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SPATIAL DISTRIBUTION AND ACCESSIBILITY TO HEALTHCARE FACILITIES IN AKURE SOUTH LOCAL GOVERNMENT AREA OF ONDO STATE, NIGERIA

Omotayo Ben OLUGBAMILA*
Department of Urban and Regional Planning, Obafemi Awolowo University, Ile-Ife, Nigeria,
e-mail: olugbamilao@gmail.com

Abstract: This study examines the distribution and accessibility to healthcare facilities in Akure South Local Government Area of Ondo State. GPS was used to pinpoint the location of each of the existing healthcare facilities in the 11 political wards of the study area. In other to establish the distribution pattern of public and private healthcare facilities, the Nearest Neighbour Analysis was used. Data were also collected using structured questionnaire administered on the residents of the 11 political wards in other to assess the accessibility pattern of residents to healthcare facilities in the study area, a total of 551 questionnaire were randomly administered on the residents. The result revealed that the distribution of healthcare facilities were random rather than being clustered or dispersed and that commuting distance to the healthcare facilities is within the WHO recommended distance. The study therefore recommend that stakeholders in the health sector and Town Planners should ensure equity in the distribution of public healthcare facilities across the Local Government Area and this should take into consideration the location of the existing healthcare facilities and apply the planning standard so as to promote equitable distribution of the healthcare facilities.

Key words: Access, Akure South LGA, Health, Healthcare facilities, Spatial Distribution,

* * * * * *

INTRODUCTION

Health is a basic element of every citizen in a country. The health of man has been regarded as most important, because all economic activities are mainly carried on by man. Adeyinka (2006) posited that health is the output that people desire and not health services (input) per se for the accomplishment of improved standard of living for them. Indeed, the health of the people not only contributes to better quality of life but is also essential for the sustained economic and social development of a country as a whole (FMOH, 2004). Health related issues therefore are of strategic concern to all including government, professionals and consumers. Government and stakeholders in the health sector are concerned and focused on the provision and maintenance of such levels of healthcare that will make it possible for individuals to live socially and economically a productive life. The maintenance of good health therefore and easy access to adequate healthcare has been a challenge to mankind because healthcare as a public right is the responsibility of the governments

* Corresponding Author

and it is to provide this care to all people in equal measure (Spencer and Angeles, 2007). This challenge has led to attempts by government(s) and non-governmental organizations/outfits to set up public healthcare facilities in various parts of the world.

Access to healthcare facilities therefore varies across space because of uneven distribution of healthcare providers and consumers and also varies among population groups. In Nigeria, explicit consideration has not been given to the need for equity in the planning and distribution of healthcare facilities over the years. This has led to the emergence of many regions within the country where both public and private healthcare facilities are sparsely provided (Agaja, 2012). According to Owoola (2002) cited in Adeyinka and Olugbamila (2016) spatial distribution of healthcare facilities was not considered by government, leading to a very high ratio of the country's population been underserved by these facilities. This often brings about lopsidedness in the spatial accessibility of these facilities with one section of a state or local government area having more facilities at the detriment of others. The spatial inequality in the distribution of healthcare facilities is also reflected in the provision of hospital beds, nurses and doctors, despite the substantial increase in man power resources in the country. Available healthcare facilities are unevenly distributed. Tertiary hospitals in secured areas where large population concentrate and without adequate first contact capacity in their proximity, tend to be overcrowded with patients suffering from common conditions (WHO, 2010). Conversely, many peripheral primary healthcare facilities were not patronized because of the poor services they provide, lack of access, and competition by alternative provider. Also, informal charging by health workers may also deter service consumption (WHO, 2010). A number of factors are responsible for the variation in the spatial distribution of healthcare facilities among the states in Nigeria. Among these are population growth, economic development, increase in human knowledge, social transformation, psychological motives, political strategies, role of missionaries, roles of community development, self-help activities and as well as the nature of settlement pattern and distribution (Onokerhoraye, 1995 cited in Balogun and Alaegor, 2006).

Every government in Nigeria holds the view that a healthy population is essential for rapid socio-economic development of the country hence, healthcare is on the concurrent list in the Nigerian constitution and its allocation comes next to education and defence in the national budget. Moreover, the Federal, State and Local Governments have formulated various policies, at one time or the other, which tended to focus attention on providing and equipping health facilities and recruitment of more health work force to make health services more accessible to the people.

In spite of all this, Nigeria is still in a very poor state of health (Olujimi, 2003), because the population with access to modern health care services is 57% compared to 75% for the industrialized countries (Olujimi, 2003). Furthermore, the infant mortality rate is put at about 73 per 1000 while the life expectancy of an average Nigerian is 54 years (CIA World Factbook, 2013), as against the infant mortality rate of 5 per 1000, and 80 years as life expectancy for the countries of the western Europe and United States of America (CIA World Factbook, 2013) where access to health and medical facilities is better. In view of the foregoing, this study attempt to examine the spatial distribution and accessibility to healthcare facilities among the residents of Akure South local Government area of Ondo State with a view to provide information that will enhance healthcare facility planning.

MATERIALS AND METHODS

The study area, Akure South Local Government Area (LGA) is one of the six (6) Local Government areas classified as the Ondo central senatorial district and one of the eighteen (18) LGAs in Ondo State with its headquarter in Akure which equally doubles as the state capital and the most populated local government area in the State. It is located between latitude 7°21'N and 7°50'N and Longitude 5°50' and 7°25'. It is about 250 metres above the sea level with a landmass covering an area of 331 square kilometers. It is bonded on the north east by Akure North Local Government Area and on the North West by Ifedore Local Government Area, Idanre Local

Government Area bonded it on the southern part (see figure 1). The population of Akure South LGA in 2006 was put at 353,211 (NPC, 2006) and with an annual growth rate of 3.03% (NPC web) the projected population of the LGA in year 2015 is put at 471,100. The increase in annual growth of the population is as a result of the administrative role of the town and as well as its long standing role as a centre of economic activities which keep attracting a large number of immigrants into it.

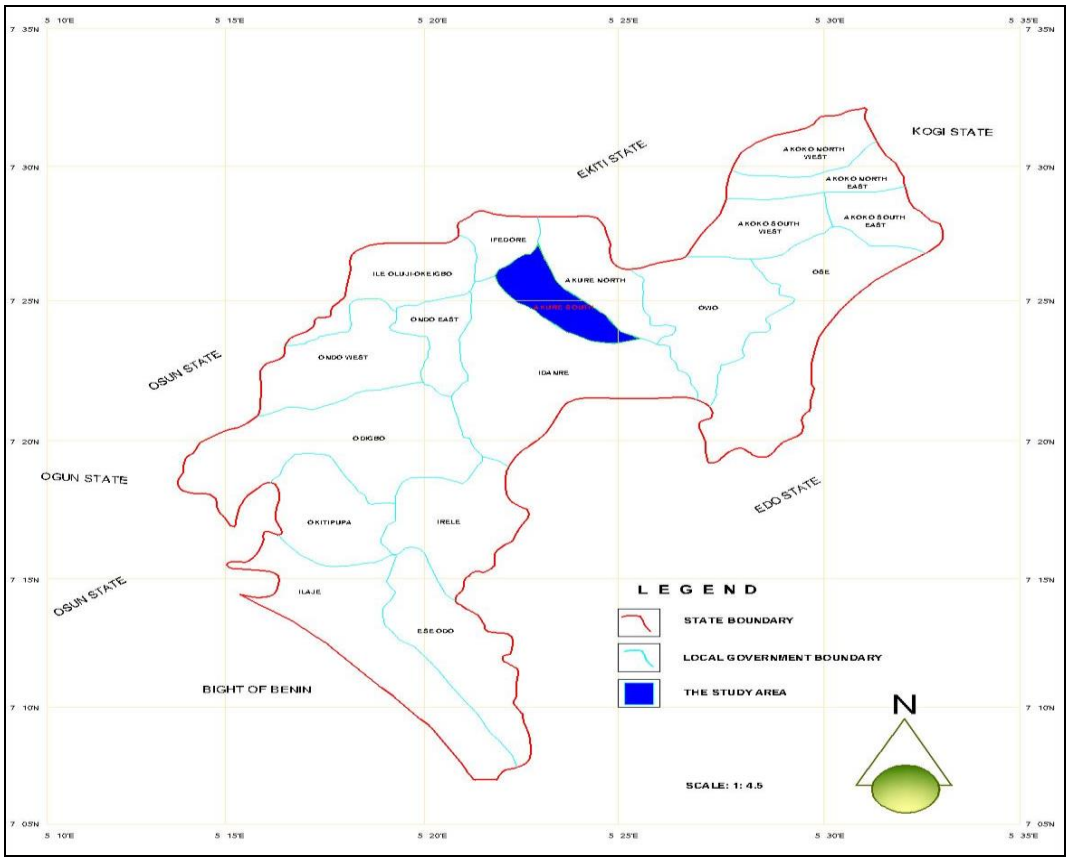

Figure 1. Map of Ondo State showing Akure South Local Government Area
Source: Ondo State Ministry of Housing and Urban Development, Akure (2015)

The study was interested in the distribution and accessibility of healthcare facilities in Akure south LGA. The study assessed the distribution of both the public and private healthcare facilities in the study area. The Global Positioning System (GIS) was used to pinpoint the location of existing healthcare facilities in the eleven (11) wards of the study area. The Nearest Neighbour Analysis (NNA) was used in analyzing the data, this was to establish the distribution pattern of public and private healthcare facilities in the study area. Nearest Neighbour Analysis is the method of exploring pattern in the locational data by comparing mean distance (Do) of the phenomena in question to the same expected mean distance (De) usually under a random distribution. The study also looked at accessibility pattern of residents to healthcare facilities in the study area. To achieve this data were collected using structured questionnaire administered on the residents on the basis of the existing 11 political wards, a total of 551 questionnaire were randomly administered on the residents of the study area across the 11 political wards of the study area.

RESULTS AND DISCUSSION

Distribution Pattern of Healthcare Facilities

Healthcare facilities in Akure south LGA are organized in a hierarchical system with three main components - primary, secondary and tertiary. Basically, the primary and secondary healthcare facilities dot the landscape in the LGA. The composition of the healthcare facilities in the local government area include 4 public secondary healthcare facilities and these include Mother and Child Hospital (figure 2), State Specialist hospital and 2 comprehensive health centres (figure 3), 32 public primary healthcare facilities and these include 1 leprosy hospital, 1 psychiatric hospital, 30 basic health centres. Others are 98 privately owned hospitals categorized into secondary and primary (including dental, optical and laboratories) (figure 4).

Figure 2. Mother and Child Hospital, Akure

Figure 3. Comprehensive Health Centre, Akure

Figure 4. Crown Hospital (Private), Akur

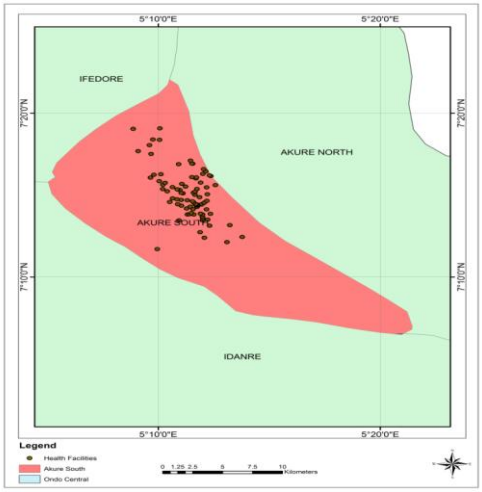

Figure 5. Spatial Distribution of Healthcare Facilities in Akure South LGA

The local government area has the highest number of healthcare facilities in the State, it has a total of 134 registered healthcare facilities that constitute 61.2 percent of the entire healthcare

facilities in Ondo State. The concentration and distribution of healthcare facilities in Akure is as a result of the fact that the settlement doubles as the local government capital as well as the State capital. Figure 5 shows the spatial distribution of healthcare facilities in the study area.

Ownership of Healthcare Facilities

The ownership and frequency of location of healthcare facilities in the study area was examined in order to reveal the spatial pattern of distribution. Ownership of healthcare facilities across the LGA can be categorized into public and private healthcare facilities. The public providers include the governments at the three-tier levels (Federal, State and Local Governments). The private healthcare facilities are operated and owned by private individuals/organization. As shown in figure 6, out of the 134 healthcare facilities, the public ownership was found to be 36, accounting for 27% while the private healthcare facilities accounted for 73%. The above analysis validates the findings of FMOH (2004), Abolade et al., (2011) and Kibon and Ahmed (2013) that private health facilities outnumbered the public health facilities.

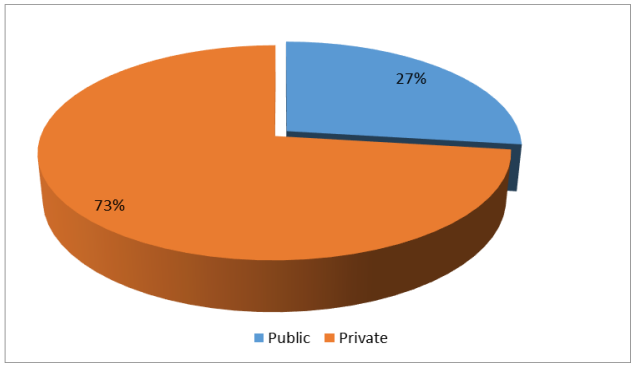

Figure 6. Ownership of Healthcare Facilities
Source: Authors Field survey, 2015

The low level of availability of government owned hospitals (teaching hospitals, general hospitals and PHC centres) versus the preponderance of privately owned hospitals/clinics has immense implication on the choice and use of these facilities. Although government owned healthcare facilities offer cheaper user cost compared to privately owned hospitals, they are however few and far apart. This shows that the private sector participates more in the establishment of healthcare facilities in the study area.

Nearest Neighbour Analysis (NNR) of Healthcare Facilities Distribution in Akure South LGA

To determine the pattern of distribution of healthcare facilities in the study area, the nearest neighbor analysis was used to statistically determine the existing pattern of distribution as to whether the distribution is regular, random or cluster in the study area. The model indicates the degree to which any observed distribution deviates from what may be expected, if the distributions of points are random. The location of healthcare facilities in the study area were captured through handheld Global Positioning system (GPS) to determine the coordinates as presented in table 1 and the spatial analysis were carried out in the GIS platform. The NNR has indices that range from zero (when there is no distribution at all) to 2.15 (when healthcare facilities have a maximum spacing and are regularly distributed). A purely random distribution has an index of 1.0 value; above 1.0 indicate a tendency towards spacing and those below 1.0 indicate clustering i.e.

$R_n = 0$: the distribution is clustered.
$R_n = 1$: the distribution is random.
$R_n = 2.15$: the distribution is regular.

Table 1. Distribution of Healthcare Facilities in Akure South Local Government Area
(**Data Source:** Authors Field survey, 2015)

S/N	Names of Healthcare Facilities	Notation	Location	Latitude	Longitude
1	Mother and Child Hospital	C1	Oke Aro, Akure	0741161	0800776
2	State Specialist Hospital	C2	Akure	0742417	0800925
3	Neuro-Psychiatric Hospital	C3	Oda Road, Akure	0745195	0798601
4	Leprosy Control Clinic	C4	Ago Ireti, Akure	0745636	0803089
5	Comprehensive Health Centre	C5	Arakale, Akure	0742287	0801998
6	Comprehensive Primary H/Centre	C6	Akure	0743243	0802841
7	Basic Health Centre	C7	Isolo, Akure	0742746	0803379
8	Basic Health Centre	C8	Oke Aro, Akure	0741146	0801421
9	Basic Health Centre	C9	Adegbola, Akure	0741186	0803232
10	Basic Health Centre	C10	Shagari Village, Akure	0742069	0805504
11	Basic Health Centre	C11	Oba Ile, Akure	0749762	0803154
12	Basic Health Centre	C12	Itaoniyan, Akure	0731238	0803786
13	Basic Health Centre	C13	Adofure, Akure	0739184	0795876
14	Basic Health Centre	C14	Ilere, Akure	0739331	0809478
15	Basic Health Centre	C15	Iloro Market, Akure	0741887	0800666
16	Basic Health Centre	C16	Ipinsa, Akure	0737117	0809403
17	Basic Health Centre	C17	Oda, Akure	0747291	0792925
18	Basic Health Centre	C18	Orita Obele, Akure	0738616	0806584
19	Basic Health Centre	C19	Danjuma	0740432	0801592
20	Basic Health Centre	C20	Esure	0743513	0798531
21	Jide Mac. Hospital	C21	Ijoka Rd. Akure	0742906	0799581
22	Crown Hospital	C22	Oja Osodi St. Akure	0742444	0802660
23	St. John/ Mary Hospital	C23	Oke-Aro Titun Akure	0740790	0801498
24	Sijuade Hospital	C24	Sijuade Akure	0743575	0799864
25	Adedewe Hospital	C25	Agunloye Street, Akure	0745180	0802394
26	Ade- Tade Hospital	C26	Tuyi St Ayedun, Akure	0739440	0804302
27	St. David Hospital	C27	Akure	0739613	0803132
28	Fujah Hospital	C28	Akure	0741281	0802166
29	St Micheal Hospital	C29	Off Danjuma Rd..	0740191	0801189
30	Oludare Hospital	C30	Fanibi Layout Akure	0739606	0802633
31	J&E. Fatunbi Hospital	C31	Oke-Aro Akure	0740857	0800938
32	Abitoye Specialist Hospital	C32	Ijapo Akure	0745067	0803261
33	Liberty Hospital	C33	Adinlewa Str. Akure	0742749	0799892
34	Joe-Jane Specialist Hospital	C34	Oke Ijebu Akure	0743587	0804120
35	Kolade Medical Centre	C35	Oshinle Akure	0741830	0799814
36	Ajiboye Hospital	C36	Irowo, Akure	0742183	0801143
37	Caring Heart Hospital	C37	Aule Road	0738863	0804248
38	First Mercy Specialist Hospital	C38	Akure	0741144	0802212
39	Crystal River Specialist Hospital	C39	Akure	0743967	0803103
40	Akintan Specialist Hospital	C40	Osokoti, Akure	0743161	0804646
41	Banky Medical Centre	C41	Ijo mimo, Akure	0743355	0799222
42	Abitoye Hospital	C42	Ijoka	0742931	0799398
43	Goshen Land Specialist Hospital	C43	Akure	0746226	0797274
44	St. Mercy Hospital	C44	Oda	0746768	0793713
45	Miracle Hospital Annex	C45	Orita Obele	0738761	0808213
46	Divine Specialist Hospital	C46	Orita Obele	0739309	0808182
47	Akure Muslim Hospital	C47	High School, Akure	0740911	0805444
48	Shifauk Hospital	C48	High School, Akure	0742017	0803991
49	Ayodele Medical Centre	C49	Lafe	0739307	0803529
50	Hopeland Specialist Med. Centre	C50	Akure	0739802	0803342

51	St. John and Mary Hospital	C51	Odo Ikoyi, Akure	0742545	0800889
52	Babalola Nine Well Hospital	C52	Oke ijebu, Akure	0742987	0804898
53	Rohi Specialist Hospital	C53	Oyemekun Road	0742198	0799786
54	Oluseun Spec. Hospital	C54	Ajegunle Akure	0741590	0800459
55	Sckye Hospital Clinic	C55	Oba Adesida Akure	0742316	0802362
56	Jobarteh Hospital	C56	Oba Adesida Akure	0743307	0802076
57	City Specialist Hospital	C57	Okearata Street Akure	0742666	0801736
58	Ebenezer Medical Centre	C58	Oluwatuyi Quts Akure	0742915	0799785
59	Charis Medical Centre	C59	Ondo-Bye pass Akure	0740830	0802596
60	MAO Clinic	C60	Gbangbalogun	0742086	0801269
61	Bisi Medical Clinic	C61	Idiagbatuntun Akure	0741655	0801384
62	Bethesida Faith Clinc	C62	Ajayi Closed Kajola	0742389	0803967
63	Grand Clinic	C63	Oshinle	0741664	0799787
64	County Dentist Centre	C64	Hospital Road	0742865	0800956
65	Brital View Eye Clinic	C65	Hospital Road	0742810	0800911
66	Beejay Medical Lab.	C66	Hospital Road	0742464	0800637
67	Pope Medical Lab.	C67	Oshinle	0742128	0800385
68	My Shepherd Medical Clinic	C68	Akure	0747711	0803116
69	Foundation Specialist Clinic	C69	Oba Ile	0748680	0802325
70	Toluwa Mat. Centre	C70	Araromi Akure	0742924	0804361
71	Standard Medical Clinic	C71	Oba Ile	0749680	0802949
72	Idera Clinic	C72	Oshinle	0741982	0799934
73	RCCG Maternity Home	C73	Akure	0744120	0805016
74	Oluremi Maternity Home	C74	Oke-Ijebu	0743473	0804197
75	Dejays Medical Clinic	C75	Gbogi	0742141	0802230
76	Blue Cross Clinic and Maternity	C76	Akure	0742933	0799130
77	Goshen Clinic	C77	Akure	0744963	0796689
78	Green-Land Clinic	C78	Oda	0746355	0794549
79	New Day Clinic	C79	Orita Obele	0738405	0807545
80	Abimbola Medical/Maternity	C80	Shagari Village	0741892	0805852
81	St James Medical Clinic	C81	Shagari Village	0742015	0805529
82	Visach Clinic and maternity	C82	Akure	0738578	0803919
83	His Apple Eye clinic	C83	Oyemekun	0741021	0802541
84	Rhema Dental Clinic	C84	Akure	0743271	0801330
85	Eye Watch Eye Clinic	C85	Oyemekun	0740417	0802860
86	Solid Healthcare Clinic	C86	Akure	0743039	0801107
87	Sarah Medical Lab.	C87	Akure	0743061	0801132
88	Immaculate Medical Lab.	C88	Hospital Road	0742367	0800889
89	Standard Diagnostic Centre	C89	Hospital Road	0742312	0800931
90	Mile-End Laboratory	C90	Fadeyi, Akure	0742350	0800955
91	Fanibi Maternity Home	C91	Fanibi, Akure	0739982	0802389
92	Yob Laboratory	C92	Hospital Road, Akure	0742472	0800790
93	Mapet Optical	C93	Hospital Road, Akure	0742439	0800822
94	Allied Optical Services	C94	Hospital Road, Akure	0742400	0800857
95	Phelab Medical Lab	C95	Ondo Bye-pass, Akure	0740805	0802617
96	Ejire Medical Clinic	C96	Amudipe, Akure	0742731	0797794
97	Ayodele Medical Clinic	C97	Ogunleye layout Akure	0741494	0802920
98	John Bosco Health Clinic	C98	Araromi St Akure	0742353	0803853
99	Bayode Medical Clinic	C99	Omoniyi St Akure	0740970	0799120
100	Olanike Medical Clinic	C100	Davog, Akure	0743087	0797174
101	Rotsam Medical Clinic	C101	Akure	0737543	0806899

Using the coordinates as presented in table 1, a Satellite imagery of the study area was used to show the distribution of healthcare facilities across the Local Government Area which is presented in figure 7.

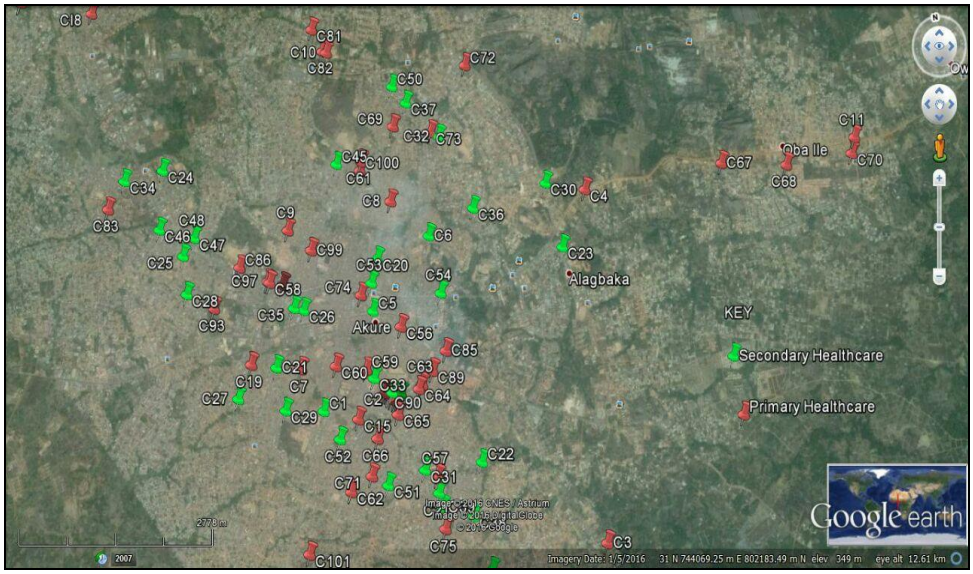

Figure 7. Satellite Imagery of Distribution of Healthcare Facilities in Akure South Local Government Area
Source: Google Earth 2016 and Author's Field Survey, 2015

Table 2. The Result of NNA in the Distribution of Healthcare Facilities
(**Data Source:** Authors Field Survey, 2015)

LGA	Observed Mean Distance	Expected Mean Distance	Nearest Neighbour Index (Rn)	Z-score	P-value
Akure South	564.096378	523.459516	1.077631	1.408929	0.158856

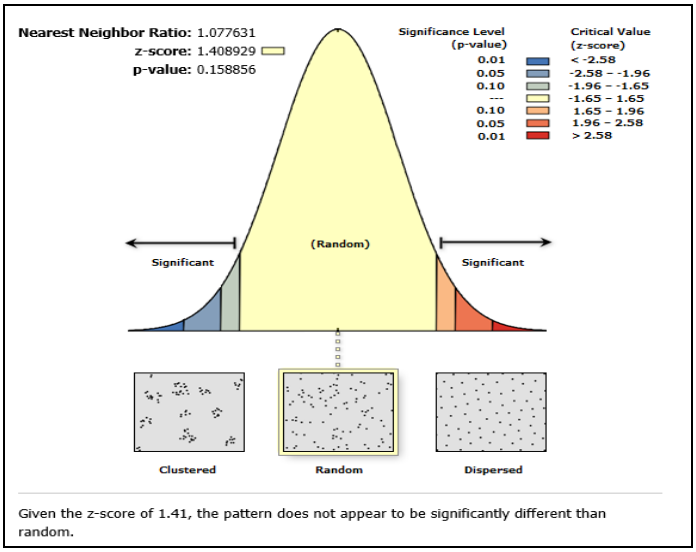

Figure 8. NNA of Healthcare Facilities in Akure South Local Government Area
Source: Authors Field survey, 2015

Proximity to Healthcare Facility Centres

Proximity to healthcare facilities to a large extent determines the degree of patronage by residents of a particular locality. The average distance covered by respondents to the nearest healthcare facility in the study area was grouped into three. These were below 400 m (5 minutes walk) as short distance, 401 – 800 m (10 minutes walk) as normal distance and 801 – 1200 m (20 minutes walk) as long distance (Halden et al., 2000). Therefore any facility that is centrally located shall draw consumers from the immediate surrounding unless political and ethnic frictions compelled otherwise (Morill and Erickson, 1969 cited in Olujimi, 2003). From the analysis in table 3, a larger percentage of respondents covered below 400 metres to the nearest healthcare facilities accounting for 81.3%. Also, residents that covered a distances of between 401 to 800 metres accounted for 3.5% while the remaining 15.2% of the population covered distances of between 801 and 1200 meters to the nearest healthcare facilities. This shows that the commuting distances to healthcare facilities is within the World Health organization recommended distance of a maximum radius of 60 kilometers for an intermediate hospital (WHO 1991).

The results of the analysis presented above are in perfect agreement with the distance decay function which states that interaction between two locales declines as the distance increases. The implication is that healthcare facilities located near the people will enjoy higher volume/level of patronage.

Table 3. Distance of Healthcare Facilities from Home
(**Data Source:** Authors Field Survey, 2015)

Distance	Frequency	Percentage (%)
Below 400m	448	81.3
401 – 800m	19	3.5
801 – 1200m	84	15.2
Total	**551**	**100**

Effects of Distance on Residents

Distance is a paramount factor in the choice and utilization of any social service centre (Adeyinka, 2006) and with regard to healthcare facilities, Bryant (1978) cited in Olugbamila (2016) stated that "distance is a critical factor in the interplay of health resources and needs". With regards to Akure South LGA, the result of the investigation carried out on the effect of distance covered by residents to healthcare facilities is presented in table 4. The result showed that out of the total residents surveyed, 146 of them which constitute 13.2% complained of death of family member as a result of the distance covered to the nearest healthcare facilities while residents which constitute 12.8% of the respondents were of the opinion that they loose interest as a result of the distance. The table further shows that residents with prolong sickness accounted for 11.5%, those that seek for alternative facility (14.9%), adequate and effective care (5.2%), waste of time (10.1%). Others are those that spend more money as a result of the distance (18.5%) and repeated visit (13.8%). It could be deduced from the table that those that spent more money on trips to healthcare facilities as a result of the distance take larger percentage of the respondents, this could be due to referral cases as well as the fact that patrons of higher economic status travel further for healthcare services than patrons of lower economic status.

Moreover, patrons show a willingness to travel further distance for various goods and services as the number of such items available at various location sources increases (intervening opportunity) (Abler et al., 1977; Adeyinka, 2006). The above result is in agreement with the concept of range of goods of the Central Place Theory which is the average minimum distance that prospective consumers are willing to cover in order to consume a good or service irrespective of time wasted and cost.

Table 4. Effects of Distance Covered on Residents
(**Data Source:** Authors Field Survey, 2015)

Effects	Frequency	Percentage (%)
Death of family member	146	13.2
Lost of interest in Visit	141	12.8
Prolong Sickness	127	11.5
Seek for Alternative facility	165	14.9
Adequate and Effective Care	57	5.2
Waste of time	111	10.1
Spend More Money	204	18.5
Repeated Visit	152	13.8
Total	1103	100

Note * The total exceeded the number of questionnaire administered because of multiple responses.

Means of Transportation to Healthcare Facilities

Presented in figure 8 is the information on residents' means of transport to healthcare facility location. It was revealed that most of the respondents used motorcycles which accounted for 36,2% while 31.5% commuted in public transport to the healthcare facilities. Those that travelled in private cars accounted for 24.2% and the least important means of transport by residents was bicycle which accounted for 0.9% while the remaining 7.2% depend on foot. It is deduced from the findings that about 93% of the residents rely on one mode of transport or the other to satisfy their transportation needs to healthcare facilities. Also the fact that about 7% of the population depend on foot to the healthcare facilities implied that distance between residences and healthcare facilities is relatively short.

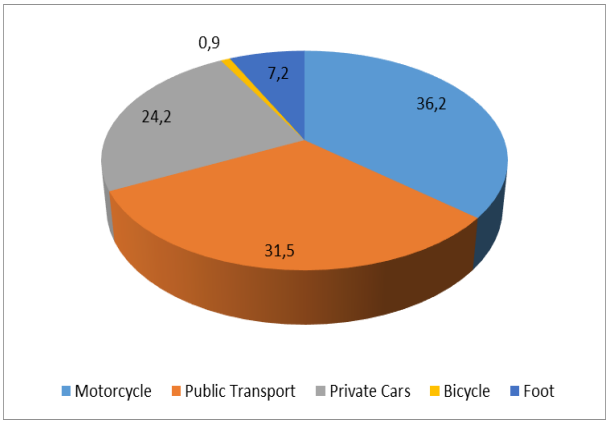

Figure 9. Means of Transport to the Health Facility
Source. Authors Field Survey, 2015

Cost of Treatment

The study also investigated residents view on the cost of treatment in the healthcare facility centres. According to Chandra and Eric (2000) cited in Adeyinka (2013), the physical location of health services relative to some other factors such as location of residence, transport cost, condition of roads and many other logistic difficulties are linked with utilization of medical services. It was revealed in table 5 that 31.5% of the respondents rated the cost of treatment in the study area to be very high. Residents that rated the cost of treatment to be high accounted for 24.2%, while majority of the residents (36.2%) rated the cost of treatment to be moderate. The table further revealed that 0.9% and 7.2% of the residents were of the opinion that the cost of treatment is low and very low respectively.

Table 5. Cost of Treatment
(**Data Source:** Authors Field Survey, 2015)

Cost of Treatment	Frequency	Percentage (%)
Very High	173	31.5
High	133	24.2
Moderate	199	36.2
Low	5	0.9
Very Low	40	7.2
Total	551	100

CONCLUSION AND RECOMMENDATION

This paper examined the distribution and accessibility characteristics of residents to healthcare facilities in Akure South Local Government Area of Ondo State, Nigeria. On the distribution pattern, it was observed that the LGA has the highest number of healthcare facilities in the State and consists of only the secondary and primary tier of healthcare facilities. Ownership of healthcare facilities across the LGA can be categorized into public and private healthcare facilities with the private sector participating more in the establishment of healthcare facilities in the study area. The nearest neighbour analysis was further used to determine the pattern of distribution of healthcare facilities in the study area and it revealed that the distribution of healthcare facilities were random rather than been clustered or dispersed.

On accessibility, the study revealed that 81.3% of the residents covered a distance of below 400 metres to the nearest healthcare facilities which shows that the commuting distance to healthcare facilities is within the WHO recommended distance of a maximum radius of 60 kilometers for an intermediate hospital. A small proportion of the residents still travel far distances to healthcare facilities which could be due to referral cases as well as the fact that patrons of higher economic status travel farther for healthcare services than patrons of lower economic status.

Based on the above findings, It is therefore recommended that more healthcare facilities be provided and should be located closer to the people within shortest possible distance. Efforts should be made by the stakeholders in the health sector and Town Planners to ensure equity in the distribution of public healthcare facilities across the Local Government Area and this should take into consideration the location of the existing healthcare facilities and apply the planning standard so as to promote equitable distribution of the healthcare facilities. Moreover, in order to achieve the objective of the National Health Policy, provision of adequate healthcare facilities in rural areas of the study area is necessary since accessibility is regarded as a very fundamental issue in patronage of healthcare facilities. Also the number of facilities provided should be proportional to the population size of the area.

REFERENCES

Abler R., Adam J., Gould P. (1977), S*patial Organization – the Geographer's View of the World*, Prentice Hall International Inc., London.

Abolade O., Adigun F.O., Adesina S. (2011), *A Study of Residents' Healthcare Facilities Patronage in Isolo, Lagos*, In Afon A.O and Aina O.O. (ed.), Issues in the Built Environment. Obafemi Awolowo University Press, Ile-Ife: 259-273

Adeyinka A.M. (2013), *Assessment of Quantity of Urban Transportation Services in Nigeria*, Academic Journal of Interdisciplinary Studies, 2(1): 49-58

Adeyinka S.A (2006), *Locational Analysis of Health Care Facilities in Ife Region. Ph.D Thesis*, Department of Urban and Regional Planning, Obafemi Awolowo University, Ile-Ife, Nigeria.

Adeyinka S.A., Olugbamila O.B. (2016), *Correlates of Residents Soci-Economic Characteristics and Frequency of Visits to Healthcare Facilities in Ondo State, Nigeria*, Research on Humanities and Social Science. 6 (18): 7-16

Agaja S.A. (2012), *Spatial Distribution of Primary Health Care Centres in Ughelli South and Warri South Local Government Areas of Delta State, Nigeria*, International Journal of Scientific & Technology Research,1 (9): 38-41.

Balogun T.F., Alaegor A.G. (2006), *An Evaluation of the Spatial Distribution of Healthcare Facilities in Edo State, Nigeria*, Knowledge Review, 12 (1): 71-78.

Halden D., McGuigan D., Nisbet A., McKinnon A. (2000), *Accessibility: Review of Measuring Techniques and their Application*, Scottish Executive Central Research Unit. [Online] www.scotland.gov.uk/Resource/Doc

Kibon U.A., Ahmed M. (2013), *Distribution of Primary Health Care Facilities in Kano Metropolis Using GIS (Geographic Information System)*, Research Journal of Environment and Health Science. 5(4): 167-176. http://maxwellsci.com/print/rjes/v5-167-176.pdf

Olugbamila O.B. (2016), *A Study of the Distribution and Patronage Patterns of Healthcare Facilities in OndoState, Nigeria*, Ph.D Thesis, Department of Urban and Regional Planning, Obafemi Awolowo University, Ile-Ife, Nigeria.

Olujimi J.A.B. (2003), *Patronage Pattern of Rural Dwellers to Health Facilities in Owo Region, Nigeria*, Ph.D Thesis, Department of Urban and Regional Planning, Federal University of Technology, Akure.

Spencer J., Angeles G. (2007), *Kernel density estimation as a technique for assessing availability of health services in Nicaragua*, Health Service Outcomes Research Method, Vol. 7: 145–157.

*** (1991), World Health Organization, WHO, *PHS capacity-building strategies*, Public Health Report Series, Geneva, 106(1): 5-15.

*** (2004), Federal Ministry of Health (FMOH), *Health Care in Nigeria. Annual Bulletin of the Federal Ministry of Health, Abuja, Nigeria*.

*** (2006), National Population Commission, NPC, *2006 Population Census Result*.

*** (2010), World Health Organization World, WHO, *Malaria Report 2010*. www.who.int/malaria/world_malaria_report_2010. Assessed on 16thDecember, 2013).

*** (2013), CIA World Factbook, *Nigeria 2013*, http://www.theodora.com/wfbcurrent/nigeria/. Accessed on 13th August 2013.

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THE PROXIMITY OF CITY - INDUSTRIAL ESTATE IN THE TOWN OF BATNA (NORTH EAST OF ALGERIA) MANAGEMENT OF MAJOR TECHNOLOGICAL RISKS THROUGH AN INTEGRATED APPROACH TO URBAN RESILIENCE

Habibi YAHYAOUI[*]
Doctorant, Laboratory LRNAT Institute of earth sciences and the universe, University of Batna 2, Algeria,
e-mail: y.habibi@univ-batna2.dz

Kalla MAHDI
Pr. Laboratory LRNAT Institute of earth sciences and the universe, University of Batna 2, Algeria,
e-mail: m_kalla1@yahoo.fr

Abstract: Urban resilience has become the subject of several scientific research in order to put the concept into operation as it is an important feature of a city's sustainability. Against this background, the proximity of industrial activity to the urban environment of the city of Batna, located in the North East of Algeria, has contributed to the rise of the concept of industrial risk, the prevention of which, demonstrates the fundamental role of urban resilience in the sustainable management of risk and urban disaster situations. This article is part of a Modeling of Application Data with Spatio-temporal features (MADS) approach for a territorialisation of integrated urban resilience with a view to meet the coordination needs amongst various highly interdependent actors and promote the development of integrated solutions that contribute to the city's resilience.

Key words: Batna, Industrial Area, Risk, MADS modelling, Urban Resilience,

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INTRODUCTION

In independent Algeria, the country has undergone a development strategy based on the setting up of a production apparatus characterized by a high integration capacity within gradually diversifying economic sectors. The rapid construction of a powerful industry was the main objective, the key priority, underlying all development policies (Mutin, 1980). This industrial activity has contributed to the emergence of the concept of industrial risks involving a large number of activities mostly associated with the manufacturing, use, storage or transportation of hazardous substances, either under the form of raw materials, products or waste entailing such properties as flammability, toxicity or explosiveness. Furthermore, the rapid and unbridled urbanization that affects risk areas is increasing the number of human, material, economic and

[*] Corresponding Author

environmental stakes, therefore worsening the vulnerability of the urban fabric and amplifying the devastating potential generated by major catastrophes (Herman, 2009; Laure and Emmanuel, 2005).

Located in the North-East of the country, the city of Batna is an appropriate case study on account of the urban sprawl casting together dangerous sites (industrial hazard sources), and, vulnerable, exposed areas of the city. The city's industrial estate was created outside the urban environment around 1974. Many hazardous facilities were built there. The city's urban sprawl has created a new neighbourhood located right in the middle of the industrial estate and the original urbanized areas, at the fringes of the factories hazard perimeter.

Nowadays, policymakers and land use planning professionals faced with industrial risk management issues need decision support tools for better management of catastrophic scenarios related to major risks.

The complexity of the interactions between the city, its urban services and technological risks finds an interesting response within the concept of urban resilience. This concept specifically allows meeting the challenges of the city's business continuity that should maintain its activity and recover quickly following a disruption.

This research focusing on the city of Batna aims to study the sustainability of industrial risks management by addressing the following issues:

How did the urban environment and the high risk industrial estate become contiguous, with major and widespread risk?

How can new geomatics technologies, including the Modeling of Application Data with Spatio-temporal features (MADS) contribute to improving urban resilience to industrial risks?

DESCRIPTION OF THE STUDY SITE

Encompassing an area of 2,852.41 ha, the city of Batna is located in the North-East of Algeria between latitude 35º34'23" and 35°31'26" North and longitude 6º7'59" and 6°13'31" East.

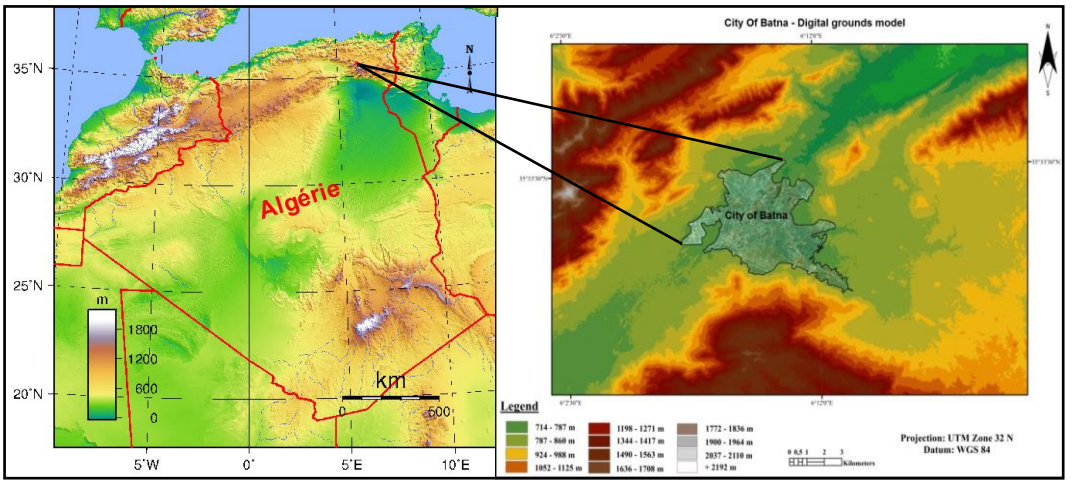

Figure 1. Location of the study area
Source: Habibi Yahyaoui

Positioned at the crossroads of cities such as Constantine, Biskra and Khenchela, Batna has acquired a polarising role. It was founded in 1844 in the middle of a natural bowl surrounded by jagged mountains from the Aures range, on a slightly sloping site, crossed by three major rivers and surrounded by rugged terrain; hence the label of "dish town".

This setting has played a major role in the urban sprawl of the city, its extension being faced by natural barriers, thus diverting the urban stretch into agricultural land and industrial areas created after the independence.

THE CONTEXT OF CITY AND INDUSTRIAL ESTATE PROXIMITY

The 1970s public industrial policies were marked by the establishment of several industrial estates outside the cities; many hazardous installations were initially set up outside built-up areas and away from residential districts. The city of Batna saw the implantation of its industrial estate in 1974, located in the North - East of the city.

Due to a lack of regulation relating to the management of major risks and urbanization on the one hand, and faced by demographic pressure and increased needs in terms of housing, neighbourhood facilities and urban infrastructure on the other, the policy of plastering over cracks and the increasing contiguity spawned the spreading outwards of the city, eventually reaching the factories in the industrial estate up to their danger perimeters, a movement enhanced by land development offers for disadvantaged population groups.

This lack of control of urbanisation has increased the vulnerability to industrial risks in the city, requiring new ways for decision support in terms of urban management and demonstrating the usefulness of upstream industrial risk integration, from the very first sketches of urban space design.

The classification of multi-date imagery of the american satellite LANDSAT allows us to illustrate and monitor diachronically the urban sprawl and the industrial estate smothering.

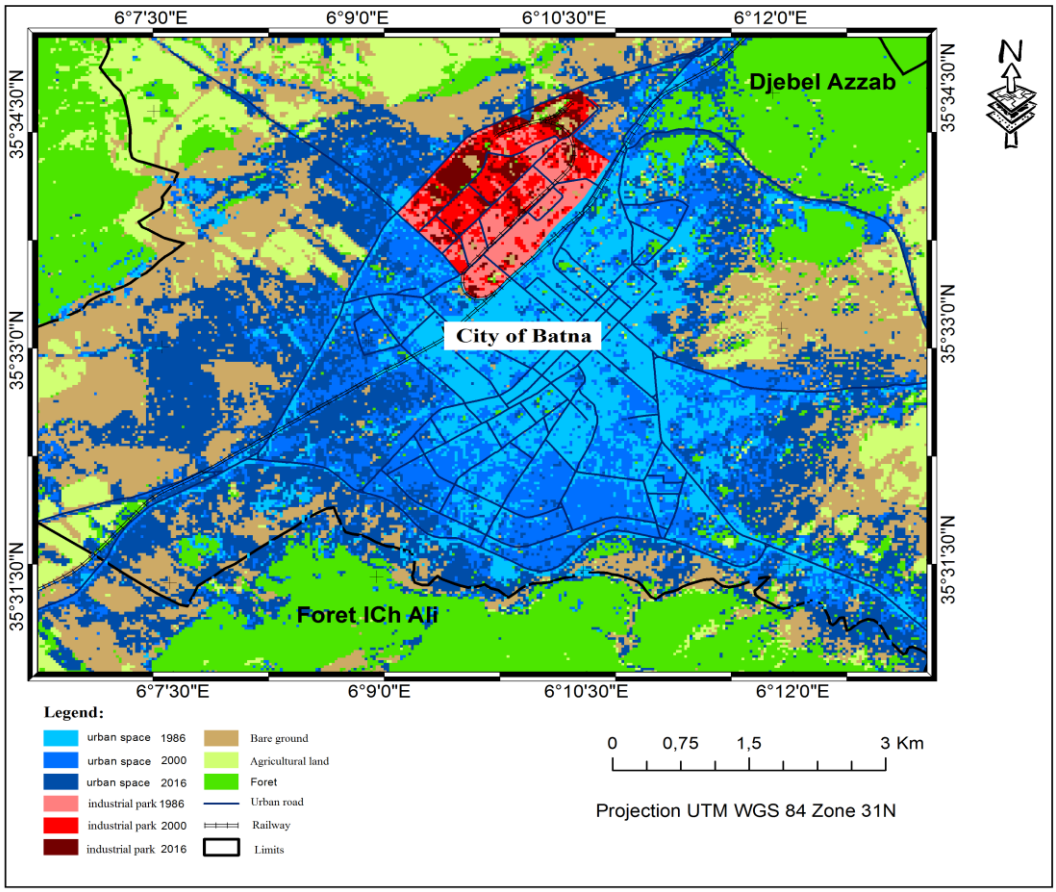

Figure 2. Diachronic monitoring of the urban sprawl phenomenon of the city of Batna
Source: Habibi Yahyaoui

TOWARDS AN INTEGRATED APPROACH OF URBAN RESILIENCE:

Industrial risk is an accidental event (fire, explosion ...) that may occur on an industrial site and have serious and immediate consequences on the staff, the surrounding population, property or the environment (DRM, 2014).

Today, the industrial area in the city of Batna is fully part of the urban fabric and this fact can result in an explosion that may cause varying degrees of damage and burns, depending on relative distance ranges.

Urban resilience to industrial risks resides in the inherent ability of an urban system to sustain shock or elude it. For this to happen, an organization may increase its resilience by acting both on the preparation, improvisation, emergency plans simulation and organizational learning.

Many theoretical definitions of resilience can be found in the scientific literature. Resilience can be perceived as "the ability to anticipate disruption, withstand it by successfully adapting to it, and recovering through restoring, as much as possible, the initial state prior the disturbance" (Marie et al., 2012, p. 5).

Therefore, urban resilience is a capacity that organizations deploy before the disturbance (in the phase of prevention and preparation), but also during the disturbance (in the response phase), and finally after the disturbance (in the recovery phase).

Consequently, urban resilience is defined as "the ability of a system to maintain or restore an acceptable level of functioning despite disruptions or failures". This definition encompasses three key concepts, namely:

- the system response to the crisis is perceived as a systemic approach;
- despite disruptions or failures, acceptability of disruptions or even system failures is necessary;
- the ability to maintain or recover before disturbances; the system adapts its management modes in order to be more resilient.

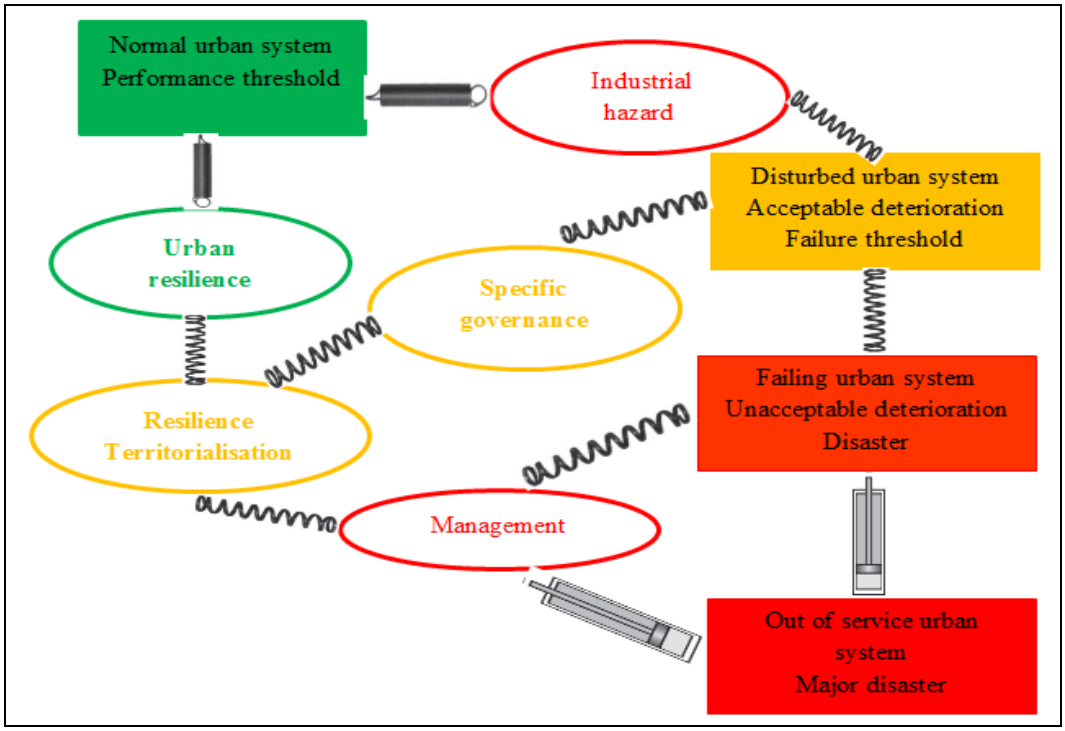

Figure 3. Mapping of urban resilience to industrial risk
Source: Habibi Yahyaoui

MODELLING OF APPLICATION DATA WITH SPATIO-TEMPORAL FEATURES - MADS

Urban resilience is perceived as the city's ability to absorb disturbance and recover its functions in its aftermath (Lhomme et al., 2010). On this understanding, the city is considered as a system in the sense that components (habitats, activities, infrastructure, populations, governance) interact to shape the urban system.

The main objective of integrated urban resilience management requires modelling of geographic objects, spatial relationships; for example, topological relationships, metric or even spatial aggregation relationship and the expression of temporality. MADS formalism (Modelling of Application Data with Spatio-temporal features). It was developed at the School of Computer Science's Database laboratory of the Swiss Federal Institute of Technology in Lausanne and offers an original method of modelling very focused on graphics. MADS is a conceptual entity-relationship model extended to the main concepts of object-oriented approach (complex structures, inheritance and methods) which also allows to model spatio-temporal applications (Parent et al., 2006).

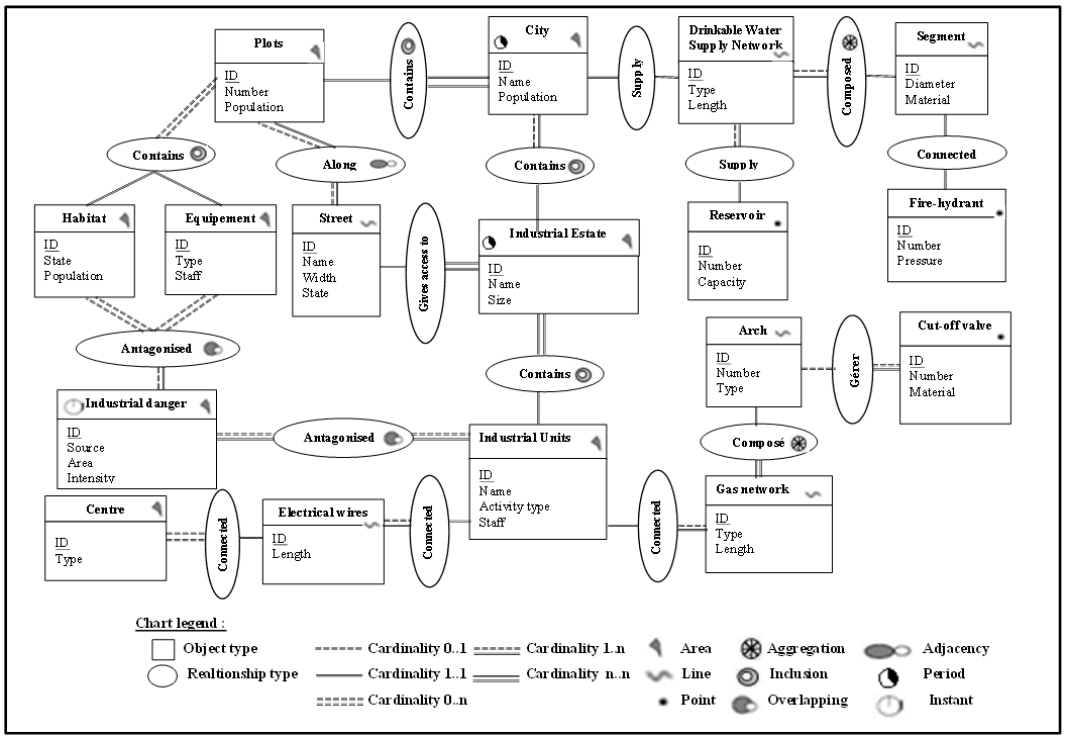

Figure 4. Conceptual Model of MADS data
Source: Habibi Yahyaoui

IMPROVING DISASTER MANAGEMENT THROUGH URBAN RESILIENCE INTEGRATION

The objective of the spatio-temporal modelling is not to define or evaluate the characteristics of urban resilience to industrial risks, but to build a process to develop a shared understanding and improve coordination amongst city administrators. Good governance of disaster situations requires technical and organizational resilience.

Organizational resilience

Organizational resilience is a strategy with a view to accelerate the return to normalcy through optimized management of means and resources as well as good accessibility. The scale of

the disaster, the complexity of interventions, the importance of interoperability and the operational response require a reorganization of the operational chain of command between the levels of decision through decision-making forecasting and operational effectiveness.

Evaluation of accidental impact on the site and the surrounding environment

Predictive mapping is the first step in the process of organizing relief for estimating damage and loss of life in the industrial unit and the surrounding environment. This assessment allows us to combine existing resources and the degree of risk.

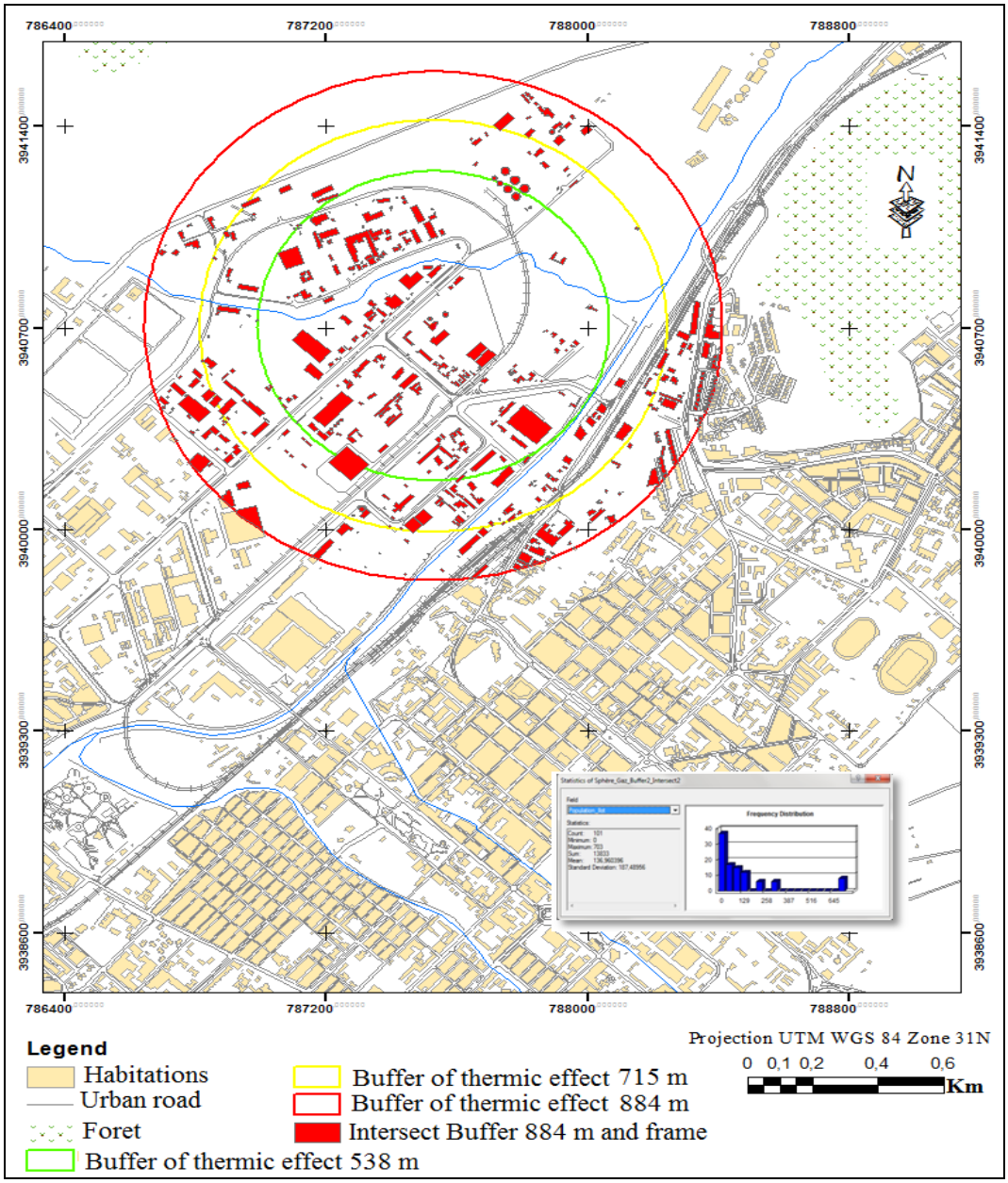

Figure 5. Projected damage map
Source: Habibi Yahyaoui

Intervention and evacuation of victims

Real time decision support through operational mapping enables to manage medical emergency for victims, which falls mainly on the city's civil protection services. The preparation and organization of emergency and intervention diagnosis can improve both the disaster handling and also reduce the recovery time to an acceptable situation. As a matter of fact, response and relief operations at a major industrial hazard location require good preparation in terms of documentation (guides, diagnosis aid help sheets for building emergency), skills and human resources available for civil security on the one hand and great access to urgent care facilities on the other. Network analysis allows us to explore this crisis management dimension by highlighting the spatial distribution of equipment, services and access means to health care in emergency situations.

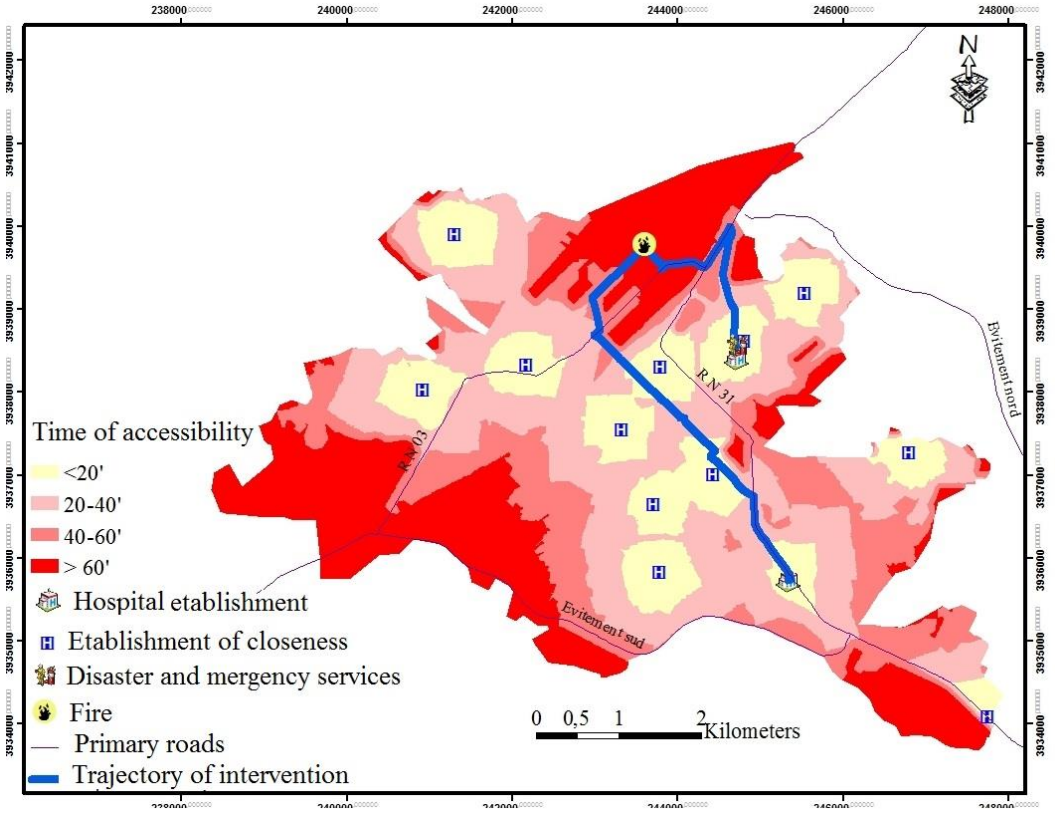

Figure 6. Spatial distribution map of health facilities by network analysis
Source: Habibi Yahyaoui

Technical resilience

Cities heavily dependent on technical systems confer the latter great importance in terms of risk spreading. To improve the resilience of cities, technical systems have already been identified as strategic (Lhomme et al., 2010). They act both as propagators of malfunction by their geographical extension and their interdependencies and are at the same time essential to reconstruction (Felts, 2005). They are the city's "nervous system" within which the slightest failure can have cascading effects on urban operation (Robert and Morabito, 2009. p.80).

Technical resilience is a technical strategy with a view to limit the degree of system disturbance through improved resilience and absorption; therefore a critical intelligence capable of removing all underestimation and any lack of preparation that could lead to a worsening of a non-

manageable situation. Furthermore, the integrated approach to urban resilience of local communities helps to demonstrate the domino effect and importance of technical networks in the spread of such a disturbance.

Domino effect

Domino effect is a chain reaction that increases the likelihood (or consequences) of a major accident, within the production units of the same enterprise or amid close plants. Each accident has several possible simultaneous aspects: explosion, fire, toxic emissions... It may prove necessary to consider some or other of these aspects as predominant in terms of relief efforts. It appears that poorly controlled interrelationships amongst different types of networks and within neighbouring industrial plants lead to vulnerabilities induced by domino effect. The technical resilience approach allows disregarding the precise facts of the initial failure mode and focusing on the impacts in terms of features (Robert et al., 2009).

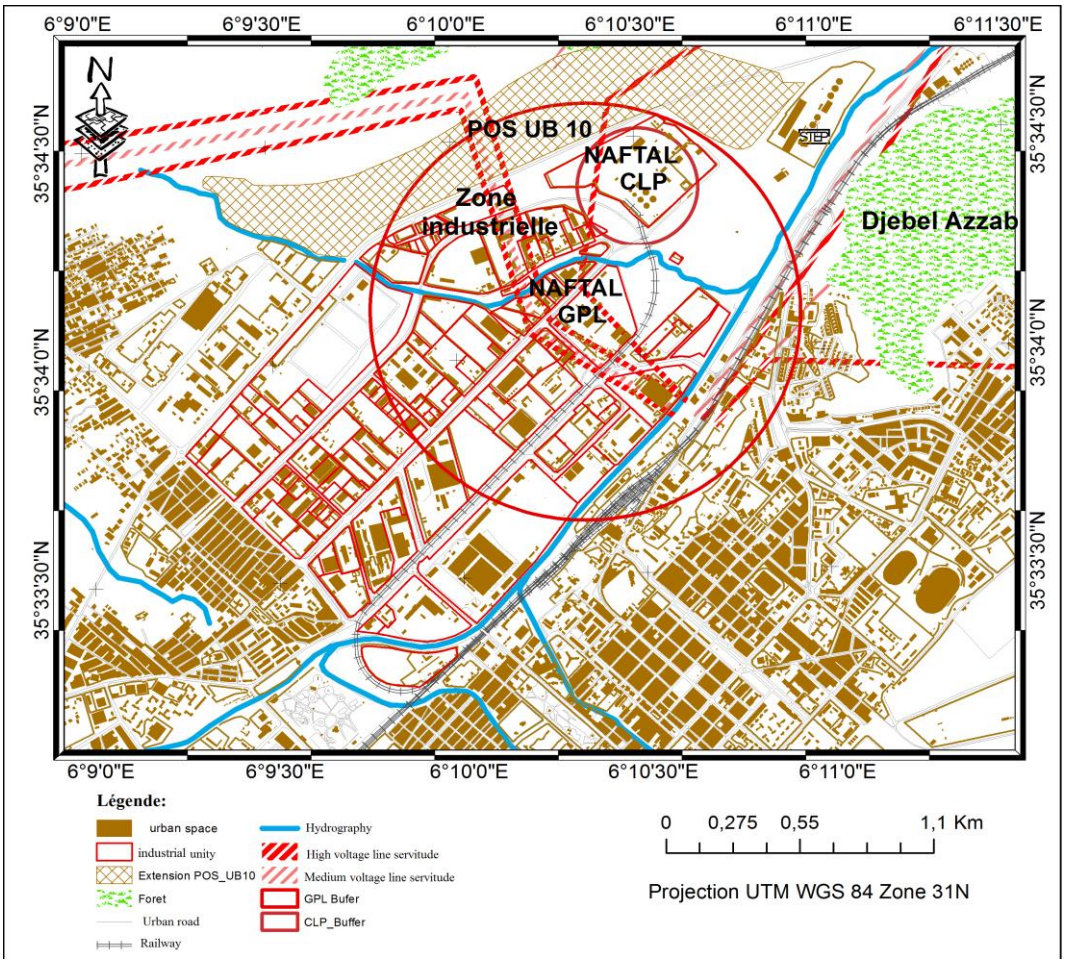

Figure 7. Map of the consequences of domino effect
Source: Habibi Yahyaoui

CONCLUSION

The urban policy adopted by the city of Batna's administrators has been causing the progressive and uncontrollable evolution of urban sprawl around the industrial estate; this proximity between the urban and industrial facilities classified as high risk may have created

insurmountable management problems of these risks. The analysis of the various potential consequences of an industrial hazard indicates that a population surrounding industrial plants is exposed to a large-scale major risk, displaying a very low urban resilience.

Territorialisation and operationalization of urban resilience to technological risk is rooted in the idea of the impossibility of zero risk of and the need for acceptance by the population, industrials and risk administrators in this city of a certain level of risk.

MADS modelling in a GIS environment is a tool for the operationalization of urban resilience thanks to its adequate tools for querying, analysing and displaying data. As a matter of fact, this tool allows us to share a real vision of the territory with all the risk management and intervention actors through a common representation of the urban space that needs to shift towards a sustainable urban development in the context of a territorial project. Moreover, the need to mobilize all prevention, emergency and disaster management actors requires the integration of time as an important parameter to maintain the spatial dynamics before, during and after the urban disturbances; this is the key to a full recovery.

The success of this urban resilience approach depends on the socio cultural resistance, which defines the culture of risk, acceptability and the response capacity of the population at risk. Therefore, urban resilience opens up prospects of a less technical and more social risk management approach. The answer would then come from the risk culture to develop. The development of the latter should be encouraged through a consultation procedure when setting up Technological Risk Prevention Plans (TRPP, equivalent to French: PPRT which stands for Plans de Prévention des Risques Technologiques). Moreover, the establishment of TRPP can have long-term effects on elected policymakers' culture of risk and on the recognition of the vulnerability of activities and constructions.

REFERENCES

Felts L. (2005), *Vulnérabilité des réseaux urbains et gestion de crise, Lyon, France, [Vulnerability of urban networks and crisis management, Lyon, France]*, CERTU, Rapports d'étude du Certu, 78 p.

Herman G. V. (2009), *Omul şi modificările antropice din Câmpia Someşului [The man and anthropogenic changes in Somes Plain]*, Editura Universității din Oradea, p. 227 p., ISBN 978-973-759-981-0, Oradea.

Laure B., Emmanuel M. (2005), *Des usines à la campagne aux villes industrielles, [From factories in the countryside to industrial cities],* Développement durable et et territoires.

Lhomme S. (2012), *Les réseaux techniques comme vecteur de propagation des risques en milieu urbain, une contribution théorique et pratique à l'analyse de la résilience urbaine, [Technical networks as a vector for spreading risks in urban areas, a theoretical and practical contribution to the analysis of urban resilience],* thèse de doctorat, Géographie, Université Paris-Diderot - Paris VII, 365p.

Lhomme S., Serre D., Diab Y., Laganier R. (2010), L*es réseaux techniques face aux inondations ou comment définir des indicateurs de performance de ces réseaux pour évaluer la résilience urbaine, [Flood technical networks or how to define performance indicators for these networks to assess urban resilience],* Bulletin de l'association des géographes français, p. 487-502.

Marie T., Serge L., Youssef D., Damien S., Richard L. (2012), *La Résilience urbaine : un nouveau concept opérationnel vecteur de durabilité urbaine ?, [Urban Resilience: A New Operational Concept Vector of Urban Sustainability],* Développement durable et territoires, Vol. 3, n° 1, 15p.

Mutin G. (1980), *Implantations industrielles et aménagements du territoire en Algérie, [Urban Resilience: A New Operational Concept Vector of Urban Sustainability?],* Revue de géographie de Lyon, Volume 55 Numéro 1 pp. 5-37.

Parent C., Spaccapietra S., Zimányi E. (2006), *Conceptual Modeling for Traditional and Spatio-Temporal Application*, The MADS Approach, Springer, 466 p.

Robert B., Morabito L. (2009), *Réduire la vulnérabilité des infrastructures essentielles, [Reduce the vulnerability of critical infrastructure],*Éditions Lavoisier, 80 p.

Robert B., Pinel W., Pairet J.-Y., Rey B., Coeugnard C. (2009), *Résilience organisationnelle - Concepts et méthodologie d'évaluation, [Organizational Resilience - Concepts and Evaluation Methodology],* Université Polytechnique de Montréal : Centre Risque & Performance, 48 p. territoires, Dossier 4.

*** (2014), DRM, Fiche DRM, *le risque industriel, [industrial risk],* DIMENC -12 p.

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NITRATE IN DRINKING WATER: HOW SAFE IS THIS IN AFRICA AND ASIA?

Francis Olawale ABULUDE[*]
Science and Education Development Institute, Akure, Ondo State, Nigeria
e-mail: waleabul@yahoo.com

Samuel Dare FAGBAYIDE
Agricultural and Bio-Environmental Engineering, The Federal Polytechnic. Ilaro, Ogun State, Nigeria
e-mail: samuel.fagbayide@federalpolyilaro.edu.ng

Abstract: Drinking water is one of the essential needs of life. Water comes from either a natural surface or a ground source. One of the rights of man is access to safe water. Unsafe water is due to anthropogenic and non-anthropogenic sources. One of the problems caused by these sources is the elevation of nitrate in water. Elevated nitrate in the body makes it harder for red blood cells to carry oxygen, this can be very dangerous for infants and some adults. Infants exposed to high amounts of nitrate may develop "blue baby syndrome". The aim of the paper is to find out how safe drinking waters are in terms of nitrate in Africa and Asia. To do this, selected articles were reviewed to determine the content of nitrate in different countries. The results were compared with national and international reference standards.

Key words: Water, unsafe, nitrate, blue baby, non-anthropogenic sources, distillation,

* * * * * *

INTRODUCTION

Water they say, is life. It means it is essential for life. It has got many uses for man, animals, plants, and others. One of its uses is drinking. According to Olaoye and Olaniyan (2012), it was noted that the quality of drinking water is a powerful environmental determinant of health.

WHO (2010) estimated, about 4.6 billion people globally, drink unclean water and 88% of diarrhea disease reported across the world is linked to unsafe water, sanitation, and hygiene. Also, about 10-20 million deaths recorded globally, are attributed to waterborne diseases (Yasin et al., 2015). Out of the record of death, more than 2.5 people die of diarrhea, children aged less than 5 years are affected in parts of Asia, Africa, and Latin America (Gambo et al., 2015).

Water from rain, well, borehole, stream, river, and waterfalls are the sources of drinking water in developing world. There are not many opportunities for pipe borne water, for this singular reason, most of the waters are polluted through lack of good sanitation and hygiene. Clean drinking water is a high priority for everyone, especially people who live in rural areas. Other sources of pollution of these waters are increases in industries, vehicles, unpaved roads, expired tyre and other natural and anthropogenic activities.

[*] Corresponding Author

For continuous regular intake of safe water, it is always good to subject the environment and water into constant evaluations. Therefore, good quality water analyses should be based on metals, physico-chemical and biological parameters. One of the parameter to be determined is nitrate.

Then what is nitrate? Nitrate (NO3-) is water soluble, it exists as a salt of nitric acid. Part of the physical characteristics of nitrates is odorless and tasteless which are formed when nitrogen from ammonia and other sources mix with water. Nitrogen and nitrates occur naturally, the increase in nitrates in drinking water have been caused by fertilizer input in agricultural practices. Elevated nitrate levels in drinking water cause skin rashes, hair loss, birth defects and "blue baby syndrome," a potentially fatal blood disorder in infants (Stett, 2012). National Institutes of Health, USA linked increased risk of thyroid cancer with high nitrate levels in public water supplies (Manassaram et al., 2006).

According to CDC (2014), the primary occupational routes of exposure to nitrates are inhalation and dermal routes. Also, the primary route of exposure to nitrates general population is ingestion. While inhalation and dermal exposures are known in non-occupational settings on some occasions but are not the primary routes of exposure for the general population.

Children less than 4 months old are most at risk of adverse health effects from overexposure to nitrates. Because most of the children foods/ feeds are prepared with nitrate-contaminated water. A vegetable is known to be the most important source of human exposure, while it is meat in the diet (nitrite is used as a preservative in many cured types of meat). Vomiting and diarrhea can exacerbate nitrite formation in infants and has been reported to be a major contributor to MetHb risk in infants independent of nitrate/nitrite ingestion (McDonagh et al. 2013). At the oxidative stress peaks, pregnant women and their fetus might be more sensitive to toxicity from nitrates at or near the 30th week of pregnancy (Skold et al. 2011). Populations that may become symptomatic at lower levels of MetHb than predicted include patients with oxygen transport or delivery conditions like anemia, cardiovascular disease, lung disease, sepsis and presence of other structural hemoglobin variants. Part of the conditions that increase the risk of developing methemoglobinemia is enzyme deficiencies such as G6PD deficiency and RBC methemoglobin reductase deficiency/impairment as well as other genetic factors (Gordon 2012).

The aim of the paper is to find out how safe drinking waters are in terms of nitrate in Africa and Asia. To do this, selected articles were reviewed to determine the content of nitrate in different countries. The results were compared with national and international reference standards.

NITRATE IN DRINKING WATER IN ASIA – ISSUES

Kim et al., (2013) study was conducted at an experimental station at the National Academy of Agricultural Science, Suwon city, Gyeonggi province, South Korea. The worked on 66 rainwater samples collected from 2009 to October 2011. The result of the nitrate was between 36.1 and 40.0 mg/L in farming and non-farming periods respectively. In comparison with the WHO standard. The water is acceptable for consumption.

Sivamanikandan and John, (2015) studied the physicochemical characteristics of river water in Theni District, Tamilnadu, India, they recorded 4.50 – 7.65 mg/L for nitrate content. Also, Sajil Kumar and James (2013) in groundwater (Post-monsoon- 2-9 mg/L, Pre-monsoon-1-63 mg/L) and Bhat and Sharma (2015) too worked on groundwaters obtained in Sambhar Lake in India. Their results were: 7.69 – 28.45 mg/L. In comparison with Eastern Mediterranean Region and WHO standards, it was observed that the results were in total agreement with results obtained.

Tayne (2005) analyzed wells and obtained >5 and <70 mg/L, Sabareza et al. (2014) analyzed river water, they got 5 mg/L and 17.71-21.73 mg/L for surface water and rainwater respectively and Flores and Zafaralla (2012) recorded 0.01 18.20 mg/L for Mananga river water. These different water sources in The Philippines are within the 50 mg/L national water standard.

In Papua New Guinea, Ayoko et al. (2007) studied water obtained from surface and ground waters (boreholes). Their results were <0.1 and 0.1 mg/L. Kafia et al. (2009) determined nitrate in river

water flowing in Erbil, Kurdistan, Iraq. The nitrate value in the river water was 1.5 to 9 mg/L. River water from Lower Mekong Basin, Cambodia had nitrate value of 0.19-0.29 mg/L (MRC, 2008).

In Thailand, the nitrate content of different drinking water have been worked upon by many scholars, for example, Pattanapipitpaisal and Suraruk (2012), Makaroom et al. (2013) and Hengsuwan et al. (2015) took their researches on the ground, surface water and drilled well respectively. Their results were 0.01 – 5.97 mg/L, 5.28 - 17.93 mg/L and not detected respectively. From the results, groundwater contained highest values. The high value was not only unique in Thailand, same was observed by Molla et al. (2015) in Bangladesh – 0.08-2.80 (surface water) and 2.10-5.20 mg/L (groundwater). In river waters from Anuradhapura, Sri Lanka, Perera et al (2014), obtained 1.45-5.28 mg/L (paddy area) and 1.05-5.28 mg/L (non-paddy area).

Semenyiih River in Selangar, Malaysia was subjected to nitrate analysis in 2013 by Al-Badaii et al. (2013). They recorded 4.23-8.53m g/L. In the same country, but different sources, Yusoff et al. (2013), determined river water (2.40-5.80 mg/L), Leachate (41.85-44.88 mg/L) and groundwater (7.45-12.67 mg/L). Kura et al. (2013) conducted their research on water ground from Kapas, Island, they reported 0.4-10.6 mg/L. From these results, it could be deduced that the drinking waters were suitable for consumption in terms of nitrate toxicity.

Nitrate values for rainwater from Southern Brazil were between 3.35 and 72.7 mg/L (Facchini Cerqueira et al. (2014). WSD (2015) reported – pump water (<2.5-14 mg/L) and surface water (1.4-2.9 mg/L) from Hong Kong. Lastly, Al-Ghamdi et al. (2014), reported 5.6-37.6 mg/L in surface and ground waters obtained from Al-Makhwah Region, Saudi Arabia.

NITRATE IN DRINKING WATER IN AFRICA – ISSUES

In Ethiopia, Yasin et al. (2015) determined nitrate in tap waters, protected and unprotected wells and springs collected at Kersa District and Jimma Zone. They were able to conclude that the values ranged between 1.92 and 2.55 mg/L and 1.92-42.39 mg/L respectively.

Akoto et al. (2011) studied rainwater samples from Ramia (0.11-0.32 mg/L), Antobuasi (0.01-0.42) and Wawasi (0.09-0.32 mg/L) all in Ghana. Also, in Akporkloe, Southestern, Ghana, Addo et al. (2013), worked on open wells and reported 0.69-1.41 mg/L. Elsewhere in Nigeria, the followings results were reported: wells from Udu community, Delta State had 0.001-0.72 mg/L. Olomukoro and Oviojie (2014), rainwater from Warri, Delta State, 0.09-0.41 mg/L (Olowoyo, 2011), harvested rainwater from Ogbomoso, Oyo State, 3.54-39.0 mg/L (Olaoye and Olaniyan, 2012) and wells from Mista-Ali Town, Bassa LGA, Plateau State, 6.0-8.0mg/L (Kangpe et al., 2014).

Far away in Ifangni District, Cotonou, Benin, Fatombi et al. (2012), worked on surface and well waters. They reported 1.30-33.0 mg/L and 21.1-102 mg/L respectively. Kushe (2009), reported 0.0-4.7 mg/L for groundwater found in Dedza, Malawi.

Maiga et al. (2014) gave their values (13.4-46.5 mg/L) for greywater samples obtained from Kologoudiesse, Burkina Faso and Likambo (2014) had 0.0-20.0 (Borehole) and 9.68-891 (Groundwater) from Yei County, South Sudan.

In Cameroon, Sorlini et al. (2013), studied waters from boreholes, open wells, rivers, piped water and lakes. From their reports, they obtained 0.0-27.6 mg/L. Wirmvem et al. (2013), worked upon ground and surface waters. Their results were 0.0-20 mg/L.

Somewhere in Bilda, Algeria, Hamaidi-Chergui et al. (2013) worked on Chiffa River, they got 0.00-7.00 mg/L same authors obtained between 8.0 and 30.50 mg/L for samples from different boreholes in the same country, Ain Defla region.

South African waters were not left out in this study. Akoth and Palamuleni (2015) obtained their results as follows: boreholes (0-11.1 mg/L) and Spring Waters (1.8-17.1 mg/L), Olivier et al. (2008) had 0.0-0.8 mg/L thermal and spring waters from Limpopo and Samie et al. (2013) recorded Nd-46.99 mg/L from boreholes located in Mopani District.

Most countries adopted The World Health Organisation (WHO) guidelines for drinking-water quality. The guidelines are not mandatory, but they are used as a guide for water safety. Below are the maximum acceptable standards set for WHO, Asia, Africa and Eastern Mediterranean Region.

HOW SAFE ARE THE DRINKING WATERS?

Generally, the results of nitrate concentrations in the reviewed studies from Asia were generally low compared to those recommended by Eastern Mediterranean Region and WHO. For the purpose of the study, none out of the water samples from Asia was above the recommended values, However, there are some water samples from Africa that were above acceptable status. Examples are waters from South Sudan, Republic of Benin, Ethiopia and Burkina Faso, especially ground waters. The elevations may be attributed to nitrate concentration in groundwater and surface water which can reach high levels as a result of leaching or run-off from agricultural land or contamination from human or animal wastes, improper well construction, well location, overuse of chemical fertilizers. Sources of nitrate that can enter the well include fertilizers, septic systems, animal feedlots, industrial waste, and food processing waste. Wells may be more vulnerable to such contamination after flooding, particularly if the wells are shallow, have been dug or bored, or have been submerged by floodwater for long periods of time (CDC, 2015). Also, rain or irrigation water can carry the nitrates down through the soil to the groundwater below.

The Health risk assessment of the water samples using table 1 and figure 1 showed that most drinking water from Asia are not polluted, but concerted efforts should be put in place to prevent them been polluted. Drinking water that has 41-100 mg/L are risky for adults and young livestock. The water is unacceptable. Apart from these, there were more of the countries nitrate value that was below the maximum limit. This indicated that the exposed population is safe at these levels.

According to CDC (2015), heating, boiling, mechanical filters or chemical disinfection cannot remove nitrate from water. Only reverse osmosis and distillation systems can remove nitrates from your water.

The differences in the nitrate contents of the water selected in the literature may be due to the geographical origin, the soil and water contents of nitrate and analytical methods employed by the different authors and countries.

Drinking Water Standards (mg/L) – Asia and Africa
(**Data source:** WHO, 2013)

Country	Maximum Acceptable	Maximum Allowable
Thailand	45	45
India Philippines	45	
Papua New Guinea	50	
Malaysia	45	
Cambodia	10	
Sri Lanka	50	
Saudi Arabia	50	
Brazil	50	
Sudan	50	
Algeria	50	
Cameroon		
Burkina Faso		
Ethiopia	50	
Ghana	50	
Nigeria	50	
Benin Republic		
South Africa	50	
Malawi		
Tunisia	45-50	

Drinking Water Standards (mg/L) – Eastern Mediterranean Region and WHO		
WHO	50	
Egypt	44	
Iraq	50	
Jordan	50	
Lebanon	50	
Morroco	50	
Oman	45	
Palestine	50	
The Syrian Arab Republic	44	

CHEMICAL FACT SHEET OF NITRATE AND NITRITE IN DRINKING WATER

GUIDELINE VALUES

Nitrate: 50 mg/l as nitrate ion (or 11 mg/l as nitrate-nitrogen) to protect against methemoglobinemia in bottle-fed infants (short-term exposure).

Nitrite: 3 mg/l as nitrite ion (or 0.9 mg/l as nitrite-nitrogen) to protect against methaemoglobinaemia in bottle-fed infants (short-term exposure).

Combined nitrate plus nitrite: The sum of the ratios of the concentrations as reported or detected in the sample of each of its guideline value should not exceed.

OCCURRENCE

In most countries, nitrate levels in drinking water derived from surface water do not exceed 10 mg/l, although nitrate levels in well water often exceed 50 mg/l; nitrite levels are normally lower, less than a few milligrams per litre.

BASIS OF GUIDELINE VALUE DERIVATION

Nitrate (bottle-fed infants): In epidemiological studies, methemoglobinemia was not reported in infants in areas where drinking water consistently contained less than 50 mg of nitrate per litre.

Nitrite (bottle-fed infants): Application of body weight of 5 kg for an infant and drinking-water consumption of 0.75 litre to lowest level of the dose range associated with methemoglobinaemia, 0.4 mg/kg body weight. This is supported by accepting a relative potency for nitrite and nitrate with respect to methemoglobin formation of 10:1 (on a molar basis).

LIMIT OF DETECTION

Nitrate: 5 mg/l or lower should be achievable using biological denitrification (surface waters) or ion exchange (groundwaters).

Nitrite: 0.1 mg/l should be achievable using chlorination (to form nitrate).

ADDITIONAL COMMENTS

Nitrite can occur in the distribution system at higher concentrations when chloramination is used, but the occurrence is almost invariably sporadic. Methaemoglobinaemia is, therefore, the most important consideration, and the guideline derived for protection against methemoglobinemia would be the most appropriate under these circumstances, allowing for any nitrate that may also be present.

Methaemoglobinaemia in infants appears to be associated with a simultaneous diarrhoeal disease. Authorities should, therefore, be all the more vigilant that water to be used for bottle-fed infants is microbiologically safe when nitrate is present at concentrations near the guideline value or

in the presence of endemic infantile diarrhea. Water should not be used for bottle-fed infants if the concentration of nitrate is above 100 mg/l but can be used if the concentration is between 50 and 100 mg/l if the water is microbiologically safe and there is increased vigilance by medical authorities.

All water systems that practice chlorination should closely and regularly monitor their systems to verify disinfectant levels, microbiological quality, and nitrite levels. If nitrification is detected (e.g. reduced disinfectant residuals and increased nitrate levels), steps can be taken to modify the treatment train or water chemistry in order to minimize nitrate formation. Efficient disinfection must never be compromised (WHO, 2011).

Infants, pregnant women, nursing mothers, or elderly people are the most vulnerable to nitrate contaminants. It is always advisable to constantly subject drinking waters to test for nitrate if water samples are tested, the results should be compared with table 1 and figure 1 for interpretation. From the table, it could be deduced that water with the 0-40ppm limit is suitable for consumption for both humans and livestock. 41-100 ppm is risky, over 100 should not be used for drinking. According to CDC (2015), removal of nitrate from water can be done by using ion exchange, distillation, and reverse osmosis as treatment processes. Whereas heating or boiling of the water may not remove nitrate, the reason is that part of the water will evaporate during the boiling process, dryness of the water will increase the concentration of nitrate if the water is boiled. The use of filters or chlorination does not remove nitrate from water.

Table 1. Nitrate levels and Interpretations
Source: Skold *et al*. (2011)

Nitrate Level, ppm (parts per million)	Interpretation
0-10	Safe for humans and livestock. However, concentrations of more than 4 ppm are an indicator of possible pollution sources and could cause environmental problems.
11-20	Generally safe for human adults and livestock. Not safe for infants because their digestive systems cannot absorb and excrete nitrate.
21-40	Should not be used as a drinking water source but short-term use acceptable for adults and all livestock unless food or feed sources are very high in nitrates.
41-100	Risky for adults and young livestock. Probably acceptable for mature livestock if feed is low in nitrates.
Over 100	Should not be used as drinking water for humans or livestock.

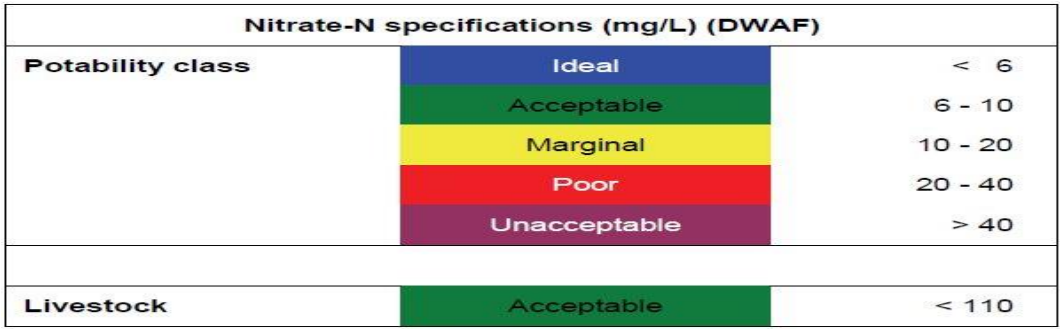

Figure 1. Nitrate level and interpretation (Colour)
Source: Skold et al. (2011)

CONCLUSION

From the literature reviewed, the nitrate contents in most of the drinking waters are low. This showed that as at the time of publishing the papers, the water samples are safe for consumption. It advisable to constantly monitor the nitrate content. This is just to ascertain that the waters are not polluted before been used or consumed.

REFERENCES

Addo M.A., Darko E.O., Gordon C., Nyarko B.J.B. (2013), *Water quality analysis and human health risk assessment of groundwater from open-wells in the vicinity of a cement factory at Akporkloe, Southeastern Ghana*, E-journal of Sc. & Tech. 4 (8): 15-30.

Akoth K., Palamuleni L. (2015), *Physicochemical and microbial analysis of selected borehole water in Mahikeng, South Africa*, Int. J. Environ. Res. Public Health. 12:8619-8630.

Akoto O., Darko G., Nkansah M.A. (2011), *Chemical Composition of Rainwater over a Mining Area in Ghana*, Int. J. Environ. Res., 5(4):847-854.

Al-Badaii F., Shuhaimi-Othman M., Gasim M.B. (2013), *Water quality assessment of the Semenyih River, Selangor, Malaysia*, J. Chem: http://dx.doi.org/10.55/2013/871056.

Al-Ghamdi A.Y., Saraya M.E., l-Ghamdi A.O., Zabin S.A. (2014), *Study of physicochemical properties of the surface and groundwater*, American. J. Environ. Sci. 10 (3): 219-235.doi:10.3844/ajessp.2014.219.235.

Ayoko G.A., Singh K., Baerea S., Kokot S. (2007), *Exploratory multivariate modeling and prediction of the physicochemical properties of surface water and groundwater*, J. Hydrology 336:115-124.

Bhat A.H., Sharma K.C. (2015), *Physico-chemical analysis of groundwater quality of adjoining areas of Sanbharlake, a Ramsar Westland of Rajasthan, India*, Curr. World Environ. 10 (3):doi:http://dx.doi.org/10.12944/CWE.10.3.37.

Facchi Cerqueira M.R., Pinto M.F., Derosil N., Esteves W.T., Santos M.D.R., Matos M.A.C., Lowinsohn D., Matos R.C. (2014), *Characteristics of rainwater at a Southeastern site of Brazil*, Atm. Poll. Res. 5:253-261.doi:10.5094/APR.2014.031.

Fatombi K.J., Ahojo T.A., Nonfodji O., Aminou T. (2012), *Physicochemical and bacterial characteristics of groundwater and surface water quality in the Lagbe town: treatment essays with Moringa oleifera seeds*, J. Water Res. & Protection. 4:1001-1008.

Flores M.J., Zafaralla M.T. (2012), *An assessment of the physicochemical parameters of Mananga River, Cebu, Philippines*, Int. J. Ecology & Conservation. 4:34-61.

Gambo J.B., James Y., Yakubu M.B. (2015), *Physico – Chemical and Bacteriological Analysis of Well Water at Crescent Road Poly Quarters, Kaduna*, International Journal of Engineering and Science, 4 (11): 11-17.

Gordon M.C. (2012), *Maternal Physiology*, In: Gabbe SG, Niebyl JR, Galan H, Jauniaux ER, Landon M, Simpson JL et al, editors. Obstetrics: Normal and Problem Pregnancies. 6th ed. Philadelphia PA: Saunders Elsevier. Chapter 3, Pages 51-53.

Hamaidi M.S., Hamaidi-Chergui F. (2014), *Physico-chemical quality of boreholes water used as a source of public supply in Arib (Ain Defla-Algeria)*, European Academic Res. 1 (12): 5379-5392.

Hamaidi-Chergui F., Errahmani M.B., Benouakhil F., Hamaidi M.S. (2013), *Preliminary study on physicochemical parameters and phytoplankton on Chiffa River (Blida, Algeria)*, J. Ecosystems. http://dx.doi.org/10.1155/3013/148793.

Hengsuwan M., Durrast H., Hansen B.T. (2015), *Geochemical characteristics and origin of CO2- rich groundwater in Southern Thailand*, 5th Geoindo, 23-24 Nove. Khon Kaen, Thailand.

Kafia M.S., Sulaiman G.M., Nazanin M.S. (2009), *Physical and chemical status of drinking water from water treatment plants on Greater Zab River*, J. Appl. Sci. Environ. Mgt 13 (3): 89-92.

Kangpe N.S., Egga E.S., Mafuyai G.M. (2014), *Physico-chemical and Microbial Assessment of Some Well Water from Mista-Ali Town, Bassa LGA, Plateau State-Nigeria*, Asian Review of Environmental and Earth Sciences. 1 (2): 39-42, 2014.

Kim M.K., Lee J.S., Jung G.B., Ko B. Gu, Kwon S.I., Kim M.Y., So K.H., Yun S.G. (2013), *Chemical characterization of rainwater over Suwon Region during farming and non-farming periods*, J. Agric. Chem. & Environ. 2 (1): 1-7.

Kura N.U., Ramli M.F., Sulaiman W.N.A., Ibrahim S., Aris A.Z., Mustapha A. (2013), *Evaluation of factors influencing the groundwater chemistry in a small tropical Island of Malaysia*, Int. J. Environ. Res., Public Health. 10: 1861-1881.doi:10.3390/ijerph/100051861.

Kushe J.F. (2009), *Assessment of the chemical quality of groundwater for drinking in Dedza, Malawi. M.Sc Thesis, Department of Civil Engineering, Faculty of Engineering*, The university of Zimbabwe.

Likambo W. (2014), *Assessment of borehole water quality and consumption In Yei County, South Sudan*, M.Sc Thesis. Department of Environmental & Natural Resources. Makerere University. Sudan. Unpublished.

Maiga Y., Moyenga D., Ushijima K., Sou M., Maiga A.H. (2014), *Greywater characteristics in rural areas of the Sahelian region for reuse purposes: The Case of Burkina Faso*, J. Water Sci. 27 (1): 39-54.doi:10.7202/102198/ar.

Makaroon T., Kasemsuwan S., Ratanavanichrojn N., Hananantachai H., Mingkhawan R., Khaodhiar S., Tulayakul P. (2013), *Critical factors on chemical properties and heavy metals in water for livestock farms in Thailand*, Thai J. Vet. Med. 43 (4):581-588.

Manassaram D.M., Backer L.C., Moll D.M. (2006), *A Review of Nitrates in Drinking Water: Maternal Exposure and Adverse Reproductive and Developmental Outcomes*, Environmental Health Perspectives. 114 (3): 320-327.

McDonagh E.M., Bautista J.M., Youngster I., Altman R.B., Klein T.E. (2013), *PharmGKB summary: methylene blue pathway*, Pharmacogenetics and Genomics 23 (9):498–508.

Molla M.A., Saha N., Salam S.A., Rakib-uz-Zaman M. (2015), *Surface and groundwater quality assessment based on multivariate statistical techniques in the vicinity of Mohanpur, Bangladesh*, Int. J. Environ. Health Eng. 4:18 MRC.

Olaoye R.A., Olaniyan O.S. (2012), *Quality of rainwater from different roof material*, International Journal of Engineering and Technology 2(8), pp. 1413-1420.

Olivier J., van Niekerk H.J., Vander I.J. (2008), *Physical and chemical characteristics of thermal springs in the Waterberg area in Limpopo province, South Africa*, Water S.A. 34 (2): 163-174.

Olomukoro J.O., Oviojie O.E. (2014), *Physico-Chemical Characteristics and Bacteriological Studies in Hand Dug Wells in Udu Community of Delta State, Nigeria,* Journal of Environment and Earth Science. Vol.4, No.22.

Olowoyo D.N. (2011), *Physico-chemical characteristics of rainwater quality of Warri axis of Delta State in Western Niger Delta region of Nigeria*, Journal of Environmental Chemistry and Ecotoxicology. 3 (2): 320-322.

Pattanapipitpaisal P., Suraruk P. (2012), *Groundwater quality and arsenic contamination in Amphoe Khemmarat, Ubon Ratchathani, Thailand*, J. Environ. Sci. & Eng. A.1:133-141.

Perera P.A.C.T., Sundarabarathy T.V., Sivananthawerl T., Edirisinghe U. (2014), *Seasonal variation of water quality parameters in different geomorphic channels of the upper Malwathu Oya in Anuradhapura, Sri Lanka*, Trop. Agric. Res. 25 (2):158-170.

Sabareza V.J.G. (2014), *Physical and chemical properties of Sipocot River on rainy and dry days. Department of Landscape and Environmental Management*, College of Agriculture and Natural Resources, Central Bicol State University of Agriculture, Pili, Camarines Sur.

Sajil Kumar P.J., James E.J. (2013), *Physicochemical parameters and their sources in groundwater in the Thirupathur region, Tamil Nadu, South India*, Appl Water Sci 3:219-228.

Samie A., Makonto O.T., Mojapelo P., Bessong P.O., Odiyo J.O., Uaboi-Egbenni P.O. (2013), *Physico-chemical assessment of borehole water used by schools in Greater Giyani Municipality, Mopani District, South Africa*, Afr. J. Biotech. 12: 4858-4865.

Sivamanikandan P. John S. A. (2015), *Impact of physicochemical parameters on bacterial population in Mullaiperiyar River water-Theni District, Tamilnadu, India*, Afr. J. Micro. Res. 9 (1): 26-32.

Skold A., Cosco D.L., Klein R. (2011), *Methemoglobinemia: Pathogenesis, Diagnosis, and Management*, Southern Medical Journal 204(11):757-761.

Sorlini S., Palazzini D., Sieliechi J.M., Ngassoum M.B. (2013), *Assessment of physical-chemical drinking water quality in the Logone Valley (Chad-Cameroon)*, Sustainability. 5:3060-3076.

Stett H. (2012), *Farming Communities Facing Crisis Over Nitrate Pollution, Study Says*, Food & Environment Reporting Network, Inc.

Tayne J.C. (2015), *Biological and chemical characteristics of groundwater in a rural settlement area of Davao Oriental,* American Sc. Res. J. Eng., Tech., and Sci. (ASRJETS). 14 (1):94-99.

Wirmvem M.J., Ohba T., Fantong W.Y., Ayonghe S.N., Suila J.Y., Asah A.N.E., Tanyileke G., Hell J.V. (2013), *Hydrochemistry of shallow groundwater and surface water in the Ndop plain, Northwest Cameroon*, Afr. J. Environ. Sci & Tech. 7 (6): 518-530. Doi:10.5897/AJEST2013.1456.

Yasin M., Ketmo T., Bacha K. (2015), *Physico-chemical and bacteriology quality of drinking water from different sources, Jimma zone, Southwest Ethiopia*, BMC Res. Notes. 8:541.

Yusoff I., Alias Y., Yusoff M., Ashraf M.A. (2013), *Assessment of pollutants migration of Ampar Tenang landfill site, Selangor, Malaysia*, Science Asia 39: 392-409.

*** (2011), *Guidelines for Drinking-water Quality* (WHO), Fourth Edition.

*** (2013), *Report on regulations and standards for drinking water quality* (WHO), Compiled by David Drury, Draft 12. November 2013.

*** (2014), *Nitrate/Nitrite Toxicity (CDC) - What Are Routes of Exposure to Nitrates and Nitrites? Environmental Health and Medicine Education*, Agency for Toxic Substances and Disease Registry. U.S. Department of Health & Human Services.

*** (2015), *Drinking Water. Diseases and Contaminants (CDC), Nitrate and Drinking Water from Private Wells*, Agency for Toxic Substances and Disease Registry. U.S. Department of Health & Human Services.

*** (2015), *Water quality monitoring data* (WSD), Dongjiang water quality for the period of October 2014-September 2015 as received in Hong Kong at Muk Wu pumping station. The government of the Hong Kong Special Administrative Region.

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INDUSTRIAL ACTIVITIES IN MUREŞ COUNTY

George-Bogdan TOFAN*
„Vasile Goldiş" Western University of Arad, Faculty of Economic Sciences, Engineering and Informatics, Departament of Engineering and Informatics, Baia Mare Branch, 5 Culturii Street, Romania
e-mail: bogdan.tofan@uvvg.ro

Adrian NIŢĂ
„Babeș-Bolyai" University, Faculty of Geography, Gheorgheni Branch, Csiki Garden, Romania
e-mail: nitaadrian@hotmail.com

Abstract: This study sets out to "x-ray" all the industrial sectors currently operating in Mureş County, a topic generally „avoided" by most researchers due to the multiple transformations that have taken place during the postcommunist transition period. Thus, we tried to present the geographic distribution of existing industries, concentrated in the *Middle Section of Mureş* (Reghin, Târgu-Mureş, Ungheni, Iernut, and Luduş) and the *Târnave* (Târnăveni and Sighişoara), while rural areas experience low industrial input and output. In terms of industrial production, it is clear that *the light industry* is dominating (7,763 employees), especially in *textiles* (45.4%), followed by wood processing, with its furniture production subsector (62.1% of the 7,513 employees). Other major industries include *food industry* (16.8%, 7,129), *machinery* (16.5%, 6,989), *chemical industry* (8.8%, 3,739), *construction materials* (7%, 3,003) and the *extractive industry* (6.2%, 2,661). In 2005, Mureş County Council inaugurated its first *industrial* park, located in Ungheni, which now hosts 18 companies with over 1,700 employees.

Key words: methane gas, secondary sector, light industry, industrial park

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INTRODUCTION

The county's location in the central part of Romania and the existence of numerous natural resources enabled the emergence of several activities concentrated in the hand of different guilds. Commercial activities thrived, which led to the creation of trade fairs in the main towns. Guild continued until the second half of the 19th century, which marked the change from simple manufacturing to massive industrialization (Pop, 2007). It is at this moment that the *Chamber of Commerce and Industry* was established in Targu Mureș. Its members were workers in different wood, skin, shoe and food industries.

Later on, during the first half of the 20th century, new factories emerged, processing local resources. Most were located in Târgu-Mureș (furniture, sugar, beer, leather), Reghin (alcohol, timber, crates) and Sighișoara (bricks and ceramic tiles). Next, the county goes through a more

* Corresponding Author

significant industrial development compared to ther areas due to the usage of *methane gas* as fuel and raw material for different industrial activities, plus its salt mines. After 1948, the economic and social environments changed drastically, the new political regime focusing in growing the secondary sector. The old industrial plants were upgraded and expanded, alongside with the creation of new industries. Forced urbanization processes were implemented, with long term effects. Thus, massive plants such as *Târnăveni Chemical Plant* and *Târgu-Mureș Chemical Fertilizer Plant* were created, requiring considerable energy input. Two new high capacity power stations were built, one in Fântânele and one in Iernut, using gas extracted from the Transilvaniei Plateau. Many more factories were built - steel, construction materials, as well as machinery, logging, textiles and food.

After 1990, as the economy transitioned to a market phenomenon, all industries suferred massive restructurings, complex and difficult privatizations, creating social problems and massive layoffs.

METHODOLOGICAL ASPECTS

We must emphasize that this scientific endeavour implied considerable research, especially the activity profiles of all current and former firms that had emerged after 1990. Therefore, the data and information provided by *Mureș Chamber of Commerce and Industry* were highly useful for this paper. Moreover, we consulted several studies which dealt with similar topics as our own (Pop, 1972, 2007, 2012; Pop & Mîrza, 2012; Claval,1974; Bailly & Béguin, 1982; Bailly et al., 2017; Șoneriu & Mac, 1973; Bailly, 1991; Herman et al., 2017; Ilie et al., 2017; Max, 1991; Carles, 1998; Raboca et al., 2001; Păcurar, 2006; Cocean, et al., 2013; Tofan, 2013, 2014).

These were „reinforced" by the information found in the general urban plans and the development strategies of the 102 administrative-territorial units, and by the statistical data provided by the Mureș Statistical Department, as well as those from online sources and local media. The most important however has been the field research, which enabled the authors to have a better view of the analysed territory, with graphical and cartographic representations.

INDUSTRIAL SECTORS

In terms of number of employees, the secondary sector comprised a total of 42,427 people in 2015. This total number of distributed as follows: light industry (18.3%), logging and wood processing (17.7%), food industry (16.8%), machinery (16.5%), chemical and paper industry (8.8%), construction materials (7%), extractive industry (6.2%), other industries (4%), electricity (3.3%), and metallurgy (1.4%).

The extractive industry

It involves extracting *nonmetal resources*, mostly *methane gas*, one of the country's largest riches. The discovery of methane gas deposits took place in *Sărmășel*, in 1908, during prospecting works for potassium salts.

In 1914 the first gas pipe was finished, spanning from Sărmășel-Turda-Ocna Mureș, with a length of 55 km and 153 mm diameter (Pop, 2012, p. 201-202). The same year, the first gas extraction fields were created in Zau de Câmpie, Șincai and Delenii (Băgaciu), the former supplying Târnăveni and Târgu-Mureș with natural gas. The ever increasing usage of this resource, including for industrial purposes, required the installation of the first ever gas compression unit in Europe, built in 1927, at Sărmășel.

During the socialist period, new gas fields we discovered in the Transilvaniei Plain and Mureș Corridor, closer to the surface, such as the domes of Sânger, Bogata, Șăulia, Mădăraș, Luduș, Dumbrăvioara, Ernei, Ilioara, Teleac, Cristești etc. Thus, this is the oldest gas area which forms the *northwestern gas pipe*, supplying urban centers such as: Cluj-Napoca, Turda, Câmpia Turzii, Ocna Mureș, Dej, Baia Mare, Satu Mare, and numerous rural areas (Pop, 1972, p. 176).

Târnavelor Plateau contains the well-known domes of Corunca, Livezeni, Miercurea Nirajului, Sângeorgiu de Pădure (use to supply the former powerplant of Fântânele), Filitelnic and

Nadeș, acting as the starting point for the eastern gas line, towards Moldova. Nonmetal resources also comprise *construction materials*, such as andesites with pyroxenes from the Mureș Defile (Meștera-Ciobotani) and Sovata (Ilieși), used primarily for road and railway constructions.

The presence of the Pannonian sedimentary cover shows the existence of major accruement of sands and gravel, which are excavated as quarry products. Such mineral reserves can be found in the vicinity of: Răstolița, Petelea, Gornești, Cristești, Ernei, Sângeorgiu de Mureș, Ungheni, Ogra, Iernut, Chețani (Mureș River); Albești și Daneș; Târnava Mică la Chibed, Sângeorgiu de Pădure, Bălăușeri, Suplac (on Târnava Mare); Ibănești and Hodac (on Gurghiu), and Eremitu and Miercurea Nirajului on Niraj. Clay is extracted in a quarry located at Dealul Viilor (Sighișoara), owned by Siceram Joint Company, used for producing tiles, bricks, ceramics and other construction materials.

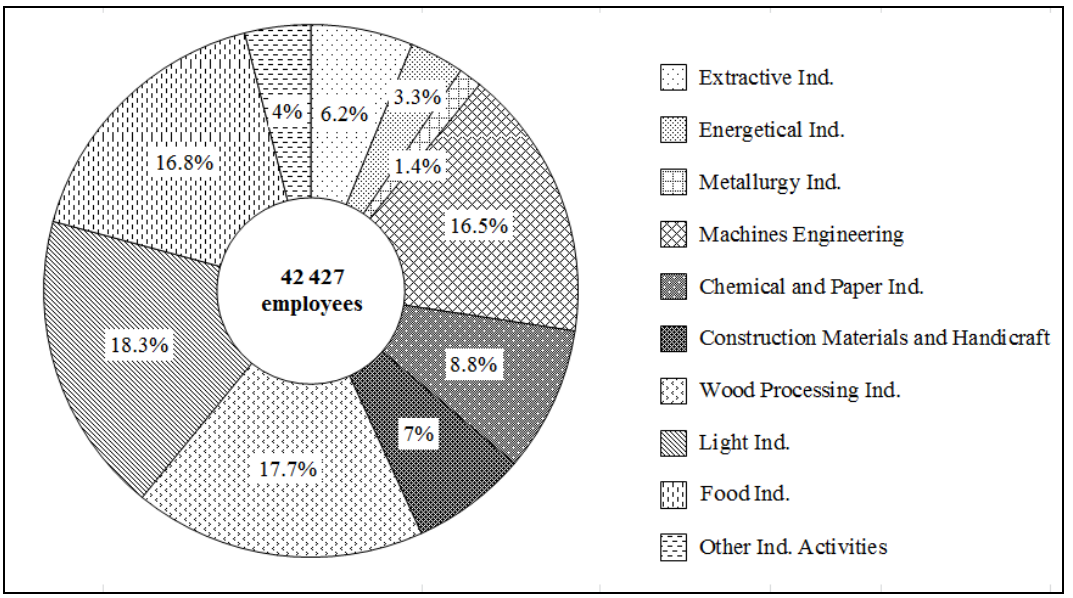

Figure 1. Industry structure in Mureș County, in 2015

Industry of electrical energy

Its origins date back to the end of the 19th century (1897), when a small powerplant was set up in Târgu-Mureș, using lamp oil, followed by the *„Turbina" hydroelectric plant,* built in 1914, on the Mureș River. The discovery of methane gas enabled the construction of a 30 MW powerplant at Târnăveni (1930-1940), located near the chemical works, closed in 1999 (Pop, 1972, p. 208; Pop, 2012, p. 234).

The large scale industrial development of the second half of the 20th century, by upgrading old units as well as by creating new ones, highly energy consuming, prompted the creation of the *Fântânele powerplant* in 1952, developed by specialists from the former USSR, and then by Germans, who added an extra 100 MW, reaching a full capacity of 250 MW. This unit was disassembled in 1996, as it was deemed too high maintenance.

During 1960-1967, between Iernut and Cuci, a new powerplant was erected, using the gas from the domes of the Transilvania Plateau. Water for cooling was redirected from the Mureș River, through a series of 8 high capacity pumps. *Iernut* powerplant has a capacity of 800 MW, with six energy groups, four at 100 MW, built in Czechoslovakia, and two at 200 MW, from the former U. S. S. R.

There is also a powerplant at *Răstolița* (35.2 MW and aproduction capacity of 117.5 GWh/year), currently under construction. North of Târgu Mureș, on the Mureș River, there is a hydroelectric node *„Nr. 1 Dam"*, built, among other things, to produce electricity (0.9 MW).

The continuous growth of the price of electricity in the last years led to an increasing usage of alternative sources for electricity. Thus, several solar parks were created, located in areas such as: Sânpaul, Chirileu village (3.6MW), linked to the national energy grid by a 20 kV powerline - Ungheni-Cipău; Sângeorgiu de Pădure (3.2MW); Râciu, Coasta Mare village (3 MW); Ideciul de Jos (3 MW); Vidrasău (part of the town of Ungheni), 2.8 MW; Ghindari (2.5MW); Sâncraiu de Mureș, Nazna village (2.2 MW); Cuci (1.9 MW); Reghin (1.8 MW); Bălăușeri, Agrișteu village (1.4 MW); Ernei, Icland village (950 kW); Vărgata, Mitrești village (945 kW) and Miheșu de Câmpie (827 kW).

Metallurgy industry

The new social and economic conditions after 1989, and the new market economy had massive repercussions on this industrial sector, with disadvantages imposed by energy intensity, but also by the need for vast resources, leading to privatisations and restructurings, as well to significant decrease in production.

One of the oldest smelting plants in Mureș was *Nicovala Joint Company* from Sighișoara, built in the 50s, but dating back all the way to 1882. In the 1980s, its had more than 2500 employees, producing cast iron products and several drilling apparatuses. It was purchased by Nicovala Holdings LTD Lymassol from Cyprus, but filed for bankruptcy in 2012. From the same period dates the fomer iron cast works owned by the *„Republica" Agricultural Enterprise* of Reghin, with roughly 40 employees. The company changed its name in 1990 to Metalurgica Reghin, and was privatised in 2003 and bought by a local investor, later becoming *S.C. Simal Steel.* In 2003, it was relocated in the industrial part of the city, with an iron cast forge with a capacity of 1200 tonnes of cast pieces and 400 tonnes of pieces cast in iron and high alloys.

Several smaller forges date back from the last decade of the 20th century, such as: S. C. Cubi-Metal S. R. L. (1991), S. C. Topocent S. R. L. (1997), S. C. Turprod S. R. L. (1992), all in Târgu-Mureș; S. C. Turnef Transilvania S. A. from Sângeorgiu de Mureș (1991); S. C. Comaro S. R. L. (1993) and S. C. Onix Multiteh S. R. L., both located in Luduș (2004). These units cast nonferous metals (aluminium, lead, zinc, tin), creating bronze bells for churches, statues, bas-reliefs, commemorative plaques, garden furniture, aluminium fences etc). S. C. Agromec Reghin S. A. (1991) producing and selling cast iron pieces, ductile iron for subpieces and industrial equipment.

S. C. Irum S. A. from Reghin, after its privatisation of 1999, aquired a state of the art cast forge, providing iron and bronze subensembles, for the machines, autovehicles, and forestry and agricultural equipment made in this unit. *S. C. Plasmaterm S. A.* from Târgu-Mureș specialises in different types of steel and special alloys, thermal treatment and nitriding for the precision mechanics industry. It produces parts for the automotive, biomedical, and textile industries. It was created in 1993 by former employees of Întreprinderi Metalotehnica, a major factory during the socialist years, that used to manufacture knitting machines, with more than 5,000 workers.

Machines engineering

a) The machinery industry is characterised by a wide array of products such as: *tool-machines for metal processing*, tools for the cold processing of metals used in drilling, cutting, bending, stamping (S. C. Sumel Electromureș S. R. L[1]), machinery for sheeting reinforcing iron (Procam; Investech, Sângeorgiu de Mureș); *agricultural tools and machinery*, such as reversible plows, wood choppers, 2 to 15 tonne trailers, single or double trailers for dispersing manure, with loading capacities between 3.5 and 10 tonnes, independent disk harrows, with widths between 2 and 6 meters, grinders, tractors, front loaders; *logging equipment and machinery*, like wood cutting

[1] The industrial units without any mention of location are situated in the City of Târgu-Mureș.

and splitting machines, splitters for turning large logs into firewood, cable railways, winches, logging articulated wheeled tractors, front loaders (IFRON 2000), logging railers (5-14 t) etc.

All of the above are manufactured by the *S. C. Maviprod S. R. L.* and *S. C. Irum S. A.* company group, the latter having been founded in 1953, initially specialized solely in creating forestyr equipment. In 1998, it became a fully privately-owned company (Maviprod as main shareholder), being an important producer of logging machinery and equipment (mainly), as well as farming equipment; *machines and equipment for different industrial sectors*, such as radiators and gas boilers (Biodom Europe, Sighișoara), hydraulic cylinders (Mureș Hidraulici), hoisting and lifting equipment (Telog, Livezeni), equipment for extraction and constructions (Prime Dfm, Râciu), electrostatic treatment and painting, metallic surface decorations (Allcolors Serv, Ungheni; Seucolor), sandblasting technologies (Sablast), ventilation and air conditioning (Ruck Ventilatoare, Târnăveni), equipment of light industry (Imatex, part of the former Întreprindere de Utilaje pentru Industria Ușoară, which manufactured equipment of the textile industry), sowing machines, components, gadgets and parts for commercial and industrial sowing machines (Durkopp Adler, Sângeorgiu de Mureș), plastic ana drubber processing equipment (Vasilache Snc), medical equipment (Ortoprofil Prod; Donautal, Reghin), wood processing equipment (East European Trade, Vidrasău), tools and accessories for producing and bottling mineral water (Artezi, Cristești).

b) The electronics and electrotechnical industry is represented above all by *Electromureș*, founded in 1970 from the former „Ciocanul" Cooperative (1950), becoming the only supplier of PVC conductors and pipes for the entire machinery and energy industry, as well as of electrical cables for all sorts of vehicles built in Romania. Until 1985, the conductor and cable divisions of the plant also manufactured products intended for export (roughly 20-30% of the total production), with deliveries to the European, American, and Asian markets. New market conditions led to a three way split in 1995: *Romcab*, specialised in manufacturing three types of products (conductors, cables, and electrical cords), for vehicles, constructions, home appliances, and infrastructure; *Electromureș*, fully privatized in 1998, produces small home appliances, oil heaters, electrical convectors, motorcycle lamps, illumination systems; and *Sumel*, which produces electrical appliances, audio appliances, tools, and special machinery.

This sub branch also contains companies manufacturing: different vehicle cables, by the Austrian company *Hirschmann Automotive*, which owns a production unit in Sânpaul, currently employing more than 2000 people, more than half women. The entire production is shipped to Daimler and BMW in Germany; electrical and electrotechnical equipment is manufactured in Sângeorgiu de Mureș, by Aages, Uno Electronics, and Top Electro; different electrical, auto and multimedia cables (Cableteam, Sighișoara); electrosecurity equipment (Nakita Prod Comimpex); pumps and electrical compressors (Euro Gas System). SVT Electronic produces equipment for industrial electronics: fingerprint/card readers, automated gates and doors, bracelets and readers for SPA, auto access equipment, etc.

c) Spare parts, metallic constructions and other metal products is currently experiencing a major upswing due the reorientation of clients towards compatible spare parts (non original), manufactured in specialised units, with little production costs. There is a large range of spare parts for agricultural and logging equipment, trucks and other industrial tools (Maviprod and Irum, Reghin), spare parts for internal combustion engines (Foris Company Impex), tools, devices, plastic molds (Sumel, Electromureș) and molds for nonferous products (Eurosystem, Luduș).

S. C. C. I. E. Matricon S. A. is part of the C. I. E. Automotive Spania Groups, and was created in 1991, for the production of aluminium parts for machinery and vehicles - Ford, Volkswagen, Audi, Renault, Dacia, etc, the products being exported to Germany, Poland, and Hungary. It also produces chisels, drill bits, precision molds, planing machines, manual broaches, and other similar tools.

Figure 2. The industrial sectors and subsectors of Mureș County, 2017

The construction sector includes the processes of manufacturing, processing and setting aluminium profiles, curtain walls, exterior plating with composite panels (Big Aluminium, Protelcon - Reghin), maunfacture of metallic constructions and parts of metallic structures (Allstar, Sid Steel Industrie), componentss, accessories and parts for window blinds, steel components processed through chipping (Romprodus), wire fences (Sumel, Rom Olsena Company), different types of screws, nuts, bolts, chains, steel cables, hooks, different assembly parts for assembly (Surub Trade), metal wire parts (Kern Liebers Carpatia, Sâncraiu de Mureș), metalwork for furniture (Sziferon, Sângeorgiu de Mureș), enameled vessels, coal grills, teflon disks, fireplaces, stoves, gas convectors, drainpipes etc, all by Ves from Sighisoara.

d) Machine and equipment repair, maintenance and installation is a highly diversified industry, mostly for road vehicles, with numerous service shops, located in the main cities and towns. Smaller shops can be found in large rural areas, situated in the proximity of urban zones. There are also several small repair and maintenance companies for electronic and optical equipment, transport equipment, machinery etc. S. C. I. R. L. U. C. F. R. S. A. („Întreținere și Reparații Locomotive și Utilaje"), division of C. F. R. Marfă, has a work station in Târgu-Mureș, which repairs DE (diesel-electrical) and DH (diesel-hydraulic) locomotives.

Chemical and paper industry

It emerged in the second and third decades of the 20th century, being a „creation" of methane gas, used as basis for the production of war materials (explosives and combat gas), manufactured by *Nitrogen* from Târnăveni (1916). We must also point out that, in 1942, this unit manufactured the first aluminium block in Romania.

Moreover, the rich salt deposits also contributed to the development of this industrial sector, astfel că with the construction of the *Mica chemical-metallurgical plant*, in 1920. This unit later merged with the previously mentioned plant, forming *the Târnăveni Chemical aggregate works*, a symbol of the Romanian chemical industry for its manufacture of calcium carbide. 1989 was a crucial year for the entire plant, as it was divided in two companies, *Bicapa* and *Carbid Fox*.

The former is specialized in inorganic chemistry, producing chrome compounds, pesticides, barium salts, tiles etc. Between 2002 and 2007, it went through two unsuccessful privatizations, filing for bankruptcy later on. The plant was bought, at an auction, by Wastes Ecotech from București. Carbid Fox is the only carbide producer in Romania, and, between 2002-2003, it employed 2000 people. Most of its production was exported. Its bankruptcy was filed in 2006, when the company had only a quarter of its former employees, and three years later it was sold to S.C. Terra Holdings from Ilfov County.

Another chemical giant was *Azomureș*, founded in 1962 as the *Târgu-Mureș Nitrogen Fertilizer Works.* In 1966 it began producing fertilizers based on: ammonia, nitric acid, and ammonium nitrate. Transformed into a stock company (1990), owned by the Romanian State, under the name *Azomureș*, it suffered several restructurings as the old installations were scrapped. Eight years later, it was acquired by Transworld Fertilizers Holding from Turcia, a move that failed due to investor noncompliance. In 2012, the aggregate works of Târgu-Mureș was bought by the Swisss company Ameropa Holding, which introduced new technologies.

Currently, Azomureș produces: complex chemical fertilizers, nitrogen chemical fertilizers, granulated urea (unique in southeastern Europe), melamine (sole producer in Romania), URAN/UAN liquid fertilizer, anhydrous ammonia, dry calcium carbonate, a part of the production being shipped to Europe, Asia, Africa, the US, and Latin America. In 2014, the plant had 1,600 employees compared to 4,782, in 1990.

Armedica, created in 1985, specialises in *pharmaceuticals* and started its production in 1989 (tablets and ointment tubes), with more than 300 employees. In 1998, it was purchased by Gedeon Richter Plc, which became the majority shareholder. In 2003, it changed its name to *S. C. Gedeon Richter România S. A*. A series of distribution companies was purchased,

grouped under the name *Pharmafarm*, while the retail part is supervised by *Gedeon Richter Farmacia*, now at more than 120 pharmacies, with good national coverage.

Among its most well known nonprescription drugs: Aspirine, Amraxol, Fasconal, Magnesix, Panangin, Postinor, Symphoral, Iodosept etc., many exported to the EU, Russia or Moldova. S. C. Gedeon Richter România S. A., currently employs over 600 workers, almost half with tertiary education.

There are several other pharmceutical companies operating in Târgu-Mureș such as: *Bioeel* (1992), initially producing cosmetics, the current portofolio containing over 100 products (prescription and non-prescription drugs, food supplements, cosmetics etc); *Sandoz* (1994), production and distribution of antibiotics (Eritromicine, Claritromicine, Azitromicine), part of one of the largest pharmaceutical companies in the world, Novartis; *Farmaceutica Aesculap*, a former state company, the Pharma Office, currently part of *Ropharma*, a company which produces food supplements (vitamins), with a distribution division that supplies products to clients from seven different counties; *Vim Spectum* (1998), based in Corunca, producing drugs for: the cardiovascular and central nervous systems, systemic antimycosis, the digestive tract, anti-inflammatory, as well as dietary supplements.

With more than 50 years experience in processing plastic materials, as well as rubber and fiber glass poliesters etc., *„Prodcomplex" Medical Enterprise* became S.C. Prodcomplex S. A.

Specialised in cleaning products, cosmetics, medical disinfectants and several other professional products (detergents and cleaners), *Romchim* was founded in 1998 and now has its own distributuion network spread in nine counties. Different plastic home products (bathroom and kitchen) are manufactured through plastic injection by several companies headquartered in Târgu-Mureș (Intersonic and Allbright).

Vitafoam is a company that focuses on producing polyurethane foam for upholstery, chairs and matresses and has a plant in Luduș. In 2001, the *Daw* conglomerate opened a paint producing installation for the *Caparol brand* in the county capital, later becoming a producer of fire resistant expanded polystyrene for buildings (*EPS Thermopor*).

Last but not least, several companies produce paper and cellulose, such as *Giant Prodimpex* Ungheni, created in 1994, one of the most improtant processors of microondulated cardboard, as well as boxes and stationery; *Rupack* Reghin, with more than 20 years experience, produces high quality cardboard boxes, while *Lacroix Ambalaje* from Sighișoara focuses on carboard boxes for the food industry (especially cheese products).

Construction materials and handicraft

It owes its presence to considerable nonmental resources, mostly clay and quartz sands, as well as to methane gas. This enabled the creation of three major industrial centers, in Sighișoara, Târnăveni, and Târgu-Mureș. This industrial sector is represented in Mureș by the following industries: *prefabricated concrete, glass, and ceramics*.

a) Concrete prefabricates began being manufactured in the 1960s at *„7 Noiembrie" Brick and Tile Factory* from Sighișoara (later Production Workshop nr. 3), when a platform for making light concrete blocks was installed, the equivalent of normal format bricks. Large panels for housing or for cultivating hops were manufactured in Luduș (until 1978), as well as in Fântânele and Ungheni, factories closed after 1990. Today, there are a series a small companies that make products for exterior design and construction: drain, kerbs or pavement (*Valpet*, Ideciu de Jos), concrete elements for walls (*Betas*), ornamental pavement, handrails, concerete fences, cinder blocks, concrete lids (*Viking*) etc.

b) The glass industry first emerged as basic workshops, some historians mentioning the existence of a small workshop in the village of Larga, later relocated in Glăjerie (Gurghiu Commune). Glassmakers created diferent bottles and ornaments, as well as window glass. In the

second decade of the 20th century (1918), there was a shift to factory manufacturing, when the Ardeleana glass plant was built in Târnăveni, which manufactured: bottles, reinforced and ornamental glass, heat resistant glass, mirrors, TV screens, jars, and glass ceramics. In 1991, the factory changed its name to *Gecsat*, becoming a joint company, eventually being privatized in 1995. A decade later, the unit was upgraded with three new production lines, one for expanded polystyrene, one for quartz sand based dry mortar and one for the production of mineral wool.

In 1992, a new company emerged from the larger unit - *Omega Prodcom*, a fully private endeavour, with a single shareholder who completely modernised the production line. It now produces different types of window glass. *Pimer Electro*, from Târgu Mureș, also known as *„The Glass Center"*, makes similar products to the ones created in Târnăveni, with the exception of some products such as glass doors and furniture.

c) The ceramics industry holds a very long tradition in the county, the most representative factory being *S. C. Siceram S. A.* from Sighișoara, founded in 1907. It was initially a small temporary plant, belonging to John and Carol Letz, located in the northwestern part of the city, at the foot of Viilor Hill, where clay deposits were excavated. Close to the factory, between 1913-1914, a new brick and tile plant was built, operating a circular 18 chamber Hoffman oven, with a capacity of 120,000 bricks and tiles (the current nr. 2 workshop), owned by Wilhelm Löw. Several temporary shutdowns occured, caused by: lack of markets, the First World War, loans that could not be paid, floods, fires etc.

In 1948, both factories became State property under the name *„7 Noiembrie" First Brick and Tile factory* Sighișoara, with 167 employees. A new organisational change took place in 1973, when the Sighișoara factory merged with the *Mureșeni* factory from Târgu-Mureș (including the Sângeorgiu de Mureș plant, which operated until 1976), and the *Hercules* factory from Târnăveni, the new unit operating under the name *„Întreprinderea de Produse Ceramice Sighișoara"*.

On 2nd November 1990, the factory was registered as *S. C. Siceram S. A* and was split in two - Târgu-Mureș and Târnăveni. In order to diversify its production, two mixed companies were created, one for ornamental ceramics, and one that produces ceramic elements for ceilings, the latter shortly shutdown. Two years later (1995), the company was privatized, the share portofolio going to the employees and management representatives, which eventually founded *Decoplant*, specialized in *fine ceramics*. A decade later it was bought by its mother company, becoming nr. 4 production workshop, which also manufactures packaging foil and new types of ceramic coating - *Smalto* (glazed coloured tiles) and *Terra Antiqua* (rustic tiles).

Due to raising fuel and employee costs, nr. 1 workshop was upgraded with new technologies in 2005, the unit becoming the most modern ceramic block plant in the country, with a capacity 5.5 times greater than the old factory, currently at 800 t/day. It also launched its own brand of masonry systems - *Termobloc*. The ceramic coating facility of Workshop nr. 3 was also modernized, the raw material provided by the newly opened quarry of Bodoc (Covasna), and it now manufactures both the older tile formats (scale, drain), and new types (sharp scale, „swallow tail", Baltica, Carpathia, and Francia). These last three models are larger than regular ones, Siceram being the only producer of such tiles, branded as *Terra Rosa*. *Mureșeni* Brick Factory of Târgu-Mureș is more than 100 years old, and used to belong to the Sighișoara Ceramic Products Enterprise, later S. C. Siceram S. A. After 2000, it became a member of Kronberger Group, one of the largest brick (Termokom) and ceramic block producers in Romania.

The refracting ceramics industry is represented by the *Hercules Plant* in Târnăveni, located in the industrial, northeastern part of the city, using the same source materials as in the 19th century. 1927 saw the installation of the first circular Hoffman oven and the production of the first tiles, dried above the oven on wooden beams. In 1977, it merged with the other ceramic plant from Târnăveni, section II Dâmbău, which belonged to *Sighișoara Ceramic Products Enterprise*. Immediately after the 1989 Coup, it became a joint stock company (the Romanian State as

majority shareholder), changing its name to *S. C. Cars S. A.* Following an unsuccessful privatization, its management team filed for bankruptcy in 2012.

In 1990, the former *„Întreprindere de Sticlărie și Faianță Sighișoara"* (1957) was divided in three smaller units: *Stimet* (production of glass cases), *Artfil* (phosphatic porcelain products), both closed shortly after privatization, and *Cesiro* (privatized in 1995 and the only one still standing), specialized in household items (plates, platters, cups, and bowls), table accessories (coffee makers, egg, napkin, and butter holders, ashtrays etc.) and decorative objects (vases, flower pots), more than 85% of the entire production being shipped to other EU members, Russia, US, and Canada.

Forestry and logging

Forestry comprises those operations involving the planting and upkeep of forests for the entirety of their biological life (silviculture) on one hand, and the logging and wood processing, viewed as industrial activities, on the other. The latter encompasses primary and secondary activities, with 17.7% (second most important industrial activity in the county).

a) The forestry economy follows the topography of the county quite faithfully, wooded areas and other areas with forest vegetation reaching a total of 209,451 hectares (31.2% of the county's surface area, 2014). The largest forests are located in the northeast, in the mountain area, as well as in the hilly area at the edge of the Transilvania Plateau. Here, there are four communes where forests register above 50% of the entire administrative territory: Chiheru de Jos (54.6%), Vătava (55.2%), Stânceni, (67.7%), and Sovata (68.2%). Values above 70% are found in: Răstolița (77%), Lunca Bradului (78.8%), and Ibănești (82.5%, the highest percentage in the entire county).

In the rural areas from Sângeorgiu de Pădure-Sovata Hills, Târnava Mare Corridor and Hills as well as Hârtibaciul de Nord Plateau, forests occupy roughly 30-40%, while in some rural settlements from Reghin Hills, Mureș Corridor, Târnava Mică Corridor and Hills, forests slowly disappear, with values around the county average (20-30%), while the Mureșană Plain has less than 20% (Ceuașu de Câmpie), with values dropping even below 5%: Cozma (4.6%), Papiu Ilarian (4.2%), Band (4%), Crăiești, and Pogăceaua (both with 3.2%), Șăulia (3%), Miheșu de Câmpie (2.7%), Valea Largă (2.2%), and Tăureni (1.3%, the lowest forest coverage in the county).

In 2014, 38.2% of the total surface area covered by forests was privately owned, belonging to individuals, compossessorates, town halls, or other types of associations. Out of a total of 209451 ha of forests, 2/4 are overseen by the „Romsilva" National Forest Agency and its Mureș Forestry Department, through 10 forest districts, as well as by three private forest districts, one of the three headquartered in Harghita County and managing „Defileul Mureșului Superior" Natural Park.

b) Wood processing industry has made important steps since the 1960s due to considerable investment in the sector. The old units were reorganised and equipped with high yield equipment, thus creating large wood processing centres for a full capitalization of wood, as high value products. Some can be found in urban areas, such as: Târgu-Mureș, Reghin, Sovata, and Ludușș, manufacturing a wide range of wood products for domestic as well as international markets. Mills found in rural areas, closer to the mountains (Lunca Bradului, Răstolița, Deda, Gurghiu), are mostly specialized in primary wood processing (timber, mostly from fir and spruce).

One of the largest furniture factories in Romania is *Mobex*, in Târgu Mureș, the former Logging and Wood Processing Aggregate Works, concentrating ¾ of the total wood production of the county. Its name was changed, during the socialist period, to „23 August" Wood Processing Enterprise. It is currently a private capital company, with approximately 700 employees, producing art, classic and modern furniture. The most widely used essences are sycamore, beech, oak, lyme, and poplar. For veneer, cherry, walnut, and mahogany wood is used. The plant expanded its services with design, production, and assembly in hotels, restaurants, bars, and other interiors. The furniture is sold nationally, but also exported to Hungary, Ukraine, Moldavia, Russia, and

Kazakhstan. Târgu-Mureș is also the location of several smaller plants such as: *Mob Design* (custom-made furniture), *Cioata Furniture* (timber and solid wood furniture), *Robex* (Romanian-German company), *Fortis* (TV stands, mirror frames, desks, wardrobes, beds etc).

Târgu-Mureș Aggregate Works also administered two units located in Reghin (Logging Enterprise and the Logging and Wood Processing Plant). The former was renamed *Prolemn S. A.* and privatized in 1998, being sold to the largest Turkish wood conglomerate, *Kastamonu*. It owns two ancillary production units (800 employees), manufacturing wooden floors (high density panels for cellular doors, door sheets, as well as different types of wooden fiberboards, 8 to 40 mm thick.

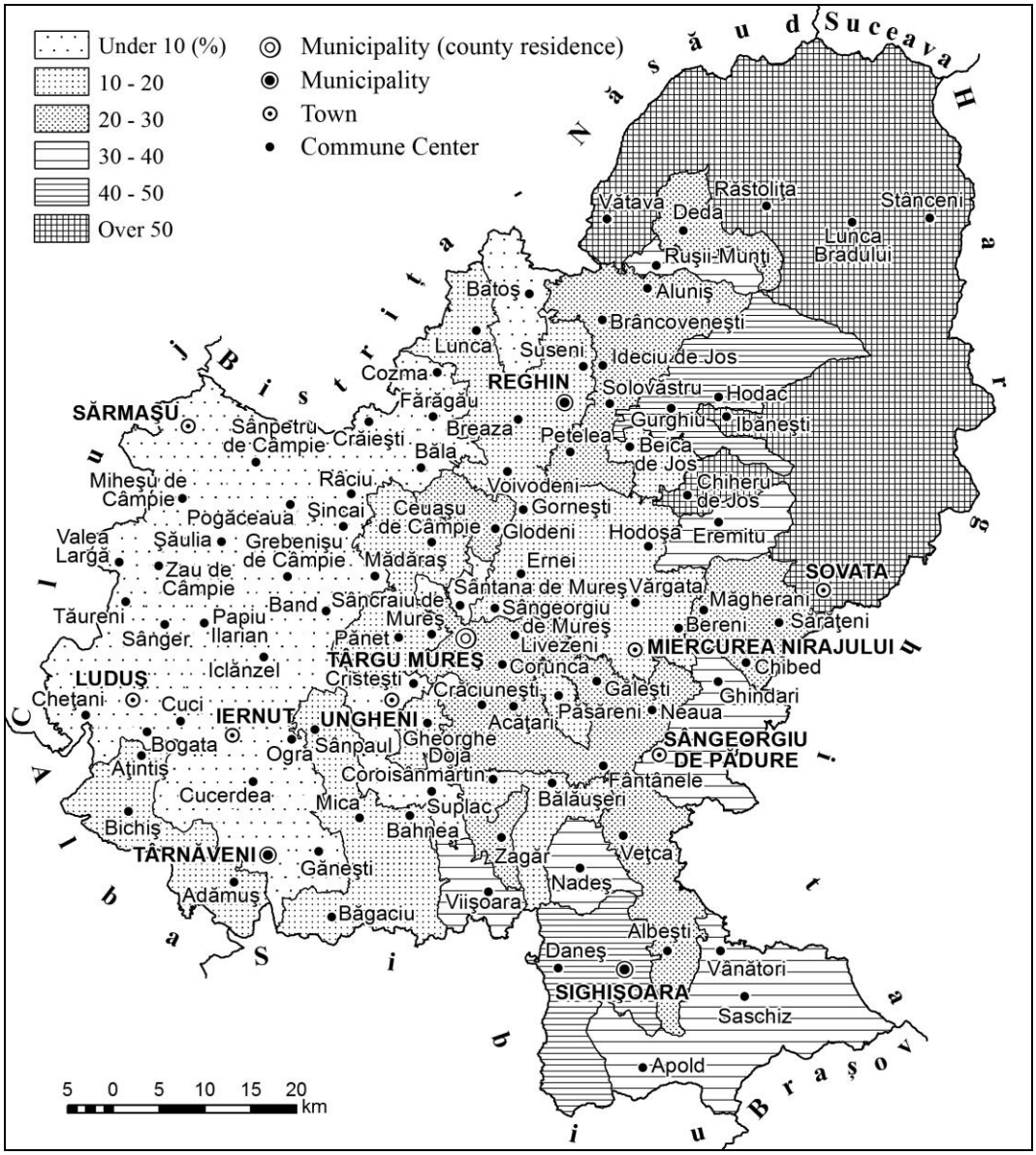

Figure 3. Mureș County. Frequency of forests and of other fields with forestry vegetation, in 2014

The second large unit, C. E. P. L. Reghin, had the same fate, as it split in two companies: *Amismob*, rustic furniture manufacturer, and *Hora*, producing musical instruments (violins, violas, cellos, contrabasses, guitars, mandolins) and accessories (boxes, strings, cases).

After 1990, the same type of products began being manufactured by new factories and workshops, such as the well known *Gliga* (1991), using spruce (for the front) and sycamore (for the back, neck and strap), from the forests of Gurghiu Mountains. It is currently the largest producer of string musical instruments in Europe (over 30,000 pieces/year), with exports to China, US, Australia, Russia, Japan, Canada.

At Reghin, *the furniture and woodwork industry* is represented is represented by a series of medium and large companies, emerged after 1990, like: *Mobila Dalin, Larix Mobila, Remex, Bucin Mob* and *Oltean Prodlemn*. The last of them is a logging company, processing timber. The first four however produce furniture from solid wood or high quality veneer (sofas, chairs and beds, alongside accessories and other furniture products, garden wood furniture, windows, blinds, interior and exterior doors etc), some shipped to Moldavia, Germany, Austria, Italy, Hungary, France, and Finland.

Other producers of furniture are located in Sovata (*Mobilă Sovata*, 550 employees), Târnăveni (*Artemob*, 150 employees), both owned by the French consortium, *Parisot Group*. The two specialise in solid wood furniture (all products are exported); Ungheni (*Grange Eastern Europe*, finishing services for classsic custom-made furniture); Sighișoara (*Xilomob*), Gurghiu (*Naiade Comexim*), Vidrasău (*Nett Front*, producer of furniture doors), Petelea (*Austrowood*, beer sets and other wooden products for gardens); as well as some small shops in Aluniș, Sângeorgiu de Pădure, Sărmașu etc.

The industry of miscellaneous wood products includes the production of wooden boxes and crates, in Sighișoara, Deda, Gurghiu, Reghin, Ernei; wooden toys and educational tools, in Acățari (panels for writing and drawing, labirinth wood table, shoes etc) and furniture for children (small chairs, tables, stools etc); pellets from wood waste (sawdust, bark etc.) in Deda and Reghin; different wood constructions for gardens (gazebos, toy houses), made by Bucin Mob from Reghin; beech wood plugs (*Mobex*, workshop in Reghin); wooden coffins and crosses (*Sefar International*, Luduș), different types of statues (*Gliga*).

Light industry

In terms of industrial production value, the light industry is the most substantial in the county (18.3%), encompassing two major sectors: 1. *textiles* and 2. *leather, shoes, and furs*, with a long lasting tradition.

a) Textiles are represented by *Textor Company* of Târgu-Mureș, with a long activity in textile production, dating back before 1990 through the Silk Mill. It currently produces table cloths, furniture upholstery, drapes, bed linen, priest clothes etc. Its participation at international fairs allowed this company to engage clients from Northern and Western Europe. Three other textile companies are located in Sighișoara, *Sefar & Monosuisse*, which create polyethylene monofilament and synthetic fibers for filtration equipment used in the chemical, food, mining, and refining industries, and *Global Safety Textiles*, which focuses on complex cutting and sowing processes for airbags, employing roughly 1,000 people (with Albești workshop). In Pănet commune, there is a small unit which produces cotton fibers and cotton-flax blends (*Kelev-Trans*). The final products are used for making shirts, blouses, table cloths, curtains, bed linen etc.

Knitwear is produced at *Larom* (1992) in Reghin, one of the most modern Romanian factories, with computerized kniting and sowing machines. It manufactures cotton, wool and acrylic socks, stockings, sportswear.

Târnava Company from Sighișoara, created in 1949, is one of the first shirt factories in the country. Privatized in 1996, the company mass-produces men and women's shirts (long and short sleeved), as well as blouses (for pregnant women as well), skirts, dresses, jackets, pijamas (for

men and women), handkerchieves and men's underwear (boxer shorts). Its products are sold in shops found in Sighișoara and Brașov, and since 2006 it has been selling in Germany as well. Sighișoara is the location of *Transtex* (cotton shirts), *Castle Fashion* (shirts and blouses), *BP Conf* (shirts for men, women, and children), while close by, at Albești, *Casamoda* produces and sells men's shirts.

In Târgu-Mureș, after 1990, several SMEs were set up: *Narves,* an Italian private company, which produces sport accessories (hiking gloves, motorcycle gloves), trekking and riding clothes (vests, blouses, hats and scarves); *Dekotex* makes protection gear against chemical and biological agents (suits); *Lisatex* (protection clothes from artificial fibers, nurse uniforms); *Lehel* (women jackets, suits, skirts and dresses); *Redytex* (underwear).

Other such factories can be found in Târnăveni (*Cotton Textil* and *Lhorindes*), which create shirts, bed linen, textiles for kitchens, bath slippers, kimonos, covers etc; Luduș (*Ademis 2000*); *Rusancom,* a 30 year old Romanian company, whose lohn-type activity lohn employs mostly women that produce clothes (pants, jackets, T-shirts, protective covers for cars). Its actual production takes place in Sâncraiu de Mureș (Nazna village) and in Iernut.

b) The leather, footwear, and fur industry is represented by the prestigious *Manpel* of Târgu-Mureș, manufacturer of leather gloves, founded in 1925, as a raw hide processing unit. The unit has been upgraded over time, the raw hides being processed and turned into leather for making mens and womens gloves (with and without wool, silk, and natural or artificial fur inner lining). Furthermore, the company adapted to market demands and began maunfacturing leather jackets for men as well as classic womens shoes. Its products are highly appreciated nationally as well as in Russia, Sweden, Norway, UK, Denmark, The Netherlands, Germany, Italy, US, and Canada. Similar products are also made by *Erma Prod Com* company from Miercurea Nirajului. Since 1992, the county capital hosts *Ilcompel* company, experienced in *processing leather and producing leather and fur products*, such as: jackets, vests, pants, skirts.

Some footwear companies are located in Reghin, the largest being *Alpina Shoe Production*, emerged in 1959 as „Întreprinderea de Piele și Marochinărie Sport". In 1998 it was sold to Modapel Group BV, a Dutch footwear company. The factory annually produces approximately 1 million pairs of high performance, casual, and sports shoes, with its own models (Ravalle, Hinson, Omnio, Viking), but also has contracts with international brands like Zara, Aldo, Deichmann, Puma și Decathlon; *Regsan* creates high quality hand-made shoes for men, women and children (shoes, sandals, boots). Other footwear companies include *Nimar* (boots, protective footwear) and *Shoes Top* (sandals, shoes, military and civilian boots).

Other leather goods are produced in Reghin by *Com Impex Dalin*, created in 1992, now part of the Dalin Group. It was once specialized in furniture and wood element production. The company changed its profile completely in 2007, and now makes briefcases and purses under different brand names such as Marocco and Anna Fellini.

Food industry

a) The food production industry contains: miller's trade, bread and pasta making, meat, tin cans, dairy and sugar.

Miller trade and breadmaking take place in numerous SMEs in rural as well as in urban areas. The county capital has two better known mills: *GoodMills*, producing since 2007, formerly known as *Mopan*. It has a massive mill and a high capacity bakery, enabling it to diversify its portofolio (white and dark flour, rusk, semolina, corn flour, pasta, bread, buns, frozen dough). The second largest unit is *TimKo Brut*, created in 1993 as a small family business specialised in home delivery products only, using the client's flour. It currently has 38 shops in the entire county. Besides bread, it also produces different types of pastries, sponge cakes and, since 2009, other types of cakes as well. Another important producer is *Eldi*, headquartered in Agrișteu, Bălăușeri Commune, with 49 shops in five counties, currently employing approximately 400 people. Its best sold product is

potato bread. Other large bakeries are found in Târnăveni (*Hermanns*), Reghin (*Sabău, Vera*), Luduș (*Dactylis*, with 150 employees, *Panem*), Voiniceni (*Dona Bakery*, which has been making bread products for 15 years: white and dark bread, rye bread, cakes, bagels, croissants, pies, rolls, pizza etc.); Valea Largă (*Daghemama*, which delivers products for PROFI stores in Târgu-Mureș and Luduș). Mill products from grains are produced in several mills in Beica de Jos, Corunca, Cipău (Iernut) etc. There is also *Promark Trade* from Târgu-Mureș, which produces *combined grain fodder* for poultry, rabbits, horses, pigs, and sheep.

The meat industry is mainly located in Târgu-Mureș, such as *Primacom* which owns the *Petry brand*, founded in 1879. It has the largest slaughterhouse in the county, as well as a meat processing unit, a shop and a small museum depicting the history of the butchers guild and Petry family. It also has stores in Reghin, Sovata, Luduș, Miercurea Nirajului, Sângeorgiu de Mureș, Cristești, Cluj-Napoca, Miercurea-Ciuc, Odorheiu Secuiesc, and Toplița. The company produces over 80 types of lunch meats, made of fresh Romanian meat. The pork is supplied by three Romanian farms while the beef is provided by producers from Mureș County; *Maris Prod Carm* (smoked meat, salami, sausages, blood pudding, pork parts, as well as a series of specialities (country ribs, sausages, and ham); *Panderosa* (pork, beef, poultry and other meat products) etc.

In Sighișoara, *Carnicomp* (with a capacity of 5 tonnes/day) is specialized in traditional products: home sausages, home lebăr, caltabos. Smaller slaughterhouses were also built in Luduș, Reghin, Gurghiu, and Chibed. *Oprea Avicom* Company from Crăiești processes poultry, owning a slaughterhouse with a capacity of 1,000 heads/hour, providing a mix de products (over 50 types), under the name *Puiul de Crăieşti*.

One of the largest produceres of shell snails is Egan Prod from Fântânele, which processes three types of eatable snails: *Helix pomatia* or the Roman snail, *Helix lucorum* or the forest snail, and *Helix spersa* or the garden snail. The company's main products are eviscerated meat and snail shells.

The can industry was once represented by the Târgu-Mureș Fruit and Vegetables Industrialization Enterprise, known after 1990 as *Conserve Mureșeni*, with over 1000 employees. Since 2005, at Breaza, close to Reghin, there has been a refrigerating unit (*AgroSprint)* which packages and sells leguminous plants (peas, beans, vegetable mix) and refrigerated fruits, for a series of hypermarkets (Auchan, Carrefour, and Cora).

In Idicel Pădure (Brâncovenești Commune), a small unit was set up for producing fruit jams (strawberry, cherry, raspberry, cranberry etc.), under the name *Dulceața lui Răzvan*. Based on local providers, this unit also produces forest fruit syrup, zacusca, plum jam. Similar products are made by *Ses Frulenco HNV* and *Transylvania Food Company* from Saschiz (near Sighișoara), the latter producing rubarb jam, paprika jam, hot sauces, marmelade, plum ketchup, and apple sauce, under the brand name *Pivnița Bunicii*.

Ther dairy industry has a long tradition in this county, developing based on cattle raising. There are many units that process milk. The largest and best known is *Hochland*, officially born in 1998 with the acquisition of the milk processing plant from Sighișoara, producing melted cheese. One year later, it bought the Sovata unit as well, which started producing different types of cheese (*Dalia* and *Brădet*). It provides the base material for the mjelted cheese unit mentioned before, that, for the first time in Romania, produced the *Mixtett* variety (as triangles) and square melted cheese (in 2000), as well as two types of *Almette* cheese cream (with sour cream and herbs).

Between 2002-2003, the Sovata unit starts producing block and sliced cheese, then cream cheese, and other types of cheese products: *Cheddar*, *Praid* (matured in the salt mine), fresh *Cottage cheese, Cheese, Brânză Făgăraș*, rolled melted cheese, cheese for hot apetizers (*Bruschetta Rustica* and *Bruscheta Pizza, Caşcava Pane* and cheese for *Pasta* and *Pizza*). In 2014 it launched new types of triangle-shaped melted - *Mixtett con Carni*, *Mixtett Picanterie* and *Gusturi Proaspete* (fresh cheese with vegetables). The base material (milk) is collected from the countryside, as well as from the northern part of Harghita County.

There are also small and medium sized enterprises, created after 1990: *Mirdatod Prod*, founded in 1994 in Ibănești, which collects milk from Gurghiului Valley (35,000 liters / day), and

employs 100 people. 39 types of dairy products are produced: block and triangular cheese, certified by the Ministry of Agriculture, telemea, with a protected designation of origin, „brânză de burduf", urda, sour cream, melted cheeses, spreadable or sliced (slour cream melted cheese, ham, mushroom or dill), spiced smoked cheese, butter; *Therezia* from Pănet, one of the most important cheese makers in Romania, managed to make a foothold on the EU market (cheese, melted cheese, butter cream, „brânză de burduf", urda, sour cream, telemea, butter); *Sanlacta* from Sântana de Mureș (cheese, simple and fruit yoghurt, sour cream, milk, butter); in Târgu-Mureș, there is a Romanian-Italian company named *Indlacto,* producing several mozarella products (ubnrefined fresh cheese) and mascarpone (spreadable cheese from coagulated sour cream); the county capital also hosts *FrieslandCampina*, which acquired the Mureș Milk Industrialization Company, and now produces solely yoghurts and milk; *Heliantus*, Reghin (cheese, telemea, sour cream); *Linţuca Prodcom* milk processing plant from Breaza produces „brânză de burduf", sour cream, telemea, different types of cheeses, all sold to Selgros and in two shops from Reghin and Târgu-Mureș.

The sugar industry is again quite old, the Târgu-Mureș Sugar Beet Industrialization Plant (*Zamur* after 1990) being a symbol of the county's industry. It had its own railroad for receiving the sugar beet produced in the Transilvaniei Plain, Mureș Corridor (around Luduș) and Târnavelor Plateau (Niraj Valley). Currently, the sugar producing company is *Tereos* in Luduș, with a processing capacity of 4000 tonnes/day. It was acquired from the Zahărul Luduș Company, which was founded in 1959.

Among its products - white sugar (34,000 tonnes in 2015), and as subproducts - molasses, wet and dry pulp (used in zootechny) and mineral fertilizers for soil structure improvement. In Reghin, *Alcisa* produces different types of *Teddy chocolate bars* (chocolate, vanilla, and coconut chocolate) and peanut and coconut wafers. Specialized in producing different types of feedstock for pastry and cake shops, ice cream, candy, wafer and biscuit producers, the Romanian-Dutch *Milkpact Company* was founded in 1994 in Livezeni. It produces chocolate and fruit glazing as well as white glazing for ice creams (*Icepact*), cocoa glazing for biscuits and wafers, glazing for chocolate candy (*Patipact*), spreadable cocoa creams, peanut butter (*Paticrem*), the last ones for croissant makers.

b) The beverages industry of Mureș County is comprised of the beer, soda and juice, and mineral water bottling industries.

Beer production first emerged in Reghin with the Beer Company, managed by the "Centrala Berii, Spirtului și Amidonului" from București. It had two sections, one for beer production (1974) and one for malt (inaugurated one year later). It is the first Romanian unit which exported beer (1976), to Italy.

After the events of 1989, the company was reorganized, changed its name to *S. C. Silva S. A.*, expanded its production line and began producing 10 ten types of beer: Mureșana, Lăpușna, Bucegi, Fortuna, Regun, Tain (for employees only) etc. In 1995, it was privatized (share were bought by employees), and three years later was sold to *Brau Union*, an Austrian company, which shut down all production in 2004. In 2007, the share majority of Brau Union was bought by Heineken. Currently, Silva (blonde, dark, and pale ale varieties) is produced in Constanța, Craiova, and Miercurea-Ciuc.

Another beer producer is *Bere Mureș* from Ungheni, which created its first beer in 1995 (*Jazz* and *Mureș brands*), while in 1998 it introduced plastic bottle technology in Romania, for a beer brand called *Neumarkt*, its best seller to date (blonde beer in 1.5 liter bottles). It also introduced *Dracula* dark beer and *Sovata* blonde beer. The plant was founded in 1992, and, in 2008, it became the youngest member of the Heineken Romania Group, presently bottling Neumarkt in 0.5 liter plastic and glass bottles (25,000 per hour), 1 liter plastic bottles (17,200 per hour), 2 liter plastic bottles (10,500 per hour) and 0.5 liter aluminum cans (13,000 per hour).

The refreshments industry is based in Reghin where *Sucmerom*, created in 1992, with the help of Swiss specialists, has production line for concentrated juice, from apples, or apple flavored, its products exported to other EU countries. Nationally, its products are distributed by Parmalat

România. The feedstock is supplied by the orchards surrounding Reghin, Socol (Cozma) and Uila (Batoș). Natural apple juice, made from „Batoș apples", under the *Din Livadă* brand name, is made by *Natur Agrofar*, which runs a production line in Dedrad, Batoș Commune. Other products include *vinegar*, made of apple concentrate by double alcoholic and acetic fermentation, in wooden tubs, at Batoș (*Aceto*) and Eremitu (*Vitaplant*, which also produces medicinal teas).

In Sovata, *Larix* also produces medicinal, herbal, and aroma teas. Near Sighișoara, at Saschiz, *Transylvania Food Company* produces syrups from locust tree flowers, elder flowers, forest fruit etc. It then delivers said products to Bottlegreen, UK, which processes and transforms them into different drinks.

The bottling of mineral water takes place at *Romaqua Stânceni*, launched and promoted at national level by *Romaqua Group*. In 1975, at Ciobotani, on the Mermezeu Valley (right tributary of Mureș), the Local Industry Group of Mureș County built a bottling installation, and later handed it over to the Reghin Beer Enterprise. It used a German BF-36 production line, with a capacity of 36,000 liters/day (G. B. Tofan, 2014, page 107). In 1990, the installation was taken over by the Borsec Mineral Water Extraction Company, the Stânceni unit becoming one of its subsidiaries. Due to wear and tear, a new plant was built in 2006, close to the E578 motorway, where the SIG Simonazzi production line from Borsec was installed, reaching a capacity of 300,000 liters/day (sparkling water in 0.5 liter and 2 liter plastic bottles).

c) The supply of drinkable and industrial water for most settlements is done from above-ground sources, such as Mureș, Târnava Mică, Târnava Mare, Gurghiu, and Sebeș rivers. Water purification is performed by different installations located in the main urban areas. Underground water sources have limited flows and high mineralization, and are mostly not potable. In order to overcome said issue, authorities decided to supplement the supply of quality drinkable water from Răstolița Lake, which will then be distributed towards the Mureș Corridor and the periphery of the Transylvanian Plain. *Aquaserv* Târgu-Mureș is the regional operator for water provision and sewage system management in the county, providing services for approximately 300,000 people. Despite the fact that significant efforts have been made to expand and improve water and sewage systems, there are still large discrepancies between rural and urban areas.

Other industrial activities

This category contains at least two sectors, among which typography and recycling, mostly found in the county capital. The first category contains several printing presses: *Tipomur*, one of the oldest in the county, producing several prints (books, university courses), fliers, stickers, catalogues, magazines, having also bookbinding services; *Cromatic Tipo* (wedding invitations, calendars, notebooks etc.); *Global Art Production* (printing on canvases), exporting in eight European countries as well as in Japan and the US; *Centrografic* (posters, business cards, envelopes, stickers, other prints); *Cominfo* (printing on plastic panels for road works or other types of constructions etc.).

The reusage of plastic materials is done by *Professional Recycle*, which produces PET flakes of different colors (transparent, blue, green, mixed, brown) for different uses in the automobile, chemical and food industries, as well as *Remat Mureș*, which collects ferous and nonferous waste, glass, electronics, paper and cardboard, used tyres etc, sorted and then shipped to specialised units for the recovery of basic materials.

Mureş Industrial Park (Ungheni-Vidrasău Platform)

After winning a 6 million euro PHARE project in 2002, Mureș County Council started developing an *industrial park* located in Ungheni (Vidrasău), in the vicinity of the E60 European motorway and the Transilvania International Airport Târgu-Mureș, with the future Transilvania Highway in close proximity. This project was inaugurated in November 2005. Most tracts of land have been leased and plans have been made to extend this park in the area of Sânpaul Commune.

The total surface area is 41 ha and comprises an administrative building, plots of land for office buildings, utilities and a road network.

The main shareholder is the county council, the remaining stockholders being the councils of Ungheni, Iernut and Luduș, as well as Sânpaul. Currently, Mureș Industrial Park has contracts with 18 companies: automotive, wood processing, constructions and utilities, special waste management, distribution of gas and electricity, light industry etc, the total number of employees reaching 1,700.

CONCLUSIONS

At the end of this scientific endeavour, we would like to draw some conclusions on the topic at hand:

- the activities of the secondary sector in Mureş are part of the Transylvanian industrial region, of great complexity, represented by almost all industries, from natural resource extraction all the way to industrial processing, with its subsectors;

- in terms of the industrial production value of the county, the light industry holds the number one spot with 18.3%, while metallurgy is last, with only 1.4%;

- Mureş County has two main industrial areas: *one on the middle section of Mureş*, with high industrial concentrations in Târgu-Mureș (metallurgy, machinery, chemical industry, wood processing, ligh and food industries), followed by other centres such as: Reghin (metallurgy, machinery, furniture and musical instruments, textiles, shoes, beverages etc); Ungheni (construction materials, machinery, furniture, beer etc), Iernut (construction materials, energy and textiles) and Luduş (sugar), while the second lies on *the Târnave* (Târnăveni, Sighişoara, Sângeorgiu de Pădure), with a concentration of industries producing machinery, electronics, glass and ceramics, furniture, textiles, dairy products etc;

- positioned in the metropolitan area of the county capital, the commune of Sângeorgiu de Mureş is the most industrialized rural area (metallurgy, machinery, other metal products etc), there are also a series of communes specialized in food industries: Agrişteu, Voiniceni, Valea Largă (bakery and pastry), Crăieşti, Fântânele (meat), Breaza, Brâncoveneşti, Saschiz (cans), Ibăneşti, Pănet, Sântana de Mureş, Breaza (dairy), Batoş (beverages), Stânceni (mineral water bottling);

- the most important industrial units are the following: *Iernut Powerplant* (energy), *Plasmaterm* (metallurgy), *Maviprod & Irum* (machinery), *Electromureş, Hirschmann Automotive* (electrotechnics and electronics), *Azomureş* (chemical fertilizers), *Gedeon Richter, Bioeel, Sandoz* (medicine and pharmaceuticals), *Romchim* (other chemical products), *Gecsat* (glass), *Siceram* (ceramics), *Mobex, Mobila Dalin, Mobilă Sovata, Artemob, Kastamonu* (furniture), *Hora, Gliga* (musical instruments), *Textor, Larom, Târnava* (textile industry), *Manpel, Alpina Shoe Production* (shoe and leather), *Eldi, TimKo Brut* (bakery and pastry), *Primacom, Oprea Avicom, Egan Prod* (meat); *AgroSprint* (can industry), *Hocland, Mirdatod Prod, Therezia, Indlacto* (cheese), *Tereos* (sugar), *Neumarkt* (beer industry), *Natur Agrofar* (beverages), *Romaqua Stânceni* (mineral water bottling) etc.

- the most significant changes took place in Târnăveni (Bicapa, Carbid Fox, and Cars), which led to depopulation and poverty;

- the existence of single industrial park, at Ungheni-Vidrasău, currently hosting with 18 firms and 1,700 employees.

REFERENCES

Bailly, A. and Béguin, H. (1982), *Introduction á la Géographie Humaine* [*Introduction in Human Geography*], Masson, Collection Geographie, Paris.

Bailly, A. (1991), *Les concepts de la Géographie Humaine* [*The Concepts in Human Geography]*, Masson, Paris.

Bailly, A. and Béguin, H. (2001), *Introduction á la Geographie Humaine* [*Introduction in Human Geography*], Armand Colin, Paris.

Bailly, A., Béguin, H. and Scariati, R. (2017), *Introducere în Geografia Umană* [*Introduction in Human Geography*], Editura Universității „Al. I. Cuza", Iași.
Carles, C.V. (1998), *Geografia Humana* [*Human Geography*], Universidad de Barcelona, Barcelona.
Cocean, P., Niță, A. and Dombay, Șt. (2013), *Judeţele României. Judeţul Harghita*. [*Counties of Romania. Harghita County*], Editura Academiei Române, București.
Claval, P. (1974), *Elements de Geographie Humaine* [*Elements of Human Geography*], M-th. Gemin, Libres Techiques, Paris.
Herman G.V., Deac A. L., Ciobotaru A.-M., Andronache I. C., Loghin V., Ilie A. M. (2017), *The role of tourism in local economy development. Bihor County Case Study*, Urbanism Architecture Constructions **8**, no. 3 (2017): 265.
Ilie A. M., Herman G.V., Ciobotaru A.-M., Grecu A., Radu R. A., Visan M. C., Giurgia M. (2017), *The role of tourism in structural dynamics of the economic profile of Sighisoara City*, Urbanism Architecture Constructions **8**, no. 4 (2017): 377.
Max, D. (1991), *Geographie humaine* [*Human Geography*], Armand Colin, Paris.
Păcurar, Al. (2006), *Geografie economică mondială* [*Economic Geography*], Editura Presa Universitară Clujeană, Cluj Napoca.
Pop, P. Gr. (1972), *România. Geografie Economică*, Partea I [*Romania. Economic* Geography], Institutul Pedagogic din Oradea, Facultatea de Istorie-Geografie, Oradea.
Pop, P. Gr. (2007), *Judeţele României. Judeţul Cluj* [*Counties of Romania. Cluj County*], Editura Academiei Române, București.
Pop, P. Gr. (2012), *Depresiunea Transilvaniei* [*Transylvania* Depression], Editura Presa Universitară Clujeană, Cluj-Napoca.
Pop, P. Gr. (2012b), *The Industry of Someşul Mic Corridor*, Cluj-Napoca: Studia UBB, Geographia, (**57**), 2, 133-144.
Pop, P. Gr., Mîrza, Adela (2012), *Industrial Park of Someşul Mic Corridor*, 2012, Studia UBB, Geographia, (**57**), 1, 53-64, Cluj-Napoca.
Raboca, N., Ciangă, N., Păcurar, Al. (2001), *Geografie economică* [*Economic* Geography], Editura „Vasile Goldiș" University Press, Arad.
Șoneriu, I., Mac, I. (1973), *Judeţul Mureş* [*Mureş County*], Editura Academiei Române, București.
Tofan, G. B., Păcurar, B. N. (2013), *Several Aspects Regarding the Specific Activities from Mureş Defile*, Oradea: Scientific Annals of Oradea University, 2013, Geography Series, (**23**), Nr. 2, 333-347.
Tofan, G. B. (2014), *Defileul Mureşului. Studiu de Geografie Umană* [*Mureş Defile. Human Geography Study*], Editura Presa Universitară Clujeană, Cluj-Napoca.
http://www.mures.insse.ro, accesed: 12 th June 2017.
http://www.cciams.ro/topul_firmelor/index.html, accesed: 12 th June 2017.
http://www.zi-de-zi.ro/, accesed: 12 th June 2017.

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THE REGENERATION OF A HUNGARIAN CITY CENTRE FROM THE 1990s TILL NOWADAYS

Tibor KECSKÉS*
University of Debrecen, Department of Social Geography and Regional Development Planning, Debrecen, Hungary, e-mail: kecskestibor72@gmail.com

Abstract: In the first part of this paper, I would like to introduce the renewal of some Hungarian historical cities. The reconstruction of Debrecen's city core is discussed in detail in the next part. As regards the paper's topic it deals mainly with the renewal of the built environment. In Debrecen's case the preparation of the city centre's regeneration began in the 1990s and bigger morphological changes could happen only during the last one and a half decade. Naturally those changes, which have led to the city centre's alteration have had effect on the city's development and its future possibilities as well.

Key words: urban regeneration, city renewal, built environment, city morphology,

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INTRODUCTION - SOME WORDS ABOUT THE BACKGROUND OF THE INNER CITY AREAS' REGENERATION

Every essay which deals with the city renewal usually tries to give certain definitions in relation to city regeneration. We usually mean by this the declined quarters' houses, public institutions and their infrastructure's restoration and reconstruction, when we try to maintain the area's typical texture, building method and the valuable part of its building stock (Egedy and Kovács, 2005).

City regenerations occur mainly in those areas where old decayed houses and their surroundings need renovation and modernization. Sometimes the infrastructure of these areas are also insufficient and out-of-date. The major part of the houses was usually built in these districts before the World War II. Smaller size, fewer rooms, lower comfort and often the unhealthy environment are the general features of these buildings. Because of these circumstances primarily the low-income families, which are in bad conditions remain in these districts. Because of the unfavourable demographic figure (e.g. aging population, the high rate of people with low-income and lower school qualification), the local authorities have to face with different social problems (the question of aids, illegal house occupations, crime, etc.).

Since an area's physical restoration does not go with automatically the area's revaluation and its rise, so real success can be achieved only by the social, economic and physical regeneration's common, integrated adoption (Egedy, 2009). Consequently, the renewal itself is a complex, multi-factor, complicated process. Every person's careful and concerted work is needed

* Corresponding Author

in this process. Different organizations and people can participate in it (local authorities, designers, technicians, contractors, people who work for protection of historic buildings or in city development, lawyers, different civil organizations, etc.). A complex plan of action of city development should be work out, which can help in the projects' achievement. Nowadays the ideas and plans of renewal or regeneration / rehabilitation do not concentrate only on the buildings' renovation and the alteration of the city construction, but the social and environmental questions connected with the quality of life are getting bigger and bigger importance (Kondor, 2007).

The renewal of a quarter can increase its competitiveness considerably and can improve the perspective of the quarter's development in the future. An ordered environment with a modern, well built in infrastructure attract the investors as well. A settlement's attractive force and its success can be measured by different objective index-numbers. Such a numerical item can be the increase of the real estates' price, the number of the investments, the different (cultural) programmes, the growing of the tourist attractive force and the improving statistical data of the population. The enhancement of value of a quarter can be measurable well by the number of people of higher classes who move into this area. In this case the urban regeneration can lead to almost the entire exchange of the population. We usually call this phenomenon gentrification.

CITY REGENERATION IN HUNGARY

In Hungary, in comparison with the Western European countries, the city regeneration (or renewal), which is an important section of the modern urbanization, was developed late. In contrast with the North American and Western European cities, there was not payed yet the required attention to the regeneration of the historical city centres of the Hungarian cities in the 1960s and 1970s.

After some failed attempts the regeneration project of Middle Ferencváros in Budapest started in the second half of the 1980s. Although the project was suspended during the change of the political regime, but the district already decided to continue it at the beginning of the 1990s. It was a necessary step because by that time, from the technical-physical, social and economic point of view, the whole district's one of the characteristic features was the advanced decay of the urban texture and its prestige decreased a lot (Bajnai, 2007). It also played role in the continuation of the regeneration that after the privatisation lots of real estates could be left in the local authority's property (Meggyesi, 2005).

During the area's regeneration one part of the buildings was partly or entirely renovated, in the place of the neglected and demolished buildings new houses were built, the public places were also renewed and the local services grew and it has a higher quality now. On the vacant sites usually dwelling houses, commercial or cultural institutions were built. The financing of the project was ensured by the sales of these vacant sites and it was also important that the biggest part of this project was carried out by private firms (Kovács, 2005). Beside the participation of private capital, the carrying out of the regeneration project was supported considerably by the sources of the capital city's regeneration funds (Tomay, 2010). Seeing the success of this regeneration project the involved area was later expanded. The Middle Ferencváros regeneration, which is quoted frequently in the scientific literature, is considered (among others) by the experts the most successful project and this regeneration has given example for every other similar project in Hungary.

During the last more than twenty-five years, which has passed since the change of regime, many regeneration projects were launched in Budapest's other districts as well. Similar to Middle Ferencváros, the considerable part of the flats remained in the local authority's property in Újpest, where the regeneration could start only in the second half of the 1990s. In Middle Józsefváros the regeneration started with chosen buildings' restoration at the end of this decade. Later the regeneration continued in the Magdolna-district, which finally completed in the Corvin Promenade Project (Egedy, 2008). Naturally it can be an important goal from the point of view of the local authorities that with minimum effort can get spectacular success. The case of Middle Józsefváros

can be an example for it, where beside the better opinion the local management also expected that the regeneration would have positive effect on the district's demography processes (Egedy, 2005).

Owing to the different developments, which were realized in Budapest's inner quarters, we could be witnesses the slow revaluation of the building plots and the real estates in the last one and a half decade. One of its sign is the big developments, which have appeared in the 19th and 20th century-built inner city surroundings and which have brought with itself not only the residential buildings but office blocks and big supermarkets as well (Csizmady, 2010.).

There were some other attempts on the regeneration of the Hungarian historical city centres in the 1980s. One of the best known examples from this decade is the regeneration of the centre of Győr. The success of this regeneration could come from the fact that it happened with state guidance and financing. The Hungarian city renewal projects' characteristic feature was that "these programmes focused expressly on the restoration of the built environment at that time" (Egedy, 2009, pp. 70-71).

Based partly on the successful and later completed city regeneration projects in the country towns (Eger, Győr, Pécs, etc.) we can say that the renewal of the historical centres of these cities before the change of the political regime could help them to preserve their prestige both as dwelling places and business quarter and these areas did not deteriorate to such an extent as some quarters in Budapest (Erő, 2005).

Although the regeneration of the historical city centres (mainly because of financial reasons) stopped short at the period of the change of regime, then (connected with the better economic circumstances) it started again in the second half of the 1990s and it changed up after the millennium. The restoration of some Hungarian cities' city centre (Debrecen, Székesfehérvár, Miskolc, Nyíregyháza, Sopron, etc.) can support this process (Egedy, 2009).

Naturally the reconstruction projects had to be fitted into the settlements' short or long term development concepts. After the change of the political system, the fast headway of the business and financial sector could be observed in the inner cities of the Central European countries (Enyedi, 1998). In the hope of the fast returns the city centres' plots with good conditions could get easily new owners within a short time. Since the beginning of the 1990s lots of modern office blocks, bank buildings and shopping centres, which contrasted with the old, tumbledown buildings of the city centre, have been built in Hungary, as well. The market economy's institutions (commercial banks, shopping centres, the headquarters of transnational companies, etc.) have been occupying bigger and bigger areas within the central parts of the cities and they have also often entered deep into the inner zone of the dwelling-houses. To quote Enyedi: "the new institutions, while they often violate the usually weak restrictions of city planning, they look for, because of prestige reasons, the city centre's symbolic parts with high status" (Enyedi, 2007, p. 17).

In recognition of the historic city centre's regeneration, Győr won the Europa Nostra Award in 1989. The reconstruction works in the city continued in the 1990s. Owing to the renovation, the renewed and newly built houses became more and more colourful and interesting in Győr (Winkler and Kurcsics, 1999; Egedy, 2007). In the reconstruction projects, instead of public financing (as opposed to the previous method) the private capital has played bigger and bigger role from the '90s. The renewal of the city centre was also helped by the fact that the houses and flats were in a high rate in the hand of the local authority. One of the local features was that (if it was possible) the residents' view was also asked in some questions. The success of the renewal in Győr can be traced back to the fact that the city already had a modern and professional reconstruction strategy in the 1980s, which got ahead of its age and whose principles are valid in practice till now (Egedy, 2007).

The strengthening of the tourist positions has played important role during the execution of the restoration projects in Pécs. Similarly to other Hungarian cities, it was also noticeable that the places of the old fashioned one-storied houses were occupied by modern block of freehold flats. On the first floor of these buildings different kind of shops were formed in many cases. "The historical city centre of Pécs with its changing functions, slowly changing population and attractive continually modernizing environmental culture becomes more attractive investment area" (Tóth, 2007, p. 260).

The regeneration and the spectacular rebuilding of the city centre of Szeged (in conformity with the quarter's detailed development plan) took place between 1998 and 2003 and it was the first step of a long-term restoration project. The renewal of Szeged's inner city was promoted by the fact (which could be also observed in the case of some restoration projects in Budapest) that the majority of the real estates was in the ownership of the local authority. The historical centre's detailed development plan was finished in 2000 and in the same year the authority regulated by decree the protection of the local built heritage, as well (Egedy, 2007). "Szeged's city centre's renewal is one of the most beautiful examples in Hungary" (Egedy, 2009, p. 122). It shows the international appreciation of the city restoration, that Szeged got the European Union's Prize for Cultural Heritage (Europa Nostra Award) in 2003.

During the last decades the Hungarian city centres have usually undergone quite spectacular transformation. "The process of renewal is not only the market transition's returns, but very often the local policy also helps it with its prestigious-like investments and main square projects" (Kovács, 2008, p. 16).

THE REGENERATION OF THE CITY CENTRE OF DEBRECEN

The historical city centre of Debrecen has been formed as a result of an organic development spanning several centuries. The genuine network of roads and streets, despite the destruction it had been subjected to during the time of World War II, was easily discernible in the maps drawn even after 1945. The area of the former settlement core, which is identified as the historical city centre of Debrecen, was also transformed as a consequence of the major construction projects implemented in the city during the 1970s and 1980s. The residential buildings and blocks of flats built in that period with the technology dubbed LPS (large-panel system) appeared at several sections of the historical city centre of Debrecen. As a result of the less than thoroughly considered interventions, the street blocks of the historical city centre were significantly disrupted at several locations, while the age-old network of streets disappeared, and the morphological features also changed. Due to these alterations, a part of the historical city centre got not only transformed but was also "modernized". The most recent consequence of this is that, in the case of certain individual city centre residential areas, because of the transformation mentioned above, the use of the attribute "historical" sounds quite anachronistic today. LPS blocks of tenement buildings were constructed in the north-western (in and around the street called Bethlen utca [Bethlen Street]) and the south-eastern (the area of Wesselényi lakótelep) parts of the former city centre, as well as at certain sections of the streets Kandia, Klaipeda, Burgundia and Csapó. These constructions had an effect not only on the inner parts of the historical city centre but also on its former boundary-line, which used to be the area of the corresponding fortification and ditch, the result of which has been that it is rather difficult to even recognize the borderlines around the former city centre that used to be the historical city centre.

Well before the establishment of the trail followed by the so-called nyugati kiskörút [western (minor) circuit], the Municipal Government had passed a general assembly resolution on the denomination of the various parts of Debrecen (Debrecen Municipal Government Resolution 92/2004. /IV. 22./ és 282/2005. /XI. 17./ Kh. on the Denomination of Parts of Debrecen). According to this resolution, and referring to the changes taking place in the previous decades, the official Belváros [City centre] was, in fact, "the middle part of the ancient city", whose boundary was marked by the streets Mester utca – Hunyadi utca – Rákóczi utca – Burgundia utca – Klaipeda utca – Sumen utca – Wesselényi utca – Erzsébet utca as well as the newly emerging formation identified as western circuit (Papp, 2007). [Although the name "western (minor) circuit" is widely used, it is a collective noun, which reffers to those streets that form the western boundary of Belváros].

Pursuant to the provisions in this General Assembly Resolution, the term Belváros today officially refers only to the area bordered by the so-called kiskörutak [minor circuits]. (Although the establishment of western circuit has not been completed yet, its emerging shape gradually reflects the western borderline of this district). The traditional small-town quarters located between

the minor circuits and the former fortification line (which used to belong to the historical city centre previously), are identified today in official statistics as traditionally constructed inner residential area. At the north-western and south-eastern parts of the former settlement core, there are blocks of flats today, which are called lakótelep in Hungarian. The former of these comprises the southern part of the current Vénkert and Libakert, while the latter makes up Wesselényi lakótelep.

THE CONDITION OF DEBRECEN'S INNER CITY BEFORE THE REGENERATION (1960-1980)

In the decades following the Second World War, there was a housing shortage in Debrecen. The destruction caused by the war was obviously responsible for this situation but the majority of the housing facilities available in the 1950s and 1960s was also outdated and badly in need of renovation. In order to satisfy the growing demand, it was necessary to initiate a shift in general attitude on the one hand, while on the other hand, new industrial construction technologies had to be introduced. By the 1960s and 1970s, the focus on quality had been replaced by the demand for quantity and speed. "As a result of the expectation to build as many flats as possible and as fast as possible, the construction of new flats came to the fore, while the maintenance or the renovation of the already available housing facilities was put on the back burner, due to partly financial, partly considerational reasons" (Béres, 1996, p. 71). While in the 1970s and '80s, huge sections of blocks of flats were constructed in various non-central parts (like, for example, Dobozi lakótelep as well as Vénkerti and Újkerti lakótelep-s in the 1970s, and then Tócóskerti lakótelep in the 1980s), a large part of the city centre area was under a construction ban. The idea behind the construction ban was that the municipality was planning a later reconstruction of individual parts of the city centre area in order to increase the built-up density by constructing LPS high-rises to replace the old and outdated single-storey buildings. In the end, the complete reconstruction of the city centre area, despite what had been planned, "was implemented only partially because of the high demolition ratio" (Süli-Zakar, 1996, p. 249). One of the negative consequences of the construction ban, which had been in effect until 1981, was the reduction of the volume of real-estate turnover and the onset of unfavorable demographic processes. What triggered the unfavorable demographic processes was the fact that the outdated and decaying city centre residential environment could satisfy the citizens' demands less and less (Szűcs, 1978). All this meant that the deterioration of the physical environment was followed by a social deterioration. As a result, a phenomenon that was also prevalent in other Hungarian cities could be observed here; namely, the restructuring of the inhabitants. To quote Kovács: "the economically active, more educated, young(er) layers with higher income brackets moved to the new blocks of flats (…); replacing them, appeared the older generations with lower incomes (old-age pensioners), and the ethnic minority". The author also points out that, in a certain part of the city centre section, there is a high risk for the development of ethnic segregation and for a potential process of ghettoization (Kovács, 1998, pp. 129., 131).

In the decades preceding the change of the political regime in the 1990s, the inner settlement core lost quite a lot of its significance as a residential area. At the same time, however, most of the municipal institutions and the commercial establishments continued to remain here. Most members of the population took care of their matters of official nature as well as of their major shopping activities in city centre Debrecen (at least, before the advent of the major shopping malls and commercial centres, which were built next to the busy thoroughfares). This, however, with the growth of automobile saturation, led to frequent traffic jams during rush hours, while parking difficulties also became a problematic issue in the city centre (Süli-Zakar, 1996).

Although, as a result of the major construction projects of the 1970s and 1980s, the overall structure of the city had undergone a significant transformation, due to a relatively minor degree of the destruction of the historical settlement core, "the ring-shaped radial structure of the city, which was regarded to be a part of its traditional historical legacy, did not change fundamentally" (Süli-Zakar, 1996, p. 249). I would also agree with the contention of Zoltán Kovács, according to which one of the main reasons for the deterioration of city centre areas in Hungarian cities was the effect

of official municipal and residential policies developed and practiced during the decades preceding the change of the political system in the 1990s (Kovács, 1998).

THE SITUATION OF THE CITY CENTRE BETWEEN THE 1990S AND THE TURN OF THE MILLENNIUM

In Debrecen, at the beginning of the 1990s, apart from the need to take action about a growing number of the old and outdated buildings that required either renovation or demolition, it was also necessary to repair public grounds, to reform the system of local transportation, and to raise the level of provision and services, as well as to stop the deterioration of demographic trends (including an ageing population, emigration, etc.). The declining economic condition of Hungary at the beginning of the 1990s (resulting from the loss of the eastern markets, the closing down of plants and factories, the increasing unemployment, the general lack of financial stability, the growing costs driven by inflation, etc.) also resulted in a difficult situation for the municipality of Debrecen as well.

Although there were instances of building reconstructions in the section of the city under scrutiny, a complex program for rehabilitating the city centre area could not be launched in the midst of the economic difficulties listed above. What is more, as time passed by, the overall situation got even worse because of the growing numbers of automobiles and the canceled or postponed infrastructural developments. A few years after the change of the political regime, one could read that "the city centre, just like other parts of the city centre area, is in a rundown and dilapidated condition, and it is also burdened with unsolved problems of road traffic and transportation" (Süli-Zakar, 1994, p. 207). Experts involved in researching the city of Debrecen pointed out the necessity of pulling down the "outdated buildings which cannot be used any more", the significance of opening up new streets that make it possible to explore inner areas and, thus, the launching of necessary developments. They concluded that the problems listed "could be ultimately solved effectively depending on the recovery of the economy" (Süli-Zakar, 1994, p. 208).

Recognizing the necessity for introducing changes, the General Assembly of the city committed itself to city centre block regeneration in a resolution at the beginning of 1993 (Kozma, 1999). In the next couple of years, "the municipal leadership endeavored to establish the funds and the institutional background required for the proper implementation of the projects, as well as to prepare the plans for reconstructing the city centre area" (Kozma, 1999, p. 75). Among other things some plans were born in relation to the main street's northern part's closing and about the forming of a pedestrian zone in 1990s. Some of them were about the reconstruction of minor squares in the centre as well. But the local government neither under its own power nor from external state sources could find the necessary money for developments.

However, because of the economic hardships mentioned above, the majority of the Hungarian settlements in the middle of the 1990s had to focus almost exclusively on the preservation of their operability and ensuring the viability of their institutions. Since the successful regeneration of the individual districts and the implementation of urban regeneration is "primarily, a financial issue", to quote Kondor, the municipal government had to be patient and wait before launching the necessary projects (Kondor, 2007, p. 74). In this period, there was less money allocated for cultural developments, and the advancement of tourism in the city was definitely less than desirable (Süli-Zakar and Kecskés, 2014).

THE TRANSFORMATION OF DEBRECEN'S CITY CENTRE: STEPS TAKEN IN URBAN REGENERATION

THE ESTABLISHMENT OF PEDESTRIAN ZONES AND STREETS

The first half of the 1990s was not exactly the best time period for implementing major infrastructural investments or urban regeneration programs. Amidst financial pressures, the most the municipal government was able to cover in the city centre section was preservation and condition maintenance, with a few occasional instances of building or façade reconstruction.

It was at the beginning of the 1990s that Batthyány Street, connecting Kossuth and Szent Anna streets, was designated to be a pedestrian street (as the very first of its kind in the city centre area). When redesigning it, ample emphasis was laid on introducing urban green spaces, installing various items of street furniture, and redecorating the buildings, in addition to laying the special paving stones. There are, among others, facilities like a restaurant, a tea house, a confectioner's, a travel agent's, a bookstore, and a clockmaker's operating now in Batthyány Street. Its name has come up repeatedly in the past couple of years during the course of the city block rearrangement related to Gambrinus köz [Gambrinus Passage-way]. However, for quite a long time after the inauguration of the first pedestrian street, there were not a lot of similar projects.

In Debrecen, just like in the case of other Hungarian cities, special significance was attached to the reconstruction of the main street (main square) of the settlement. A salient feature about the street structure forming through the urban development of Debrecen was that there was no genuine central square developing in the city centre. Instead of a market square, there was a market street, which broadened into a square only in front of Református Nagytemplom [Reformed Great Church] (formerly Szent András templom [St. Andrew Church], then András templom [Andrew Church]). The problem about this on the one hand was that, in the historical settlement core, there was no central square or space where the citizens or tourists could take their time to sit down in order to chat a little or just take a few minutes' rest, etc. On the other hand, however, the real problematic aspect was that Piac Street [Market Street, the actual main street of Debrecen], which broadened into a square in front of the building of Great Church, had suffered from the environmental burden of ever growing traffic for several decades. Finally, it was at the end of the 1990s that the opportunity for redesigning this area became available for the municipal leadership. According to their plans, a main square was to be created in the centre of the city in which, by way of increasing the public green space, people could relax, have fun, and recharge their batteries through participating in colorful activities. As a matter of course, this resulted in the banning of vehicles from the central area with the exception of tram traffic. (It was, in fact, the closure of traffic in the upper part of Piac Street, which used to be the north-south transportation axis in the city of Debrecen, that made it necessary to build the western circuit.) The re-construction works commenced in the year 2000, and the (new) main square of the city was inaugurated as early as less than a year afterwards (figure 1).

Thus, the first, truly important, step in urban regeneration was the inauguration of the main square (officially: Kossuth tér [Kossuth Square]) in 2001. The establishment of the main square itself created a new tourist destination in the heart of the city. Besides the building of Reformed Great Church, which is considered to be the symbol of the city (and a significant place of interest itself for the tourists), the square was also fitted with new public space elements. Among these, the most notable ones are the municipal coat-of-arms in front of the renovated Kossuth Statue, the glass pyramid constructed next to Great Church (as part of the reconstruction of the remnants of the former church building in what is called Romkert [Garden of Ruins]), and the two fountains built in Renaissance style. The newly installed green areas, together with the fountains are expected to facilitate the recreation efforts of not only the local inhabitants but also those of the tourists and visitors. "The intention of the municipal government and the architects preparing the reconstruction plans was evident. They endeavored to enhance the historicizing effect of the main square of Debrecen through the new public space items as well as to create an environment for the major cultural events hosted or organized by the city" (Biczó, 2005, p. 88). Naturally, when designing a public space like a square, a lot depends on the intention of the architect responsible for it concerning what kind of (potentially new) role he or she assigns to the reconstructed or rebuilt area or what kind of new additional functions he or she would like to introduce into the project. For example, in the course of establishing a main square, "urban planning can help by creating an environment that produces an ambiance for engendering a sense of community" (Lukovich, 1997, p. 124). Thanks to the alterations, Debrecen's renascent (or rather, perhaps, newly created) main square became suitable for hosting cultural events of varying magnitude.

During the past fifteen years, the square has been the site for numerous cultural, touristic, sports, etc. events (including military tattoos, choir contests named after Béla Bartók, book-week events, events related to the annual flower festival, streetball tournaments, ice skating events, etc.). Apart from these, memorial services and meetings as well as political rallies can also be held on the square. One of the former functions of the (main) square is revived through holding a fair before Christmas. An indication of the growth of the touristic significance of this area is indicated by the fact that there were several coffee houses and restaurants opened here in the time period mentioned above.

Figure 1. Renewed city centre with the Reformed Great Church [1]

The green spaces and parks in the vicinity of the main square have an important recreational and touristic role. Kálvin [Calvin] Square (i.e., the area comprising Emlékkert [Memorial Garden] and Romkert [Garden of Ruins]), located right next to the main square, has undergone a significant alteration and reconstruction recently. The project related to the functional expansion of Debrecen's city centre was launched in 2009. As an organic part of this project, the reconstruction of the area behind Great Church was completed in 2011. It involved the restoration of the lawn and plants as well as the installation of walkways, new benches, and lighting fixtures. Beyond the refurbishment of Garden of Ruins, there were new service providers (an art gallery and a coffee house) opened here. In addition, the area of the redesigned park is now protected from uncongenial nocturnal visitors with a wrought iron fence.

Close to Kálvin Square, there are two other public squares: Déri Square and Baltazár Dezső Square. Both of these are connected to prominent cultural institutions. Déri Square houses Déri Múzeum [Déri Museum], while Baltazár Dezső Square provides the visitors of the art gallery

[1] *www.pulykanapok.hu*

MODEM (among others) with possibilities for recreation and repose. In the case of Déri Square, the primary objective of the alterations was to retain its original function of providing recreation and tranquility. Its reconstruction was completed after the inauguration of the main square. In addition to the restoration of the green spaces and the overhaul of the bubbler, the old benches were replaced with new ones. Baltazár Dezső Square is one of the most recently built public squares in Debrecen, which displays signs of modern architectural concepts. Its genesis is closely connected to the building complex housing Kölcsey Központ [Kölcsey Centre] and MODEM [an acronym of Modern Művészetek, Hungarian for Modern Arts]. Among other things, it serves as the open-air venue for accommodating cultural events hosted by the institutions mentioned above.

During the course of the past couple of years, there have been several other streets and public squares renovated or created (within the framework of function expanding urban regeneration projects). The transformation of a part of Csapó Street has also been partially related to the (re)shaping of the main square. Even more important than that has been the introduction of a pedestrian zone between the streets Vár and Rákóczi. A good opportunity for these transformations was provided by the construction of the monumental building of the shopping mall called Fórum. In this modern pedestrian zone, which evokes a Mediterranian atmosphere in the summer, the old buildings are gradually restored and the stores offer new kinds of services. The pedestrian zone no longer serves as a location for the former street market. Some of the street vendors have moved into the building of the new Nagypiac [Big Market], while a part of the former flower market has been relocated to the area between Vár Street and Piac Street.

Another one of the most recently established pedestrian zones of the city centre area comprises the street Simonffy utca and the neighboring area of Hal köz [Hal Passage-way]. The touristic appeal of both of these locations has grown significantly. Following their recent renovation, the twin tenement buildings of Simonffy Street now display their original beauty: apart from the restoration of their facades, the roof structures have also been overhauled and the former turrets have been replaced, too. The reconstruction of the upper part of Simonffy Street was completed in 2004, while the redesigned and expanded Hal Passage-way area was opened for the general public in 2010. In addition to the new pavement, modern benches and lighting fixtures were also installed. Along Simonffy Street, a single file of trees were planted, whereas Hal Passage-way was fitted with a spectacular fountain. It should also be noted that during the course of these alterations and pedestrianization, a new access was also opened directly between Hal Passage-way and Bajcsy-Zsilinszky Street.

Consequently, all this definitely increased real estate values in the immediate neighborhood on the one hand, while on the other hand it also meant that the area could become part and parcel of the overall touristic package offered by the city centre. An impressive development recently has been the proliferation of coffee houses with patios and terraces for the customers to sit outside. The words in a recently published study also seem to support this, stating that although the most popular and frequented location for restaurants and other types of catering businesses is Piac Street, more and more of these have appeared in smaller streets, too (OTP Hungaro-Projekt Kft.) (figure 2). On the basis of the above facts and the ourstanding role of the city centre area, it is not at all surprising that the relative value of shops and businesses of catering here is the highest in the city of Debrecen (Euro-Régió Ház Kht., 2008).

This neighborhood is also fairly popular among those who intend to buy a flat or an apartment. More and more of the old and crumbly buildings are getting replaced by new and fashionable condos. The development project covering Simonffy Street also includes the restoration of its stretch between Hal Passage-way and western circuit. During the course of the investment process that started at the beginning of 2014, the road surface has been repaired, together with the sidewalk, while the old plants have also been replaced with new ones.

A task for the near future will be the reconstruction of Petőfi Square, a square located “at the southern gate” of the city centre area. As I have pointed out earlier, although there have been developments implemented during the course of the past few years, “the square in its entirety still

reflects a rundown condition even now". In addition, in its present condition, the square attracts shady and untrustworthy characters from the nearby railway station (Nagyállomás [Big Station]) and its surroundings. Naturally, it is also important what sort of an image it is that arrivals at the railway station usually get about this part of the city and what their first impressions happen to be (Kecskés, 2011). A solution for this problem may be the establishment of the so-called intermodal community transport centre, as the area of and around Nagyállomás is planned to be significantly transformed and modernized through its construction. According to the current plans, there will be an opportunity at that time for the proper reconstruction of Petőfi Square. [2]

Figure 2. Simonffy Street with its coffee bars is one of the most popular places in the city centre

It is important in connection with the regeneration of the city centre area that, "through the establishment of pedestrian zones and streets, there should be an urban design that, at least partially, resurrects the former ambiance of Debrecen, in which both the members of the local population and the visitors from other locations to the city feel fine" (Süli-Zakar, 1994, p. 225).

URBAN BLOCK CONNECTIONS AND BLOCK REGENERATIONS IN DEBRECEN'S CITY CENTRE

The part of the city centre area in which the (more or less single-storey) houses of the inner residential circle are located, displayed a generally lower level of saturation before the turn of the millennium as compared to the other districts. A study published in 1996 notes that "there are quite a few lots in the city centre area that have significant parts still available behind the residential

[2] *www.dehir.hu 2015.07.24.*

buildings". The study also adds that most of these lot parts are used by the inhabitants or by the owners as vegetable gardens (Béres, 1996, p. 84).

During the past fifteen or twenty years, not only the streets, public squares, and individual buildings have been restored but there have been block connections and block regenerations implemented as well. I do not wish to repeat here the formerly included definition concerning block connections and block regenerations but note that an integral part of it is related to the rational utilization or recycling of the usually rundown and not properly used inner parts of the lots.

In the case of the Batthyány Street pedestrian zone, which was inaugurated in 1994 (and which for a long time used to be the single public area of this kind in the city centre section), the inner yards were explored, repaired and, in many cases, connected. As a continuation of this effort, a plan was prepared about the stretch between Gambrinus Passage-way and Batthyány Street for pulling down the dilapidated backyards and the relevant crumbling building parts and for constructing a passageway between the two areas. As a part of the regeneration of this neighborhood, the surrounding real estate property pieces were also to be restored and new parking places to be established.

In Debrecen, the first area destined to undergo the process of block regeneration following the change of the political regime was the zone bordered by Révész Square – Széchenyi Street – Mácsai Sándor Street – Arany János Street – and Piac Street. At the relevant section of Széchenyi Street, there were several run-down residential buildings demolished as early as during the second half of the 1990s. The building complex housing Táblabíróság [Regional High Court] was then constructed in what used to be a part of this zone. Nevertheless, even today, almost twenty (!) years after the demolition of the old buildings, there are still unused and empty lots in this city centre part.

As a consequence of the block connections opened in the area of Hal Passage-way, "the price of the hitherto unkempt but favorably located buildings has gone up" (Szinyei, 1998, p. 82). Here, it is the coffee shops, galleries, etc., that provide new perspectives for development. It is also true for Debrecen that "due to the fact that the streetfront real estate pieces in the city centre area are all occupied, there is an enhanced investment attention observable concerning the yards, with an eye to the possibilities of how to build them in. This is also true for minor commercial, catering, office, and service providing business functions as well as for building homes" (Tóth, 2007, p. 259). In Piac Street, too, there have been more and more inner yards restored or renovated during the course of the past couple of years. There are small business streets established behing the streetfront gates. At various parts of the city centre, several building restoration projects have been implemented and the portal structures of a number of old buildings have been renovated.

In the central part of Debrecen, one of the most significant block regeneration effort has been launched in the zone bordered by the streets Arany János Street – Piac Street – Miklós Street. Through the course of the rehabilitiation of the so-called Apolló tömb (which was named after the movie theater situated on the corner of Piac and Miklós), the objectives were to build in the empty lot located behind the movie theater and to construct a new shopping mall and an underground parking garage, among others. This investment project was supposed to facilitate the provision of those living in the vicinity and to alleviate the parking issues. The foundation stone of the institution that was named Apolló Superior was laid in September 2008 but (as opposed to the original plans), out of the three projected buildings of the commercial centre, only the one on Miklós Street has been completed. For the most part, the building of Apolló Üzletház [Apollo Business House]is empty today, and the planned restoration of the façade of the movie theater is also lagging behind schedule. The investing legal entity has explained the reason for the delay and the stopping of the construction through "lack of interest in the commercial centre". [3]

As part of the block reconstruction at the location of the former market hall, the construction of the building of Debrecen Fórum Kulturális és Kereskedelmi Központ [Debrecen Forum Cultural and Commercial Centre] was completed in 2008. The grandiose building of Fórum

[3] *www.dehir.hu 2012.08.27.*

indicates its leading role in the commercial life of Debrecen through its impressive size and parameters. Debrecen's new marketplace was then built next to Fórum, which has taken its original place, to replace the old and outdated two-level parking facility. It was officially opened at the beginning of 2008. It was also within the framework of the same block reconstruction project that Pulykakakas Üzlet- és Irodaház [Gobbler Business and Office Centre], in which commercial enterprises, service providers, residential apartments, and offices are located was completed (Euro-Régió Ház Kht. 2008). These construction projects have immensely influenced the morphology of this section of the city.

MORPHOLOGICAL TRANSFORMATIONS OF THE CITY CENTRE OF DEBRECEN

From the time of the change of the political regime onwards, and as a result of the political and socio-economical transformations, there have also been significant changes in the urban planning and construction of Hungarian settlements (primarily, the cities). As of the beginning of the 1990s, instead of the centrally planned huge blocks of flats, built with LPS technology, there have been more and more condominiums and houses, constructed by private building contractors primarily out of brick. During the past ten or twenty years, there emerged and became widespread the so-called (gated) residential communities, too, which strengthened (voluntary) social segregation. Concerning the regeneration projects of city centre or inner city areas, the general practice (primarily, in Budapest, but also in several major cities apart from the capital) has been that, for the majority of the extremely outdated and run-down buildings, the only solution left was partial or full demolition. At certain locations, it was possible to initiate block regeneration and infill residential development of vacant lots between existing buildings. In the time period under scrutiny, the proportion of constructing continuous (unbroken) developments of multi-storey buildings in the cities grew considerably. This is due partly to infill residential development, partly to the practice that, in order to replace old single-storey buildings, multi-storey buildings were constructed. In the city centre areas or of some of our provincial towns, the typical single-storey houses are now mostly replaced with multi-storey condominiums, apartment or tenement buildings, community buildings, or office buildings. (Several, mostly deteriorated, detached houses were pulled down in Debrecen around the streets Bajcsy-Zsilinszky Street and Pásti Street. Their places were taken over by 2 or 3 storey high apartment buildings. As regards the location of the former single-storey market hall, there is a high-rise shopping centre there today.) The urban regeneration projects that aimed at transforming and developing the inner-city areas have, to a considerable extent, managed to change the morphological features of these areas. Although these projects did not always fully appeal to everybody (by which I mean aesthetic differences in taste), the relevant statement, according to which "with more advanced technologies and building materials, more aesthetically appealing buildings of higher quality are constructed" is generally true (Csapó, 2005, p. 22).

In Debrecen, the characteristic feature of the central section of Piac Street and its surroundings is exactly continuous (unbroken) developments of multi-storey buildings. The typically 3 or 4-storey high buildings of this relatively small area (city centre or settlement core) were mostly built at the end of the 19th or at the beginning of the 20th century. These buildings (Püspöki palota [Bishop's Palace], Vármegyeháza [County Hall], Arany Bika Szálló [Golden Bull Hotel], etc.) are rather heterogeneous from the aspect of architectural style. The "modern" buildings of the settlement core were, almost without exception, constructed after the Second World War, in lieu of those destroyed during the war. Quite a lot of these are located in the vicinity of the railway station (Nagyállomás), which was bombed, on nearby Petőfi Square and in its immediate neighborhood. During the past decades, the buildings in the central part of the city centre area (primarily, on Piac Street) have retained their original form (with the exception of some minor or major alterations). The urban regeneration efforts of recent years have had a number of different effects on these buildings. A part of these buildings have been renovated (wherever it became necessary) and, if it was possible, a building reconstruction also took place. It was in the framework of this that the turrets of the twin tenement building on the corner of Piac

and Simonffy streets were restored and the beautiful portals of the former tenement building on the corner of Piac and Kossuth streets were repaired. There were also cases when the restoration went hand in hand with a shift in function. An example for this could be the building of Fazekas Mihály Általános iskola [Mihály Fazekas Elementary School] on Simonffy Street, in the case of which the building was transformed as part of the urban regeneration project. The Ifjúsági Ház [Youth Centre] located and operating here hosts, among others, an office for the prevention of and providing information on drug abuse, but the community spaces of the building are also regularly used by civilian societies, artistic ensembles, clubs, and other societies. [4]

Related to the urban regeneration projects of the past few years, there has been a number of new shopping centres, office complexes, and residential buildings completed in the central part of the city. Perhaps, one of the most controversial buildings among these is the huge block-like edifice of Fórum shopping centre, due mainly to its sheer size. One of the characteristic features of Debrecen's city centre is that 3 or 4-storey high buildings, constructed before the Second World War, are located almost along the main street and in one or two side streets, branching off it. As one moves further away from Piac Street, the number of storeys of the buildings decreases drastically.

In the area making up the old historical urban core, there are still some examples of the old single-storey cívis [roughly: middle-class, specifically in the city of Debrecen] houses that are typical of small towns. A few of these are located in the streets called Hatvan, Széchenyi, and Miklós, and in the smaller side streets (Garay, Csók, Zsák) or in their immediate vicinity. However, the buildings located here (in a way similar to the city centre part) are rather heterogeneous from the aspects of architectural value and their general condition (figure 3).

Figure 3. Bajcsy-Zsilinszky Street with old single-storey middle-class houses. The road with the pavement and plants were renewed in the near past

[4] *www.ifihazdebrecen.hu*

Apart from the old cívis houses, there are also less valuable single-storey houses here, which are very often not fitted with all modern conveniences. Quite a few of these have been pulled down during the course of the more recent construction projects (related partly to the urban regeneration program) and the setting of the route for western circuit. There are street parts (like, for example, a section of Bethlen Street) where entire rows of houses were replaced in past years. What Ferenc Erdei noted back at the beginning of the 1970s concerning how in Debrecen (and in Szeged, too) "the atmosphere of the old middle-class houses" is retained only by a few short street sections is still valid and true today (Erdei, 1974, p. 123). The demolitions were primarily aimed at the houses of neglected condition and without modern conveniences. They have been mostly replaced by condominiums of two or three storeys but there are also large and vacant lots left empty and still waiting for potential future investors.

Figure 4. A typical (renewed) dwelling house in Jászai Mari Street

The block development method in Debrecen (just like in most of the other Hungarian cities) spread after the Second World War, especially as of the 1960s. Although the construction technology changed several times (brick – prefabricated panel – brick), what is common in these buildings is that they were originally planned to be fully residential. However, it can very often be the case today that, in one part of the buildings, the lower levels (especially the ground floor) apartments are rented out for the purpose of rendering business services, operating as office venues or doctor's surgeries and waiting rooms. In the past couple of years, wherever they could afford it, a proportion of these buildings have been renovated, and their mechanical and heating systems were upgraded. In general, it may be stated that the buildings that were produced as blocks in Debrecen's city centre miniature blocks of flats could be regarded as a novelty (concerning their morphological features) and oftentimes did not fully harmonize with their environment. Their

presence in the specific parts of the city centre area, however, has become less conspicuous by now, and a sharp contrast between them and their neighborhood can be noticed only where these high-rises are located in streets where there are also older houses or vacant lots. Typical examples for block development in Debrecen would include the neighborhood of Jászai Mari Street and Vármegyeháza Street, as well as the streets called Bethlen, Hajó, and Csemete (figure 4).

In the historical city centre, there are also occasional terraced houses, too. A characteristic feature of the houses in this category is the continuous (unbroken) rows and that there is a small front garden in front of them. Houses of this kind can be either single-storey or two, maybe, even three storey high. Another one of their salient features is that although this mode of construction had also been present in Hungary beforehand, they became popular again around the time of the change of the political regime.

THE CONTINUATION OF URBAN REGENERATION: IDEAS FOR THE FUTURE

According to Új Főnix Terv [New Phoenix Plan], which was announced and presented in June 2016, within the European Union budget period ending in 2020, there are going to be development-related investments in the value of HUF 200 billion implemented at various parts of the city. As it is made clear in the plan, which may be regarded as the city's own vision of the future, a part of these investments are going to effect the city centre area as well.

As regards the so-called constructed environment of the city centre, there are going to expansions administered to the pedestrian zones therein, public squares are planned to be restored and/or transformed, and buildings will be reconstructed, too. The actual plans for converting the areas around Dósa nádor Square and the Csapó Street block. As it is evident in the intention of the municipal leadership, the principle identified as "from grey to green" is going to be followed, and there would be an even more expanded pedestrian area in the city centre parts concerned, with more green areas (Zöld Város Projekt [Green City Project]). Besides decreasing the parking space at ground surface level, there would be two new underground parking garages built. Work on renovating the building of the old town hall would be resumed, while the Csapó Street flower market would be restored and a music block (with a concert hall included in it) would be created in this area. [5]

New Phoenix Plan lays substantial emphasis on implementing cultural developments. Apart from the Csapó Street concert hall mentioned above, there are also plans for renovating the buildings of Csokonai Színház [Csokonai Theater] and Kodály Zoltán Zeneművészeti Szakgimnázium és Zeneiskola (Zenede) [Music School] on the corner of Csapó Street and Vár Street. For this latter renovation, the budget is around HUF 500 million and the work would be launched and implemented in 2017 and 2018. [6] Among the plans, there is also an intention for completing the long-awaited theater called Latinovits Színház in the building complex of the shopping centre Fórum. The projected cultural developments may assist Debrecen in winning the title European Capital of Culture by 2023.

An important element of New Phoenix Plan is about the upgrading of the transport connections and facilities in our city, together with the related construction projects. At the gate to the city centre, a so-called intermodal transport centre would be established. Besides the construction of a new railway station, this would significantly improve the accessibility of Debrecen: among other things, the main railroad line (number 100) running into the city would be modernized and a direct road access would be established between the railway station and the airport. There would also be a modern transportation hub created close to the centre of the city. As part of this investment, it would also be possible to improve community transport facilities as well. In New Phoenix Plan, there would be as much as HUF 21 billion allocated for the completion of the new railway station. This is supposed to be one of the largest investments of

[5] *www.haon.hu 2016.08.25.*
[6] *www.debrecenizenede.hu*

the near future, which is also a part of urban development. (I have to refer to the fact that similarly to other Hungarian cities, the last years' developments – in contrast with the previous projects – could mainly be realised by the assistance of the European Union.) The construction of the station and the additional buildings will definitely result in further morphological transformations in the area concerned.

The ring road embracing the city centre will be fully completed through the construction of the northern section of western circiut. The section between Hatvan Street - Bethlen Street - Mester Street, constituting the third phase of the project, may also function as an alternative route for motorists. This section will hopefully decrease the traffic load and the time required to cover the same distance as well. Concerning the completion of this section, an amount of HUF 1.3 billion has been allocated for the purpose in Településfejlesztési Operatív Program [Settlement Development Operative Program] (www.ikkk.hu). The construction and completion of this section will be finished in the near future.

New Phoenix Plan also contains the development of the local network bicycle routes, too. The central part of the city (and the major residential areas) are relatively well accessible by bicycle. Perhaps, this is the reason for the fact that future developments focus not so much on the city centre but rather on the parts at the edge of the city and in the suburbs. The developments detailed in New Phoenix Plan are also highly significant from the aspect of tourism in the city.

According to Mayor László Papp, the vision contained in New Phoenix Plan "will surely and definitely determine the image and future of Debrecen". [7]

SUMMARY

In Hungary it can be traced back that, because of the failure of investments and developments, the environment's deterioration could be observed in the case of many cities and quarters at the turn of the 1980s and 1990s. The negative effects occurred to an increased degree in the city centres. In the majority of the Hungarian cities the centres surrounding inner residential quarters (apart from some exceptions) declined in value by the time of the transition. In order to make the city centres more attractive for the investors (using of the international examples as well) it became necessary to elaborate the city restoration plans. In connection with the urban regeneration there were some experimentative attempts in the 1980s, but in fact progress could happen in this respect only after the change of the political regime (Egedy and Kovács, 2005).

At turn of the 1980-90 (similar to other Hungarian cities) the considerable part of Debrecen's city centre showed neglected, shabby-looking image and the regeneration of the area became more and more urgent. The process of regeneration could begin slowly when the economic situation became more difficult. While mainly the stagnation was typical in the early '90s, from the end of this decade the signs of progress became visible. From this time (in connection with the regeneration and modernization of the built environment) significant changes have happened. We could be the witnesses of these changes, from which some of them also had an effect on the city centre in the last 15-20 years. The forming of the main square between 2000 and 2001 was the first significant city regeneration project in Debrecen. Many reconstructions and process of constructions (in connection with the city renewal) have happened and are going on in this part of the city, as well. In the case of Debrecen, the block and building renewals usually connected with the forming of a (new) pedestrian precinct or zone. The birth of the main square anticipated the forming of the western minor circuit. The construction works alongside the western circuit also help the alteration of this quarter and its further development.

The city's morphological features changed a lot during the last decades, as well. The city centre's spectacular renewal and its different quarters' functional alteration has been lasting up to now.

The centre's regeneration has promoted the modernization of the infrastructure and it has also made important changes in the traffic conditions.

[7] *www.dehir.hu 2016.06.14.*

We can conclude that similarly to other European and Hungarian cities' alteration Debrecen's city centre's renewal has taken place in the same way. Beside the reconstruction of the built surroundings and the infrastructure, in many cases the buildings and squares' function has also changed a lot. They often have got more new function, which can be known as function broadening city regeneration. In the case of Debrecen we could observe that because of the effect of more liveable surroundings, the social opinion of these areas has become better and real estates' value have become also higher. All this helped the moving of the educated people with higher income in the inner quarters. This phenomenon is called gentrification.

The city of Debrecen underwent so important alteration during the last almost twenty-five years, which can have influence on the image of the city and the direction of its development in the future, too. Since Debrecen's city centre's alteration (the regeneration of some inner quarters) have not finished yet so the city's renewal and its effects have further possibilities of research in store for those experts who would like to deal with this topic.

REFERENCES

Bajnai L. (2007), *Városfejlesztés [Urban development],* Scolar Kiadó, 14-34.

Béres Cs. (1996), *A debreceni belváros szociológiai problémái [The sociological problems of the city centre of Debrecen],* in: Süli-Zakar I. (Ed.), Tanulmányok Debrecen Városföldrajzából II. [Essays from Debrecen's Urban Geography II], Kossuth Lajos Tudományegyetem Társadalomföldrajzi Tanszék, Debrecen, pp. 71-88.

Biczó G. (2005), *Séta a debreceni Kossuth téren, avagy a „vizuális narratológia" gyakorlatban [A walk on the Kossuth Square in Debrecen or the visual narratology in practice],* in: Kovács N. T., Böhm G., Mester T. (Eds.), Terek és szövetek. Újabb perspektívák a városkutatásban [Spaces and textures. Newer perspectives in city research], Kijárat Kiadó, Budapest, p. 88.

Csapó T. (2005), *A magyar városok településmorfológiája [The settlement morphology of the Hungarian towns],* Savaria University Press, Szombathely.

Csizmady A. (2010), *Fel- és leértékelődő területek [Revaluated and undervaluated areas], in: Város Tervező Társadalom [Urban Planning Society],* SÍK Kiadó, Budapest, pp. 193-228.

Egedy T. (2005), *A városrehabilitáció hatásai a lakásmobilitásra és a társadalmi mozgásfolyamatokra [The city restoration's effects on the mobility of flats and the social movement process],* in: Egedy T. (Ed.), Városrehabilitáció és társadalom. Tanulmánykötet [City regeneration and society. Volume of essays and studies], Magyar Tudományos Akadémia Földrajztudományi Kutatóintézet, Budapest, pp. 103-158.

Egedy T. (2007), *A történelmi belvárosok rehabilitációja vidéki nagyvárosainkban – Szeged és Győr [The historical city centre's regeneration in the bigger country towns – Szeged and Győr],* in: Enyedi Gy. (Ed.), A történelmi városközpontok átalakulásának társadalmi hatásai [The social effects of the renewal of the historic city centres], MTA Társadalomkutató Központ, Budapest, pp. 261-292.

Egedy T. (2008), *A városrehabilitáció lehetséges hatásai a helyi társadalomra és az életminőségre. Esettanulmány a középső-józsefvárosi Mátyás tér felújításának várható hatásairól [The city renewal's possible effects on the local society and quality of life. Case study about the expected result of the restoration of Mátyás Square in Middle Józsefváros],* in: Alföldi Gy., Kovács Z. (Eds.), Városi Zöld Könyv – Urban Green Book, ÉTK – MTAFKI – RÉV8, Budapest, pp. 26-50.

Egedy T. (2009), *Városrehabilitáció és életminőség [City regeneration and the quality of life],* Magyar Tudományos Akadémia Földrajztudományi Kutatóintézet, Budapest.

Egedy T., Kovács Z. (2005), *A városrehabilitáció néhány elméleti kérdése [Some theoretical questions of the city renewal],* in: Egedy T. (Ed.), Városrehabilitáció és társadalom. Tanulmánykötet [City regeneration and society. Volume of essays and studies], Magyar Tudományos Akadémia Földrajztudományi Kutatóintézet, Budapest, pp. 9-20.

Enyedi Gy. (1998), *Transformation in Central European Postsocialist Cities*, in: Hrubi L. (Series ed.), Discussion Papers, No. 21., Centre for Regional Studies of Hungarian Academy of Sciences, Pécs.

Enyedi Gy. (2007), *A város szíve [The heart of the city],* in: Enyedi Gy. (Ed.), A történelmi városközpontok átalakulásának társadalmi hatásai [Social effects of the historical city centres' transformation], MTA Társadalomkutató Központ, Budapest, pp. 11-21.

Erdei F. (1974), *Magyar város. Erdei Ferenc összegyűjtött művei [The Hungarian city. Ferenc Erdei's collected works],* Akadémia Kiadó, Budapest.

Erő Z. (2005), *Műemlékvédelem és városfejlődés [Protection of historic buildings and city development],* in: Egedy T. (Ed.), Városrehabilitáció és társadalom. Tanulmánykötet [City regeneration and society. Volume of essays and studies], Magyar Tudományos Akadémia Földrajztudományi Kutatóintézet, Budapest pp. 269-287.

Kecskés T. (2011), *Debrecen városfejlődése a rendszerváltás után [Debrecen's city development after the change of the political regime],* in: Süli-Zakar I. (Ed.), "Falvaink sorsa" és "A városnövekedés szakaszai". Tisztelgés a 80 éves Enyedi György akadémikus előtt ["Our villages' fortune" and "The periods of the city growing". Saluting of the

80-year-old Prof. György Enyedi], Debreceni Egyetem Kossuth Egyetemi Kiadó, Debrecen, pp. 133-140.
Kondor A. Cs. (2007), *A városrehabilitáció fő színterei – egy megvalósult projekt bemutatása [The city regeneration's main scenes – an introduction of a realized project],* in: Kondor A. Cs., Egedy T. (Eds.), Városfejlődés és városrehabilitáció. Budapesti és lipcsei tapasztalatok [City development and city renewal. Budapest and Leipzig experiences], Magyar Földrajzi Társaság, Budapest, pp. 73-80.
Kovács T. (1998), *A debreceni lakosság térbeli szegregációja [The spatial segregation of the population of Debrecen],* in: Süli-Zakar I. (Ed.), Tanulmányok Debrecen Városföldrajzából [Essays in Debrecen's urban geography], Kossuth Lajos Tudományegyetem Társadalomföldrajzi Tanszék, Debrecen, pp. 121-133.
Kovács Z. (2005), *A városrehabilitáció eredményei és korlátai Budapesten [Results and limits of city regeneration in Budapest],* in: Egedy T. (Ed.), Városrehabilitáció és társadalom. Tanulmánykötet [City regeneration and society], Magyar Tudományos Akadémia Földrajztudományi Kutatóintézet, Budapest, pp. 159-174.
Kovács Z. (2008), *A városi táj átalakulása Magyarországon a rendszerváltozás után [The alteration of the city landscape in Hungary after the change of the political regime],* in: Orosz Z., Fazekas I. (Eds.), Települési környezet [Environment of settlement], Debreceni Egyetemi és Nemzeti Könyvtár Kossuth Egyetemi Kiadója, Debrecen, pp. 14-20.
Kozma G. (1999), *A városmarketing elemeinek alkalmazása Debrecenben a rendszerváltozás után [The use of the elements of city marketing in Debrecen after the change of the political regime],* In: Studia Geographica 7. A Kossuth Lajos Tudományegyetem Földrajzi Tanszékeinek Kiadványa, Debrecen.
Lukovich T. (1997), *A posztmodern kor városépítészetének kihívásai [Postmodern era's challenges in urban planning],* Szószabó Stúdió, Budakalász.
Meggyesi T. (2005), *A 20. század urbanisztikájának útvesztői [20th century urbanism's labyrinth],* TERC, Budapest.
Papp J. (2007), *Városrésznevek [Denomination of the various parts of Debrecen],* in: Balogh L. (Ed.), Debrecen város utcanévkatasztere [The city of Debrecen's street name's register], A Hajdú-Bihar Megyei Levéltár Közleményei 30, Debrecen, p. 453.
Süli-Zakar I. (1996*), Debrecen gazdaságának és településszerkezetének történeti-földrajza [Historical geography of Debrecen's economy and settlement's structure],* in: Süli-Zakar I. (Ed.), Tanulmányok Debrecen Városföldrajzából II. [Essays from Debrecen's urban geography II], Kossuth Lajos Tudományegyetem Társadalomföldrajzi Tanszék, Debrecen, pp. 149-265.
Süli-Zakar I. (Ed.) (1994), *Debrecen fejlesztési elképzelései [Development conceptions of Debrecen],* Debreceni Regionális Gazdaságfejlesztési Alapítvány, Debrecen.
Süli-Zakar I., Kecskés T. (2014), *Tourist and cultural economy of the historical towns from the point of view of towns regeneration (example of Debrecen),* in: Radics Zs., Pénzes J. (Eds.), Enhancing competitiveness of V4 historic cities to develop tourism, DIDAKT Kft., Debrecen, pp. 194-220.
Szinyei B. (1998), *Épített környezet Magyarországon [Built environment in Hungary],* Kereskedelmi és Gazdasági Főiskola, Szolnok.
Szűcs I. (1978), *A városrekonstrukció társadalmi indokoltságának kérdéséhez [For the question of the social justification of urban reconstruction],* in: Városépítés [Urban planning], 1 (1978): 12-13.
Tomay K. (2010), *Városrehabilitációs modellek a rendszerváltást követően [Urban regeneration models after the change of the political regime],* in: Város Tervező Társadalom [Urban Planning Society], SÍK Kiadó, Budapest, pp. 76-82.
Tóth Z. (2007), *Pécs belvárosának átalakulása [The alteration of Pécs's city centre],* in: Enyedi Gy. (Ed.), A történelmi városközpontok átalakulásának társadalmi hatásai [The social effects of the historical city centres' alteration], MTA Társadalomkutató Központ, Budapest, pp. 247-260.
Winkler G., Kurcsics L. (1999), *Győr, 1939-1999 [Győr, 1939-1999]*, Műhely Folyóiratkiadó Kht., Győr.
*** Dehir elektronikus hírportál [Dehir electronic news portal]
*** Euro-Régió Ház Kht (2008), *Debrecen Megyei Jogú Város Integrált Városfejlesztési Stratégiája, 2008 [Debrecen Town of County Rank Integrated Urban Development Strategy, 2008],* http://portal.debrecen.hu/upload/File/Gazdasag/varosrehabilitacio/IVS_Debrecen_20080407.pdf
*** Haon elektronikus hírportál [Haon electronic news portal], http://www.haon.hu/ilyen-lesz-a-dosa-nador-ter-megvan-a-tervpalyazat-gyoztese/3162466
*** Ifjúsági Ház [Youth Centre] http://www.ifihazdebrecen.hu/magunkrol/
*** Intermodális Közösségi Közlekedési Központ [Intermodal Community Transport Centre] http://www.ikkk.hu/a-projektrol
*** OTP Hungaro-Projekt Kft. „Debrecen Belváros Funkcióbővítő Városrehabilitáció Akcióterületi Terv, 2009" [Debrecen city centre function expanding urban regeneration plan]
*** Zenede [Music School] http://www.debrecenizenede.hu/hirek/249-zenede-felujitas-az-uj-fonix-terv-reszekent
http://portal.debrecen.hu/upload/File/Gazdasag/varosrehabilitacio/Debrecen_Belvaros_ATT_090901_mod.pdf
http://www.dehir.hu/debrecen/nem-tudni-befejezik-e-valaha-az-apollo-superiort/2012/08/27/
http://www.dehir.hu/debrecen/az-intermodalis-kozpont-elott-zoldovezet-lesz-majd-a-petofi-ter-videoval/2015/07/24/
http://www.dehir.hu/videogaleria/alaposan-atalakul-debrecen-belvarosa/
http://www.dehir.hu/debrecen/hiszunk-debrecenben-nagyon-fontos-bejelenteseket-tett-papp-laszlo/2016/06/14/

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FORMS AND PROCESSES OF SOIL DEGRADATION AND IMPACTS ON AGRICULTURE IN LAKE BASIN IZVORUL MUNTELUI

Ioana Monica MUSCALU*
The University of Bucharest, Faculty of Geography, Doctoral School Simion Mehedinţi - Nature and development,
e-mail: monica_muscalu@yahoo.com

Abstract: The basin of Lake Izvorul Muntelui has soils with a reduced but constantly increasing erosion coefficient. Due to the practice of agriculture and some inadequate methods of cultivation, there is a tendency of passage of soils from moderate erosion to strong erosion. The most affected areas, of degradation processes, are the massive slopes around the lake, where the effects of gravitational processes and of mechanical denudational processes can be observed. The plowing works for corn and potato crops, as well as overburdening, are a permanent threat, causing soil erosion processes, their destruction, crustification, the loss of nutrients and organic matter in the soil. The use of pesticides and chemical fertilizers increases soil productivity but affects the entire edaphic ecosystem and causes once ingested by the human body, disorders of several systems and devices or even chronic diseases. In order to combat these phenomena and reduce soil degradation in the area, it is recommended to maintain vegetation on the slopes and to introduce organic farming practices.

Key words: soil erosion, landslides, degradation, geomorphological process, anthropogenic impact

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INTRODUCTION

In order to correctly identify the soil degradation forms in the Izvorul Muntelui Lake area, the soil types were first surveyed in the studied area and a map of their spatial distribution was made. The lake Izvorul Muntelui is covered by the slopes that belong to Ceahlău, Bistriţa and Stănisoarei mountains, and soil degradation is determined both by natural conditions (biopedo-climatic natural setting and geological composition) and by anthropic activities, especially due to agricultural practices and land exploitation. The soil is the most important productive factor of agriculture and must therefore be protected and exploite in accordance with its physical and chemical properties and fertility. From the desire to have larger and safer agricultural productions, people have practiced agricultural techniques with numerous negative effects on the environment, starting with the plowing works that have been done along the slope and until the chemicalization of the agriculture (Herman, 2009, 2010). The repeated passage of agricultural machinery over certain types of soils contributes to their destruction by compaction of the soil both on the surface and in the depth, the modification of the soil structure, the reduction of the organic matter content and the biotic activity which determines the reduction of

* Corresponding Author

the humus quantity and natural fertility of the soil. Under the current conditions for the development of a sustainable agriculture it is necessary to rationalize the soils and preserve their natural fertility. The geomorphological processes in the Lake Izvorul Muntelui area can be analyzed both from the perspective of the paleogeographic evolution of the region as well as from the historical perspective, including transformations, forms and processes determined by the appearance of the lake. Until the occurrence of the reservoir lake, in the area around it, dominates the river basin, represented by: the Bistriţa stream beds and their tributaries and terraces, as well as a fluvio-denudational relief seen on the slopes of the Ceahlău Mountains, visibly shaped by landslides and pseudo-fluxions as well as torrential organisms. After the construction of Lake Izvorul Muntelui, the deposits acquire a deltic structure; there are specific phenomena of submarine creep abrasion, underwater slides and drifts, phenomena due, the emery and submersion alerts and the conditions specific to the lake. For the slopes around the lake, following their construction, the type of deposits on the slope and the anthropic intervention, frequent landslides, crashes that can determine in the future, the clogging of the lake and the unbalance of the slopes can be observed. Other frequent processes are: solifluxion and pluviodenudation, affecting all deforested slopes, which is manifested by the appearance of some gullies and furrows of the torrents, at whose shed were formed the dejection cones.

RESEARCH METHODOLOGY

In order to analyze the soil properties in the Izvorul Muntelui lake basin and the impact of agriculture on them, in the basin of the Izvorul Muntelui lake, we made a cartographic inventory of the soil types in the studied area, establishing the correlation between them, the land use and the degree of soil erosion. We have analyzed the influence of the classical system of soil works on both the production of fodder, potatoes and maize and on the direct and indirect effects of these practices on soil properties. In order to determine the influence of agricultural works on the physical properties of soil, we carried out field and laboratory tests, taking the samples and interpreting the results, as well as monitoring the evolution of crops throughout the vegetation period in order to ascertain as accurately their perspective (Choy et al., 2005). The identification of the degraded land and the monitoring of its evolution has been differentiated according to the intensity of the erosion phenomenon and the natural or anthropogenic causative factors, aiming at establishing an optimal strategy for reducing or eliminating the negative effects on the habitats or the preservation of the lands in danger. The analysis of agricultural techniques and practices was carried out from the perspective of time evolutions, together with the identification of soil types and subtypes, the analysis of the geomorphological processes in the studied area, and their role in the pedogenesis or in erosion process.

SCIENTIFIC CONTENT

Geographical position

The lake dam Izvorul Muntelui formed in 1960, is located in the middle basin of the Bicaz River being crossed by the parallel of 47 degrees north latitude and the meridian of the 26 degrees east longitude. At its maximum, it has a length of 31 km in a northwest-south-east direction with numerous lateral extension areas, with the Bistricioara River (3 km). There is a difference of 82 m between the maximum elevation at 516 m altitude and minimum at 434 m altitude (the level varies depending on the operating regime). From the east, the long slope of the Stânișoarei Mountains, slightly fragmented, dominates by 400-500 m of the surface of the lake, while to the west the high silhouette of Ceahlăul, although not integrated into the slope in the immediate vicinity, rises to over 1400 m relative altitude, above lake level, with a particular importance in the evolution of this lake, especially in climatic and geomorphologic terms.

Geographic features of the lake

The Lake Izvorul Muntelui is surrounded by the peaks belonging to Ceahlău, Bistriţa and Stânişoarei Mountains. The Ceahlău Mountains have the highest altitude of 1,800 m, the Stânşoarei Mountains are 1500 m altitude and the Bistriţa Mountains have an altitude of 1100 m and only two peaks over 1500 m. Climatically, the average annual temperature is 7-7.5 degrees C, the average temperature in January of -4 degrees C and the average temperature in July of 17 degrees C. Average annual rainfall is 650-670 mm. Lake water has a high transparency of 2-10 m, a neutral pH towards low alkaline, and water temperatures of 22-24 degrees C in the warm season. From a biological point of view, the high water transparency indicates an oligotrophic environment, with a fish fauna composed of: clean, marsh, specific to medium sized Bistrita valley, but also prussian carp and common bream, lacustral basin species.

FORMS AND PROCESSES OF GROUND DEGRADING IN THE STUDY AREA

The cryonival modeling system

At altitudes above 1700 m, in the Ceahlău Mountains is the subalpine floor of bushes, characterized by the average annual temperature between 0 and 2 °C, annual precipitation of 1000-1200 mm per year, conditions in which due to the cliffs and their cover with vegetation on the largest surfaces, the most frequent geomorphological processes are the crionival ones, due to which the eluvio-deluvial layer continuously transforms, thickens, being frequent mass movements such as: creep and solifluxions (Domuta, 2011) whose effects can be observation on Vf. Ocolaşul Mic in the form of waves, terraces or grasshoppers (Albota, 1994). On slopes whose cliffs exceed 10 degrees sliding blocks are visible whereas on slopes with lower inclines and on flat surfaces can be identified depressions of nivalis compulsion. Due to frost and thaw, gelling or soliflux processes are generated. Gelivation occurs as a result of the frost and thaw that penetrates into the cracks of the rocks, but also because of the diurnal and seasonal thermal differences. Under the conditions of a humid and cold climate, detritic rocks are continuously fractured, and then suffer chemical alteration processes, thus creating soil conditions. Through this process, rocks are transformed by mechanical, physical and chemical agents into the atmosphere called the meteorization process. On surfaces belonging to the steep slopes without vegetation and the soil blanket are conditions of triggering of the gravitational and nival processes, as a result of which the slope profile changes due to accumulations of detritic rocks at their base. In pleistocene, such processes occupied larger areas in the Ceahlău Mountains and the Bistriţa Mountains, which were located in the periglacial area, as evidenced by the thick deposits of stumps, dating from the beginning of the Quaternary, deposited at the base of the mountains, some of which were covered by a soil cover and vegetation. The intensity of today's gelifraction processes is much lower, appearing disaggregation forms, which belong to a residual relief, with a ruinous appearance, represented by: pyramidal peaks, toothed sprocket grooves, but also by accumulation forms of the type of grooves that can be separated into: eluvial grooves arranged on interfluvials and slope grooves. Along the torrent valleys, there are also the storms of stones or grooves cones deposited at the base of the slopes. In the Ceahlău Mountains, due to the disintegration processes, an eluvio-deluvial layer, with a thickness of 0.5-5 m, with a coarse granulometric structure (sandy, rocky, permeable grain structure allowing the accumulation of groundwater, which can be in peak Ocolaşu Mare, Bâtca lui Ghedeon and Lespezi. The alteration blanket or ergolite can be seen on the high bridges of the peaks. Its apparition is due to the geological processes specific to the transition period from the glacial climate to the present one. The solifluxion processes are specific to thawing when the soil is soaked with water, coming from both the melting of snow and the abundant spring precipitations. The soil soaked blanket slides the frozen substrate from the surface of the slopes with small inclinations, and because the phenomenon is repeated in each year, can be considered a mixed process, bothfrost-riven as well as gravitational, and the resulting relief forms are gelisoflixion sliding and terracing stones.

Modeling processes and periglacial relief

The mountains around the Bistriţa valley and the Izvorul Muntelui reservoir lake had no continuous permafrost, a fact that showed lack of polygonal soil, and striated, but also the lack of ice feather structures that had formed lately pleistocene, a period when most of the Periglacian structures in the area date. Instead, in the region the modeling action was accomplished by polysonal and azonal processes. The polysonal processes acted upon the relief, being conditioned by freeze-thaw, temperature drops and by the existence of pergelsol, in a seasonal or multi-annual regime. The gelifraction process has been differentiated according to the lithological properties of rocks, in macrogelifration and microgelifration, the first having more pronounced effects on rocks, such as diaclase, cracking, or stratification, due to both freeze-thaw or gelivation as well as prolonged frost, causes that determined the disintegration of the rocks. The structural shortcomings of a periglacial nature are the main forms of relief due to gelifraction, representing at the same time geological structures favoring the separation of the grooves. The ruiniform relief is the residual witness of gelifraction, being well represented in the Ceahlău Mountains. The gelifraction, along with other transport and accumulation processes such as rolling, rocking, rock creep, talus - creep, have resulted in the formation of some forms of accumulation such as: thick grooves on the slopes or grooves cones at the base of the abrupts that can be found in the pools the Galu, Fagul, Suha Mare rivers. The nivation is part of the polisonal periglacial process, defining the action of snow in the evolution of the relief, manifested by mechanical erosion, dissolution, protection, evacuation and accumulation (Hamelin and Cook, 1967). Although the nivation is analyzed more closely in the study of the modeling of the higher areas of the Carpathian Mountains, the perimeter studied can be reconstituted with the effects of pleistocene nivation, represented by nivation niches, peak pressures, and pleistocene pergelisol existence. The nivation niche, of 80-100 m wide, was identified at altitudes of 1150 m on Mount Tiflea, while the depressions of peaks separated by a narrow threshold have depths of up to 16 m and are present on the interfluve of Cracău-Negru-Cuejdiu. Periglacial conditions, as well as the action of running waters and wind, are associated and are present in the mountains of Bistriţa Valley. The slopes had a leveling evolution that was demonstrated by the rhythmic stratification of the rocks on the slope, indicating that diffuse leakage predominated in slope modeling, generating erosion and accumulation forms, such as glacises. An important feature of the evolution of the slopes in periglacial conditions is due to the accumulation processes generated by the precipitation, being represented by the rise of the bases of the slopes, up to 10-15 m. The formation of the dejection cones in the shedding areas of the rivers represents the contribution of the running waters to this process. Sometimes the length of the dejection cones can represent ¼ of the length of the valley seen in the Fărcaşa, Sabasa and Suha Mare rivers. Some smaller valleys were blocked altogether due to the pleistocene climatic conditions which did not allow for the permanent release of the slopes of the material deposited here, as a result of the transport. Due to this tendency, many valleys in the region present thalweg format in adobe deposits without being submerged up to the base rock.

Nival processes

On the high peaks of Bistriței, Ceahlău and Stânișoara Mountains, an important role from a morphogenetic point of view, has snow, which stagnates for a long time, between 150-180 days a year, the snowfall being produced for 10 months from September to June. On the high plateaus of the Ceahlău Mountains the snow layer maintains an average of 165 days per year, especially on the shaded slopes exposed to the north. The snow is responsible for mechanical processes, erosion, or avalanches as well as chemical processes influenced by water from snow melting, dissolution or oxidation. To the north of Bâtca lui Ghedeon, through the nival compression, two micro-depressions were formed, whereby the accumulation of water resulted in lakes, which dried up about 500 years ago. The nivation is manifested both by slow and slow-moving compaction and erosion processes, such as the aforementioned, as well as by rapid avalanche rapid erosines. They play an important role in shaping the steep slopes around the

Izvorul Muntelui Lake because it trains the detritic rocks on the slopes and activates simultaneously, and other external agents that shape unspoiled areas such as gelivation or torrentiality. The annual avalanche production determines the widening and deepening of torrential valleys through the appearance of avalanche corridors.

Torrential processes

In the basin of the Izvorul Munteului Lake, processes of linear erosion, such as ravens, breezes, torrents, and surges, can be observed. The factors contributing to the emergence and evolution of these processes are of climatic, lithological, geomorphological, biogeographic, and anthropic kind, of which the most important external agent that accentuates the evolution of this type is the precipitation. For the studied area, precipitation is considered to be of a torrential nature, if it exceeds 50 mm in 24 hours (Rădoane, 1980). Such values were recorded at the Ceahlău-Toaca meteorological station in July 2007 (52.9 mm in 24 hours, in July 2011 (99.9 mm in 24 hours, in June 2016 – 56 mm in 24 hours), which reveals that there are few such events recorded in the Ceahlău Mountains. A stronger impact it has the antropic intervention through forestry because it favors the phenomenon of draining and concentrated water leakage both on the trails of wood, as well as along the forest roads, where the furrows are frequent. A reduced distribution has the ravines because the lineat erosion forms can not be deepened to the specific dimensions of a ravine due to the reduced thickness of the formed debris and the hardness of the rocks in the substrate. The torrential processes are manifested on steep slopes, and lacking in vegetation. The torrential formation is favored by abundant precipitation, from the spring months, especially from May to June, which, together with the melting of snow causes the accumulation of water in the receiving basins, the erosion of soils and the eluvio-diluvial deposits, their transportation, and the deposition in the form of dejection cones (Demeter, 2006). This way, the torrent reception basins are regressing towards the interfluves, and they also affect the grassy surfaces so that they are produced, and the detachment of the material from the bunch of grooves, already fixed. On the sloping cliffs, made up of poorly erosion-friendly slopes, water is formed on the slopes, gullies, ravines and dunes that swiftly reach, touch to the mother rock and then spread through linear erosion processes. The erosion and torrential accumulation processes are of a temporary nature with maximum intensity when maximum leakage is due to snow melting and torrential rains.

Processes of pluvial erosion

The precipitation falls in large quantities and therefore acts on the relief, by surface scrubbing, flow, and soil erosion. The result of this form of erosion is observed by non-irrigated terrain, eluvial and adobe soil deposits and affected by gelivation. These processes precede the torrential erosion and can also be triggered by intensive grazing, sheep circulation or the removal of juniper trees for the extension of pastures and meadows (Berca, 2008).

Denudational processes

In the rainy periods conditions is observed that lands most exposed to degradations through mass movement processes are found in the area of roads builded on diluavial slopes. The breaking of natural balance of the cliff of those slopes in conditions of some thick diluvial coverlet (areas along the Poiana Teiului-Bicaz, Poiana Teiului-Pipirig, Borca-Mălini roads; some forestry road: on the upper valley of Hangu river, area of Bucșoaia village) created the most favorable places of slides reactivations. It is necessary to consider that one of the slopes feature is the big thickness and big discontinuity of their spreading on the slopes (Buloiu, 1953; Buloiu and Ionescu, 1986; Grimm and Montanerlla, 2002; Luca and Oncia, 2000, Montgomery, 2007; Moțoc et al., 1975). The old diluavial mass, even when we can not talk about the slides reactivation, is into a "hidden" dynamics, in the creep phenomen: stable slides are potential areas of some ample processes. The flow varied during the time both in intensity as well as erosion regime and accumulation. Up to historic times, which also mark the beginning of the

grubs, is more accentuated the chemical erosion, while, after man intervention through grub, the mecanichal erosnion became dominant. The landslides in the area of Lake Izvorul Muntelui are favored by the lithological composition, in particular by the presence of the Cretaceous greyish flysch and the Cretaceous argillaceous specific to Hangu strata. The landslides are manifested both by primary displacements of deluvial material as well as by the reactivation of some older landslides. The localities frequently affected by landslides are: Poiana Teiului, Hangu, Bicaz, where hundreds of landslides have been identified. Areas affected by landslides meet along the Bistrita Valley, but also on the slopes of the Stânisoarei Mountains, where the deluvials can reach up to 20 m thick, especially in the Vârlan, Huidumani, Grozăveşti and Rugineşti basin rivers. The landslides in the area can be grouped into two morphological types: simple and complex. Simple landslides have sculptural shapes but also sliding shapes such as cornices, steeples, diluvia, but also sloping slopes with a U-shaped profile with accumulation microrelief on the bottom of the valley and with drainage channels at the sides of the contact with the base of the slopes. In the hydrographic basin of Lake Izvorul Muntelui there are processes of land degradation: gravitational (landslides, collapses, solifluxions) but also denudational (ravens, gullies, torrents). The landslides have the highest frequency due to the petrographic composition of theflysch from clays, marches, marno-clay shale, advanced plasticity rock in contact with water (Stănescu et al., 1980). Gravitational processes are still present upstream of Poiana Teiului and continue up to Izvorul Muntelui, being easily visible on the left slope of the Bistrita valley. Torrents also present on the steep slopes are activated by torrential rains or the sudden melting of snow and develop a specific erosion due to the reduced hardness of the rocks and the lack of forest vegetation (Barbu et al., 1981). Slopes with lower inclinations are affected by processes of solifluxion and pluviodenudation, processes that can be observed in the valleys: Bistricioarei, Schitului and Jgheabuluui. In Poiana Teiului, 975 landslides were identified, 160 of which affected the dwellings. Other localities currently affected by landslides are: Bicaz, Păstrăveni, Făuneni, Hangu and Cuejdel, situated on the slopes limiting DN 15. The commune of Hangu has an intensely affected area of denudational processes and landslides that affect both the road and the protective works of DN 15 as well as the civil and agricultural fields. In this area, the slides are activated and reactivated also due to the reception basins of the streams: Vârlam, Buba, Buti, Huidumani and Grozăveşti. In 2005 there was a landslide on an old deluvium, which led to a road squeeze on a length of 80 m, accompanied by a fracture of the carriageway. In the same year in the reception basin of the Grozăveşti brook a secondary runway was set in motion, causing the road to be dilated, due to the lack of measures to stabilize the talweg of the torrent as well as the absence of consolidation works of the slopes. The stability of the DN 15 road was affected by valley landslides in the area of Grozăveşti, where mounds and lenses belonging to some 3-8 m separations affected the stability of the road and was located on both sides of it. The Huidumani Brook has a hydrographic basin representative of denudational processes (Martelloni et al., 2012) in the area of different ages, predominantly in the mass of the Buti stream crossing the road to 12 m below the road surface through a concrete tunnel, thanks to which the phenomenon of the slope of the road is 50 m high with 0.7 m vertically. The traffic on DN 15 is blocked due to slippage and muddy flowing from the deluvium belonging to the Buba brook, which has developed a sliding valley below Bubei's edge. Since 2011, drainage, slope consolidation works have been carried out to stabilize and reduce the effects of geomorphological processes without being sufficient. The degradation of the lands in the hydrographic basin of Lake Izvorul Muntelui is manifested both on the slopes' litology, by the gravitational geomorphological processes, of which the landslides prevail, but also by denudational mechanical processes such as: gullies, ravens, torrents. The mechanical processes can also affect the soil in the studied area through deep-seated transport and deposition erosion, which can continue until the complete removal of the soil layer. In the studied area prevails the slopes, with average inclinations of 15-30 degrees, that is why the lands affected by landslides and drainages represent 12% of the surface of the basin. The lands

afforested with soils of the brown-ferluvial type, brown-acid type, podzolic representing 56% of the surface of the basin are not affected by erosion. The soils affected by erosion under the pastures and meadows are part of the category of brown-acid soils, brown eumezobasic and lithosols as well as brown-lucius soils, representing about 21% of the studied area. The smallest weights belong to the soils with moderate erosion, in the category of brown luvic and brown eumezobazic soils, which represent 6% of the studied area, while only 5% is the weight of soils with strong erosion of brown eumezobasic erodet soils and erodisols.

Impact of soil degradation on agriculture

In the basin of the Izvorul Munte Lake, the specific crop is that of the potato expanded on more than half of the arable land, followed by: corn and vegetable crops in the river meadows. In farming practices a significant share, however it has the animal husbandry based on natural pastures and meadows. Sheep are raised in transhumance mode, bovine and poultry, with the highest frequency of over 60 %. To increase agricultural yield over time, people have grazed lands in slopes and used poor farming practices. A consequence of these phenomena is the washing and transport of soil from sloping lands not covered with vegetation in the Bistriţa waters and its affluences, especially during the winter. The erosion of the soil is manifested in parallel with the phenomenon of clogging of the rivers and, implicitly, of the mountain spring and is characterized by: the emergence of differentiated ditches according to dimensions, in gullies and ravines, which determines the reduction of the soil productivity. When chemical fertilizers or pesticides have been used, water pollution on the slope leads to pollution of surface and underground waters, accompanied by the loss of nutrients and soil organic matter (Bechet and Neagu, 1975; Herman, 2009; Bully and Stănescu, 1998).

POLLUTION OF SOIL WITH PESTICIDES AND CHEMICAL FERTILIZERS

Pesticides are used to prevent and combat insects, rodents or other pests in agriculture and forestry. In the basin of Lake Izvorul Muntelui, these are used both in deciduous and coniferous forests, as well as on agricultural cultivated surfaces with corn and potato. Most commonly used are those in the orogan-chlorinated category with high persistence. Their use is necessary because they increase potato production by more than 50% and in the absence of pesticides that combat the Colorado and hand-beetle, production could drop by 70% in potatoes and by 50% in maize (Dumitrescu and Sarbu, 1979). Although necessary pesticides act on microorganisms in the soil, it influences biochemical processes in the soil and generally the whole edaphic system. The mode of pesticide accumulation in the soil is done in three ways: by treating the aerial parts of the plants, which are washed by rainfall, they then reach the soil by incorporating plant and animal residues containing pesticides into the soil or air transport (Florea, 2003; Quido, 1974; Surdeanu, 1998). Pesticides persist for many years in the soil, where they can be displaced by mass or solution transport, and chemical reactions that occur between pesticides and organic or mineral compounds can decompose. There are also types of pesticides resistant to degradation that have long-term effects, also called pesticide residues. After 1990 in the Basin of Izvorul Munteului lake began to be introduced pesticides that degrade faster, an example being organo-phosphorus insecticides. In the basin of Lake Izvorul Muntelui, phosphorus deficiency occurs in the colder and drier primes affecting the production of potato and corn. Phosphorus originates naturally from the parental soil on which the soil was formed, but on the slopes of Ceahlău, Bistriţa and Stănişoara, the soils under the meadows, and under the forest plantations, exhibit at a depth of 60-80 m a layer with a content low in phosphorus, while in the outlying areas of the localities, only 1% of the phosphorus-containing soil can be easily accessed to crop plants within a year. Potassium-based fertilizers are necessary for plants because the insufficiency of this element leads to the withering of plants, the decrease in their resistance or the appearance of humorous

necrotic spots on the leaves. In the area of Izvorul Muntelui Lake, a high potassium content of 4 grams, potassium k/100 grams of soil was found in clay soils and a much lower content of less than 1 gram / 100 grams of soil in more developed soils, affected by clay-altering processes. Due to contamination with fertilizers or pesticides, soils and vegetation cause a high degree of toxicity both on plant organisms and on animals, and especially on humans. Due to the cliff of the relief, fertilizers and pesticides can also reach the flowing waters in many localities as sources of drinking water (Neamţu, 1996).

Following the ingestion of pesticides, their metabolic reaction in the human body consists in the functional disruption of several immune, nervous, endocrine, respiratory, cardiovascular, renal and reproductive systems. The exposure to pesticides and their ingestion may also cause chronic diseases such as Parkinsonism, cancer, alzheimer, diabetes, cardiovascular and renal diseases (Parichi, 2007).

REMEDIAL MEASURES

In order to reduce soil erosion, it is advisable to permanently cover the cultivated soils on slopes with large cliffs around the Izvorul Muntelui Lake, as well as the afforestation of slopes with long cliffs or the lands situated along valleys and drainage channels (Traci and Corbu, 1966). In protected areas where no afforestation can be achieved, may be used protected crops, consisting of: shrubs, grass or hedges (Dârja, 2000). The effects of pesticides and fertilizers can be diminished and combated by identifying areas affected by pollution, their effects on vegetation, fauna, soils and human health. If excess amounts of fertilizers and pesticides are identified in water or soil, it is advisable to interrupt their use and to decontaminate the entire contaminated area. Another method is to change the agricultural practices by using compost, an ecological element that replaces chemical fertilizers, and the use of trapping crops to attract pests to abandon pesticide use. By these measures, the agriculture in the Izvorul Muntelui lake area gets ecological valences, and the soil erosion forms are net-diminished.

RESULTS

The types of soils identified in the Lake Izvorul Muntelui area are: Differentiated in altitude, ranging from lakes to peaks, three complexes: the complex at the base of the slopes, includes crusty soils through landslides, raw and young soils, and brown-acid soils. The soils on the slopes at low altitudes are raw-brown, young-brown out of flysch, brown and yellowish-brown, brown-grained, brown and brown-polysolite, while the soils complex on the slopes at high altitudes include brown-acide grained soils, brown soils and yellowish-brown acide, brownish-humid frained soils, acidic-podzolic brown soils, grained podsols. The use of lands in the studied area is differentiated at altitude, so at low altitudes the potato and corn cultivation is practiced, there are also lands from the localities or under roads, railways, hydrotechnical constructions, along with other vegetables at medium altitudes on the slopes the land has a forest destination, but also natural pastures and meadows, and at higher altitudes there are areas of forests, conifers and areas declared as natural reserves (Secu, Ceahlău). The erosion of the soil in the studied area is due to mechanical geomorphological processes, affecting about 44% of the surface of the hydrographic basin. Poor erosion affects the acid soils, lithosols, and brown-luvic soils, located under grassland and meadows, representing about 21% of the studied area. Soils with moderate erosion in the brown-eumezobazic and brown-luvic category represent 6% of the analyzed area, and the rest is represented by soils with strong erosion of type of eroded brown eumezobazic and erodisols.

CONCLUSIONS

The soils in the lake basin of Izvorul Muntelui have various types of evolution, properties and a geographic distribution correlated with the specificity of the Carpathian Flysch. In the studied area there were identified 7 types of soils with different weights belonging to the classes:

cambisols (brown-acid soils, protisols (lithosol), histisols (histosol), chernisols (rendzine). The most common soil type is brown-eumezobazic soil, spread over 37% of the analized area. The texture of the soil is predominantly sandy-clayey and loam-clay. From the hypsometric analysis, 4 distinct steps of relief can be identified, corresponding to 4 steps of vegetation floors belonging to the beech forests, mixed beech and coniferous, coniferous and a subalpine floor. The erosion values in the studied area range from 0 to over 8 tons per hectare per year and from the correlation of erosion susceptibility data bases, there are no eroded lands or with very high vulnerability to erosion. Of the technical and editorial factors influencing the agricultural production capacity, soil is the most important component. The physical and chemical properties of the soil that directly affect the growth of plants are gleizing, alkalizing, texture, permeability and humus content. The main forms of soil degradation in the studied area are: determined by pluvio- denudational and gravitational processes. Some of them accelerated by anthropogenic intervention, manifested by deforestation, improper farming practices or chemisations. In order to practice a sustainable agriculture and to reduce soil erosion, remedial measures can be taken to modify agricultural practices and to permanently cover the cultivated soils with vegetation.

REFERENCES

Albota M. G. (1992), *Munţii Ceahlău, monografii montane [Ceahlău Mountains, mountain monographs Bucharest]*, Bucureşti.

Barbu N., Lupaşcu Gh., Rusu C. (1981), *Considerations phytopedologiques et amelioratives sur les montagnes [Phytopedological considerations and amelioratives sur les montagnes].*

Bechet S., Neagu I. (1975), *Amenajarea şi exploatarea antierozională a terenurilor în pantă [Anti-erosion planning and exploitation of sloping land]*, Editura Scrisul Românesc Craiova.

Berca M. (2008), *Probleme de ecologie a solului [Soil Ecology Problems]*, Editura Ceres, Bucureşti.

Bully R. J., Stănescu P. (1998), *Alunecările de teren, prevenire şi combatere [Land Slides, Prevention and Control]*, Editura Ceres, Bucureşti.

Buloiu V. (1953), *Ameliorarea terenurilor erodate [Improvement of eroded land]*, Editura Agro-Silvică, Bucureşti.

Buloiu V., Ionescu V. (1986), *Apărarea terenurilor agricole împotriva eroziunii, alunecărilor şi inundaţiilor [Defense of agricultural lands against erosion, landslides and floods]*, Editura Ceres, Bucureşti.

Choy J., Limm K., Sehin Y. (2005), *Soil erosion measurement and control techniques [Soil erosion measurement and control techniques]*, Kangwon National University Chunceon press.

Dârja M. (2000), *Combaterea eroziunii solului [Combating soil erosion]*, Editura Risoprint, Cluj-Napoca.

Demeter T. (2006), *Degradarea învelişului de sol: factorii, procese, efecte [Soil Degradation: Factors, Processes, Effects]*, Editura Ceres, Bucureşti.

Domuta C. (2011), *Eroziunea terenurilor în pantă [Erosion of lands in the slope]*, Editura Universităţii din Oradea.

Dumitrescu N., Sârbu G. (1979), *Pajişti degradate de eroziune şi ameliorarea lor [Degraded erosion grasslands and their improvement]*, Editura Ceres, Bucureşti.

Florea N. (2003), *Degradarea, protecţia, şi ameliorarea solurilor şi terenurilor degradate*, Editura Universitară, Bucureşti.

Grimm M. J., Montanerlla L. (2002), *Soil erosion risk in Europe*, (1993), office for official publications off the european comunities, Louxembourg.

Hamelin, L. E., Cook, F. A. (1967), *Le périglaciaire par l'image [The periglacial image]*, Québec, Presses de l'Université Laval.

Herman G. V. (2009), *Omul şi modificările antropice din Câmpia Someşului [The man and anthropogenic changes in Somes Plain]*, Editura Universităţii din Oradea, 227 pag., ISBN 978-973-759-981-0, Oradea.

Herman G. V. (2010), *Structure and share of agricultural lands, key indicators in quantifying the anthropogenic impact in the Somes Plain*, in Analele Universităţii din Oradea Fascicula „Construcţii şi Instalaţii Hidroedilitare", Editura Universităţii din Oradea, vol. XIII, nr. 2, pp. 153 - 159.

Luca E., Oncia S. (2000), *Combaterea eroziunii solului [Combating soil erosion]*, Editura Alma Mater, Cluj Napoca.

Martelloni G., Segoni S., Fanti R., Catani F. (2012), *Rainfall thresholds for the forecasting of landslide occurrence at regional scale, Landslides*, 2012/12/1, springer.com

Montgomery D. R. (2007), *Soil erosion and agricultural sustainability*, Proceedings of the National Academy of Sciences.

Moţoc M., Băloiu V., Munteanu S., Stănescu P. (1975), *Eroziunea solului şi metodele de combatere [Soil erosion and methods of control]*, Editura Ceres, Bucureşti.

Neamţu T. (1996), *Ecologie, eroziune şi agrotehnică antierozională [Ecology, erosion and anti-erosion agrotechnics]*, Editura Ceres, Bucureşti.

Parichi M. (2007), *Eroziunea şi combaterea eroziunii solurilor [Erosion and Fighting Soil Erosion]*, Editura Fundaţiei România de Mâine, Bucureşti.

Quido Z. (1974), *Alunecările de teren şi stabilizarea lor [Land Slides and Their Stabilization]*, Editura Tehnică, Bucureşti.

Rădoane N. (1980), *Contribuţii la cunoaşterea unor procese torenţiale din bazinul râului Pângăraţi în perioada 1976-1979*

[Contributions to knowledge of torrential processes in the Pângrati river basin in the period 1976-1979], St. Cercet. G.G.G., s. Geogr., t. XXVII, nr.l.

Stănescu I., Văcărașu, Sficlea V., Swizewski C., (1980), *Masivul Ceahlău. Ţara Giurgeului. Depresiunea Dărmăneşti. Podişul Covurlui : Cercetări în geografia României [Ceahlău Massif. The Land of Giurge. Dărmăneşti Depression. Covurlui Plateau: Research in the Geography of Romania]*, Editura Științifică și Enciclopedică, București

Surdeanu V. (1998), *Geografia terenurilor degradate [Geography of degraded lands]*, Editura Presa Universitară, Cluj-Napoca.

Traci O., Corbu E. (1966), *Terenuri degradate și valorificarea lor pe cale forestieră [Degraded lands and their exploitation by forestry]*, Editura Agro-Silvică, București.

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SPATIAL DISTRIBUTION OF HOSPITALITY INDUSTRY IN ILORIN METROPOLIS: AN EXAMPLE OF HOTELS

Enekole Esther ADENIYI[*]
Department of Geography Environment Management, University of Ilorin, Nigeria,
e-mail: adeniyi.ee@unilorin.edu.ng

Abstract: This study examines the spatial distribution of hotels in Ilorin metropolis. The specific objectives include examine the trend of hotels in Ilorin, determine the factors influencing location of hotels in Ilorin, assess the services rendered in the hotel and determine the impact of hotels in the study area. Both primary and secondary data were used for this study. One hundred and sixty questionnaires were administered in the study area. Descriptive (charts, tables, simple percentages) and inferential statistics chi-square (x^2) were used to analyse the data for this work. The study revealed that market and commercial activities are the most influential factors of location of hotel industry in Ilorin and the major impact of hotel industry in Ilorin is the provision of employment. Recommendations were put forth to government to provide a sound database to monitor the effective operation of the hotel industry, a workable mechanism must also be put in place by the government to ensure tourism related activities all year round in the state, and investment in electricity supply by ensuring electricity is supplied to residents of Ilorin metropolis. Also, Individuals, government and corporate organizations such as NGOs should also take active part in the development of hotel industry in Ilorin to stimulate infrastructural development and job creation.

Key words: tourism, hotels, trends, infrastructure, services

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INTRODUCTION

Tourism have emerged as a result of the growth and changes in tourism activities (Cooper et al, 2006) defined tourism as the temporary movement of people to destinations outside their normal places of work or residence, the activities undertaking during their stay in those destinations and the facilities created to cater for their needs. Also, United Nations World Tourism Organization (2007) defines tourism as collection of activities, services, industries which deliver a travel experience comprising transportation, accommodation, eating and drinking establishments, retail shops, entertainment businesses and other hospitality services provided for individuals or groups traveling away from home. One of the most exciting and fastest growing form of tourism is hotel. As a service industry, tourism has numerous tangible and intangible elements. Hospitality is the provision of the accommodations, venues, meals and drinks to those people who are out of their homes. The hospitality industry is a broad category of fields within the service industry that

[*] Corresponding Author

includes lodging, event planning, theme parks, transportation, cruise line, and additional fields within the tourism industry. Hospitality industry is a major sector in the tourism industry, which in turn is one of the most rapidly expanding fields in the service industry. Hospitality industry has brought tremendous growth to the global economy by providing services ranging from accommodation, sight-seeing, feeding as well as other services related to the tourism industry (Herman et al., 2017; Ilie et al., 2017). It not only provides employment but also plays a vital role in the economic returns of a country in the form of foreign exchange.

The boom of modern hotels in Nigeria started in the 1950s and since this period, hotels had sprung up in many Nigerian cities. The hospitality (hotel) industry has become a lucrative business in Nigeria as result of modern technological facilities put in place by hoteliers makes the destination attractive and conducive for visitation. The hotel industry in Nigeria has is known for providing the facilities for recreation and entertainment, meeting and conferences and business transmission, contributing the output of goods and related services which build well-being of the nation.

Today, the growth of hospitality (hotel) industry and the influx of visitors, the residents within these laudable potentials have generated significant socio cultural and environmental concerns that range from noise, water and land pollution. Most of these hotels are located within cities and residential areas and are often used for outdoor recreational activities such as marriage, conferences etc, all which are sources of environmental pollutions which have pose serious threat the health and wellbeing of people. This research therefore seeks to examine the spatial distribution of hotels in Ilorin metropolis.

Statement of the Problem

A hotel is a commercial establishment offering lodging to travelers and sometimes to permanent residents, and often having restaurants, meeting rooms, stores, etc., that are available to the general public. In Nigeria, the hospitality (hotel) industry has become a lucrative business as result of modern technological facilities put in place by hoteliers makes the destination attractive and conducive for visitation. Most of these hotels are found in the cities including Ilorin due to high market demand. Ilorin city has experience a gradual increase in growth of hotel industry due to improved economic condition of the state and increased urbanization. The hostel industry in Ilorin has been an important contributor to the economic development, generating income and revenue for both individuals and the government, and attracting foreign investors.

Although rapid growth of hotel industry in major Nigerian cities including Ilorin has its own share of contribution to national economic development and growth, little attention has been paid to other impacts on environment, human health and well-being. Waste are poorly managed and are littered around, in most cases blocking major drainage channels thereby exposing residents to the risk of flooding and creating conducive environment for the survival of disease vector such as mosquito. Also, most workers in these hotels are exposed to indoor air pollution, especially those working with the use of traditional source of energy for their cooking such as stove, firewood and charcoal, therefore deteriorating their health and well-being of the workers. Researchers have shown that traditional energy sources have contributed a reasonable percentage to the total atmospheric causing global warming. Further most of these hotels fall below building standards, in order to maximize profit many of these hotels have substandard rooms which are not well ventilated and are poorly equipped.

The following are the set objectives are to: examine the trend of hotels in Ilorin; determine the factors influencing location of hotels in Ilorin; and assess the services rendered in the hotels.

Justification of the study

The hospitality (hotel) industry in Ilorin metropolis is experiencing a great surge in growth over the past few years. This growth has broadened the concern of researchers beyond the economic impacts to socio-cultural, environmental as well as the developments on human health and wellbeing. This study was able to give a clear direction to policy makers in designing

appropriate economic and environmental policies to manage and mitigate the environmental effects of hotels industry in Ilorin city. It also provides a useful guide for future academic research in area of tourism and recreation.

STUDY AREA

Ilorin is located approximately on latitude 8º30' and 8º50' North of the equator and Longitude 4º20'and 4º35' East of the Greenwich Meridian.Ilorin is the gateway between the Southern and Northern Nigeria with an approximate land area of 100 kilometres square. It shares boundaries with Moro Local Government to the north, Asa Local Government to the west and Ifelodun Local Government to the East, Ilorin metropolis composes parts of Ilorin west, Ilorin south, Ilorin east and Asa Local Government of Area kwara State (See figure 1).

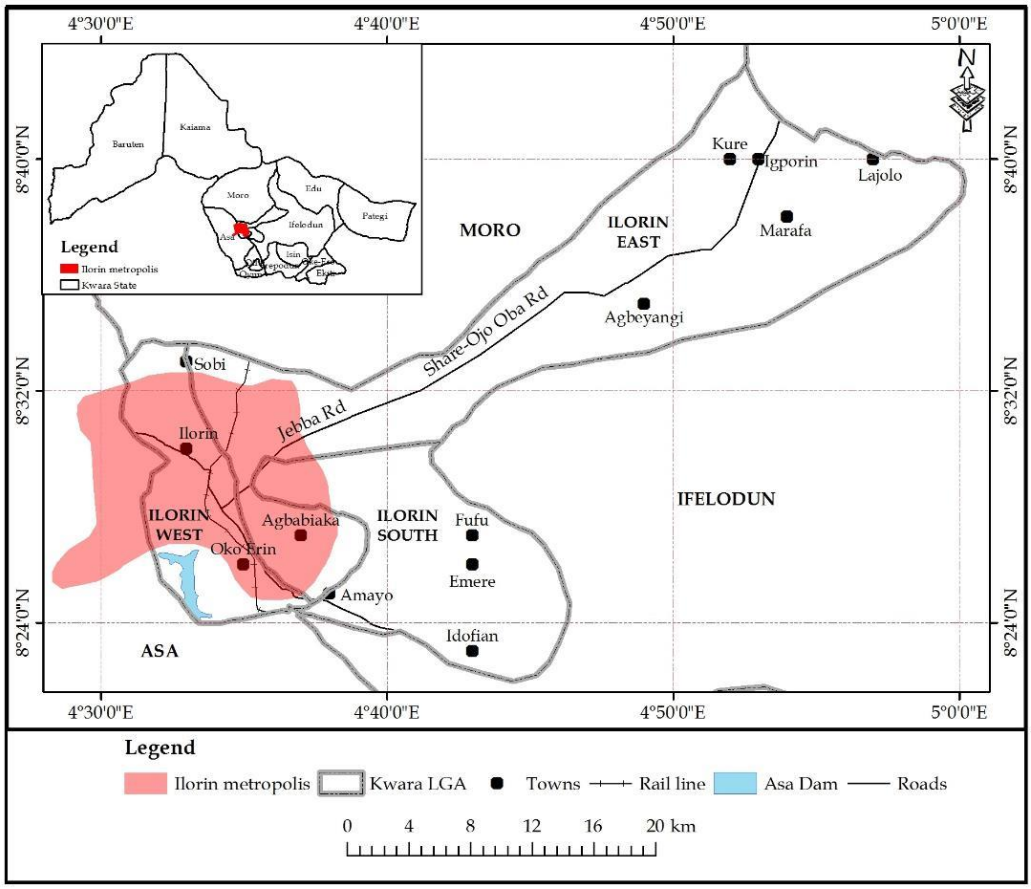

Figure 1. Map of Ilorin Metropolis
Source: Kwara State Ministry of Land and Survey (2009)

Ilorin has been described as one of the fastest growing urban centres in Nigeria with a population of 40,990 in 1952 and 208,546 in 1963. The population rose to 480,000 in 1984 with areas of about 200 km^2 (Oyegun, 1987). The population of Ilorin was estimated to be 456,738 and 717,258 in the year 1990 and 2000 respectively. Ilorin has been witnessing influx of people from different parts of the country since 2006 which contributed immensely to the growth of the Metropolis. Population projection of Ilorin for 2006 to 2015 (9 years) using annual growth rate of 2.8% is 2015 (1,097,466) NPC (2015).

During the pre-colonial period, Ilorin had been a major commerce and industrial centre involved in major craft industries such as, batana, bead making, pottery, black smiting and weaving (Adedayo and Oyebanji, 1986).

The indigenes of Ilorin are predominantly farmers, growing crops such as yams, cassava, sweet potatoes, guinea-corn etc. The city boasts the biggest traditional pottery workshops in Nigeria (Kwara state diary, 2012). The pottery is located in Dada area of Okelele, Eletu in Oju-Ekun, Okekura, Oloje, Abe Emi and Itam - Erin. Also thriving is the traditional textile industry in various part of the city, Aso-Oke are made in large quantities in okelele area. A large number of the population are engaged in trading, industrial and administrative activities, banking, teaching and blacksmith work etc (Olorunfemi, 1995). Increase in socio-economic activities over the years has led to demand for places where event takes place, for example exhibition of products, social events and conferences in Ilorin.

The metropolis is a confluence of cultures, populated by Yoruba, Hausa, Fulani, Nupe, Baruba and other Nigerians and foreign nationals. The indigenous people's culture is predominantly Islamic, as most of the Islamic festivals such as Eid-el fitri Sallah, Ramadan are greatly celebrated compared with anywhere in the country (Abdullateef, 2013). Ilorin has a range of tourist attractions such as the Sobi Hill, the Okuta Ilorin, Idi Ape quarters, the Alfa Alimi Mosque and residence which has been built since 1831.

Like many traditional cities in Nigeria, Ilorin Metropolis retains the characteristics of traditional town alongside a modern urban centre; the traditional part is located west of Asa River with a concentric pattern (Aderamo, 2002). The zone of transition contains deteriorating houses. While second zone is the independent working man zone, comprising of men of second generative immigration into the city. The third zone is zone of better residence i.e. middle class, small business men, professional people and salesmen. The last zone is the commuter zone of small cities, towns and hamlets which serve as dormitory and suburbs for the weather city dwellers for example Ganmo and Tanke (Aderamo, 2002). The modern residential part of Ilorin developed along the east and south of Asa River and this area attracted industrial, residential, administrative, commercial, transportation, institutions, communication, health, religions, financial and primary land uses. The recreation land use in the town is not efficiently utilized because of people's perspective to tourism.

Concept of Hotel

A hotel is an establishment that provides lodging paid on a short-term basis. It is a commercial establishment offering lodging to travelers and sometimes to permanent residents, and often having restaurants, meeting rooms, stores, etc., that are available to the general public. Facilities provided may range from a basic bed and storage for clothing, to luxury features like en-suite bathrooms. Larger hotels may provide additional guest facilities such as swimming pool, business Centre, childcare, conference facilities and social function services (Chap, 2010).

Model of Urban Hotel Location

Ashworth and Tunbridge, (1990) proposed a typology of hotel locations for classification of commercial accommodation establishment in historic cities. As shown in figure 2, the model presented six hotels location in historic cities which are labeled A-F (A- historic city location; B-railway station; C- along main access; D-cluster of small hotels and pensions in nice area; E- the zone of overlap between the historic city and the modern commercial city, and F-peripheral locations). According to the model, the first location - A, is the historic city locations which often have history of continuous operation extending back centuries and form part of the attraction of the historic city. Asworth and Tunbridge (1990) stressed that the development of B and C locations is traceable to improvement in urban accessibility, while location D exists because of the convenient and attractive locations in or near high amenity zones. According to them, hotels in location E are often large and purpose built, usually part of large hotel chains and are within walk able distance

of both historic and modern attraction. Hotels in F locations are in the peripherals to the historic city and their constructions cause a spatial separation of accommodations from other urban tourism resources, including heritage. The stressed further that these hotels are conveniently located for tourist desiring to visit attractions outside the urban area, but their peripheral locations can deter visitors from visiting the historic core of the city.

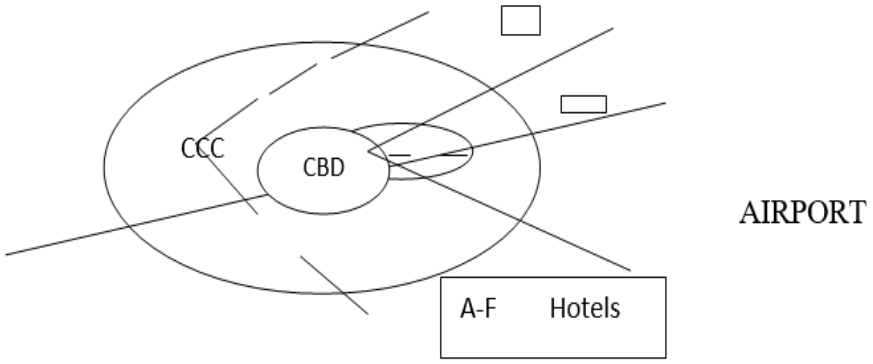

Figure 2. Typology of Urban Hotel Locations
Source: Adapted from Ashworth and Tunbridge (1990)

MATERIALS AND METHODS

Both primary and secondary source of data were used in this research. Primary Source of Data were obtained through the use of open and closed ended questionnaire and while Secondary sources of data were obtained from books (published and unpublished), internet search journals and conference proceeding. Systematic random sampling technique was adopted for this study. Descriptive statistics (tables and chats) and inferential statistics were used (chi square).

Results and Discussion

Socio-Economic Characteristics of Respondents

As shown in table 1, 23.1% (37) of the respondents are between age 18 and 28 years, while 41.9% (67) of the respondents are between the ages of 29-39 years. Also, 28.8% (46) of the respondents are between age 39-49 years, while 5.6% (9) of the respondents are between age 48 and 59 years. Only 0.6% (1) of the respondent were above 60 years. This data shows that most of the respondents are in their productive age. The gender distribution of the respondents shows that 74.4% (119) of the respondents are male, while 25.6% (41) are female, it was observed that most of the respondents are male. This may be due to high level of commitment required by the job. Also, 58.9% (91) of the respondents are married, while 31.3% (50) are single and 4.4% (7) are widowed. Only 7.5% (12) of the respondents are separated. These implies that many of the respondents are married.

Further, as shown in table 1, 92.5% (148) of the respondents are tertiary school certificate, while 5% (8) of the respondents are SSCE holders. Also, 1.9% (3) of the respondents were primary school certificate holders, while only 0.6% (1) of the respondents have no formal education. In addition, the income distribution of the respondents were as follow 13.1% (21) of the respondents earn less than N18,000, while 22.5% (36) of the respondents earn between 18,000-N25, 000 and N26,000-N35,000 respectively. Also, 20.0% (32) of the respondents earn between N36, 000-N45, 000. Also, 21.9% (35) of the respondents earn above N45,000. The above data shows that most of the respondents earn above the minimum basic salary of N18, 000. It implies that most of the respondents earn minimum wage and very few of the respondents had tertiary education.

Table 1. Socio-economic Characteristics of Respondents
Data source: Author's Field work, 2017

Socio-economic Characteristics	Frequency	Percentage
Age		
18-28 years	37	23.1
29-38 years	67	41.9
39-48 years	46	28.8
49-59 years	9	5.6
Above 60 years	1	0.6
Total	160	100
Gender		
Male	119	74.4
Female	41	25.6
Total	160	100
Marital Status		
Married	91	56.9
Single	50	31.3
Widowed	7	4.4
Separate	12	7.5
Total	160	100
Level of Education		
Primary Education	3	1.9
Secondary Education	8	5.0
Tertiary Education	148	92.5
No formal Education	1	0.6
Total	160	
Income		
Less than N18,000	21	13.1
N18,000-N25,000	36	22.5
N26,000-N35,000	36	22.5
N36,000-N45,000	32	20.0
Above N45,000	35	21.9
Total	160	100

Trends in Hotels in Ilorin Metropolis

Figure 3 shows that, 0.63% (1) of the hotels were established between 1975 and 1980, while 0.63% (1) of the hotels was established between 1987 and 1992.

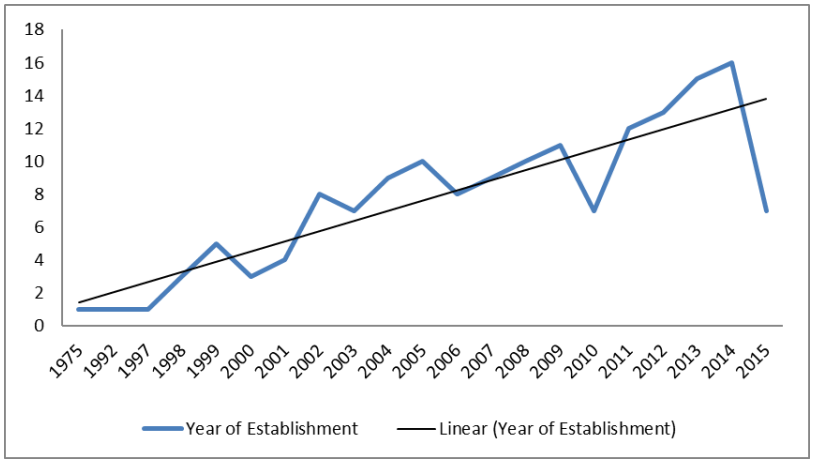

Figure 3. Trend of Hotels in Ilorin Metropolis
Source: Author's Field work, 2017

Also, 2.5% (4) of the hotels were established between 1993 and 1998, while 22.5% (36) of the hotels were established between 1999 and 2004. 34.38% (55) of the hotels were established between 2005 and 2010, while the majority of the hotels 39.38% (63) were established between 2011 and 2015 whilst the figure is expecting to rise in the coming months. The data therefore shows that there is fluctuation in the establishment of hotels in the study area and this make be linked with the unstable economic condition of the country. It connotes that urbanization and civilization have positive impact in increase in hotels in Ilorin.

Factors Influencing the Location of Hotels in Ilorin Metropolis

Table 2 shows that, 26.9% (43) of the respondents indicated that the major factor that influence the location of hotels is presence of physical infrastructure, while 41.3% (66) of the respondents indicated that market and commercial activities are the major factors considered in the location of hotels. Also, 10.6% (17), 3.8% (6) and 16.3% (26) of the respondents indicated that government influence, education, cheap cost of land, market, and commercial activities respectively are the factors, influencing the location of their hotels. Only 1.3% (2) of the respondents indicated that presence of physical infrastructure, market and commercial activities are the major factors influencing the location of hotels. From table 3, it can be deduced that market and commercial activities are the most influential factors of location of hotel industries in the study area.

Table 2. Factors Influencing the Location of Hotels in Ilorin Metropolis
Data source: Author's Field work, 2017

Factors	Frequency	Percentage
1. Presence of Physical infrastructure	43	26.9
2. Market and commerce	66	41.3
3. Govt. Influence	17	10.6
4. Education	6	3.8
5. Cheap cost of land and commercial activities	26	16.3
6. Presence of physical	2	1.3

Types of Services Rendered in Hotels in Ilorin Metropolis

Table 3 shows the type of service rendered by the hotels in the study area. According to the table, most of the hotels render more than one service.

Table 3. Types of Services Rendered in Hotels in Ilorin Metropolis
Data sources: Author's Field work, 2017

Types of Service	Frequency	Percentage
Room Service (High)	17	10.6
Room Service (Medium)	12	7.5
Room Service (Low)	5	3.1
Bar (High)	19	11.9
Bar (Medium)	12	7.5
Bar (Low)	4	2.5
Night club (High)	6	3.8
Night club (Medium)	18	11.3
Night club (Low)	12	7.5
Swimming pool (High)	2	1.3
Swimming pool (Medium)	4	2.5
Swimming pool (Low)	1	0.6
Halls/Events Centers (High)	5	3.1
Halls/Events Centers (Medium)	6	3.8
Halls/Events Centers (Low)	6	3.8
Restaurant (High)	15	9.4
Restaurant (Medium)	9	5.6
Restaurant (Low)	7	4.4
Total	160	100.0

Impacts of Hotels in Ilorin Metropolis

As shown in Figure 3, most of the respondents 55.0% (88) indicated that hotel industry in the study area provides employment opportunities for residents of the area, while 7.5% (12), 10.0% (17), 6.9% (11) and 1.3% (2) of the respondents indicated hotel industry in the study area provide road, electricity, conducive relaxation centre and road respectively for the residents of the area. 1.9% (3) indicated that their hotels creates accommodation, fast and relaxation respectively.

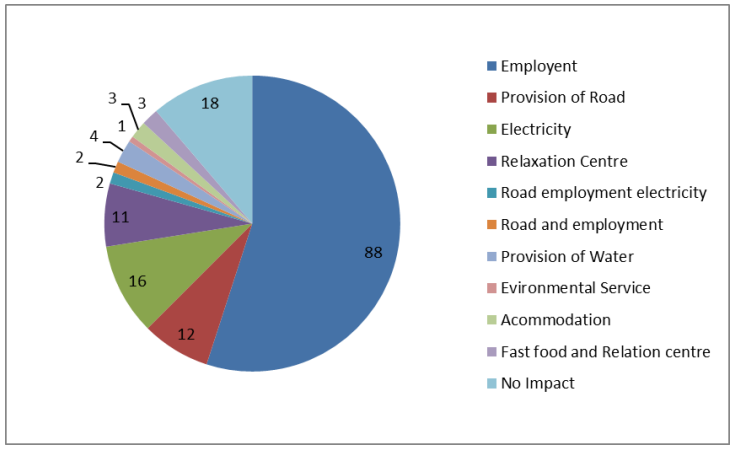

Figure 3. Impacts of Hotels in Ilorin metropolis
Data source: Author's Field work, 2017

Table 4. Chi-square Result
Data source: Author's Field work, 2017

Pearson chi-square	Value	df	Asymp. sig
Level of Education	1.600[a]	1	0.206
Social class	0.025[a]	1	0.635

The result of chi square as presented in table 4 implies that there is statistically no significant association between the level of education of residents and social class of people on the location of hotels in Ilorin. This is reflected in the fact that p> .050 is less than calculated value. Therefore, the null hypothesis is accepted.

CONCLUSION

In conclusion, the study suggested that, a sound database should be provided by the government to monitor the effective operation of the industry. A workable mechanism must be put in place by the government to ensure tourism related activities all year round in the state.

REFERENCES

Abdullateef A. (2013), *People and Culture*, Weekly Trust Newspaper, August 10, (13).

Adedayo A., Oyebanji J. O. (1986), *Private Entrepreneurship and the Role of non-indigenes in the Industrial Development of Ilorin*, Kwara State, Benin Journal of Social Sciences 1.2., http://www.unilorin.edu.ng/socialsciencepublication, Accessed on the net May 7th 2015.

Aderamo A. J. (2000), *Spatial Pattern of intra-urban transport in Ilorin*, Geo-studies Forum, An International Journal of Environment and policy Issues 1(2): 45-57.

Ashworth G., Tunbridge J. (1990), *Amsterdam and New York*, Pergamon.

Chap (2010), *The Traditional Hotel Industry*, http://biblio3.url.edu.gt/Libros/2012/check/1.pdf.
Cooper C., Fletcher J., Gilbert D., Fyall A., Wan Hill S. (2006), *Tourism; principles and practice (3rded.)* London: Longman.
Herman G. V., Deac A. L., Ciobotaru A. M., Andronache I. C., Loghin V., Ilie A. M. (2017), *The role of tourism in local economy development. Bihor County Case Study*, Urbanism Architecture Constructions 8(3): 265-274.
Ilie, A. M., Herman, G. V., Ciobotaru, A. M., Grecu, A., Radu, R. A., Visan, M. C., Giurgia, M. (2017), *The role of tourism in structural dynamics of the economic profile of Sighisoara City*, Urbanism Architecture Constructions, 8(4), 377.
Mathieson A., Wall G. (1982), *Tourism Economic Physical and Social Impacts Harlow*, UK: Longman.
Olorunfemi J. F. (1995), *Pattern of change in accessibility and intestinal space in Ilorin*, Environmental issue (1): 106-117.
Oyegun R. O. (1987), *Man-Induced Movement of Earth Materials into Ilorin City*, Nigeria Journal of Environmental Education and Information 6(2):142-152.
*** (2007), United Nation World Tourism organization Barometer (2007): 5 (2).
*** (2009), Kwara State Ministry of Lands and survey, *Government Press*, Ilorin Nigeria.
*** (2012), Kwara State of Nigeria, *Kwara State Diary*, Government Press, Ilorin Nigeria.

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WATER, SANITATION AND POVERTY IN THE CHANGING WORLD. CASE OF NIGERIA

Francis Olawale ABULUDE *
Science and Education Development Institute, Akure, Ondo State and Department of Chemistry, Federal University of Technology, Minna, Niger State, Nigeria, e-mail: walefut@gmail.com

Samuel Dare FAGBAYIDE
Department of Agricultural Engineering, The Federal Polytechnic. Ilaro, Ogun State, Nigeria,
e-mail: fsamueldare@gmail.com

Abstract: Water, sanitation, and hygiene are rights to everybody no matter which country one belongs. In developing countries, people are being denied the rights. This has resulted in poverty, diseases, and death especially in children. In line with the Millennium Development Goals (MDGs), the UNDP responded to one of the key issues by embarking on programs on water governance for poverty reduction in Africa, Asia, the Pacific and other areas where they fall short of water, sanitation, and hygiene. The paper aims to highlight the water-related challenges facing countries globally, Africa and Nigeria. To achieve this, the paper focuses on the effects lack of water has on women and children. The effects include sickness, death, loss of money on drugs, time wasting on sourcing for water, educational, other social and economic effects. Also, the causes of water, sanitation, hygiene, and poverty were discussed. From the foregoing, it was observed that most of the MDGs goals in developing countries recorded only substantive progress. It is hoped that if recommendations in this paper followed to the letter coupled with the new Sustainable Development Goals (SDGs), the world will be transformed in terms of water, sanitation, and hygiene.

Key words: water, poverty, MDGs, Africa, Nigeria, Aids, children

* * * * * *

INTRODUCTION

Poverty, as defined by WHO (2016), is low income (less than the US $2 a day). It was explained, that poverty is linked to a range of human attributes, including health. This means that the poorest of the poor anywhere in the world will have worst health, housing, education, and even water. The World Bank described by New Brunswick, Canada (2016) put it as having many faces like lack of money, not being able to participate in recreational activities, not being able to send children to school, not being able to pay for medical facilities and so on. In a nutshell, poverty is a menace that affects one when the basic standard of living cannot be met.

Water is a universal and important solvent needed in life. It has many uses depending on wants of individuals. Water covers more than 70% of the earth's surface. It makes what we call

* Corresponding Author

groundwater and surface water such as well, river, rain, stream, etc (Fashae et al., 2017; Herman, 2010; Khongwir et al., 2014; Slimani and Kalla, 2017; Yasin et al., 2015).

Lack of safe and good water and proper sanitation is known as water poverty. According to the Water Project (2016), WHO (2016), UNDP (2014) and Living Water Africa (2016), about one billion people do not have access to clean and save water. In many places of the world, access to water has been potentially a critical factor in alleviating poverty and enhancement of economic growth.

WHO (2015), provided these water facts:

I. Globally, at least 1.8billion people use drinking-water source contaminated with feces;

II. By 2025, half of the world's population will be living in water-stressed areas;

III. 2.6 billion people have gained access to an improved drinking water source since 1990;

IV. In 2015, 91% of the world's population had access to an improved drinking water source;

V. 4.2 billion people now enjoy the highest level of water access to a piped water connection at their homes; 2.4 billion people access water through other improved sources including public taps, protected wells, and boreholes;

VI. 663 million people worldwide rely on unimproved water sources, including 159 million dependent on surface water;

VII. At least 10% of the world's population is thought to consume food irrigated by wastewater;

VIII. Two out of five people without access to an improved drinking water source life in Africa;

IX. By 2015 water scarcity is expected to affect more than 1.8 billion people-hurting agricultural workers and poor farmers the most.

GLOBAL CHALLENGES

Lack of potable water has greater effects on women and children. They are forced to use many hours each time in the course of looking for water. They needed to trek, carry the heavy load and water and even their babies at their back. United Nations estimates that in sub-Saharan Africa, 40 billion hours per year are lost when trying to collect water. The social and economic effects caused by a lack of clean water are often the highest priorities of African communities when they speak of their own development (Water Project, 2016).

Other attendant problems caused by lack water and poverty are healthcare costs. This global cost is due to the diseases that affect the people combined with poor hygiene. This causes the death of children under the age of five and contributes to up to 50% of malnutrition. Around 700,000 children die each year of diseases. Families spend a lot on purchasing drugs.

United Nations Secretary-General Ban Ki-moon once said that an estimated 42,000 people die weekly due to low-water borne diseases and lack of adequate and proper hygiene.Educational goals are largely affected due to effects of poor water and poverty. Majority of people who supposed to attend school and work would not be able to do this due to sickness and time wasted during the time of searching.

According to WHO/UNICEF (2006) Statistics, about 315,000 children under five years due every day through diarrhoeal caused by drinking dirty water and poor sanitation. Furthermore, more than 650 million people in the world do not have access to safe water, every year also 60 million children do not have the opportunity to sanitation, and nearly half of the people who had the opportunity to gain access to water in 1990 to 2010 resides in India and China.

According to Africa Infrastructure Country Diagnostic (AICD) study it was revealed that funding for water and sanitation infrastructure is shot of US $115 million a year in sub-Saharan countries (Hutton, 2013), while a global estimate of $535billion is needed as investment to reach universal access, or $26.75 billion per year between 2010 and 2030 (WHO, 2012).

POVERTY AND WATER IN AFRICA CHALLENGES

Poverty is an epidemic result in Africa due to political instability, ethnicity, climate change lack of access to clean drinking water, and many other man-made factors (figure 1).

a) b)

c) d)

e) f)

g) h)

Figure 1. Pictures Speak for Themselves – Water and Poverty
Source: Living Water Africa, 2018

Over a million of African citizens are not opportune to have access to good, potable and safe water. This problem is solvable but due to poverty and selfish interests of the leaders, this seems attainable. The most affected people are women and children. A day cannot pass by without inflicting the injuries on them. Imagine somebody trekking several kilometers in search of what can be termed 'scare commodity' at many times especially during the dry seasons. During these periods human, animals and farming activities will be in dear need of water, especially portable and safe water for 'man and animals'. No doubt, there will be scrambling for water, during this, there may be water pollution.

WHO has shown that the time taken in the search for water costs a fortune. It was depicted in terms of economics that for every $ 1 invested in water and sanitation, there is always an economic return of between $ 3 and $ 34 (Water Aid, 2016, The Water Project, 2016). Water Aid is a non-profit organization in Africa. The aim of this outfit has been a charitable one. They were able to execute this as a water charity. Their impact has affected so many African countries by carrying out advocacy works to influence policy makers through local partners who are the key stakeholders who can reach those communities most in need of assistance. Their works are focused on reaching the poorest and most marginalized people of the areas visited.

According to Water Aid (2016), Zambia as one of the fast-growing economies of the world lost over half of his populate due to poverty and lack of safe and basic toilets, also over 5 million do not have access to safe water. Ghana empowered with natural resources has many of her citizenries die due to unemployment, poverty, and lack of water. Tanzania's problems could be due to the hot (dry) climate lack of safe water to use and not enough to grow plant crops. These issues have serious effects on children education, livelihood, well-being, and deaths especially children under age 5 years (Table 1). Other countries have almost the same crisis rocking the citizens of the nations (Water Aid, 2016).

Table 1. The summary of problems identified in ten different countries
Data source: Water Aid, Accessed (2016)

S/N	Country	Lack of Access to Water	Lack of Access to Sanitation	Death & Cause
1	Burkina Faso	14 million	3 million people	>800 children due to diarrhoeal)
2	Ethiopia	42 million	>70 million people	>9000 (diarrhoeal)
3	Lesotho	380,000	1.5 million people	>300 children (")
4	Mozambique	13 million	21.5 million people	4,200 children (")
5	Rwanda	3 million	4.5 million people	600 children under 5 years
6	Sierra Leone	2 million	5 million people	>1,600 children (diarrhoeal)
7	South Africa	650 million	2.3 billion people	>315,000 children
8	Tanzania	44 million	44 million people	>4000 children
9	Ghana	3 million	44 million people	>2,100 children under 5 years
10	Zambia	5 million	8 million people	>1,000 children under 5 years

POVERTY AND WATER IN NIGERIA CHALLENGES

Nigeria is one of the fastest growing economies in Africa. It has the population of more than 165 million people. Politics, religion, and corruption have been the bane behind the reduction in economic growth. According to (IFAD, 2016), 70% of Nigerians live in abject poverty, living on less than US$1.25 a day. Several international like IFAD, World Bank, WHO, UNICEF, UNDP, and others have financed many projects in Nigeria, but most of the programs are being benefited by urban dwellers, leaving the rural settings to disadvantage, hence causing rural migration.

The objectives of these funding agents targeted the betterment of rural people especially women and children, unfortunately, corruption of the people at the helm of affairs of the nation has made these laudable funding to go down the drain, most projects failed (Johnson, 2013).

In a study conducted by the Oxford Poverty and Human Development Initiative, Hughes (2015), observed that 22.1% of inhabitants in the urban areas is vulnerable to poverty while only 14.4% of children of ages 0-14 (43.2%). In between the rich and the poor, there is a wide gap. The rich are getting richer, while the poor are getting poorer.

Due to the many factors highlighted earlier, part of the failure of the Nigerian government is lack of provision of clean and save water especially within the rural setting. Many people lack good infrastructures and employment and this project into the poor living standards. In riverine areas, local fishermen needed water for their daily living unfortunately, these waters are contaminated and polluted thereby resulting in less harvesting of fishes, meaning less yield, poor income.

Nowadays, federal, state and local governments have failed citizens with regard to water infrastructure, there are no funds for necessary provisions. Most rural communities suffer a lot like in the other African countries. Those widely affected are women and children. From a case study from Biming Gaye in the Northern part of the nation, a 60year old woman related her village experience in the sense "that she always dig deep in a dry riverside to collect dirty water for her family. In the raining periods, it is difficult to collect water due to the slippery and dangerous footpaths. Due to the long distance from her home to the farm, she cannot collect more than two buckets a day". To her, it is a hazardous task coupled with the task of taking care of her family members.

WHO statistics put the happenings in Nigeria as follows:

I. About 57 million people have no opportunity to potable drinking water, while over 130 million people opportuned to have enough sanitation;

II. 680,000 children under 5 years old die every year from diarrhoeal. Like other developing countries due to poor water and sanitation.

Nigerian Government has not deemed it fit prioritized sanitation. Most homes in the urban areas do not have toilets not to talk of rural settings, people have resulted in using bushes as toilets. This has caused health problems. The cost of producing ideal toilets are high and due to poverty level on the increase and lack of lackadaisical attitudes of the government and public health staffs, people have put up carefree attitudes to sanitation. To many people, poverty is a "satanic curse".

The cost of providing sources of good water like the sinking of boreholes and digging of wells are far above the reach of many people, even harvesting of rainwater from the rooftops are costly. The few people who could fund it have resulted in selling. Many of these sources of water lack hygienic handling and so results in sickness and many government hospitals are not well funded and so lack ideal medications. Many hospitals only prescribe drugs. The cost of procuring these drugs are high, many people resulted in self-medication or taking of local herbs. Sickness and death rates are high due to poverty levels of Nigerians.

In Nigeria, there have been right interventions by international agents and other charitable organizations to provide safe and potable water, but the implementations have been poor due to corruption.

In 2011 the former president Jonathan made pronouncements that in 109 Senatorial districts of Nigeria, motorized boreholes will be drilled, in 18 states, 1000 hand pumps borehole will. The Same year, the former president voted a huge sum to rehabilitate hand pump boreholes, drill motorized boreholes treatment plants, and to complete the abandoned water projects. Despite the laudable plan, it met a Waterloo. The money went down the drain.

CONCLUSION

The Millennium Development Goals (MDGs) has made substantive progress in many developing countries on the provision of good water but this has been uneven across countries. Efforts are needed to reach the most vulnerable people. It is hoped that the new agenda 2030 for Sustainable Development will safe Nigerians from the issue of water and poverty if the present causing agents of failures are removed or eliminated (United Nations, 2016).

Provision of Drinking Water and Sanitation is one of the human rights of citizens of a country. Without these, it may not be possible for a nation to sustainable developed. The water crisis in Nigeria and this has resulted in poverty.

National sustainability depends on the followings:

- corruption should be reduced to lowest minimum;
- the political stability of the nation should be ensured;
- literacy campaign of water, sanitation, and hygiene should be mounted both in the rural and urban areas;
- proper monitoring of water projects should be put in place and no fund should be diverted into another project;
- all stakeholders should be alive to their responsibilities;
- there must be proper planning and action implementations of projects.

REFERENCES

Fashae O. A., Ayomanor R., Orimoogunje O. O. (2017), Land use dynamics and surface water quality in a typical urban centre of South-Western, Nigeria, Analele Universităţii din Oradea, Seria Geografie, 27(1), 98-107.

Herman G. V. (2010), Using Geographical Information (GIS) System for Management of Flood Risks in the Somes Plain, in Cross-Border Partnership with Special Regard to the Hungarian - Romanian - Ukrainian Tripartite Border, Book Editors Ioan Horga, Istvan Suli Zakar, Publishing House University of Debrecen Press, p. 175 -179.

Hughes C. (2015), *Poverty in Lagos, Nigeria*, The Borgen Project. Accessed 10th July 2016.

Hulton, G., & World Health Organization (2012), *Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage*.

IFAD (2016), *Rural poverty in Nigeria*, Rural Poverty Portal. Accessed 10th July 2016.

Johnson A. (2013), *Poverty in Nigeria increasing despite GDP growth*. The Borgen Project accessed 10th July 2016.

Khongwir S., Shabong D. N., Jyrwa L. M., Dohling B., Diengdoh M. (2014), *Physico-chemical and bacteriological analysis of river Umkhrah, Shilling, Meghalaya, India*, Int. J. Res. Environ. Sci & Tech. 4(1), 1-5.

Living Water Africa (2018), Water poverty. https://www.livingwaterafrica.org.uk/water-poverty/. Accessed 10th January 2018.

New Brunswick Canada (2016), *Economic and Social Inclusion Corporation. What is poverty*? The government of New Brunswick.

Slimani K., Kalla M. (2017), Estimation of the potential vulnerability to floods by "suitability modeling" method. Case of Batna City, Northeast of Algeria. Analele Universităţii din Oradea, Seria Geografie, 27(2), 164-174.

The Water Project (2016), *Poverty and water. The water project*. Accessed 10th July 2016.

UNDP Human Development Report (2014), *Sustaining human progress*, Reducing vulnerabilities and building resilience.

United Nations (2016), *Sustainable Development Goals - 17 goals to transform our world*. UN web services section. Department of Public Information, United Nations. Accessed 11th July 2016.

Water Aid (2016), *Water charity*. Accessed 10th July 2016.

WHO (2015), *Media Centre fact sheet No 391 Drinking water*.

WHO (2016), *Poverty. Health topics*. (Updated).

WHO/UNICEF (2012), *A joint monitoring program for water supply and sanitation*.

Yasin M., Ketema T., Bacha K. (2015*), Physico-chemical and bacteriological quality of drinking water of different sources, Jimma zone, Southwest Ethiopia*. BMC research notes, 8(1), 541.

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THE IMPACT OF URBAN GROWTH ON REGIONAL DEVELOPMENT OF AKURE METROPOLIS, ONDO STATE, NIGERIA

Adejompo FAGBOHUNKA[*]
Geography and Planning Sciences Department, PMB 001, Adekunle Ajasin University,
Akungba Akoko, Ondo State, Nigeria, e-mail: adejompofagbohunka@gmail.com

Abstract: The paper posits that the impact of urban growth could be understood from regional development perspective, using Akure metropolis, Ondo State, Nigeria as a case study. The first stage in the collection of primary data involves the reconnaissance survey of the study area, followed by the random administration of 25 questionnaires in each of the six identified quarters. Secondary data were also adopted, while data were descriptively and inferentially analyzed. The research revealed that one of the major causes of urban growth is employment opportunities, while the impact of urban growth on employment has not been satisfactory. The paper has found out that the impact of urban growth on economic activities was very good, whereas it was insignificant on infrastructural development. The research shows a fair impact of urban growth on health status, the paper also shows a positive relationship between urban growth and social vices. It was further revealed that the impact of urban growth on the standard of living and on the urban sprawl was fair and fairly significant respectively. The impact of urban growth on housing was not satisfactory. The paper shows that birth control measures could be adopted in mitigating the regional adverse effect of urban growth. It was further recommended that, in order to ensure urban tranquility, livability, socio-economic advancement and sustenance, government should create more employment, prioritizing increase in government expenditure and adequate security provision should be endeavoured.

Key words: Urban growth, Regional development, Impacts, Akure metropolis

INTRODUCTION

Urbanization refer to the process of coming together of human population, the multiplication of such centers of human agglomeration and the enlargement in size of each centre of human concentration. The growth and decline of urban areas as an economic phenomenon is inextricably linked with the process of urbanization. Measurement of urban growth rests on the definition of urban area' which is not standard throughout the world involving area variation according to countries and differs even within the same country depending upon the nature of local jurisdictions and how they might have changed over time. Economic Geography literature has emphasized how an economy can become differentiated into an industrialized core (urban sector) and an agricultural 'periphery' that is, urban concentration is advantageous due to the fact that the population benefits from the greater variety of goods produced and may be sustained because a large population in turn generates greater demand for those goods (Krugman, 1991; Bloch et al., 2015).

[*] Corresponding Author

Rapid urban growth is responsible for many environmental and social changes (Herman, 2009, 2010), it is noted that rapid growth of cities often strains their capacity to provide basic amenities. Amenities such as energy, transport facilities, education, health care, portable water supply, sanitation and physical securities which are required to sustain and keep urban environments functioning efficiently has to be competed for. It is noted that reduced government spending on maintenance and provision of services has turned some environment in Akure to massive slum with serious environmental problems and widespread poverty. With more and more people preferring cities as their choice of settlement, the challenges lies not in stemming this tide of migration, but in planning, managing and governing our cities better, to improve quality of life and living standard. While urban planning is a dynamic activity that works to improve the welfare of people and their communities by creating more convenient, equitable, healthful, efficient and attractive places for present and future generations (American Planning Association, 2006).

The evolution of cities involves an admixture of natural increase (excess of fertility over mortality), internal migration and international migration. In Africa expansion and population growth led to high demand from the environment and ultimately struggle for more land and local rancor and war. However, poverty which is seen as 'widespread and continuous in Africa is worsening by rapid population growth (Fagbohunka, 2010).

Conceptual Issues/Literature Review

Nevertheless, the city growth in the developing nations of the world is associated with absence of economic development capable of explaining or justifying it (Bairochi, 1989; John, 2005). It has been observed that efforts could be made to decelerate growth of cities. This has been demonstrated in France through migration to rural areas near many of the major cities (Chapius and Brossard, 1989). The united Nation Human settlement program (UN Habitat) has identified social polarization as an indirect but crucial determinant of contemporary patterns of segregation of people and land use around the world. Lack of urban facilities is one of the most pressing problems in Nigeria cities (Lee, 1989; Lee and Anas, 1989).

According to the UN methodology, and following the convention in Nigeria, settlements with a population of 20,000 or more are classified as urban; all state capitals are included. Previous to British rule, urbanization tended to concentrate in the north and southwest, and the southeast had a predominant rural character (Abumere, 1994). It is impossible to predict how population densities will change, but in general rates of urban expansion have exceeded rates of urban population growth in West Africa (Angel, 2012).

While rural-urban migration contributes to urban growth, the significance of urban natural increase and reclassification due to rural densification have been widely underappreciated while the role of rural-urban migration has likely been overstated in Nigeria, and indeed in sub-Saharan Africa more generally (De Brauw et al., 2014; Jedwab et al., 2014; Fox 2014).

This process of growth and urban change integrates a diversity of settlements, ranging from housing estates, educational facilities and industrial sites to unplanned residential developments on urban fringes progressively incorporating peripheral peri-urban (and rural) settlements (Ogu, 2009). While there are a number of accounts describing the changes that Nigerian urban structures are undergoing at a national level (Falade, 2009; Bijimi, 2013; Olujimi, 2009), most of the analyses of contemporary urban expansion have tended to use a specific city as a case study, from which they have derived generalizations of transformations occurring at the national level (Ade and Afolabi, 2013; Alabi, 2009; Aguda and Adegboyega, 2013; Tofowomo, 2008; Atu et al., 2008; Ajala and Olayiwola, 2013; Isma'il et al., 2010; Oriye, 2013; Ujoh et al., 2010).

THE STUDY AREA AND METHODS

Akure is located approximately 700 kilometers south west of Abuja, the federal capital of Nigeria and about 350 kilometers to Lagos the former capital of Nigeria. The city is located within Ondo State in the south western part of Nigeria. It is located within the tropical rainforest region of

Nigeria where rainfall is high throughout the year. It lies approximately on latitude 7º15[1] North of the equator and longitude 5 º 15[1] East of the Greenwich.

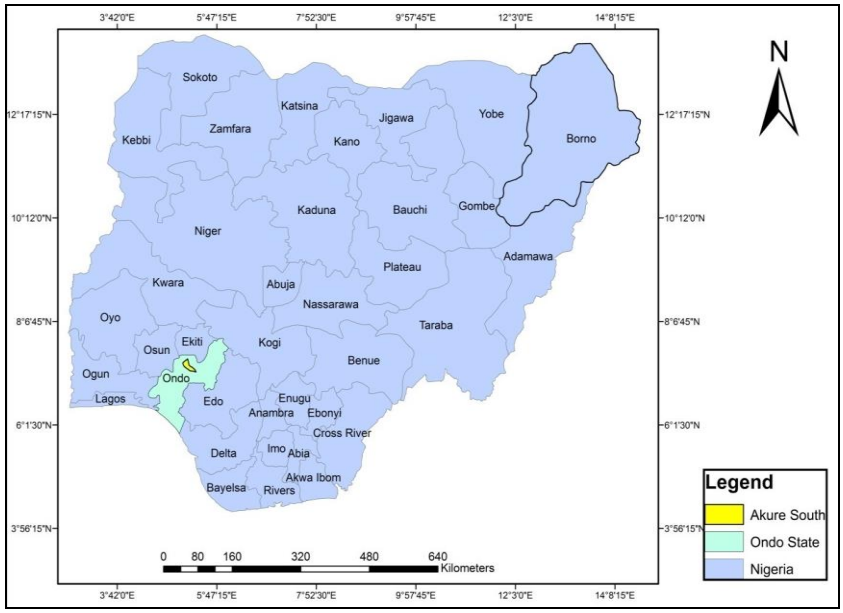

Figure 1. Map of Nigeria showing the location of Ondo State
Source: Africa map library 2014

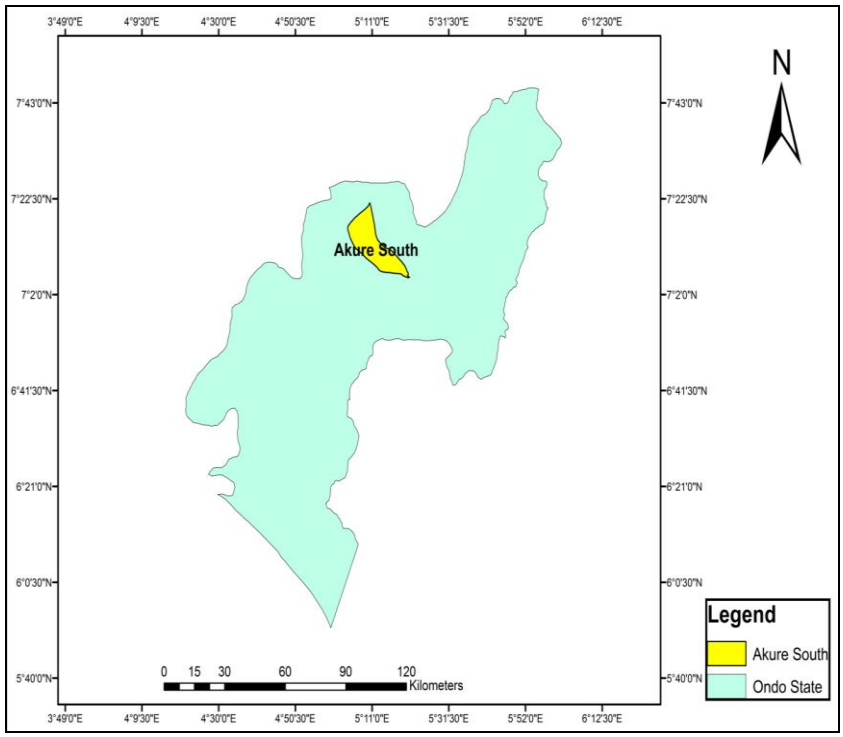

Figure 20. Map of Ondo State showing Akure South
Source: Africa map library 2014

The people of Akure are hardworking, studious and very articulate and industrious and serious minded people who are mixed in economic activities, some are civil servants, bankers, farmers and engineers while the women are majorly involved in commercial activities like trading and tailoring. The population of the city grew from 38, 852 in 1952 to 71,106 in 1963 (National Population Census, 2010). The 1991 national population census recorded the population of Akure as 239,124. But the unofficial calculated population was estimated at 556, in 2015.

The collection of primary data involves the reconnaissance survey of the study area. Six quarters (6) including Ijoka, Oke-aro, Ijomu, Oba Adesida, Ijo mimo and Ala quarters, were identified for the purpose of easy administration of questionnaires, twenty five (25) questionnaires were randomly administered in each of the quarters, making a total of 150 questionnaires. Secondary data were also adopted, while data were descriptively and inferentially analysed.

FINDINGS

Table 1. Demographic Characteristic of Respondents
Data source: field survey, 2017

Sex	**Number of respondent**	**Percentage %**
Male	103	69
Female	47	31
Age (in years)		
<20	04	03
21-30	20	13
31-40	33	22
41-50	48	32
51-60	27	18
60+	18	12
Education Status		
No formal education	30	20
Primary education	41	27
Secondary education	47	32
Tertiary education	20	13
Others	12	08
Occupation		
Farming	77	51
Civil servant	14	09
Trading	22	15
Artisan	18	12
Others	19	13
Monthly Income		
< N 10,000.00	05	03
N10,000-25,000	23	15
N26,000- 40,000	61	41
N41,000-N55,000	28	19
>N55,000	33	22

Table 1 shows the demographic characteristics of the respondents, 103 (69%) are males, while 47 (31%) are females. Also, 04 (03%) respondents are less than twenty years, whereas 48 (32%) are between 41 and 50 years. Another, 47 (32%) respondents have secondary education, while 30 (20%) have no formal education. Furthermore, 77(51%) respondents are farmers, whereas 14 (09%) are civil servants. Also, 5 (03%) respondents receive monthly income of less than N10,000.00, while 61 (41%) receive monthly income of between N26, 000 and N40, 000.00.

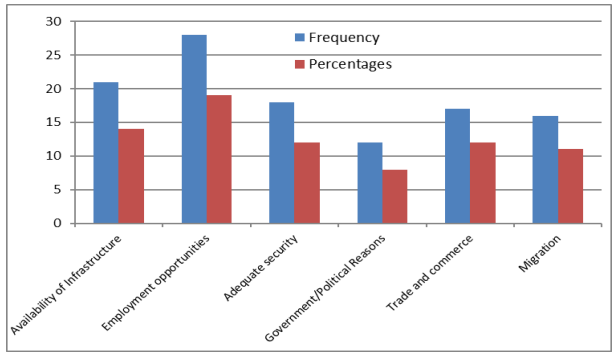

Figure 3. Causes of Urban Growth
Data source: field survey, 2017

Figure 3 shows that, out of 150 (100%) respondents; 28 (19%) agreed that one of the major causes of urban growth is employment opportunities, while 10 (07%) opined population growth. Another, 21 (14%) respondents asserted availability of infrastructural facilities, contrary to 12 (08%) who believed that government/ political reasons is the cause of urban growth. Also, 18 (12%) agreed adequate security, whereas 13 (07%) believed that the status of the study area as a capital city is the most important cause of its (urban) growth.

Table 2. The Impact of Urban Growth on Employment
Data source: field survey, 2017

Impact on Employment	Frequency	Percentages
Very satisfactory	23	15
Satisfactory	32	21
Fairly Satisfactory	21	14
Not satisfactory	56	38
No Effect	18	12
Total	150	100

Table 2 reveals that 56 (38%) respondents believed that the impact of urban growth on employment has not been satisfactory, while 18 (12%) opined no effect. Another, 32 (21%) agreed that the impact of urban growth on employment is satisfactory, contrary to 21 (14%) who opined fairly satisfactory.

Table 3. The Impact of Urban Growth on Economic Activities
Data source: field survey, 2017

Impact on Economic Activities	Frequency	Percentages
Excellent	29	19
Very Good	55	37
Good	22	15
Fair	23	15
Poor	21	14
Total	150	100

Table 3 shows that 55 (37%) respondents believed that the impact of urban growth on economic activities is very good, contrary to 21 (14%) respondents who opined poor. Also, 29 (19%) respondents agreed to the excellent impact of urban growth on the economic activities, whereas 23 (15%) opined fair.

Table 4 reveals the impact of urban growth on infrastructural development. Out of 150 (100%) respondents, 39 (26%) agreed insignificant impact of urban growth on infrastructural development, whereas 19 (13%) opined no effect. Another, 35 (23%) respondents believed that urban growth has a fairly significant impact on infrastructural development, while 23 (15%) agreed significant impact.

Table 5 depicts that 54 (36%) respondent's opined a fair impact of urban growth on health status, while 8 (05%) agreed an excellent impact. Also, 35 (23%) respondents believed that the impact of urban growth on health facilities is good, contrary to 14 (09%) who opined no effect.

Table 6 reveals that, 76 (51%) respondents agreed that the impact of urban growth on social vices is positive, whereas 45 (30%) believed that it is negative. Another, 29 (19%) respondents agreed that urban growth has no impact on social vices.

Table 4. Urban Growth and Infrastructural Development
Data source: field survey, 2017

Impact on Infrastructure	Frequency	Percentages
Very Significant	34	23
Significant	23	15
Fairly Significant	35	23
Not Significant	39	26
No Effect	19	13
Total	150	100

Table 5. The Impact of Urban Growth on Health Facilities
Data source: field survey, 2017

Impact on Health Facilities	Frequency	Percentages
Excellent	08	05
Very good	17	12
Good	35	23
Fair	54	36
Poor	22	15
No Effect	14	09
Total	150	100

Table 6. The Impact of Urban Growth on Social Vices
Data source: field survey, 2017

Impact on Social Vices	Frequency	Percentages
Positive	76	51
Negative	45	30
No Effect	29	19
Total	150	100

Table 7. Urban Growth and Standard of Living
Data source: field survey, 2017

Impact on Standard of Living	Frequency	Percentages
Excellent	23	15
Very Good	25	17
Good	32	21
Fair	56	38
Poor	14	09
Total	150	100

Table 7 depicts the impact of urban growth on the standard of living, 56 (38%) respondents opined fair, while 14 (09%) agreed that the impact of urban growth on standard of living is poor. Furthermore, 23 (15%) respondents agreed an excellent impact of urban growth on standard of living, whereas 32 (21%) opined a good impact.

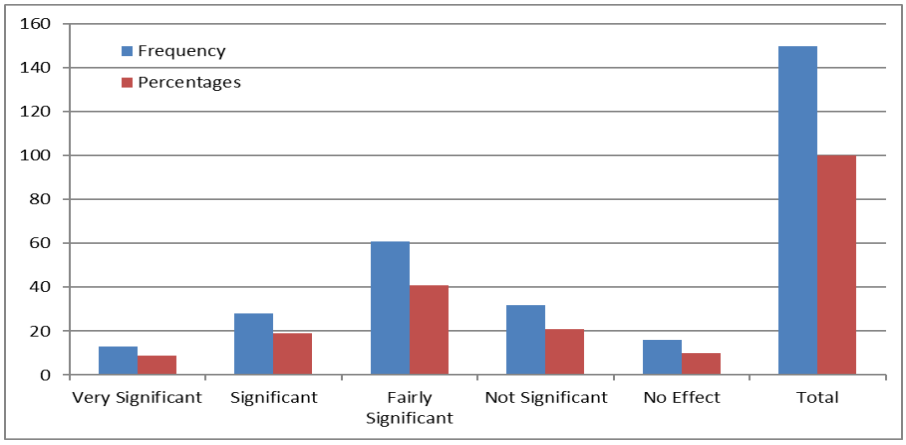

Figure 4. Urban Growth and Urban Sprawl
Source: Field Survey, 2017

Figure 4 shows that 61 (41%) respondents believed that urban growth has a fairly significant impact on urban sprawl, while 13 (09%) agreed very significant. Also, 32 (21%) respondents agreed an insignificant impact of urban growth on urban sprawl, contrary to 16 (10%) who opined no effect.

Table 9 reveals that 49 (33%) respondents believed that the impact of urban growth on housing is not satisfactory, while 14 (09%) agreed it has no effect. Another, 45 (30%) respondents believed that the impact of urban growth on housing is fairly significant, whereas 19 (13%) opined very satisfactory.

Table 9. The Impact of Urban Growth on Housing
Data source: field survey, 2017

Impact on Housing	Frequency	Percentages
Very satisfactory	19	13
Satisfactory	23	15
Fairly Satisfactory	45	30
Not satisfactory	49	33
No Effect	14	09
Total	150	100

Table 10. Control Measures on the Adverse Effect of Urban Growth
Data source: field survey, 2017

Control Measures	Frequency	Percentages
Birth Control	48	32
Deportation of Non- Indigene	02	01
Creation of More Employment	31	21
Government Expenditure Increase	33	22
Adequate Security	36	24
Total	150	100

Table 10 shows the various respondents view concerning control measures which could be adopted in mitigating the regional adverse effect of urban growth. Out of 150 (100%) respondents, 48 (32%) opined birth control, while 36 (24%) agreed adequate security. Furthermore, 33 (22%) believed that government should increase its expenditure, whereas 2 (01%) respondents agreed deportation of non-indigene as a measure of control on the adverse effect of urban growth.

SUMMARY AND CONCLUSION

What constitutes an 'urban' area is conceptually and practically ambiguous, urban settlements are demographically large, relatively densely populated, built-up areas. Urban growth could be a positive symbol of socio-economic advancement, but in most of the developing countries, the rates of growth have not only progressively compounded and exacerbated inter-related challenges of human settlements and the environment, but have also greatly catalyzed poverty.

The research revealed the following as the causes of urban growth; availability of infrastructural facilities, government/ political reasons, trade and commerce, migration, capital city, population and natural increase, and the employment opportunities which happened to be the most dominant. It was also vivid that the impact of urban growth on employment has not been satisfactory, this lends credence to the fact that population increase tend to have negative relationship with employment availability. The paper has found out that the impact of urban growth on economic activities was very good, in real sense people tend to agglomerate in regions with buoyant economy and economic activities. Therefore, wide varieties of goods and services are readily available for man's consumption in such situation.

Also, the impact of urban growth on infrastructural development was insignificant; this perhaps as a result of competition and strain on the available facilities. The research shows a fair impact of urban growth on health status and a positive relationship between urban growth and social vices. It was further revealed that the impact of urban growth on the standard of living and on the urban sprawl was fair and fairly significant respectively. The impact of urban growth on housing was not satisfactory, it must be noted that in many urban areas adequate housing is usually a dominant problem as it does not corroborate with those opportunities available. The paper shows that birth control measures could be adopted in mitigating the regional adverse effect of urban growth. It was further recommended that, in order to ensure urban tranquility, livability, socio-economic advancement and sustenance; government should create more employment, prioritizing increase in government expenditure and adequate security provision should be endeavoured. The government should embark on development policy with the aim of developing a dynamic system of urban settlement that will promote efficient urban and regional development and ensuring improved standard of living.

REFERENCES

Abumere S. I. (1994), Nigeria. In: Tarver, James D. (editor), *Urbanization in Africa: A Handbook Hardcover*, Greenwood.

Ade M. A., Afolabi Y. D. (2013), *Monitoring urban sprawl in the federal capital territory of Nigeria using remote sensing and GIS techniques*, Ethiopian Journal of Environmental Studies and Management, 6(1), 82-95.

Aguda A. S., Adegboyega S. A. (2013), *Evaluation of Spatio-Temporal Dynamics of Urban Sprawl in Osogbo, Nigeria using Satellite Imagery & GIS Techniques*, International Journal of Multidisciplinary and Current Research, 60-73.

Ajala O. A., Olayiwola A. M. (2013), *An assessment of the growth of Ile-Ife, Osun state Nigeria, using multi-temporal imageries*, Journal of Geography and Geology, 5(2), 43.

Alabi M. O. (2009), *Urban sprawl, pattern and measurement in Lokoja, Nigeria*, Theoretical and Empirical Researches in Urban Management, 4(4 (13), 158-164.

America Planning Association (2006), *The Nature of cities,* Annuals of the America Academy of political and social Science.

Angel S. (2012), *Planet of Cities, lincoln Institute of land Policy*, Cambridge, Ma: Lincoln Institute of Land Policy.

Atu J. E., Offiong R. A., Eni D. I., Eja E. I., Esien O. E. (2012), *The effects of urban sprawl on peripheral agricultural lands in Calabar, Nigeria*. International Review of Social Sciences and Humanities, 2(2), 68-76.

Bairoch P. (1988), *Cities and Economic Development*, Chicago: University of Chincago Press.

Bijimi C. K. (2013), *The Relevance Of A Good Urban Design In Man-aging Urban Sprawl In Nigeria*, International

Journal of Technology Enhancements and Emerging Engineering Research, 1(4), 123-125.
Bloch R., Monroy J., Fox S., Ojo A. (2015), *Urbanization and urban expansion in Nigeria, Urbanisation Research Nigeria (URN)* Research Report, London: ICF International.
Chapuis R., Brossard T. (1989), *The demographic evolution of rural France (1968–1982)*, Journal of Rural Studies, 5(4), 357-365.
De Brauw A., Mueller V., Lee H. L. (2014), *The role of rural–urban migration in the structural transformation of Sub-Saharan Africa*, World Development, 63, 33-42.
Fagbohunka A. (2010), *Population Growth and its Effects on Economic Activities in Akungba*, International Journal of Sustainable Development, Volume 3, Number 5.
Falade B. (2009), *The Millennium Development Goals and Urban Sustainability*. United Nations Human Settlements Programme.
Fox S. (2014), *The political economy of urbanization and development in sub-Saharan Africa*. PhD Thesis, London:
Herman G. V. (2009), *Ways of anthropic intervention in the Someşului Plain*, Analele Universităţii din Oradea, Seria Geografie, 20(1), 120-126.
Herman G. V. (2010), *Omul şi modificările antropice din Câmpia Someşului [The man and anthropogenic changes in Somes Plain]*, Editura Universităţii din Oradea, 227 pag., ISBN 978-973-759-981-0, Oradea.
Isma'il M., Salisu A., Yusuf S., Muhammed Z. D. (2013), *Spatial analysis of urban growth in Kazaure local government area of Jigawa state, Nigeria*, International Journal of Geomatics and Geosciences, 4(1), 47.
Jedwab R., Christiaensen L., Gindelsky M. (2014), *Rural push, urban pull and... urban push? New historical evidence from developing countries*, Institute for International Economic Policy, The George Washington University, Working Papers, 4.
John L. S. (2005), *Planning Sustainable Urban Growth in Nigeria, Challenges and Strategies*: A Paper Presented at the Conference on Planning Sustainable Urban Growth and Sustainable Architecture, United Nations Headquarters, New York.
Krugman P. (1991), Geography and Trade. The MIT Press. Cambridge, Massachusetts.
Lee A. (2006), Community development: Current issues and challenges combat poverty. The Community Health Exchange (CHEX), Scottish Community Development Centre (SCDC).
Lee H., Anas A. (1989), *Manufacturers Responses to Infrastructure Deficiencies in Nigeria: Private Alternatives and Policy Option*, Working Paper, Infrastructure and Urban Development Department. The World Bank, NY.
London School of Economics and Political Science.
National Population Commission (2010), *National Internal Migration Survey 2010* (First zero draft-4/11/2011).
Ogu V. I. (2009), *Urban infrastructure development and sustainability in Nigeria*, Human Settlement Development-Volume III, 109.
Olujimi J. (2009), *Evolving a planning strategy for managing urban sprawl in Nigeria*, Journal of human ecology, 25(3), 201-208.
Oriye O. (2013), *Urban expansion and urban land use in Ado Ekiti, Nigeria*, American Journal of Research Communication, 1(2), 128 - 139.
Tofowomo A. (2008), *The planning implications of Urban Sprawl in Akure*. In 44th ISOCARP Congress (Vol. 2008).
Ujoh F., Nigeria Federal Character Commission (2010), *Understanding urban sprawl in the Federal Capital City, Abuja: Towards sustainable urbanization in Nigeria*. Journal of Geography and Regional Planning, 2(5), 106.

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URBAN REGENERATION. A CHANCE FOR SUSTAINABLE DEVELOPMENT OF ORADEA MUNICIPALITY

Miruna Cristina BOCA*
University of Oradea, Universităţii Street, no 1, Oradea, Bihor County, România
PhD Student in Geography, e-mail: mirunaboca@yahoo.com

Abstract: Urban regeneration is a widely experienced but little understood phenomenon. It is also a great solution to bring declined cities back to life. Nowadays, the number and state of the industrial sites in Oradea, is not known. The aim of this paper is to study the state of the industrial sites in Oradea and highlighting them. The methods that have been used were different, from collecting data from the National Archives, to studying the buildings on site.

Key words: urban regeneration, industrial buildings, strategies, inventory, Oradea

* * * * * *

INTRODUCTION

Urban regeneration is a new topic for the Oradea urban space, strongly marked by the forced industrialization process of the communist period, followed by a process of deindustrialisation after 1990, processes that marked the evolution of the urban environment.

The current scientific approach is centered on the analysis of the geographical area of Oradea from the point of view of the industrial areas, and the study is based on the identification and inventory of the areas where the former industrial platforms in Oradea operated.

Through its past, Oradea is one of the cities in which the study of urban regeneration is particularly interesting as a result of its economic development. After a period of forced industrial development,when, a large number of industrial areas, some of national importance, mainly based on the heavy industry (machine building, chemical, energy), energy consuming, major polluters have been implemented, built and developed, followed a period of decline (failed privatizations, bad management or own interests, as well as lack of performance), which led to their closure. Most of these spaces have been left in ruins, becoming heaps of ruins, generating environmental hazards and bordering areas.

By Government Decision no. 1296 of December 13, 1990, art. 1. state-owned enterprises are transformed into joint stock companies. The major concern of these companies was that they could not adapt to the rigors imposed by the market economy because of the giant dimensions at which the plants were designed and more because of the system in which they operated during the planned economy when they did not have to identify themselves, neither the market where they would sell their products nor buy the raw material. This has led, over time, to an acute

* Corresponding Author

shortage of culture in relation to the consumer as well as to the relationship with suppliers that are vital in the conditions in which the market operates according to the harsh rules of demand and supply of goods and services. As a result, many of these companies have gone bankrupt, others have reconfigureured their activity profile, or have used different asset-leasing methods as a form of subsistence for economically unviable businesses.

The term of urban regeneration in its current form was conceived in 1950 by American economist Miles Calean and refers to the renovation of the city's building, equipment and infrastructure as a result of its aging or adaptation to new uses and different activities. It is a complex phenomenon that can take many different paths and is related to other types of urban processes such as rehabilitation, rehabilitation or succession invasion (Cervera Pascual, 2013).

Many definitions of urban regeneration have emerged, but the next short selection shows a high degree of coherence between authors from different backgrounds, writing at different times in time:

- the process of urban regeneration is one in which the state or local community is trying to bring back investment, employment and consumption, and improving the quality of life in an urban area (Couch, 1990);

- according to Nae Mariana (2015) urban regeneration is one of the most relevant ways of revitalizing city centers;

- under the Sectoral Operational Program for Human Resources Development 2007 - 2013, urban areas can be revitalized with the effort of the municipality, owners and local officials, resulting in improved living standards;

- urban regeneration is also defined as an integrated vision and action, the result of which is to find the best development solutions, aiming at sustainable improvement in the economy, society and the environment (Roberts and Skyes, 2000).

In Romania, in 2015, the Ministry of Regional Development and Public Administration prepared a platform aimed at informing the public and private persons who wanted to carry out urban regeneration, defining it as a set of operations for transforming the urban space, coherent actions in areas such as economic, social, environmental, architectural, and urban development, aiming at increasing the quality of the urban environment and improving the living conditions of the population.

The studied area is the city of Oradea. Oradea, the city of Bihor County residence, through its geographical location, has been the subject of a strong industrialization process. The city of Oradea is seated at the opening of the Crişului Repede Valley, between the extensions of the Apuseni Mountains and the Banato-Crişana Plain. It is an area of morphological complementarity between the plain and the hill area, an area passing from the hilly relief (Western Hills, Oradea Hills) to the plain area and entrance to the Vad-Borod Depression. Most of Oradea is located between 110 m and 146 m altitudes. In the north and northeast it is situated in a hilly area between 140 and 283 m altitude (Borcea and Gorun, 1965; Herman et al., 2016a, b; Ilieș et al., 2013).

METHODOLOGY

The study methods used in the present research belong to both geography and architecture and have assisted the use of qualitative and quantitative methods in the collection and interpretation of data and information on the field (Herman et al., 2016b, c; Ilieș et al., 2017). Sources of data and information used in the research are multiple and complex: the National Archives, the city's PUG, various laws, documents and reports released by local authorities, including PUDs and PUZs. This analysis was accompanied by the observation of concrete reality on the field. The latter played an important role in the study, as reality on the field becomes a very good witness of the evolution of these spaces. Between November 2015 and April 2018, using the participatory observation method, we studied and evaluated on site the evolution of the former industrial areas identified in the study.

RESULTS AND DISSCUSIONS

Following field observations and analyzes of documents on the economic development of this city, we have identified not less than 37 former industrial-major scale platforms (with a total estimated area of more than 300 ha) in different stages of destruction / left or partially carrying out economic activities, according to the object of activity. This study identified large industrial sites and those that had a major economic and historical value. No former craft cooperatives (Invalids Cooperatives, Igiena etc.), ex-warehouses of materials and materials (Basis 1 - 4, ICRA, CLF, etc.) or former decommissioned military units (Tank Units, etc.) were taken into account.

Thus, as a result of the study, from the point of view of the present state, the studied sites were divided into four categories, according to table 1, as follows: demolished (8); reconverted or rebuilt sites (13); in destruction, abandoned buildings, in a major degradation state (10); sites on which there are currently functional buildings, where various economic areas of activity are carried out (6).

The former industrial areas are an important point in the development of a city due to the extensive surfaces on which they are built (i.e. Înfrățirea Plant - 28 hectares, The spirts and yeast Factory - 3,2 hectares, CET II - 144 hectares, Alumina Plant - 70 hectares, The Brewery - 7,2 hectares, Sinteza - 17 hectares, The Milk Factory - 2,9 hectares, etc.). Due to their favorable position, they are the main subject of interest for real estate samsars who want to demolish them and build new buildings.

The field study found that preferred departments for landowners and building owners, to obtain direct, faster benefits from the regeneration process, are:

- building shopping centers (The Brewery);
- bussiness centers (”Alfa” Furniture Factory);
- new rezidential building (Înfrățirea Plant, Furniture Factory);
- large commercial spaces, belonging to retailers with recent large investments on the Romanian market (Înfrățirea Plant - Kaufland, Penny, Furniture Factory-LIDL);
- developing tourist (Milk Factory) or social (Oradea’s Slaughterhouse) accomodation;
- it is worth mentioning the transformation of industrial spaces into functional urban spaces (Moara Răsărit Mill, ”1 Mai” Fur Factory).

Table 1. Sites grouped according to their existing state

Demolished	Reconstructed	In degradation	Functional
Alumina Plant	Alfa Mobila S.A	Miorița S. A.	Plastor
Spirit and Yeast factory	Sinteza, Calea Borșului	Crișul and Arta	CET I
CET II	Milk Factory	”1 Mai” Fur Factory - Rovex	UAMT
Oil Factory	Înfrățirea Plant	Mechanical and Spare Parts Plant	Solidaritatea Shoe Factory
Emilia Mill	Furniture Factory	Avântul Cannery	State-owned polygraphic enterprise
Oradea Greenhouses	Brick Factory	The Asbestos Factory	Chair Factory
S.C Cominca S.R.L	Brewery	Electrometal	
Adria Mill	The Garment Company Oradinum	Sugar Factory	
	S.C Drum Nou	The Industrial Parts and Installations Plant	
	Moara Răsărit Mill	Sinteza Paint Factory, Calea Clujului	
	Metalica S.A		
	The Slaughterhouse		
	ChimProd		
TOTAL: 37 studied industrial platforms			
8	**13**	**10**	**6**

From the point of view of the emplacement, these sites have been grouped as such (table 2):

- located in the central area - a number of 12 industrial sites have been identified in the area between C.F.R. Trainstation, Dacia street, Decebal, P-ța 22 Decembrie, Bistriței street, Seleușului street, Averescu street, Olteniei street;

- located in the pericentral zone 2 - this area is covered between Aleea Salca, Armatei Române street, Aluminei street, Dacia, Italiană street, Ștefan cel Mare street, Izvorului street, Calea Clujului, Grădinarilor street and Nufărului street, being identified 16 former industrial platforms;

- sites in area 3 and 4 - perimeter - area where 9 sites were identified.

In Oradea, most of the industrial premises that have not been demolished have been abandoned, left in a major state of deterioration due to the indifference of both owners of industrial sites and local authorities. In the last century, especially during the communist period, there was a major expansion of the city from the urban point of view, the industrial areas, which at one point were in the city's outskirts, are currently located in the immediate vicinity of the city center being integrated in residential quarters.

Table 2. Sites grouped according to their emplcement

	Site	Existing buildings on site	Total (Site and existing buildings)	%
Located in central area	2	10	12	32,44
Located in the pericentral area	3	13	16	43,25
Located at the perimeter	3	6	9	24,31
TOTAL	8	29	37	100

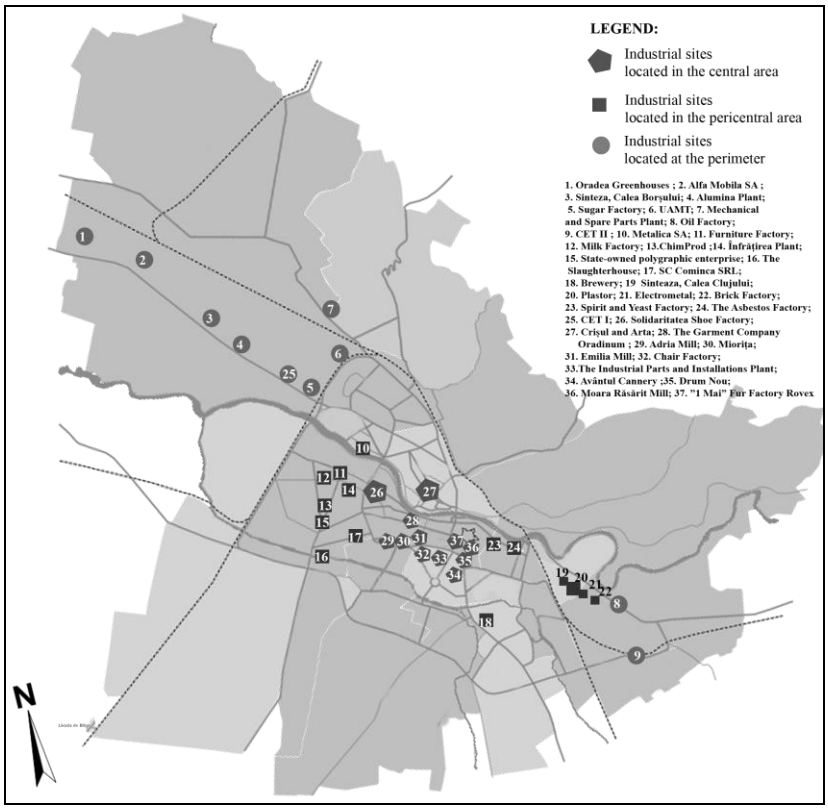

Figure 1. Location of the studied industrial sites

The former industrial areas are an important point in the development of a city due to the extensive surfaces on which they are built (i.e. Înfrățirea Plant - 28 hectares, The spirts and yeast Factory - 3,2 hectares, CET II - 144 hectares, Alumina Plant - 70 hectares, The Brewery - 7,2 hectares, Sinteza - 17 hectares, The Milk Factory - 2,9 hectares, etc.). Due to their favorable position, they are the main subject of interest for real estate samsars who want to demolish them and build new buildings.

Historically and architecturaly-value speaking, we grouped these sites, primarily after the historical period in which they were built, namely:

- built at the end of the 19th century and the beginning of the 20th century, a period in which the city placed on Crișul Repede shores has its place of manifestation, architects of a remarkable value and architectural styles very close to Central and Western Europe: Moara Răsăritul Mill, 1857 (figure 2); Emilia Mill, 1884 - unfortunately it was not figureured as a historical monument, now demolished (figure 3); The Brewery, Oradea, 1896; Adria Mill, 1890 (figure 4); „1 Mai" Fur Factory, buildings from 1870; Oil Factory, 1940; Solidaritatea Shoe Factory, Oradea, 1923 (National Archives; Hochhauser, 2010).

- buildings built after 1948, generally industrial halls with large openings and openings, not necessarily respecting a certain architectural style. They have generally been subject to real estate transactions after being bankrupt and subsequently demolished (Barna, 2015) (table 3).

Table 3. Sites grouped according to their historical period of construction

	No. sites
Built at the end of the 19th century-begining of the 20th century	27
Built after 1948	10
Total	**37**

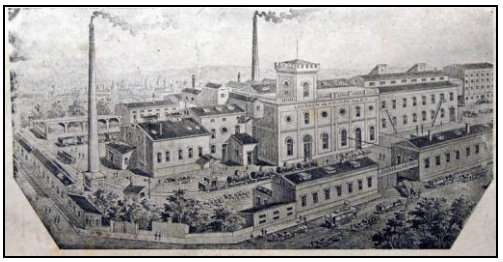

Figure 2. Moara Răsărit Mill
Source: Hochhauser, 2010, p. 189

Figure 3. Emilia Mill [1]

Figure 4. "Adria" Mill
Sursa: Hochhauser, 2010, p. 189

Figure 5. The demolition of a building of Înfrățirea Plant, 2015
Photo source: personal archive

[1] *http://arheologie-industriala.blogspot.ro/2014/02/oradea-sos-moara-emilia.html*

For the reintegration of these former industrial platforms, integrated urban regeneration projects need to be carried out under the strict supervision of local authorities, as different landowners act independently depending on their own interests or do not have the necessary financial resources for the regeneration / conversion of the buildings or land. (Alumina Plant, Înfrățirea Plant (figure 5), Metalica, Sinteza, Spirit and Yeast Factory).

These former industrial sites should be reintegrated into the urban context of the city, both the local authorities and citiziens should show interest in this happening in the mere future. Unfortunately, the high costs of regenerating the sites, constructing laws, depolluting the soil (in some cases) and the lack of involment of local authorities have been a set back for the owners of the sites in order to redevelop (Herman et al., 2014a), demolishing the buildings or leaving them on the verge of destruction is a recurring reality in Oradea.

CONCLUSIONS

Former industrial platforms are a major cultural potential that has not yet been harnessed to its full potential. Unfortunately, however, the status of these areas is uncertain due to the lack of accurate information.

At present, there are a significant number of such sites in Oradea. After the study in the office - maps, history from the point of view of urban development of Oradea, and field study- the current situation of the industrial platforms, 37 sites being identified. Thus, the development of the areas where these sites are located, some being rebuilt (the Milk Factory, The Brewery, Înfrățirea Plant, etc.), some being abandoned and left in a state of major degradation (Avântul Cannery) from which a major number (a total of 28) are located in the central and pericentral area of the city.

REFERENCES

Arhivele Naționale - Direcția Județeană Bihor, *Fabrica de blănuri 1 Mai Oradea [National Archives - Bihor County Directorate, Fur Factory 1 May Oradea]*, Fond 945;

Arhivele Naționale - Direcția Județeană Bihor, *Întreprinderea Bere, Spirt, Drojdie [National Archives - Bihor County Direction, Beer Company, Spirits, Yeast]*, Fond 175;

Arhivele Naționale - Direcția Județeană Bihor, *Întreprinderea de blănărie 1 Mai, Oradea [National Archives - Bihor County Direction, Fur Enterprise 1 May, Oradea]*, Fond nr 1-5;

Arhivele Naționale - Direcția Județeană Bihor, *Uzina Înfrățirea Oradea, Firma Frații Grundwald [National Archives – Bihor County Directorate, Înfrățirea Factory Oradea, Grundwald Brothers Company]*, Fond 101;

Arhivele Naționale - *Direcția Județeană Bihor, Uzina Înfrățirea Oradea, 1952-1954 [National Archives - Bihor County Directorate, Înfrățirea Factory Oradea, 1952-1954]*, Fond nr 112;

Barna M. (2014), *Industrializare și demografie în centrele urbane ale Crișanei (1960-1980) [Industrialization and demography in Crișana's urban centers (1960-1980)]*, Editura Universității din Oradea.

Borcea L., Gorun Gh. (1965), *Istoria Orașului Oradea [History of Oradea],* Edit. Cogito.

Cervera Pascual G. (2013), *La renovación urbana y su régimen jurídico [Urban renewal and its legal regime],* Editorial Reus.

Couch C. (1990), *Urban renewal: Theory and practice*. Basingstoke, Macmillan Education.

Herman G. V., Baias S., Măduța F. (2016a), *Aspects Regarding the Brownfields from Oradea City, Bihor County, Romania*, pp. 25 - 39, in Brownfields, friches urbaines et recompositions territoriales La durabilité en question, Olivier Dehoorne, Huhua Cao, Dorina Ilies, PUAG – Publibook.

Herman G. V., Ilieș D. C., Baias Ș., Măduța M. F., Ilieș A., Wendt J., Josan, I. (2016b), *The tourist map, scientific tool that supports the exploration of protected areas, Bihor County, Romania*, GeoSport for Society, 4(1), 24-32.

Herman G. V., Ilieș D. C., Măduța M. F., Ilieș A., Gozner M., Buhaș R., Mihok-Geczi I-M-T. (2016c), *Approaches regarding the importance of Natura 2000 sites' settings pupil's education through geography*. *Case study: Valea Rose (Red Valley) Natura 2000, Bihor country, Romania*, Journal of Geography, Politics and Society, 6(4): 57–62.

Hochhauser R. (2010), *O contribuție la o istorie a industriei de fabrică la Oradea în perioada 1848-1948 [Acontribution to a history of the factory industry in Oradea during 1848-1948]*, Muzeul Țării Crișului.

Ilieș D. C., Baias S., Buhaș R., Ilieș A., Herman G. V., Gaceu O., Dumbravă R., Măduța F. (2017), *Environmental education in protected areas. Case study from Bihor County, Romania,* GeoJournal of Tourism and Geosites, 19(1): 126-132.

Ilieș D. C., Herman G. V., Dehoorne O., Măduța F. (2013), *The role and the importance of cyclotourism in the development of the Oradea Metropolitan Area (Romania),* GeoJournal of Tourism and Geosites, 12(2): 101-110.

Ministerul Dezvoltării Regionale și Administrației Publice. Direcția Generală Dezvoltare Regională și Infrastructură,

Metodologie de intervenție privind regenerarea urbană pentru anumite tipuri de teritorii [Methodology on Urban generation for Certain Types of Territories], http://www.dezvoltareurbanaintegrata.ro/ghiduri-si metodologii, accesed at 02.10.2016.

Monitorul Oficial Nr. 13 bis din 21 ianuarie 1991 [Official Gazette Nr. 13 bis of 21 January 1991], http://www.monitoruljuridic.ro/monitorul-oficial/13-bis/1991-01-21/, accesed at 15.12.2017.

Nae M. (2015), *Regenarea și reconversia teritoriilor [Regeneration and conversion of territories]*, Editura Universitară București, https://issuu.com/intermaster/docs/4.-nae- regenerarea_reconversia, accesed at 02.02.2018;

Programul Operațional Sectorial pentru Dezvoltarea Resurselor Umane 2007 – 2013, Axa prioritară 2 "Corelarea învățării pe tot parcursul vieții cu piața muncii" Domeniul major de intervenţie 2.3 "Acces și participare la formare profesională continuă" [Sectoral Operational Program Human Resources Development 2007 - 2013 Priority Axis 2 "Correlation of Lifelong Learning with the Labor Market" Key Area of Intervention 2.3 "Access to and Participation in Continuing Vocational Training"], http://www.regenerareurbana.ro, accesed at 31.05.2018

Roberts P., Skyes H. (2000), *Urban regeneration*, A handbook, SAGE.

http://arheologie-industriala.blogspot.ro/2014/02/oradea-sos-moara-emilia.html accesed at 19.02.2018.

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ANALYSIS OF THE DISTRIBUTION PATTERN AND ACCESSIBILITY OF STUDENTS TO SECONDARY EDUCATIONAL FACILITIES IN LOKOJA, KOGI STATE, NIGERIA

Musilimu Adeyinka ADETUNJI*
Geography Department, Faculty of Arts & Social Sciences, Federal University Lokoja, Kogi State, Nigeria,
e-mail: maadetunji@yahoo.com, musilimuadetunji@yahoo.com

Oluwole ALOBA
Geography Department, Faculty of Social Sciences, Obafemi Awolowo University, Ile –Ife, Nigeria,
e-mail: oaloba48@gmail.com

Abstract: This study assesses the pattern of distribution and accessibility of students to secondary education in Lokoja metropolis. Both primary and secondary data were utilized for the research. The coordinates of locations of public and private schools were obtained using a hand held Geographical Position System (GPS). The average distance of the nearest public school to each identified important places in Lokoja was measured using the 'Ruler' menu of ArcGIS 10.3.1 software. Two sets of questionnaire were structured to elicit information from sampled population. The first was directed at parents with students in secondary schools, while the second focuses on students' journey to schools. A total of three hundred questionnaires were administered to sampled secondary schools in the study area. Descriptive and inferential statistics were used to analyse the research. The findings reveal that 66.7% and 8% of public secondary schools are located along the major roads in the high and low density areas of Lokoja respectively. The pattern of distribution of secondary schools is cluster rather than random. Approximately 47.2% of students in public secondary schools travel more than 4kms to schools in Lokoja. 51.8% of parents qualify education rather than distance was the determinant factor in placing their wards in secondary schools in Lokoja. The study concludes that public secondary school should be provided in some localities that do not have so as to reduce long distance trip to educational facilities. Also Quality delivery of secondary education must be properly monitored by the government at affordable price.

Key words: Schools, Transport, Location, Secondary and Planning

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INTRODUCTION

Education has been described as the bed rock of national development (Ukaoha, 2010). Thus, education at the secondary school has offer been given prime place in national budgets (Central Bank of Nigeria statistical Bulletin and information, 2013, p. 82; Hinchliffe, 2002, p. 8). It is at the secondary school that the basic foundation of the various disciplines which the students

* Corresponding Author

will acquire later in tertiary institutions. Secondary schools are therefore important trip generators in any economy in the world (Owoeye and Yara, 2011, p. 173; Goeverden and Boer, 2013, p.73; Ipingbemi and Aiworo, 2013, p. 77; Easton and Ferrari, 2015, p. 15). It is particularly interesting to note that in the last three decades or so, the average commuting distance of secondary school pupils has increased tremendously. According to the Department for Transport (2013 as cited in Easton and Ferrari, 2015, p. 9), the average distance travelled by students of between 11 and 16 years in the United Kingdom in the mid-1980s was 2 miles. This figure rose to 3.7 miles in 2013. Studies on journey to school in both US and Sweden have shown that distance from home to school is a major factor affecting modal choice of students (Mcdonald, 2008, p. 28; Johanson et al., 2012, p. 212).

Studies have equally shown that long distance commuting to school arose from the fact that locations of schools were not based on population distribution but rather on community participation (Omoyemi, 1978 as cited in Owoeye and Yara, 2011, p.170). The work of Orebiyi (1981) in Oyi Local government area of Kwara State (Okun speaking areas of present Kogi State) affirmed that unplanned locations of secondary schools have limited the establishment of secondary schools to few areas. Tanimowo (1995; see Owoeye and Yara, 2011, p.171) have argued that pupils living near the few schools together with their parents enjoyed minimum travelling distance to education institutions while some other members of the population travel lower considerable distances to reach their schools. In another study done in Europe for example, factors like high rate of urbanization and decentralization have led to more dispersed children population in urban centres (Hoare, 1975 as cited in Easton and Ferrari, 2015, p. 9). But according to Goeverden and Boer (2013, pp. 73-74) and Parsons, Chalkley and Jones (2000, p. 33) it was the opportunity given to parents to choose secondary schools for their wards that increased the travel distance to schools. The resultant effect of long distance commuting to schools is high dependency on automobile (cars, school buses, taxi, motorcycles and tricycles) with serious environmental challenges such as high traffic congestion, fatigue and traffic crashes on urban routes as well as transport related diseases such as asthma and difficult breathing (Ipingbemi and Aiworo, 2013, p. 77; Easton and Ferrari, 2015, p. 9). On the other hand short distance commuting to school will encourage walking and increased physical activity that can promote good health among school children (Dieleman et al., 2002; Kallio et al., 2016, p. 1; Newman and Kenworthy, 2006, p. 36; Kim, 2014, p. 2).

Few studies on secondary school trips in Nigeria focus on distance travelled and mode choice to school (Ogunyemi et al., 2014, p. 5; Ipingbemi and Aiworo, 2013, p. 80). Even then most of these studies are not adequate for any meaningful sustainable transportation planning for secondary education in Nigeria. In addition parental contribution to the placement of their wards to secondary schools were lacking in earlier studies. For instance, a number of employed parents will place their wards in strategically located schools with a view to accompany them to school in the morning (Parsons et al., 2000, p. 33). Thus, parents who drive to work are likely to choose a school located on their way to work (Cross, 1998; DSG, 2001 as cited from Scottish Executive Central Research Unit, 2012, p.4). Some other studies identified the role of gender and safety in journey to school by pupils. In England, the Department of transport (2014; p. 7) has observed that more women than men take their children to school in order to avoid road accidents and other social ills. This study therefore aims to examine pattern of distribution of Secondary Schools and determine the principal factors considered by parents in their choice of secondary schools for their wards in Lokoja, north central, Nigeria.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

There are no theories that explain the spatial distribution of Secondary Schools and patterns of journey to them in the literature. However one of the theories that explain some of the principal factors affecting patterns of trips in urban environment is Residential Location Model (RLM). Naess (2000, pp. 2-3) used Residential Location Model to explain land-use, transportation and socio economic characteristics of urban commuters. The model states that inner-city residents are expected to make shorter trips than persons living in the sub urban areas (low density areas). Naess

(2000, p. 3) was of the opinion that a high proportion of destinations are easily reached by walking / cycling by inner city dwellers. Thus, residents located close to the city centre are expected to move over short distances to central facilities such as cultural institutions, restaurants, entertainment, specialized stores and Schools.

The Residential Location Model can be used to explain that population or Students who live at the inner parts of cities where schools are located are expected to travel short distances rely more on walking or cycling for journey to Schools. On the other hand, those students living at the outskirts or low density areas of the city are expected to commute long distances to School. Studies at the global level have shown that students who live in the low density parts of cities travel long distances and rely on motorised transport than students living in inner cities who walked to schools (McDonald, 2008, p. 30; Ipingbemi and Aiworo, 2013, p. 80). Modal split model (MSM) also provides another useful explanation of travel behaviour with regard to choice of travel mode. According to this model, different modes of urban transport are available and open to trip makers. These include cars, buses, taxis, trains, tricycles and walking. The choice of any of these modes by an urban commuter is influenced by such factors as trip length, trip purpose, socio-economic characteristics of the trip maker (income, age, automobile ownership, and residential density), route length, modal availability and modal affordability (Ipingbemi and Aiworo, 2013, p. 80; Olawole and Olapoju, 2016, p. 150; Okonko, 2001, p. 236). Of all the modes, walking is the most environmental friendly while other are not particularly when commuting over short distances. A parent's decision of whether or not to allow their ward to walk to school unaccompanied by senior members of the families is a perception of the child's reliability and distance travelled to School. Alparone et al., (2003, p. 437) developed a Traffic Danger Perception Scale (TDPS) and Social Danger perception (SDPS) to measure parent concerns about these risks. According to these models, the less a parent perceives the neighbourhood to be safe and environmental friendly, the less likely the child is to be allowed to move about independently. The risk perception of parents to allow their wards to walk in heavy traffic where there is poor design of urban road networks, characterised by poor design of pedestrian walkways, absence of pedestrian crossing and traffic warden as observed in in many cities of the world (Adetunji, 2014, p. 24; Christie et al., 2007, p. 394; Sangowawa et al., 2012, p.3 2) may discourage children from walking to and from school and rely more on automobiles. Other environmental factors perceived by parents that might affect mode choice of their wards to schools are weather and crime rate in cities (Kim, 2014, p. 41).

THE STUDY AREA

Lokoja metropolis is the study area. The city is located on latitude 7º45'27.56" - 7º51' 04.34" N and longitude 6º41' 55.64" - 6º45' 36.58" E of the equator on the confluence of Rivers Niger and Benue (see figure 1). The city comprises of seven major localities namely, Adankolo, Lokongoma, Felele, Zango Daji, Army Barrack and Ganaja (NPC, 2006). These localities are parts of three local government areas of Kogi State, Lokoja, Ajaokuta and Adavi local governments areas.

Shortly after Lokoja became the state capital of Kogi State in 1991, the city witnessed influx of people from all over the country. This led to the growth and rapid development of the city. Smaller settlements like Ganaja, Army Barrack and Zango Daji have now former parts now referred to as Greater Lokoja thus become a major city in North Central Nigeria (Olawepo, 2009, p. 78).

The strategic location of Lokoja as a gate way between the northern and southern parts of the Nigeria has acted as a catalyst to it's globally status. Historically Lokoja was the first administrative and commercial capital of Nigeria. The first primary school in Northern Nigeria was established there in 1865 (Usman, 2013). The city also houses the Saint Clement Seminary which was the first secondary school established by Roman Catholic Missionary (RCM) in 1963 at Adankolo area in Lokoja metropolis. Similarly, the Crowther Memorial College was established in 1964 in Lokoja by Anglican Missionary Society (CMS). Government Science Secondary School was established in 1976 at Zone 8 area (Kogi State Ministry of Education, 2017). In 1979, three more additional Secondary Schools were established in Lokoja metropolis namely Bishop Delisle

College, Moslem Community Secondary School and Institute of Arabic and Islamic Studies. These schools are located at Lokoja core area of Lokongoma and Lokoja core area respectively. Pupils living in areas without secondary schools had to travel to parts of the city with schools named above. However, the spatial structure of the educational facilities changed soon after Lokoja became a state capital in 1991. The population of Lokoja increased from 47, 447 in 1991 to 139,061 by 2006. In 2011, Lokoja population is estimated at 222,842 (National Population Commission, 2016). The new political status saw the establishment of 19 new private Secondary Schools have been in Lokoja (Kogi State Ministry of Education, 2017). Today virtually all communities in the city have atleast one Secondary School. Yet it has been observed that many students still can cross the city landscape travelling long distances in order to access educational facilities located outside their wards. It is on this background that this study was designed to examine the pattern of distribution of Secondary Schools and the reasons why some parents prefer to send their wards to Secondary Schools outside their immediate neighbourhoods in Lokoja metropolis.

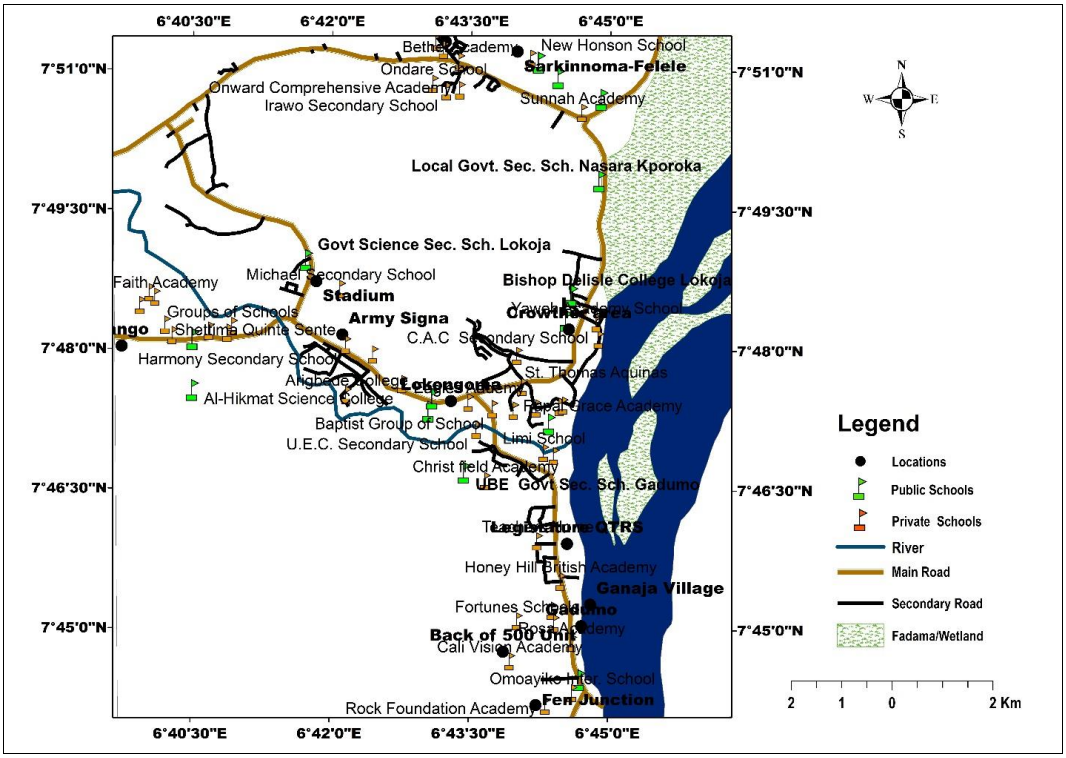

Figure 1. Map of Lokoja

MATERIALS AND METHODS

Three sets of data were required for this type of research. The first category of data concerned the location and distribution pattern of both public and private and Secondary Schools in Lokoja. The second category of data focused on where the students live, location of the schools attended, and the distance travelled to such schools. The third category of data gathers information on the socio-economic characteristic of parents with children in Secondary Schools in the study area. Data were also obtained on factors influencing the decision of parents to send their wards to particular schools.

The data used for the study included an administrative map of Lokoja made available by Kogi State Ministry of Education, Lokoja. Other data were the coordinates of (i) important

locations in Lokoja (ii) Public Schools and Private Schools in the city, using a hand held Geographical Position System (GPS). These coordinates were subsequently plotted to produce point maps using the UTM, Zone 31, Minna datum coordinate system. The point maps produced were overlaid on the scanned administrative map which was used to produce (i) Map showing the locations of Public Schools in Lokoja (ii) Map showing the locations of Private Schools in Lokoja. Furthermore, the average distance of the nearest Public School to each of the important places in Lokoja was measured using the 'Ruler' menu of ArcGIS 10.3.1. Furthermore average nearest neighbourhood analysis was performed for the point data using the Spatial Statistics toolbox of ArcGis 10.3.1 software.

A structured questionnaire divided into two sections was administered on the field. The first section was on the opinions of parents with students in Secondary Schools, while the second section focused on travel behaviour of Students captured by the survey. The total number of existing registered Secondary Schools in Lokoja metropolis were 62. Ten percent (10%) of these registered schools were selected for questionnaire administration. In all, a total of 6 Secondary Schools with the largest number of student were purposefully selected. They include three Public and three Private Secondary schools. In each of the School sampled, averages of 50 students were randomly selected across junior and Senior Secondary schools (JSS 1- 3 and SSS 1-3). The questionnaire was administered to the students with the assistance of the Principal of each Secondary School. Based on the study by Krejcie and Morgan (1970, p. 608), an average of three hundred questionnaires were administered to Secondary Schools in the study area.

RESULTS AND DISCUSSION

The findings revealed that there are 12 Public Senior Secondary Schools and 6 Junior Public Secondary Schools in Lokoja metropolis. Table 1 indicates that an approximately 66.7% of these Public Secondary Schools are located along the major roads in the high density parts of Kabawa, Kporoka, Seriki Noma, and karaworo. Further analysis revealed that 25% of public Secondary Schools are located at the medium density areas of Lokoja. Some of these Public Secondary Schools are the Muslim Community Secondary School at Phase II and Army Day Secondary School along Muritala Muhammed road. Table 1 shows that only one Public Secondary School; Government Science Secondary School is located in the low density part of Lokoja along Zone 8 road (see figure 2). The high concentration of Public Secondary Schools in the inner parts of Lokoja has led to long distance travel to schools by students and parents who live in low density parts of the city. The high rate of urbanization of Lokoja metropolis since 1990s has led to high rate of student enrolment in all Public Secondary Schools in the city. The Kogi State government has registered and gave licenses to more than twenty (20) Private Secondary Schools in Lokoja to cater for the educational needs of the growing population of Secondary School pupils in the city. Again the distribution of these Private Secondary School is skewed towards the medium density areas of Lokoja where land is available. Table 1 indicates that more than 45% of the Private Secondary Schools in Lokoja are located in the medium density areas of Ganaja-Ajaokuta road, Muritala Muhammed road, and Lokongoma Phase 1 and 11 roads (see figure 3).

Table 1. Distribution Patterns of Secondary Schools in Lokoja
Source: Author's Field Survey, 2017

Density Areas	Public Secondary schools No	%	Private Secondary Schools		Total Number of Secondary Schools	
High Density	8	66.7	13	27,1	21	35.0
Medium Density	3	25.0	25	52.1	28	46.7
Low Density	1	8.3	10	20.8	11	18.3
Total	12	100.0	48	100.0	60	100.0

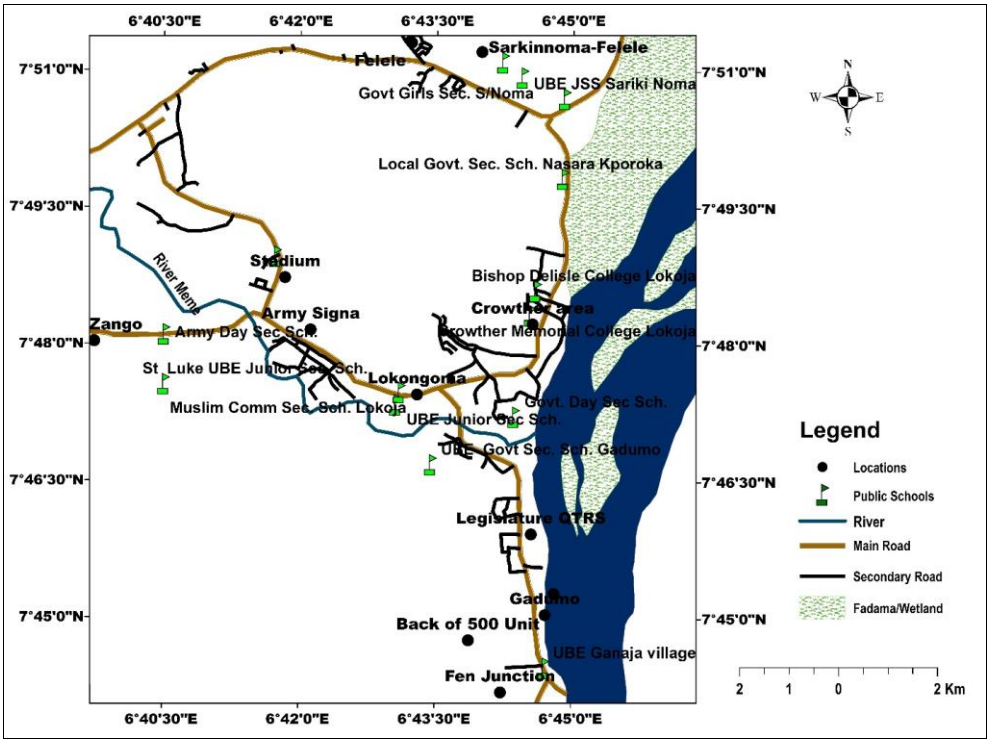

Figure 2. Public Secondary Schools in Lokoja

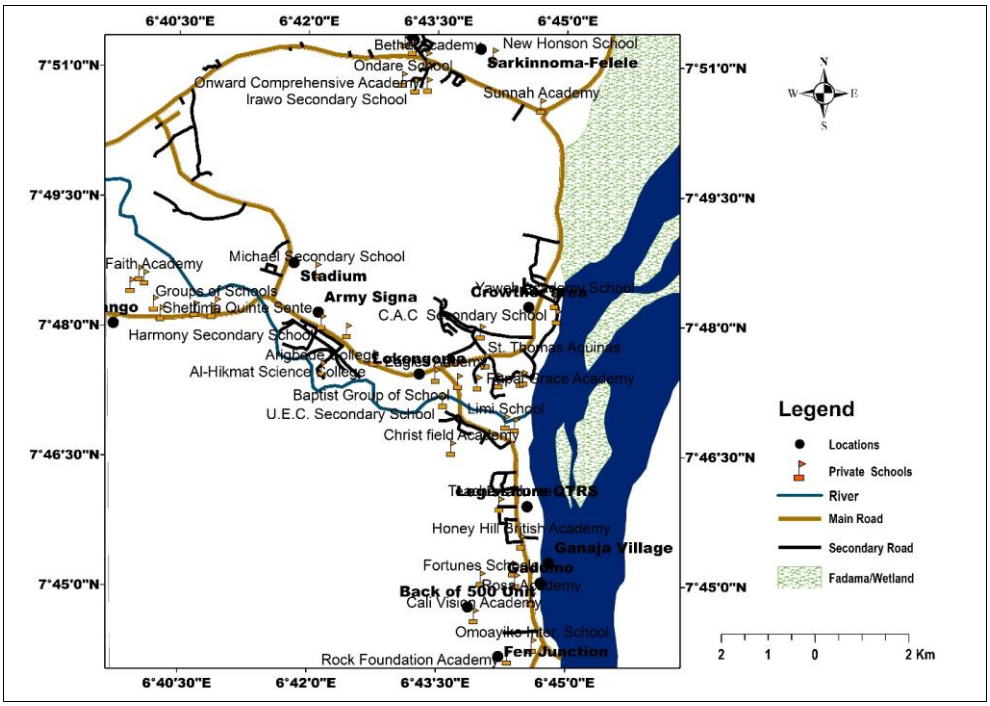

Figure 3. Private Secondary Schools in Lokoja

When disaggregated, the number of Secondary Schools located in each locality varies tremendously in Lokoja metropolis. Table 2 reveals that before the creation of Kogi State in 1991 there were only Six Public Secondary Schools and two Private Secondary Schools in Lokoja metropolis. Two of the Public Secondary Schools are located in kabawa and Seriki Noma areas which constitute part of the core of Lokoja. It is note-worthy that neither public nor private secondary schools are found in Felele and Zango Daji which are two major communities in the metropolis. This implies that residents where those facilities are lacking will therefore travel considerable distances for Secondary education in the city.

Table 2 further indicates that one public and one private Secondary School were established between 1992 and 1996 in the study area. Shortly after Lokoja became the capital of Kogi State in 1991, the built up area of Lokoja was estimated to have increased from 2,800.72 hectares in 1986 to 38, 393.10 hectares in 2001, which represents about 92.7% increase. But by 2006, the built up area has increased astronomically to about 47,909.04 hectares, which represents 48.4% increase within a period of 10 years (Adeoye 2012, p. 46). This rapid expansion of the built up area of Lokoja which has been attributed to mass movement of people from the neighbouring communities and other states of the Federation also saw a corresponding population between 1991and 2006 (Adeoye, 2012, p. 46). For instance, the population jumped from 47, 447 to 139,061 on 2006. The population of the city however doubled between 2006 and 2016 to an estimated population of about 392, 242 (NPC, 2016). The resultant effects of these changes in population is the constrains on the utilization of some basic facilities such as hospitals and educational facilities. This has subsequently necessitated the establishment of more Schools in the city. Thus twelve (12) public Secondary Schools were established in quick succession after Lokoja became the capital of Kogi State in 1991 to meet the demands for secondary education in the city. The emergency of more private secondary schools in the city was to compliment the state efforts at making education more accessible to the growing population. For instance, according to table 2 only 2 Private Secondary Schools were established before 1991. However, between 1992 and 2011, additional 19 Private Secondary Schools were established in the city while 26 Private Secondary Schools were established between 2012 and 2016.

Table 2. Pattern of Distribution of Secondary Schools in Lokoja Metropolis from 1991 to 2016
Source: Author's Field Survey, 2017

Locality	Before 1991			1992-1996			1997-2001			2002-2006			2007-2011			2012-2016		
	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total	Public	Private	Total
Lokoja (Kabawa Seraki Noma Karaworo)	2	2	4	1	0	1	0	0	0	1	0	1	0	5	5	3	7	10
Adankolo	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Lokongoma	1	0	1	0	1	1	0	1	1	1	3	4	0	3	3	0	3	3
Felele	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	1	2	3
Zango Dagi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Army Barrack	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
Ganaja	0	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0	5	5
Total	6	2	8	1	2	3	0	3	3	2	5	7	0	11	11	4	26	30

The accessibility of students to secondary education within workable distance is a crucial factor in order to achieve a just fair and equitable spread of socio-economic amenities in any geographical area (Orebiyi, 1981 as cited in Owoeye and Yara, 2011, p. 170; Kim, 2014, p. 31; Ogunyemi et al., 2014, p. 5). The mean distance travel to Public secondary schools by residents in 12 different locations in Lokoja metropolis is 1.18 km. This ranged from 0.18 km in Crowther area

to 2.50 kms in Legislature Quarters which are located in the low density areas of Lokoja metropolis. Table 3 reveals that residents who live at Crowther, Seriki Noma and Lokogoma areas are expected to travel less than 0.5 km. Students in these neighbourhoods have Public Secondary Schools close their residence.

Table 3. Average distance travel by Residents from Twelve Different Locations to the Nearest Public Secondary School
Source: Author's Field Survey, 2017

Name of the Locations	Distance to Nearest Public Sch. (Km)	Nearest Public Sec School
Stadium	0.46	Govt. Sci Sec. Sch. Lokoja
Fen Junction	1.10	UBE, Ganaja village
Crowther area	0.18	Crowder Memorial College Lokoja
Sarkinnoma-Felele	0.47	St Peter UBE Felele Along Express Rd
Felele	1.9	St Peter UBE Felele Along Express Rd
Lokongoma	0.36	Muslim Community Sec. Sch. Lokoja
Legislature QTRS	2.50	UBE Government t Sec Gadumo
Back of 500 Unit	1.60	UBE, Ganaja village
Ganaja Village	1.5	UBE, Ganaja village
Army Signal	1.70	Govt. Sci Sec. Sch. Lokoja
Zango	1.42	Army Day Sec. School
Gbadumo	1.07	UBE Ganaja Village
Total	14.26	
Average Distance Travel	1.18	

Despite the provision of a minimum of either one public or one private secondary school in each locality in Lokoja metropolis, it is interesting to note that distance travel to Secondary Schools by students in Lokoja varies from one locality to another. An examination of the distance travelled by students to different types of Secondary Schools in the study area indicates that 29.2% of private secondary school students travelled for less than 2 kms. Another 44.9% of Private Secondary School students travelled between 2 km and 4 kms. An approximately 25.9% of these students travelled more than 4 kms to Schools, whereas 47.2 % of the Public Secondary School students travelled for more than 4 kms (table 4).

Table 4. Distance travel to different types of Secondary Schools in Lokoja metropolis
Source: Author's Field Survey, 2017

		Type of school attended by your children				Total	
		Private secondary school		Public secondary school			
		No	%	No	%	No	%
Distance from your house to school	Less than 2 km	43	29.2	25	23.6	68	26.9
	2-4 km	66	44.9	31	29.2	97	38.3
	More than 4 km	38	25.9	50	47.2	88	34.8
Total		147	100.0	106	100.0	253	100.0

Several reasons have been attributed for the long distance commuting in order to have access to Secondary Education by students in the study area. For instance, table 5 reveals that 51.8% of the sampled parents claimed that they enrolled their wards in Secondary Schools which according to their own assessment provide good education in spite of the location of such schools in Lokoja metropolis. The affordability of School fees (19.6%) was ranked second and as one of the major determinant factors for choice of schools by parents. In this study, those parents who ranked place of residence high in their choice of schools for their wards accounts for only 13% in the study area. Only 4.98% considered religion before placing their pupils in schools of their choice in Lokoja.

Table 5. Reasons given by parent on schools attended by their wards
Source: Author's Field Survey, 2017

Different Reasons given by the Parents	Frequency	Percentage
Nearest to School	39	12.96
Good Standard Education	156	51.83
Religion affinity	15	4.98
The school fees are affordable	59	19.60
The school is owned by the State Government	32	10.63
Total	301	100.0

The decision of parents to accompany their wards to school depend on a number of variables (Age of Student, F=7.395, p<.0.01; Class of Student, F= 1. 40, p<. 24). Those variable vary across the residential areas of Lokoja (table 6). Although, safety appears a crucial factor in overall for choice of schools by parents for their wards in order to achieve sustainable transport to schools. Many Secondary Schools in Lokoja are located on major but dangerous roads in Lokoja. For instance, many of these roads have neither pedestrian walk-ways nor traffic wardens to escort the children across the roads. Studies have shown that children less than 13 years can hardly predict the speed of on-coming vehicles before crossing the highway which invariably puts them at risk of being hit by vehicles (Goeverden and Boer, 2013, p. 73). The Department of Transport in Great Britain had observed that 2,412 children were killed or seriously injured in a road accident before their 16th birthday – that's an average of 7 children every day (DTGB, 2011).

Table 6. Parent Decision on escorting their wards to Secondary Schools in Lokoja
Source: Author's Field Computation

		Sum of Squares	Df	Mean Square	F	Sig.
Average age of student	Between Groups	25.236	1	25.236	7.395	.007
	Within Groups	788.249	231	3.412		
	Total	813.485	232			
Class of the student	Between Groups	.869	1	.869	1.396	.238
	Within Groups	151.834	244	.622		
	Total	152.703	245			

Mode choice to school is another important factor that affects the accessibility of students to Secondary Schools in any geographical area. Table 7 reveals that 29.9% of Secondary School students walk to school in Lokoja every day. Kim (2014, p. 35) has reported very similar findings with respect to Secondary School pupils in some developed countries where 12-17% of the students are engaged in active commuting to school. These categories of students are healthier than those who go to school in automobiles (Goeverden and Boer, 2013, p. 73; Centres for Disease Control and Prevention, 2012 as cited in Kim, 2014, p. 2; Kallio et al., 2016, p. 1; Newman and Kenworthy, 2006, p. 36). Further analysis reveals that 12.8% of the Secondary School students rely on School buses for their journey to school. Another 16.6% and 17.1% of the students rely on tricycle and motorcycles respectively. A significant proportion (23.7%) of Secondary School students rely on car trips to school (table 7). The choice of automobile by a large population indicates that many students live far away from their schools in Lokoja.

In order to determine the Pattern of distribution of Secondary Schools in Lokoja metropolis, Nearest neighbour analysis was employed to determine the distance between one Secondary School and another in Lokoja metropolis and compare the expected value from a random sample of points (Complete Spatial Randomness). In an attempt to determine the Null hypothesis of complete spatial randomness pattern of Secondary Schools, the Z –statistic was employed. A negative Z score indicates clustering; a positive score indicates evenness (Diggle, 1990). Figure 4

reveals that the mean nearest distance of public Secondary Schools is computed at 1280 metres, while the expected mean distance is 1816.5 metres. The computed Z- value is Z= -2.113202, with P- value of (0.03). This implies that a cluster rather than randomness pattern of distribution of Public Secondary Schools exist in Lokoja metropolis. Similar pattern occurred for Private Secondary Schools in Lokoja (figure 5).

Table 7. Mode of choice to school in Lokoja
Source: Author's Field Survey, 2017

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Walk	63	23.1	29.9	29.9
	School bus	27	9.9	12.8	42.7
	Tricycle	35	12.8	16.6	59.2
	Motor cycle	36	13.2	17.1	76.3
	Car	50	18.3	23.7	100.0
	Total	211	77.3	100.0	
Missing	System	62	22.7		
Total		273	100.0		

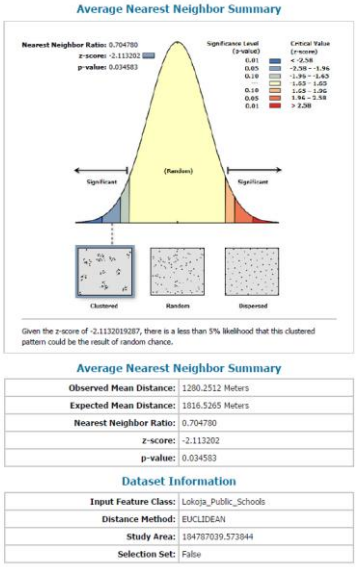

Figure 4. Nearest Neighbour of the Distribution Pattern of Public Secondary Schools in Lokoja

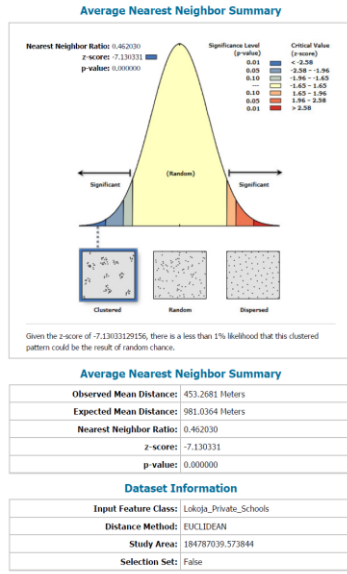

Figure 5. Nearest Neighbour of the Distribution Pattern of Private Secondary Schools in Lokoja

CONCLUSION AND PLANNING IMPLICATIONS OF THE STUDY

This study has assessed the pattern of distribution and accessibility of children to Secondary Education in Lokoja metropolis in Kogi State, Nigeria. The study utilized both primary and secondary data. Using both descriptive and inferential statistics, the findings reveal that Secondary Schools are not evenly distributed in the study area. More Public Secondary Schools are found in few places especially in high densities areas or core Lokoja, Lokongoma and Army signal areas. The study further reveals that between 1992 and 2011, more than 19 Private Secondary Schools

were established in the city while 26 Private Secondary Schools were also established between 2012 and 2016. Some of these Schools were clustered along the major roads in the city where pedestrian walk-ways and traffic wardens to assist the children to cross the roads are not provided thus putting the pupils at risk of road accident. Approximately 47.2 % of public secondary school students travelled for more than 4 kms to school. 51.8% of the parents claimed that they enrolled their wards in Secondary Schools that provide good education in spite their locations in Lokoja metropolis. Affordability of School fees was ranked second for choice of Schools for their children. The decision of the parents to accompany their wards to schools depend on (Age of Student, $F=7.395$, $p<.0.01$; Class of Student, $F= 1.40$, $p<.24$) and this varies across the residential areas of Lokoja. The study concludes that more Public Secondary Schools should be provided where there are none particularly at Zango Daaji and Ganaja areas. The standard of Secondary Education should be monitored and solely controled by the government. The study also recommends that pedestrian walk-ways should be provided along the urban routes so as to encourage students to walk to schools. All these may likely reduce long distance trips to Secondary Schools.

REFERENCES

Adeoye N. O. (2012), *Spatio-Temporal Analysis of Land Use/Cover Change of Lokoja: A A Confluence Town*, Journal of Geography and Geology, 4(4): 40 -51.

Adetunji M.A. (2014), *Maintenance of Urban Roads Infrastructure in a Medium Sized City in North Central Nigeria*. Romanian Review of Social Sciences (RRSS), 7: 23-3, The Publication of the Faculty of Social and Administrative Sciences, Nicolae Titulescu University, Bucharest, Romania.

Alparone F. R., Prezza M., Tucci F., De Ruosi A. M. (2003), *Crescere in citta. Come i genitori percepiscono il rischio e l'insicurezza urbana per i bambini*. Sentirsi in/sicuri in citta, 129-160.

Central Bank of Nigeria statistical Bulletin and information (2013), http://www.nigeria.gov.ng, accessed at 08.10.2017.

Centres for Disease Control and Prevention (2012), *Physical activity and the health of young people*. Available from Internet: http://www.cdc.gov/obesity/data/childhood.html

Christie N., Ward H., Kimberlee R., Towner E., Sleney J. (2007), *Understanding high traffic injury risks for children in low socioeconomic areas: a qualitative study of parents' views*, Injury Prevention, 13(6), 394-397.

Cross T., Thornthwaite S. (1998), *Travel patterns of young people*. Final report for DTLR.

Department for Transport (2013), *National Travel Survey: England 2013*, Statistical Release Department for Transport, London.

Department of Transport Great Britain (DTGB, 2011), *Child deaths from road traffic accidents.* http://www. makingthelink.net/child-deaths-road-traffic-accidents, accessed at 10.10.2017.

Department of Transportation England (2014), *National Travel Survey 2014: Travel to School*, https://www.gov.uk/government/uploads/system/uploads/.../travel-to-school.pdf, accessed at 02.04.2017.

Dieleman F. M., Dijst M., Burghouwt G. (2002), *Urban form and travel Behaviour: Micro-level household attributes and residential context*. Urban studies, 391: 507-527.

Diggle Peter J. (1990), *A Point Process Modelling Approach to Raised Incidence of a Rare Phenomenon in the Vicinity of a Prespecified Point*. Journal of the Royal Statistical Society A, 153(3): 349-362.

Easton S., Ferrari E. (2015), *Children's travel to school-the interaction of individual, neighbourhood and school factors*, Transport Policy, 44: 9-18.

Goeverden C. D. V., Boer E. D. (2013), *School travel behaviour in the Netherlands and Flanders*, Transport Policy, 26: 73-84.

Hinchliffe H. (2002), *Public Expenditures on Education in Nigeria: Issues, Estimates and some Implications*, WorldBank, Group, Africa Region Human Development Working Paper Series, 1-44, http://www.siteresources.worldbank.org/AFRICAEXT/Resources/no_29.pdf, accessed at 12.10.2017.

Hoare R. A. (1975), *The location efficiency of secondary schools*. Institute of British Geographers, Transport Group.

Ipingbemi O., Aiworo A. B. (2013), *Journey to school, safety and security of school children in Benin City*. Transportation Research Part F, 19: 77-84.

Johanson K., Laflamme L., Hasselberg M. (2012), *Active commuting to and from school among Swedish children-a nation and region study*. European Journal of Public Health, 22: 209-214.

Kallio J., Turpeinen S., Hakonen H., Tammelin T. (2016), *Active commuting to school in Finland, the potential for physical activity increase in different seasons*, International journal of circumpolar health, 75(1).

Kim C. (2014), *The Journey to School: A case study at Mission Hill School. Spain*, A thesis submitted in partial fulfilment of the requirements for the degree of Master of Arts in Urban Environmental Policy and Planning, Tufts University.

Kogi State Ministry of Education (2017), *Unpublished Data of the List of Registered Secondary Schools in Lokoja metropolis.*

Krejcie V. R., Morgan D. W. (1970), *Determining Sample Size for Research Activities*, Educational and Psychological Measurement, 30: 607-610.

MCdonald N. C. (2008), *Children's mode choice for secondary school trip: The role of distance and school location in walking to school*. Transportation, 35: 23-35.

Naess P. (2000), *Residential location and transport in a Small Danish Town-a contribution to the discussion on the influence of land use on travel behaviour*. Paper for the seminar: Transport and tourism in sociology and geography in Roskilde, November 2, 2000. Aalborg University, Fibigerstraede 11, Dk-9220 Aalborg, Denmark, pp. 1-19.

National Population Commission (2006), *National Population Census of the Federal Republic of Nigeria, http://www.google.com/search?client=firefox-*, accessed 10.04.2017.

National Population Commission (2016), Estimated *population of Lokoja from 1991-2016. Data obtained from NPC Head Office, Lokoja*.

Newman P. K. J. (2006), *Urban design to reduce automobile dependence. Opolis,* Int. J. suburban Metropolitan Studies, 2: 35-52.

Ogunyemi K. H., Muibi K. H., Eguaroje O. E., Fabiyi O. O., Halilu A. S. (2014), *A geospatial approach to evaluation of accessibility to secondary education institution in Ogun State, Nigeria,* 7th IGRSM, International Remote Sensing & GIS Conference and Exhibition. IOP Conference Series: Earth and Environmental Science, 20:1-13.

Okonko E. (2001), *Quantitative Techniques in Urban Analysis*. Ibadan Kraft Book Limited, Nigeria.

Olawepo R. A. (2009), *Evaluating Housing Problems through Participatory Rural Appraisal in Lokoja, Nigeria*, African Research Review, 3(1): 77-96.

Olawole M.O., Olapoju, O.M (2016), M*ode choice of undergraduates: A case study of lecture trips in Nigeria,* Indonesian Journal of Geography 48 (2):145-156

Omoyemi Y. O. (1978), *School map for the rationalisation of secondary education in Ondo State*, Unpublished Dissertation, University of Ibadan, Nigeria.

Orebiyi A. K. (1981), *The locational cost implication of secondary education in Oyi Local Government Area of Kwara State of Nigeria*, Unpublished Doctoral Dissertation, University of Ibadan, Nigeria.

Owoeye J. S., Yara P. O. (2011), *School location and academic achievement of secondary school in Ekiti State, Nigeria*, Asian Social Science, 7 (5): 170-175.

Parsons E., Chalkley B., Jones A. (2000), *Schools catchments and pupils movements: a case study in parental choice*, Education Studies, 26: 33-48.

Sangowawa A. O., Adebiyi A. O., Faseru B., Popoola O. J. (2012), *An observational study of road safety around selected primary schools in Ibadan Municipality, Oyo State, Southwestern Nigeria,* Annals of African Medicine, 11(1):32-35.

Scottish Executive Central Research Unit (2002), *Review of research on school travel*. Final Report, DHC.

SDG (2001), *Factors leading to increase school journey length*. Steer Dvis Gleave Final report and literature review for DTLR, http://www. ceadserv1.nku.edu/longa//geomed/ppa/doc/NNA/NNA.htm

Tanimowo N. B. (1995), A*n analysis of school location, school facilities and school efficiency Unpublished M.Ed. Dissertation*, University of Ibadan, Nigeria.

Ukaoha A. (2010), *Sound Education, bedrock of national development*, http://www.vanguardngr.com, /2010/11/sound-education-bedrock-of-national-development-says-prof-ukaoha, accessed at 01.09.2017.

Usman A. B. (2013), *Nigeria: North's First Primary School Suffers Neglect. Daily Trust*, 5th January, http://www. allafrica.com/stories/201301060075.html, accessed at 11. 01.2017.

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EFFECTS OF MICROCLIMATE ON FISH PRODUCTION IN ILORIN WEST LOCAL GOVERNMENT AREA, NIGERIA

Rhoda Moji OLANREWAJU*
Department of Geography and Environmental Management, University of Ilorin, Ilorin, Nigeria
e-mail: rodamoji@gmail.com

Tayo WORINDE
Department of Geography and Environmental Management, University of Ilorin, Ilorin, Nigeria
e-mail: ptayour@gmail.com

Godwin Peter AKPAN
Department of Geography, Kebbi State College of Basic and Advanced Studies, Yauri, Nigeria
e-mail: godisgood885@gmail.com

Abstract : The study examined the effects of microclimate on fish production in Ilorin West local government area. The study was conducted to determine fish responses to its microclimate on daily basis at different seasons of the year and also to determine the quality of water for pond fish culture. Experimental research of earthen pond was set up at Atiku Road located in Adewole Housing Estate area for a period of two years which spanned between 2014-2015. Temperature of the pond water was recorded at different depth intervals of 30 cm, 60 cm, 90 cm and 120 cm respectively. The pond water was sampled and analyzed for ammonia, nitrate content, dissolved oxygen, Biochemical Oxygen Demand (BOD), suspended solids, pH, electrical conductivity and turbidity level to determine its chemical properties and reveal the quality of water using standard laboratory methods. The amount of feed consumed was measured on monthly basis. The rate at which fish gained weight was also noted. Both descriptive and inferential analysis of correlation and regression were carried out to find out the strength of relationships between fish weight, feed and temperature. The temperature of the depth of pond water that is most critical for fish production using earthen pond was determined. The study revealed that the average temperature of the water ranges between 26.83 °C and 29.96 °C. The month of January recorded the lowest temperature of 26.83 °C, while the highest of 29.96 °C occurred in the month of February, thus giving the range of over 3 °C per annum. The results also showed that fish does not cluster at 30 cm depth which has the lowest temperature but between the depth interval of 60 cm and 90 cm throughout the seasons.

Key words: Microclimate, Fish Production, Temperature, Ammonia, PH,

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* Corresponding Author

INTRODUCTION

Fish farming has enormous potentials of improving the nutritional standard of the masses. The average protein intake in Nigeria is about 19.38 grams/head/day which is far below the Food and Agriculture organization (FAO) requirement of 75 g/head/day (FAO, 1995). Fish contains higher percentage of protein than meat and is important for its high nutritive value and significance in improving human health. The microclimate of fish is an important determinant factor in fish production. Arvil (1967) asserted that everything originated in water, everything is sustained by water.

Water quality is determined by various physico-chemical and biological factors (), as they may directly or indirectly affect its quality and consequently its suitability for the distribution and production of fish and other aquatic animals (Moses, 1992). The status of water bodies after receiving various kinds of pollutants alters its quality and its characteristics physically, chemically and biologically. All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits has adverse effects on their body functions (Davenport, 1993; Kiran, 2010).

Therefore, the role of various factors within the micro environment of fish such as temperature, transparency, turbidity, water colour, carbon dioxide, pH, alkalinity, hardness, ammonia, nitrite, nitrate, primary productivity, biochemical oxygen demand (BOD), plankton population etc. cannot be over emphasized for maintaining a healthy aquatic environment and for efficient fish production. Thus the proper management of these environmental factors becomes imperative for the survival and optimum fish growth and yield. This study attempts to investigate the responses of fish to the microclimate of pond and how it affects its growth and development.

THE STUDY AREA

The experimental site is located in Adewole, along Atiku drive Ilorin west local government area of Kwara state (figure 1). Ilorin city is located between latitude 80 24'N and 80 36' North of the equator and between longitudes 4 10'E and 4 36' East of the Greenwish meridian (Oyegun, 1983). The city has an approximate area of 150 sq.km and by 1991 census, a population of about 512,026, which has grown over the years to 847,582 (NPC, 2006), thus making a lot of demand on fish production.

Ilorin has a humid tropical climate which is characterized by wet and dry seasons. The temperature of Ilorin ranges between 33 °C to 34 °C between November and January while from February to April, the value ranges between 34 °C to 37 °C . The mean monthly temperatures are usually very high varying from 25 °C to 28.9 °C. Rainfall in Ilorin is controlled by two surface opposing winds of the moist south west monsoon wind and the dry northeast continental winds, it exhibits great variability both temporally and spatially. The total annual rainfall in the area is about 1,200 mm (Olaniran, 2002). Relative humidity in Ilorin during the wet season is between 75% and 80%, while in the dry season it is about 65% (Tinuoye, 1990). The period of dry season is characterized by a long sunshine hours of between 6.5 - 7.7 hours daily from the month of November to May (Olaniran, 1983; Jimoh, 2008). However, during the rainy season sunshine reduces drastically most especially during the month of August break (July-August) to 3 - 4 hours daily. This kind of climate support fish farming. However, most fish ponds suffer flooding during the period of high and prolonged rainfall.

The vegetation of the area is situated in the guinea savanna belt of Nigeria; this vegetation type is characterized by scattered trees and grasses which are mostly common in the transitional zone of deciduous forest of the south and dry savanna grassland of the north.

The climate of the study area exhibits a definite wet season and a marked dry season in response to the pressure pattern resulting in the seasonal shift of pressure belts associated with apparent mark of the overhead sun and also in response to the Inter tropical Discontinuity between the moist south west monsoon wind and the dry North east continental wind. Mean monthly temperature rises between 29.2 °C in the month of July to 37 °C during the month of March (Areola, 2007; Olanrewaju, 2010).

The city is drained mainly by River Asa and its tributaries namely; Rivers Aluko, Alalubosa, Okun, Osere, Agba, and Atikeke (Jimoh and Iroye, 2009), and this gives the whole drainage basins a dendritic pattern. These rivers are highly seasonal in flow and the flood plains of these rivers are used for fish farming in Ilorin.

The dominant occupation of the people in Ilorin is mainly civil servant and traders. Majority of government ministries can be found within the city. Residents of the city also engaged in primary occupations such as farming (cultivating crops such as maize, vegetables and fishing), bakery and blacksmithing. The occupation of the indigenous people are farming and trading.

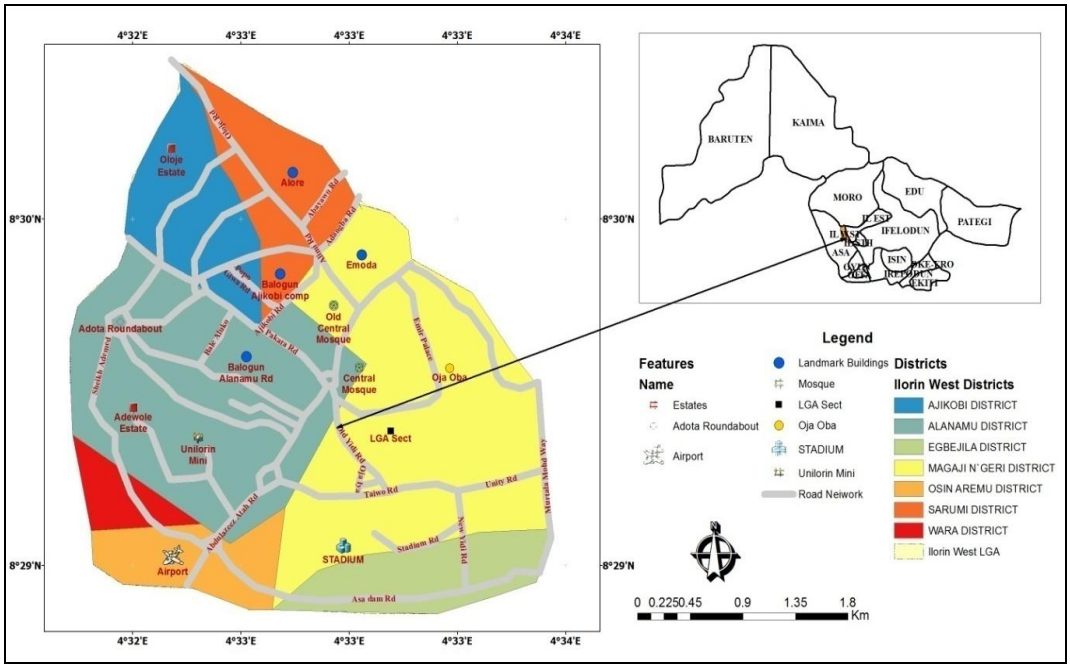

Figure 1. Map of Ilorin West LGA of Kwara State
Source: Digitized from Google Earth Pro. (2015)

MATERIALS AND METHODS

Data used in this study were primary in nature. The primary source of data were water temperature for four varying depth intervals (°C), the physico-chemical properties of the ponds, weight of fish as they grow from fingerlings to table size and weight of feed consumed. The sample of the pond was collected with a clean container to prevent contamination. The sampling was done midstream by dipping the sampling container at approximately 20 - 30 cm below the water surface. Daily water temperature at different depth intervals of the ponds were grouped on monthly basis to correspond with the monthly weight gained by fish. The parameters were calculated, grouped and summarized using descriptive statistics of mean to produce a quantitative summary which were tabulated. Other data were gathered from already existing and published works such as text book, government reports, journals, news, internet and website.

RESULTS AND DISCUSSION

PATTERNS OF VARIATION IN WATER TEMPERATURE

Highest temperature was mostly observed in the evening. Increase in temperature with depth experienced might not be unconnected with the fact that water react sluggishly at absorbing and emitting of radiant energy (figure 2). Heat gain during the afternoon is retained and this keeps

the water body warmest mostly in the evening and also causes temperature increase with depth. Pond water temperature decreases at the depth of 120 cm because the convectional distribution of heat is no longer active at this depth. Figure 2 shows the mean temperature of pond water at all depths considered.

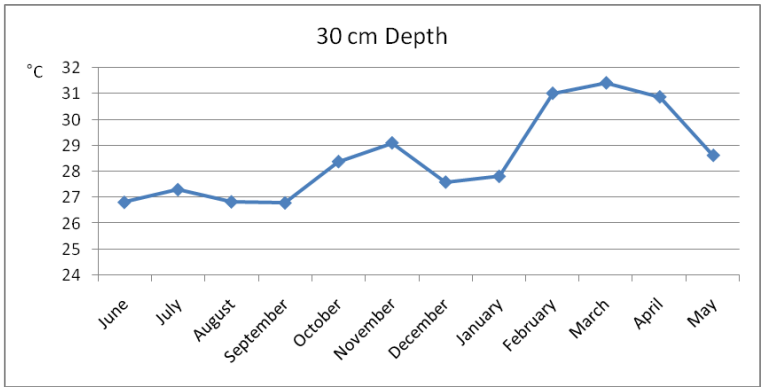

Figure 2. Average Temperature of Pond Water
Source: Field Survey, 2015

The average temperature of the water ranges between 26.83 and 29.96 °C. The month of January recorded the lowest temperature of 26.83 °C, while the highest 29.96 °C occurred in the month of February, thus giving us a range of over 3 °C per annum. This finding makes the pond water considered suitable for fish production because it is in broad agreement with the conclusion of Santhosh and Singh (2007) which put the temperature of suitable water for production of fish at between 24 °C and 30 °C. The range of 26.83 °C and 29.96 °C is subsumed within the range of Santhosh and Singh (2007) threshold values.

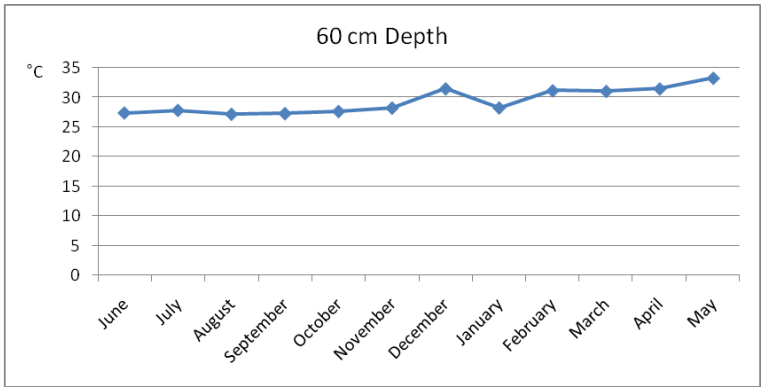

Figure 3. Average Temperature of Pond Water at 30 cm Depth
Source: Author's Field Survey, 2015

The pattern of mean monthly temperature at 60 cm depth is quite steady between the month of June and October. These are the month of rainy season, though, there was no much rain during this period but air temperature was not too high and this must have been responsible for the consistent low water temperature reported. However, this trend was interrupted with a sudden rise in water temperature in December. The highest mean monthly temperature was recorded in the month of May. This might be linked with slight metabolic activities of fishes.

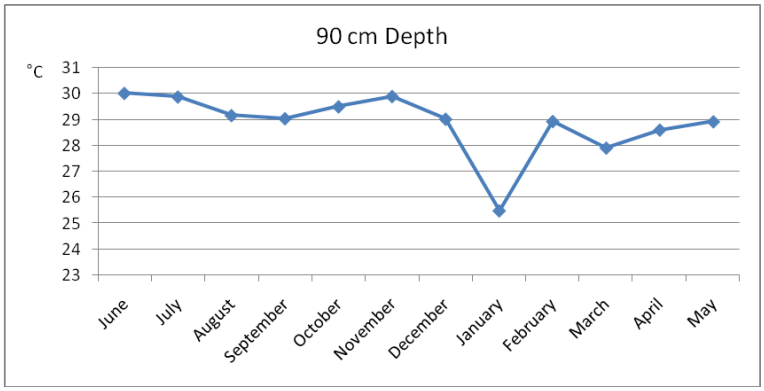

Figure 4. Average Temperature of Pond Water at 60 cm Depth.
Source: Author's Field Survey, 2015

The trend of temperature pattern at this depth assumed a concave shape between July and October and a convex shape between October and December. The implication is that there was a decline in water temperature at the depth of 90cm between the period of July through October and inverse is the case during October and December.

The month of January recorded the least temperature while the month of February exhibited the highest temperature. The pattern of temperature variation observed at this depth resemble that at 90 cm depth, the only difference is that here temperature of the water is lower. It is not surprising since fishes hardly cluster at this depth. Generally, water temperature was higher between February and May at all depths considered. This coincides with the months of dry season when the area used to experience heat wave. The sudden fall of temperature observed during the month of January could be associated with harmattan wind (among other factors) which reaches its peak during this month.

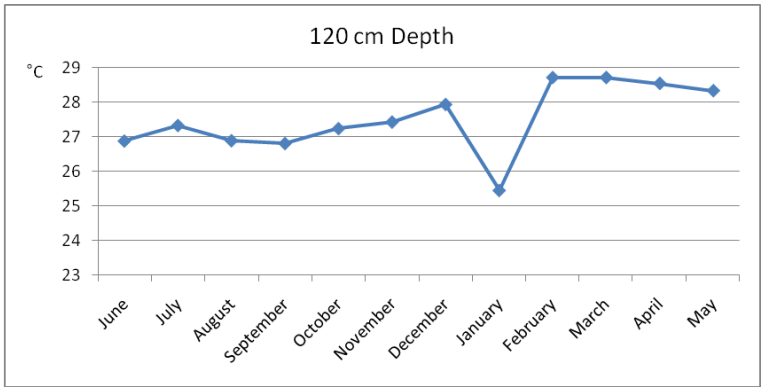

Figure 6. Average Temperature of Pond Water at 120 cm Depth
Source: Author's Field Survey, 2015

CONCLUSION AND RECOMMENDATIONS

Fish is an important source of animal protein for many households. Food and Agriculture Organization (FAO, 2007), opines that fish contributes more than 60 % of the world supply of protein especially in the developing countries such as Nigeria. The role of various factors within the micro environment of fish development and growth are very vital in the process of fish production. The study revealed that the average temperature of the water ranges between 26.83 °C

and 29.96 °C, the month of January recorded the lowest temperature of 26.83 °C, while the highest of 29.96 °C occurred in the month of February, thus giving the range of over 3 °C per annum.

The implication of the findings is that the untapped potentials for fishing production must be optimally harness to step down the loss of foreign exchange and as such provide employment for many along the fish value chain, which will contribute to poverty reduction and ultimately foster sustainable economic development in Nigeria.

Once the level of inputs and waste produced are greater then what the pond can contain, water quality starts to deteriorate and the ponds carrying capacity is reached, hence productivity declines. However, in order to prevent this situation, fish should be stocked based on the pond carrying capacity for the specific pond management.

Static water should be maintained during the course of production and when the water quality begins to deteriorate, it should be changed to avoid mortality or diseases.

REFERENCES

Areola F. O. (2007), *Fish marketing and export potentials of fish and fisheries products of Nigeria*, In Educative and Informative Aquacultural workshop and Aqua-Exhibitions, Lagos, 23rd Feb (Vol. 32).

Arvil R. (1967), *Man and Environment*, Penguin, Harmondsworth.

Davenport Y. (1993), *Responses of the Blenniuspholisto fluctuating salinities*, Marine Ecology Progress Series, 1, pp 101 - 107.

Jimoh H. I., Iroye K. A. (2009), *Managing high runoff discharge in the urbanized basins of Asa river catchment area of Ilorin, Nigeria*, Environmental Research Journal, 3(2), 25-34.

Jimoh, H. I. (2008). *Drainage problems in a tropical environment: Perspectives on urban quality management*, Journal of human ecology, 23(4), 325-329.

Kiran B. R. (2010), *Physico-chemical characteristics of fish ponds of Bhadra project at Karnataka*, RASĀYAN Journal of Chemistry, 3(4), pp 671-676.

Moses B.S. (1992), *Introduction to Tropical Fisheries*, Ibadan University Press.

National Population Commission (2006), *Population and Housing Census of the Federal Republic of Nigeria*: Priority Tables.Value 1. Abuja: National Population Commission.

Olaniran O. J. (2002), *Anomalies in Nigeria: The contemporary understanding*, 55th Inaugural Lecture University Press, University of Ilorin, Ilorin, Nigeria.

Olaniran, O. J. (1983), *The monsoon factor and the seasonality of rainfall distribution in Nigeria*, Malaysian Journal of Tropical Geography, (7), 38-45.

Olanrewaju R. M. (2010), *The Effect of Climate on Yam Production in Kwara State, Nigeria, Environmental Issues* 3(1): 30-34.

Oyegun R. O. (1983), *Water Resources in Kwara State Nigeria*, Matanmi and sons printing and publishing company ltd, Ilorin, Nigeria.

Santhosh B., Singh N. P. (2007), *Guidelines for water quality management for fish culture in Tripura*, ICAR Research Complex for NEH Region, Tripura Center, Publication no. 29.

Tinuoye A. (1990), *Climatic condition in dry and wet years at Ilorin*, Unpublished B. SC dissertation, Department of Geography University of Ilorin, Nigeria.

*** (1995), *FAO,Yearbook Production*, Rome: FAO. p. 45.

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TOURISM AND LOCAL DEVELOPMENT. STUDY CASE: BĂILE FELIX-BĂILE 1 MAI TOURISM SYSTEM, BIHOR COUNTY, ROMANIA

Grigore Vasile HERMAN*
University of Oradea, Department of Geography, Tourism and Teritorial Planning, University St., 410087, Oradea, Romania, e-mail: grigoreherman@yahoo.com

Daniel PEPTENATU
University of Bucharest, Faculty of Geography, 1, Nicolae Bălcescu Avenue, Bucharest, 1st district, 010041, Romania. Research Center for Integrated Analysis and Territorial Management, University of Bucharest, 4-12 Regina Elisabeta Avenue, 030018 Bucharest, Romania, e-mail: peptenatu@yahoo.fr

Vasile GRAMA
University of Oradea, Department of Geography, Tourism and Teritorial Planning, University St., 410087, Oradea, Romania, e-mail: vasile.grama2014@gmail.com

Radu-Daniel PINTILII
University of Bucharest, Faculty of Geography, 1, Nicolae Bălcescu Avenue, Bucharest, 1st district, 010041, Romania. Research Center for Integrated Analysis and Territorial Management, University of Bucharest, 4-12 Regina Elisabeta Avenue, 030018 Bucharest, Romania, e-mail: pinty_ro@yahoo.com

Abstract : The study presented has the purpose of highlighting the role and importance of tourism in the development of the local economy of the touristic system Băile Felix – Băile 1 Mai, Bihor County, Romania. This fact is concluded from the results of several analyses and corelations between the following factors : the numbers of companies, employees, fiscal value and recorded profit between the years 2000-2014.

Key words: tourism, local development, companies, employees, fiscal value

INTRODUCTION

One of the most dynamic economic sectors with durable development responsible for the local economy is tourism (Drăghici et al., 2015; Dumitru, 2007; Herman et al., 2017; Ilie et al., 2017). An important part of it is represented by curative and recreational tourism. Optimal conditions for the appearance and development of such activity have been met in the tourist system Băile Felix - Băile 1 Mai (Ilieș et al., 2011, 2013). A big role in this was played by the existence of

* Corresponding author

curative natural factors such as geothermal water, mud and the climate. Explored since older times (Borovic and Markovic, 2015), geothermal water is an important factor in touristic motivation, being a source of health and well being (Kapczynski and Szromek, 2008; Joppe, 2010; Kosic et al., 2011). Alike thermal water, the beneficial effects of therapeutic mud have been known and used from the oldest times (De Vos, 2010, Khiari, 2014). The mud used in the curative therapy is ”extracted from Băile 1 Mai, has the consistency of natural paste, care which was born from long geologic and biologic processes,from the mixture with water of organic and inorganic insoluble microparticles” (Munteanu et al., 1979, p. 43). ”Climate is one of the geophysical elements that make up geographical space, contributing to the environmental conditions that facilitate or hinder human settlement. People seek to settle in those spaces that offer the greatest comfort and possibilities of survival in terms of climate. Tourism, as a human activity, is also governed by these same imperatives. Therefore, climate is an important criterion for locating tourism centers, helping to determine how an area is to be used” (Martin, 2005, p. 573).

The local curative factors are beneficial ”for treating a wide range of health conditions: “inflammatory rheumatic disease rheumatoid arthritis, rheumatic diseases degenerative cervical, dorsal and lumbar spondylosis, polyarthroses; post-traumatic post-traumatic post-traumatic joint disorders, post-operative posture in joints, bones, fractures, sprains, sprains; central and peripheral hemiparesis neurological disorders at least 6 months after occurrence, parapareze at least 3 months after myelitis, after surgery on the marrow, after vertebral trauma, various paresis and paralysis; chronic gynecological chronic underlying conditions, minor puberty or menopause disorders; associated diseases metabolic and nutritional diseases, type II diabetes, endocrine diseases, gout with localized joints”, using the following procedures: ”diadinamic and interferential currents; magnetodiaflux; ultrasound; ultrasounds; ionization; aerosols; thermotherapy; therapeutic baths with thermal mineral water in bathtubs and pools; galvanic baths; underwater shower; manual segmental massage; physical therapy at the gym”. [1]

Based on this, the role of the study of the importance of tourism in the develpopment of economy is mandatory, for durable development of the Bihor society, the obtained results being used by public authorities, local population, tourist service providers, tour operators, tourists etc.

The local economy is tied to the concept of local development which also means the development of the society starting from what is specific to the area. They are defined, among others, by the natural setting, which had a big role in the shaping of the local socio-economic system (Pires et al., 2015; Bercu, 2015; Kisman and Tasar, 2014; Rogerson, 2015; Lu et al., 2016; Boccella et al., 2016).

[1] *http://www.tratamentbalnear.ro/baile-1-mai*

The touristic system Băile Felix - Băile 1 Mai is located in Sânmartin, Bihor County, ”in the west part of Romania, right near Romania’s state border with Hungary, at the contact between the morphological units of Tisa Plain (subunit of the Western Plain) with the Carpathian Mountains (The Occidental Carpathians), in the hydrographic basin of the Tisa River, tributary on the left of the Danube River” (Herman et al., 2017, p. 266 - 267) (figure 1).

Figure 1. Spațial location of the Felix - 1 Mai spa tourist system

”From the tourism point of view, the valorization of specific resources in this area dates back to the XV-XVII centuries when around the localities Băile 1 Mai and Băile Felix it began the exploitation for curative purposes of the mineral waters and vegetable slime extracted from the lake in the locality” (Herman et al., 2017, p. 267).

The appearance and development of tourism in the area of the touristic system Băile Felix – Băile 1 Mai, which ”includes all objects, processes and facts related to the tourist activity of Băile Felix, 1 Mai-Haieu, Sanmartin, Cordau and Rontau within its structure” was a slow process, of long continuance, whose evolution is far from being over (Herman and Tătar, 2015, p. 116). Sitting at the base of this evolutional process is a series of posivite aspects, that have to do with the natural and antropic setting. Thus, this is the context that the study imposes, having as purpose the highlighting of the relationship between specific aspects of curative and recreational tourism and the local economy.

WORK METHODOLOGY

To highlight the role tourism has in the development of the local economy, several bibliographic and field researches have been made, followed by analysis and corelations between the number of companies, employees, fiscal value and profit recorded between the years 2000-2014, regarding the touristic system of Băile Felix – Băile 1 Mai, Bihor County, Romania (Drăghici et al., 2015; Herman et al., 2017; Ilie et al., 2017; Pintilii et al. 2014; Stoian et al. 2014).

RESULTS AND DISCUSSIONS

Evolution of the number of companies, employees, fiscal value and profit, at the level of the tourism system Băile Felix - Băile 1 Mai, between 2000 and 2014, saw an upward trend (marked by some oscillations specific to 2010, 2012), each indicator analyzed, recording significant increases as follows: the number of companies increased from 177 firms in 2000 to 646 firms in 2014; the number of employees increased from 1711 employees in 2000 to 2375 employees in 2014; the fiscal value increased from RON 40 888 100 in 2000 to RON 430 247 981 in 2014; the profit increased from RON 1 335 795 in 2000 to RON 33 972 086 in 2014 (Figures 2, 3, 4 and 5). As for the comparisons between the obtained results, at the level of studied area and the results obtained in a similar study carried out at the Bihor County, one can observe the existence of similarities and differences at the same time (Herman et al., 2017).

The time analysis of the share of tourism in the analyzed indicators reveals the existence of some time fluctuations for each indicator. In 2000, the situation was: the number of companies (19% of services, 16% of the total); number of employees (69% of services, 59% of total); the fiscal value (39% of services, 33% of total); profit (58% of services, 43% of total) (Figures 2, 3, 4 and 5). In 2014, the situation was: the number of companies (16% of services, 13% of the total); number of employees (56% of services, 44% of total); the fiscal value (32% of services, 17% of total); profit (36% of services, 17% of total) (figures 2, 3, 4 and 5).

The analyzes of the comparative evolutions of the above-mentioned indicators, by sectors of activity, showed growth tendencies in all three sectors of activity during the analyzed period, thus, between 2000 and 2014, the number of primary sector companies increased by 525%, followed by those in the secondary sector (509%) and tertiary (340%), the number of employees in the primary sector increased by 589.4%, followed by those in the secondary sector (163.8%) and tertiary (128.5%), the fiscal value in the primary sector increased by 4301.9%, followed by those in the secondary sector (2056.5%) and tertiary (678.2%), the profit in the primary sector increased by 83906.9%, followed by the ones in the secondary sector (2763.4%) and tertiary (1614.4%) (figures 6, 7, 8 and 9).

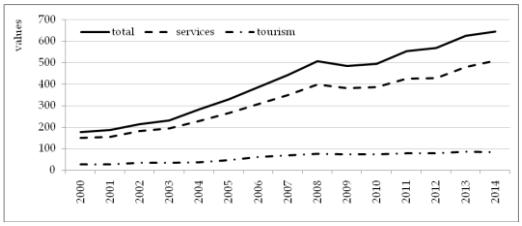

Figure 2. Touristic system Băile Felix – Băile 1 Mai correlation between the evolutions of number of companies in tourism, services and total number of firms between the years 2000-2014

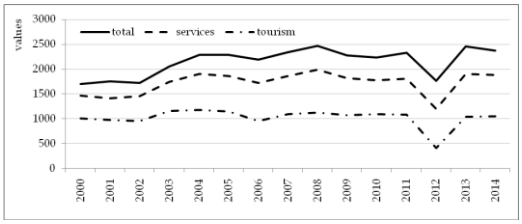

Figure 3. Correlation between the evolutions of the number of employees in tourism, services and the total number of employees between the years 2000-2014

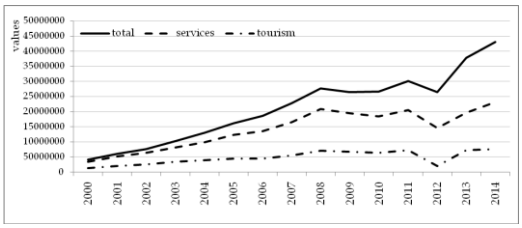

Figure 4. Correlation between the evolutions of turnover in tourism, services and the total turnover between the years 2000-2014

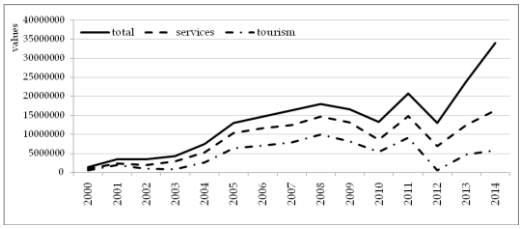

Figure 5. Correlation between the evolutions of profit in tourism, services and the total profit between the years 2000-2014

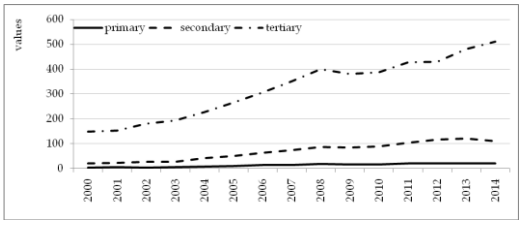

Figure 6. Correlation between the evolutions of the number of companies in primary, secondary and tertiary sectors between the years 2000-2014

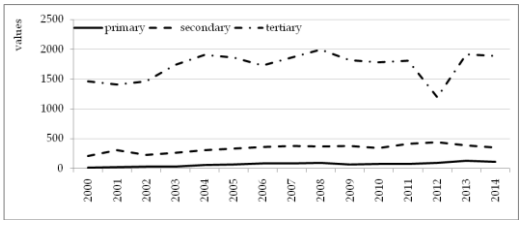

Figure 7. Correlation between the evolutions of the number of employees in primary, secondary and tertiary sectors between the years 2000-2014

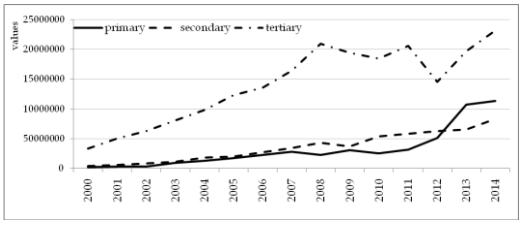

Figure 8. Correlation between the evolutions of the turnover in primary, secondary and tertiary sectors between the years 2000-2014

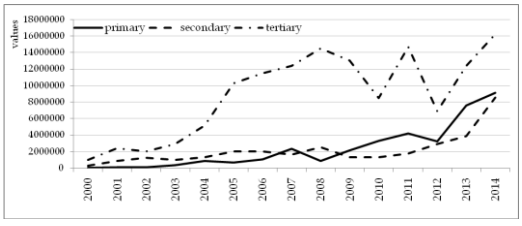

Figure 9. Correlation between the evolutions of profit in primary, secondary and tertiary sectors between the years 2000-2014

Nevertheless, from the analysis of the evolution of the weight of the number of companies, the number of employees, the fiscal value and the profits per sectors of activity, between 2000 and 2014, is remarkable the predominance of the share of those in the tertiary sector, followed by the secondary and the primary sector. For instance, in 2014, the activity by business sectors of the indicators analyzed was: the number of companies (primary sector 3%, secondary 18%, tertiary 79%); number of employees (primary sector 5%, secondary 15%, tertiary 80%); the fiscal value (primary sector 26%, secondary 20%, tertiary 54%); profit (primary sector 27%, secondary 25%, tertiary 48%) (figures 6, 7, 8 and 9).

CONCLUSIONS

The mutations happening on a social, economic and mental level of our society, characterized by a change of the existential values of people which led to the identification of new niches when it comes to local development. One of these niches, implying its structure and functionality, is tourism in general, curative and recreational ones especially. From a historic point of view, it has its roots even from previous centuries, today, we can notice somewhat of a refreshment of this activity, acknowledging its positive effects on the human body that is being affected by the exhausting rhytm of today's global society. In this context, we can highlight that the analysis and comparative correlations between the number of companies, employees, fiscal value and profit recorded, in time, on a local level, constitutes a prime indicator when it comes to the purpose of tourism in the development of the local economy specific to the touristic system Băile Felix – Băile 1 Mai.

To support this afirmation we have the conclusions of the study presented:

- the increasing number of companies, employees, fiscal value and profit, in the tourist system Băile Felix – Băile 1 Mai, between 2000 – 2014, has been ascending, (with some oscillations in the years 2010, 2012);

- from the study of number of companies, employees, fiscal value and profit in the touristic area we notice the existence of some oscillations in time for each indicator and the prevalence of the activities specific to tourism;

- the analysis of the comparative evolutions of the previous indicators, on activity sectors, have shown tendencies of increasement in all 3 activity sectors, in the time interval 2000-2014 ;

- the analysis of the evolution of the number of companies, employees, fiscal value and profit on activity sectors, between the years 2000-2014, highlight the dominance of the tertiary sector, followed by the secondary and primary ones.

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REFERENCES

Bercu A.-M. (2015), *The Sustainable Local Development in Romania - Key Issues for Heritage Sector*, Procedia - Social and Behavioral Sciences, 188, 144-150.

Boccella N., Salerno I. (2016), *Creative Economy, Cultural Industries and Local Development*, Procedia - Social and Behavioral Sciences, 223, 291-296.

Borović S., Marković I. (2015), *Utilization and tourism valorisation of geothermal waters in Croatia*, Renewable and Sustainable Energy Reviews, 44, 52-63.

De Vos P. (2010), *European materia medica in historical texts: longevity of a tradition and implications for future use*. J. Ethnopharmacol, 132, 28-47.

Draghici C. C., Pintilii R. D., Peptenatu D., Comanescu L. G., Sirodoev I. (2015), T*he Role of SPA Tourism in the Development of Local Economies from Romania*, Procedia Economics and finance, 23, 1573-1577.

Dumitru N. (2007), *Contribuţia turismului în procesul creşterii economice*, Revista de turism-studii si cercetari in turism, (3), 41-47.

Herman G. V., Deac A. L., Ciobotaru A. M., Andronache I. C., Loghin V., Ilie A. M. (2017), *The role of tourism in local economy development. Bihor County case study*, Urbanism. Arhitectura. Constructii [Urbanism Architecture Constructions], 8(3), 265.

Herman G. V., Tătar C. (2015), *Trends and prospects in the evolution and dynamics of the Felix-1 Mai Spas Tourist System*, Annals of the University of Oradea, Geography Series/Analele Universitatii din Oradea, Seria Geografie, 25(1).

Ilie A. M., Herman G. V., Ciobotaru A. M., Grecu A., Radu R. A., Visan M. C., Giurgia M. (2017), *The role of tourism in structural dynamics of the economic profile of Sighisoara city*. Urbanism. Arhitectura. Constructii [Urbanism Architecture Constructions], 8(4), 377.

Ilieş D. C., Herman G. V., Dehoorne O., Măduţa F., (2013), *The role of the importance of cyclotourism in the development of the Oradea Metropolitan area (Romania)*, GeoJournal of Tourism and Geosites, 12(2).

Ilieş D. C., Ilieş A., Herman G.V., Baias Ş., Morar C. (2011), *Geotourist map of the Băile Felix - Băile 1 Mai - Betfia area (Bihor County, Romania)*, GeoJournal of Tourism and Geosites, (8) 2: 219-226.

Joppe M. (2010), *One country's transformation to spa destination: the case of Canada*, J Hosp Tourism Manage, 17:117-26.

Kapczynski A., Szromek A.R. (2008), *Hypotheses concerning the development of Polish spas in the years 1949–2006*, Tourism Manage, 29:1035–1037.

Khiari I., Mefteh S., Sánchez-Espejo R., Cerezo P., Aguzzi C., López-Galindo A., Jamoussi F., Iborra C.V. (2014), *Study of traditional Tunisian medina clays used in therapeutic and cosmetic mud-packs*, Applied Clay Science, 101, 141-148.

Kisman Z. A., Tasar I. (2014), *The Key Elements of Local Development*, Procedia Economics and Finance, Volume 15, Pages 1689-1696.

Kosic K., Pivac T., Romelić J., Lazić L., Stojanović V. (2011), *Characteristics of thermal–mineral waters in Backa region (Vojvodina) and their exploitation in spa tourism*, Renewable and Sustainable Energy Reviews, Volume 15, Issue 1, January 2011, Pages 801-807.

Lu Y., Boudiffa M., Dall'Ara E., Bellantuono I., Viceconti M. (2016), *Development of a protocol to quantify local bone adaptation over space and time: Quantification of reproducibility*. Journal of Biomechanics, (49)10: 2095-2099.

Martín M.B.G. (2005), *Weather, climate and tourism a geographical perspective*, Annals of Tourism Research, (32)3: 571-591.

Munteanu L., Berindei I., Ludovic G. (1979), *Mic îndreptar turistic, Băile Felix – Băile 1 Mai*, Editura Sport-Turism, Bucureşti.

Peptenatu D., Drăghici C., Merciu C. (2012a), *Characteristics of entrepreneurial profile in some emergent territorial structures in Romania.* Actual Problems of Economics, 12(138): 448-458.

Peptenatu D., Pintilii R., Draghici C., Merciu C., Mateescu R. D. (2012b), *Management of Environment Risk within Emergency Territorial Systems, Case Study - the Influence Area of the Bucharest City*. Journal of Environmental Protection and Ecology, (13)4: 2360-2370.

Pintilii R.D., Braghina C., Draghici C.C., Saghin I. (2014), T*erritorial imbalances in the distribution of creative industries in the North EasternDevelopment Region*, Procedia Social and Behavioral Sciences, 122, 179-183.

Pires S.M., Fidélis T., Ramos T. B. (2014), *Measuring and comparing local sustainable development through common indicators: Constraints and achievements in practice*. Cities, 39, 1-9.

Rogerson C. M. (2015), *Local Economic Development*, In International Encyclopedia of the Social & Behavioral Sciences (Second Edition), edited by James D. Wright, Elsevier, Oxford, 2015, Pages 279-283.

Stoian D., Peptenatu D., Pintilii R. D. Schvab A. (2014), *Territorial distribution of creative poles in Romania*, Procedia Social and Behavioral Sciences, 122, 184-188.

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