SUSTAINABLE RECONSTRUCTION – CONCEPT OF DEVELOPMENT FOR HUMAN SETTLEMENTS SYSTEMS (CASE STUDY – BACĂU DISTRICT)

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Abstract: The author presents her own research made in the inter-disciplinary research project "Research concerning an ecosystemic approach to sustainable development at administrative-territorial level", project financed by National Council of Scientific Research in High Education (CNSIS). The project is ongoing at district level in three phases: in the first phase, year 2004, ecosystems and human habitations were identifed and a diagnosis was made; in the second phase, year 2005, a concept and a development model was elaborated based on the achieved diagnostics; in phase three, year 2006, the elaboration of a sustainable development strategy of the district shall follow, based on the proposed model.

Keywords: sustainable reconstruction, human settlements systems, ecosystems, territorial ballance, hazards.

1. INTRODUCTION

According to the General Theory of Systems, human settlements systems were considered particular types of systems, made out of a multitude of elements organized after certain rules and of the relations between them.

The constitutive elements of human settlements systems were considered to be environment factors like: water, air, soil, flora, fauna and human settlements.

This way of interpretation was based on the utilization of analytical methods in interpreting independently the environment factors in interaction with the other factors.

The development of theoretic basis of ecology with the elements specific to systems and cybernetics after 1970 led to the conception that environment is organized as systems between which there are specific hierarchical relations established.

After year 1972, The Convention on Biological Diversity Preservation acknowledged that environment is organized as systems between which there are specific hierarchical relations established. The theoretical concepts which are laid down as a basis for understanding environment organization and for solving problems regarding man-nature relation were gradually consolidated from the initial phase defined as "biological ecology" to the today's "systemic ecology" or science of ecological systems.

Systemic ecology is the science of huge, complex systems, interpreting the dependence relation in management activity between socio-economical infrastructure and bio-physical infrastructure which upholds it (providing it

with mineral resources and energy and processing its wastes), as well as between man and nature on different scales of space and time [1].

Up to early 1990, ecological research was made at the level of systems as local ecological systems, excluding those made by man, which led to the practice of a sectoral and nonperformant management on the long run, having as consequence the accumulation of certain effects which generated the "ecological crisis" or the "relation crisis" between man and nature.

Today, it is recognised that human settlements systems which were interpreted for a long time as an ensemble of natural factors or environment factors made of air, soil, water, vegetal and animal organisms and human settlements, represent, in fact, complex systems formed of series of systems organized hierarchically, in space and time.

The organization of nature on space-time scale (at local, district, regional, national, macroregional, ecosphere level) into a hierarchy of interdependent and one into the other integrated systems, comprises all components of the physical and biological natural environment, transformed or built up by man.

2. METHOD

For the elaboration of the development concept following steps were made:

2.1 Identification of ecosystems and systems projected and built up on district territory

Identification was made on basis of the existing maps: Plan of Organization of District Territory and General Urban Plan of Human Habitations.

2.2. Investigation and diagnosis of ecosystems and systems projected and built up

Investigation was made on basis of direct observations made in the field and of information received from the decentralized institutions of the district. Goal of this step was to evaluate the health condition and the production and support capacity of natural and seminatural ecosystems, identification of zones in need of investments (zones with low living standard, zones without industry, but with resources, zones geographically isolated, polluted or degraded zones, zones which should be submitted to industry restructuring, zones with big potential hazards, anthropical or natural, zones characterized by inactivity, zones in need of technical and public utility infrastructure, zones in need of transport and telecommunications infrastructure etc.), identification of resources which are not attracted into economical circuit and elaboration of solutions concerning their valorization, type of investments, identification of financing sources, priorities aiming at structural and functional preserving of ecosystems and providing an economical-social and ecological balance at the level of human settlements systems.

2.3 Drawing up of territorial balance

The territorial balance (table 1) shows a global image over the whole territory, the weight of each type of ecosystem in the total area of the district, the deterioration degree of ecosystems, the way of using lands.

Table 1. Territorial balance and health condition of ecosystems and systems projected and built up

Ecosystems	**Area (ha)**	**Weight in district area (%)**	**Weight in ecosystems area (%)**
A. AGRICULTURAL ECOSYSTEMS			
AREA TOTAL (ha) out of which:	323.415	48,85	
- arable land	184.742		57,18
- vineyards	5.126		1,58
- orchards	1.675		0,52

Ecosystems	**Area (ha)**	**Weight in district area (%)**	**Weight in ecosystems area (%)**
- pastures	88.122		28,27
- hay fields	40.157		12,43
DEGRADATION DEGREE			
- undegraded soils	7.980		2,4
- moderately degraded soils	141.204		42,5
- highly degraded soils	99.868		30
- very highly degraded soils	83.383		25,1
TYPES OF DEGRADATION			
- salted soils	4.537		
- marshy land	40.988		
- acidification	80.419		
- land settling	102.815		
- erosion	200.413		
B. AQUATIC ECOSYSTEMS			
TOTAL AREA (ha) out of which:	14.763	2,23	
- lakes	6.436,25		43,6
• natural	4,6		0,031
• artificial	6.431,65		43,5
- rivers	8.326,75		56,4
Critical zones as regards quality (the most disadvantageous indicator)			
- SIRET RIVER - on the section from entrance to the district as far as to the confluence with Coteşti			
- BISTRIŢA RIVER – on the section downstream from Bacău as far as to the confluence with Siret			
- TROTUŞ RIVER – on the section downstream from Oneşti as far as to the confluence with Siret			
- reduction of the biodiversity as a result of pollution with city and commune residual water, insufficiently purified or unpurified, as well as with industrial water			
C. FOREST ECOSYSTEMS			
TOTAL SURFACE (ha) out of which:	279.059	42,15	
- forest	270.975		97
- grounds for regeneration	302		0,1
- grounds for crops	115		0,04
- natural reservations	33		0,01
- grounds of forest households	2.522		0,9
- unproductive grounds	122		0,0437
- grounds taken out of the forestal fund	15		0,0053
MAJOR RISKS			
- reduced afforestation rate on areals: A. mountain 121215 ha 44% B. hill 118460 ha 43% C. tableland 35814 ha 13%			
- pollution with wastes from exploitation			
- unbalances on age classes			
- uncorrelation of the cutting quota, with the forests possibility calculated through the forest plannings for every production unit			

Ecosystems	**Area (ha)**	**Weight in district area (%)**	**Weight in ecosystems area (%)**
- compressing of the cuttings in the accessible forest massives			
- intensive extension delay of the treatments which promote the natural regeneration			
- non-execution of attendance and leading works on brushwoods, hygene works etc. on all the surface needing such intervention			
- non-exploitation on due time and, implicitly, the inadequate capitalization of the wooden mass			
- the „free to choose" valorization of the forest species to be exported as raw and semi-finished materials			
- reduction of the biodiversity flora and fauna as a result of massive afforestations			
D. PROJECTED AND BUILT UP SYSTEMS			
TOTAL SURFACE (ha) out of which:	30.308	4,58	
- grounds within the city	20.078		3,03
- ways of communication	10.230		1,55
Main sources of pollution in the district localities are : • domestic and industrial water purifying stations - surface water pollution; • domestic and industrial garbage/waste graves – air, earth, underground water pollution; • thermo-electrical power stations – air, earth, underground water pollution; • road, railway traffic - air pollution, air transport – phonic pollution; • wooden wastes (sawdust) – water, earth pollution. Critical zones as regards pollution: ▪ critical zones as regards atmospheric pollution: × the area near the Bacău Sud industrial platform, because of S.C.Sofert, S.C.Letea, CET; × the Oneşti-Borzeşti petrochemical platform. ▪ critical zones as regards surface water pollution: - on Siret river - Bacău Sud industrial platform zone; - on Trotus river - Borzeşti–Oneşti industrial platform; - on river Lucăcioaia, Urmeniş, Tazlăul Sărat – hydrocarbons pollution. ▪ critical zones as regards underground water pollution: ➢ areas from the enclosure or proximity of following commercial societies: S.C.			

Ecosystems	Area (ha)	Weight in district area (%)	Weight in ecosystems area (%)
Chimcomplex Borzeşti, S.C. Rafo Oneşti, S.C. Carom Oneşti, S.C. Sofert Bacău, S.N.P. Petrom-Moineşti branch, S.C. Conpet, Moineşti branch; ➢ deposits of animal dejections from animal breeding centres, due to waterproof lack. ▪ Critical zones as regards degradation of soil:	13.201		0,43
⅄ Măgura Park in Tg. Ocna city, because of salt exploitations;	519		0,026
⅄ City districts: Hangani, Lucăceşti, Găzărie, Văsăineşti – hydrocarbons pollution.	1621		0,053
▪ Ecologically vulnerable areas that need ecological reconstruction measures	133		0,0043
✧ easily floodable zones;	4537		0,149
✧ zones with deposits of sterile, wastes, ponds and ash rests from Oneşti, Comăneşti thermo-electrical power stations, Comăneşti mining enterprise, S.C. Sofert Bacău;			
✧ zones with residual products – used water, dejections, mud from the zootechnical centres and the purifying stations from towns;			
✧ oil and salted water areas include oil extraction areas and pipes route;			
✧ areas with salted grounds – in the localities: Valea Siretului, Valea Berheciului and Valea Zeletinului.			
Natural risks The district territory is subject to following natural hazards: Earthquakes – there are three seismic zones identified of B, C, D calculation, the most exposed area being the South-Eastern part respectively Onesti town and about 40 % of rural localities. Landslides – entire district surface is subject to this phenomenon, the areas with major risk being Buhusi. Faraoani, Helegiu, Livezi, Moineşti, Zemeş, Agăş, Tg. Ocna towns. Floods – due to the hydrographic network, relief, climatic conditions and economical factors, on the district surface, there are three flood risk areas which affect localities from the hydrographic basins of Siret, Bistriţa and Trotuş rivers, including their affluents. Dangerous meteorological phenomena - rains in torrents - storms and hail			

Ecosystems	**Area (ha)**	**Weight in district area (%)**	**Weight in ecosystems area (%)**
- abundant snow - snow storms and coverings Disfunctions: ➢ insufficient surfaces meant for traffic, houses, equipments, greenspaces and parking lots; ➢ big agricultural surfaces in the land within Moinesti, Comanesti, Dărmăneşti, Buhuşi cities; ➢ low capacity and high wear degree of the technical-urban public utility networks in Moineşti, Comăneşti, Buhuşi cities; ➢ inadequate placement of garbage graves, all placements are pollution sources; ➢ Dărmăneşti city does not comply to the conditions regarding the city statute according to Law 351/6th of July 2001. Neither do the small cities mett all conditions regarding equipments and urban infrastructure according to Law 351/6th of July 2001; ➢ Uncontrolled extension of cities.			
E. UNPRODUCTIVE GROUNDS			
TOTAL (ha)	14.508	2,19	
TOTAL	**662.052**	**100%**	

3. CONCLUSIONS

From the Territorial Balance analysis and the health condition of ecosystems and projected and built up systems the following results may be shown:

- critical natural capital stock – seminatural district capital, represents 359134,6 ha meaning 56% of the natural district capital;
- critical and anthropized natural capital is 631745 ha. The optimal limit of critical natural capital stock is considered to be half of the natural capital of a complex system [2] in order to be able to provide natural resources and services necessary to projected and built up systems;
- high degradation rate of seminatural ecosystems;
- high degradation rate of anthropized ecosystems;
- environment agents pollution: water, air, soil;
- irresponsible administration of forest ecosystems, the wood resource is subject to uncontrolled exploitation;
- biological diversity reduction due to pollution and irrational exploitation of seminatural ecosystems;
- high weight of unproductive lands as a result of excessive degradation;
- irrational use of land within cities and uncontrolled expansion in territory;

To all these we may add[3]

- low level of life quality;
- industrial structure and equipment exercises pressure over the ecosystems, it is an industry dependent on critical natural capital;
- industry does not create high added value, unbalanced development of localities.

Under these conditions, the development concept that answers to the real situation of the district on which the development strategy shall rely is the sustainable reconstruction that assumes remaking of production capacity and natural capital supportability, the district economy adaptation depending on its own natural capital structure and capacity, improvement of life quality.

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