

## **4.7. Potential Social and Economic Impact**

### **4.7.1. Demography**

The data on population distribution presented in this study were prepared by Project SA Constanta (Ref 4.7-1) at the level of the year 2000 and estimated for the future period until the year 2030 (see Tables 4.7.1-1 ÷ 4.7.1-4 and Figure 4.7-1).

Analyzing the distribution of the population with permanent residence in the 30 km radius area, it is found that the sectors with most inhabitants are those of Medgidia, Cernavoda and Fetesti. The ESE sector had 57570 inhabitants at the level of the year 2000 and it will have about 58945 inhabitants at the level of the year 2030. This sector includes Medgidia Town, at 18 km ESE from the site, a town having 46457 inhabitants at the level of the year 2000 and an estimated population of 47000 inhabitants in 2030 (Ref 4.7-1). This sector is not located on the direction of dominant winds.

Another sector with many inhabitants is located on WNW direction and its population concentration reaches about 41598 inhabitants at the level of the year 2000 and it is to be about 41370 inhabitants in the year 2030. This sector includes Fetesti Town, located at 18 km distance from the Cernavoda NPP site, with a population of 36684 inhabitants, that is to reach 36000 inhabitants at the level of the year 2030. The town is not on the dominant winds direction.

Cernavoda Town, the greatest concentration of population in the vicinity of the Cernavoda NPP site, is located at about 2 km distance on WNW, NW, and NNW sectors. The town had 20384 inhabitants at the level of the year 2000 and is to reach about 23000 inhabitants in 2030.

Around Cernavoda NPP, in the 1 km radius area (exclusion zone), there is no settlement or population with permanent residence.

### **Transient Population**

Tables 4.7.1-5 and 4.7.1-6 show an analysis of the distribution of the transitory population that stays in the area a short period of time (Ref. 4.7-1).

There is seasonal work in wine yards and orchards, in spring (February, March), and then in autumn for harvesting, when the number of employees and the work time period is longer (August, September, October).

A small number of people is employed for seasonal work in most of the farms (cereals, animal breeding) for the period February-October, but the number of this people is small (2-6 employees) and they have not been recorded.

The case of Cernavoda Town is an exception due to the relatively high number of commute people reaching about 800 persons.

Tourism do not generate long-time stay in the analyzed area (30 km area).

### **Population Density**

Within the area in the vicinity of Cernavoda NPP, the distribution of the urban and rural settlements on unit area is not uniform since it has been influenced by the natural conditions and economic factors.

So, the settlements within the 30 km radius, that concentrate a lot of population, i.e Cernavoda, Medgidia and Fetesti, are located along the Bucharest – Constanta main railway.

The rural settlements with most inhabitants (between 2000 – 9000 inhabitants) are located along the Danube River and the Borcea Branch.

The average density of the population in the 30 km radius area is 63.5 inhabitants/km<sup>2</sup>.

The structure of the Cernavoda, Fetesti, Medgidia population, according to age and sectors, is presented in Table 4.7.1-7.

**Table 4.7.1-1.** Distribution of the population - year 2000

Radius-(km)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2	0	0	0	0	0	0	0	36	0	0	0	0	0	4383	0	8	4427
2-3	0	0	0	0	0	0	202	205	0	0	0	30	0	124	8483	1026	10070
3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	30	2879	3298	6207
4-5	0	0	0	0	0	0	0	354	0	10	0	0	0	0	0	113	477
5-6	816	0	0	0	0	0	1138	345	0	0	0	0	0	0	0	0	2299
6-7	0	0	0	0	0	0	0	0	0	0	1227	0	0	0	0	0	1227
7-8	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	100
8-9	489	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	689
9-10	0	0	0	0	20	0	0	0	509	0	0	0	0	0	0	0	529
10-15	0	731	630	0	1771	3726	263	0	420	0	2689	0	0	0	0	0	10239
15-20	94	0	741	0	3075	44968	0	1846	0	26	0	0	0	12059	1963	0	64772
20-25	1865	378	206	1608	0	3969	0	680	968	119	1299	1595	11072	25002	3990	0	52751
25-30	0	2046	332	3272	0	4907	2773	1598	345	2225	1606	0	1720	0	0	6018	26842
TOTAL 0-30	3264	3155	1909	4880	4966	57570	4576	5064	2242	2380	6821	1625	12792	41598	17315	10463	180620

**Table 4.7.1-2.** Distribution of the population - year 2010

Radius-(km)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2	0	0	0	0	0	0	0	37	0	0	0	0	0	4385	0	8	4430
2-3	0	0	0	0	0	0	208	210	0	0	0	30	0	125	8492	1025	10090
3-4	0	0		0	0	0	0	0	0	0	0	0	0	30	2880	3300	6210
4-5	0	0	0	0	0	0	0	365	0	10	0	0	0	0	0	115	490
5-6	800	0	0	0	0	0	1170	350	0	0	0	0	0	0	0	2320	4640
6-7	0	0	0	0	0	0	0	0	0	0	1215	0	0	0	0	0	1215
7-8	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	100
8-9	480	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	680
9-10	0	0	0	0	20	0	0	0	540	0	0	0	0	0	0	0	540
10-15	0	720	650	0	1790	3840	260	0	420	0	2685	0	0	0	0	0	10365
15-20	50	0	750	0	3160	44525	0	1875	0	25	0	0	0	11770	1910	0	64065
20-25	1850	360	185	1630	0	4090	0	685	965	115	1290	1590	10920	24475	3925	0	52080
25-30	0	2030	325	3370	0	5120	2810	1630	345	2220	1590	0	1680	0	0	5900	27020
TOTAL 0-30 km	3180	3110	1910	5000	5070	57575	4648	5152	2270	2370	6780	1620	12600	40785	17207	12668	181925

**Table 4.7.1-3.** Distribution of population - year 2020

Radius-(km)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2	0	0	0	0	0	0	0	37	0	0	0	0	0	4685	0	8	4730
2-3	0	0	0	0	0	0	208	210	0	0	0	30	0	135	9082	1095	10760
3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	30	3080	3525	6635
4-5	0	0	0	0	0	0	0	365	0	10	0	0	0	0	0	120	495
5-6	800	0	0	0	0	0	1170	350	0	0	1185	0	0	0	0	0	2320
6-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1185
7-8	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	100
8-9	480	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	680
9-10	0	0	0	0	20	0	0	0	520	0	0	0	0	0	0	0	540
10-15	0	720	630	0	1790	3840	265	0	420	0	2615	0	0	0	0	0	10280
15-20	45	0	720	0	3235	45495	0	1875	0	25	0	0	0	11770	1860	0	65025
20-25	1805	350	180	1565	0	4195	0	685	885	110	1245	1540	10835	24490	3855	0	51730
25-30	0	1970	310	3235	0	5330	2820	1610	320	2110	1475	0	1625	0	0	5900	26705
TOTAL 0-30 km	3130	3040	1840	1545	5145	53530	1843	5132	2145	2255	5335	1570	12450	41110	17877	10648	181185

**Table 4.7.1-4.** Distribution of the population - year 2030

Radius (km)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-2	0	0	0	0	0	0	0	37	0	0	0	0	0	4940	0	8	4985
2-3	0	0	0	0	0	0	208	210	0	0	0	30	0	140	9592	1155	11335
3-4	0	0	0	0	0	0	0	0	0	0	0	0	0	30	3250	3720	7000
4-5	0	0	0	0	0	0	0	365	0	10	0	0	0	0	0	125	500
5-6	800	0	0	0	0	0	1170	350	0	0	0	0	0	0	0	0	2320
6-7	0	0	0	0	0	0	0	0	0	0	1185	0	0	0	0	0	1185
7-8	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	100
8-9	480	0	0	0	0	0	200	0	0	0	0	0	0	0	0	0	680
9-10	0	0	0	0	20	0	0	0	520	0	0	0	0	0	0	0	540
10-15	0	720	610	0	1790	3840	265	0	420	0	2615	0	0	0	0	0	10260
15-20	40	0	690	0	3235	45495	0	1875	0	20	0	0	0	11770	1855	0	64980
20-25	1760	340	175	1565	0	4195	0	685	845	105	1245	1540	10725	24490	3785	0	51455
25-30	0	1910	310	3235	0	5415	2850	1630	310	2020	1475	0	1590	0	0	5800	26545
TOTAL 0-30 km	3080	2970	1785	4800	5145	58945	4693	5152	2095	2155	6520	1570	12315	41370	18482	10808	181885

**Table 4.7.1-5.** Population in isolated residential areas and transitory population in Cernavoda NPP Site area  
(r = 30 km)

No	Location – village, farm, job site	Permanent residents	Temporary residents	Floating	Remarks
<b>I. CONSTANTA COUNTY</b>					
1	CERNAVODA	-	-	800	Boarding school, hospital, ophenages, sanatoria
2	„Vifrucer,, S.A. - Center	30	70 - 180	-	
3	„Vifrucer,, S.A. – F4	30	30 - 50	-	
4	„Vifrucer,, S.A. – F15	10	30 - 50	-	
5	NPP	-	-	566	
6	MEDGIDIA	-	-	300	Hospital, boarding, hotel
7	„Fruvimed,, S.A. - Center	150	50 – 100	-	
8	„Fruvimed,, S.A. – F4,5,18	26	50 - 100	-	
9	BASARABI	-	-	-	
10	„Vie – vin,, Murfatlar – F 4 - 5	24	50 - 150	-	
11	CASTELU	-	-	30	Boarding high school
12	„Agrias,, S.A. F 3 - 7	120	-	-	
13	CIOCĂRLIA	-	-	-	
14	„Stelacer,, S.A. - Center	200	30 - 50	-	
15	„Cilacer,, S.A. - Center	150	-	-	
16	DELENI – Pietreni „Agropit,, S.A. - Center	150	-	-	
17	MIRCEA VODA - Gara	200	-	-	
18	„Fruvisat,, S.A. – Satu Nou	-	140 - 210	-	
19	Facliă	-	-	100	
20	NICOLAE BALCESCU	150	-	-	
21	Dorobantu - „Docefran,,	100	-	-	
22	PESTERA	-	-	-	
23	„Fruvimed,, S.A. F19 - Suditu	90	60 - 80	-	
24	„Fruvimed,, S.A. F11 – Pomicola	10	20 - 50	-	
25	„Pesco,, S.A. F. Poligon	63	20 - 30	-	
26	POARTA ALBA Nord	700	-	3,170	Jail, boarding school, sanatoria
27	„Vie – vin,, Murfatlar S.A. F 8 – 12	50	100 - 300	-	

No	Location – village, farm, job site	Permanent residents	Temporary residents	Floating	Remarks
28	RASOVA	-	-	-	
29	„Vifruce”, S.A. Complex ferme	100	100 - 300	-	
30	„Vifruce”, S.A. F 8,9,19	8	60 - 120	-	
	TOTAL I	2,361	810-1770	4966	
<b>II. CALARASI COUNTY</b>					
1	„Agrozootehnica”, S.A. Gr`dijtea – Fetejti	168	-	-	
2	„Agrozootehnica”, S.A. F1 – Depozite	124	-	-	
	TOTAL II	292	-	-	
<b>III. IALOMITA COUNTY</b>					
1	FETESTI	-	-	300	Hospital, boarding school, hotel, C.F.R. railway
2	„Agrozootehnica”, S.A. Bordusani F8 - Cegani	150	-	-	
3	„Agrozootehnica”, S.A. Stelnica F 5,6,7	40	-	-	
	TOTAL III	190	-	300	
	TOTAL AREA r = 30 Km	2843	810-1770	5266	



**Table 4.7.1-6.** Transient population (tourism, job site) in Cernavoda NPP site area (r = 30 km) broken down on sectors and distances

Distance km	I N	II NNE	III NE	IV ENE	V E	VI ESE	VII SEE	VIII SSE	IX S	X SSW	XI SW	XII WSW	XIII W	XIV WNW	XV NW	XVI NNW	Total
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0 - 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1 - 2	-	-	-	-	-	-	-	-	-	-	-	-	-	310	146	-	456
2 - 3	-	-	-	-	-	-	-	-	-	-	-	180	-	-	720	50	950
3 - 4	-	-	-	-	-	-	-	-	-	-	-	-	-	50	30	-	80
4 - 5	-	-	-	-	-	-	-	-	-	50	-	-	-	-	-	-	50
5 - 10	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-	20
10 - 15	-	-	-	-	-	210	130	-	-	420	-	-	-	-	-	-	760
15 - 20	-	-	-	-	-	400	30	-	-	-	-	-	-	300	-	-	730
20 - 25	-	-	-	-	-	440	-	-	-	-	-	-	-	-	-	-	440
25 - 30	-	-	-	-	-	3.320	50	-	-	-	-	-	-	-	-	-	3.370
TOTAL	-	-	-	-	-	4.370	410	-	-	470	-	180	-	660	896	50	7.036

Mentions:

In sector VI, d = 25 – 30 km, the value represents the number of persons in Poarta Alba prison (and Valu lui Traian).

**Table 4.7.1-7.** The structure of the Medgidia, Fetesti and Cernavoda population according to age and sectors

Age	Medgidia Sect. VI (ESE)	Fetesti Sect. IV (WNW)	Cernavoda		
			Sect XIV (WNW)	Sect. XV (NW)	Sect. XVI (NWN)
0 –1year	1,157	913	91	309	107
1 – 2 years	808	638	64	216	75
2 – 7 years	3,967	3,133	313	1,062	366
7 – 12 years	3,823	3,019	302	1,023	352
12 – 17 years	4,190	3,309	331	1,121	386
> 17 years	32,515	25,672	2,568	8,707	2,995
TOTAL	46,460	36,684	3,669	12,438	4,281

#### 4.7.2. Economic Activities

Some considerations related to the Cernavoda NPP U3, respectively U4 impact on the economic activities (agriculture, tourism, commerce, transport, etc) in the area are presented in this section. A 10 km radius zone around the reactor is considered to be the area of concern because, in compliance with IAEA recommendations (Ref. 4.7-2), the economic objectives located at a greater distance than 10 km away from the NPP shall not affect/be affected the /by the plant.

a) Figure 4.7-1 present the **economic objectives** within the influence zone of Cernavoda NPP (Ref. 4.7-1). The activities in the area of 10 km radius around the Cernavoda NPP are grouped in the following zones:

- A. Cernavoda – Saligny industrial area;
- B. Cernavoda harbour industrial area;
- C. Dispersed inside the Cernavoda town area;
- D. Dispersed inside the villages of Mircea Voda, Stelnica areas.

The main fields of economic activity in the 10 km zone are the following, excepting for the activities performed inside the NPP exclusion area (1 km around the reactor), related only to the nuclear power plant:

- naval activities (ships repairing, shipping transport);
- oil products storage and delivery;
- agriculture (reception and storage of agricultural products, food storage, services in the agricultural field);
- construction works;
- extraction works (clay quarry).

b) The Figure 4.7-1 also identifies the **oil and gasoline pipelines** (Constanta-Pitesti, Constanta-Ploiesti, Constanza-Borzesti, and Ploiesti-Constanta) routing through the Cernavoda NPP analyzed zone. The pipelines have been provided with isolating valves when crossing the main roads, the railways or sub-crossing the waterways.

c) **The transport routes** (railway, road and naval) developed in the area of concern are presented in the Figure 4.7-1. The minimum distances between Cernavoda NPP and the transport routes are presented in depth in Figure 4.7-2.

c.1) *Road transport network* is constituted mainly by:

- A2 highway (Bucharest-Constanta) the Fetesti-Cernavoda segment (to be finalized);
- National road 22C Cernavoda – Basarabi;
- County road 223, parallel with the Danube River, between Cochirleni, Cernavoda and Seimeni villages;
- Village roads DC60 and DC61, within NNE and NE sectors located at a distance greater than 5 km from the NPP enclosure.

The following main mixed bridges (on roads and railways) serve this road network:

- Bridge on DN 22C, for Danube - Black Sea Canal crossing;
- Crossing bridge of Cernavoda NPP intake cooling channel.

c.2) *Railway transport* is represented by:

- Fetesti-Medgidia railway segment of Bucharest – Constanta main railway, served by Cernavoda Harbour station;

- Secondary railway Saligny – Cernavoda town; the hazardous materials carried on this railway are used only by Cernavoda NPP.

c.3) *Naval transport* is represented by Danube River and Danube - Black Sea Canl.

c.4) *Civil air transport* is represented by:

- Mihail Kogalniceanu International airport located at about 35 km distance from Cernavoda NPP.

From airway traffic point of view, the Cernavoda NPP influence area is considered an interdiction zone (specified as “LRP2” on the airway maps), for the flights up to 4000 ft. (about 1200m) altitude, in a cylindrical zone with 5 miles (about 10 km) radius and the axis passing through the NPP axis.

### **4.7.3. Population Health Condition**

Assessment of the health condition of the population in the areas around Cernavoda NPP was made on basis of studies elaborated for Cernavoda NPP (Ref. 4.7-4).

It is considered that the recorded statistic data employed for the assessment of the health condition of the population in the area next to Cernavoda NPP, are relevant for the purpose of this document.

Data which characterize the population health condition were processed for the years 1994, 1995 and they represent the reference data with natural incidence of cancer diseases and mortality determined by various causes. The data are summed-up in Tables 4.7.3-1 and 4.7.3-2.

Generally, the population health condition is influenced by the population aging degree.

The aging phenomenon is usually accompanied by the phenomenon of poly morbidity and an increase of the number of chronic diseases, including cancer with aged people.

Since in Cernavoda area the percentage of young people is grater, if statistically compared to the entire country, the death rate (death per 100 000 inhabitants) in Cernavoda area, shows smaller values, by comparison with the values recorded on country scale (Table 4.7.3-1).

For the cancer death rate, the values were processed and assessed by means of the incidence rate (i.e natural incidence of cancer disease).

Table 4.7.3-2 illustrates the rates of some cancer forms recorded with the population in Cernavoda area, by comparison with the situation in the country.

**Table 4.7.3-1.** Mortality in Cernavoda area by comparison with the whole country

Rate	1994		1995	
	Cernavoda zone	Romania	Cernavoda zone	Romania
Mortality Death No. Rate at 100000 inhabitants	1238 801,07	266101 1107,70	1043 852,92	271672 1198,00
Mortality Cancer Death No. Rate at 100000 inhabitants	143 92,53	36880 102,20	65 53,59	37539 165,51
Mortality Leukemia Death No. Rate at 100000 inhabitants	1 0,65	143 0,63	2 1,65	141 0,62

**Table 4.7.3-2.** Incidence of some cancer forms\*

Cause of disease	1994		1995	
	Cernavoda zone	Romania	Cernavoda zone	Romania**
CANCER New no. of cases Incidence	107 73,66	40477 180,4	193 122,63	
From which: LEUKEMIA New no. of cases Incidence	4 2,75	932 4,10	1 0,82	
PULMONARY CANCER New no. of cases Incidence	3 1,94	7042 30,96	6 3,81	
THYRIOD CANCER New no. of cases Incidence	0	239 1,05	0	
BREAST CANCER New no. of cases Incidence	**	4281 18,82	**	

\* Incidence = new cases found at 100 000 inhabitants

\*\* data unavailable

#### **4.7.4. Estimated Social and Economic Impact**

The impact of noise and vibrations generated by various equipments and installations on human settlement and other activities will be insignificant. Among in the inhabited areas, the only exposed locality is the Cernavoda town, but there is a natural screen (a hill) between the NPP site and the town. Due to attenuation with distance, by absorption in air and diffraction, the contribution of Units 3 and 4 to the noise equivalent level in the town is assessed as being negligible.

The impact of the Cernavoda NPP Units 3 and 4 on the economic activities in the area beyond the exclusion zone (1 km away from the reactor) is insignificant.

Generally, the economic activities in the area of concern have to be authorized taking into consideration the potential impact on the NPP safe operation and not in a reverse way.

The existence of the nuclear power plant in this zone is a positive factor for the development of the economic activities in the vicinity.

The main beneficial social and economic effects of the Units 3 and 4 completion and operation will be:

- positive return of important previously started investments;
- generation of a large quantity of electric energy;
- avoidance of greenhouse gases emission increase and of other effects that would occur by fossil fuel burning in a comparable thermal power plant;
- population employment and qualification;
- stimulation of other economic activities;
- financial sources for the population and the local administration;
- development and improvement of local infrastructure.

#### **4.7.5. Impact Mitigation Measures**

The protection of the personnel, population and environment is a main objective of Cernavoda NPP. This objective is achieved by implementing the current practices world-wide and of the international recommendation regarding the design and operation of nuclear power plants (Ref. 4.7-6).

Further on there is a brief description of such protection measures:

- The establishment of an exclusion zone of 1 km around the reactor where only NPP related activities are permitted; beyond this point, the concentrations of the radioactive effluents shall be within the admissible limits (5 % of the Derived Emitted Limits) and all activities will not be perturbed;
- General arrangement will be performed so that the potential missiles generated by U1, U2, U3 and U4 turbine break will not affect the vital areas of the nuclear power plants, and consequently there will be no impact on the economic activities in the neighborhood;
- Design and location measures will be taken for the limitation of the toxic or explosive gas (used at the nuclear power plant) releases, so that the NPP structures integrity will not be affected; consequently there will be no impact on the economic activities in the neighborhood;
- Provision of restriction measures on the terrestrial transport routes located within the exclusion zone (DJ 223 or Saligny - Cernavoda Town railway segment) will ensure the minimizing of the reciprocal impact nuclear power plant - terrestrial transport activities;
- Provision of restriction navigation measures on the channel so that the reciprocal impact nuclear power plant – navigation transport activities will be minimized;
- in point of air traffic, the Cernavoda NPP zone of concern is considered a prohibited area for the flights up to 4000 feet (about 120m) encompassed in a right circular cylinder of 5 miles radius (about 10km) with its axis passing through the plant axis;



- As regards the liquid releases, the inactive chemical monitoring environment program is including the necessary activities in order to meet the regulation requirements regarding both environmental protection and supplementary programs that may be implemented in case of accidental leakage of chemical substances;
- Cernavoda NPP platform is so designed that the normal operation of Units 3 and 4 should not negatively influence the operation of Units 1 and 2;
- Unit 3, respectively 4 is designed as an independent operational unit as to Unit 1 and Unit 2, and therefore any abnormal or emergency condition generated by Unit 3, respectively 4 is not jeopardizing the operation and safety of Unit 1 and Unit 2 and neither their operation personnel;
- Unit 3, respectively 4 designs is so conceived that it does not make use of installations and systems common to the other units, that once failed in Unit 3 or Unit 4, might induce failures in Unit 1 or Unit 2. The effects of failures in the objectives adjacent to Unit 3, respectively 4 are not influencing the other units operation.

## References

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