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Identification of Land Uses through the Application of Multiple Nuclei Model in Bahawalpur City, Pakistan: Planning Perspectives

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Abstract: Land use models of urban structure have wide applications in urban planning and management as urban growth in cities accelerated. Amongst, the classical models of urban land use have wide utilization by geographers and urban planners. Therefore, in present research the Harris and Ullman's multiple nuclei model were applied in the Bahawalpur city with the main objective to identify the possible land uses to facilitate the municipality for better planning in services provision. Results reveal notable similarities in the city's land uses with varied developmental directions and differentiated land uses. The possible identified land uses were CBD (old city), High, medium and low class residential and slum areas, residential and industrial suburbs. The delivery and existence of basic municipal services and facilities were satisfactory in high and medium class residential areas, but inefficient in low class residential and slum areas and needs special attention of the municipality. The industrial areas were limited in the city, but a number of nuclei were being developed on the fringes of the city and modifying the city's land use pattern dramatically. Therefore, the model is not fairly applicable on Bahawalpur as the land use classes and directions of city's growth varied and requires specific changes.

Keywords: Identification Land Uses, Management As Urban Growth.

1. INTRODUCTION

In the modern era, rapid urban growth taking place in cities and towns worldwide particularly in the developing world. Therefore, the need for better planning and management of land use, transformational network and secured quality of the environment from sprawl, overcrowding, lack of housing facilities and decreasing open spaces has enhanced many fold (Paul, 2002). In this regard, models of urban-spatial growth have attained the wide familiarity and frequent applications to monitor, formulate and implement land use plans and policies by governments and authorities. Urban land use is a dynamic phenomena varying over place and time (Narimah, 2006). Land use defined as the utilization of land under different sectors like to build up land, agricultural land, commercial land etc. while planning is simply described as the system of restrictive control on land zoning and subdivisions according to the principles (Brawne, 1956). Although the land use planning in most of the developing countries is highly inefficient yet the significance of land use planning cannot be overlooked as it is vital to ascertain uniform development and effective functionality of different uses of land to fulfill the dwellers' increasing demands of municipal services and facilities (Ogunkan and Jelili, 2010). Urban planning is thus becoming more important with rapidly urbanizing society (Ibrahim, 1996). Geographers and resource planners are always seeking for the solution of analyzing and classifying of urban places to comprehend the process by which present urban pattern evolved. City spatial growth along with expanding population is inevitable and this can result in the spatial expansion of the city. Although, it is thought a much difficult task to assess the changing land use of the cities, yet change in spatial pattern or structure closely influences the morphology and functions of the city that may appear in the form of changing land use and altering the surrounding land cover. It is found that change in a residential location within the urban area plays as important role in altering the urban system and urban spatial structure (James and Brown, 1971). Therefore, land use planning becomes essential in order to ensuring better predictions of urban growth and eventual developmental patters and for the sufficient deliverance of many public amenities and services (Samuel and Olatubara, 2004a, 2004b). Several models, hitherto, have been postulated in literature and generally in an attempt to understand the spatial pattern and the responsible factors of urban growth and changing land use, a combined approach of geography and urban economics has used by geographers spatial planners.

2. CLASSICAL MODELS OF URBAN LAND USE: BRIEF OVERVIEW

Land use models of urban structure are the tools of interests for geographers to know and predict about the urban growth patterns, morphology, functions and land use diversifications. In literature various models of urban land use exist which exhibit city spatial structure. Among these, some are considerably resemble with requisite alterations for the urban areas of developing nations' cities like Bahawalpur City in Pakistan. Among

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these, the most popular ones are (Johann and Von, 1875) Concentric Zone Model, (Harris and Ullman, 1945) Multiple Nuclei Model, (Philip 1965) Sector-Zone Model, (Norton *et al.,* 1991) Desakota Model etc.

Burgess's, Hoyet's and Harris and Ullman's models are considered the phenomenal works for city's urban structure and morphology and thus familiar as the classical or basic models of urban land use. But specifically, these models have been designed for the cities of U.S and western world for instance; Burgess's concentric model is particularly designed for the cities like Chicago (USA). Similarly, Hoyt's sector model and Harris and Ullmann's multiple nuclei model are also not fully applicable for real world cities due to certain limitations. Therefore, they hardly equate for the cities of developing countries of eastern world those have a different pattern and layout in their growth and structural array. It may not say explicitly that the concentric and sector models are not being applicable on modern world or beyond US cities, but many newly developed models explains urban land use in a much better way (Alison, 2001). However, many land use experts utilize and follow classical models when they examined the land use and growth patterns of the cities of developing nations in planning perspectives. Hence, they are known as the 'classical models of land use' and useful for urban land use planners to find out the layout of the cities as they are easy to understand and distinguishable between different classes of land use. Due to these benefits, they are used as devices in town planning to realize the size and nature of urban areas' land use (Alex, *et al.,* 1998; Philip, 1993; Sajid, 2004; Tamara, 1984). Moreover, the multiple nuclei model suggests that land use patterns may deviate depending on the local conditions. Therefore, it may be nearer to the reality in city's land use (Michael, 2005).

2. STUDY AREA

Bahawalpur City is situated in the southern part of the Punjab province between nearly 29°-22′ north latitude and 71°-37′ east longitude and divided into municipal and cantonment areas administratively **(Fig.3).** The municipal area is controlled and administrated by the Tehsil Municipal Administration (TMA) whereas cantonment area is managed by the Cantonment Board of Bahawalpur (CBB) (TMA Bahawalpur, 2011). In recent years Bahawalpur City had shown a significant increase in population and eventual expansion in spatial extent. The population of the city that was just 408,305 in 1998 climbed up to 560,588 in 2012 with a growth rate of over 3% per year (Govt. of Pakistan, 1998; Govt. of Punjab, 2012; Muhammad, 2013). On the other hand, the city's municipal area also being spreads outward drastically. The urban area of the city was about 123.5 acres in 1950s and later been expanded to 11,500 acres in 2014 and still on the move (Asad , *et al.,* 2014; Muhammad, 2013). This remarkable change in the city's urban land area has brought dramatic and rapid change in city's land use mainly by the straggling private housing schemes and other infrastructure and creating the administrative and managerial problems for local government for the provision of basic municipal services and amenities. Hence, in the present research, the effort is made to discover the existing land uses of the city by the application of Harris and Ullmann's multiple nuclei model to supplement the land use planners for effective policy making and implementation.

4. OBJECTIVE OF THE STUDY

The main objective of the current research is the identification of possible land uses by applying a multiple nuclei model to facilitate the municipality for better planning in services provision.

5. APPLICATION OF MULTIPLE NUCLEI MODEL ON BAHAWALPUR CITY

The Multiple nuclei model was put forward by Harris and Ullman in 1945 in their article 'The Nature of Cities'. This model describes the layout of a city or land use in groups form linked with specific activities or functions. This model explicitly recognizes the multi nodal quality of urban growth in cities (Michael, 2005). Central business district (CBD) is in the center of the city and around it wholesale, light manufacturing; Low, middle and high class residential areas; Heavy manufacturing; Outlying business district; Residential suburbs and industrial suburbs are located respectively (Fig.1). Based on this model, similar industries with common land use and financial requirement are established near each other and this clustering influences their immediate neighborhood with the development of a number of nuclei or nodes indicating the levels of the city's growth. In recent years, it is witnessed that the growth patterns and change in Bahawalpur City's land use partly resembles in the actual layout of the city exhibited in the model. By making the first compatibility comparison with a map it is clears that both of this model and map of Bahawalpur city in 1995 have approximately same groups or zones of residential and commercial agglomerations but the developmental directions varied and land uses are differentiated in both models **(Fig.1 and Fig.2).** The second comparison of this model with Bahawalpur City map 2013 proposed by Mohsin (Muhammad, 2013), reveals the potential similarities with identifiable deviations. As exhibited in model, the central business district (CBD) is located most inner and congested part of the Bahawalpur city and also known as the old city **(Fig.3).** Various commercial activities with wholesaling and retailing business are carried out here in specialized *Bazars* (Series of Selling Shops) i.e. Shahi *Bazar*, Fathe

Khan *Bazar*, Machli *Bazar*, Giri Ganj *Bazar*, Sarafa (Gold) *Bazar* with multiple commodities and stuffs. A significant number of consumers daily visited these *Bazars* and purchased their required items. These *Bazars* have comprised with typical structured *Mohallas* (Specific old settlements) with narrow streets and inefficient drainage and sewerage system deteriorating ground water. Therefore, the concerned authorities need to cope up with this problem on an immediate basis to reduce the threat of waterborne diseases. Wholesale and retail business mainly congested in and around the old city across the circular road as portrayed in the model, but unlikely the light manufacturing is not so prominent. Among high class residential areas of the city, Model town A is adjacent to the old city and many recently developed colonies like Hashmi Garden, Allama Iqbal town, Cheema town Phase 1 etc. mostly in fringing areas of the city as depicted in the model. These colonies housed high income groups of the society i.e. bureaucrats, politicians, professionals etc. and are well managed by the concerned authorities. Medium class residential areas are mainly found in Model town B, Shadab colony, Cheema town phase 2, Garden town and many other settlements situated in western and northern parts of the city. These colonies housed with middle class income group, i.e. Businessmen, teachers, lawyers etc. The overall sanitary situations are satisfactory in these areas, but some issues like improper solid waste disposal, bad quality of drinking water persists. Low class residential and slums can be observed in northern (Bindra Basti, Javed colony) and southern (Islamic colony, Nadir colony) parts of the old city as portrayed in the model. Besides, Hamatian and Tiba Badar Sher are notable slum areas in western parts of the city. There are also a number of other low class residential areas as well, including Karna Basti, Basti design, Basti kumharan, Maqbool colony, Nazirabad, Bhata no.1, Bhata no.2, Mohalla sharifpura etc. In these areas the municipal services and facilities are sporadic and several sanitary and cleanliness issues also prevailed i.e. poor quality of drinking water, unpaved streets, heaps of waste material, poor drainage of sewerage system etc. causing serious health problems for residents.

Residential areas along with public places like government offices, hospitals, official residences, and educational institutions are situated mostly in southern and western part of the core city. The civil police line exists at the western side of the old city. Cantonment area found in the southern part of the city and managed by Cantonment Board. Semi-arid suburbs found in southern and western parts of the city as depicted in the model and are gradually becoming thickly populated. manufacturing city yet few agro based, heavy and light Since Bahawalpur city is not a renowned industrial and industrial units exist in northern and western part of the

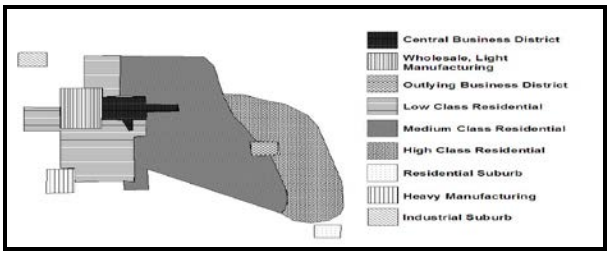


Fig.1: Multiple Nuclei Model
Source: Modified from
www.upload.wikimedia.org/wikipediacommons88fMultiple_nuclei_model.svg

city respectively as depicted in the model **(Fig. 1, 3).** Besides, commercial centers are mainly observed along with road network as demonstrated in model i.e. circular road and a few also exist within the settlements like commercial area in Satellite town etc. Apart, many other nodes marked with specialized functions are also being developed at fringing areas of the city i.e. district hospital and drug testing laboratory on Jhangiwala road in northeastern part, Baghdad-ul-jadeed campus of The Islamia University in southeastern part, new fruit and vegetable market on Ahmedpur East road in south western part, grain market in model town B, timber market alongside old city, bus terminals on north of the core city, shopping plazas, marriage lawns, new private housing schemes in fringing areas and the recent construction of northern and southern bypasses also brought significant modifications in the city's present land use pattern and further expected to contribute more changes in land use adjustments.

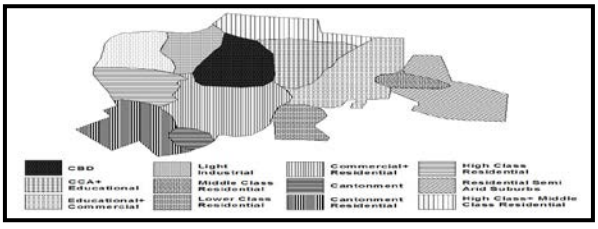


Fig.2: Map of Land Use Classes in Bahawalpur City in 1992
Source: Modified from Ahmed (1995)

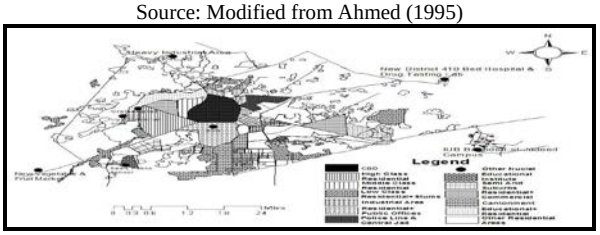


Fig.3: Map of land use classes in Bahawalpur City in 2013
Source: Mohsin (2013)

Thus, the true application of this model is not fully appropriate for the cities like Bahawalpur except some exceptions in the structure of the city. Land uses and outlying structure are also varying from the land uses found in Bahawalpur city. However, this model may come hardly true in contrast to other western and American cities models. In short, the multiple nuclei model has some fair application regarding the layout of

the Bahawalpur city where different specialized functional nuclei that are more than a dozen in number existed beside residential and commercial cores in different directions of the city. But hierarchy suggested by Harris and Ullman in their model might differ from Bahawalpur city's land use in past years.

3. CONCLUSION

Land use models of urban structure are gaining increasing importance and wide applications in urban planning worldwide as the urban growth accelerated. Among these, despite the certain limitations and criticism the classical models of urban land use have wide familiarity and common utilization by geographers and urban planners. Therefore, the multiple nuclei model was applied to the Bahawalpur city for the identification of possible land uses to aid the municipality for highlighting the services deficit areas of the city. The application of the model reveals notable similarities in the city's land uses with varied developmental directions and land uses. The possible identified land uses were CBD (old city), High, medium and low class residential and slum areas, residential and industrial suburbs. Commercial centers mainly found along road sides

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