



Impacts of Urbanization on Quality of Environment in Jammu Region

Shahnawaz Ahmad Dar¹, Tauseef Shaban¹, Mohd Sajad Dar² and Ramesh Bharadwaj³

¹Department of History, Jiwaji University Gwalior (Madhya Pradesh), India

²Department of History, Rani Durgavati Vishwavidyalaya (M.P.), India

³Department of History, Govt. PG College Datia (Madhya Pradesh), India

(Corresponding author: Shahnawaz Ahmad Dar)

(Received 12 November, 2017 accepted 15 December, 2017)

(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: With rapid development there is an appreciable impact on the quality of environment. This change has caused various types of problems to the mankind. The changes are reflected in the biodiversity, land use and natural resources in the Jammu city. Due to population pressure these resources are under extreme stress and are depleting very fast in Jammu region as well. The present study is an attempt to highlight the various causes that cause damage to the environment with special reference to urbanization.

Key words: population, urbanization, resources, Jammu

I. INTRODUCTION

With rapid urbanization there is constant degradation of natural resources, stress of water bodies' contamination of land, increase in crime rates, violence energy crises, depletion of forest resources, generation of solid water etc. Human's beings used land and its resources for the begging in a pursuit of their healthy lives. But it has been exploited its resources over time is a serious problem [1] as it has changed land cover and impacted the balance of the ecosystem. The agriculture, modern technology, and the rise of capitalist mode of economy, the degradation of land and its resources has increased dramatically. Modern land use practices like agriculture, mining, logging, housing, recreation, etc. have become so intensive and predominant that The impacts in forms of uncontrolled development like urbanization and sprawl had deteriorating had quality of environment, loss of agricultural lands, destruction of resources, and depletion fish and distraction wildlife habitats. Such impacts have decreased the local capacity of lands to support both ecosystem and human enterprise at global scale. Therefore, the effect of land use change is no longer a local environmental problem but a global issue [2]. At global scale, detailed information on existing land use pattern and sound knowledge about changes in land use through time is important for legislators, environments, historically planners, and State and local governmental officials [3]. Towns are growing faster all over the world. There will be nearly 2 billion new city residents accounting for around 60 percent of the world's population by 2030 leading to a severe destruction of natural resources and

ecosystems (The Nature Conservancy, 2008). When cities grow, it requires more land and resources to support the growth. This leads to change in land use causing environmental damage like air and water pollution, loss of open space and biodiversity, heat island effects, and so on. Based on the fact the global human population is growing and rural to urban migration is increasing, the urbanization trend will continue to happen in future. This continuation of urbanization pattern will enhance land and resource consumption, and increase the environmental problems which have already posed threats to our planet and cost billions of rupees to our economy. Therefore, planners, government bodies planning agencies environment and others should acknowledge these problems immediately and put environmental perspective into land use planning and decision making process very effectively without any delay. Although, ecosystem services provide myriad of functions and services that create value for human users and are central to the continuation of human civilization, humans have obscured the existence and importance of ecosystem services [4]. Express the truth of increasing disconnection of humans with nature as: "We live in two interpenetrating worlds. The first is the living world [natural world], which has been forged in an evolutionary crucible over a period of four billion years. The second is the world of roads and cities, farms and artifacts (human designed world), that people have been designing for themselves over the last few millennia".

The growth and progress of the human dominated world has come at the natural resources. Sim Vander Ryn and Stuart Cowan agreed that the “designed mess we have made of our neighborhoods, cities, and ecosystems owes much to the lack of a coherent philosophy, systematic trend vision, and practice of design that is grounded in a rich understanding of ecology”. There is a big gap between these two worlds—living or natural world and human designed or cultural world that has distanced humans from nature. To minimize bridge gap and link humans with nature, we need a balanced thinking in planning practice [4]. As proposed by Ryn and Cowan conservation, regeneration, and stewardship strategies into the land use planning and decision making process can be applied.

A. Impact Urbanization on Soil

The changes in the structure of soil due to constant urbanization of the J&K have caused great damage to food and fiber, forests and wetlands [5]. New homes, buildings, roads and other structures are being built everywhere and the developments are directed. Are these developments guided by sound knowledge about the soil information of the area is that, intellectual and serious judgment in allocating lands based on soil information for different uses & without any care soil at all about. The answer to these questions is negative as almost all developments that have happened and are continuing to happen are guided by economic benefits.

Marcotullio, Braimoh, and Onishi [6] have discussed the impact of urbanization on soil and found the biological, chemical and physical properties of soil and there by degrading the quality in a way that it leads to loss of vegetation, poor water infiltration, accumulation of heavy metal, excess water runoff and soil erosion. Soil quality is often damaged by soil erosion. The stability of natural and artificial slopes decides the vulnerability of landslides or slope failure in the Encroachment of urban land into nearby forested or vegetated areas in Jammu and the expansion of built up areas near Jammu city and transportation networks into steeper terrain destabilizing slopes lead to slope failures. Urban and recreational developments in Jammu into hillside areas have put more people and property into risk of landslide hazards as can be seen in Udhampur, Kathua, Reasi and other similar areas. Most of the populations are at greater rise due to the migration of people towards ecological sustained areas.

B. Impact of Urbanization on Water Resources

Population growth, increasing trend of urbanization, and land use and climate change has affected water availability and quality in the Jammu in such a way that the water resources in Jammu are increasingly becoming limited. In many parts of the Jammu conflicts over water resources have already occurred and the situation are deteriorating in future. Although the quality of water in Jammu with introduction of current population has significantly improved in last few decades due to the government regulations and environmental protection programs such as water act but most of the rivers and streams in the Jammu are impaired or polluted and most of the aquatic ecosystems together with their biota have been lost in Jammu region or diminished to a great number due to non-point source contamination of surface and ground water from agricultural and urban lands. The wetland is grossly polluted, water bodies are highly contained and ground water is not dream able due to UN systematic urbanization in Jammu. The agricultural lands have been coasted in to urban area that has badly affected the system of water bodies in Jammu region to urban development. Most of the land has been damaged and degraded upto the irrigable level.

C. Impact of Urbanization on Biodiversity

Urbanization in Jammu alters habitat through housing, road construction, pavement, devegetation, plantation of non-native species, land fragmentation etc. Residential development in Jammu associated with expansion of roads, utilities etc. poses threat to wildlife through loss, degradation, and fragmentation of habitat alteration from urbanization is so drastic in Jammu that it results in the endangerment and extinction of species accompanied by long lasting habitat loss even in healthy areas. Apart from reducing the richness of native species, urbanization increases the dominance of nonnative species in the area thereby causing biological homogenization that is very difficult to assess.

Collaboration with member natural heritage programs in all 50 states, the database summed that of around 30,000 imperiled species i.e. about 15% of the total known species of the U.S. since 1999 as per the estimates of US [7]. According to the Nature Serve, Texas ranks, second in diversity, third in endemism, fourth in extinctions and eleventh in risk based on the state-wide distribution analyses of 21,395 plant and animal species of the 50 states including District of Columbia.

Table 1: Population of Jammu division by districts – 2011.

S.NO	District	Area(sq.km)	Population as per 2011 census	Density(persons per sq.km of area 2011)
01	Jammu	2342	1529958	653
02	Samba	904	318898	353
03	Udpr.	2637	554985	210
04	Reasi	1719	314667	183
05	Kathua	2502	616435	246
06	Doda	8912	409936	46
07	Kishtwar	1644	230696	140
08	Ramban	1329	283713	213
09	Rajouri	2630	642415	244
10	Poonch	1674	476835	285
	total	26293	5378538	257.3

Diversity refers to species richness, endemism refers to unique to particular state, Extinctions refers to global extinction of species and Risk refers to the percentage of a state's plant and animal species at risk of extinction [8]. The Jammu and Kashmir is endemically rich in different species but is struggling with their conservation due to urbanization more species in J&K have lost their habitat due to urbanization. Habitat loss, which affects about 85% of the imperiled species, is the leading cause of species endangerment. Spread of non-native species is the second most threat, which affects 49% of the imperiled species 7. Invasion of non-native species, urbanization and agriculture are the three leading causes of species endangerment due to habitat loss in Jammu Urbanization, which endangered 50% species in Jammu, the second most species endangerment habitat loss in the combined areas.

Of the 6,400 imperiled species identified by Nature Serve, 4,173 species were analyzed in the mainland U.S, which showed approximately 60% are found in one or more of the mainland metropolitan areas, with 31% found exclusively within metropolitan areas. It is a clear demonstration of our traditional reckless planning approach which ignored the importance of critical environmental habitats and continued to develop. It means the future of these species depends upon the growth patterns of metropolitan areas [8]. The future of the species living in the Jammu region is at risk if the consecration measure is not taken into consideration.

Land cover is the physical state of the land surface which includes both natural amenities e.g., crop lands, mountains, vegetation, soil type, biodiversity, water resources and man-made structures (buildings, pavements) [9]. Change in land cover usually happens in two ways conversion of land and land cover modification. Land cover conversion is due to change in the overall classification of land cover through a complete replacement of one type of land cover by another type due to change in urban extent, agricultural

expansion or deforestation however, land cover attractions is simply a change in the character of land cover without undergoing its overall classification [10]. Land use refers to the way human beings employ and exploit land cover for several purposes [9,11], such as farming, mining, housing, logging, or recreation. Therefore, land use change is the exploitation of land cover through its conversion and/or modification over time primarily to serve human needs.

D. Causes of Land Use Change

There are many reasons for the land use change. Identifying causes of land use change requires the understanding of land use decision making process which is influenced by several factors [11]. Scientists have explained proximate and urbanization is the main cause of land use change. Underlying causes of land use change to understand the land use decision making process. Proximate causes of land use change involve a direct and immediate physical action on land cover at local level like individual farms, households, or communities [12]. The underlying causes of land use change are the basic forces that alter one or more proximate causes and operate at regional or even global level [11]. Technological, economic, political, institutional, demographic and cultural [13] are fundamental causes in the context of the Jammu, these underlying causes/fundamental forces are also the causes of urbanization which in turn is the driver of land use change.

E. Connection between Land Use Change and Urbanization

In a more general sense, urbanization is the concentration of population due to the process of migration and redistribution [14]. The migration and redistribution refers to the spatial location and relocation of human population, resources, and industries in a landscape.

Broadly speaking, urbanization in the Jammu was the output of two major processes – economic growth and population. Growth of city and economy was brought about by the political independence of the Jammu, rapid expansion of overall population, development of railroads and growth of vehicular fleet, and the high level of agricultural productivity. This was also confirmed by the other studies [15].

The process of urbanization results in a dense settlement called an urban area. The conglomeration of urban areas including cities and their suburbs linked economically and socially constitutes a system called a metropolitan area or region [14]. This metropolitan area has left out one of the major linkages of the system, an ecological linkage, exploitation of which has created the system itself [16] advocates that metropolitan area (urban area) is due to capitalism which enhances diffusion of habitat and activities based on economic functioning and administrative activities. The mission of habitat and activities refers to the consumption of land to locate growth of industries, administrative divisions, new housing units and other infrastructures. Metropolitan or urban area “decreases the importance of the physical environment in the determination of the system of functional and social relations, abolishes the difference between rural and urban, and places in the forefront of the space/society dynamic the historical conjuncture of the social relations that constitute its basis [16]. Hence, one of the goals of this thesis is to make the ecological linkage visible, although roughly 5% of the people were city dwellers in 1800AD in Jammu. This number has increased to 14% in 1900 and 30% in 1950 and more than 74% of people live in cities now. The density of population increases with increase in population and is true only for the confined area the total land area of Jammu remains the same, but net migration of people increases, then the overall population density of Jammu increases. But if we consider an urban area within Jammu, the land area of which is subject to change (usually increase) with time to accommodate influx of people and businesses, the population density may not necessarily increase, instead decrease.

Although overall population density of the Jammu is increasing over years, the amount of land that is consumed for urban development has superseded the population density. This is mainly due to the migration of people from urban core and rural areas to suburbs. In a period of 15 years from 1982 to 2001, the amount of urban land in the contiguous Jammu increased by 21.5% However urban densities decreased by about 09%. In the states with growth management regulations, urban land increased by about 34% and

urban densities decreased by 7.5%. In the states without growth management regulations, urban land enhance by about 37% and urban densities decreased by about 13% [17].

In the context of the land use planning and policy making decisions are entrusted to local governments of J&K Usually, local governments regulate land development through building codes, platting regulations and zoning laws [18]. Most of the cities adopt a future or long range plan called master plan” to determine the type of development in their cities so is doing done by J&K govt. The master plan is prepared by a planning commission and approved by public hearings of reaches countries it shows that land use planning and decision making process involves a participation of local public, historian’s professionals, legal experts, economists planners and many. Hence, decisions made by these groups of people determine the future land development patterns and their results to economy and environment. However, these decisions are neither untouched from politics nor free from vested a economic interest that is very negative aspect of urbanization. From each individual to enterprise and towns, everybody wants to grow continuously growth is central to politics and a secular religion of society [19]. As a result, despite the fact that land developments are regulated through codes, laws and regulations, most often lands are allocated in terms of real estate values, profits, and political pressures. The voters, planners, professionals, developers, policy makers should acknowledgeable that natural environment is too important to be allocated on the basis of profits [20]. If we fail to live in balance with nature the world will get collapsed with a short period of time [21].

Environmental resources are classic common goods of our society. The societal cost of making a poor or false decision about the allocation of these resources is enormous if we value each species & energy species that is extinct, and each acre of wetland that is lost. Only the well-informed and uninformed citizens can make better decisions and produce classic public goods [22]. Therefore, citizens of Jammu must be educated, and well informed about the benefits of natural ecosystems against having a big lot house far from the city center in an ecologically sensitive area. In addition, citizens must also consider it their obligation not only rights to be well educated about the future land use plans of their town and the negative impacts on the Citizens of Jammu, besides thinking about their stock market, retirement plan, Medicare and social security, should also concern themselves about the security of natural amenities they are very important at the work of urbanization.

Traditional administrative rules, laws and regulations, Acts alone neither did consume our environment nor will give us security from natural calamity, unless we change our thinking towards environment. Reversing our thinking from contemporary profit laden mind to a fair ground of harmony between man and nature requires a sense of “ethics to civilization to continue civilization” [23]. The continuation of civilization depends upon what we are passing to our next generation. Must pass our next generation the community with full of biodiversity and more ecological hot spots, more wetlands and less paved lands, and more protected rivers and more water or the community with full of environmental amenities. The thinking of unity is much assented here and we have to protect on reasons for the future generations.

Land use or city planners should impart knowledge and be well -informed about the local environment of their community (city) and must make environmental data base. The environmental data base would enlist of important environment factors that need to be considered while making planning decisions. Planners could use their information either by collaborating with federal and non-profit organizations NGO's environmental organizations, historians and research groups or by doing their own research such as site visits, public participation, etc. The most make environmental impact assessment of the future land use plans and identify the risks associated with the plans. Third, they should inform the planning commission and citizens about the environmental data base and probable environmental effects of proposed or future land use plans without being biased with any political affiliation or economic gains.

Urbanization is one of the major drivers of land use change in Jammu as in evidenced by data base Through land use change, it changes natural landscape for several reasons such as housing, transportation, recreation and so on that are also estimated for living. Such changes of natural land into urban land have provided lot of space and opportunities for billions of people to live, work and raise their standards of living and the cost of environment. Many believe that towns (urban areas) are ecosystems in themselves, called „urban ecosystems“ where we see complex and interesting interactions of social, biological, and physical components [24]. But it is necessary to accurate that urban ecosystems constitute only a small part of the larger ecosystem required to support the urban population [25]. Hence, we must conserve the whole natural ecosystems upon which humans depend for survival. We should not continue using urbanization as a weapon to dominate natural ecosystem in Jammu.

We need to bring a fundamental change in the people of Jammu to understanding urbanization. We must not understand urbanization as an evil to environment but should work in close harmony with it. This is need and the process to how cities grow by size with demand for goods and services. What we must understand is urbanization does not drive land use change in an environmentally detrimental way without our decisions about how to use land and its resources. That is critical and very important in the long run.

F. Environment and resources

The other set of variables capture the environmental indicators and the resource consumption that include land-use, generation of solid waste and collection, consumption of water and generation of efficient and energy-consumption, sources and end users. The water bodies open land, and vegetation is critical for environment. The solid waste management metrics consider per-capita generation and mode of collection. The water consumption per capita per day and the corresponding wastewater generated and the treatment capacities form the metrics under water and wastewater are also important parameters that decides the fate.

G. Energy sources

The measurement of energy sources in Jammu found that electricity and LPG were among the most widely accessed source Firewood is also used by the people living in the areas of Jammu mainly for during the chilling winters of the valley. However, due to non-availability of electricity, firewood during winters compelled even urban poor to switch over to L.P.G, Kerosene and electricity as the main source of energy. It is further interesting to note that solar energy is being tapped mostly in the newly constructed houses in the south-eastern zone of Jammu city. charcoal and biogas are totally absent while as cow dung is minimally used by the poor people of urban periphery in Jammu Electricity and L.P.G were the most accessed source for cooking, heating and lighting purposes by the urban dwellers.

H. Water, mode of disposal of wastewater and solid waste

The source and supply of water constitutes one of the significant component of urban services in Jammu region In the past, people of Jammu were using the waters of lakes, rivers and deferent khuls/canals for domestic purposes. It was in 1894 A.D when piped water supply was for the first time introduced in some parts of the Jammu City during Dogra Rule.

Table 2: Land Use /Cover in (Ha) for years 1989, 2000 and 2014 in Jammu city, India.

S. No.	Land use/cover class	1989(ha)	1989%	2000(Ha)	2000%	2014(Ha)	2014%
1.	Agriculture	1921.83	48%	19877.59	48%	18427.44	45%
2.	Buildup	4356.28	11%	6283.54	15%	8750.81	21%
3.	canal	68.40	0%	68.40	0%	68.40	0%
4.	Facility	822.47	2%	1184.15	3%	1483.53	4%
5.	Industrial	471.56	1%	609.28	1%	741.33	2%
6.	Moderately Dense Forest	2076.99	5%	2076.99	5%	2076.99	5%
7.	Open Forest	3202.06	8%	3281.79	8%	3281.79	8%
8.	Open Vacant	376.42	1%	415.06	1%	355.92	1%
9.	River	725.36	2%	644.57	2%	775.10	2%
10.	River bed	2086.29	5%	1630.23	4%	875.19	2%
11.	Scrub	4071.77	10%	2307.17	6%	2260.72	5%
12.	Stream Bed	1581.22	4%	1264.85	3%	629.94	2%
13.	Tree cover	1492.16	4%	1609.20	4%	1525.67	4%
	Total	41252.82	100%	41252.82	100%	41252.82	100%

Table 3: Land Use /Cover Change Matrix for Jammu City from 1989 to 2000 (Ha).

1989-2000	Agri.	Built- up	Industry	Forest	Open vacant	River	River bed	Scrub	Stream bed	Tree cover	Change	Evolution
Agriculture	0.00	1173.95	58.38	0.00	0.00	22.86	17.97	139.17	8.61	78.39	1499.31	-43.23
Buildup	134.52	0.00	24.96	0.00	5.98	0.00	0.00	88.94	1.32	207.47	463.18	2286.26
Industrial	0.60	3.01	0.00	0.00	42.18	0.00	0.00	0.00	0.00	57.52	103.31	137.72
Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	79.73
Open vacant	135.64	109.09	0.54	79.73	0.00	0.00	0.00	0.00	0.00	0.52	325.52	38.71
River	46.68	0.17	0.00	0.00	0.00	0.00	305.93	45.61	4.11	0.00	402.51	-80.79
River bed	186.58	3.35	0.00	0.00	0.00	282.32	0.00	480.48	1.22	5.70	959.66	-456.06
Scrub	830.38	1070.57	120.14	0.00	206.32	16.54	60.47	0.00	19.72	255.30	2579.46	-1764.44
Stream bed	65.02	110.14	0.00	0.00	20.48	0.00	119.23	29.93	0.00	5.22	350.02	-315.05
Tree cover	56.66	279.16	37.00	0.00	89.27	0.00	0.00	30.88	0.00	0.00	492.98	117.15
Total	1456.08	2749.44	241.03	79.73	364.23	321.72	503.61	815.01	34.97	610.13	7175.96	

REFERENCES

- [1]. Cieslewicz D.J. (2002). The environmental impacts of sprawl, in Gregory D.S (editor), Urban sprawl: Causes, Conquences and policy Responses, Urban Institute press, 23-38.
- [2]. Houghton, R. A. (1994). The worldwide extent of land-use change. *Bioscience*, **44**(5), 305-313. Retrieved from <http://www.jstor.org/stable/1312380>.
- [3]. Anderson, J. R., Hardy, E. E., Roach, J. T., & Witmer, R. E. (1976). A land use and land cover classification system for use with remote sensor data. (Geological Survey Professional Paper No. 964).
- [4]. Vander Ryn, S., & Cowan, S. (2007). Ecological design (10th Anniversary Edition ed.). Washington, D.C.: Island Press.
- [5]. Scheyer, J. M., & Hipple, K. W. (2005). Urban soil primer. Lincoln, Nebraska: United States Department of Agriculture, Natural Resource Conservation Service, National Soil Survey Center.
- [6]. Marcotullio, P. J., Braimoh, A. K., & Onishi, T. (2008). The impact of urbanization on soils. In A. K. Braimoh, & P. L. G. Vlek (Eds.), *Land use and soil resources* (pp. 201-250). Sweden: Springer.
- [7]. Wilcove, D. S., & Master, L. L. (2005). How many endangered species are there in the United States? *Frontiers in Ecology and the Environment*, **3**(8), 414-420.
- [8]. Stein, B. A. (2002). States of the union: Ranking America's biodiversity. Arlington, Virginia: Nature Serve.
- [9]. Meyer W.B, (1995). Past and present land use and land cover in the USA. *Conquences*, **1**(1), 19 October 2010-25 -33.
- [10]. Lambin, E. F., Geist, H. J. & Lepers, E. (2003). Dynamics of land-use and land-cover change in tropical regions. *Annual Review of Environment and Resources*, **28**, 205-241.
- [11]. Lambin, E. F., Geist, H., & Rindfuss, R. R. (2006). Introduction: Local processes with global impacts. In E. Lambin F., & H. Geist (Eds.), *Land-use and land-cover change local processes and global impacts* (1st ed., pp. 1-8). Germany: Springer.
- [12]. Ojima, D. S., Galvin, K. A., & Turner, B. L., II. (1994). the global impact of land-use change. *Bioscience*, **44**(5), 300-304. Retrieved from <http://www.jstor.org/stable/1312379>
- [13]. Geist, H., McConnell, W., Lambin, E. F., Moran, E., Alves, D., & Rudel, T. (2006). Causes and trajectories of land-Use/Cover change. In E. F. Lambent, & H. Geist (Eds.), *Land-use and land-cover change local processes and global impacts* (1st ed., pp. 41-70). Germany: Springer.
- [14]. Geruson, R. T., & McGrath, D. (1977). Cities and urbanization. New York: Prager Publishers.
- [15]. Bairoach, Paul, 1988, Cities and Economic Development: From the draw of History to the present, Mansell publishing limited, London.
- [16]. Rostow, Walt W. (1977). "Regional Change in the Fifth Kondratieff Upswing." In D.C. Perry and A.J. Watkins, *The Rise of the Sunbelt Cities*. Beverly Hills: Sage, pp. 83-103.
- [17]. Anthony J. (2004). Do state growth management regulations reduce sprawl. *Urban affairs review*, **39**(30), 376-397
- [18]. Ophuls, W. P., & Boyan, A. S., Jr. (2005). The American political economy II: The non-politics of laissez faire. In J. S. Dryzek, & D. Schlosberg (Eds.), *Debating the earth* (2nd ed., pp. 191-206). Oxford: Oxford University Press.
- [19]. Anderson, T. L., & Leal, D. T. (1998). Visions of the environment and rethinking the way we think. In J. S. Dryzek, & D. Schlosberg (Eds.), *Debating the earth* (1st ed., pp. 207-223). Oxford: Oxford University Press.
- [20]. Torgerson D, (1998). Randisation methods is controlled trials *BMJ* 317, 1301
- [21]. Anderson, T. L., & Leal, D. T. (1998). Visions of the environment and rethinking the way we think. In J. S. Dryzek, & D. Schlosberg (Eds.), *Debating the earth* (1st ed., pp. 207-223). Oxford: Oxford University Press.
- [22]. Sagoff, M. (2005). The allocation and distribution of resources. In J. S. Dryzek, & D. Schlosberg (Eds.), *Debating the earth: The environmental politics reader* (2nd ed., pp. 147-162). Oxford: Oxford University Press.
- [23]. Nilon, C. H., Berkowitz, A. R., & Hollweg, K. S. (2003). Introduction: Ecosystem understanding is a key to understanding cities. In A. R. Berkowitz, C. H. Nilon & K. S. Hollweg (Eds.), *Understanding urban ecosystems* (pp. 1-13). New York: Springer.
- [24]. Rees, W.E. (2003). Understanding urban ecosystems: An ecological economics perspective. In A. R. Berkowitz, C. H. Nilon & K. S. Hollweg (Eds.), *Understanding urban ecosystems* (pp. 115-136). New York: Springer.
- [25]. Walker, Richard A. *The Suburban Solution: Urban Geography and Urban Reform in the Capitalist Development of the United States*. Ph.D. Thesis in Geography, Baltimore: Johns Hopkins University.