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APPROACHING LAND COVER AND LAND USE CHANGES USING STATISTICAL DATA VALIDATION FOR URBAN POLICIES IMPROVEMENT

Maria Ioana VLAD-SANDRU[1,2], Corneliu IATU[2]

[1]Romanian Space Agency, [2]Alexandru Ioan Cuza University of Iasi

Introduction

Land use land cover changes are prevalent, while aggregated globally, they affect key aspects of Earth system functioning. They directly impact biodiversity loss worldwide, contribute to local and regional climate change (Chase et al., 1999), cause soil and air pollution, destroy of stratospheric ozone by nitrous oxide release from agricultural land and altered local and regional hydrology (dam construction, wetland drainage, increased impervious surfaces in urban areas). One of the most worrying and important issue on land cover changes is showed by the long-term threat to future production of food because of transformation of productive land to nonproductive uses, a conclusive example being the one of changing over agricultural land to residential use.

The main objective of the present investigation is to analyze the nature and extent of land-use/land-cover changes and to identify the main socio-demographic synergies in the urban area. The intention was to provide a better understanding and improve our knowledge about the changing land use / land cover patterns and the influencing coherence between the environment and the human being vitality, quantified by geo-information and socio-demographic indicators. Assessing this environmental patterns could be useful to an urban policy implementation, which should provide a general framework to conduct public interventions in urban areas as a reference tool for public and political awareness of the achievements to be obtained from sustainable urban development, as well as an opportunity to promote smart city territory development.

The study area consist of eight urban areas of different sizes, lying along Danube River, coming across in four counties and having in common the Danube course, which borders each administrative unit. Comply with EU Strategy for a prosperous Danube Region demanding issues, the present research focus on environmental consideration analysis, building prosperity and strengthening Romanian South-East Danube region by improvement of urban policy significance following four time series of earth observation satellite data for identifying land cover changes.

Data and methods

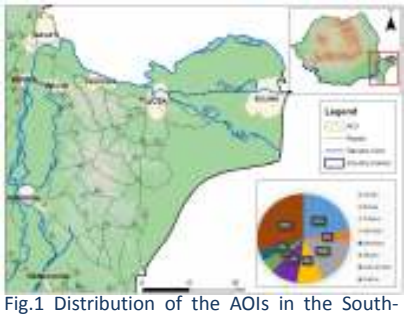

Fig.1 Distribution of the AOIs in the South-East Development Region

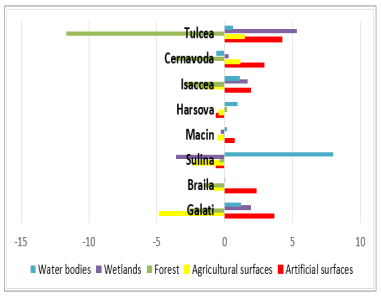

Fig.2 Annual rate of land cover change for the AOIs (2012-1990)

AoI	Artificial surfaces				Agricultural area				Semi-natural area				Wetlands				Water bodies			
	1990	2000	2006	2012	1990	2000	2006	2012	1990	2000	2006	2012	1990	2000	2006	2012	1990	2000	2006	2012
Galati	43,64	49,02	49,68	47,31	153,2	144,9	143,2	148,4	13,8	12,2	13,14	11,16	5,71	4,74	4,74	7,66	30,4	35,29	35,28	31,65
Braila	26,85	27,13	27,79	29,18	11,24	11,47	10,8	10,39	3,43	1,88	0,32	1,96	0	0	0	0	3,44	4,5	6,05	3,46
Sulina	3,6	3,73	3,72	2,96	7,67	5,25	5,24	5,38	6,22	5,4	5,38	5,87	266	264,7	264,4	262	48,4	53,39	53,4	56,36
Macin	3,58	4,73	4,73	4,3	41,24	41,38	41,43	40,71	9,56	8,66	8,58	9,49	0,66	0,36	0,36	0,36	1,21	1,1	1,12	1,39
Harsova	4,74	4,45	4,52	4,1	80,67	80,15	79,37	80,22	14,79	15,87	16,31	14,96	0	0	0	0	6,36	6,11	6,33	7,3
Isaccea	4,14	6	6,37	6,04	38,3	35,56	34,92	36,47	28,12	25,32	24,13	25,23	17	18,56	19,77	18,68	13,5	15,54	15,76	14,57
Cernavoda	4,47	5,37	5,62	7,36	26,32	29,56	28,71	27,47	8,66	4,61	5,18	4,94	0	0	0,19	0,3	4,13	3,85	3,85	3,5
Tulcea	13,28	17,79	18,07	17,52	135,7	137,4	135,8	137,2	36,52	27,12	23,54	24,87	8,1	10,5	15,13	13,41	5,95	6,72	6,86	6,56

Fig.3 Land cover change (km²) from 1990 to 2012 in the South-East Development Region

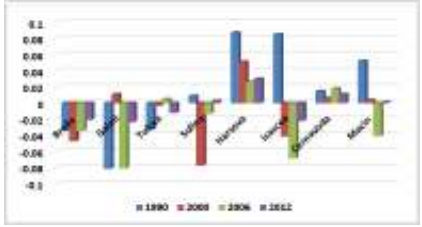

Fig.4 Total population growth rate evolution in the South-East urban areas

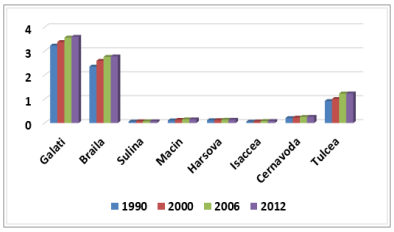

Fig.5 The extension of the living area (km²) in the South-East Danube urban areas

Results

		Statistical data					
EO data variables	Validation method	Extended living area	Private building extension	Green area	Households	T.p.growth	Average employees agric.
Artificial surfaces	Pearson Correlation	.706	.447	.150	.631	.687	-.562
	Sig.(2-tailed)	.050	.267	.722	.093	.060	.147
	N	8	8	8	8	8	8
Agricultural surfaces	Pearson Correlation	-.083	-.750	.114	.381	-.131	.143
	Sig.(2-tailed)	.844	.032	.788	.352	.758	.753
	N	8	8	8	8	8	8
Forest and semi-natural areas	Pearson Correlation	-.425	.028	-.168	-.972	-.453	.191
	Sig.(2-tailed)	.289	.948	.690	.001	.260	.651
	N	8	8	8	8	8	8

Fig.6 EO and statistical data involved in Pearson correlation coefficient

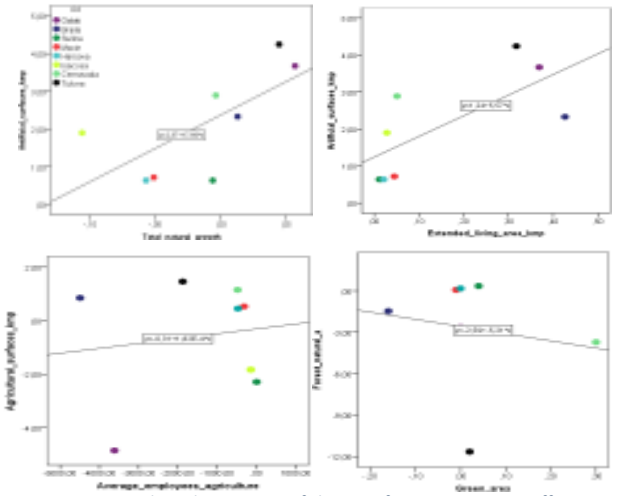

Fig.7Scatterplots description of the significant Pearson coefficient

Conclusions

Land cover change urban extent provide an useful indicator of whether regional land uses are increasing or decreasing over time. This could create an urban capacity building method for detecting and reporting land use change as a critical issue in evaluating and monitoring trends in the effectiveness of public investment in natural resource management. The involvement of models and historic data to predict past, present and future land uses changes based on specific input data and statistical correlation may help identify key drivers of land use change, implement scenario planning and fill gaps in data availability which contribute to an accurate urban extent appraisal.

The benefits of considering and become aware of changes in land cover/land use data should become more and more helpful for public authorities. The better management of land resources is essential for sustainability and for improving quality of life in cities and towns, as one of the keys to meeting commitments on several international obligations for climate change and biodiversity. Accurate, timely accessible and up-to-date information on new housing and industrial/commercial developments can be routinely provided from satellite observation in support of regional and municipal planners' decision on policy and spatial planning.

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