

HISTORICAL ASPECTS OF WATER MANAGEMENT IN THE LOWER BASIN OF CERNA, CINCIȘ - SÂNTUHALM SECTOR

G. DOBREI¹

ABSTRACT. – **Historical aspects of water management in the lower basin of Cerna, Cinciș - Sântuhalm sector.** This paper aims to analyze historical changes in water resources management in the lower basin of Cerna on the Cinciș - Santuhalm sector. Historical issues of water resources management near the city of Hunedoara begins with the development of the steel industry in the late 1880s. Gradual development of industry has brought urban development in the area of Hunedoara, this imposing the creation of complex structures including dams, water management systems, water intakes, river bed deviations, land drainage, etc.. Following the two periods of development of the steel industry in Hunedoara, U.F.H. Steel Works from 1882 to 1956 and then C.S.H. from 1956 to the present, culminating with the construction Cinciș dam, we will analyze specific problems and solutions in water management in each era. Using a series of historical maps and with the help of GIS techniques we will identify how industrial development and the demographic boom affected the structure and quality of water resources in the Cerna basin.

Keywords: Cinciș Dam, flood prevention, industrial water management, river flow.

1. INTRODUCTION

Cerna is the main river which drains the north-eastern part of Poiana Rusca Mountains being tributary to the river Mureș. Cerna only has tributary streams from the right side, the most important being Govăjdiei, Zlaștiului, Peștișului, Cristurului and Ursului. Its catchment area covers an surface of over 740 square kilometers.

Due to the particularities of the relief, delimitation of Cerna's sectors is relatively simple, the upper sector, the mountain one, where the course digs massively into the mountain ranges, stretches between the the spring area and the Cinciș dam and the lower sector, characterized by the massive deposit of silt and the creation of terraces, ranges from Cinciș dam to the point of confluence with the Mureș river near village of Santuhalm (Fig 1).

The upper sector spans 43 km in length and the lower one only 22 km. On the lower sector Cerna has an average slope of 3.84 m/km and a sinuosity coefficient of 1.18 and has and an average flow of 3.5 m³/s.

If in the upper sector human impact is extremely low in the lower sector this impact is significant, the course of Cerna beeing significantly altered in the past 150 years.

¹ "Babeș-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: gabriel.dobrei@ubbcluj.ro

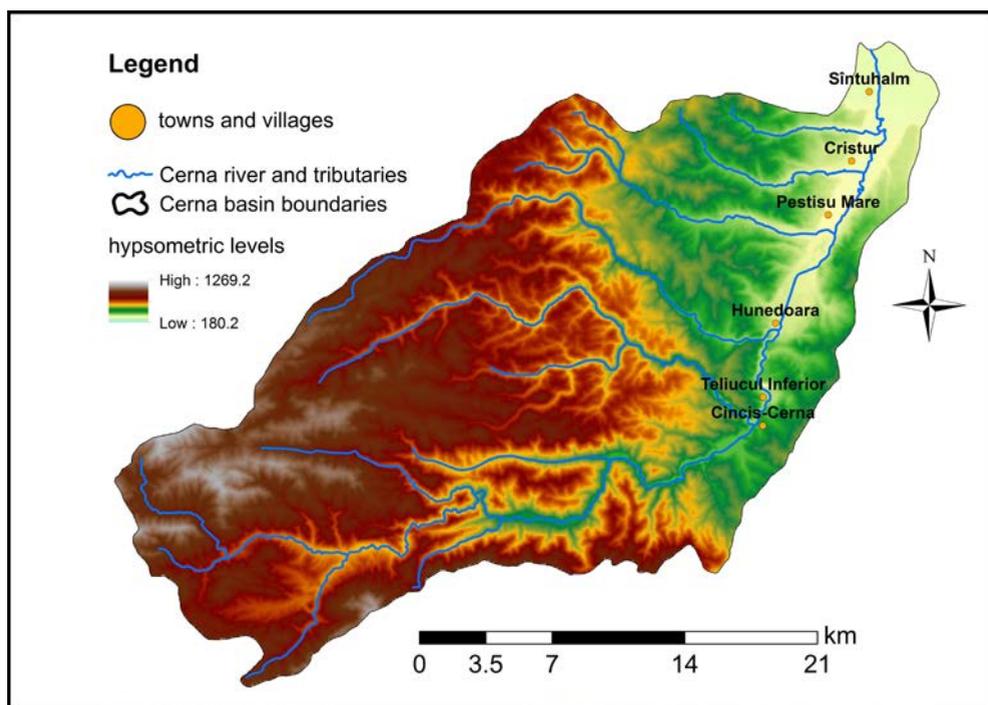


Fig. 1. Cerna basin

2. WATER MANAGEMENT ASPECTS BETWEEN 1882 AND 1956

The period between 1882 and 1956 is characterized major changes in land use and water management of river courses in the lower basin of Cerna. The changes were largely caused by the spatial evolution of Hunedoara and the villages downstream of it. In 1884 in Hunedoara is inaugurated the first modern blast furnace having a capacity of 110 cubic meters, in 1885 furnace no. 2 with a capacity of 110 cubic meters is put into operation. In 1890 furnace no. 3 is put into operation with a capacity of 140 cubic meters, in 1895 blast furnace no. 4 is turned on and the number 5 furnace is started in 1902.

To accommodate all these production capacities work starts on terracing the left bank of the Cerna near the Franciscan Monastery and to the south a retaining wall is build to protect the bank from erosion. To ensure proper operation of the blast furnaces the Zlaști dam was built in 1883 to provide water for the U.F.H. and subsidiary provide electricity for the town of Hunedoara.

The Zlaști hydroelectric station was small, 65Kw. The river water was used for consistently cooling blowers for furnaces, so that the above-mentioned power station was unreliable for producing energy . It could only work a few hours, usually in case of repairs or system crash.

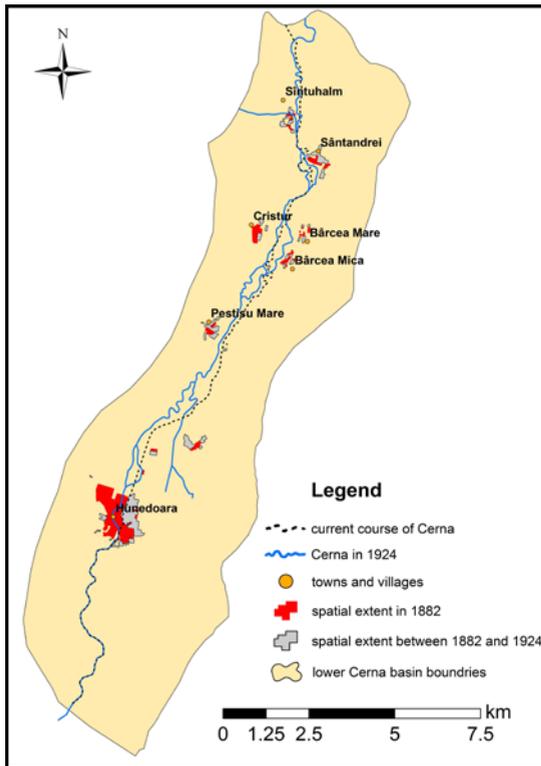


Fig. 2. Cerna course between 1882 and 1924

With the development of the production capacities and the increase in the number of inhabitants in Hunedoara, led to the need to build new homes (Table 1). From historical sources it is known that the Hunedoara region dominated wetlands. Drainage of these lands and construction of the first residential areas required extensive hydrotechnical works between the Castle and the bridge north of the town (Fig. 2).

Downstream from Hunedoara the morpho - structural changes in the riverbed were minor, referring generally to land drainage made by the local community.

Census year	1850	1880	1910	1930	1956	1966	1977	1992	2002
Population	1937	2302	4520	4600	36498	64199	76451	78551	68452
Spatial evolution (ha)	25	102	*	154	*	*	774	1015	1069

* - no data

Table 1 Population and spatial evolution in Hunedoara city between 1850 and 2002

2. WATER MANAGEMENT ASPECTS BETWEEN 1956 AND 2012

The period is characterized by profound changes in the management of water resources in the lower basin of Cerna. The development of C.S.H.'s industrial area imposed many changes in the course of Cerna between the Castle and Peștișu Mare village. To make room for the new blast furnaces, the coke plants, the Steel Mill 1 and 2 and the rolling mills near Peștișu Mare, the Cerna river is channeled and diverted to the east, resulting in a wide flat area on the left bank (Fig. 3).

Downstream of Hunedoara regularization works were performed near the villages of Cristur and Bârcea Mică, furthermore some channeling work was done

near the point were Cerna flows into the Mureş river. During these works in 1967 some embankments were put up from Cristur to Sântuhalm to protect from any flash floods.

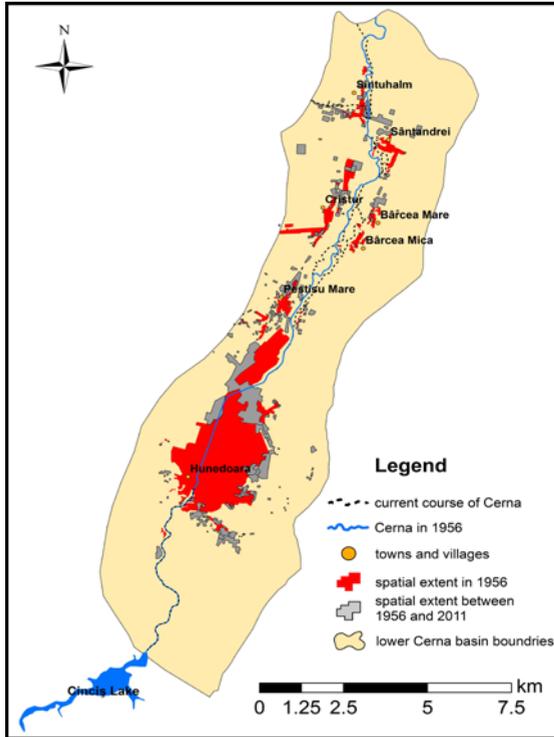


Fig. 3. Cerna course between 1956 and 2011

The Cinciş dam on the river Cerna was built in order to ensure the necessary industrial water required by C.S.H which experienced after 1948, an impetuous development in steel production. The dam site was chosen at about 6.5 km upstream of Hunedoara on the eastern slopes of Poiana Rusca mountains, after Cerna's confluence with Govăjdia where geo-morphological conditions were the most favorable. The river valley was narrow, with symmetrical slopes inclined at 45 to 55 °, with rock up to date and in good quality, the riverbed alluvial deposits were small in thickness.

For unloading high waters there was built a front overflow pool, located in the central plots, with 5 openings of 6.40 m and 4 holes 1.50 x 0.60 m, being able to evacuate a flow of 250 m³/s. In the dam there was incorporated a metal pipe with a 800 mm diameter, for use as the bottom drain.

The dam execution lasted 14 months, from April 1963 to May 1964, for which the largest amount of works were: digging - 36,250 m³ and 62.000 m³ concrete structures.

Upstream of the chosen construction site of the dam six villages (Cinciş, Cerna, Plosca, Bălana, Moara Ungurului and Baia Craiului) were relocated to what became the village Cinciş – Cerna located to the east of Teliucul Inferior village.

Regarding drinking and industrial water supply in Hunedoara a major progress was made with the construction of a dam at Cinciş which was meant to have primary industrial use. The decision to build a water treatment plant at Teliucul Inferior came as a result of the exponential growth of population in Hunedoara from 4600 inhabitants in 1930 to over 36.000 in 1956, fearing that the main water supply from Sântămăria - Orlea couldn't cope with the increased demand.

The secondary role of the dam at Cinciș is to supply electricity. The electricity is generated by CHEMP Cinciș. The power station was built in 1985 on the industrial water feed pipe with an installed power of 850 Kw.

3. CONCLUSIONS

Over the last 150 years in the management of water resources in the lower basin of the Cerna there were major changes in the context of spatial evolution of Hunedoara city and the villages downstream of it.

The most significant changes occurred in the riverbed form of Cerna: upstream from the city of Hunedoara the Cinciș dam was constructed, downstream drainage works and minor adjustments of the course are carried out, including the construction of an embankments between Cristur and Sântuhalm. In the Hunedoara municipality Cerna is channeled and diverted to make room for the industrial area.

In parallel with the changes in the riverbed there were significant progresses made in terms drinking and industrial water supply by building the dams at Cinciș and Zlaști and the water treatment plant at Teliucul Inferior village.

Currently the lower sector of Cerna between Cinciș and Santuhalm is a anthropic sector, the various technical works were aimed at reducing the vulnerability and optimal use of agricultural land between Hunedoara and Santuhalm. In the future it will be necessary that hydrotehnic works focus on the Peștisu Mare - Cristur sector in order to reduce vulnerability by building embankments and channel the whole course.

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