phase of the study;
- Final Spring 2011: 10 to 12 May 2011 - The fourth phase of the study

To underlain the conclusions of the study, the results obtained from the analyzes were corroborated with information from

- Previous studies made for NPP Cernavoda nuclear power units 1 and 2 (referenced in the study)
- Reports resulting from environmental monitoring carried out by NPP Cernavoda Units 1 and 2 , according to the Environment and Waters Management Authorizations in force.

The final Report responds to provisions / requirements of EU environmental regulations and national legislation applicable to biodiversity conservation and protected areas, such as:





- Habitats Directive (92/43 / EEC) of 21 May 1992 on the conservation of natural habitats and wild fauna and flora of community interest, amended by European Council Directive no. 2006/105/EC.
- Birds Directive (79/409 / EC) on the conservation of birds, amended by European Council Directive no. 2006/105/EC;
- Water Framework Directive (2006/60/EC);
- Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life, with subsequent amendments;
- Government Emergency Ordinance no. 57/2007 on the status of protected areas, conservation of protected areas, natural habitats, flora and fauna, with subsequent amendments.
- Government Decision no. 202/2002 for approving the Technical Norms interesting the surface waters quality, needing protection and improvement to support fish life, with subsequent amendments;
- Government Decision no. 445/2009 on the impact of certain public and private projects on the environment);
- Government Decision no. 445/2009 on the impact of certain public and private projects on the environment);
- Government Decision no. 563/2006, amending and supplementing Government Decision no. 202/2002, for approval of the technical quality of surface waters needing protection and improvement to support fish life;
- Government Decision no. 188/2002 for approving the rules on conditions for discharge of wastewater into the aquatic environment;
- Government Decision no. 352/2005 on amending and supplementing the Government Decision no. 188/2002 approving the rules interesting the conditions of discharge into the aquatic environment;
- Order of the Ministry of Environment and Water Management no. 161/2006, approving the Norms interesting the classification of surface water quality to determine the ecological status of water bodies;
- Order of the Minister of Environment and Forests no. 19/2010 for approving the Methodological Guidelines for proper assessment of potential effects of plans or projects on protected natural areas of interest;
- Order of the Minister of Environment and Forests no 135/2010 for approving the methodology for implementing environmental impact assessment for public and private projects;

The study also meets the requirements specified in:

- o Letter of the Ministry of Environment and Forests No. 28169/EP/01.06. 2010, amended and completed by letter of the Ministry of Environment and Forests No. 10124/MA/02.03. 2011;
- o Notice of Water Management, No. 35/14 March 2011 on "Cernavoda nuclear power Units 3 and 4" issued by the National Administration for Romanian Waters.





B. INFORMATION ON THE PLAN / PROJECT TO BE APPROVED

B. 1. Information on the plan / project

The adequate evaluation study is performed for Cernavoda Nuclear Power Plant Project (NPP) Units 3 and 4.

Project description is presented in the document entitled "Environmental *Impact Assessment Report for Cernavoda NPP Unit 3 and 4*", published on the Ministry of Environment and Forests-MMP website (http://www.mmediu.ro/protectia_mediului/centrala_cernavoda.htm) in the assessment procedure for Environmental Accord for the project "Further construction and finishing works of Units no. 3 and 4 Cernavoda Nuclear Power Plant".

The impact on biodiversity was analyzed in the study of adequate evaluation, as a result of cooling water evacuation from Cernavoda NPP Units 3 and 4. This requirement derives from the transposition into the national legislation of EU directives and regulations in an integrated approach to issues relating to environmental impact assessment and *adequate evaluation* by implementing specific demands of adequate evaluation of potential effects of the projects on the protected natural areas of Community interest.

The study focused on the potential impact on biodiversity, which could cause the cooling water evacuated from Units 3 and 4, i.e. of a Nuclear Power Plant with 4 units, located in the neighbourhood of Natura 2000 sites of Community interest.

Description of the cooling water discharge from Cernavoda NPP

Overview

The way of cooling water discharge is represented by the evacuation canal of cooling water from Cernavoda NPP presented below.

The hydrotechnical part for discharging from NPP the technological cooling water that does not require treatment is made by:

- Canals and cooling water evacuation pipes, tank siphoning and special manholes;
- Canals for cooling water drainage in Race II Danube Black Sea Canal (DBSC). This evacuation route is used only in situations and with approvals regulated by Water Management Authorization;
- Mixture Canal for warm water - cool water;
- Tunnels for cooling water evacuation to the Danube (see description below);
- Evacuation lateral spillway from Cismelei Valley valves house in Race II DBSC, in case of emergency





Warm water canals were designed to evacuate a cooling water discharge of 54m³ / s / each NPP unit.

Details of construction and installation parameters of the cooling water discharge are specified in the Water Management Permit No. 35 of 2011 for Units 3 and 4 and Water Management Authorization No. 241 of 2010, replaced by Water Management Authorization No. 277 of 2011 for Units 1 and 2.

Tunnel to discharge cooling water into the Danube

Evacuation of cooling water from four NPP units in the Danube is made through a circuit made up of boxes, tunnels, and open concrete type canal and an earthen canal with outlet / opening in Danube. The circuit starts in siphoning tank I, under crosses the Cișmelei Valley, the hill between valley Cișmelei and Seimeni Valley, and continue to the left side of the Seimeni Valley. After crossing the road Cernavoda – Hârșova, the canal crosses the Danube Meadow and discharges into the Danube at km 296.00.

The circuit is dimensioned so as to ensure the evacuation of 100 m³ / s on each wire tunnel and a flow of 200 m³ / s on the concrete canal.

Each circuit includes:

- Box sections with section 5.75 X 5.75 m, indirectly based on limestone through drilled columns or based directly on rock. These sections are located in Cișmelei and Seimeni Valley and connect the siphoning basin valve house Cișmelei Valley with the two wires tunnels, and out of the tunnels connect with the valve house Seimeni Valley;
- tunnels have a length of 2760 m, 2650 m respectively, have circular section with diameter of 5.40 m and longitudinal slope of 1.13 ‰ for T2 tunnel and 1.14 ‰ for T1 tunnel;
- common works for both circuits are:
 - Valley Cișmelei valve house, a structure which connects the tail water and water upstream, create selectable cooling water circuit, facilitates revisions of valves and equipment. The goal is to select the evacuation of one of the discharging tunnels and limit the maximum pressure that can occur on the exhaust circuit;
 - adjacent the valve house, towards the Cismelei Valley, there is an overflow able to evacuate 54 m³ / s into Cișmelei Valley (in case of evacuation circuit to the Danube), in the Race I of Danube-Black Sea Canal, in case of damage of both outlet circuits of hot water: in the Danube and in Danube-Black Sea Canal (Race II), for short periods in accordance with regulations of the water management authorization in force;





- sections of upstream double box that connect the siphoning tank and Cismeley Valley valves house and downstream of the valve house to exit of undercrossing of Cișmelei Valley. On the left bank of the Cismelei Valley is located the drainage manhole of boxes from the siphoned undercrossing (Cișmelei Valley) with two EPEG 100 pumps;
- Seimeni Valley valves house connects each tunnel wire and concrete canal;
- Concrete canal from the left side of Seimeni Valley slope has trapezoidal section and a length of 2,500 m, gradient slope 1: 2.5, basic width of 12.00 m. The route of concrete canal is along the Seimeni slope at its base. The slope is arranged not to clog the canal due to erosion. For the valleys that cross the canal works for discharge canal were arranged in the intersection. Upstream arrangement was required for these valleys, as they have a torrential character; during periods of heavy rainfall solid material is brought that can clog the canal;
- the Seimeni Valley spillway that connect the concrete canal to the earthen canal is a concrete building aiming to separate upper water and tail water during high waters of the Danube concomitantly with the maximum evacuation discharge on the canal;
- earthen canal crosses the Danube valley, has a trapezoidal section base 29 m and 1:4 slopes. On the right bank there is access and circulation road at the level of 11.50 m referred to the Baltic Sea (**RBS**), which is a spur of broken stone for protection towards canal and drainage spur into canal at the downstream face. Releasing in Danube River at the level of 3.80m RBS was executed in the optimal variant for entry into the Danube River , resulted from hydraulic model studies;
- the translation from the concrete canal to earthen canal was made through a spillway with a crest of 10.40 m RBS and a energy disperser that is based on moulded walls and has the level 4.00 m RBS. The function of this spillway is to maintain a constant level at the end of the drainage circuit into the Danube, level that is not influenced by the variability of water level in the Danube;
- pumping stations located on the evacuation route from the Danube are used to empty the water circuit and are located in Seimeni Valley, one out of the tunnel, upstream of the valve house and exhaust the tunnels and discharge tapes in Ramadan canal and the other located on its left bank. The water captured by drains placed in the canal slope is discharged through the pumping station on the concrete canal;
- the tunnel is emptied by pumping;

Construction works designed for the water systems of Units 3 and 4 are foreseen in the technical documentation of the Water management Permit No. 35 / 2011, Chapter 4.





B. 2. The geographical and administrative localization, with the specification of the stereo coordinates of the plan/project

Within the present study it has been determined the location of the evacuation way of the effluent resulted from the operation of the Units 3 and 4 in relationship with the protected natural areas including the project zone.

The evacuation canal of the cooling water from Cernavoda NPP is located in South Eastern Romania, in Constanta county, on the administrative territory of Cernavoda.

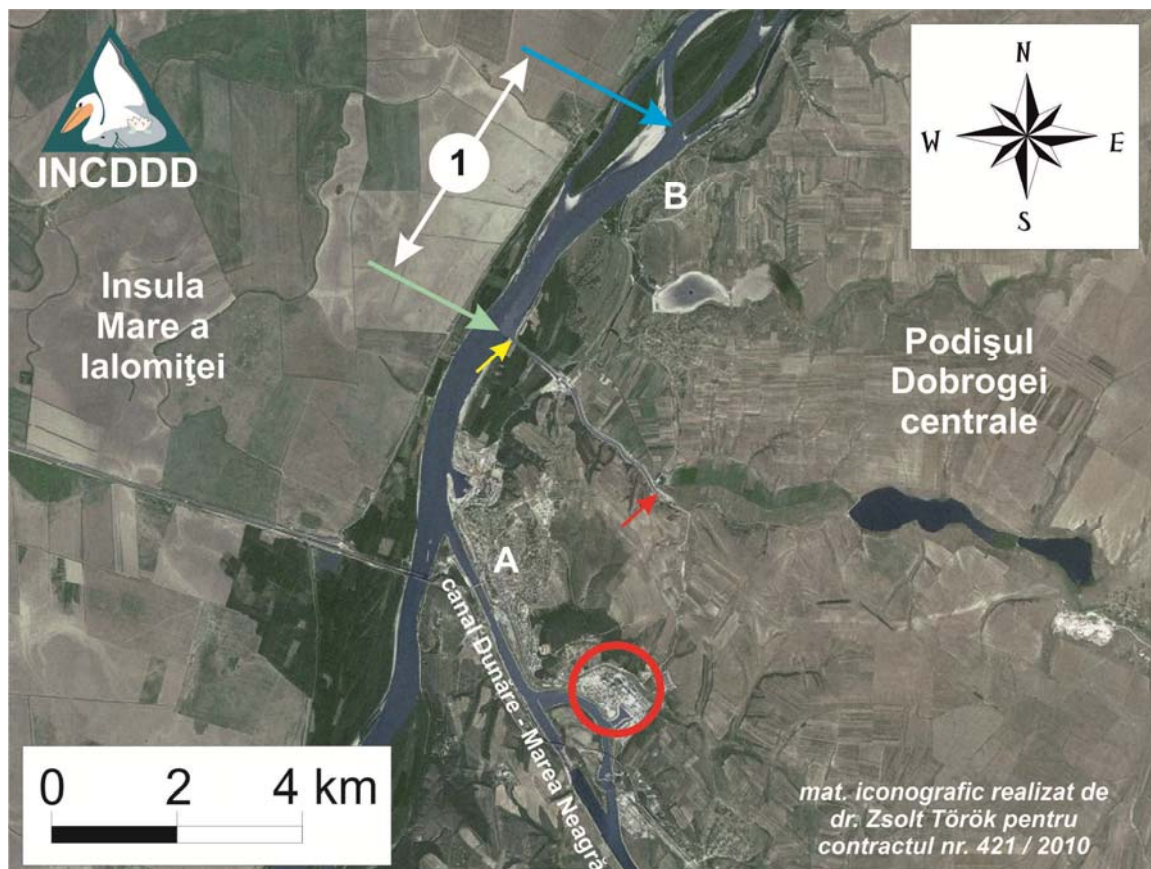


Fig. B.1. The overview of the location of Cernavoda NPP Units 3 and 4, the evacuation canal of the cooling water and the area affected by the high temperatures waters.

Note: 1 – The Danube River sector with high temperatures water failure caused by the cooling water evacuation from the Units 1 and 2 of Cernavoda NPP; red circle – the location of the NPP Units 3 and 4; red arrow – the upstream extremity of the cooling water evacuation canal; yellow arrow – the downstream extremity water evacuation canal (the confluence with the Danube River); green arrow – the upstream extremity of the Danube River sector with hot water failure; blue arrow – the downstream extremity of the Danube River sector with hot water failure.





The cooling waters evacuation canal of Cernavoda NPP is located as follows from the Natura 2000 sites within the Cernavodă-Hârsova sector of the Danube River.

- ROSCI0022 site "**Canaralele Dunării**" (Fig. B.2): the protected area includes about 700 m from the downstream part of the ground canal at the end of which the cooling water is discharged in the Danube River.
- ROSPA0002 site "**Allah Bair - Capidava**" (Fig. B.3): the Southern extremity of the protected area is located at about 6,5 Km downstream from the place where the cooling water is discharged in the Danube River
- ROSPA0017 site "**Canaralele de la Hârșova**" (Fig. B.4): the Southern extremity of the protected area is located at over 33 Km downstream from the place where the cooling water is discharged in the Danube River.

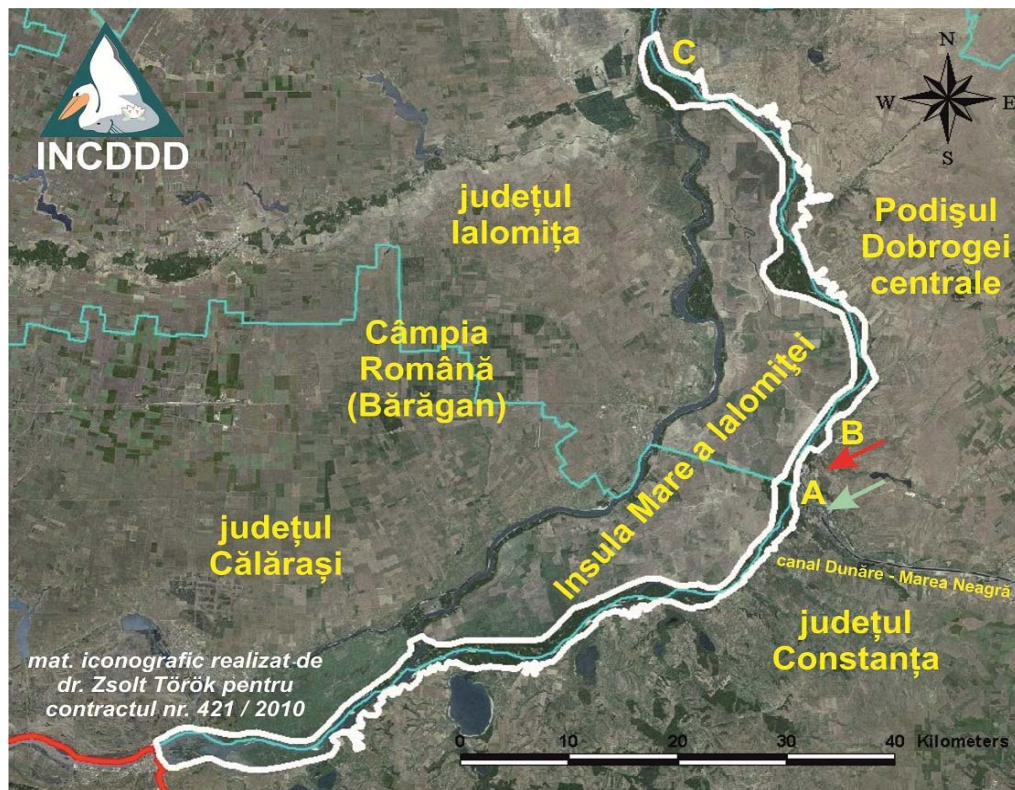


Fig. B.2. The location of the Cernavoda NPP and the cooling water canal related to the ROSCI0022 site "**Canaralele Dunării**"

Note: white line – the limit of the ROSCI0022 "Canaralele Dunării" protected area; red arrow - the place of the cooling water canal arrangement from the Cernavoda NPP; green arrow – the location of the Cernavoda NPP (Units 3 and 4); A – Cernavodă; B – Seimeni; C – Hârșova; blue line – county limit; red line – state border.



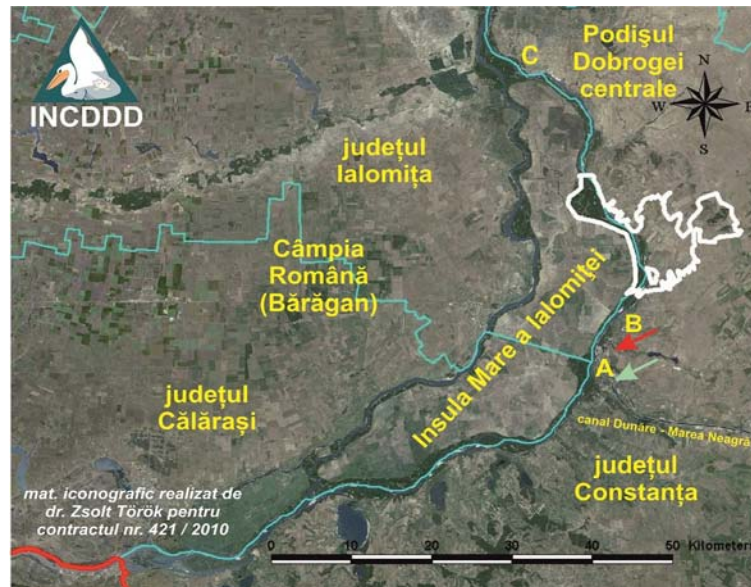


Fig. B.3. The location of the Cernavoda NPP and the cooling water canal related to the ROSPA0002 “*Allah Bair - Capidava*”

Note: white line – the limit of the ROSPA0002 “*Allah Bair - Capidava*” protected area; red arrow - the place of the cooling water canal arrangement from the Cernavoda NPP; green arrow – the location of the Cernavoda NPP (Units 3 and 4); A – Cernavodă; B – Seimeni; C – Hârșova; blue line – county limit; red line – state border.

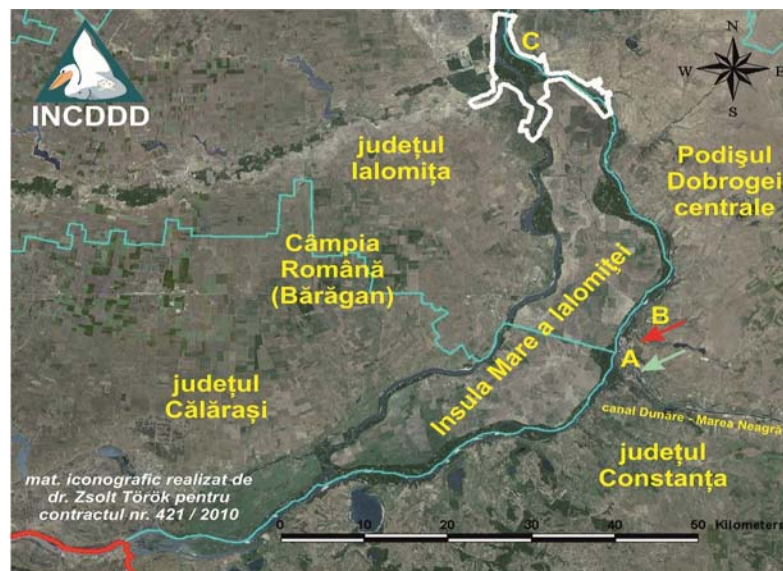


Fig. B.4. The location of the Cernavoda NPP and the cooling water canal related to the ROSPA0017 “*Canaralele de la Hârșova*”

Note: white line – the limit of the ROSPA0017 “*Canaralele de la Hârșova*” protected area; red arrow - the place of the cooling water canal arrangement from the Cernavoda NPP; green arrow – the location of the Cernavoda NPP (Units 3 and 4); A – Cernavodă; B – Seimeni; C – Hârșova; blue line – county limit; red line – state border.





C. SAMPLING STATIONS AND INVESTIGATION METHODS

C.1. Sampling stations

Sampling stations were selected to allow the analysis of the potential impact of cooling waters of the Cernavoda Nuclear Power Plant (**NPP**) on the favourable conservation status of wild species and habitats of community interest for which the neighbouring Natura 2000 sites were designated (**Fig. C.1.1.**).

Table C.1.1. List of sampling (hydrochemistry and hydrobiology) and measurement stations

Crt. No.	Station Code	Location	KM & GPS coordinates	Activities
1	S5	downstream Rasova	KM 310,3 N 44 26 359 E 27 95 394	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;
2	S4	downstream Cernavodă harbour basin	KM 297,6 N 44 36 059 E 28 02 271	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;
3	S3	Mouth of cooling water evacuation	KM 296,0 N 44 37 974 E 28 04 129	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;
4	P0	cooling water evacuation canal	(200 m inside from the mouth of the canal) N 44 22 175 E 28 02 240	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;
5	S2	Seimeni	KM 292,5 N 44 23 471 E 28 03 544	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;
6	S6	Dunărea	KM 286,5 N 44 43 750 E 28 11 139	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;
7	S1	Capidava	KM 279,0 N 44 29 384 E 28 05 132	- Physical-chemical measurements; - hydrochemical sampling; - algological sampling; - sampling of bottom macro invertebrates; - bottom fishing;





Table C.1.2.

List of special temperature measurement stations in the vertical water column and cross-section (left bank – channel – right bank) in the water plume with modified temperatures

Curt. No.	Station Code	Location	KM & GPS coordinates	Activities
8	P1	700 m downstream of the mouth of canal for evacuation of cooling water	KM 295,3 N 44 37 974 E 28 04 129	- temperature measurements -spectro-fluorometrical measurements
9	P2	1,5 km downstream of the mouth of canal for evacuation of cooling water	KM 294,5 N 44 23 065 E 28 02 481	- temperature measurements -spectro-fluorometrical measurements
10	P3	2,5 km downstream of the mouth of canal for evacuation of cooling water	KM 293,5 N 44 23 303 E 28 03 236	- temperature measurements -spectro-fluorometrical measurements

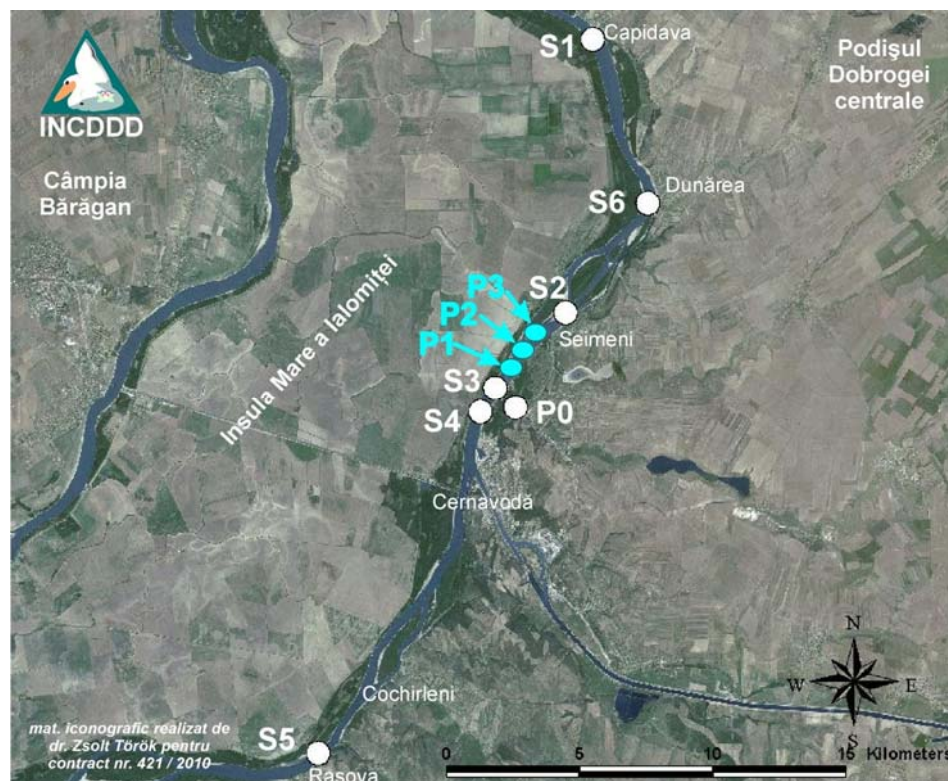


Fig. C.1.1. Location of sampling stations

Note. P0 – cooling water canal; P1 - 700 m downstream of the mouth of canal for evacuation of cooling water; P2 – 1.500 m downstream of the mouth of canal for evacuation of cooling water; P3 – 2.500 m downstream of the mouth of canal for evacuation of cooling water; S1 - Capidava; S2 - Seimeni; S3 – near de mouth of canal for evacuation of cooling water; S4 - downstream Cernavodă – upstream canal mouth; S5 - Rasova; S6 - Dunărea.





C.2. Investigation methods

During (and in the frame of) the present study there were used the following research methods:

- Measurement of water temperature
- Chemical analysis (water and sediment).
- Algological analyses
- Methods for study of flora (plants) and vegetation
- Methods for study of benthofauna
- Methods for study of fish
- Methods for study of amphibians
- Methods for study of reptiles
- Methods for study of birds
- Methods for study of mammals

The analyzed physico-chemical indicators of water were the following ones:

- *acidification and thermal regime: temperature and pH;*
- *Oxygen system: dissolved oxygen, biochemical oxygen demand after 5 days, chemical oxygen demand (potassium dichromate method), chemical oxygen demand (potassium permanganate method);*
- *nutrients: nitrogen from ammonium, nitrogen from nitrite, nitrogen from nitrate, total nitrogen, mineral phosphorus and total phosphorus;*
- *Salinity: conductivity, total suspended matter, Filterable residuum dried at 105 °C, chlorides, carbonates, bicarbonates, sulfates, calcium, magnesium, sodium, potassium;*
- *metals: zinc, copper, cadmium, iron, manganese, lead, chromium, nickel.*

The analyzed physico-chemical indicators of sediments were the following ones:

- *Mineral salts of 1:5 aqueous extract: chlorides, carbonates, bicarbonates, sulfates, calcium, magnesium, sodium, potassium;*
- *pH, electrical conductivity;*
- *metals: zinc, copper, cadmium, iron, manganese, lead, chromium, nickel.*

The quality indicators and authorized limits for the Cernavoda NPP Units 1 and 2, respectively Units 3 and 4

The quality indicators and the requirements established for the Units 1 and 2 are stipulated by the Waters Management Authorization no. 241/2010 and the Waters





Management Approval no. 35/2011 for the Units 3 and 4. These resulted from the corroboration of the requirements stipulated in the regulations and the conclusions of the EIAs carried out starting with the operation of the Unit 1 till now.

Environmental Impact Assessments studies:

1. The study of the thermic impact determined by the simultaneous exploitation of the Cernavoda NPP Units 1 and 2 in the case of the solution of the evacuation of the warm water in the Danube river (2001 - Research and Development National Institute for Environmental Engineering – Bucharest);
2. Monitoring of the thermal discharge from Cernavodă NPP Unit 1 into Danube; environmental effects of the thermal effluent (2003 – GeoEcoMar);
3. Cernavodă NPP Thermal Impact Report 1996-2004 (Research and Development National Institute for Environmental Engineering – Bucharest);
4. The highlighting of the mechanical effects (attracting and impingement) upon the aquatic flora and fauna that reached the nets of the cooling water supply system of Cernavoda "CNE PROD" as well as upon the organisms from the filtered water circulated subsequently in the cooling system (2006 – National Institute for Marine Research and Development, Constanta);
5. The highlighting of the mechanical effects (attracting and hitting) upon the aquatic flora and fauna that reached the nets of the cooling water supply system of Cernavoda "CNE PROD" as well as upon the organisms from the filtered water circulated subsequently in the cooling system (2006 – National Institute for Marine Research and Development, Constanta)
6. The study of the impact of Cernavoda NPP operation on the aquatic and terrestrial organisms from the influence area of it (2009-2012 – Research and Development National Institute for Cryogenic and Isotopic Tehnologies, ICSI / Ramnicu Valcea).

Applicable normative and regulative acts according to the authorizations :

- G.D. no. 188 / 2002 (NTPA – 001), ammended and suplmented with the G.D. no. 352 / 2005;
- G.D. no. 351 / 2005, ammended and suplmented with the G.D. no. 783 / 2006;
- Guideline of monitoring and development of the integrated monitoring system of Romanian waters approved by the MMGA Order no. 31/2006;
- Law of Waters no. 107/ 1996, with the subsequently ammendments and suplplements;
- Negociated acquis with the European Union, Chapter 22 – Environment;
- Technical documentation submitted in order to obtain the Waters Management Authorization, "The Regulations of operating, exploiting and maintaining, U1/U2 – 03700-ST code" approved for not changing by the „Romanian Waters” National Administration, part of the Waters Management Authorization.





D. RESULTS

D.1. Data regarding the protected natural areas of community interest: surface, types of ecosystems, types of habitats and the species that could be affected through the implementation of the plan/project

D.1.1. "Canaralele Dunării" (ROSCI0022) Site of Community Interest

The protected area ROSCI0022 "**Canaralele Dunării**" site includes about 700 m of the downstream part of the ground canal at the end of which the cooling water is discharged into the Danube River.

Surface

"Canaralele Dunării" (ROSCI0022) site has a total surface of 26.064 ha, its boundaries being established by the **Minister of Environment and Sustainable Development Order no. 1964 / 2007**. From the total surface of this site 25502 ha are included within the Danube River Valley and 562 ha outside the conventional boundary of the Danube River Valley.

Ecosystems

Within the perimeter of "Canaralele Dunării" (ROSCI0022) site there are the following types of ecosystems:

- aquatic ecosystems: about 8080 ha;
- semi-aquatic ecosystems: about 1303 ha;
- anthropic ecosystems: about 782 ha;
- ecosystems dominated by herbal vegetation: about 522 ha;
- woodlands: about 15378 ha.

We mention that the operation of the Cernavoda NPP Units 3 and 4 can produce the modification of the temperatures only for 2,16% of the aquatic ecosystems (the surface represented by the section of about 3,5Km length and max. 350 width from the Danube River sector located between the confluence of the cooling water evacuation canal and the area in front of Seimeni locality).

The description of the thermic regime of the water into the Danube River and the aspects that characterize the biodiversity and the influence of the effluent evacuated from Cernavoda NPP on the protected areas are presented in detail in chapter D.8.





Types of habitats

Based on the data available till year 2011, "Canaralele Dunării" (ROSCI0022) area has been designated part of the Natura 2000 Network for the protection of 15 natural habitats of community importance and conservative interest.

Species

Based on the data available till year 2011, it shows that within the perimeter of "Canaralele Dunării" (ROSCI0022) site there are 23 species of wild flora and fauna (other taxonomic groups than birds), of community importance and of conservative interest, as follows:

- two species of superior plants (cormophyta);
- one species of aquatic invertebrates;
- 15 species of fish;
- two species of amphibians;
- two species of reptiles;
- one species of mammals.

Priority habitats and species

There are no priority habitats and species neighboring the project area for which conservation Natura 2000 sites have been designated - as they are mentioned in the text of the **Emergency Ordinance no. 57 / 20.06.2007**, regarding the protected natural areas regime and the conservation of natural habitats and the species of wild flora and fauna, amended and republished afterwards.

D.1.2. "Allah Bair - Capidava" (ROSPA0002) - Special Protection Area

ROSPA0002 "**Allah Bair - Capidava**" site has the southern limit at about 6,5Km downstream from the place where the cooling water is discharged into the Danube River.

"Allah Bair - Capidava" (ROSPA0002) site has been included in the European Natura 2000 Network through the **Government Decision no. 1284 / 2007**, while through the **Government Decision no. 971 / 2011** it has been established that the site has a total surface of 11645 ha after small rectifications of the limits of this Special Protection Area.

Based on the data available till year 2011, it shows that within the perimeter of "Allah Bair - Capidava" (ROSPA0002) sites there are 43 species of wild birds of which conservation requires the designation of the Special Protection Areas.





We mention that the Cernavoda NPP Units 3 and 4 are not included within the "Allah Bair - Capidava" (ROSPA0002) site surface and therefore its operation can affect none of the wild bird species of which conservation requires the designation of the Special Protection Areas and which are existing within the site.

From this point of view we can affirm that there is no environmental impact on the wild bird species of which conservation determined the designation of the special protection area if Units 3 and 4 are operating.

D.1.3."Canaralele de la Hârșova" (ROSPA0017) Special Protection Area

The Southern limit of the ROSPA0017 "**Canaralele de la Hârșova**" protected area is located at over 33 km downstream of the place where the cooling water is discharged into the Danube River.

"Canaralele de la Hârșova" (ROSPA0017) site has been included in the European Natura 2000 Network through the **Government Decision no 1284 / 2007**, while through the **Government Decision no. 971 / 2011** it has been established that the site has a total surface of 7406 ha after small rectifications of the limits of this Special Protection Area.

Based on the data available till year 2011, it shows that within the perimeter of "Canaralele de la Hârșova" (ROSPA0017) site there are 39 species of wild birds of which conservation requires the designation of Special Protection Areas.

We mention that the Cernavoda NPP Units 3 and 4 are not included within the "Canaralele de la Hârșova" (ROSPA0017) site surface and therefore its operation can affect none of the wild bird species of which conservation requires the designation of the Special Protection Areas and which are existing within the site.

From this point of view we can affirm that there is no environmental impact on the wild bird species of which conservation determined the designation of the special protection area if Units 3 and 4 are operating.





D.2. Data regarding the presence of the species and/or the habitats of community interest existing in the area or neighboring the plan/project zone

In the standard Natura 2000 Form and in the documentation afferent to the Minister of Environment and Forests Order no. 2387/2011, in the case of the ROSCI0022 (Canaralele Dunării) site there are nominated the species and the habitats of community interest described below.

D.2.1. Plant species of community interest

- *Campanula romanica*
- *Moehringia jankae*

None of the two nominated species is present in the area of the plan/project, close to it or in the aquatic zone with modified temperatures caused by the waters discharged from the cooling waters evacuation canal of Cernavoda NPP.

In conclusion, the Units 1 and 2 activity **does not affect** the plant species of community interest for which conservation has been designated ROSCI0022 ("Canaralele Dunării") site. Furthermore, the **simultaneously operation of the four units** of Cernavoda NPP will not affect the plant species of community interest for which conservation has been designated ROSCI0022 ("Canaralele Dunării") site.

D.2.2 Invertebrate species of Community Interest

- *Anisus vorticulus*

Above mentioned invertebrate species is not present in the plan/project range, in its immediate vicinity or in the area with modified temperatures by the discharge of the cooling waters of the Cernavoda Nuclear Power Plant (NPP).

In conclusion, the activity of Units 1 and 2 is not affecting the invertebrate species of Community interest for whose conservation ROSCI0022 site ("Canaralele Danube") was designated. Simultaneous operation of the four units of Cernavoda NPP will also not affect *Anisus vorticulus*.

D.2.3. Fish species of community interest

1. *Alosa pontica* (*A. immaculata*) – Danube shad





- During the investigation period this species was recorded at Seimeni and in the reach of the river including the area with modified water temperatures.
2. *Alosa tanaica* – Azov shad
During the spring sampling among the Danube shad (*Alosa immaculata*) larvae found Seimeni and in the reach of the river including the area with modified water temperatures there are for sure also larvae of *Alosa tanaica*. However in the reference literature there are no distinctive characteristics allowing their separation from *Alosa immaculata*.
 3. *Aspius aspius* – asp
Species recorded during the investigations at Rasova and in the area with modified water temperatures of Seimeni and Capidava.
 4. *Cobitis taenia* – spine loach
Species recorded during the investigations at Rasova and in the area with modified water temperatures of Seimeni and Capidava.
 5. *Gobio albiginnatus* / *Romanogobio vladykovi* – White-finned gudgeon
Species recorded during the investigations at Seimeni and Capidava.
 6. *Gobio (Romanogobio) kessleri* – Kessler's gudgeon
Species recorded during the investigations at Rasova, Seimeni and Capidava
 7. *Gymnocephalus baloni* – Balon's ruffe
Species recorded during the investigations at Seimeni and Capidava
 8. *Gymnocephalus schraetzer* – Schraetzer
 9. *Misgurnus fossilis* - loach
 10. *Pelecus cultratus* – Ziege
 11. *Rhodeus amarus* - Bitterling
Species recorded during the investigations at Rasova and in the area with modified water temperatures of Seimeni and Capidava.
 12. *Zingel zingel* – Zingel
 13. *Zingel streber* – Streber
 14. *Sabanejewia (aurata) bulgarica* – Goldside loach
Species recorded during the investigations at Seimeni and in the area with modified water temperatures.
 15. *Eudontomyzon mariae* – Ukrainian brook lamprey
Species recorded during the investigations at Rasova.

According to the Natura 2000 Form, the dimension of local populations for the above listed species found in the perimeter of the site ROSCI0022 "Canaralele Dunării" represents about 2% of the national stock of each species.

During the period of investigations the species *Gymnocephalus schraetzer*, *Misgurnus fossilis*, *Pelecus cultratus*, *Zingel zingel* and *Zingel streber* were not recorded in any of the sampled areas.





The results of investigations conducted during 2010 – 2011 show that fish species of community interest are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of community interest. However, investigations and observations conducted in this study allowed to deduce that there could be effects on one part of the young age class of the sub-populations of two shad species (*Alosa tanaica* and *Alosa immaculata*) of community interest, spawning upstream of the mouth in the Danube of the cooling water evacuation canal of Cernavoda NPP. Details of observations interesting these species are presented in chapter **D.5**.

D.2.4. Species of amphibians of Community Interest

- *Bombina bombina* – Fire-bellied toad
The species was identified in several places along the Borcea branch and the main Danube branch, including in the river-sector with temperatures modified by the cooling-waters of Cernavoda NPP (on the left shore of the Danube – on the opposite side of the river than the one with the outlet).
- *Triturus dobrogicus* – Danube Crested Newt
During the period of investigations this species **was not recorded** in any of the studied sites.

The results of investigations carried out in 2010 – 2011 period show that amphibian species of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of amphibians of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”).

D.2.5. Species of reptiles of Community Interest

- *Emys orbicularis* – European Pond Terrapin
In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded specimens of *Emys orbicularis*. In the Ostrov - Hârșova sector of the river this species was recorded only upstream of Cernavodă.
- *Testudo graeca* – Spur-tighed Tortoise
In the investigation period the species *Testudo graeca* was recorded nearby the artificial channel with cooling waters of Cernavodă NPP (in bushy areas of the





slopes parallel to the channel) and at the upper edge of the slopes nearby the shore of the Danube river (between Dunărea and Capidava localities).

The results of investigations carried out in 2010 – 2011 period show that reptile species of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of reptiles of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”).

D.2.6. Species of birds of Community Interest

According to the comparative analysis of the species lists from the up-dated versions of the standard Natura 2000 sheets (annexes of Governmental Decision No. 971/2011) of sites ROSPA0002 (Allah Bair - Capidava) and ROSPA0017 (Canaralele de la Hârșova), in these areas there were nominated the following 44 species of wild birds of which conservation needs designation of Special Protection Areas:

1. *Accipiter brevipes* (Natura 2000 code: A402)
2. *Alcedo atthis* (Natura 2000 code: A229)
3. *Anthus campestris* (Natura 2000 code: A255)
4. *Aquila pomarina* (Natura 2000 code: A089)
5. *Botaurus stellaris* (Natura 2000 code: A021)
6. *Bubo bubo* (Natura 2000 code: A215)
7. *Burhinus oedicnemus* (Natura 2000 code: A133)
8. *Buteo rufinus* (Natura 2000 code: A403)
9. *Calandrella brachydactyla* (Natura 2000 code: A243)
10. *Caprimulgus europaeus* (Natura 2000 code: A224)
11. *Chlidonias hybridus* (Natura 2000 code: A196)
12. *Chlidonias niger* (Natura 2000 code: A197)
13. *Ciconia ciconia* (Natura 2000 code: A031)
14. *Ciconia nigra* (Natura 2000 code: A030)
15. *Circaetus gallicus* (Natura 2000 code: A080)
16. *Circus aeruginosus* (Natura 2000 code: A081)
17. *Circus cyaneus* (Natura 2000 code: A082)
18. *Circus macrourus* (Natura 2000 code: A083)
19. *Circus pygargus* (Natura 2000 code: A084)
20. *Coracias garrulus* (Natura 2000 code: A231)
21. *Dendrocopos medius* (Natura 2000 code: A238)
22. *Dendrocopos syriacus* (Natura 2000 code: A429)
23. *Dryocopus martius* (Natura 2000 code: A236)
24. *Emberiza hortulana* (Natura 2000 code: A379)





25. *Falco peregrinus* (Natura 2000 code: A103)
26. *Falco vespertinus* (Natura 2000 code: A097)
27. *Ficedula albicollis* (Natura 2000 code: A321)
28. *Ficedula parva* (Natura 2000 code: A320)
29. *Haliaeetus albicilla* (Natura 2000 code: A075)
30. *Hieraaetus pennatus* (Natura 2000 code: A092)
31. *Lanius collurio* (Natura 2000 code: A338)
32. *Lanius minor* (Natura 2000 code: A339)
33. *Larus minutus* (Natura 2000 code: A177)
34. *Lullula arborea* (Natura 2000 code: A246)
35. *Melanocorypha calandra* (Natura 2000 code: A242)
36. *Milvus migrans* (Natura 2000 code: A073)
37. *Oenanthe pleschanka* (Natura 2000 code: A533)
38. *Pelecanus onocrotalus* (Natura 2000 code: A019)
39. *Pernis apivorus* (Natura 2000 code: A072)
40. *Phalacrocorax pygmeus* (Natura 2000 code: A393)
41. *Picus canus* (Natura 2000 code: A234)
42. *Sterna hirundo* (Natura 2000 code: A193)
43. *Sylvia nisoria* (Natura 2000 code: A307)
44. *Tadorna ferruginea* (Natura 2000 code: A397)

The results of investigations carried out in the frame of the present study show that bird species (for which conservation were designated the sites ROSPA0002 "Allah Bair - Capidava" and ROSPA0017 "Canaralele de la Hârșova") are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of birds from the sites ROSPA0002 "Allah Bair - Capidava" and ROSPA0017 "Canaralele de la Hârșova").

D.2.7. Species of mammals of Community Interest

In the standard Natura 2000 sheet of site ROSCI0022 ("Canaralele Dunării") there was nominated as present only one mammal species:

- *Lutra lutra*

In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded specimens of *Lutra lutra*.

In conclusion, the mammal species of Community Interest (for which conservation was designated the site ROSCI0022 – "Canaralele Dunării") is not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations





of this species of mammal of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”).

D.2.8. Types of natural habitats of Community Interest

Freshwater habitat types

1. Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (Natura 2000 code: 3130)
In the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP this habitat type was recorded nearby Seimeni locality.
2. Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp (Natura 2000 code: 3140)
3. Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* — type vegetation (Natura 2000 code: 3150)
In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded the types of habitats of Community Interest coded with 3140 si 3150.
4. Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (Natura 2000 code: 3270)
In the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP this habitat type was recorded nearby Seimeni locality.

Temperate heath and scrub

5. * Ponto-Sarmatic deciduous thickets (Natura 2000 code: 40C0*)
In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there was not recorded the the type of habitat of Community Interest coded with 40C0*.

Natural and semi-natural grassland formations

6. * Ponto-Sarmatic steppes (Natura 2000 code: 62C0*)
7. Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (Natura 2000 code: 6430)
8. Alluvial meadows of river valleys of the *Cnidion dubii* (Natura 2000 code: 6440)
9. Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (Natura 2000 code: 6510)





In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded the types of habitats of Community Interest included into the category of *Natural and semi-natural grassland formations*.

Forests

10. * Eastern white oak woods (Natura 2000 code: 91AA)
11. Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*) (Natura 2000 code: 91F0)

12. * Euro-Siberian steppic woods with *Quercus* spp. (Natura 2000 code: 91I0*)

13. Pannonian-Balkan turkey oak–sessile oak forests (Natura 2000 code: 91M0)

In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded the types of natural habitats of Community Interest coded with 91AA, 91F0, 91I0* and 91M0.

14. *Salix alba* and *Populus alba* galleries (Natura 2000 code: 92A0)

In the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP this habitat type was recorded on the river-islands downstream Seimeni locality.

15. Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*) (Natura 2000 code: 92D0)

In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there was not recorded the type of natural habitat of Community Interest coded with 92D0.

The results of investigations carried out in 2010 – 2011 period show that the natural habitat types of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the natural habitat types of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”).





D.3. Description of ecological functions of affected species and habitats of community interest

As it was mentioned in chapter D.2, investigations conducted during 2010 – 2011 concluded that the activity of Cernavoda NPP is not affecting the conservation of species of community interest for which the site ROSCI0022 ("Canaralele Dunării") was declared.

Ecological functions of *Alosa immaculata* and *Alosa tanaica* which are present in ROSCI0022 "Canaralele Dunării", and for which investigations and observations were conducted during 2010 – 2011 allowing to deduce that there could be effects on a part of the young age class of the sub-populations spawning upstream of the mouth in the Danube of the cooling water evacuation canal of Cernavoda NPP, are presented as follows.

Species *Alosa immaculata* (Danube shad) is present only about 5 month of the year (April - August) in the perimeter of site ROSCI0022 ("Canaralele Dunării"). During April – May the majority of adults of *Alosa immaculata* migrate from the Black Sea in the Danube River, different groups of adults spawning and fertilizing their eggs in sites distributed along the Lower Danube River, their main spawning sites being between Calarasi and Braila, both on the main Danube and on the Borcea branch (while the Macin branch is less important for the spawning of this species).

Adults are not affected by the functioning of Units 1 and 2 of Cernavoda NPP, and respectively by the simultaneous functioning of the 4 units of Cernavoda NPP. Regarding their ecological functions, adults of *Alosa immaculata* play less the role of secondary consumers (predators); the majority of adult specimens die after spawning. Thus - at least from the point of view of other species – adults of Danube shad represent a component of food chain of ichthyophagous (foremost of birds but also of aquatic mammals and fish) and of necrophagous organisms (consuming dead bodies / cadavers).

We appreciate that only one part of the pre-larval stages of *Alosa immaculata* drifting in water currents on the right side of the main Danube River, originating from eggs layed in spawning sites situated upstream of Cernavoda at a distance which can be covered in at least 4 days by drifting fertilized eggs and pre-larvae (depending on the temperature of water these could hatch in the Danube River upstream Cernavoda) are likely to be affected.

Floating eggs and pre-larvae of *Alosa immaculata* floating on the Borcea branch are not affected by functioning of the two units of Cernavoda NPP in operation, or by future functioning of units 3 and 4 of Cernavoda NPP.





According to the above mentioned aspects and due to the lack of statistical data before this study, our „expert judgement” procedure may conclude that the environmental impact of functioning of Units 1 and 2 is not significant and the same level could be considered for the future simultaneous functioning with Units 3 and 4 of Cernavoda NPP.

Regarding the ecological functions of these stages (eggs and pre-larvae), these represent a component of the trophic spectrum of different secondary consumers (predators feeding on ichthyoplankton). During the pre-larval stage (and even during the first part of the larval stage) specimens of *Alosa immaculata* are feeding on resources from their yolk sac, until it is totally absorbed (phenomenon which happens at about 5 days after hatching).

Regarding the larval stages, only one part of these, originating from eggs layed in spawning sites situated upstream Cernavoda at distances which can be covered in at least 5 days by organisms that cannot move actively (like fertilised pelagic eggs) or have a weak capacity of moving actively (like yolk sac stage pre-larvae and first stage larvae) is probably affected by the temperature differential. Even of these specimens could be affected only those carried by currents on the right side of the main course of the Danube River. Larvae carried by currents on the Borcea branch are not affected nor by the two functioning of Units of Cernavoda NPP, nor by future functioning of units 3 and 4 of Cernavoda NPP.

Larvae of *Alosa immaculata* are not only pray for ichthyoplankton consuming species but are playing also the role of secondary consumers feeding on small rotifers, misids, gammarids, ostracodae, chironomidae, cladocerae, copepodae and crustaceans.

Besides those mentioned above an evaluation made by „expert judgment” procedure concludes that the environmental impact is insignificant during operation of Cernavoda NPP Units 3 and 4.

Due to the uniqueness and sensitivity of Dnabue ecosystem the caution principle is applied and even if the impact is low (insignificant) a monitoring of species *Alosa immaculata* is proposed according to the program presented in chapter F.

2. *Alosa tanaica* – Azov shad

The situation of *Alosa tanaica*, species of community interest present in ROSCI0022 “Canaralele Dunării”, is similar to that of *Alosa immaculata* – mentioning that for this species there are probable effects of the warm water plume on a much smaller number of specimens. This is so because, despite mixing and migrating together with *Alosa immaculata*, *Alosa tanaica* is present in a much lower proportion.





D.4. Conservation status of the species and habitat types of Community Interest

D.4.1. Plants of Community Interest

In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded species of plants of Community Interest.

In the standard Natura 2000 sheet of site ROSCI0022 ("Canaralele Dunării") there were nominated as present two plant species of Community Interest:

1. *Campanula romanica* (Natura 2000 code: 2236):
 - zoological status at national level: "*Endangered*" (EN);
2. *Moehringia jankae* (Natura 2000 code: 2079):
 - zoological status at national level: "*Vulnerable*" (VU);

According to the legislative framework, the two species have the following statute:

- species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;
- species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;

The results of investigations carried out in 2010 – 2011 period show that plant species of Community Interest (for which conservation was designated the site ROSCI0022 – "Canaralele Dunării") are not affected by functioning of Units 1 and 2 of Cernavoda NPP.

Consequently, it was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of plants of Community Interest (for which conservation was designated the site ROSCI0022 – "Canaralele Dunării").





D.4.2. Invertebrates of Community Interest

No species of invertebrates of Community Interest have been identified in the Danube reach with modified water temperatures due to cooling water from Cernavoda NPP.

One invertebrate of Community interest was nominated as present in the ROSCI0022 (Canaralele Dunarii) site:

- *Anisus vorticulus* (Natura 2000 code: 4056)
 - its zoological status at national level: „endangered”
 - legally *Anisus vorticulus* has the following status:
 - species of community interest requiring designation of Special Areas of Conservation – Annex 3 of Emergency Ordinance of the Romanian Government No. 57/2007
 - species of community interest in need of strict protection – Annex 4A of Emergency Ordinance of the Romanian Government No. 57/2007

Based on investigations and observations of the present study confirmed by results of monitoring activities conducted as required by Environmental Authorities, with Units 1 and 2 in operation, it can be concluded that the cooling waters of the two units has no impact on *Anisus vorticulus* in ROSCI0022

Consequently, it can be concluded that the cooling waters of four nuclear units (after commissioning of Units 3 and 4) of the Cernavoda NPP will have no impact on populations of *Anisus vorticulus* in ROSCI0022 area.

D.4.3. Fishes of community interest

1. *Alosa pontica* (code Natura 2000: 2491) / *Alosa immaculata* (code Natura 2000: 4125) – Danube shad

- zoological statute at national level: “least interest”;
- from legal point of view, *Alosa pontica* (*Alosa immaculata*) has the following statute:
 - species of community interest whose conservation requires establishing of special conservation areas – Annex 3 of O.U.G. 57/2007;
 - species of community interest whose taking from the wild and exploitation are the object of management measures - Annex 5A of O.U.G. 57/2007;
 - protected species – listed in Annex 3 of Law 13 / 1993.

2. *Alosa tanaica* (Natura 2000 code: 4127) – Azov shad

- zoological statute at national level: “least interest”;
- from legal point of view, *Alosa tanaica* has the following statute:





- species of community interest whose conservation requires establishing of special conservation areas – Annex 3 of O.U.G. 57/2007;
- species of community interest whose taking from the wild and exploitation are the object of management measures - Annex 5A of O.U.G. 57/2007.

From legal point of view all species mentioned this after have in common the following statute:

- species of community interest whose conservation requires establishing of special conservation areas – Annex 3 of O.U.G. 57/2007;
- protected species – listed in Annex 3 of Law 13 / 1993.

3. *Aspius aspius* (code Natura 2000: 1130) – asp
 - zoological statute at national level: “not established / evaluated”;
4. *Cobitis taenia* (code Natura 2000: 1149) – spine loach
 - zoological statute at national level: “not established / evaluated”;
5. *Eudontomyzon mariae* (code Natura 2000: 2484) – Ukrainian brook lamprey
 - zoological statute at national level: “critically endangered”;
6. *Gobio albipinnatus* (code Natura 2000: 1124) – White-finned gudgeon
 - zoological statute at national level: “not established / evaluated”;
7. *Gobio (Romanogobio) kessleri* (code Natura 2000: 2511) – Kessler’s gudgeon
 - zoological statute at national level: “endangered” in case of sub-species *Gobio (Romanogobio) antipai* (Bănărescu, 1953), present in the Lower Danube River;
8. *Gymnocephalus baloni* (code Natura 2000: 2555) – Balon’s ruffe
 - zoological statute at national level: “vulnerable”;
 - from legal point of view, *Gymnocephalus baloni* has the following statute:
 - species of community interest requiring strictly protection - Annex 4A of O.U.G. 57/2007
9. *Gymnocephalus schraetzer* (code Natura 2000: 1157) - Schraetzer
 - zoological statute at national level: “not established / evaluated”;
10. *Misgurnus fossilis* (code Natura 2000: 1145) - loach
 - zoological statute at national level: “not established / evaluated”;
11. *Pelecus cultratus* (code Natura 2000: 2522) – Ziege
 - zoological statute at national level: “not established / evaluated”;
12. *Rhodeus sericeus amarus* (code Naturae2000: 1134) - Biterling
 - zoological statute at national level: “not established / evaluated”;
13. *Sabanejewia aurata* (code Natura 2000: 1146) – synonymous with species *Sabanejwia bulgarica* – Goldside loach
 - zoological statute at national level: “not established / evaluated”;
14. *Zingel (Aspro) zingel* (code Natura 2000: 1159) – Zingel
 - zoological statute at national level: “vulnerable”;
 - from legal point of view, *Zingel (Aspro) zingel* has the following statute:





- species of community interest requiring strictly protection - Annex 4A of O.U.G. 57/2007
- species of community interest whose taking from the wild and exploitation are the object of management measures - Annex 5A of O.U.G. 57/2007.

15. *Zingel streber* (code Natura 2000: 1160) – Streber
- zoological statute at national level: „endangered”;

Based on investigations and observations made in this study combined with the results of monitoring conducted by Cernavoda NPP, with functioning Units 1 and 2, according to the requirements of environmental authorities, the cooling water of the two nuclear units in function of Cernavoda NPP have no impact on fish species of community interest of ROSCI0022. Consequently, the evacuation of cooling water from 4 nuclear units (after the operational start of Units 3 and 4) of Cernavoda NPP will have no impact on fish populations of community interest of site ROSCI0022.

As it was mentioned it was considered that evacuation of cooling water of Units 3 and 4 into the Danube River could affect only one part of the larvae of species of conservative interest *Alosa immaculata* present in the site ROSCI0022 „Canaralele Dunarii”.

We evaluate that reported to the population existing in the Black Sea the locally recorded phenomenon is not representing an environmental impact for this species.

D.4.4. Amphibians of Community Interest

D.4.4.1. Species of amphibians of Community Interest for which conservation there is need for designation of Special Conservation Areas

1. *Triturus dobrogicus* (Natura 2000 code: 1993) – Danube Crested Newt
- zoological status of the species *Triturus dobrogicus*:
 - on national level: “Endangered”;
 - on World-level: „Near Threatened”;
 - on European level: „Near Threatened”;
 - on the level of European Union: „Near Threatened”;
 - According to the legislative framework, *Triturus dobrogicus* has the following statute:
 - species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act (Law) No. 13 / 1993.





2. *Bombina bombina* (Natura 2000 code: 1188) - Fire-bellied Toad

- zoological status of the species *Bombina bombina*:
 - on national level: "aproape amenințată";
 - on World-level: "Least Concern";
 - on European level: "Least Concern";
 - on the level of European Union: "Least Concern";
- According to the legislative framework, *Bombina bombina* has the following statute:
 - species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;
 - species of Community Interest which needs strict protection - Annex 4A of the G.E.O. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

3. *Pelobates fuscus* - Common Spadefoot

- zoological status of the species *Pelobates fuscus*:
 - on national level: „Vulnerable”;
 - on World-level: "Least Concern";
 - on European level: "Least Concern";
 - on the level of European Union: "Least Concern";
- According to the legislative framework, *Pelobates fuscus* has the following statute:
 - species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

The results of investigations carried out in 2010 – 2011 period show that *Triturus dobrogicus*, *Bombina bombina* and *Pelobates fuscus* (species of Community Interest for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP.

Consequently, it was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of amphibians of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”).





D.4.4.2. Amphibian species of Community Interest that need strict protection

1. *Hyla arborea* - European Tree-Frog

- zoological status of the species *Hyla arborea*:
 - on national level: „Vulnerable”;
 - on World-level: “Least Concern”;
 - on European level: “Least Concern”;
 - on the level of European Union: “Least Concern”;

2. *Bufo (Pseudepidalea) viridis* - Green Toad

- zoological status of the species *Bufo (Pseudepidalea) viridis*:
 - on national level: “aproape amenințată”;
 - on World-level: “Least Concern”;
 - on European level: “Least Concern”;
 - on the level of European Union: “Least Concern”;

3. *Pelobates syriacus* – Eastern Spadefoot

În the site ROSCI0022 (“Canarelele Dunării”) this species was recorded only upstream of Cernavodă, the zoological status of *Pelobates syriacus* being the following one:

- on national level: “Endangered”;
- on World-level: “Least Concern”;
- on European level: “Least Concern”;
- on the level of European Union: “Near Threatened”;

4. *Rana dalmatina* – Agile Frog

În the site ROSCI0022 (“Canarelele Dunării”) this species was recorded only upstream of Cernavodă, the zoological status of *Rana dalmatina* being the following one:

- zoological status of the species *Rana dalmatina*:
 - on national level: „Vulnerable”;
 - on World-level: “Least Concern”;
 - on European level: “Least Concern”;
 - on the level of European Union: “Least Concern”;

According to the legislative framework, the mentioned amphibian species have the following statute:

- species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
- strictly protected species - according to Annex 2 of Act No. 13 / 1993.

The results of investigations carried out in 2010 – 2011 period show that species *Hyla arborea*, *Bufo (Pseudepidalea) viridis*, *Pelobates syriacus* and *Rana dalmatina* from the site ROSCI0022 – “Canarelele Dunării” are not affected by functioning of Units 1 and 2 of Cernavoda NPP.





Consequently, it was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of amphibians of Community Interest from the site ROSCI0022 – “Canaralele Dunării”.

D.4.4.3. Species of amphibians of Community Interest whose taking in the wild and exploitation may be subject to management measures

1. *Rana (Pelophylax) ridibunda* - Marsh Frog

- zoological status of the species *Rana (Pelophylax) ridibunda*:
 - on national level: not included in any category;
- According to the legislative framework, *Rana (Pelophylax) ridibunda* has the following statute:
 - Species of Community Interest whose taking in the wild and exploitation may be subject to management measures - Annex 5A of O.U.G. 57/2007;
 - protected species - according to Annex 3 of Act 13 / 1993.

2. *Rana (Pelophylax) kl. esculenta* – Edible Frog

- zoological statute al taxonului hibrid *Rana kl. esculenta*:
 - on national level: not included in any category;
- According to the legislative framework, *Rana kl. esculenta* has the following statute:
 - Species of Community Interest whose taking in the wild and exploitation may be subject to management measures - Annex 5A of O.U.G. 57/2007;
 - protected species - according to Annex 3 of Act 13 / 1993.

3. *Rana (Pelophylax) lessonae* – Pool Frog

În the Calarași – Hârșova sector of the Danube valley this species was recorded only at Borcea branch, the zoological status of *Rana (Pelophylax) lessonae* being the following one:

- on national level: not included in any category;
- According to the legislative framework, *Rana (Pelophylax) lessonae* has the following statute:
 - species of Community Interest which needs strict protection - Anexa 4B a O.U.G. 57/2007;
 - protected species - according to Annex 3 of Act 13 / 1993.

On international level, the above mentioned amphibian species have the following zoological statute:

- on World-level: “Least Concern”;
- on European level: “Least Concern”;





- on the level of European Union: "*Least Concern*";

The results of investigations carried out in 2010 – 2011 period show that species *Rana (Pelophylax) ridibunda*, *Rana (Pelophylax) kl. esculenta* and *Rana (Pelophylax) lessonae* from the Călărași – Hârșova sector of the Danube valley are not affected by functioning of Units 1 and 2 of Cernavoda NPP.

Consequently, it was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of amphibians of Community Interest present in the Călărași – Hârșova sector of the Danube valley (including those from site ROSCI0022 – "Canarelele Dunării").

D.4.5. Reptiles of Community Interest

D.4.5.1. Species of reptiles of Community Interest for which conservation there is need for designation of Special Conservation Areas

1. *Emys orbicularis* (Natura 2000 code: 1220) – European Pond Terrapin

- zoological status of the species *Emys orbicularis*:

- on national level: „Vulnerable”;

- on World-level: "*Lower Risk*" ("risc redus") / „Near Threatened”;

- on European level: "*Near Threatened*";

- on the level of European Union: "*Vulnerable*".

- According to the legislative framework, *Emys orbicularis* has the following statute:

- species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;

- species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;

- strictly protected species - according to Annex 2 of Act No. 13 / 1993;

În the site ROSCI0022 ("Canarelele Dunării") this species was recorded only upstream of Cernavodă.

2. *Testudo graeca* (Natura 2000 code: 1219) – Spur-tighed Tortoise

- zoological status of the species *Testudo graeca*:

- on national level: "*Endangered*";

- on World-level: "*Vulnerable*";

- on European level: "*Vulnerable*";

- on the level of European Union: "*Vulnerable*".

- According to the legislative framework, *Testudo graeca* has the following statute:





- species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;
- species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
- strictly protected species - according to Annex 2 of Act No. 13 / 1993;

The results of investigations carried out in 2010 – 2011 period show that reptile species of Community Interest *Emys orbicularis* and *Testudo graeca* (for which conservation was designated the site ROSCI0022 – “Canarelele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of *Emys orbicularis* and *Testudo graeca* (for which conservation was designated the site ROSCI0022 – “Canarelele Dunării”).

D.4.5.2. Species de reptiles of Community Interest that need strict protection

1. *Lacerta agilis* (Sand Lizard):

- zoological status of the species *Lacerta agilis*:
 - on national level: not included in any category;
 - on World-level: not yet evaluated;
 - on European level: “Least Concern” ;
 - on the level of European Union: “Least Concern” .
- According to the legislative framework, *Lacerta agilis* has the following statute:
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

This species was recorded only upstream of Cernavodă, outside of the site ROSCI0022 (“Canarelele Dunării”).

2. *Lacerta trilineata* (Balkan Green Lizard):

- zoological status of the species *Lacerta trilineata*:
 - on national level: “Endangered”;
 - on World-level: “Least Concern”;
 - on European level: “Least Concern” ;
 - on the level of European Union: “Least Concern” .
- According to the legislative framework, *Lacerta trilineata* has the following statute:
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.





The species *Lacerta trilineata* was recorded in few sites, at the western limit of the Dobrogean mainland, the site from downstream of Dunărea locality (Constanța county) being the closest area to the Danube sector with the plume with temperatures modified by the cooling waters of Cernavoda NPP.

3. *Lacerta viridis* (Green Lizard):

- zoological status of the species *Lacerta viridis*:
 - on national level: not included in any category;
 - on World-level: "Least Concern";
 - on European level: "Least Concern" ;
 - on the level of European Union: "Least Concern" .
- According to the legislative framework, *Lacerta viridis* has the following statute:
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

The species *Lacerta viridis* is relatively common in various terrestrial habitat types distributed along the right shore of the Danube river, between Ostrov and Hârșova localities. This species is also present in the vicinity of the channel with the cooling waters of Cernavoda NPP.

4. *Podarcis taurica* (Balkan Green Lizard):

- zoological status of the species *Podarcis taurica*:
 - on national level: "Near threatened";
 - on World-level: "Least Concern";
 - on European level: "Least Concern" ;
 - on the level of European Union: "Least Concern" .
- According to the legislative framework, *Podarcis taurica* has the following statute:
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

The species *Podarcis taurica* is common in various terrestrial habitat types from the western limit of the Dobrogean mainland, but it is not present in the forest-dominated habitats distributed along the right shore of the Danube river. The site from downstream of Dunărea locality (Constanța county) is the closest area to the Danube sector with the plume with temperatures modified by the cooling waters of Cernavoda NPP where this species was recorded during the investigations carried out in 2010 – 2011 period.

5. *Podarcis muralis* (Wall Lizard):

- zoological status of the species *Podarcis muralis*:
 - on national level: „Vulnerable”;





- According to the legislative framework, *Podarcis muralis* has the following statute:
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

The species *Podarcis muralis* was recorded in few sites, at the western limit of the Dobrogean mainland, the site from Canaralele Hârșovei being the closest area to the Danube sector with the plume with temperatures modified by the cooling waters of Cernavoda NPP.

6. *Natrix tessellata* (Dice Snake):

- zoological status of the species *Natrix tessellata*:
 - on national level: "Near threatened";
 - on World-level: not yet evaluated;
 - on European level: "Least Concern" ;
 - on the level of European Union: "Least Concern".
- According to the legislative framework, *Natrix tessellata* has the following statute:
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.

The species *Natrix tessellata* was recorded in several sites of the Danube valley (most of them being upstream of Cernavoda), including the in the channel with the cooling waters of Cernavoda NPP.

The results of investigations carried out in 2010 – 2011 period show that species of Community Interest *Lacerta agilis*, *Lacerta trilineata*, *Lacerta viridis*, *Podarcis taurica*, *Podarcis muralis* and *Natrix tessellata* from the Călărași – Hârșova sector of the Danube valley are not affected by functioning of Units 1 and 2 of Cernavoda NPP.

Consequently, it was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of these species of reptiles of Community Interest present in the Călărași – Hârșova sector of the Danube valley (including those from site ROSCI0022 – "Canaralele Dunării").

In the areas nearby the Danube valley (on sector Ostrov – Cernavodă) there were recorded other reptile species of Community Interest, as *Coronella austriaca*, *Coluber caspius*, *Elaphe longissima*, *Elaphe (quatuorlineata) sauromates*, *Eryx jaculus*, *Vipera ammodytes*, but these are not present in the Danube sector with the plume with temperatures modified by the cooling waters of Cernavoda NPP.





D.4.6. Birds of Community Interest

1. *Accipiter brevipes* (Natura 2000 code: A402)
 - zoological statute:
 - on national level: „Vulnerable”;
 - on European level: „Vulnerable”;
 - According to the legislative framework, *Accipiter brevipes* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998).
2. *Alcedo atthis* (Natura 2000 code: A229)
 - zoological statute:
 - on national level: not included into any category;
 - on European level is temporarily considered as having „Depleted” statute;
 - According to the legislative framework, *Alcedo atthis* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.
3. *Anthus campestris* (Natura 2000 code: A255) -
 - zoological statute:
 - on national level: not included into any category;
 - on European level: „species in decline”;
 - According to the legislative framework, *Anthus campestris* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.
4. *Aquila pomarina* (Natura 2000 code: A089)
 - zoological statute:
 - on national level: „Vulnerable”;
 - on European level: „species in decline”;
 - According to the legislative framework, *Aquila pomarina* has the following statute:





- species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
- strictly protected species - according to Annex 2 of Act No. 13 / 1993;
- species of which trade is regulated by Act 69 / 1994;
- species which is object of international treaties (according to Act 13 / 1998).

5. *Botaurus stellaris* (Natura 2000 code: A021)

- zoological statute:
 - on national level: not included into any category;
 - on European level is temporarily considered as having „Depleted” statute;
- According to the legislative framework, *Botaurus stellaris* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;

6. *Bubo bubo* (Natura 2000 code: A215)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level is temporarily considered as having „Depleted” statute;
- According to the legislative framework, *Bubo bubo* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;

7. *Burhinus oedicnemus* (Natura 2000 code: A133)

- zoological statute:
 - on national level: “*Endangered*”;
 - on European level: “*Vulnerable*”;
- According to the legislative framework, *Burhinus oedicnemus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998).

8. *Buteo rufinus* (Natura 2000 code: A403)

- zoological statute:





- on national level: „Vulnerable”;
 - on European level: “*Vulnerable*”;
 - According to the legislative framework, *Buteo rufinus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998).
9. *Calandrella brachydactyla* (Natura 2000 code: A243)
- zoological statute:
 - on national level: not included into any category;
 - on European level: „species in decline”;
 - According to the legislative framework, *Calandrella brachydactyla* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.
10. *Caprimulgus europaeus* (Natura 2000 code: A224)
- zoological statute:
 - on national level: not included into any category;
 - on European level is temporarily considered as having „Depleted” statute;
 - According to the legislative framework, *Caprimulgus europaeus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993.
11. *Chlidonias hybridus* (Natura 2000 code: A196)
- zoological statute:
 - on national level: not included into any category;
 - on European level is temporarily considered as having „Depleted” statute;
 - According to the legislative framework, *Chlidonias hybridus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
12. *Chlidonias niger* (Natura 2000 code: A197)





- zoological statute:
 - on national level: not included into any category;
 - on European level is temporarily considered as having „Depleted” statute;
- According to the legislative framework, *Chlidonias niger* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998).

13. *Ciconia ciconia* (Natura 2000 code: A031)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level is temporarily considered as having „Depleted” statute;
- According to the legislative framework, *Ciconia ciconia* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998).

14. *Ciconia nigra* (Natura 2000 code: A030)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level: „Rare” species;
- According to the legislative framework, *Ciconia nigra* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998).

15. *Circaetus gallicus* (Natura 2000 code: A080)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level: „Rare” species;
- According to the legislative framework, *Circaetus gallicus* has the following statute:





- species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
- strictly protected species - according to Annex 2 of Act No. 13 / 1993;
- species of which trade is regulated by Act 69 / 1994;
- species which is object of international treaties (according to Act 13 / 1998).

16. *Circus aeruginosus* (Natura 2000 code: A081)

- zoological statute:
 - on national level: not included into any category;
 - on European level: "secure" (favourable conservation statute);
- According to the legislative framework, *Circus aeruginosus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998).

17. *Circus cyaneus* (Natura 2000 code: A082)

- zoological statute:
 - on national level: not included into any category;
 - on European level: "depleted" ;
- According to the legislative framework, *Circus cyaneus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998).

18. *Circus macrourus* (Natura 2000 code: A083)

- zoological statute:
 - on national level: "Endangered";
 - on European level: "Endangered";
- According to the legislative framework, *Circus macrourus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;





- species which is object of international treaties (according to Act 13 / 1998).
19. *Circus pygargus* (Natura 2000 code: A084)
- zoological statute:
 - on national level: “*Endangered*”;
 - on European level: “*secure*” (favourable conservation statute);
 - According to the legislative framework, *Circus pygargus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998).
20. *Coracias garrulus* (Natura 2000 code: A231)
- zoological statute:
 - on national level: not included into any category;
 - on European level: „*Vulnerable*”;
 - According to the legislative framework, *Coracias garrulus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998).
21. *Dendrocopos medius* (Natura 2000 code: A238)
- zoological statute:
 - on national level: not included into any category;
 - on European level: “*secure*” (favourable conservation statute);
 - According to the legislative framework, *Dendrocopos medius* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
22. *Dendrocopos syriacus* (Natura 2000 code: A429)
- zoological statute:
 - on national level: not included into any category;
 - on European level: “*secure*” (favourable conservation statute);
 - According to the legislative framework, *Dendrocopos syriacus* has the following statute:





- species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
- strictly protected species - according to Annex 2 of Act No. 13 / 1993;

23. *Dryocopus martius* (Natura 2000 code: A236)

- zoological statute:
 - on national level: not included into any category;
 - on European level: sigură/stabilă "secure";
- According to the legislative framework, *Dryocopus martius* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;

24. *Emberiza hortulana* (Natura 2000 code: A379)

- zoological statute:
 - on national level: not included into any category;
 - on European level: "depleted" ;
- According to the legislative framework, *Circus cyaneus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993 .

25. *Falco peregrinus* (Natura 2000 code: A103)

- zoological statute:
 - on national level: "Endangered";
 - on European level: "secure" (favourable conservation statute);
- According to the legislative framework, *Falco peregrinus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998) .

26. *Falco vespertinus* (Natura 2000 code: A097)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level: „Vulnerable”;
- According to the legislative framework, *Falco vespertinus* has the following statute:





- species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
- strictly protected species - according to Annex 2 of Act No. 13 / 1993;
- species of which trade is regulated by Act 69 / 1994;
- species which is object of international treaties (according to Act 13 / 1998) .

27. *Ficedula albicollis* (Natura 2000 code: A321)

- zoological statute:
 - on national level: not included into any category;
 - on European level: "secure" (favourable conservation statute);
- According to the legislative framework, *Ficedula albicollis* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998) .

28. *Ficedula parva* (Natura 2000 code: A320)

- zoological statute:
 - on national level: not included into any category;
 - on European level: "secure" (favourable conservation statute);
- According to the legislative framework, *Ficedula parva* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998) .

29. *Haliaeetus albicilla* (Natura 2000 code: A075)

- zoological statute:
 - on national level: "Critically Endangered";
 - on European level: „Rare” species;
- According to the legislative framework, *Haliaeetus albicilla* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - specie migratoare Endangered (în conformitate cu Legea 13 / 1998);





- species which is object of international treaties (according to Act 13 / 1998) .

30. *Hieraaetus pennatus* (Natura 2000 code: A092)

- zoological statute:
 - on national level: “*Critically Endangered*”;
 - on European level: „Rare” species;
- According to the legislative framework, *Hieraaetus pennatus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998) .

31. *Lanius collurio* (Natura 2000 code: A338)

- zoological statute:
 - on national level: not included into any category;
 - on European level: “*depleted*” ;
- According to the legislative framework, *Lanius collurio* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993 .

32. *Lanius minor* (Natura 2000 code: A339)

- zoological statute:
 - on national level: not included into any category;
 - on European level: “*in decline*” ;
- According to the legislative framework, *Lanius minor* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993 .

33. *Larus minutus* (Natura 2000 code: A177)

- zoological statute:
 - on national level: not included into any category;
 - on European level is temporarily considered as having „Depleted” statute ;
- According to the legislative framework, *Larus minutus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;





- strictly protected species - according to Annex 2 of Act No. 13 / 1993;

34. *Lullula arborea* (Natura 2000 code: A246)

- zoological statute:
 - on national level: not included into any category;
 - on European level: “*depleted*” ;
- According to the legislative framework, *Lullula arborea* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993 .

35. *Melanocorypha calandra* (Natura 2000 code: A242)

- zoological statute:
 - on national level: not included into any category;
 - on European level: “*in decline*” ;
- According to the legislative framework, *Melanocorypha calandra* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993 .

36. *Milvus migrans* (Natura 2000 code: A073)

- zoological statute:
 - on national level: “*Critically Endangered*”;
 - on European level: „*Vulnerable*”;
- According to the legislative framework, *Milvus migrans* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998) .

37. *Oenanthe pleschanka* (Natura 2000 code: A533)

- zoological statute:
 - on national level: „*Vulnerable*”;
 - on European level: “*secure*” (favourable conservation statute);
- According to the legislative framework, *Oenanthe pleschanka* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;





- strictly protected species - according to Annex 2 of Act No. 13 / 1993;

38. *Pelecanus onocrotalus* (Natura 2000 code: A019)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level: „Rare” species;
- According to the legislative framework, *Pelecanus onocrotalus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998) .

39. *Pernis apivorus* (Natura 2000 code: A072)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level: “secure” (favourable conservation statute);
- According to the legislative framework, *Pernis apivorus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species of which trade is regulated by Act 69 / 1994;
 - species which is object of international treaties (according to Act 13 / 1998) .

40. *Phalacrocorax pygmeus* (Natura 2000 code: A393)

- zoological statute:
 - on national level: „Vulnerable”;
 - on European level: “secure” (favourable conservation statute);
- According to the legislative framework, *Phalacrocorax pygmeus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998) .

41. *Picus canus* (Natura 2000 code: A234)

- zoological statute:
 - on national level: not included into any category;





- on European level is temporarily considered as having „Depleted” statute ;
- According to the legislative framework, *Picus canus* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;

42. *Sterna hirundo* (Natura 2000 code: A193)

- zoological statute:
 - on national level: not included into any category;
 - on European level: “secure” (favourable conservation statute);
- According to the legislative framework, *Sterna hirundo* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;
 - species which is object of international treaties (according to Act 13 / 1998) .

43. *Sylvia nisoria* (Natura 2000 code: A307)

- zoological statute:
 - on national level: not included into any category;
 - on European level: “secure” (favourable conservation statute);
- According to the legislative framework, *Sylvia nisoria* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;

44. *Tadorna ferruginea* (Natura 2000 code: A397)

- zoological statute:
 - on national level: „Critically Endangered”;
 - on European level: „Vulnerable”;
- According to the legislative framework, *Tadorna ferruginea* has the following statute:
 - species of which conservation needs designation of Special Protection Areas - Annex 3 of the O.U.G. 57/2007;
 - strictly protected species - according to Annex 2 of Act No. 13 / 1993;

The results of investigations carried out in the frame of the present study show that bird species (for which conservation were designated the sites ROSPA0002 “Allah Bair - Capidava” and ROSPA0017 “Canaralele de la Hârșova”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the





populations of birds from the sites ROSPA0002 "Allah Bair - Capidava" and ROSPA0017 "Canaralele de la Hârșova").

D.4.7. Mammals of Community Interest

In the standard Natura 2000 sheet of site ROSCI0022 ("Canaralele Dunării") there was nominated as present only one mammal species:

Lutra lutra (Natura 2000 code: 1355)

- zoological status at national level: „Vulnerable”;
- According to the legislative framework, *Lutra lutra* has the following statute:
 - species of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 3 of the O.U.G. 57/2007;
 - species of Community Interest which needs strict protection - Annex 4A of the O.U.G. 57/2007;

In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded specimens of *Lutra lutra*.

The mammal species of Community Interest *Lutra lutra* (for which conservation was designated the site ROSCI0022 – "Canaralele Dunării") is not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the populations of this species of mammal of Community Interest (for which conservation was designated the site ROSCI0022 – "Canaralele Dunării").

D.4.8. Types of natural habitats of Community Interest

All types of natural habitats of Community Interest occurring in site ROSCI0022 ("Canaralele Dunării") have the following statute:

- types of natural habitats of Community Interest of which conservation needs the designation of Special Conservation Areas – Annex 2 of the O.U.G. 57/2007;.

As it was specified in chapter **D2**, the types of natural habitats nominated in the standard Natura 2000 sheet of site ROSCI0022 ("Canaralele Dunării") and recorded in the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP are the following ones:

- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (Natura 2000 code: 3130);





- Rivers with muddy banks with *Chenopodium rubri* p.p. and *Bidention* p.p. vegetation (Natura 2000 code: 3270) and
- *Salix alba* and *Populus alba* galleries (Natura 2000 code: 92A0).

Taking into account the location of the areas where these habitat types were recorded and the fact that the temperature-difference caused by the cooling waters from the Cernavoda NPP is only about 0.5°C, we consider that these natural habitat types of Community Interest coded with 3130, 3270 and 92A0 (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. The cooling water from all of the four Units (after the functioning of Units 3 and 4, too) of Cernavoda NPP will not generate a temperature difference higher than 0.5°C - 1°C in the respective area. Consequently, the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the natural habitat types of Community Interest coded with 3130, 3270 and 92A0 from the site ROSCI0022 (“Canaralele Dunării”).

The results of investigations carried out in 2010 – 2011 period show that the natural habitat types of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”) are not affected by functioning of Units 1 and 2 of Cernavoda NPP. It was estimated that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the natural habitat types of Community Interest (for which conservation was designated the site ROSCI0022 – “Canaralele Dunării”).

D.5. Data about the structure and dynamics of populations of affected species

According to the results of investigations conducted during 2010 – 2011, the functioning of Units 1 and 2 of Cernavoda NPP, does not affect the numerical evolution of species of community interest for the conservation of which the site **ROSCI0022 “Canaralele Dunării”** was declared.

Consequently the estimated percent of populations affected by the implementation of the project is 0 (zero) %. We appreciate that the characteristic habitats of species of community interest are large enough to ensure long-term survival of species.

We estimate that the functioning of Units 3 and 4 of Cernavoda NPP **will not affect the dynamics, numerical evolution of populations of community interest** existing in the perimeter of protected site ROSCI0022 “Canaralele Dunării”.

Regarding the two fish species of community interest (*Alosa tanaica* and *Alosa immaculata*) present in ROSCI0022 “Canaralele Dunării”, in case of *Alosa tanaica* the adult specimens mix with shoals of *A. immaculata*, migrating together, and larvae of





the two species behave in the same way, no morphological difference between them being visible, only maybe at genetic level (so far there are no data about the genome of *A. tanaica*).

Among larvae found in the spring samples there are for sure also larvae of *A. tanaica* but in the literature there are no characteristics which can differentiate them from *A. immaculata*.

Consequently, we consider that the situation of *A. tanaica* is similar to that of *A. immaculata* – with the specification that the number of *A. tanaica* is only about 3 – 5 % of the total number of *A. immaculata*.

The situation of larvae of *Alosa immaculata*, based on the results of investigations conducted during 20110 – 2011 is presented briefly as follows.

In the 14 sampling stations investigated during the spring of 2011, 25 larvae of *Alosa* sp. were found. Among the different stations, the most numerous were larvae found 500 m downstream of the mouth of the of Cernavoda NPP cooling water evacuation canal, in the thermal plume with modified water temperatures, centre right. In this station 13 larvae were captured. In one third of sampling stations, both upstream and downstream of the mouth of the cooling water evacuation canal, no larvae were captured.

Differences in the number of larvae captured in the unit of volume of water filtered are explained by the fact that these larvae are drifting discontinuously in the water body of the river.

The dominant larval stages in the samples point to the fact that the spawning site was not far from the area sampled; being either under the influence of the thermal water plume, or for the stage I larvae, after Vladimirov 1953 (the dominant stage found), the spawning site was situated in this period of the year upstream, at a distance of at least 4 days of free flowing of the Danube River.

Larvae of genus *Alosa* are migrating passively, in the pelagic, from upstream of Cernavoda. One part of the larvae situated in the area of the thermal water plume can be affected at the contact with the cooling water of Cernavoda NPP. This situation can happen especially during periods with high water levels, when the mixing of cooling water from Cernavoda NPP with the Danube is delayed / slower – as it was seen in the results of investigations during July 2010.

It is noteworthy that in this period of 2010 extreme meteorological phenomena were recorded, with torrential rainfall and flooding, including in the area of this study. During this time larvae of Danube shad (*Alosa immaculata*) were captured in drift nets for eggs and larvae set on the bottom of the river, in stations below the thermal water plume.





We appreciate that the presence of a part of Danube shad larvae on the bottom of the river in the downstream part of the thermal plume is the effect of maintaining over a certain distance a high water temperature differential ($\Delta T \geq 7^\circ \text{C}$) between the water of the Danube and that of the cooling water evacuated by the Cernavoda NPP.

We consider that the spawning habitats for *Alosa immaculata* in the Lower Danube River are sufficiently large (and not affected by the simultaneous functioning of the four units of Cernavoda NPP) to ensure long-term survival of the species in conditions of future operation of Units 3 and 4 in parallel with Units 1 and 2 of Cernavoda NPP.

Taking into consideration the aspects detailed above, as a conservative measure, and to establish a data base of species of genus *Alosa* in the area of the project, we highly recommend **monitoring**, after the start of construction works at Units 3 and 4, the effect of the thermal plume on larvae of species of genus *Alosa* migrating in the area of Cernavoda.

D.6. Structural and functional relationships that creates and maintains the integrity of the protected natural areas of community interest

ROSCI0022 (Canaralele Dunării) site is clearly dominated by two life environments: wetlands (about 36% of the site surface – most part of this category being represented by the Danube River) and woodlands (about 60% of the site surface – the most representative - both at the site level and the national level – being the habitat with willow and poplar).

Based on the investigations made between years 2010 and 2011 it shows that from the two life environments the woodlands areas are not affected by the operation of the Units 1 and 2 of Cernavoda NPP. We predict also that neither the operation of Units 3 and 4 of Cernavoda NPP will affect these areas.

In regards with the wetlands areas, the operation of Cernavoda NPP Units could affect, in certain conditions, part of the biotic components of the lotic ecosystem (running waters), as follows:

- by favoring the development of the populations belonging to *Corbicula* genus (exotic molluscs get in the aquatic bodies as result of anthropic activity related to shipping)
- the likely effect of the warm water evacuated by Cernavoda NPP on the part of larvae and fingerlings of *Alosa* sp. coming from the eggs layed down at about 300Km upstream of ROSCI0022 site - in late spring and summer periods characterized by high levels of Danube River (situation generating the phenomenon of the higher





temperatures waters layer preserved on the River surface on a hundred meters distance long between the discharging mouth of the cooling waters evacuation canal of Cernavoda NPP and Seimeni locality).

D.6.1. Aquatic macro-invertebrates

Among amphipods which represents dominant macro-invertebrates in samples, individuals of *Corophium curvispinum* build mud or sand tubes settled on submersed objects. The tubes are also settled on valves of *Dreissena polymorpha* shells. The results from research reveal a correlation between these two species, *C. curvispinum* being present only at the sampling point where *D. polymorpha* was recorded – the shells of latter offering both a substrate for tubes fixation and a specific feeding habitat.

Regarding the population of *Corbicula fluminea*, it has a high reproductive potential with one adult individual producing more than 68,000 pediveliger larvae (last larval stage) per year thus being able to form very high densities in short time intervals. Adults can grow up to 50-70 mm and have a life span of 3 to 4 years. Given the high invasive potential, we emphasize the importance of monitoring studies of this species dynamics simultaneously with native species – *Dreissena polymorpha* – spatial and numerical distribution.

Considering the results of field investigations conducted during the summer of 2010 and the spring of 2011, one can not conclude that under the effects of modified water temperatures the native species (*Dreissena polymorpha*) would be replaced by the alien invasive species (*Corbicula fluminea*). Even if in the locations with high abundance of *Corbicula fluminea*, the individuals of *Dreissena polymorpha* are present in small numbers (or not present at all as observed at certain times of year), possible pressure exerted by alien species may not be the only factor responsible for species dynamics. The cooling waters outlet canal of Cernavoda NPP can function as a reservoir where the alien species *Corbicula fluminea* finds a foothold even in winter and can passively disperse by water currents downstream Danube. Even so the density of individuals is reduced from 1960 individuals/m² in P0 sampling point (cooling water outlet canal) to 461 individuals/m² at S2 sampling point (near Seimeni) and 219 individuals/m² at S1 station (in the locality Capidava). Abundance of the non-native species is considerably lower in the spring (May 2011) compared to other seasons of the year.

In conclusion, thermal water plume impact on studied invasive alien species in case of operation of Units 3 and 4 is not significant.

Considering the aspects that were presented in case of the invasive species a monitoring of *Corbicula fulminea* species according to the monitoring program from chapter F of this study.





D.6.2. Fishes

To date 52 fish species have been observed in the investigated Danube River sector, including ROSCI0022 "Canaralele Dunării", of which 35 species were identified by study (experimental) fishing during the period summer 2010 – spring 2011 (28 are bottom / demersal species and 7 are pelagic).

Most fish species are constantly present in ROSCI0022 (Canaralele Dunării), even if their number varies from season to season, according to the biology of each species. The largest number of species were observed during the summer (27 species), while the smallest was observed during the winter time (8 species)

A few species are only temporarily present in ROSCI0022 (Canaralele Dunării), as are especially the species which migrate from the Black Sea to this area and even upstream of this Natura 200 site, the Danube shad (*Alosa immaculata*) and Azov shad (*A. tanaica*) as well as the three species of anadromous sturgeons.

Of these species the Danube shad (*Alosa immaculata*) has its most important spawning area of Romania between Calarasi and Braila – including in ROSCI0022 (Canaralele Dunării). Adults of this species do not feed during the spawning period, and after laying their eggs the most of the adults die- consequently this species represents one part of the trophic spectrum of ichthyophagous and necrophagous species during a period of time limited to a few month (generally between April and August, but this function is more relevant during the middle of this period, from May to July).

The presence of the high biomass of species of genus *Corbicula*, possibly favorised by the water with modified temperatures (of the site downstream of the mouth of the cooling water evacuation canal of Cernavoda NPP), is attracting some of the bentophagous (bottom feeding) fish species. The high number of fishes in the cooling water evacuation canal of Cernavoda NPP and in the area with modified water temperatures is attracting also a high number of predatory fishes – phenomenon demonstrated also by the fact that these areas (with modified water temperatures and accumulations of molluscs of genus *Corbicula*) are preferred by a higher number of sport fisher, compared to other areas of the river.

D.6.3. Birds

In the given period of 2010-2011, in the sector between Rasova and Capidava of the Danube River Valley, 116 bird species have been identified, till now, out of which 41 species are belonging to aquatic birds group – from these, 28 aquatic species are





occurring more frequently/constantly (at least in some periods of the year) in the area of the river sector where it is also the area with the modified temperatures.

From the aquatic bird species observed feeding in the banks areas and on the Danube River flow and gathering on the river banks and isles, 8 species have more important numbers. The highest numbers of aquatic birds has been recorded in the summer season on the Danube River sector located between the cooling waters evacuation canal of Cernavoda NPP and Seimeni locality. In the other seasons of the year, the populations were of aprox. same dimension as the other populations from the other river sectors with the same habitat characteristics as from the sector investigated in this study.

D.6.4. Other groups of aquatic and semi-aquatic vertebrates

In regards with other groups of aquatic and semi-aquatic vertebrates (amphibians, reptiles and mammals) these have populations of aprox. same dimensions as the other populations from the other river sectors with the same habitat characteristics as from the sector investigated in this study.

Out of these groups of vertebrates, just the Anures (amphibians without a tail in the adult stage) had higher populations in habitats with shallow stagnant waters both upstream and downstream the cooling waters evacuation canal of Cernavoda NPP but at a long distance from it (i.e. in flooding areas from the right bank of Danube, aprox. near Tichilesti locality, Constanta County). However, this type of habitat (with shallow stagnant waters spread on large surfaces and with rich aquatic and semi-aquatic vegetation) does not exist on the bank area of the river sector where modified temperatures waters occur.

D.7. The conservation objectives of the protected natural areas of community interest, if they were established by management plans.

The cooling waters evacuation canal of Cernavoda NPP is located in relation with the sites included in the European network of protected natural areas of community interest from the Cernavoda-Harsova sector of the Danube River as follows:

- ROSCI0022 site "**Canaralele Dunării**": the protected area includes about 700 m from the downstream part of the ground canal at the end of which the cooling water is discharged in the Danube River.





- ROSPA0002 site "**Allah Bair - Capidava**" (: the Southern extremity of the protected area is located at about 6,5 Km downstream from the place where the cooling water is discharged in the Danube River
- ROSPA0017 site "**Canaralele de la Hârșova**": the Southern extremity of the protected area is located at over 33 Km downstream from the place where the cooling water is discharged in the Danube River.

Out of these three protected natural areas of community interest, none of them has till now a management plan officially developed or approved and therefore neither the conservation objectives of these three protected natural areas of community interest have been established.

D.8. The description of the actual conservation status of the protected natural areas of community interest including evolutions/changes that might be occurring in the future

D.8.0. Anthropic pressures with an impact on the ecological status of Danube River in the project area of interest

The Management Plan of the Danube River, Danube Delta, Dobrogea Hydrographic Area and Coastal Waters has been approved by GD no.80/2011 and published in OM no.265 bis / 14.04.2011. By analyzing this Plan it resulted a synthesis for this study of the significant anthropic pressures with an impact on the ecological status of the Danube River in the project area of interest. Therefore, the significant pressures identified and the assesement of their impact are described below.

Point and diffuse significant pollution sources

Point and diffuse significant pollution sources identified in the Management Plan of the Danube River, in the Danube Delta, Dobrogea Hydrografic Area and Coastal Waters are urban areas industrial and agricultural sources. Lack or insufficient wastewater treatment lead to surfacewater pollution with organic matter, which reaching in the surfacewaters begin to degrade and to consume oxygen. Organic substances pollution produce a significant impact on aquatic ecosystems by changing the species composition, biodiversity decreasing and reducing the fish populations or even fish mortality under drastic reduction of oxygen concentrations.

Nutrient emissions are due to:

- Point sources (urban wastewater, industrial and agricultural untreated or insufficiently treated),
- Diffuse sources (specially, agricultural: farming, use of fertilizers),





- Malfunction of wastewater treatment plants.

Other important problem of water management in the Danube Basin is nutrient pollution (nitrogen and phosphorus), leading to water eutrophication (nutrient enrichment and excessive algal biomass growth), specially stagnant water bodies or semi-stagnant (lakes accumulation), which produce the change of species composition, biodiversity decreasing and impaired quality of water resources (drinking water, recreation, etc.).

In Cernavoda area, a potential contributor of nutrient pollutant (nitrogen and phosphorus) is SC. Raja SA that manages the water supply and sewerage including the system that serves Cernavoda town. It is mentioned that evacuation of treated sewage waters from the sewage treatment plant of Cernavoda town is made in the channel of cooling water evacuated from Cernavoda NPP Units 1 and 2 (close after the spillway which makes water translation from the concrete canal to earthen canal). Thus in the section of the channel where treated sewage water is evacuated the quality of these waters affects the quality of the evacuated cooling water.

The presence of human settlements characterize the Danube area studied in this report, localities representing significant pollution sources considering the insufficient number of wastewater treatment plants.

Water body Chiciu-Isaccea of the Danube River Hydrografic Basin, Dobrogea Hydrografic Area, Danube Delta, and Coastal Waters where the investigated area is situated is characterized by a sensitivity to high levels of nutrients concentrations, a special contribution being represented by the insufficient number of wastewater treatment plants from basin settlements and therefore the discharge of urban wastewaters, untreated industrial and agricultural water.

Also, potential pollutants contributors are industrial-agroindustrial and municipal objectives from influence area of Cernavoda NPP U3 and U4.

Significant hydromorphological pressure

The Danube River is characterized by a high degree of planning, due to hydrotechnical works carried out, determined of the uses for which they were created.

The most important uses of the Danube River are:

- Electricity;
- Flood protection;
- Agriculture;





- Navigation;
- Urbanization.

In accordance with Management Plan of Danube River, Danube Delta, Dobrogea Hydrographic Area and Coastal Waters, the investigated area is a part of Chiciu - Isaccea water body which is strongly modified water body.

Physical alteration refers to flood protection works - damming. Chiciu - Isaccea water body has embankment works on about 92% of its length.

The main uses of damming works are flood protection and navigation. This works serve as protection and reducing the flood effects for agriculture lands, socio-economic objectives, for local and county roads, settlements, etc.

The Chiciu – Isaccea water-body is distributed along the following protected areas: **ROSCI0022 (Canaralele Dunării)**, ROSPA0039 (Dunăre – Ostroave), **ROSPA0002 (Allah Bair – Capidava)**, **ROSPA0017 (Canaralele de la Hârșova)**, ROSCI0006 (Balta Mică a Brăilei), ROSPA0005 (Balta Mică a Brăilei), ROSCI0012 (Brațul Măcin), ROSPA0040 (Dunărea Veche – Braț Măcin) and ROSPA0031 (Delta Dunării și Complexul Razim – Sinoie), ROSCI0065 (Delta Dunării).

The Chiciu – Isaccea water-body has connection with the following underground water-bodies: RODL07 (Lunca Dunării Hârșova-Brăila) and ROIL11(Lunca Dunării Oltenița-Hârșova).

The management plan established that the civil works (for creating polders) had as result the interruption of lateral connectivity, changed the habitats, reduced the breeding areas of some aquatic species and loss of other services of wetlands. Furthermore, this impact will last in the future due to the lack of alternative technical measures to replace the present ones.

As conclusion: taking into account the above mentioned aspects, the Management Plan of Danube River, Danube Delta, Dobrogea Hydrographic Unit and Coastal Waters (approved by the Governmental Decision No. 80 / 2011, published in the Official Monitor of Romania No. 265 bis - on April 14th, 2011) identified several anthropogenic pressures with direct impact on the quality-status of the Danube and on the biodiversity (including the species of conservative interest from the sector of the Danube investigated in the frame of the present study). These anthropogenic pressures are not generated by the Units 3 and 4 of Cernavoda NPP project.

D.8.1. The thermal regime and flowing velocity of water





During the study measurements were undertaken in summer (July and August 2010), autumn (September – November 2010), winter (January – March 2011) and spring (April – May 2011). Hydrochemical and hydrobiological samples taken during the same periods from the cooling water canal of Cernavoda NPP and the different stations of the river sector Rasova – Capidava were analyzed in the laboratory. Field survey was undertaken in the sector Călărași – Hârșova.

Field investigations resulted in following conclusions:

- (i) during high water levels of the Danube River at Cernavoda (over 200 cm, as recorded during the summer and winter), the water of cooling water canal is floating over a distance of 3 – 3.5 km on the Danube (without mixing with the water of the river) (**Fig. D.8.1.1**).
- (ii) during low water level of the Danube River at Cernavoda (bellow 200 cm, as recorded during the spring and autumn) the stratification phenomenon does not happen, the mixing of the cooling water from the canal starts already during the first one hundred meter after their contact, and the thermal water plume has only a length of 1.5 – 2 Km;
- (iii) the thermal water plume with modified temperatures has a variable width from 300 to 400 m, at the inflow of the canal, and is reduced to only 50 m in front of Seimeni;
- (iv) overall the effect of the thermal gradient poses no significant environmental impact, the functioning of Units 1 and 2 are respecting the requirements of Water Management Authorisation (**WMA**) No. 241/2010. This foresees that in the Danube the water temperature will be maximum 10 °C ($\Delta T = 10$ °C) higher than the temperature of the inflowing natural river, but after passing the mixing zone not higher than 35 °C; as it is foreseen in the WMA No. 277 / 2011, which is actualizing WMA No. 241 / 2010, the thermal load of the cooling water evacuated into the Danube River will be maximum 10 °C higher than the temperature of the Danube , but after passing the mixing zone not higher than 35 °C; this document also foresees that during the periods of injection the warm water of the distribution basin the value of ΔT will be analyzed by Cernavoda NPP compared to the water temperature of the distribution basin (condensators) and the Seimeni section; from economical point of view ΔT will be calculated between the temperature of the receiving natural water body and that of the cooling water, according to the measurement sections mentioned in the protocol of monitoring the use of water resources and the receipt of used water in the water resources.



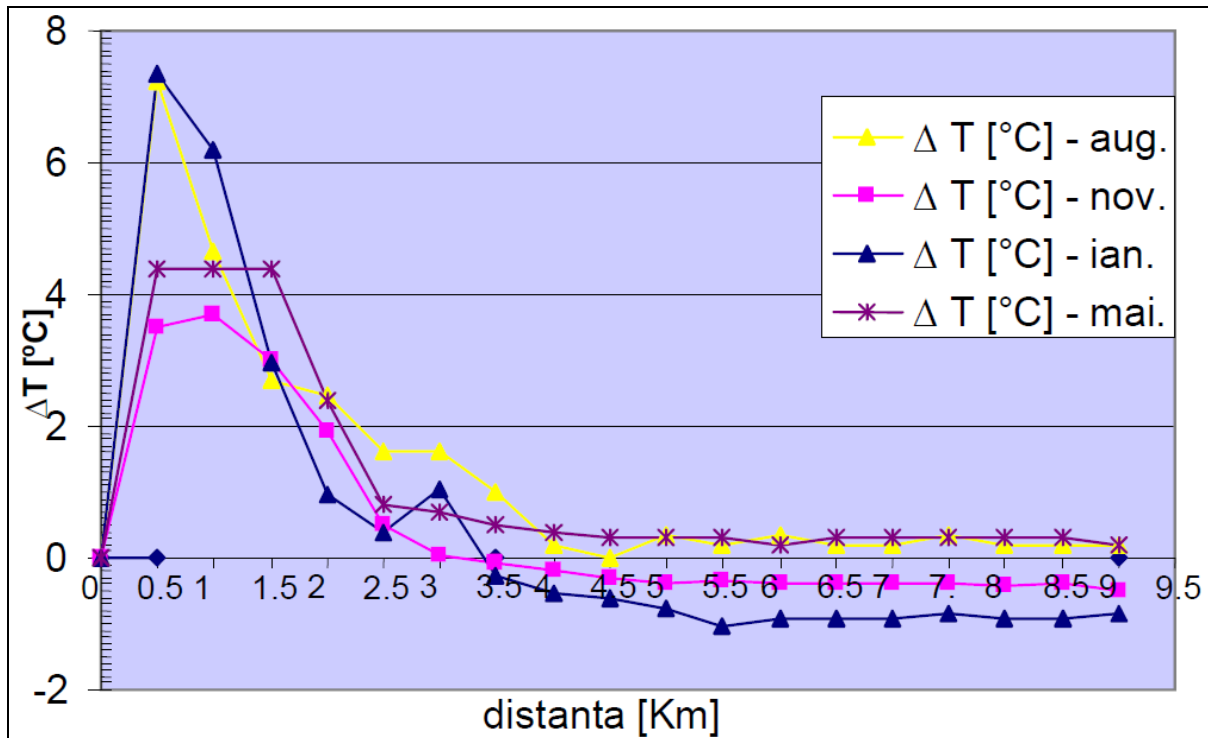


Fig. D.8.1.1. Temperature differential (ΔT) at the interface between the effluent (the thermal water plume - with modified temperatures) and the Danube River upstream, during different seasons of the year

Note 1. The origin of the graph on the OX correspond to River km 296.1

Note 2. The origin of the graph is associated to the reference temperature, i.e. the temperature differential (ΔT) in the origin is zero in each of the

Note 3. The water level of the Danube River at Cernavoda: August 2010: 236 cm; November 2010: 135 cm; January 2011: 386 cm; May 2011: 103 cm.

Changes which may happen in the future

We appreciate that after the start of Units 3 and 4 of Cernavoda NPP the following changes can happen:

a) The length of the thermal water plume with modified temperatures

- during the periods of the year with high water level of the Danube River (summer and winter) the thermal water plume will probably extend to a length of 4.5 – 6.5 Km (**Fig. D.8.1.2.** and **Fig. D.8.1.3.**) (in relation foremost to the discharge of cooling water and less to the temperature differential);
- during the periods of the year with low water level of the Danube River (autumn and early spring) the thermal water plume will probably extend to a length of 3 –





3.5 Km (Fig. D.8.1.4. and Fig. D.8.1.5.) (in relation foremost to the discharge of cooling water and the temperature differential);

b) the width of the thermal water plume with modified temperatures near the mouth of the cooling water canal of Cernavoda NPP

Due to the doubling of the cooling water discharge (from about 100 m³/s to about 200 m³/s) by the operation of Units 3 and 4, it is to be expected that the width of the thermal water plume will increase at about 450 m. This phenomenon of expansion of warm water at the first contact with the water of the river is described in the literature for cooling waters at Thermal Power Plants and NPPs.

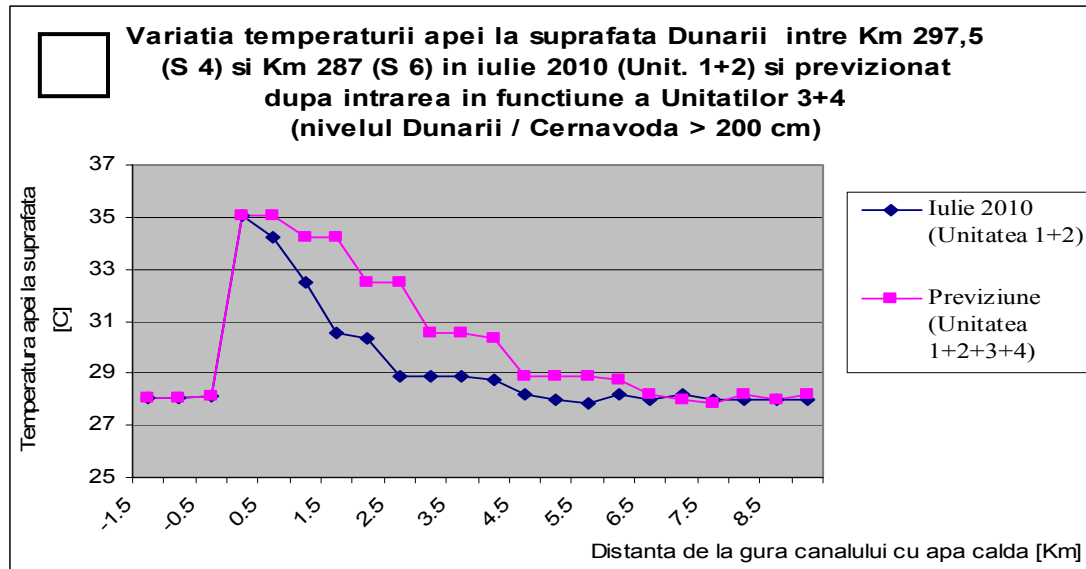


Fig. D.8.1.2. Variation of water temperature at the surface of the Danube River during the summer, in case of functioning of Units 1 and 2 of Cernavoda NPP and that foreseen for the situation when all four units of Cernavoda NPP will function

Note 1. Measurements realized in July 2010, on a distance of about 9 Km (between the origin situated at 1500 m upstream of the mouth of the cooling water canal of Cernavoda NPP until the village Dunărea) in case of functioning of Units 1 and 2 of Cernavoda NPP.

Note 2. The origin of the graph on the OX corresponds to River km 297.5.



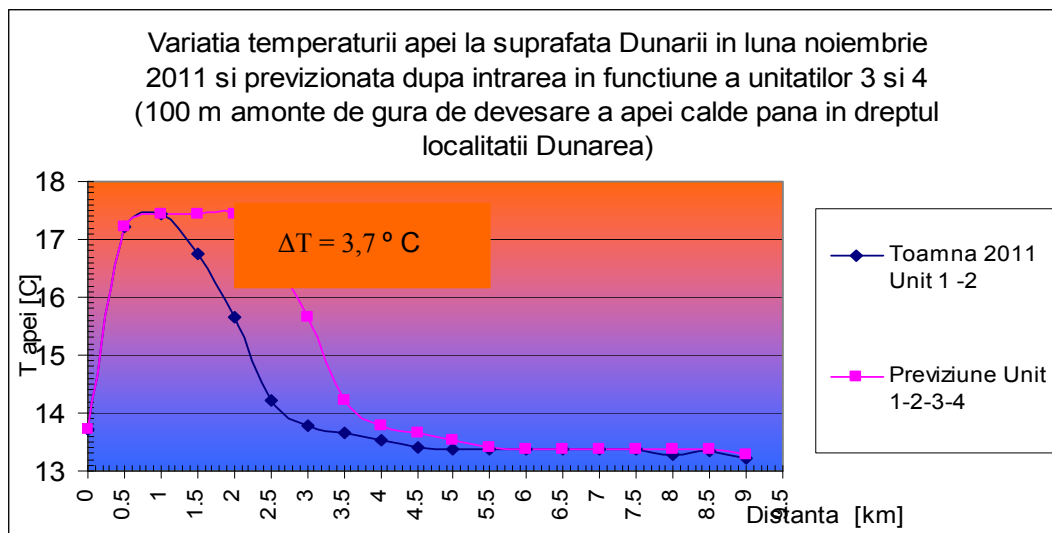


Fig. D.8.1.3. Variation of water temperature at the surface of the Danube River during the autumn, in case of functioning of Units 1 and 2 of Cernavoda NPP and that foreseen for the situation when all four units of Cernavoda NPP will function

Note 1. Measurements realized in November 2010, on a distance of about 9 Km (between the origin situated at 1500 m upstream of the mouth of the cooling water canal of Cernavoda NPP until the village Dunărea) in case of functioning of Units 1 and 2 of Cernavoda NPP.

Note 2. The origin of the graph on the OX corresponds to River km 296.1.

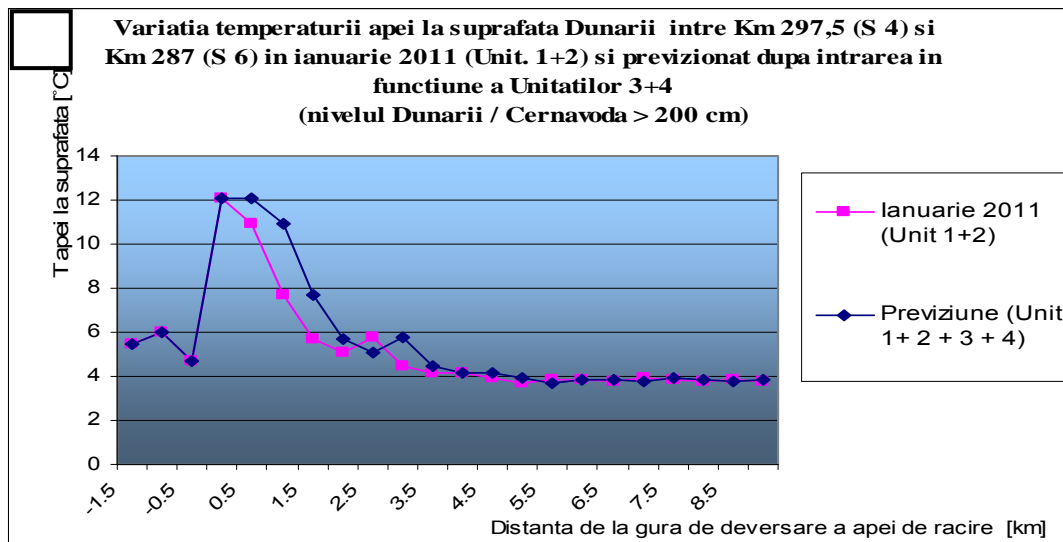


Fig. D.8.1.4. Variation of water temperature at the surface of the Danube River during the winter, in case of functioning of Units 1 and 2 of Cernavoda NPP and that foreseen for the situation when all four units of Cernavoda NPP will function

Note 1. Measurements realized in January 2011, on a distance of about 9 Km (between the origin situated at 1500 m upstream of the mouth of the cooling water canal of Cernavoda NPP until the village Dunărea) in case of functioning of Units 1 and 2 of Cernavoda NPP.

Note 2. The origin of the graph on the OX corresponds to River km 297.5.



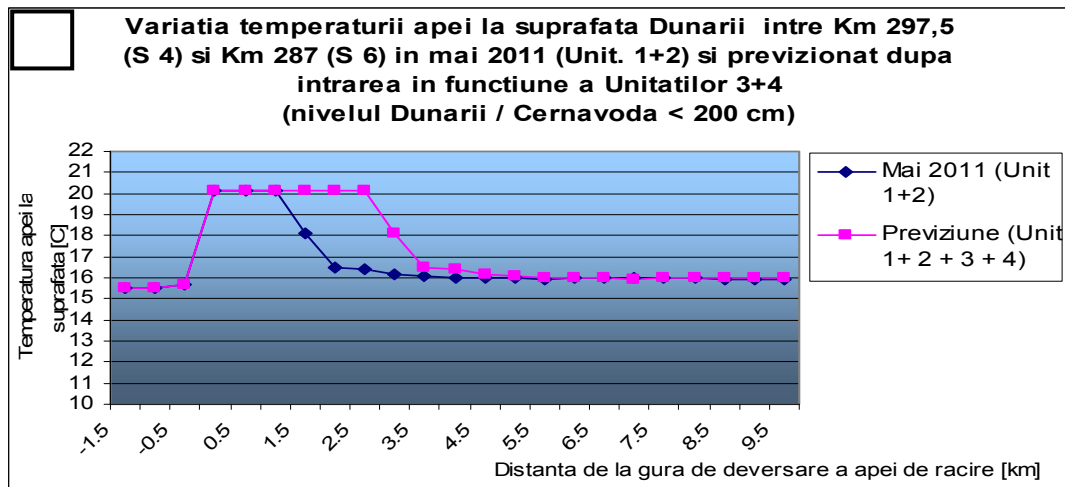


Fig. D.8.1.5. Variation of water temperature at the surface of the Danube River during the spring, in case of functioning of Units 1 and 2 of Cernavoda NPP and that foreseen for the situation when all four units of Cernavoda NPP will function

Note 1. Measurements realized in May 2011, on a distance of about 9 Km (between the origin situated at 1500 m upstream of the mouth of the cooling water canal of Cernavoda NPP until the village Dunărea) in case of functioning of Units 1 and 2 of Cernavoda NPP.

Note 2. The origin of the graph on the OX corresponds to River km 297.5.

D.8.2. Chemistry (water and sediment)

Introduction

Based on the INCDDD – Tulcea experience, in this chapter have been investigated a number of physico-chemical indicators for the characterization of Danube water quality upstream and downstream from cooling water discharge from C.N.E. Cernavodă, as mentioned in section C2.2. It was also analyzed the temperature influence of discharged cooling water on physical and chemical indicators.

There were also analyzed physico-chemical indicators from sediment samples and the influence of temperature on them.

The specific operating physico-chemical indicators in Units 1 and 2 Cernavoda NPP are in accordance with the Water Management Authorization (AGA) no. 241/2010 on "Water supply and sewage disposal for Units 1 and 2 of Cernavoda NPP".

For Units 3 and 4 Water Management Permit nr.35/2011 Approval is issued by ANAR. Discharge limits and other physico-chemical indicators included in this Approval, are





similar to those imposed by the AGA 241/2010 updated no. 277/2011 for Units 1 and 2 from Cernavoda NPP.

There has to be stressed that not all of the studied parameters are coming from Cernavoda NPP.

National Environmental Report for 2010 prepared by ANAR establishes that, for the Danube river in the Dobrogea Coastal Area the ecological and chemical status is good (second quality class). In accordance with Trans National Monitoring Network (TNMN) the quality of Danube water in Romania frame into the first quality class, the Danube section characterized by "satisfactory" status according to TNMN is due to Arges.

Water sampling points were those mentioned in section C.1. - Sampling stations.

Water discharges from Wastewater Treatment Plant from Cernavoda city is made in the discharge channel of cooling water from the Cernavoda NPP, upstream of the point P0.

Interpretation of obtained values for physico-chemical indicators was done taking into account that identified pollutants in water samples do not come entirely from the operation of Cernavoda NPP, respectively:

- During the investigation period there were extreme natural phenomena (floods in Cernavoda in July 2010, drought periods with a significant decrease in the Danube water levels) that influence the Danube water quality;
- In the investigation area, water quality is influenced by the existence of economical activities / urban, industrial activity, harbor activities, shipping, agriculture, zootechnics activities, construction activities, municipal waste disposal, municipal waste sorting, waste-water treatment plant of Cernavoda city that generate pollutants.

Elements of anthropogenic pressures identified for Dobrogea Coastal Area in the Management Plan issued by GD 80/2011 are presented at the beginning of this chapter.

The conclusions of the analysis showed that the concentrations of physico-chemical indicators varies with water temperature increase. The physico-chemical indicators values of water quality discharged from Cernavoda NPP are in the limits authorized by ANAR.

The indicators concentrations determined in the study and whose values exceed the maximum allowed limits according with Romanian legislation, are due to other natural factors (eg. ecosystem status at the time that analyses were performed) and / or influence of other economical / urban activities in the area (other than Cernavoda NPP





activities): manufacturing, agriculture, Cernavoda wastewater treatment plant, etc.. (see chapter about anthropogenic pressures).

Sediment sampling and analysis for the summer season has concluded that temperature variation did not modify the sediment composition.

Taking into account that the restrictions /conditions of approval are the same for each nuclear power unit it can be concluded that the operation of Units 3 and 4 Cernavodă NPP will not influence the physico-chemical indicators values of the effluent, which are under the approved limits.

Units 3 and 4 will work within the approved pollution limits (for which no negative environmental impact exists) stipulated in the environmental and waters management authorizations, and will monitor and report regularly to the authorities the results to prove the compliance with the imposed limits.

The water polluting substances like heavy metals, organic materials etc. are not resulting from the nuclear activities but they are specific for sludge treatment plants (wastewater treatment plant of Cernavoda city), agricultural and household activities because of the improper discharges (fertilizer, manure, etc.). These anthropogenic pressures are identified for Dobrogea-Costal Area and in Management Plan approved by Government Decision 80/2011 and published in Official Monitor no. 265 bis of April 14, 2011.

Analysing the obtained results we can conclude that, the requirements for units 3 and 4 of the Cernavoda NPP to meet environmental objectives established by Art. 4 from Water Framework Directive and evaluated in the Annex to the Official Monitor No. 80/2011 "Management Plan River Danube, Danube Delta, Dobrogea Area River and Coastal Waters" are accomplished.

In terms of physical-chemical water indicators together with the influence of biological factors we expect that the environment impact due to the function of Units 3 and 4 is insignificant.

D.8.3. Phytoplankton

Based on the results of investigations carried out in 2010 – 2011 it was concluded that the variation in temperature of waters in the Danube sector with the plume generated by the cooling waters of Cernavoda NPP does not influence the natural succession and composition of reofilous phytoplankton from the Danube.





The phytoplankton biomass exceeded the threshold of blooming along all the investigated sector, but these exceedings are not generated by the increase in water-temperature caused in the respective plume by the cooling waters from Cernavoda NPP. The increase in phytoplankton biomass is in between the limits of natural temporal variations.

Taking into account the results of the investigations carried out in August 2010 – May 2011 period, respectively the results of the monitoring programmes carried out before the mentioned period, we conclude that the reofilous phytoplankton populations from the Danube are not affected by functioning of Units 1 and 2 of Cernavoda NPP, and will not be affected by the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP.

D.8.4. Superior plants, vegetation and habitat types of Community Interest

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the plants of Community Interest *Moehringia jankae* and *Campanula romanica*, for which conservation has been designated ROSCI0022 ("Canaralele Dunării") site, these species having **good global conservation status**.

Furthermore, the **simultaneously operation of the four units** of Cernavoda NPP will not affect the two plant species, the vegetal asociatons and the 15 types of natural habitats of Community Interest for whose conservation has been designated ROSCI0022 ("Canaralele Dunării") site.

D.8.5. Invertebrates

Species of Community interest

Between Capidava and Rasova, *Anisus vorticulus* (Natura 2000 code: 4056) species of Community interest for whose conservation ROSCI0022 site ("Canaralele Dunarii") was designated is not present. The population is likely to be located upstream of Rasova.

Operation of Units 3 and 4 of Cernavoda NPP will not influence species of community interest *Anisus vorticulus* from ROSCI0022 "Canaralele Dunării" site.





Other benthic macroinvertebrates

Between 2010 and 2011 a total of 22 species of aquatic macro-invertebrates were found in the investigated area, the number of taxa identified in different seasons ranging between 15 and 18.

Thus:

- A total of 22 species of benthic macro-invertebrates have been identified in Rasova – Capidava area of the Danube River;
- No pattern of species distribution due to the influence of thermal water plume (species fluctuates due to natural variability) is observed at the end of the research interval of 4 seasons;
- Compared to other seasons the abundance of *Corbicula fluminea* is less during spring;
- As a result of one year (summer 2010 - spring 2011) research can not be concluded that native species *Dreissena polymorpha* would be replaced by alien invasive species *Corbicula fluminea* as a result of the latter being favored by the modified water temperatures downstream of the cooling waters outlet canal of the Cernavoda NPP.
- literature, including studies on invasive species in the assessment program of the Black Sea coastal zone concluded that eutrophication is driving factors for invasive species evolution.
- In conclusion, the thermal water plume from Units 3 and 4 of Cernavoda NPP will not result in encouraging the development of invasive species.

D.8.6. Fishes

Of the 52 species of fish in the Danube River, the total number of fishes observed / recorded by experimental fishing during the period summer 2010 – spring 2011 is 35, out of which 28 demersal / bottom species and 7 pelagic species. In the investigated Danube River sector, including ROSCI0022 "Canaralele Dunării", 15 species of fishes were identified, for the conservation of which it is necessary to designate Special Conservation Areas.

Based on investigations conducted we conclude that:

- specific habitats, important for species, had and have predominantly a **conservation degree of type B** (good), from this point of view- in the whole site ROSCI0022 "Canaralele Dunării" species have a good conservation status (**B**)
- from the point of view of isolation the population of these species is classified in class B or class C – population non – isolated from populations of other





- zones (outside the perimeter of site ROSCI0022 "Canaralele Dunării") of the distribution areal of the species;
- **the global conservation status** of species within the perimeter of site ROSCI0022 "Canaralele Dunării" has predominantly **good value**.

Pooling the information from above with information presented in previous chapters it is estimated that the functioning of Units 3 and 4 will have a non-significant environmental impact on species of fish of the Danube River sector investigated, for which the site ROSCI0022 „Canaralele Dunarii” was designated.

D.8.7. Amphibians

In the Calarași – Hârșova sector of the Danube valley there were recorded up to the present a total number of 12 taxa (11 species and a hybrid) of amphibians, out of which 4 taxa (3 species and a hybrid) were recorded in the area of the plume with temperatures modified by the cooling waters of Cernavodă NPP.

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the amphibians of Community Interest from the site ROSCI0022 ("Canaralele Dunării"), these species having **good global conservation status**.

In conclusion, the **simultaneously operation of the four units** of Cernavoda NPP will not affect the species of amphibians of Community Interest for whose conservation has been designated ROSCI0022 ("Canaralele Dunării") site.

D.8.8. Reptiles

In the Calarași – Hârșova sector of the Danube valley there were recorded up to the present a total number of 11 of reptile species, out of which 6 species were recorded in 2010 – 2011 (4 of the species being recorded also in the area of the plume with temperatures modified by the cooling waters of Cernavodă NPP.)

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the reptiles of Community Interest from the site ROSCI0022 ("Canaralele Dunării"), these species having **good global conservation status**.

In conclusion, the **simultaneously operation of the four units** of Cernavoda NPP will not affect the species of reptiles of Community Interest for whose conservation has been designated the ROSCI0022 ("Canaralele Dunării") site.





D.8.9. Birds

In the 2010 – 2011 period, in the Rasova – Capidava sector of the Danube valley there were recorded up to the present a total number of 116 of bird species, out of which 40 species are nominated in Annex I of the Bird Directive (European Council Directive No. 79/409 EEC) and 41 species recorded in the area of the plume with temperatures modified by the cooling waters from Cernavoda NPP are belonging to the ecological group called “waterbirds”.

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the waterbirds of Community Interest from the site, these species having **good global conservation status**.

In conclusion, the **simultaneously operation of the four units** of Cernavoda NPP will not affect the species of reptiles of Community Interest for whose conservation have been designated the sites ROSCI0022 „Canaralele Dunarii” ROSPA0002 (Allah Bair - Capidava) and ROSPA0017 (Canaralele de la Hârșova).

D.8.10. Mammals

In the 2010 – 2011 period, in the area of the water plume with temperatures modified by the cooling waters from the Cernavoda NPP there were recorded only three mammal species (none of them being from the category of species whose conservation needs the designation of Special Areas of Conservation).

In conclusion, the **simultaneously operation of the four units** of Cernavoda NPP will not affect the species of mammals of Community Interest for whose conservation have been designated the ROSCI0022 (“Canaralele Dunării”) site.

D.9. Other relevant information related to the conservation of protected areas of community interest, including possible changes in the natural evolution of the protected areas of community interest

The activities that could have as result changes in the natural evolution of the ROSCI0022 (Canaralele Dunării) protected area of community interest are those related to the development of ISPA 1 project (for improvement of navigation on the Danube, between Călărași and Brăila – KM 375 and KM 175).





According to the studies, there were foreseen only small-scale anthropogenic interventions, that will have impact only in seasons with low waters, but on long-term they will contribute to the reductions (or even total ceasing) of dredging of the Danube.

We estimate that after the execution of the civil works from ISPA 1 project there will be the following changes in the area with the plume with temperatures modified by the cooling waters:

- the length of the plume will decrease (depending on the amount of the waters redirected by the infrastructures built at the critical point No. 1 of the IPSA 1 project);
- there will be longer periods when the mixing of the cooling waters will be on the total length of the plume with temperatures modified by the cooling waters from Cernavoda NPP.

As a consequence, there will be more often present the phenomenon of mixing of the waters with different temperatures at the beginning (upstream part) of the plume, and as a result the drop in the temperature-difference will happen on a shorter distance of the respective plume.

Taking into account the above mentioned aspects, we consider that as a result of these changes the impact of the cooling waters on the natural evolution of the protected areas of Community Interest will be more reduced than in the absence of the respective changes.

D.10. Other aspects that are relevant for the natural protected area of community interest

The European Union's Strategy for the Danube Region (2011/C 166/5 - adopted in 24 June 2011), in the frame of which Romania is a contributor state, includes the main direction of interest, objectives and actions necessary for the sustainable development of the Danube region.

The present study was carried out taking into account the direction of national and European interest of the respective Strategy and its Action Plan, for aspects related to monitoring and conservation of biodiversity.

The measures proposed in the adequate evaluation study consist in a Special Monitoring Programme, as it is shown in chapter F, in correlation with the regulations of the National Water Management Company (ANAR) – which issued the Water Management Permit No. 35/2011 (conditions 6 and 7) -, all of these contributing to the fulfilment of the objectives from the action plan of the Strategy, as follows:





- ensuring in the Danube the existence of viable populations of sturgeons and other **native fish** (especially the ones for which there was designated the Site of Community Importance ROSCI0022 "**Canaralele Dunării**") by controlling the invasive species;
- implementation of the plans for managing the risk of larg-scale floodings; this objective is fulfilled by the Water Management Authorization No. 277/2011 for Units 1 and 2 (condition 14);
- to reduce the areas affected by soil erosion: this objective is fulfilled by the Water Management Permit No. 277/2011 for Units 1 and 2 (conditions 16 and 26);
- global monitoring system for environment and security (GMES), into which is included the monitoring system proposed for the period of building and functioning of Units 3 and 4 of Cernavoda NPP, correlated with provisions of Water Management Permit No. 35/2011 for Units 3 and 4 (conditions 6 and 7).

Climate-change issues

The Assessment report of the Intergovernmental Panel on Climate Change (IPCC), published in 2007, describes an accelerated transition toward a World with warmer climate, characterised by more frequent occurrence of extreme temperatures, including heat-waves, presence of more intense drought in some regions, meanwhile there will be more frequent rainfalls in other regions, melting of ice in the Arctic, including rise of the level of the seas and oceans.

According to the respective report, the average global temperature of the air has increased with 0.74°C in the last 100 years (1906 – 2005), meanwhile the increase was 0.6°C in 1901 – 2000 period (IPCC Report, 2001).

11 of the last 12 years were among the warmest years after 1850.

Amount of rainfall increased significantly in the northern hemisphere, and in the southern hemisphere the periods with drought became more frequent.

The global warming has as a consequence an increased frequency of extreme events, a fast alternation between heavy rainfalls and floodings, severe heat and increased drought – with major economic and social effects.





The climate-data from the last decades reveal a progressive warming of the atmosphere and the increase of the frequency of extreme events, being more and more evident the fast alternation of periods with severe heat (and drought) and heavy rainfalls (and floodings).

In the Development Region No. 2 (South-East) of Romania, in the 2001 – 2008 period the average annual temperature of the air increased with 0.9°C, the biggest positive deviations (>1.0°C) being recorded in January (1.1°C), February (1.0°C), March (1.6°C), May (1.4°C), July (1.9°C) and August (1.7°C). In a period of 48 years (1961 – 2008), the frequency of years with extreme drought was 10.4% (5 years), meanwhile the frequency of years with severe drought was 43.8% (21 years) and with moderate drought was 39.6% (19 years). This means that there were totally 45 years with drought (corresponding to 93.8% of the years), the annual rainfall in the respective period being under the optimal level for agricultural crops (600.0 mm). In the South-Eastern Development Region Dobrogea represents the driest area (taking into account the amount and distribution of annual rainfall).

According to results of climate-modellings, in Dobrogea there is an increase of 0.8 – 0.9°C in the annual average air-temperature in the 2001 – 2030 period, in comparison with the 1961 – 1990 period. Also, regarding the rainfalls, in the same period there is a decrease in the annual rainfalls, a phenomenon more evident in the western part of Dobrogea. The decrease in rainfall with about 20% will have as result the extension of areas with rainfall-deficit and increase of their intensity by the increase of the classes with excessive drought (below 350 L/m²) and with drought (351 - 450 L/m²)

Taking into account the foreseen climate changes (on medium and long-term), correlated with the non-significant overall impact on the environment of the Units 3 and 4 of the Cernavoda NPP, based on the experimental data and our experience we consider that:

- the thermal impact of the cooling waters from the four units of Cernavoda NPP will remain non-significant in comparison with the impact of climate changes on the species, habitats and sites of conservative interest from nearby the project area;
- it is not predictable the eventuality of having a cumulative environmental impact of the cooling waters (evacuated into the Danube) from the four units of Cernavoda NPP with the effects of the climate changes.

On medium and long term the species of Community Interest for whose conservation there were designated the Natura 2000 sites could be affected, depending on their tolerance for variations induced by climate changes (increase of annual average temperatures, frequency of periods with extreme drought, heavy rainfalls and floodings) in Dobrogea region.





As a conclusion: the cooling waters (evacuated into the Danube) from Units 3 and 4 of Cernavoda NPP, in the context of the above mentioned climate change scenarios, does not generate negative effects on the species and habitats of conservative interest, and the environmental impact is considered as being non-significant.





E. IDENTIFICATION AND ASSESSMENT OF THE IMPACT

E.1 Characteristics of the initial state of the project target area

Interpretation of the results obtained in the frame of the present study was performed by taking into account information on biodiversity and impact of warm waters from reports of environmental authorities and Cernavodă NPP compiled during the development of the project related to Units 1 and 2, respectively before the functioning of Unit 1 (up to 1996), during the exploitation of only Unit 1 (1996 – 2007 period) and after functioning of Unit 2, too (the simultaneous functioning of Units 1 and 2), in 2008 - 2010 period.

According to the results of the measurements of physical-chemical parameters, the values are in the limits established by the environmental permits/water management permits issued for Units 1 and 2 of Cernavoda NPP and there was established that the cooling waters from the power units did not have a negative influence on the water-quality of the Danube. The comparative analyses of the physical-chemical parameters of the waters measured upstream the discharge-site of the cooling waters and downstream of the respective discharge site revealed that there are no differences that could suggest a negative chemical impact on the Danube of the cooling waters.

The supplementary heat-in-put (represented by the cooling waters) creates a plume with modified temperatures which has no significant impact on the evolution of the flora and fauna from the investigated area.

The economical activities and objectives existing and developed in the interest area of CNE Cernavoda (Units 1 to 4), are not elements/factors to determine an impact cumulative with types of activities developed at CNE Cernavoda.

E.2 Elements of biotope

E.2.1. Thermal regime of the Danube River

During periods with water levels of the Danube River at Cernavoda (during the summer and winter) of 200 cm, the water of the cooling water canal of Cernavoda NPP float on the Danube (without mixing with the water of the river) over a distance of 3 – 3.5 km, the water plume having a width varying between 300 and 400 m, near the mouth of the canal and is reduced to about 50 m in front of Seimeni (where the temperature differential is within the natural limits of variation of the water of the Danube River).





During periods with water levels of the Danube River at Cernavoda (during the autumn and early spring) under 200 cm, the water of the cooling water canal of Cernavoda NPP do not produce a stratification of waters with different temperatures, the mixing of cooling water from Cernavoda NPP taking place already during the first one hundred of meters after the mouth of the canal, and the thermal water plume with modified temperatures has a length of only 1.5 – 2 km.

Overall the gradient of the thermal effluent from Cernavoda NPP presents a non-significant environmental impact, the functioning of Units 1 and 2 respecting the requirements of Water Management Authorisation (**WMA**) No. 241 / 2010 actualized with WMA No. 277 / 2011, according to the data of monitoring the physical – chemical and biological parameters reported to ABADL (Danube Littoral Basinal Administration).

After starting the operation of Units 3 and 4 of Cernavoda NPP, we estimate that until the end of works in areas upstream of Cernavoda (in the framework of ISPA 1 project), during the periods of the year with high water levels (during the summer and winter) the thermal water plume with modified temperatures will probably extend over a length of 4.5 – 6.5 km, and during the periods of the year with low water levels of the Danube River (in autumn and early spring) the zone with modified water temperatures will probably have a length of about 3 – 3.5 km, and the width of thermal water plume will grow probably to 450 m near the mouth of the cooling water evacuation canal of Cernavoda NPP.

After the finalization of works of the ISPA 1 project we estimate following changes in the area with modified temperatures:

- the length of the zone with modified water temperatures will decrease (related to the supplementary water discharge diverted to the Old Danube by infrastructures created upstream Cernavoda);
- the periods in which the mixing of the cooling water with the Danube happens along the whole length of the area with modified water temperatures will be prolonged.

E.2.2. Environmental Chemistry

Variations in physico-chemical parameters influenced by temperature increases are not due to discharging cooling water from Units 1 and 2 of Cernavoda NPP for the following reasons:

- Identified pollutants in water samples do not come entirely from. Cernavoda NPP operation;
- The existence of activities in the area that generates specific pollutants (eg. Lead, nickel, chromium, oil, etc..)
- Framing of pollutants from the Cernavoda NPP in authorized limits established by impact studies to be negligible in terms of negative impact on the





environment (neutral impact / environmental insignificant or no environmental impact).

Under these conditions the operation of Cernavoda NPP Units 3 and 4 will not affect biodiversity in the investigated area, as presented in the summary below:

E.2.3. Phytoplankton

In case of algal populations the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the algal populations directly or indirectly, neither on short or long term, in none of the technological phases (construction, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).

E.2.4. Superior plants

In case of superior plants the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the superior plants directly or indirectly, neither on short or long term, in none of the technological phases (construction, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).

E.2.5. Invertebrates

In the case of the native species of invertebrates, cumulative impact is not required and measures to reduce or eliminate a certain type of activity are not proposed, thus a residual impact is not the case.

Functioning of Units 3 and 4 of Cernavoda NPP will not have a direct or indirect, short term or mid term impact on the native species of invertebrates, nor in the construction or operation phase, nor in the decommissioning stage, nor cumulative with the eventual impact of other activities, other than those carried out by Cernavoda NPP.





Regarding the non-native species, the presence of the exotic mollusks from the *Corbicula* species was identified in the Danube, in the upstream, as well as in the downstream of the outlet canal of the cooling water from Cernavoda NPP, as well as in the respective discharge canal, but a negative effect of the presence of this non-native mussel over native mussels occupying similar spatial ecological niches was not detected, allowing the species to cohabitate.

These exotic mussels from the *Corbicula* species became a component of the food chain of the local population of certain native species (birds and fishes) which are feeding on mussels. To predict the long term evolution of *Corbicula* species with an appropriate accuracy, further monitoring of the species is necessary, especially after the Units 3 and 4 start operating – inclusively by taking in consideration both data regarding the *Corbicula* populations from the upstream of the outlet canal and from the downstream of outermost part of the area with modified water temperatures, as well as elements due to global warming.

E.2.6. Fishes

Based on results of investigations realized during 2010 – 2011, we consider that the functioning of Units 1 and 2 of Cernavoda NPP could influence one part of the larvae of *Alosa immaculata* hatched from eggs layed at about 300 – 350 km upstream of Cernavoda – in a sector of the Danube River outside the site ROSCI0022 (Canaralele Dunării), reached by a non-significant part of the brood fishes of this species (whose main spawning sites are in the sector situated between Călărași an Brăila).

In case of species *Alosa tanaica* – species of community interest – present in ROSCI0022 "Canaralele Dunării" - the situation is probably similar to that described for *A. immaculata* – with the specification that the percentage of number of *Alosa tanaica* is only about 3 – 5 % of the total number of *A. immaculata*.

E.2.7. Amphibians

In case of amphibians the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the amphibians directly or indirectly, neither on short or long term, in none of the technological phases (construction, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).

E.2.8. Reptiles





In case of reptiles the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the reptiles directly or indirectly, neither on short or long term, in none of the technological phases (building, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).

E.2.9. Birds

In case of birds the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the birds directly or indirectly, neither on short or long term, in none of the technological phases (building, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).

E.2.10. Mammals

In case of mammals the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the mammals directly or indirectly, neither on short or long term, in none of the technological phases (building, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).

E.2.11. Natural habitats

In case of the natural habitats the cumulative impact is not an issue, consequently there is no need for measures to reduce or eliminate any type of activity or infrastructural element – furthermore, there is also not the case of taking into account any residual impact.

The functioning of Units 3 and 4 of the Cernavoda NPP will not affect the natural habitats directly or indirectly, neither on short or long term, in none of the technological





phases (building, operation/functioning and decommissioning), not even with cumulation with other eventual impact of human activities (other than the ones developed by Cernavoda NPP.).





F. Special monitoring programme

For this study, the following have been used:

- information from publications; management plans, studies;
- data bases with values of physico-chemical indicators, including the values for pH and temperature indicators provided by CNE Cernavoda (Unit 1 and Unit 2). These dates are reported since 1996 to local and national regulatory authorities for environmental protection and water management.
- direct investigation in the field performed by INCDDD experts. Interpretation and results are presented in chapters D1 – D10 including appreciations regarding the estimated effects on habits and protected species, from SCI and SPA areas from the vicinity of the project area;
- experience acquired during construction and operation phases of Units 1 and 2, studies and monitoring performed in these phases, elements of civil society interventions in the project vicinity, climate change forecasts and hydrological information (data on the Danube flows).

All these information corroborated with experimental results and specific interpretation of the INCDDD experts led to a sustainable conclusion on operation impact of CNE Cernavoda with 4 Units.

Because of the uniqueness and sensitivity of the Danube ecosystem, the caution principle is applied both for interpretations based on „expert judgment” from the actual study and in developing Monitoring Program for the project and subsequent operation of Units 3 and 4.

The monitoring recommended by this study to be included in the monitoring program for the project and the subsequent operation of Units 3 and 4 are presented below in this chapter.

After starting the construction of Units 3 and 4 we recommend monitoring activities of thermal water plum effects both as a conservation measure as well as for the development of a database for *Alosa* and *Corbicula* species.

F.1. Special monitoring programme of the invasive species *Corbicula fluminea* in the area of Cernavoda NPP

1. Monitoring objectives

- 1.1. Dynamics of *Corbicula* pediveligers in cooling waters discharge channel of Cernavoda NPP;
- 1.2. Distribution of *Corbicula* pediveligers;





1.3. *Corbicula* abundance in benthic habitats of project area

2. Duration of monitoring: 6 years.

Note. Given the present situation of operating only 2 units and considering the modification of thermal water plume length by operation of four units, to quantify the potential influence of plume on invasive species, we recommend a three years monitoring during construction of Units 3 and 4 and another three years monitoring after the completion of construction activities.

3. Monitoring frequency and period

At least 3 samplings per year distributed in time so as to capture both thermal water plume and hydrological variations.

4. Sampling points

- 4.1. One control sample collected upstream of cooling water outlet canal;
- 4.2. Samples will be collected at regular intervals both from cooling water outlet canal and the Danube, along the length of thermal water plume.

5. Recommended monitoring methods

- 5.1. In order to establish abundance dynamics and distribution area of pediveligere larvae quantitative samples will be collected using a phytoplankton net with a diameter of 50 cm and a mesh size of 55 μ m.
- 5.2. Adults will be sampled with a Petersen dredge; for each sample three replicates will be collected.

6. Sample conservation, species identification, data analysis and storage

- 6.1. Sampled larvae will be fixed with absolute ethanol. Adults, separated by washing dredged material with 500 micrometer sieve are preserved in 70% ethanol;
- 6.2. Optical microscope analysis coupled with PCR-RFLP method will be used to distinguish *Corbicula* of other bivalve species, particularly *Dreissena polymorpha*; pictures will be taken to have control over species identification.
- 6.3. All data will be recorded into an Excel database with at least two backups loaded on adequate external support.
- 6.4. Annual monitoring results will be submitted both to the beneficiary and the National Environmental Protection Agency / Ministry of Environment and Forests and National Authority for Fisheries and Aquaculture / Ministry of Agriculture and Rural Development.

7. Requirements for monitoring team

The activity must be performed by a specialized institution in biodiversity monitoring in aquatic area (expertise that should be demonstrated by





participation in similar previous studies and specific publications in limnology area or/and aquatic mollusks). The institution should be licensed for developing the impact studies / adequate evaluation studies and to own ISO17025 accredited laboratories.

F.2. Special monitoring programme of species *Alosa immaculata* in the zone of Cernavoda NPP

1. Objectives of monitoring

- 1.1. elucidate the migration behaviour of adult shads in relation to the presence of thermal water plume in the zone of Cernavoda NPP;
- 1.2. elucidate the behaviour / the potential effect of transition of larvae and early fry of Danube shad in the area with thermal water plume (mostly due to the temperature differential between the water of the Danube from upstream and the start of the thermal water plume near the evacuation of the cooling water canal in the Danube);
- 1.3. elucidate the presence of early fry of *Alosa* sp. On the bottom of the Danube River in the terminal reach of the thermal water plume;
- 1.4. surveying the flowing parameters and the temperature of Danube water downstream of the $\frac{1}{2}$ and $\frac{1}{1}$ of the length of the thermal water plume. This point is foreseen to be realized according to WMA for Units 3 and 4 No. 35 / 2011 (condition 7).

2. **Duration of monitoring:** minimum 3 years.

3. Frequency of monitoring and the period of the year

- I. Migration of adults (April – May/ min. 3 days / week);
- II. Abundance and the drifting towards the Sea of larvae and early fry (April – July / min. 3 days / week).

4. Recommended monitoring methods

- 4.1. For adults – fishing with 2 trammel nets and monofilament gill nets for shads with mesh size of the internal net of $a=30$ mm and minimum length of 100 m and height of 2-4 m, armed to operate pelagically, length of fishing site of at least 1000 m, chosen as to cover **concomitantly** the section of the Danube under the influence of the warm water (along the right banc) as well as that situated outside (along the left bank);
- 4.2. for larvae and early fry– **concomitant fishing** with at least 2 ichthyoplanktonic nets of type “Bongo – net” with opening of \varnothing 0,5 m, with mesh size of 0,5 mm, pulled along the board of the working boat , duration of operation min. 5 min / series;





- 4.3. for the early fry – **concomitant fishing** with min. 6 ichthyo-planctonic nets with mesh size of 2 mm and semicircular opening \varnothing 1m , anchored on the bottom of the river in sectors of interest upstream of and at $\frac{1}{2}$ and $\frac{1}{1}$ of the length of the thermal water plume;
- 4.4. To determine the flowing parameters at characteristic cross-section of the river the use an A.D.C.P (Acoustic Doppler Current Profiler) system - type River Surveyor M9;
- 4.5. To determine the water temperature profiles at characteristic sections the use of an ISY multimeter with sensor attached to a 35 m cable of a hydrological measurements system constituted of a centimetrical winch and adequate hydrological weight.

5. Operating technique

To conduct **concomitant experimental fishing** both in the thermally affected zone and outside of it working with minimum 2 fishing crews.

Each fishing day will start with recording of flow velocity and temperature of water in characteristic cross-sections, using ADCP M9 and ISY multimeter to know where the zone with highest water flow is situated (where the most of shad larvae are drifting downstream) and if the thermal water plume phenomenon is present on that day or not.

6. How to preserve and determine species; storage and processing of data

- 6.1. Adults captured will be measured for biometrics and weight and scales will be sampled for later age determination; some of the specimens will be taken digital photographs to have a control of the species (small *A. immaculata* can be confused with *A. tanaica*);
- 6.2. Larvae will be preserved in 70 % ethanol and will be determined in the laboratory using a binocular and the larvae, fry and fingerling identification book [32];
- 6.3. Early fry captured in bottom ichthyoplanktonical nets will be sorted on the site keeping all fry of *Alosa*, and Cyprinids (species of the genera *Alburnus*, *Abramis*, *Blicca*, *Aspius*, etc), which could be confounded with fry of *A. Immaculata*. Species will be determined in the in laboratory using a binocular and the larvae, fry and fingerling identification book [32];
- 6.4. All data will be stored in an Excel data base of which at least two security copies will be stored on adequate external HD;
- 6.5. Data will be analyzed comparatively both in time (weekly, monthly and multi-annually) and spatially (in are not affected by the hot water concomitantly with zones situated under the influence of hot water);





- 6.6. Catch data will be interpreted comparatively taking into consideration the distribution of velocities and temperatures of water in characteristic cross-sections as recorded during the respective day;
- 6.7. Annually the results of monitoring will be presented to the beneficiary and to the National EPA / Ministry of Environment and Forests and the National Agency for Fishery and Aquaculture / Ministry of Agriculture and Rural Development.

7. Requirements regarding the monitoring team

The activity must be performed by a specialized institution in monitoring ichthyofauna of the Danube - expertise that should be demonstrated by participation in similar previous studies (at least 5 years of experience in monitoring Danube shads - adults and larvae) and at least 3 specific papers (signed as authors/coauthors by the bidder experts) regarding the adults and larvae of *A. Immaculata* Danube (published in ISI quoted journals)

F.3. Monitoring program for Danube temperature in thermal water plume area

We consider the necessity to continuous monitoring of Danube temperature in the upstream area of thermal water plume area (in perimeter of the area), proposal also justified by (corroborated with, respectively) the Water Treatment Permit no. 35/2011 for Units 3 and 4, item 7 and item 27 from Water Treatment License no. 277/2011 (for Units 1 and 2).

Based on the results of the observations and direct measurements performed by INCDDD – Tulcea during the fourth seasons in 2010-2011 period, we consider that the optimum point to continuous monitoring of Danube temperature influenced by the cooling water coming from CNE Cernavoda is about 150 m downstream from the mouth of the cooling water evacuation canal and about 150 m away from the bank.

A second set of sensors (necessary for reference data collections regarding the Danube temperature in an area unchanged by the cooling water coming from CNE Cernavoda) will be placed at about 150 m upstream from the mouth of the cooling water evacuation canal and about 150 m away from the bank.

The above requirements will be taken into consideration in the project of placing temperature sensors. In the event that the project demonstrates that the sensors location can not be made in compliance with the above requirements the regulatory authorities in environmental and water protection shall be notified to agree appropriate solutions.





In conjunction with monitoring programs proposed in this chapter, for species and protected habitats for which this study has identified that there is no impact, the study proposes a set of minimum requirements to be met according to applicable laws. It is assumed that by the compliance with requirements / measures listed in the study, any possible residual impact on species and habitats covered by this adequate evaluation study, is eliminated.





CONCLUSIONS

The final report of the study "Adequate evaluation of the environmental impact of Units 3 and 4 of the Cernavoda NPP – Impact on biodiversity", compiled by INCDDD-Tulcea, includes analyses based on the results of investigations carried out in four seasons from 2010 – 2011 period (summer of 2010, autumn of 2010, winter 2010 – 2011, spring of 2011).

The adequate evaluation study comprises the results of complex field investigations and laboratory analyses of samples from 6 sampling-stations from the Danube river (upstream and downstream of the discharge-point of cooling waters) and a sampling-station from the channel with cooling waters from Cernavoda NPP.

Supplementary, in the study there were used information from impact studies carried out up to the present since the start of operation (functioning) of Unit 1.

The sampling-stations were selected in order to assess the potential/eventual impact of the cooling waters from Cernavoda NPP on the favourable conservation status of the wild species and types of natural habitats of Community Interest for whose conservations there were designated the Natura 2000 sites located in (or nearby) the discharge-point of cooling waters, as follows:

- ROSCI0022 ("Canaralele Dunării") site: the protected area includes ca 700 m of the downstream part of the channel with cooling waters from Cernavoda NPP;
- ROSPA0002 ("Allah Bair - Capidava") site: the southern limit of the protected area is at about 6,5 km downstream from the discharge-point of the cooling waters;
- ROSPA0017 ("Canaralele de la Hârsova") site: the southern limit of the protected area is at more than 33 km downstream from the discharge-point of the cooling waters.

The methodology used to adequately assess the impact on wild species and natural habitats of community interest

In the case of **ROSCI0022 "Canaralele Dunării"** site, which completely overlaps with the zone influenced by the cooling water discharged from Cernavoda NPP, **observations and direct measurements for four seasons** (in the period 2010 to 2011) were made, conclusions regarding the impact being based on findings during Units 1 and 2 operation, respectively estimations for the operation of four units of Cernavoda NPP; in both cases the observations and direct measurements were **supplemented by elements based on expert opinion** ("Expert Judgement"). For these elements observations (comparative data) from different reference study areas located upstream and downstream of the thermal water plume were taken into account.





This method was used for natural habitats and wild species belonging to the following systematic groups (which are present in the zone of the thermal water plume and the neighboring zones):

- Algal flora;
- Upper Flora (hydrophilic and hydrophilic species);
- Benthic fauna (aquatic macroinvertebrates in the bottom waters);
- Ichthyofauna (pelagic freshwater fish and bottom);
- Amphibians;
- Reptiles;
- Bird population;
- Mammals.

In the case of ROSPA0002 ("Allah Bair - Capidava") and ROSPA0017 ("Canaralele from Harsova") sites, the observations targeted the bird species that are present in the areas situated near the banks of the Danube River, paying particular attention to species within the ecological group called generically "aquatic birds". In the case of these sites and for the bird species for which these areas were declared parts of the European ecological network Natura 2000, conclusions on the ecological status of the areas and species were based on the technique called "Expert Judgement" - based on results of multianual investigations INCDDD made for designation of these Natura 2000 sites (in the period 2003 to 2007), supplemented by observations made during 2008 to 2011.

The observations and analyses carried out in four seasons revealed the followings:

Biotop elements

The thermal regime of the Danube River in the sector where cooling water of Cernavoda NPP are evacuated

- (i) During the high water levels of the Danube River at Cernavoda (over 200 cm, during the summer and winter) cooling waters of the evacuation canal of Cernavoda NPP float on the Danube (without mixing with the water of the river) over a distance of 3 – 3.5 Km;
- (ii) during low water level of the Danube River at Cernavoda (bellow 200 cm, as recorded during the spring and autumn) the stratification phenomenon does not happen, the mixing of the cooling water from the canal starts already during the first one hundred meter after their contact, and the thermal water plume has only a length of 1.5 – 2 Km;





- (iii) the thermal water plume with modified temperatures has a variable width from 300 to 400 m, at the inflow of the canal, and is reduced to only 50 m in front of Seimeni;
- (iv) Overall, the gradient of the thermal effluent from Cernavoda NPP presents a non-significant environmental impact, the functioning of Units 1 and 2 respecting the requirements of Water Management Authorisation (WMA) No. 241 / 2010 actualized with WMA No. 277 / 2011, according to the data of monitoring the physical – chemical and biological parameters reported to ABADL (Danube Littoral Basinal Administration);
- (v) After starting the operation of Units 3 and 4 of Cernavoda NPP, we estimate that until the end of works in areas upstream of Cernavoda (in the framework of ISPA 1 project), during the periods of the year with high water levels (during the summer and winter) the thermal water plume with modified temperatures will probably extend over a length of 4.5 – 6.5 km, and during the periods of the year with low water levels of the Danube River (in autumn and early spring) the zone with modified water temperatures will probably have a length of about 3 – 3.5 km;
- (vi) After starting the operation of Units 3 and 4 of Cernavoda NPP the width of thermal water plume will grow probably to 450 m near the mouth of the cooling water evacuation canal of Cernavoda NPP.

Chemical regime (water and sediment)

There were analyzed the physical-chemical water indicators, specific and nonspecific for Cernavoda NPP functioning.

There was found that variations in physical-chemical indicators influenced by the temperature increase are not due to the discharge from Units 1 and 2 Cernavoda NPP cooling water.

Since the restrictions / conditions of approval are the same for each unit nuclear power we estimate that also functioning of Cernavoda NPP Units 3 and 4 will not influence the physical-chemical indicators of the effluent taking into account the following:

- The materials used in construction of equipments at U3 and U4 are similar to those for U1 and U2 so no pollutants are identified in addition to those identified;
- Discharge limits for each pollutant from liquid effluent of the U3 and U4 are established in Water Management Permit, below the maximum allowed concentrations provided by Romanian regulations. U3 and U4 will monitor the





- pollutants of liquid effluent, also the temperature values and flow values to verify the compliance with the requirements of Water Management Permit / Authorization (conditions 6 and 7);
- Discharge limits included in the Water Management Permit for the period of construction, installation and commissioning and further in Water Management Authorization are approved by ANAR only after the impact studies prepared for each substance were made, so the approved maximum allowed concentrations in the discharge point to be in accordance with the situation in which the residual concentration of pollutant has no effect on aquatic flora and fauna. The requirements are included in Water Management Permit of U3 and U4 no. 35/2011 (Table 'of discharged water quality indicators ") and are monitored in the tests phase of Units 3 and 4 function (conditions 6 and 7);
 - U3 and U4 will function within the pollution limits (for which no negative environmental impact exists) approved by the Water Management Authorization and Environmental Authorization and will monitor and regularly report to the authorities the results to prove compliance with the imposed limits (this is an existing practice at U1 and U2 and the maximum allowed limits were not exceeded);
 - The identified water pollutants like heavy metals, organic matter are not the results of nuclear units functioning and they are specific for treated wastewaters evacuated (wastewater treatment plants of Cernavoda city), agricultural activities, etc.

The bottom sediments heavy metals and salts concentrations does not vary with increased water temperature coming from Cernavoda NPP cooling-water effluent .

According to the obtained results it is found that the requirements for U3 and U4 of the Cernavoda NPP met the objectives established by Water Framework Directive Art. 4 and evaluated in the Annex to the Official Monitor no. 80/2011 "Management Plan of Danube River, Danube Delta, Dobrogea Hydrografic Area and Coastal Waters".

In terms of physical-chemical water indicators together with the influence of biological factors we expect that the environment impact due to the function of Units 3 and 4 is insignificant.

BIOCENOTIC COMPONENTS

The impact of the effluent from Cernavoda Units 1, 2, 3 and 4 on the biocenosis of the Old Danube is estimated starting from the studies regarding the influence of the effluent from Units 1 and 2 elaborated by ICIM and other specialized institutions over the years.





Over several studies, quality of the aquatic environment was analyzed based on the biological results and physical and chemical indicators.

Phytoplankton and zooplankton organisms from the Danube, upstream and downstream of the effluent discharge section, have been found to have naturally variable values depending on seasonal conditions. Both inside and outside the thermal water plume, the values found by analyzing water samples are comparable. On the Danube, downstream of the effluent, a similar range of values to upstream was found. Therefore, phytoplankton and zooplankton results obtained during the campaigns carried out by ICIM does not show an influence due to the effluent (see RIM, Annex A-4.1.4 " results of the biological analysis of Danube water").

At this point, the ecological status of the studied sector of the Danube was not affected by thermal and chemical loads of the effluent from Unit 1 (in commercial operation since 1996) and Unit 2 (in commercial operation in 2007). In support of this statement there are assessments on conservation status of the Natura 2000 forms related to ROSCI0022, ROSPA0002, ROSPA0017.

Taking into account the estimated impact of the effluent from Cernavoda NPP (after the start of Units 3 and 4) on water temperature and on the physical and chemical indicators of water quality, the influence of the effluent on the biocenosis components is expected not be significantly different.

Phytoplankton

The variation in temperature of waters in the Danube sector with the plume generated by the cooling waters of Cernavoda NPP does not influence the natural succession and composition of reofilous phytoplankton from the Danube.

The phytoplankton biomass exceeded the threshold of blooming along all the investigated sector, but these exceedings are not generated by the increase in water-temperature caused in the respective plume by the cooling waters from Cernavoda NPP.

The increase in phytoplankton biomass is in between the limits of natural temporal variations.

Taking into account the results of the investigations carried out in August 2010 – May 2011 period, respectively the results of the monitoring programmes carried out before the mentioned period, we conclude that the reofilous phytoplankton populations from the Danube are not affected by functioning of Units 1 and 2 of Cernavoda NPP, and will not be affected by the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP.





Superior plants

In the shore areas of the Danube river (Rasova – Capidava sector), belonging to the protected site ROSCI0022 (Canaralele Dunării) there were recorded 129 species of superior plants (cormophytes), out of which 2 species are of Community Interest (*Campanula romanica* and *Moehringia jankae*).

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the status and evolutions of superior plants, and also the **simultaneously operation of the four units** of Cernavoda NPP will not affect the dynamics or numerical evolution of the populations belonging to the superior plant species (including the two species of Community Interest) occurring in the protected area ROSCI0022 ("Canaralele Dunării").

Invertebrates

The results of investigations carried out between 2010 – 2011 shows that the operation of Units 1 and 2 of Cernavoda NPP does not affect native invertebrate species. We also estimate that operation of Units 3 and 4 of NPP will have no negative impact on these species.

Regarding invasive mussels of the genus *Corbicula*, as a result of studies carried out in ROSCI0022 site area (Canaralele Dunării) between 2010 - 2011 we can conclude:

- the presence of these exotic molluscs has been identified both upstream and downstream of the Cernavoda NPP cooling waters outlet canal; the mentioned exotic mollusc is also present in the outlet canal;
- A negative effect of the presence of the non-native mussels over native ones occupying similar spatial ecological niches was not detected, allowing the species to cohabitate.

These exotic mussels from the genus *Corbicula* became a component of the food chain of the local population of certain native species (birds and fishes) which are feeding on mussels. To predict the long term evolution of *Corbicula* species with an appropriate accuracy it is recommended after starting the construction works of Units 3 and 4 to perform correlated measures - both in the area unaffected by thermal water plume and in the area with modified water temperatures. A previously established schedule and methodology is necessary to characterize the observed effects.

In order to characterize multiannual dynamics of species in the thermal water plume area a monitoring activity of approximately 6 years after starting the construction works of Units 3 and 4 is necessary.





Fishes

Results of investigations conducted during four seasons of the year (summer 2010, autumn 2010, winter 2010 – 2011, spring 2011) have shown that out of the 15 species of fishes of Community interest, 13 are not affected by the functioning of Units 1 and 2 of Cernavoda NPP. We estimate that the functioning of Units 3 and 4 (simultaneously with Units 1 and 2) of Cernavoda NPP will not affect the dynamics and numerical evolution of populations of fish species of Community interest. Based on results of investigations conducted during 2010 – 2011, in case of species *Alosa immaculata* (Danube shad / Pontic shad) it was concluded that:

- the functioning of Units 1 and 2 of Cernavoda NPP has no effects on adults transiting the Danube River sector with modified water temperatures; we consider that the functioning of Units 3 and 4 will also have no negative impact on this age class of the population;
- a higher number of larvae has been recorded / captured in the reach of the river with modified water temperatures, and a higher number of larvae on the bottom of the Danube River at the downstream end of the thermal water plume with modified temperatures;
- during the investigations conducted in this study, which covered only partially the whole biological cycle of the species, elements recorded were not sufficiently to show any positive or negative effect of the presence of waters with modified temperatures on larvae and fry of *Alosa immaculata*;
- due to lack of reference data (at both national and international level) to which the results of this study could be referred to, we consider as premature the establishing of an impact on *Alosa immaculata*.

Taking into consideration that the species is of Community interest, it was recommended to conduct correlated observations / experimental fishing after the start of construction works at Units 3 and 4 – both in the thermally not affected zone and in that with modified temperatures of water – according to a pre-established programme and a methodology to characterize observed / recorded effects.

To characterize the multi-annual dynamics of *Alosa immaculata*, it is necessary to monitor it after the start of construction works at Units 3 and 4, to cover completely the biological cycle of the species, during the spawning migration period, in the reach of the Danube River thermally influenced by water evacuated from Cernavoda NPP.

The same considerations and monitoring recommendations can be applied in case of species *Alosa tanaica* – species of community interest – present in ROSCI0022 "Canaralele Dunării" - as described for *A. immaculata* – with the specification that the percentage of number of *Alosa tanaica* is only about 3 – 5 % of the total number of *A. immaculata*.





Amphibians

In site ROSCI0022 ("Canaralele Dunării") and/or its close neighbourhood (existing the possibility that some of the species recorded only outside of the protected area to be present – even if sporadically – also inside the protected area) up to now there were recorded 8 species of amphibians of Community Interest.

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the status and evolutions of populations belonging to the species of amphibians of Community Interest, and also the **simultaneously operation of the four units** of Cernavoda NPP will not affect the dynamics or numerical evolution of the populations belonging to the amphibian species of Community Interest present in the protected area ROSCI0022 ("Canaralele Dunării").

Reptiles

In site ROSCI0022 ("Canaralele Dunării") and/or its close neighbourhood (existing the possibility that some of the species recorded only outside of the protected area to be present – even if sporadically – also inside the protected area) up to now there were recorded 11 species of reptiles of Community Interest.

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the status and evolutions of populations belonging to the species of reptiles of Community Interest, and also the **simultaneously operation of the four units** of Cernavoda NPP will not affect the dynamics or numerical evolution of the populations belonging to the reptile species of Community Interest present in the protected area ROSCI0022 ("Canaralele Dunării").

Birds

In site ROSCI0022 ("Canaralele Dunării") and/or its close neighbourhood (existing the possibility that some of the species recorded only outside of the protected area to be present – even if sporadically – also inside the protected area) up to now there were recorded 116 species of birds, out of which 44 species belong to the category of species whose conservation need the designation of Natura 2000 sites.

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the status and evolutions of populations belonging to the species of birds of Community Interest, and also the **simultaneously operation of the four units** of Cernavoda NPP will not affect the dynamics or numerical evolution of the populations belonging to the bird species of Community Interest present in the protected area ROSCI0022 ("Canaralele Dunării").





Mammals

In the standard Natura 2000 sheet of site ROSCI0022 ("Canaralele Dunării") there was nominated as present (in the respective protected area) only one mammal species of Community Interest: the otter (*Lutra lutra*). In the study area or nearby it (the sector of the Danube where there is the plume with temperatures modified by the cooling waters of Cernavoda NPP) there were not recorded specimens of *Lutra lutra*.

Based on the results of the investigations carried out in 2010 and 2011, we consider that the activity of Units 1 and 2 **does not affect** the status and evolutions of populations belonging to the species of mammals of Community Interest, and we assume that the **simultaneously operation of the four units** of Cernavoda NPP will not affect the dynamics or numerical evolution of the populations belonging to the mammal species of Community Interest present in the protected area ROSCI0022 ("Canaralele Dunării").

Natural habitats

In the protected site ROSCI0022 (Canaralele Dunării) there were recorded up to now types of natural habitats of Community Interest.

According to the results of the investigations carried out in 2010 and 2011, the activity of Units 1 and 2 **does not affect** the status and evolutions of natural habitats of Community Interest, and also the **simultaneously operation of the four units** of Cernavoda NPP will not affect the dynamics or numerical evolution of the natural habitats of Community Interest present in the protected area ROSCI0022 ("Canaralele Dunării").

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In conclusion, based on the existing data, we consider the environmental impact of operation of Cernavoda NPP Units 3 and 4 is insignificant, as it results from the present study of adequate evaluation, conditions for licensing and provisions of the environmental legislation being met. To apply the caution principle the implementation of a monitoring program is proposed as detailed in chapter F of the study.

