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# Irrigated Perimeters and Eco-Social Diagnosis. Case Study: North Brăila Terrace

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## ABSTRACT

The irrigation systems determine the modernization of agricultural activities by promoting technical innovation and emancipation of rural social networks, by inducing and dissipating the organizational behaviours and transformation of rural traditional values. As a response to the rural patrimony changes, the hydro-agricultural development generates strong agricultural zones with diverse agricultural structures and socio-ecological particularities. In these spatial economic contexts, the rural communities manage to keep food insecurity under control, to reduce unemployment, mainly in the case of male labour force, to promote rural women's economic involvement.

## 1. INTRODUCTION

The rural area of Brăila Terrace, consisting of the 4 investigated communities, includes 13 villages; the average number of villages per commune is 3.2; the population of this area totals 11,169 inhabitants.

The population density, specific to this region, registers low values, ranging from 0.15 inhabitants/ha (commune Siliștea) to 1.2 inhabitants/ha (commune Cazașu). The main resource of the investigated area is the patrimony, hence *the main development pattern being the patrimonial pattern*, in terms of sustainability.

The patrimony is a territorial resource for the construction and alternative development of rural areas, making up a social construction that structures and differentiates the rural sub-systems of the North Brăila Terrace.

The analysis of the modality in which the irrigation system determined the patrimony change identified the reaction mode of the territory, of the social spaces in which new organization modalities appeared around the existing resources.

The study conducted in the rural sub-system defined by the localities Cazașu, Tudor Vladimirescu, Siliștea and Vădeni was carried out according to the ecologic connectivity requirements: the functional approach to the relation between the social networks and the environmental factors; redefining the relations between the local players according to the organizational system generated by the irrigated rural structures.

The history of ecologic connectivity, of the economic and social transformations, with significant sociologic implications, makes it possible to find out the main characteristics of the patrimonial change process. The system was constructed in the period 1969-1972, enabling the development of rural communities, and inducing agrarian cohesion and adoption of modern values.

With the macro-social changes, the irrigation system became increasingly dysfunctional, while at social level negative phenomenon appeared and got multiplied, generated by: poverty, *gray economy*, and economic polarization.

The rural patrimony is no longer tributary to the irrigation system, the rural communities are trying to adapt using individual schemes, whereas the rural stakeholders are trying to follow a capitalist logic in which both modern and traditional values that govern the relations with the environment are missing.

## 2. THEORY AND METHODOLOGY

The present rural development patterns are based upon the inter-conditionality of processes, resources and factors that are characteristic for a defined space. The correlated analysis of the social factors and environment represents a redefinition of modalities in which nature-society relate, “...the territory has become a reaction, intervention mode, making it possible for the patrimonial development forms to emerge. This results from the togetherness of stakeholders in favour of the emergence of the new organization modalities around the existing resources” [3]. Among the national concerns for deciphering development on the basis of social processes, we can mention: the academic studies conducted by the Research Institute for Quality of Life, such as: “*Social Capital as Premise for Sustainable Development*” by Bogdan Voicu and “*Employment Phenomenon and Sustainable Development*” by Ana Maria Preoteasa. At international academic level, the main theories were developed by: Pierre Bourdieu – *The Forms of Capital* (1986), in which he differentiates three forms of capital: economic capital, cultural capital and social capital [1]; Robert Putnam - *Bowling Alone: The Collapse and Revival of American Community* (2000) – the main advocate of the concept (yet not its creator) considers that this concept “refers to the collective value of all social networks” [5]. Nan Lin has a more individualistic approach to the social capital concept “investments in social relations of returns” [4]. The social relations as driving engine of economic, ecological and social sustainability represented the main subject of development patterns [2]. The sociological dimensions of the economic and social development were investigated by: Abdmouleh Ridha, 2009, Beaurain Christophe, 2009, Zacai Edwin and Villalba Bruno, 2006, Bourdeau Philippe, 2009.

By establishing the extent to which the irrigation system influenced the rural patrimony, it made possible to use the statistical and organizational analyses of the investigated rural communities.

The methods on which the study was based were the interview and the direct observation.

The information sources that have been used are official data and data obtained from field surveys conducted under a research project<sup>1</sup>.

## 3. RESULTS AND DISCUSSION

The analysis on the quality of environmental factors in the rural area North Brăila Terrace took into consideration elements such as: air, water, soil and natural protected areas.

For the perimeter consisting of the four communes: Cazașu, Tudor Vladimirescu, Vădeni and Siliștea, air quality is monitored at the Station Brăila 3 (located on the territory of the commune Cazașu). This monitors the average pollution levels in the suburban area due to the transport of pollutants that come from Brăila municipality. The monitoring has in view the evaluation of population and vegetation exposure from the localities from the fringe of the urban area, on a representative area of 25 – 150 km.

Table 1. Value of pollutants, 2008-2010. Yearly average concentrations (µg/mc).

Pollutant	2008	2009	2010	Accepted limit value <sup>*)</sup>
Nitrogen dioxide (NO <sub>2</sub> )	8.61	9.00	7.59	40
Sulphur dioxide (SO <sub>2</sub> )	10.3	10.8	13.9	20
Suspension powders (PM <sub>10</sub> ), out of which:	-	-	-	-
nephelometric PM <sub>10</sub>	32.5	22.3	27.3	40
gravimetric PM <sub>10</sub>	9.0	23.0	23.6	40
Heavy metals - lead (Pb)	0.006	0.006	0.005	0,5
Carbon monoxide – CO	0.204	0.169	0.29	10
Ozone – O <sub>3</sub>	33.5	69.7	85.2	120

<sup>\*)</sup> OM 595/2002

Source: Report on the quality of environmental factors in Brăila County, 2010, Station Brăila 3, Environment Protection Agency Brăila

Air quality in the period 2008-2010 was very good, if we take into consideration the values of yearly average concentrations of pollutants under monitoring that were much below the legally accepted limits.

On the territory of communes Cazașu, Tudor Vladimirescu, Vădeni and Siliștea there are no surface water resources. The only water course that crosses adjacent areas is the Danube. In the period 2008-2010, this river was under monitoring on five sections, and the average values of most physical-chemical quality indicators indicated that the river waters were within the limits of the 2<sup>nd</sup> quality class. Although it is subject to the polluting effect of used water discharge, due to the high river water flow, pollutant concentrations do not produce any modifications of the quality class.

<sup>1</sup> FP-7 Project - Sustainable Irrigation Water Management and River - Basin Governance: Implementing User-Driven Services, (SIRIUS), 2010-2013.

As regards the *ground waters*, these are found in the low and high depth phreatic aquifer layers. The measurements reveal an exceeding of the content of organic substances, iron, nitrites, total hardness (the main source being the anthropogenic load) and of the non-treated used water discharges. A high level of mineralization is also found, the values of indicators fixed residue, chlorides, sulphates being exceeded in most monitored drillings.

The total length of the drinking water distribution network is 95.3 km: commune Cazașu - 21.1 km, commune Vădeni - 33.6 km, commune Silișteea - 15.2 km and commune Tudor Vladimirescu - 25.4 km.

The drinking water is supplied from surface source, through the zonal system of Brăila, and the raw water source used for obtaining drinking water is the Danube, the water catchment being made through a shore water intake, located in the vicinity of the locality Chișcani. Water is treated in two stations: Chișcani and Brăila. Each year, drinking water is monitored on a monthly basis, and the quality category of drinking water is A2. The pig breeding farm Brăila - Baldovinești Farm is located in the investigated area, where the discharged used water volume was 1,125 million m<sup>3</sup> in 2008, 1,156 million m<sup>3</sup> in 2009 and 1,247 million m<sup>3</sup> in 2010.

The environment authorities from Brăila county made a series of controls on this farm and found out an exceeding of the accepted limits of the quality indicators of used water discharged into the Danube; at the same time, on the occasion of these controls, it was found that the existing equipment from the used water treatment station is not operated and maintained according to the legal norms, the waste produced on the farm is not legally managed, i.e. the slurry (dejections) from the water treatment station.

At the same time, it was found out that no necessary measures are applied in order to remove the unpleasant smell generated by the farm, which has a negative impact upon the people living in the area.

The *soil* situation is closely linked to the land use modality, to the land structure.

The degraded and non-productive land accounts for 18% of total non-agricultural land in the commune Cazașu, 12.9% in the commune Silișteea, 49% in the commune Tudor Vladimirescu and 5.7% in the commune Vădeni.

The soil in the four communes belonging to the investigated area has certain pollution problems as effect of anthropogenic activities, namely:

- past practice of intensive agriculture;
- irrational use of pesticides; discharge of industrial pollutants in the water courses that contributed to the pollution of ground water layers, as well as of soil by using this water for irrigations, the pollutants remaining in soil;
- disturbance of the soil water and hydro geological system; past use and operation of the

irrigation systems without simultaneously using the drainage systems, which led to the emergence and development of soil salinity and secondary swamping phenomena;

- the absence of a sewage system leads to the pollution of soil and ground waters; waste storage in inadequate places (in the fields, on the road side, in the vicinity of dwellings).

Table 2. Land distribution by categories of use in the testbed area.

Category of use	Area – ha -			
	Cazașu	Silișteea	Tudor Vladimirescu	Vădeni
<b>Agricultural total</b> , out of which:	<b>2,428</b>	<b>10,168</b>	<b>6,786</b>	<b>11,514</b>
Arable	2,196	9,701	5,943	10,733
Orchards	111	65	-	10
Vineyards	21	48	37	31
Pastures	100	354	806	740
<b>Total non-agricultural</b> , out of which:	<b>260</b>	<b>1,480</b>	<b>1,066</b>	<b>4,394</b>
Forests	11	288	49	1,743
Waters	49	523	137	1,211
Buildings	91	218	186	838
Communication ways	62	260	171	351
Degraded and non-productive land	47	191	523	251
<b>Commune total</b>	<b>2,688</b>	<b>11,648</b>	<b>7,852</b>	<b>15,908</b>

Source: Locality fiche, INS-BDL, Brăila, 2010.

The rural domestic waste storage platforms were declared non-conform and had to cease their activity by July 2009.

At present, an ecologic domestic waste storage area has already been built and has authorization for operation. The ecologic storage Muchea has a designed capacity of 1,668,800 m<sup>3</sup>, a storage area of 18.1 ha and it will cease its activity in 2018 or when it has covered the storage area. The domestic waste and industrial waste assimilable to this, generated by the economic operators and the population from Brăila municipality and from the adjacent areas are removed to this storage place. In the four investigated communes, waste collection and transport is made by specialized firms, and waste is stored at the ecological storage site Muchea (village belonging to the commune Silișteea).

On the territory of investigated communes *special protection areas* are found: two sites of community importance (SCI) and two sites of special avi-faunistic special protection (SPA) as part of the European ecologic network Natura 2000 [8].

Table 3. SCI and SPA sites in the investigated area.

Site name	Site code	Administrative territorial area where the site is located
Lunca Siretului Inferior	ROSCI0162	Măxineni, Siliștea, Vădeni
Ianca - Popu - Sărat – Comăneasca	ROSCI0305	Ianca, Movila Miresii, Romanu, Traian, Tudor Vladimirescu
Ianca - Popu - Sărat	ROSPA0048	Ianca, Movila Miresii, Traian, Gemelele, Tudor Vladimirescu
Lunca Siretului Inferior	ROSPA0071	Măxineni, Siliștea, Vădeni

Source: Report on the quality of environmental factors in Brăila County, 2010, Environment Protection Agency Brăila

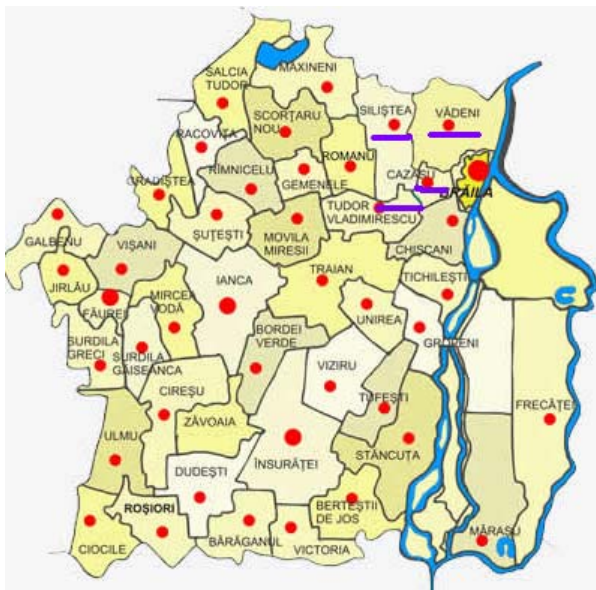


Fig. 1. Brăila county and the testbed area – Cazașu, North Brăila Terrace.

The evolution of the demographic patrimony specific to the investigated area – the rural communities Cazașu, Tudor Vladimirescu, Siliștea, Vădeni – is defined by the modernization of the socio-economic structures; the specific demographic process was the decrease in number of the rural population, being determined by the demographic evolution specific to the respective rural communities and by the economic and technical changes induced by the zonal agricultural strategies.

*The demographic patrimony is defined by:*

- balanced structure of genders, the share of female population is 50.2%;
- demographic ageing: the share of population aged 60 years and over is 23.1%; in 2010, the community Cazașu had the highest share of aged population: 27% of total population;
- severe demographic phenomena: the birth rate in the rural area is 8.5%, whilst death rate reached

13.9%. The natural increase of the population was noticed only in the rural community Siliștea (+5.9%), while in the remaining communities it had negative values, ranging from - 19.5% in commune Tudor Vladimirescu to - 1.2% in commune Cazașu. The particularity of the occupational pattern consists in the occupational disequilibrium generated by the prevailing employment in the agricultural sector. The excessive contraction of the job supply supports this pattern, which has become specific for the rural area in Brăila County.

The excessively large shares of the population employed in agriculture describe the excessive economic and social dependence on this activity, both economically and socially, which also indicate the maximum risk the respective rural communities are facing. A mainly mono-occupational structure is materialized into an increased vulnerability to any type of natural, economic and social risk. The unemployment phenomenon affects the employed population of the investigated area, the most vulnerable group being represented by the male population.

Table 4. Occupational structure indices (%).

Commune	Share of employed population in total rural population	Share of employed population in agriculture in total employed population
Siliștea	33.0	76.0
Vădeni	38.0	62.0
Tudor Vladimirescu	35.0	63.0
Cazașu	38.0	62.0
Investigated rural area	35.7	58.0

Source: own calculations based on the data from the Locality Fiche, Directorate of Statistics from Brăila county, 2010.

Table 5. Unemployment indices (%).

Commune	Share of unemployed in total population	Share of male unemployed in total unemployed population
Siliștea	4.4	85.2
Vădeni	3.1	68.1
Tudor Vladimirescu	5.2	83.8
Cazașu	4.0	74.6
Investigated rural area	4.0	76.5

Source: Commune fiches applied in the period June 2011, March 2012.

Although at the level of statistical analysis problems can be identified as being determined by the lack of jobs, and the not enough diversified supply, at the social analysis level much more complex problems have been established. In the opinion of formal leaders vulnerability is the result of the lack of finance, poverty, and incorrect application of agricultural policies.

Table 6. Problems of the investigated rural areas.

Commune	Problems of the community
Siliștea	Temporal gaps of subsidies – non-concordance between the periods when these are necessary and the terms in which they are allocated
Vădeni	Lack of finance for commune modernization
Tudor Vladimirescu	Lack of jobs
Cazașu	Rural poverty

Source: Commune fiches applied in the period June 2011, March 2012.

The identification of problems is tributary to the socio-economic history of the zone; the collective mentality, generated many decades ago, according to which the problems are generated only by factors outside the community and must be solved by exogenous factors are materialized into problems identified by the leaders.

The social patrimony is characterized by: social relations with positive effects (information transmission, knowledge and information exchange and internalization of the interests of the group the rural players are part of) and negative effects (their sticking to the traditionalism matrix enables the emergence of the anti-innovatory behaviour and the low internalization of values referring to the natural environment preservation). The first category of social relations relies on the organization of water users into formalized entities (there are 6 irrigation water users' organizations) and on the establishment of producers' associations ("Association of sheep and cattle raisers" from the locality Siliștea).

Table 7. Perception of water users' organizations by the formal leaders of rural communities.

Locality	Irrigation water users' organizations is beneficial because:
Siliștea	- it respects members' rights - it settles down the intra-organizational conflicts - it settles down the inter-organizational conflicts
Vădeni* Tudor Vladimirescu	- it respects members' rights
Cazașu	- it respects members' rights - it helps members - it settles down the intra-organizational conflicts - it complies with the members' requirements/wishes

\*missing data

Source: Commune fiches applied in the period June 2011, March 2012.

The water users' organizations are a true relational nucleus benefiting the whole rural

community as it supports and promotes the specific principles/values of:

- organizational cohesion: "We understand each other, we are like a family, we have no problems." (IWUO president Petriou); "There are no problems, the person with 440 hectares pays, and then he gets his money back." (IWUO member APT Comăneasca, commune Tudor Vladimirescu).

- organizational solidarity: „The rights are ensured by law” (WUO president, Siliștea).... "Farmers get help; water is paid for the small farmers who became members because they grow vegetables." (IWUO member APT Comăneasca, commune Tudor Vladimirescu).

The social relations with negative effects are determined by:

- poverty: "...people are aware of being dependent on water but they are too poor to irrigate, although they are the small private farmers who do not have any other source of money." (IWUO member APT Comăneasca, commune Tudor Vladimirescu).

- minimum rural cohesion generated by a specific participatory pattern. The involvement in the community life is ambivalent; a non-involvement in the public works exists: "Lazy people, if the town hall has something left, why can't we get it as a gift" (employee, Cazașu town hall), "No, the great majority are old people." (vice-mayor, commune Tudor Vladimirescu). There is also a manifest participatory pattern: "They are eager to do things, 50 people came up to shovel off the snow" (town hall secretary Siliștea).

#### 4. CONCLUSION

The environmental factors do not constrain the functionality of the irrigation system.

For the investigated period, i.e. 2008-2010, air quality was very good. The main surface water, the Danube river, is the water source for irrigations. Water quality from the phreatic layer is not in accordance with the drinking water standard, due to the influence of the anthropogenic factor upon the surface waters, which is transmitted by leaching to the phreatic layer. The ground water is used for household needs, which do not require quality water and is not used for irrigations.

Under conditions of non-irrigating land, certain modifications of the soil characteristic in the present weather conditions can be produced, with a higher drought risk. The application of agro-chemicals and the effect of pollution with waste coming from livestock production represent risk factors for soil quality. The demographic patrimony is a restrictive factor for the irrigation system functionality; the population decline and the population's demographic ageing contribute to the increase of rural passivity and to the very low involvement in the process of innovation and modernization of agricultural activities.

The social patrimony has positive implications, being one of the beneficial factors of the irrigation system. The socio-economic history of the modality in which the irrigation system has been used proves the possibilities of rural communities to adapt to agricultural modernization through the intermediary of the social capital.

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