



STANCA-COSTESTI RESERVOIR-THE MOST IMPORTANT WATER MANAGEMENT UNIT IN PRUT CATCHMENT AREA

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Abstract

Stâncă-Costești reservoir was put in use in 1976 in co-operation with Moldova Republic, is located on the Prut river, on 580 km from the confluence with the Danube River. Lake was provided by a dam with a height of 47 m and a length of 740 m, retaining a gross volume of 1 285 million m³ and use volume of 450 million m³ (of which 225 million m³ for the Romanian side) with an area of 59 km² and a maximum depth of 41.5 m, with bottom drain. It was built to regulate the flows of Prut river, and for water supply to population centers, industrial enterprises in this region, for electricity generation and to attenuate the high floods. The main rivers that form accumulation are: Prut river, with a flow of 81 m³/s, on the right bank, Volovățul, with a flow rate of 0.1-0.2 m³/s, on the left side, Vilia, Lopatinca, Racovățul and Ciugurul, which can achieve a total flow of 1 m³/s.

Keywords: accumulation, Stanca-Costesti, hydrotechnical node, hydropower, fisheries, protected area, water bodies.

1. General data

Characteristics

Stanca-Costesti reservoir is located on the Prut river, which is the border between Romania and Moldova; it has a total volume of 1 285 mil. m³, out of which 665 mil. m³ is flood defence volume (fig. 1). The use volume is about 450 million m³ (of which 225 million m³ for the Romanian side).

Main uses

The uses of the Stanca-Costesti reservoir are:

- Flood defence and flow regulation downstream reservoir. Stanca-Costesti reservoir has a large capacity and assures a very good flow regulation and reduction of floods;
- Hydropower generation – power plant capacity = total 32 MW (16 MW for Romania, respectively Moldova);
- Water supply for Iasi town (Tutora intake on Prut river); the maximum capacity of the water intake is 6 m³/s, also for irrigation of 140 000 ha, 70 000 ha for Romania, respectively Moldova.

Significant Physical Alterations

- direct physical alterations on river channel or bed – by dam and hydropower station construction;
- indirect alterations – are referring at the pressures of the construction downstream reservoir, as well as on riparian zone.

Changes in the hydromorphological characteristics of the Water Bodies

The main changes that Stanca-Costesti reservoir added in characteristics of the Prut Water Bodies are:

- change of water category - change of river to dammed reservoir;
- change in flow regimes ($Q_{low\ flow} = 1.8\ m^3/s$, $Q_{95\%} = 9.0\ m^3/s$) and sediment transport;
- downstream reservoir, the river bed recorded important morphological changes (thalweg lowering 50-60 km length downstream reservoir);
- affecting the migratory biota - obstacles for sturgeon (*Acipenseridae*) and waller (*Silurus glanis*).

2. Objectives of water arrangements in the Prut river basin

Fittings for water in the Prut river basin were considered in particular:

- cover the requirement of water for population centers, industrial and other uses;
- combating destructive effects of water;
- unlocking the potential of hydro power for the main course of river water.

Besides these facilities of water management it was watched for other goals such as protecting sources of water quality in pools, on the one hand and ensuring the ecological health and population supply, on the other.

For this purpose in the Prut basin have been numerous works, installations and facilities of water.

Stanca-Costesti Lake is the largest aquatic unit of Prut basin having implications in all aspects of water management facilities.

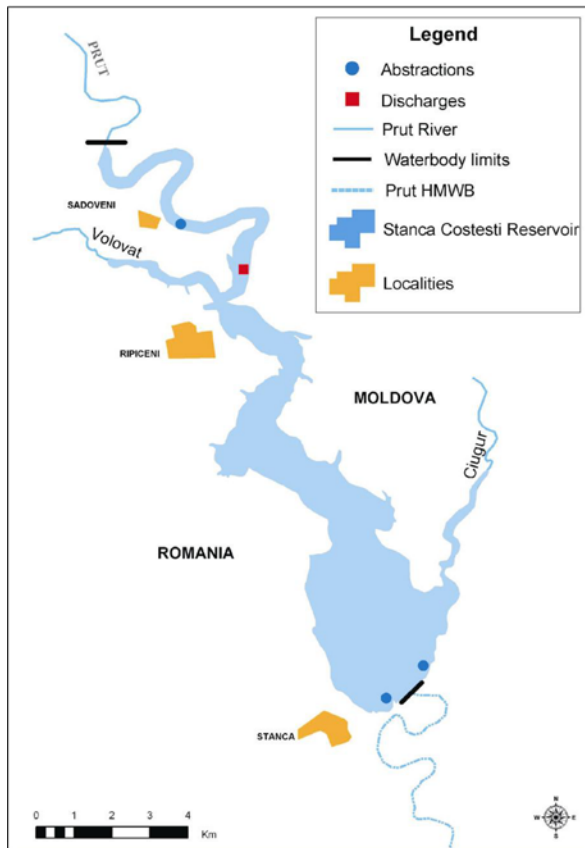


Figure 1. The geographical position of Stanca-Costesti reservoir
 (Source: Petru Serban, Daniela Radulescu, 2004)

This accumulation stretches for 30 km, from the Ripiceni village to Stanca village (in Romanian side) and Costesti as well (in Moldavian side), where the dam is.

Relief ranges around Lake is characteristic for Jijia Plain, except the Stanca section, near the dam, where it was identify some limestone cliffs. Marginal zone comprises an alternation in composition - clay sides to the tail and middle of the lake and the limestone cliffs to the dam. The alternation is also in depth. Sometimes the banks are steep and high, sometimes as a forward in the water beach.

By the conditions of operation of the dam Stanca-Costesti, alimentation-
 evacuation is difficult in the technological interest period.

Design these facilities it was quantify in a financial effort and material than required by the socio-political conditions. Now under the new socio-political conditions, the effect is felt negative. The arranged areas are unable to operate in accordance with the original destination, and technologies are changed (from

abandoned in whole or in partially to discharge water, or passed to farming).

Also, influence on the environment was not very favorable from an ecological aspect and it was resulted in restriction of breeding of many fish species.

3. Functions of the lake from Sâncea-Costești

a) planning to meet water requirements

In the Prut river basin is in operation 307 lakes with a gross volume of 1.657 million m³, a useful volume of 681 million m³ of which ones are 18 complex lakes with total gross volume of 1 451 million m³ and useful 510 million m³. Of these the most important is the accumulation of the Stanca-Costesti on the Prut river with a gross volume of 1 285 million m³ and 450 million m³ useful volume (of which 225 million m³ for the Romanian side).

This accumulation provide water for Iasi and Vaslui towns, all settlements in the bordering area of the lake and downstream, and also the irrigation of 70 000 ha of agricultural land.

The amount of water captured from the Stanca-Costesti accumulation for different uses has been established at riparian states as follows:

- centralized supply of settlements and industries 5.0 m³/s;
- fishery use 1.45 m³/s;
- health limits (wholesome flow) 2.50 m³/s.



Figure 2. The position of Stanca-Costesti reservoir (left)- Landsat image
Source: [http://glcf.umiacs.umd.edu/data/landsat/\(with processing\)](http://glcf.umiacs.umd.edu/data/landsat/(with%20processing)) and **The dam of Stâncea-Costești accumulation** (right) Source: <http://www.apeprut.ro/sgabt.html>

Other accumulation executed to cover the requirement of water for population centers, industrial and other uses are distributed as follows:

-White Knight, Mileanca and Negreni with a gross volume of 34 million m³ and useful volume of 19 million m³ on the Bașeu river, supplying irrigation about 3 400 hectares of land, water supply of Săveni city and traditional fishing use (the Negreni lake is in most part eutrophysated);

-Cătămărești and Hălțeni ponds on the Sitna river and respectively Miletin river, what amounts to a gross volume of 26 million m³ and useful volume of 19 million m³, which provides irrigation to 11 600 hectares of land, water supply to the Vădeni settlement and fishing use;

-12 accumulations on Bahlui river and its tributaries, with a gross volume of 98 million m³ and useful volume of 27 million m³, wick providing irrigation to 5 400 ha land, water supply for Hârlău city, and Belcești settlement and fish use.

Table. no. 1 Units that capture water from Stanca-Costesti reservoir

| Name of unit | Water source | Km on the water lenth | Cover installed the source | Water captured | |
|--------------------------|--------------------------|-----------------------|----------------------------|----------------|--------------------------|
| | | | | Flow (l/s) | Volum m ³ /an |
| SC ZATRUS SA Trușești | On surface/Ac. Stâncă | 680 | 60,0 | 60,0 | 630.700 |

Source: <http://www.apeprut.ro/>

Table no. 2 Main units which take water for irrigation from Stanca-Costesti reservoir

| Name of unit (arranged) | Irrigated area - ha- | Flow installed m ³ /s | Volume of water used mil.m ³ |
|--------------------------------|----------------------|----------------------------------|---|
| Trifești –Sculeni – Santa Mare | 725 | 0,552 | 0,04 |
| Crasnaleuca | 762 | 1,2 | 1,52 |
| Stâncă-Ripiceni | 3.025 | 3,0 | 6,28 |
| Liveni-Manoleasa | 6.275 | 4,0 | 11,2 |

Source: <http://www.apeprut.ro/>

b) planning to combat the destructive effects of water

The Prut area, both in Romania and the Republic of Moldova presents a situation in respect of specific needs of high water supply on the one hand, the river valley were subjected to frequencies extensive flood, on the other hand, which do not allow the practice of the crops.

In order to optimize these needs and to obtain a certain quantity of electricity in December 1973 began work, both the Romanian and Moldavian side, for the construction of what was commonly called Stanca-Costesti Hydrotechnical

Node, which including a clay dam located between the Stanca village in Romania and Costesti on the territory of Republic of Moldova.



Figure. 3 The effects of 2008 floods on the Prut river in the Stanca-Costesti area
Source: <http://www.apeprut.ro/>

c) arrangement to maximize the hydro-potential value

With the exception of the Prut river, water courses of the Prut river basin have low hydro-potential. The potential of hydro power generated by achieving Stanca-Costesti retention dam and the effect of regulated lake, through sharing with the Republic of Moldova is exploited by building the Stanca-Costesti H.E.C. (**Hydro-Electric Complex**) with an installed power of 16 MW and an average production energy of 65 GWh/year.

In addition to the Stanca-Costesti H.E.C. in this river basin are arranged a number of 3 MHC (**Micro-Hydroelectric Complex**) what amounts to an installed power of about 0,8 MW and an average production of energy about 2 GWh/year.

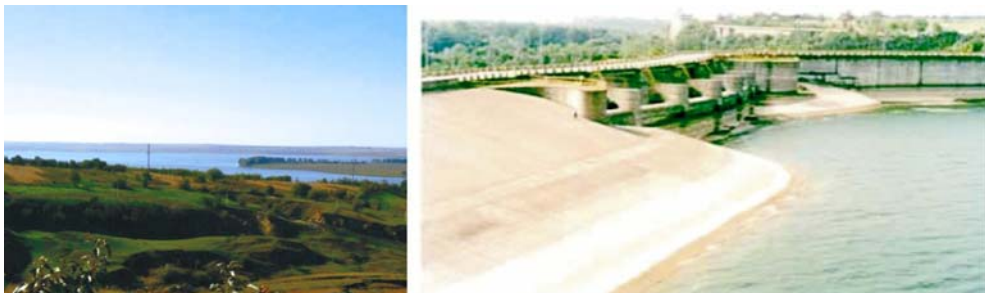


Figure 4 The Stânca-Costești reservoir in 2009 source: Florin Vartolomei (left) and Stânca Costești Hydroelectric unit (right) source: <http://www.apeprut.ro/sgabt.html>

Hydroelectric use of the accumulation on the Prut river is achieved through the construction of hydropower unit on the right bank of the Prut and left also for Modova side, at the bottom of the dam. These units enter in function in 1978.

As a result of riverbed of Prut is steeped largely in Cretaceous limestone formations, the river valley is narrow, strong wind, which form the present lake Stanca-Costesti, stretching over a length of 60 km, from Stanca near to Miorcani.

d) Fishing arrangement

Fishing fauna of the Stanca-Costesti Lake is represented by reophyle species in Prut river before the flooding period and some species placed in the Stanca-Costesti Lake. In present, was inventoried a number of 18 species of fish from 26 species and subspecies that was inventoried following investigations carried out during 1995-1997, being caught samples of species such as: *Abramis sapa*, *Ctenopharhyngodon idella*, *Proterorhinus marmoratus*, *Gobius fluviatilis* and *Cobitis taenia*.

The List of species present in Stanca-Costesti Lake must be filled with *Barbusse Barbusse* species fished in Romanian side, so resulting a total of 27 species of fish.

Dominant species is *Abramis Brama*, 27.95%, followed by *Rutilus rutilus carpathorossicus*, 25.78%, *Vimba vimba carinata*, 23.12% and to a lesser extent *Stizostedion* and *Perca fluviatilis htcioperca*.

Prut river in the Stanca-Costesti Lake section is in the area of *Barbusse Barbusse* species, based on environmental characteristics and this species is dominant in the upstream of the lake, 3.13% compared with the *Leuciscus cephalus* species which represents 1.44 % and the species *Chondrostoma nasiis* that are found in catches. Downstream of the lake, species *Barbusse Barbusse* represents 4.76% of total specimens caught, the species *Chondrostoma nasus*, 2.38% and *Leuciscus cephalus* species does not appear in catches (table no. 3).

Table no. 3 Ihtiofauna composition in Stâncă-Costești Lake between 1995-1999

| Species | Stâncă-Costești Lake | |
|---|----------------------|----------|
| | 1995 (%) | 1999 (%) |
| <i>Rutilus rutilus carpathorossicus</i> | 6.12 | 25.78 |
| <i>Scardinius erythrophthalmus</i> | 3.92 | 1.69 |
| <i>Aspius aspius</i> | 5.41 | 0.72 |
| <i>Alburnus alburnus</i> | - | dominant |
| <i>Blicca bjorkna</i> | - | 0.24 |
| <i>Abramis brama</i> | 41.65 | 27.95 |
| <i>Vimba vimba carinata</i> | 2.82 | 23.12 |
| <i>Percafluviatilis</i> | 5.88 | 7.20 |

| | | |
|------------------------------------|------|-------|
| <i>Acerma cernita</i> | - | 0.48 |
| <i>Stizistedion lucioperca</i> | - | 12.53 |
| <i>Leuciscus cephalus</i> | 2.82 | - |
| <i>Cyprinus carpio</i> | 4.01 | - |
| <i>Silurus glanis</i> | 2.12 | - |
| <i>Chondrostoma nasus</i> | 0.94 | - |
| <i>Brama sapa</i> | 4.94 | - |
| <i>(Tarassius auratus gibelio)</i> | 4.94 | - |
| <i>Esox liicius</i> | - | - |
| <i>Hypophthalmomyctys molitrix</i> | 2.82 | - |
| <i>Aristichtys nobilis</i> | 1.18 | - |

Source: <http://www.apeprut.ro/>

In the lake itself in the present some reophyle species have disappeared (barbel, dace or stone-fish), but in reverse, is developed species with the mixed regime.

e) arrangement with function of leisure

By its size and position, the Stanca-Costesti accumulation presents various possibilities for the realization of tourism potential with the facilities for recreation. Activities supporting this function include:

-*navigating* with light boat along the Stanca-Costesti accumulation, but also on the Prut river, in Bivolari-confluence with the Danube, section.

-*sportive fishing* is activity that complements the tourism and leisure activities carried out under this water units.

f) arrangement with environmental protection function

Special Protection Aquafaunistical Area, *Stanca-Costesti Lake*, has an total surface of 2 950 hectares and occupies part of these localities in Botoșani county: Mitoc, Liveni, Manoleasa, Manoleasa-Prut, Sadoveni, Ripiceni, Stanca. Special Protection Aquafaunistical Area, *Stanca-Costesti Lake* has the approve of N. M. C. (Natural Monuments Comitee) no. B 939/07.06.2004.

Give the official status in the future of "*transboundary protected site*", this area will enable the establishment of restrictive measures in order to protect and conserve biodiversity, while encouraging the preservation of traditional practices of sustainable exploitation of natural resources and preserve socio-cultural values of riparian communities.

Conservation of wetlands includes an important transborder component, within the meaning of collaboration and the adoption of a joint and uniform strategy

as regards the integrated administration and management of wetlands resources of great economic value, natural, scientific and recreational.

Declaring the project and its implementation as Special Protection Aquafaunistical Area *Stanca-Costesti Lake*, will seek to conserve and restore unique populations of birds who live in wetlands, under the Convention on Wetlands of international importance, especially as a habitat of aquatic birds concluded at Ramsar in 1971 and ratified by Romania by Law no. 5/1991.

It should be referred the reservations for the flora from Ripiceni and Ștefănești, designated as Natural Protected Areas of the national network of protected areas classified according to U.I.C.N. These natural protected areas, recognized by the Annex I of Law no. 5/2000, were set up for displacement of *Schierickia podolica* species, when starting to build the lake, which occupy a part of the natural spread of this flora species.

g) arrangement to protect the quality of water sources from catchment and to ensure the health and ecological requirements of population

Stanca-Costesti reservoir on the Prut River is the second accumulation in the country (total volume: 1 451 millions of m³), after the Iron Gates I, on the Danube (total volume: 2 900 million m³), was made for a complex service: regularize the waves of flow and flood mitigation, water supply of populated centers, industrial purpose and hydro-electricity.

Following hydro-chemical and hydro-biological analysis made in 2002, up to 6 sections, have outlined the following conclusions about water quality:

- the degree of saturation of dissolved oxygen, ranging from 79.3 – 119.7% were classified the lake in oligotroph category;

- total mineral nitrogen concentration has been the highest in November, about 4.824 mg/dm³, revealed throughout the sampling values between 1.576 – 1.747 mg/dm³, who placed the lake in the eutroph water category;

- similar to the total mineral nitrogen, total phosphorus recorded the highest value of 0.091 mg/dm³ throughout November, in the other months of sampling emphasizing values between 0.045 – 0.078 mg/l, characteristic to mezotroph water;

- phytoplankton biomass presented values between 1.2 – 2.75 dm³, - which falling water in the oligotroph category;

- the total phosphorus and phytoplankton biomass were placed in Stanca-Costesti water accumulation in 2002 in the oligo-mezotroph, although the total mineral nitrogen has high values characteristic to eutroph water.

Conclusion

Stanca-Costesti Lake is the largest accumulation of water in the basin of the Prut and the second in the country, builded jointly by the two riparian states (Romania and Republic of Moldova), for attenuate the effects high flood, in order to prevent damage caused by floods, providing water supply for the population, industry, irrigation, fishery and unorganized use, to a high probability of requirements ranging from 80-97%, but also for hydro-energy production and fish production.

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