

THE RESTLESS URBAN FRINGE ENVIRONMENT AND RURAL LANDSCAPES OF INDIA: A CASE STUDY TO RETHINK THE GEOGRAPHIES OF TRANSFORMATION

Kamal Asif

Head, Department of Geography, Delhi Public School (SW), Aligarh (U.P.), India
Email: kasif2006bustan@gmail.com

Abstract: *The purpose of the paper is to present a summary of urban-rural transitional spaces in the fringe of cities in India and to discuss the problems connected with the rapid growth of urban population. These transitional spaces have emerged in the form of rural-urban fringe areas where productive agricultural land has been transformed, to be used for urban purposes. This phenomenon has brought changes in the natural environment of the rural landscapes. In the recent time, as a result of urban encroachment on agricultural lands, most cities in India are experiencing rapid urbanization in the form of urban sprawl, creating a restless environment. A case study has been incorporated to highlight the local development and transformation of fringe area of Aligarh city located in an alluvial tract between the Ganga and the Yamuna rivers, in the northern India. Here the development of rural-urban fringe is questioned on the issue of sustainability because of irrational planning which has not fully considered the socio-economic and the environmental aspects of development. The study concludes to think over the geographies of transformation and suggests the need of rational policies which should be adaptive, participatory, and effective.*

Keywords: Rural-urban fringe, urban encroachment and landscape transformation.

Introduction

The notion 'building of an ecologically sustainable society' is a common global consensus and its importance has been widely accepted. Productive land is the most important natural resource and pre-requisite to all civilizations. However, the most usable quality of land has gone under change due to the surging growth of urban areas. The rapid increase of urban populations compared to total population growth is not apt to be in no way, attributed to superior natural increase of urban population. Consequently, the surplus of rural population moves to urban areas, which contribute to urban growth (Khan 1967). It may also be noted that the horizontal expansion of cities or urban sprawl leads to the encroachment of rural lands, which may be agriculturally rich. Such an encroachment adds to urban expansion by taking lands from surrounding fringe areas (Hussain 1983).

Urban living is a defining characteristic of life in the twenty-first century for the majority of the world's population. Therefore, the changing forms of economic base and social structure of cities will continue to be of immense importance. According to the current estimates, cities occupy 4 per cent of the world's terrestrial surface, yet they are home for almost half of the global population. They consume three-quarters of the world's natural resources, and generate three-quarters of the world wide pollution. This phenomenon is more common in Asia. It has been estimated that the fastest rate of urban growth over the next 25 years will be in medium-sized cities with 1 to 5 million citizens and that a major share of the urban population will live in smaller cities of less than 1 million people (United Nations 2012; Hamnett 2014). Even though big cities capture most of the attention, but most of the urban population lives in smaller cities. The United Nation projects that the largest share of increase in urban population by 2015 will be in smaller urban areas reflecting both population growth and reclassification of rural and urban areas.

One of the most important features of the growth of cities in developing countries like India is the development of transitional zones known as 'rural-urban fringes'. Rural-urban fringe areas are physical entities that have generally emerged from nuclear patches, which

are connected with either dense or less dense populated localities, and have emerged through the transformation of agricultural land for urban uses (Asif 2014). The rural-urban fringe is that spatial entity where most dynamic changes are occurring in terms of land use, economic development, and social change or construction activity. Thus, incorporating planning policies for the rural-urban fringe is a challenge to politicians, planners, officials and scientists (Zsilincsar 2003). Movement of population from one place to another is an outstanding feature of Indian history. People generally migrate from rural areas to urban centres. The basic causes of this migration are well known and are commonly explained by disparity between demographic explosion of the population while agricultural production and its derived income, in many cases, has remained stationary or has even diminished. Thus, the increase in number of landless labourers in rural areas and the transformation of artisans into wage earners have promoted the movement of rural population towards urban centres in search of employment and better opportunities (Khan 1967).

The main aim of this paper is to highlight the problems related to unplanned expansion of most cities in India, which has caused conversion of rural lands for urban purposes. The most affected landscapes belong to rural-urban fringe areas, especially to those of middle class cities. The study was carried out to explain the link between urbanization and the expansion of urban areas into the rural-urban fringes, and also to explain various socio-economic and environmental issues related to it. The paper has been structured into three sections. The first section provides an introduction, a review of geographical perspectives and a conceptualization of the rural-urban fringe. The second section highlights the urban development and expansion of cities in India, and associated problems related to rural-urban fringe areas. The third section comprises a case study of a middle size city in north India known as the Aligarh, taking it as an empirical example. Aligarh city is located in an alluvial tract between the Yamuna and the Ganga rivers in north India. This tract of productive land is locally known as *Doab* (a tract of land lying in between two rivers). *Doab* region is one of the most densely populated parts of the country and accommodates a number of rapidly urbanizing middle class cities mainly belonging to medieval period. This section discusses the process of urban growth and expansion of city into its rural-urban fringe area, and highlights the efforts for development and planning. The paper ends with a conclusion as to how human and physical environments in a rural-urban fringe in India are restless, and require wider debates on their management.

Materials and Methods

The scientific validity of the research comes from the process of generating, documenting and analysing information grounded with theoretical concepts of the scientific literature associated with the theme of the paper '*rural-urban fringe*'. Various measures of the urban form are developed by researchers, which include the methods of diagnosing sprawl in a city. The research's work mainly tries to understand the impact of the urban form on transportation, environmental, and socio-economic variables (Johnson 2007 and Kotharkar 2014). The study is based on secondary source of statistical data obtained from records from various government departments, organizations and other research agencies. Policy reviews and various public documents namely, master plan reports and district census handbooks: village and town directories were garnered in order to give a scenario of city development. The discussion has involved case study approach, which was applied to present the process and parameters of urban growth and encroachment of agricultural lands in the rural-urban fringe areas. For this purpose, a middle class city of Aligarh located in north India was selected, because a rapid pace of urbanization in the country is a phenomenon that is seen in such cities. It is a unique study because the city possesses a multifarious functional character in addition to its physical location. This study highlights the actions, including future planning of the city, that have been taken by the government for the balanced development of its rural-urban fringe. Necessary statistics pertaining to demography and land use were obtained from *Aligarh District Census Handbooks: Village and Town Directory*, 1971, 1981, 1991, 2001 and 2011. A map showing the expansion of city outside its municipal limit was prepared with the help of an overlaying technique while using the municipal map and Google Earth imagery.

Geographical perception of rural-urban fringe

A landscape can be referred to as a 'place' which has been used as an alternative to a location. Places can be categorized in different ways on the basis of people's perception. Places can be categorized as 'urban' or 'rural' (Cresswell 2014). Rural-urban fringe areas are defined by Herington (1984) as "an area which is partly assimilated in the growing urban complex, which is still partly rural and where many of the residents live in the countryside, but are not socially and economically forming part of it". Hence, rural-urban fringe area is an important spatial entity in the field of rural and urban studies and is considered as the place where urban and rural characteristics meet (Adell 1999). In the environmental context, urbanization in particular, alters both biotic and abiotic ecosystem properties within surrounding, and even at great distances from urban areas (Grimm et al. 2008). Thus, the nature, pattern, pace, ecology and societal consequences of land use change will vary in all spatial scales as a result of spatial variation in human preferences, economic and political pressures, and environmental sensitivities (Carpenter et al. 2007).

Rural-Urban Fringe

What and where is the rural-urban fringe? A precise definition is not necessarily available and drawing an accurate map is not always possible. "Hinterland between town and country" or alternatively as the transition zone where urban and rural uses are mixed and often clash (Anbumozhi 2007). On a similar line, according to Bourne and Simmons (1978), the rural-urban fringe means, those areas just beyond the built-up part of a city subjected to intense development pressures. The distinction between rural and urban is probably inescapable for descriptive purposes. However, it often implies a dichotomy, which encompasses both spatial and sectoral dimensions (Tacoli, 1998). The rural-urban fringe is not a line on map; it is a zone of radial diminishing urban-style activities. It is the existence of a fringe that prevents one from being able to distinguish the urban from the rural, since the fringe has features of both. Here agricultural and non-agricultural activities are spatially integrated, because of a distinction in between rural and urban has become problematic (Anbumozhi 2007).

The definition of rural-urban shifts changes according to location. In Europe, where urban areas are intensively managed to prevent urban sprawl and protect agricultural land, the urban fringe is characterized by certain land uses, which have either purposely moved away from the urban area, or require much larger tracts of land. In Asian countries, rural-urban fringe is defined as the surface located in between the urban outskirts (the limit) of the built-up area and the region with rural features. The preference of the term 'rural-urban fringe' instead of peri-urban is derived from the idea that city forces alter the features of the fringe and not vice-versa through the penetration of rural features into the city or its fringe perimeter. In the case of China (referred by Avram, 2009), the rural-urban-fringe is defined as the surface located-outside the urban outskirts or the limit of the built-up surface to the region with rural features (XuFeng, 2004).

In the Indian scenario, the rural-urban fringe is an area of mixed urban and rural population and land uses, which begins at the point where agricultural land uses appear near the city and extend to the point where villages have distinct urban land uses, or where residents of village communities commute to city daily for work or other purposes (Husain 2007) Thus, the rural-urban fringe is neither truly urban nor truly rural. It is characterised by certain land uses, such as garden centres, agricultural fields, dairy activities, poultry, farm houses, agro-based industries, boarding schools, colleges, new residential colonies etc.

Discussion

Urbanization and expansion of cities in India

In India, out of a total population of 1,210 million, 31.2 per cent lives in urban centres and 68.8 per cent live in rural areas (*Census of India 2011*). Since independence, an absolute increase in population has been reported as more population lives in urban areas rather than the rural. More so, urbanization levels have increased from 27.81 per cent (*Census of India 2001*) to 31.16 per cent (*Census of India 2011*). During the decade of 2001–2011, the share of rural population has declined from 72.2 per cent to 68.8 per cent. Urban population has

increased by 31.81 per cent and rural population by 12.11 per cent (Table 1). It is expected that, the share of urban population will increase to the extent of 40 per cent of the total population by year 2021. An increase in urban population during the period of 1971-2001 is clearly visible from Table 2.

Table 1: Share of rural-urban population in India, 2001 and 2011 (in millions)

	2001	2011	Population Growth (in Actual)	Population Growth (in per cent)
India	1,029 (100.0 %)	1,210 (100.0 %)	181	17.58
Rural	743 (72.2 %)	833 (68.8 %)	90	12.11
Urban	286 (27.8 %)	377 (31.2 %)	91	31.81

Source: Census of India 2001 and 2011

Table 2: Increase in urban population in India during three decadal periods (1971-1981, 1981-1991 and 1991-2001)

Source of Increase	Increase in Urban Population in India		
	1971-1981 (in per cent)	1981-1991 (in per cent)	1991-2001 (in per cent)
Natural increase	51.7	62.7	59.2
Net rural-urban migration	19.8	22.6	21.1
Expansion of boundaries	11.9	2.1	9.9
Net reclassification	16.6	12.5	9.6
Total	100.0	100.0	100.0

Source: Census of India, 1971, 1981, 1991 and 2001

There is a sharp contrast in the absolute change in total as well as in urban population in India. At the time of independence in 1947, about 60 million people (15 per cent) lived in urban areas, during the next 50 years the total population grew by two and half fold, while the urban population by nearly five times. Rapid urbanization has brought about disorganized and unplanned expansion of towns and cities; thereby the pressure of this growing population has become a burden on limited civic amenities, which are virtually collapsing. The asymmetrical growth of urban centres has consumed agricultural lands in fringe areas, resulting in low agricultural productivity and changes in the rural surroundings (Asif and Rahman 2013). Indian cities hold tremendous potentials as engines of economic and social development, creating jobs and generating wealth. They need to be sustained and augmented through high urban productivity for the country's economic growth. National economic growth and poverty reduction efforts can be determined by the productivity of these towns and cities. For Indian cities to become growth oriented and more productive, it is essential to achieve a world class urban system.

In India, with an unprecedented population growth and migration, an increased urban population and urbanization is inadvertent. More and more towns and cities are blooming with a change in land use along the highways and in the immediate vicinity of the city (i.e. rural-urban fringe area). Urban sprawl is responsible for encroachment of land, and often reflects poorly planned development that destroys green space, increases road traffic, contributes to environmental pollution, leads to congestion due to overcrowding, social conflicts and does not contribute significantly to revenue (government's income), which is a major concern.

The Census of India 2011 defines an urban area as:

- a) All places with a municipality, corporation, cantonment board or notified town area committee, etc.
- b) All other places which satisfied the following criteria:
 - i) A minimum population of 5,000 people,
 - ii) At least 75 per cent of male main working population engaged in non-agricultural pursuits, and
 - iii) A density of population at least 400 people per sq. km.

The first category of an urban unit is known as 'Statutory Towns' (ST), which are notified under law by the concerned State/UT Government and have local bodies like

municipal corporations, municipalities, municipal committees, etc. The second category of towns (as in item 2 above) is known as 'Census Town' (CT). The third type is of 'Urban Agglomerations' (UA) which are defined as continuous urban spreads constituting a town and its adjoining out growths or two or more physically contiguous towns together with or without out-growth of such towns. The fourth category of urban unit is known as 'Out Growth' (OG) which is a village or a hamlet or an enumeration block made up of clearly identifiable boundaries. For instance, railway colonies, university campus, port area, military camps, etc., which have risen near a statutory town outside its statutory limits (or rural-urban fringe) but within the revenue limits of a village or villages contiguous to the town.

During the 2001 Census, there were a total of 475 statutory towns in India, which increased to 4,041 by 2011 Census. Remarkable growth can be seen in number of Census Towns i.e. 1,362 in 2001 to 3894 in 2011. In 2011 Census, 475 places with 981 out-growths have been identified as Urban Agglomerations, as against 384 UAs with 962 OGs during 2001 Census (Table 3). The total urban population as per the Census of 2011, in the country was over 377 million, constituting 31.16 per cent of the total population. About 265 million people (70 per cent) of the total urban population live in UAs/Towns. This proportion has increased considerable over the last census decade of 2011.

Table 3: Growth of towns/urban agglomerations and out growths in India for the year 2001 and 2011

Type of Towns/Urban Agglomeration	Number of Towns/Urban Agglomeration	
	2001 Census	2011 Census
Statutory Towns	3,799	4,041
Census Towns	1,362	3,894
Urban Agglomerations	384	475
Out Growths (OG)	962	981

Source: Census of India 2011

Urban expansion in India is associated with a high concentration of population in towns and cities mainly in plain areas, where agriculture had been more developed in earlier times, and possesses future prospects for urban growth. At the same time, plain areas are more favourable to the establishment and expansion of towns and cities. The emergence of 'Development Zones' and 'Real Estate' hotspot deals with a use of large amount of land and capital has led to serious problems such as reduction in the acreage of arable land.

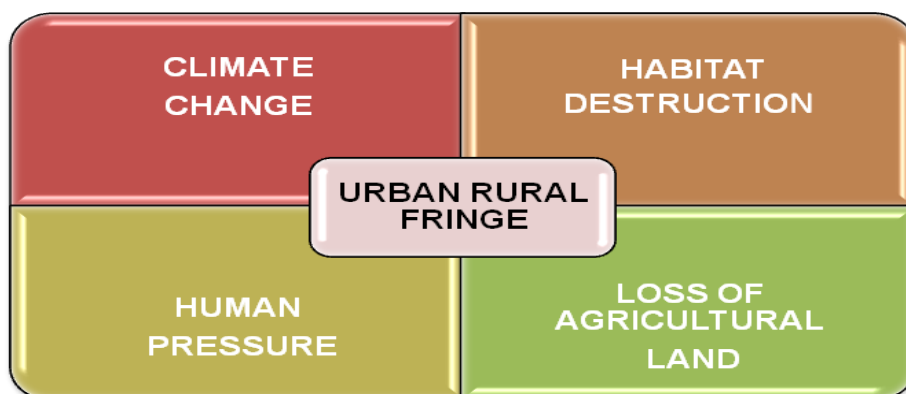
A major after effect is seen in the form of incursion onto fertile agricultural lands causing shortages of productive farm lands in fringe areas, which forces farmers to cultivate increasingly the distant lands. Most of the high quality land, throughout the country, has been misused for non-agricultural purposes. The per capita availability of arable land in India has decreased from 0.5 ha (in 1950–1951) to 0.15 ha (in 1999–2000) owing to population escalation and it is expected to come down to 0.09 ha by 2031 (Balaguravaiah, 2003; Singh, 2006). The total cultivable land has declined from 185.09 million ha. (in 1980–1981) to 182.57 million ha. (in 2005–2006). Land for non-agricultural uses mainly for housing, industry and other uses (human settlement) has increased from 9.36 million ha. (in 1951) to 22.97 million ha. (in 2001), an increase of 2.5 times. Thus, it is a paradoxical situation that on one hand a higher production is required from the scarce soil resources to meet the demands of ever-expanding population, and on the other hand vast areas are either going out of cultivation or showing a reduction in productivity due to soil degradation at an alarming rate (Chadchan and Shankar 2012).

Rural-Urban Fringe and Environmental Issues

Environmental pollution in India can broadly be attributed to the rapid industrialization, energy production and consumption, urbanization, commercialization and an increased number of motorized vehicles (Maitra 1993). Urban sprawl, a consequential phenomenon of urbanization (also known as suburban sprawl), show quite high diversification of land uses (for stores, industrial and residential), and various features that encourage dependency on motor vehicles. Vehicles are the major contributors to air pollution in towns and cities, and in suburban areas. The rate of generation of solid wastes in urban centres has outpaced the

urban waste generation rate normally disposed off in low lying vacant areas of the city's outskirts i.e. rural-urban fringe areas (Mohan 2001). Urban development in most cities of India has been responsible for creation of a number of environmental problems in both built-up as well as in rural-urban fringe areas (Fig.1). Concentration of ambient air pollutants in most cities is high enough to cause increased health risks and mortality. The generation of solid waste in urban centres has outpaced the population growth in recent years with wastes normally disposed in outskirts of the cities. Thus, population growth and rapid urbanization process in cities leads to a debate over environmental issues such as solid waste generation, waste water generation, vehicular emission, and destruction of wetlands and deforestation.

Figure 01: Environmental implications of urban encroachment on agricultural lands in rural-urban fringes



Source: Composed by the author.

A burning issue in rural-urban fringe areas is land degradation due to the erosion of the productive top soil aggravated by intensive strip mining, deforestation, improper land management as well as injudicious tillage practices in agricultural fields. Besides this, a loss in a sizeable amount of top layer of land has been attributed to brick making industry. Another cause of land degradation is the open dumping of urban and industrial waste in fringe areas of cities. This has adverse impact on health and living conditions of the people living in rural-urban fringe areas (Fig. 2). Loss of wetlands and depletion of biodiversity due to spatial expansion of urban boundaries is also a consequence of rapid urbanization. Decreasing wetlands, ecological function deteriorating and reduction in biodiversity have produced a series of adverse environmental effects such as frequent flood disasters and serious losses to water and soil. Every anthropogenic activity concerning land resource leaves an imprint in the atmosphere. The rapid pace of land use changes enforced by industrial development and urbanization causes an increase in the emission greenhouse gases to the atmosphere resulting in climate change (Asif and Rahman 2012).

Figure 02: A rural farm site (left) used for illegal earth mining and a slum locality (right) facing the problem of water logging in rural-urban fringe area.



Local development and planning of urban fringe area: The case of Aligarh city

Urban sustainability is threatened by heightened global uncertainty and change. Generally, these changes consist of the following global factors: economic change, scarcity of resources, rapid technological advancement, socio-economic and aftermath of environmental changes. Cities are key leverage points in the quest for global sustainability due to high levels in production, consumption and waste generation.

In the above sense, urban fringes are characterized with urban development, where encroachment on agricultural land and their abandonment are predominant phenomena. Urban encroachment can be examined on the basis of following parameters: city morphology, rural-urban migration, development of residential houses, transportation facilities, industrial development, commercial and market development, government offices, community services, such as education, health, sanitation and other services. Of these parameters, migration is considered to be the most significant parameter of urbanization. Causes which are acting as pull factors have shown a rapid increase in rate of migration of population of cities and their periphery are: development of industries, educational facilities, markets, health and infrastructure. Therefore, urban expansion in Indian cities is considered to be a major cause of permanent loss and abandonment of agricultural lands (Asif 2014).

Figure 03: Pictures showing the processes of chalking out prime agricultural land (left) and a land (right) which is already taken for urban purposes and left uncultivated.



Figure 04: A recently constructed apartment building (left) and an institutional building (right) under construction after conversion of prime agricultural lands in the fringe of Aligarh city.



Since the process of urban encroachment is associated with the process of urbanization (Figs. 3 and 4), substantial changes in population and urban land use have occurred in each decennial period of urban history of Aligarh (Tables 4 and 5). The process of outward expansion and consequent encroachment on rural land has remained imperceptible over the period of about 50 years (1951 to 2001). In the first decade of the post-independence period of the country, there was a significant engulfment of land (20.80 sq. km. in 1961), showing a 188 per cent growth in the municipal area (Table 5). This land was primarily acquired for educational, commercial, health and other public uses. Specifically, the outskirts of the city were the preferred locations for these establishments,

which were purely of agricultural bases. The educational institutions served not merely as growth points that opened up new areas, thus forcing farmers to relocate further into the hinterland, but also facilitated a rapid expansion towards their locations and even beyond (Fig. 5). During 1971, the municipal area of the city increased by engulfing 2.59 sq. km. of land in the fringe area. During the span of 20 years, the municipal area was further increased by 5.98 sq. km. in 1991, and in the subsequent decade, the municipal area again increased to the extent of 4.43 sq. km. (2001 Census). Thereafter, between 2006 and 2011 the growth in urban land use continued to be 5.68 and 6.18 sq. km., respectively.

Table 04: Actual and decennial growth rate of population in Aligarh city during the period 1901-2011 and the prospect for 2021

Census Year	Total Population	Decennial Growth (in Actual)	Decadal Growth (in percent)
1901	72,084	-	-
1911	66,344	- 5,740	- 7.96
1921	66,963	+ 619	+ 0.93
1931	83,878	+16,915	+25.26
1941	1,12,655	+98,777	+34.31
1951	1,41,618	+28,963	+25.71
1961	1,85,020	+43,402	+30.65
1971	2,52,314	+67,294	+36.37
1981	3,20,861	+68,547	+27.17
1991	4,80,520	+1,59,659	+49.75
2001	6,69,087	+1,88,567	+39.24
2006	7,89,529	+1,20,442	+18.00
2011	8,72,575	+2,03,488	+30.41
2021*	12,49,352	+3,76,777	+43.18
1901-2011	8,72,575	+8,00,491	+1110.50

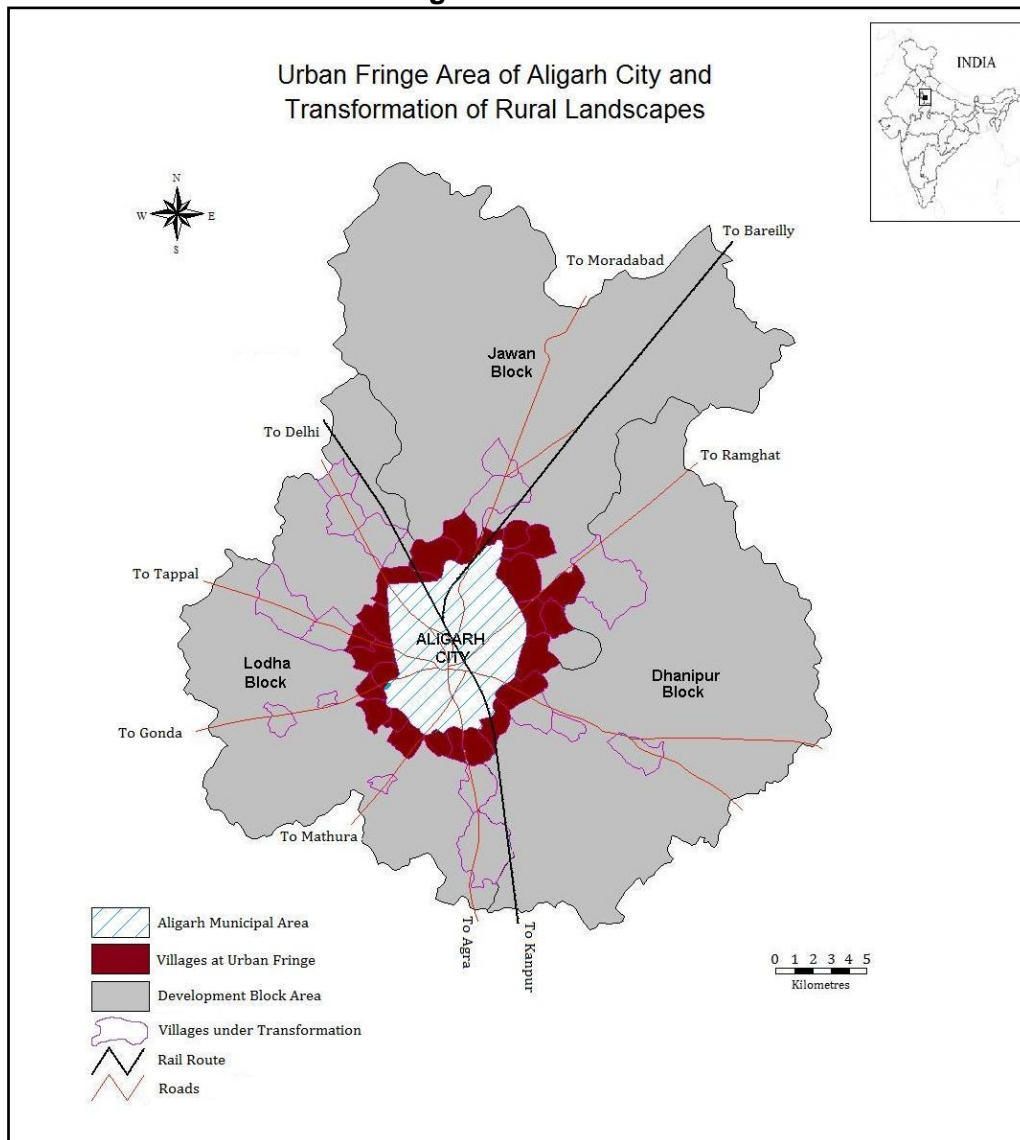
Source: (a) Aligarh District Census Handbooks: Village and Town Directory, 1971, 1981, 1991, 2001 and 2011. (b) *Extrapolations by Aligarh Development Authority (ADA)

Table 05: Actual area and its growth under urban land use in Aligarh city for the periods 1901-1951, 1961-2011 and the prospects for 2021

Year	Area (in sq. km.)	Actual Growth (in sq. km.)	Growth (in per cent)
1901-1951	11.06	-	-
1961	31.86	20.80	188.06
1971	34.45	2.59	8.12
1981	34.45	0.00	0.00
1991	40.43	5.98	17.35
2001	44.86	4.43	10.95
2006	50.54	5.68	12.66
2011	56.72	6.18	12.22
2021	113.79	57.07	100.61

Source: (a) Aligarh District Census Handbooks: Village and Town Directory, 1971, 1981, 1991, 2001 and 2011. (b) *Extrapolations by Aligarh Development Authority (ADA)

Figure 05: Urban fringe development area of Aligarh city and transformation of agricultural lands.



Source: Composed by the authors.

During 2001, the Aligarh Development Authority (ADA) has recorded the total urban area of Aligarh city as 4482.45 ha. out of which high density residential/built-up areas covered 1142.32 ha. Another category with the name of 'low density residential area' was added to land use which occupied an area of 1340.61 ha. This low density area comprising newly built-up areas, is a continuation of the old high density built-up area of the city. In view of increasing population beyond the built-up area, and economic growth of the city, ADA has extrapolated the land use of built-up area for 2021. The extrapolated area is estimated to be 11,370 ha. by 2021, showing a growth of 100.61 per cent (Table 6) that would be managed by the ADA. In this way all categories of land use would gain land area accordingly by comprising area from the fringe. Hence, the land use area under ADA would become double from the area that existed in 2001. Thus, the Aligarh Urban agglomeration will chop-out a large portion of rural agricultural area, approximately equal to that of the present built-up area.

The streaming growth and hasty expansion of Aligarh city acts as a powerful magnet for economic opportunities and has a potential to unlock the multiplication of economic activities in the city. Progress in manufacturing and service activities, ranging from agriculture to construction and hospitality to communication provide a good platform for producers and

consumers. Other growth factors include the development of highways, nearness to the National Capital Region of Delhi in the north, an airport in the south, opening of the Yamuna Expressway and a dedicated freight corridor (construction is in progress) in the west, and proposed Ganga Expressway in the east. Besides, the development of industrial estates and residential colonies along highways are also included in the panorama of urban expansion.

**Table 06: Urban land use distribution in Aligarh city
(Extrapolations by ADA for the year 2021)**

Land Use Category	Area (in hectares)	Per cent share
High density residential area	1138.32	-
Medium density residential area	1908.08	-
Low density residential area	3081.74	-
Total residential area	6128.03	53.42
Commercial	158.92	2.26
Industrial	1077.70	9.41
Administration and offices	343.24	3.00
Community services (including university)	942.95	8.20
Transportation (Railway and roadway)	1083.66	9.45
Park and open spaces	1109.37	9.67
Water bodies/wetlands	152.85	1.33
Others	373.76	3.26
Total	11370.48	100.00

Source: Master Plan Report 2001-21, Aligarh Development Authority (ADA)

**Table 07: Sector wise planning of Aligarh city and its rural-urban fringe area as
planned by Aligarh Development Authority 2001-21**

Areas Included in Different Zones	Sector Number
High density residential area	SECTOR- I
Area between Kanpur G.T. Road and Mathura Road.	SECTOR- II
Area between Mathura Road and Delhi G.T. Road.	SECTOR- III
Area between Delhi G.T. Road and Bareilly rail route.	SECTOR- IV
Area between Bareilly rail route and Kanpur G.T. Road (including Harduaganj town)	SECTOR- V

Source: Master Plan 2001-21, ADA, Aligarh

Therefore, in order to minimize the pressure of traffic and for a proper balanced development of the city, the Aligarh Development Authority (ADA) has adopted a sector wise planning in the Master Plan 2001-21. According to this plan, the city and its peripheral areas have been divided into five development zones through which proper access of all community services in respective zone area will be provided to the residents (Table 7). The framework of zoning scheme is based on following characteristics:

- In sector wise zoning of Aligarh city, only general land uses of the Master Plan- residential, commercial, industrial, offices, public services, parks and farmlands have been taken into consideration.
- Preparation of a maps indicating main land use activities considering zoning regulations.
- Including new ancillary/incidental activities of the area for sustainable development.
- Ensuring regulatory steps regarding the construction of houses, commercial and other areas by devising proper methods to be incorporated in the plans.
- Simplifying the complexities in traditional zoning regulations and making zoning friendlier.
- Zoning includes flexibility in land use according to time and situation of sector wise plan.
- Enhancing the operational and economic workout, so that the basic plan of land use in respective zone should not be deteriorated.

- Colonies in which land use is practiced as uncontrolled and illegal will have a regulation option with the regulations of zonal plan/sector plan/layout plans.
- Ensuring the availability of resources for development authorities and taskforces so that there will be a provision of income generation through realizing taxes.
- Transparent processes will examine and regulate the land utilization in colonies and other assets by a board or a committee constituted by the ADA.

The main land use activities regarding zoning regulations included in the master plan are residential, commercial, industrial, offices, public services, parks and farmlands. It is necessary to include new ancillary/incidental activities for sustainable development. Ensuring the regulatory steps related with the construction of new houses, commercial buildings and others, so as to simplify the complexities in traditional zoning regulations and to make zoning user friendlier. Operational and economic workouts are also necessary, so that the basic plan of land use in respective zones should not be deteriorated. New residential localities, where land use is practiced as uncontrolled and illegal, will have an option to confirm with regulations of zonal plan/sector plan/layout plan. Land uses must be examined through transparent process and by a board or a committee constituted by the ADA under special task forces. In the urban fringe of Aligarh city socio-economic growth is a continuous phenomenon, therefore, there is need to maintain equilibrium in planning to achieve a sustainable development.

Conclusion

Land is a natural resource which is not only used for agricultural purposes, but also for many other purposes that are of an 'urban' nature. Urban purposes for which land is brought for basic use are: construction of buildings, housing, parks, roads, railways etc. This concept has received much attention. With the rapid increase of urban population and expansion of city areas, the problem has increased manifolds. Like many cities in Asia, Indian cities also experience streaming growth, which acts as a powerful magnet for economic opportunities and has a potential to unlock the multiplication of economic activities. The transitional zone of sub-urban systems, rural-urban fringes, follows a process of restructuring the demographic, land use and socio-economic setup of rural areas. The results obtained motivate the physical expressions and patterns of urban expansion which have a general opinion and appear to be divided over the socio-economic and environmental impacts of urban expansion. If the restructuring of urban spaces continues, rural spaces will experience significant changes, and new urban landscapes will suffer more. Relationships between urban and rural landscapes underpin the mosaic of geographical space of the country, which create new research enquiries.

Aligarh city presents an example of a scenario of radical changes in socio-economic and environmental regimes, and too in its rural-urban fringe area. It suggests that smaller cities also require effective urban planning policy for providing better environment to the residents. Demographic indicators of change show that, as the city expands into its fringe areas, there is a need for sector wise zoning to provide urban comfort and easy access to community services. To overcome the risks of associated rapid urbanization, there is also a need of rational policies which should be adaptive, participatory, and effective. Urbanization offers both opportunities as well as difficulties for local municipalities. In other words, planners must adopt the policy of creating spaces where human beings can live with nature in harmony. Planning must be done with reference to sustainable management of natural resources, so that, it can contribute to socio-economic viability of urban and rural areas for ensuring better living, generating employment and ensuring food security.

References

1. Adell, G., (1999) *Theories and Models of the Peri-Urban Interface: A Changing Conceptual Landscape*. The Development Planning Unit, London.
2. Aligarh Development Authority (ADA). (1991-01 and 2001-21) *Master Plan Reports of Aligarh*, Aligarh, India.
3. Anbumozhi, V., (2007) *Eco-Industrial Clusters in Urban-Rural Fringe Areas - A Strategic Approach for Integrated Environmental and Economic Planning*, Business and the Environment Research Project, Kansai Research Center, Hyogo, Japan.

4. Asif, K., (2014) Encroachment of Agricultural Land in Urban Fringe Areas of Aligarh City, India – Process and Parameters. *Asian Geographer*, 31(2), pp.29-48.
5. Asif, K., Rahman, H., (2012) Planning and Governance of Urban-Rural Fringe Areas around Aligarh City - A Diagnostic Approach. *The Geographer*, 59(1), pp.18-33.
6. Asif, K., Rahman, H., (2012) Environmental Degradation and Ecological Changes in the Urban Fringe Areas of Aligarh City, India. *Journal of the Environment*, 9(1), pp.101-113.
7. Asif, K., Rahman, H., (2013) Land Use and Socio-Economic Responses to Urban Encroachment on Agricultural Land – A Study of an Indian Urban-Rural Fringe. *Geographical Journal*, 65(4), pp.289-314.
8. Avram, S., (2009) The Position of Rural-Urban Fringe in the Framework of Human Settlement System. *Forum Geografic. Studii și Cercetări de Geografie și Protecția Mediului*, 8(8), pp.139- 145.
9. Balaguravaiah, D., (2003) *Impact of Land Utilization Systems on Agricultural Productivity*. Asian Productivity Organization, Tokyo, Japan.
10. Bourne, L.S., Simmons, J.W. (1978) *Systems of Cities: Readings on Structure, Growth and Policies*, Oxford University Press, New York.
11. Carpenter, S.R., et al., (2007). Understanding Regional Change: Comparison of Two Lake Districts. *BioScience*, 57, pp.323–335.
12. Census of India, (1971, 1981, 1991, 2001 and 2011) *Aligarh District Census Handbooks: Village and Town Directory*.
13. Chadchan, J., Shankar, R., (2012) An analysis of urban growth trends in the post-economic reforms period in India. *International Journal Sustainable Built Environment*, 1, pp.36-49.
14. Cresswell, T., (2014) Place. In: Cloke, P., Philip Crang and Mark Goodwin, editors, 2014. *Introducing Human Geographies*. Routledge New York, 249-261.
15. Grimm, N.B., Faeth, S.H., Golubiewski, N.E., Redman, C.L., Wu, J., Bai, X., Briggs, J.M. (2008) Global Change and the Ecology of Cities. *Science*, 319, pp.756–760.
16. Hamnett, C., (2014) Urban Forms. In: Cloke, P., Crang, P. and Goodwin, M., editors, 2014. *Introducing Human Geographies*. Routledge, New York, 46, pp.690-705.
17. Herington, J., (1984) *The Outer City*. Harper and Row, London, 205p.
18. Husain, M., (2007) *Models in Geography*, Rawat Publication, New Delhi.
19. Husain, M.I., (1983) Urban Expansion and Encroachment: A Case Study of Khurja (1950-73). *The Geographer*, 30(1), pp.82-93.
20. Johnson, A., (2007) Monitoring Settlement Sustainability-A Review of Practice. In: *The Proceedings of the Conference on Politics of Planning*, 27-30 March, 2007, New Zealand Planning Institute, Palmerston North, New Zealand.
21. Khan, M.N., (1967) Rural Push-Urban Pull Population Pattern in India. In: *The Proceedings of the Autumn School in Geography*, 18-25 October, 1967, Department of Geography, Aligarh Muslim University, Aligarh, pp.1-9.
22. Kotharkar, R., Bahadure, P. and Sarda, N. (2014) Measuring Compact Urban Form: A Case of Nagpur City, India. *Sustainability*, 6, pp.4246-4272.
23. Maitra, A.K., (2000) *Urban Environment in Crises*, New Age International Publishers, Delhi.
24. Mohan, R., (2001). *State of the Environment: India* (Report No. 1999EE45), Submitted to the United Nations Environment Programme.
25. Singh, M., (2006) *Land Resources and Need for Land use Policy*. Planning Department, Government of Uttar Pradesh.
26. Tacoli, C., (1998) Rural-Urban Interactions: A Guide to the Literature. *Environment and Urbanization*, 10(1), pp.147-166.
27. Xu, F., (2004) Modelling the spatial pattern of urban fringe. International Institute for Geo-Information Science and Earth Observation, Enschede.
28. Zsilincsar, W., (2003) The Rural-Urban Fringe: Actual Problems and Future Perspectives, *Geografski Vestnik*, 75(1), pp.41-58.