

THE POTENTIAL MEASURES FOR REDUCING THE DROUGHT EFFECTS IN DANUBE FLOODPLAIN, ON SADOVA-CORABIA SECTOR

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Abstract

Changes occurring at the global and regional level as a result of climate change generate a series of problems with a significant negative impact on local communities, on aquatic and terrestrial ecosystems, on the local economy and on the entire society. The medium and long-term effects of these phenomena are difficult to quantify and evaluate, but scientific research can bring innovative, realistic and pragmatic solutions, with the aim of reducing the main negative effects in an important area affected by the extreme events, such as drought, aridization, desertification, flash floods, all in the context of the climate change. The present paper is focused on the aspects related to the water management in drought affected areas of the Danube Valley, taking in to account a study case placed in the Sadova-Corabia sector, a riverside sector of the Danube River, which include an important part of Dăbuleni area, considered the "pole of desertification" in Oltenia region and even in Romania. As a novelty element, the paperwork brings to attention a holistic approach regarding the implementation of the measures that respond equally to the requirements related to water management both the requirements of the Water Framework Directive 2000/60/EEC, but also to the Flood Directive 2007/60/EEC.

Keywords: climate change, drought, water management

INTRODUCTION

Water is an essential matter in maintaining biological life and processes, is also a part of the natural hydrological cycle, conditioning all economic and social activities and must be taken into account in development policies in all fields. The climate change process, represented by floods and droughts, affecting both the environment and human activities, from economic and social point of view. In general, due to the effects of climate change on water-dependent economic sectors, there is still a need for greater clarity and precision on the climate impact between sectors and for future knowledge integration in cross-sectoral cooperation activities, e.g., between flood risk management, inland navigation, hydropower or agriculture. This will help to better establish measures programs to promote win-win integrated solutions. In

addition, it will allow more efficient identification of priority and new actions, which will be addressed at the river basin level, as is already the case with the water deficit and drought. It is expected that the water shortage and drought will become relevant over time for the management of water resources in the river basin, in this regard paying greater attention to climate change. In Romania, according to the EUROSTAT 2017 data, the WEI + water exploitation index, at national level, did not exceed the limit of 20% which constitutes the warning threshold for the water deficit and much below 40% which is the limit for the severe water deficit. Romania is one of the EU countries with the lowest water availability per capita. Water demand is expected to increase in the future, mostly for irrigation due to the increasing frequency and magnitude of droughts. At

this moment 62% (1,863,392 ha) of the irrigation network are not viable.

MATERIALS AND METHODS

For the preparation of this paper, a series of materials used in water management were used, namely management plans for the Jiu, Olt and Danube river basins, reports and evaluations carried out in the water quality analysis laboratories, data on the condition of the soil with information for the Danube floodplain area on the Sadova-Corabia sector. The methods that were the basis of the study are the questionnaires results from the field visits, the different comparisons, establishing the similarity of the existing situation in the Sadova-Corabia area with other case studies from Europe, in the sense of the identify of some solutions that can be proposed as measures in the local management plans for the areas affected by drought throughout the Oltenia Plain and why not, also for the Lower Danube Meadow.

RESULTS AND DISCUSSIONS

Desertification is therefore a severe phenomenon of climate risk whose multiple causes are related to a complex of factors. Droughts are risk complex climate phenomena with a slow manifestation, which affects and implies (depending on their duration and intensity), a varied number of components of geographic environment. There are mainly caused by meteorological factors and manifest through effects not only on both atmospheric, hydrologic, pedological, vegetal, animal environment, etc. Consequently, in their classification it speaks of meteorological, hydrological, edaphic (from a pedological point of view, something related to soil nature) and agricultural drought. This is due, in the first

place, to the lack of precipitations or their deficit, and the negative effects caused on different components of the geographic environment are visible on vegetation, soil and hydrological resources. Drought is a time-based phenomenon, and aridity is a characteristic of a certain region on which two factors acted simultaneously, namely: clima and anthropogenic impact. At the European level, the *European Strategy* is elaborated on adapting the effects of climate change. This strategy was adopted by the European Commission in 2013 and established a framework and mechanism for a degree of effective preparation for current and future impacts of change climate for all EU Member States. At the level of the Danube River Basin, under the coordination of the International Commission for the Protection of the Danube River (I.C.P.D.R.), was elaborated in 2012 the *Strategy for Adaptation to Climate Change for the Danube Basin*, which is considerate the link between the Water Framework Directive and Flood Directive, and which refers to the framework conditions, climate change scenarios, water impact, vulnerability to climate change and possible measures adaptation. The impact of these climatic changes on the water bodies consists mainly of seasonal changes in the flow, the occurrence low flow situations and water deficit with the possibility to becoming more severe, producing more and more precipitation frequent, both locally and regionally.

For the Sadova-Corabia sector of the Danube Floodplain, the research established that in the study area there are designated 3 groundwater bodies: ROJI05-*Jiu's meadow and terraces*; ROJI06-*Danube's meadow and terraces*; ROOT08-*Oltenia groundwater body* and in

the next proximity of these, the ROOT13-West of the Valah Depression (deep groundwater body). The water quality status of the surface and groundwater bodies in the pilot area is present in the next table (the table 1).

Table 1. The monitoring stations and the water quality status for the surface waterbodies in the pilot area

Water body's name (WB)	Type of the WB	Water body code	Ecological Status/ Ecological Potential	Chemical status	Monitoring station	Target to achieve ecological objectives
DANUBE: IRON GATE II - <i>Chicim</i>	HMWB	RORW14_B3	Moderate potential	Bad chemical status	<i>Calafat</i>	2022-2027
<i>Jiet</i> (Old <i>Jiu</i>) spring-Danube confluence with <i>Georoșel</i> and <i>Valea Predeștiilor</i> tributaries	Natural WB	RORW14-1-29_B185	Good ecological status	Good chemical status	<i>Ostroveni</i>	2015 (achieve)
<i>Jiu</i> - <i>Restorativistic confil. Damare</i>	Natural WB	RORW7.1_B148	Moderate ecological status	Bad chemical status	<i>Zeyal</i>	2022-2027

In these quality water conditions, the measures proposed through this research consist in the development of projects that have in view the ecological rehabilitation of the rivers in the pilot area (*Jiet* and *Teslui* rivers), through the implementation of which not only an increase of biodiversity is obtain, but also a good achieving of the Framework Water Directive 2000/60/EEC objectives regarding the improvement of the ecological status of surface water bodies, but also an improvement of the status of the historically degraded soils sites in the pilot area. Some of the measures presented in this paper are selected from the questionnaires answered by the interviewees (large farmers, small farmers, research institutions, universities, etc.). From the questionnaires received from small farmers, we centralized their following requests: implementation of the solutions to limit the desertification process of the area (eg. planting acacia forests); increase productivity and implicit profits; resizing the farms, diversifying the types of crops; creating centres for product capitalization and building factories for processing agricultural products; establishment of agricultural

cooperatives, with associative character (farmer proposal); use of the solar panels to benefit from cheap energy for the pumping stations in the irrigation system (farmer proposal); rebuilding the irrigation system (proposed by *Dabuleni* farmer); restoration of the fishing areas in *Danube Floodplain* (wetlands restoration).



Figure 1. Crops in drought affected area of *Dăbuleni* by *Jiu* Water Basin Administration, 2019

Table 2. The potential measures for reducing of the drought effects in *Danube floodplain* on *Sadova-Corabia* sector

Nr. Crt.	Proposed measure	Who can implement the measure?	Risks / Remarks
1.	Rehabilitation of the <i>Sadova-Corabia</i> irrigation system for and maintaining it in working order	Ministry of Agriculture ANIF Dolj	The main risk can be the <i>Danube</i> River water quality. On the other hand the neighborhoods with <i>Natura 2000</i> protected sites can be an impediment. There is a project completed in 2017, financed by the <i>World Bank</i>
2.	Use of groundwater (deep water bodies) for irrigation in agriculture fields	Big farmers	It is not approved by the <i>Romanian Water Law</i> (Strategic resource) From Quantity point of view the ground water bodies can be affected in the long run.
3.	Improving the condition of the secondary irrigation canals	ANIF Dolj Ministry of Agriculture	There are project proposals in this regard, some have already been started
4.	Extension of the channel systems for smaller lots in the pilot area	Big farmers ANIF Dolj Ministry of Agriculture	Requires Feasibility Study Land improvement specialists claim that they have found through other projects that in the <i>Danube Floodplain</i> the land configuration has changed a lot compared to the 70s.
5.	Adaptation of the irrigation system to the conditions of the area, to the types of crops and to the climatic changes (use of other irrigation methods - eg drop by drop, etc...)	ANIF Dolj Ministry of Agriculture Big farmers	There is research conducted within <i>Dabuleni</i> Research Institute
6.	Adaptation of crops to the conditions of the area Use of hybrid varieties adapted to drought	Big farmers Small farmers	There are researches conducted within <i>Dabuleni</i> Research Institute. Large farmers implement sea buckthorn, raspberry, etc. crops.

From the water management system point of view, the most important measures are provided in the table no. 2, for example the rehabilitation of the entire irrigation system, use the groundwater bodies sources, extension the secondary channels in the study area and not at least use of the best hybrids adapted to drought.

CONCLUSIONS

After the expert judgment evaluation, the conclusions were that there are two areas of interest (Figure 2):

- the red area-the area of large farms, where the water supply is assured using the ANIF channels system;
- the orange area- area of small farms, that use the groundwater sources.

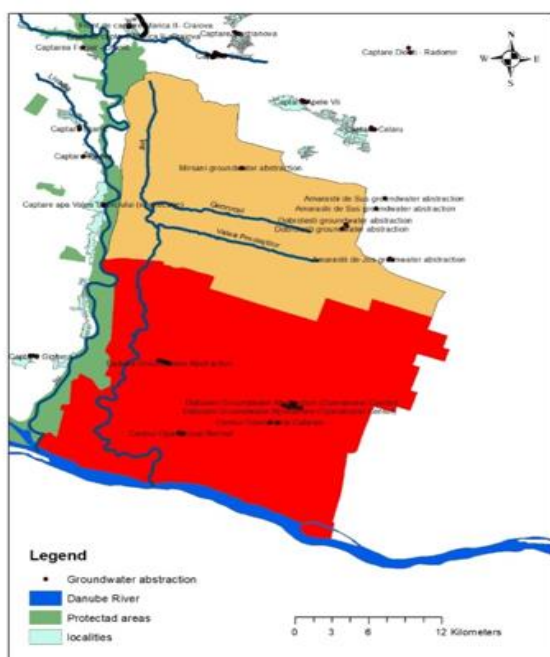


Figure 4 The map of the study area

The main measures proposed for the red area are:

- implementation, by the ANIF and the Ministry of Agriculture of the projects that will ensure the bringing/spread of water on agricultural lands for a good functioning of the irrigation systems;

- development of the public-private partnerships for the transfer of water from the Danube towards the fragmented plots of big and small farmers;

The main measures proposed for the orange area:

- there is a great reluctance regarding the effective involvement of stakeholders;

- development of research for obtaining drought-resistant hybrids (plant varieties).

ACKNOWLEDGEMENTS

This research work was carried out with the support of the Jiu Water Basin Administration and NA *Apele Romane*, starting with the draft report of the BLUE DEAL Phase I project, *Integrated Water Resources Management through stakeholders involvement- a case study on drought in the Oltenia plain*, an Romanian -Dutch Water Authorities bilateral cooperation.

REFERENCES

<https://jiu.rowater.ro/proiect-blue-deal/>