

APPLICATION OF GIS IN THE SPATIAL ANALYSIS OF SLUMS IN FAISALABAD, PAKISTAN

Muhammad Shafqaat¹, Abdul Ghaffar², Ibtisam Butt³, Muhammad Sajjad⁴,
Nasir Aslam⁵

¹ Department of Geography, Govt. College University Faisalabad, PAKISTAN.

Phone No.: 0092-333-8370770 E-Mail: shafqaatanjum@hotmail.com

² Department of Geography, University of the Punjab, Lahore.

Email: ghaffarpu@yahoo.com

³ Lecturer, Department of Geography, University of the Punjab, Lahore

Email: ibtisambutt2009@gmail.com

⁴ EMAIL: mah.sajjad@gmail.com

ABSTRACT: *Slums are considered as the eyesore in urban areas and appeared spontaneously and haphazardly. This research is an attempt to assess the spatial and temporal pattern of slums in Faisalabad city from 1978 to 2006 in order to analyze their distribution in time and space using GIS. The frame work of research is three fold. First fold is consisted of temporal analysis of the establishment of slums; secondly the spatial analysis of slums along major roads, and thirdly the analysis of slums with respect to distance from city center creating buffers with ArcGIS. The study reveals that the slums are concentrated in the western part of the city and they have emerged swiftly from 1978 to 1985 due to the development of industry in this time period. The spatial and temporal study shows that slums have been emerged in the areas of low land values and along major transport lines.*

Key Words: Slum, Faisalabad, Buffer analysis, Spatial analysis, GIS

INTRODUCTION

The slums have various definitions and pattern of appearance in various parts on the surface of globe [1]. On a global level, about 924 million people lived in slums in 2001 and 32% population of urban areas is of slum dwellers. The slums are found all around the world but south, east and central Asia have high concentration of slums having a proportion of 50% of total slums in the world [2]. Various studies have been conducted to analyze the pattern of slums all around the world [3]. The focus of the present study is the locational analysis of slums using ArcGIS rather than to observe the socioeconomic aspects of slums which was the focus in many earlier studies. There is a strong need for the spatio-temporal analysis of the slums in any urban areas to assess the pattern of their emergence and development.

Faisalabad (*Layllpur*), also known as the Manchester of Pakistan was established in the form of a town market between 1895 and 1905. The city was named after the name of Sir James Layll who was Lieutenant Governor of the Punjab at that time. The city of Faisalabad is the 3rd largest city of Pakistan and rapidly emerging as an urbanized area. Now a days Faisalabad is spreading and sprawling very rapidly and is characterized by a large number of un-serviced and under-serviced areas or *Katchi Abadies* where the population is living in a very deprived condition [4]. The slums (*Katchi Abadies*) were emerged in different time periods and locations. This GIS based analysis of slums was conducted to assess the pattern of slums in study area and to highlight the possible reasons behind this phenomenon. In the present study, a temporal and spatial analysis of the slums in Faisalabad has been conducted to analyze how they are distributed in time and space with the help of GIS techniques.

MATERIALS AND METHODS

The data used in the research is secondary and collected from FDA (Faisalabad Development Authority). As the study of slums in Faisalabad is very limited and rare, and the data is not collected on a regular basis that is why the analysis has been conducted on the basis of available data only for the years 1978, 1985 and 2006. The location of slums was marked in the form of point features on the map of Faisalabad with the help of ArcGIS 10. The analysis was done in three folds. First of all, the temporal analysis of overall slums in the city of Faisalabad. Secondly, the spatial analysis of the slums around transport lines by creating buffers of 1 Km around major roads using ArcGIS. Thirdly, the spatial analysis of the slums with respect to distance of slums from the city center by creating buffers of 4, 6 and 8 Km radii around the city center.

Temporal analysis of establishment of the slums

The overall trend of the location of the slums in Faisalabad expresses that their emergence was mainly determined by transport lines, small scale industry and the neighborhood of areas already occupied by the local population. The agglomeration of new settlements in the neighborhood of areas already inhabited caused the clustering of the slums in particular areas towards certain transport lines. As these new settlements were emerging near the areas having small and cottage industry, as a result they appeared as slums. The trend of slums in Faisalabad city is more towards western part of the city, in the vicinity of *Jhang* road, *Narwala* road and *Sargodha* road. The slums on western side of Faisalabad are clustered as compared to eastern side due the presences of already inhabited areas because the western part of Faisalabad is adjacent to *Jhang* and *Bhawana*, and these areas are older than the city of Faisalabad. Second reason of clustered slums in the western part is the development of small scale and cottage industry in these areas. The areas

like *Ghulam Muhammadabad, Razaabad, MaddanPura, Choti 79, Kashmir road* and *Faizabad* are the core areas of small scale and cottage industry which are not too far from the local yarn and textile market. As the transport lines played a major role in the establishment of slums that is why some slum units are present in the neighborhood of railway track. But all these settlements are too small and could not be declared as formal railway stations, so the people preferred to settle down in the adjacent areas of roads. *Narwala* road has large number of slum units in three time periods (1978, 1985 and 2006). Particularly in 1978 and 1985 due to development of roads and availability of transport people settle down in the rural urban fringe. In 2006 relatively smaller number of slum units established around the *Jaranwala* road due to the developed colonies like Peoples colony and *Madina* town which caused land values to be higher in these areas. *Jhang* road has higher proportion of slum units in 1985 and 2006 as compared to 1978. *Sargodha* Road also has a significant number of slum units, due to the construction of motorway and Industrial Estate.

In 1978, the slums were more scattered than 1985 and 2006. The possible reason behind this might be the small population; due to which a large number of open lands were available for slums. These slums are present only in the neighborhood of the areas already occupied by the local population. An analysis of North-South comparison reveals that the concentration of slums is more towards the northern side of Faisalabad as compared to the southern side. Later on, in 1985 the slums are congested and also clustered. These slums cover the central area of city and western part of city towards *Narwala* road. The era of 1980s is known as the golden period for textile industry in Faisalabad. This is also a major reason that a large number of people from the rural areas migrated to the city for employment. These slums were the settlements of that population which became industrial labor. During 1980's, some industrial units were established in eastern part of Faisalabad like *TATA* factory and industrial area of *Gaushala*, so a small number of slums were also established on eastern side on *Satianaroad* and *Jaranwala* road.

In 2006 when the market of Faisalabad was well developed, a small number of slums were established as compared to the period of 1985. Because of the development of colonies at *Jhang road, Risalawal* road, *Sargodha* road and *Jaranwala* road, the land values increased and as a result, the major concentration of the slums in 2006 is at *Narwala* road due to absence of posh colonies and planned towns and low land values. The central area has a very low concentration of slums in 2006 as in figure 1. Due to larger market all the slums adjacent to the core area (clock tower) are converted into plazas and shops.

Spatial analysis of slums around the major transport lines

For the purpose of spatial analysis of the location of the slums along major transport lines, buffer analysis was conducted with the help of ArcGIS. Buffer analysis shows that about 80% slum units are present within the range of

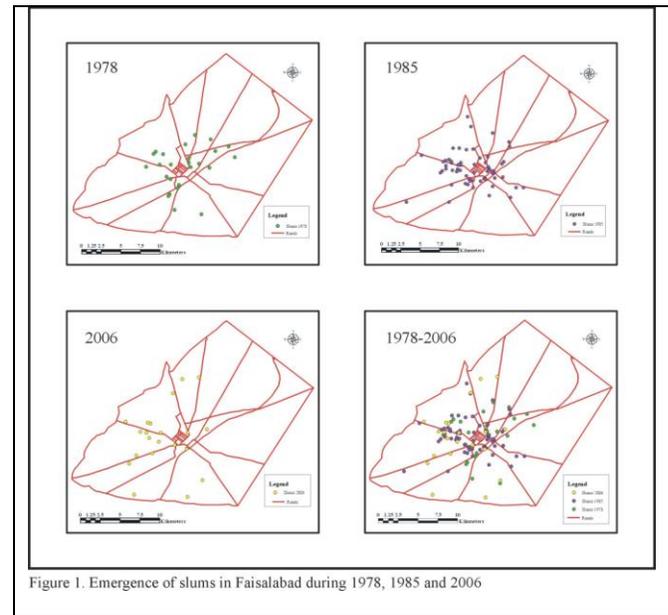


Figure 1. Emergence of slums in Faisalabad during 1978, 1985 and 2006

one kilometer of transport lines during 1978-2006 as in Figure 2. As the roads are the best mode of transportation for goods and individuals that is why the slums are clustered around the roads rather than railway track because the railway is not fit for short distance and small scale industry. This result supports the hypothesis that, the majority of slums are present in close proximity with major roads. Because the population of these slums mainly belongs to industry and was the labor of daily wages, so they have to travel daily, that is why they settled down in the areas adjacent to the transport lines.

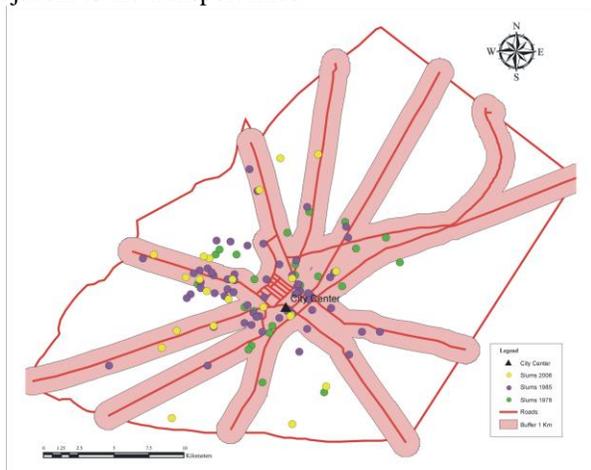


Figure 2. Slums Within 1 Km along major roads

The slums which were established till 1978, showed a higher concentration near major roads. There were 80% slum units which were within 1Km distance of the major roads (see Table 1). The maximum number of slums was emerged on *Risalawala* Road (20%) due to main *Ghalla Mandi* and Grain Elevators. After this the concentration of slum units is on *Jhumra* road (17%), *Sargodha* road, *Sammundri* road, *Millat* road (16%) and *Jhang* road (12%). As the population of these slums was the labor of the market and small scale

industry, so this is also a reason of establishment of the slums near transport lines.

In 1985, 53 out of 63 (84%) slums were established in the area of one kilometer near the major roads. In 1985, the maximum number of slums established around one kilometer of area around the transport line on *Narwala Road* (25%) and *Sargodha road* (21%), *Samundri road* (14%), *Jhumra road* (17%), *Jaranwala road* (11%) and *Jhang road* (16%). The reason behind this was the small scale industry and availability of transport because transport lines play very important role in transportation of goods and people. The minimum number of slums established in 1985 was on *Sheikhupura road* which is just 5% and these slums were established due to emerging industrial units like *Nishat textile* and *Chinab textile mills* (see Table 1).

Road	Year	Total No. of Slums	No. of slums within 1 km of major transport lines	Percent age
Narwala Road	1978	25	3	12
	1985	63	16	25
	2006	22	5	23
Jhang Road	1978	25	2	8
	1985	63	10	16
	2006	22	7	31
Kesalawala Road	1978	25	3	12
	1985	63	9	14
	2006	22	2	9
Samundri Road	1978	25	0	0
	1985	63	6	10
	2006	22	2	9
Stiana Road	1978	25	0	0
	1985	63	7	11
	2006	22	0	0
Jaranwala Road	1978	25	0	0
	1985	63	6	10
	2006	22	1	5
West Canal Road	1978	25	3	12
	1985	63	3	5
	2006	22	0	0
Shekhupura Road	1978	25	3	12
	1985	63	3	5
	2006	22	0	0
Jumra Road	1978	25	3	12
	1985	63	11	17
	2006	22	1	5
Millat Road	1978	25	4	16
	1985	63	5	8
	2006	22	2	9
Sragodha Road	1978	25	4	16
	1985	63	13	21
	2006	22	3	14

Source: Author 2012

In 2006, the trend of slum establishment very near to the transport lines was decreased due to developed colonies and planed towns which caused sudden increase in land values in certain areas. The slums established in 2006 in the vicinity of roads are only 64% which is less as compared to 1978 and 1985. The study reveals that 14 out of 24 slums are only in 1Km around the transport lines. The maximum number of slums established on *Narwal road* (23%), and minimum on *Sheikhupura road* and *Jaranwala road* (0%). Along these roads, the development of planned posh colonies and large investment in property by private enterprises caused high land values which discouraged the development of slums however, they established on *Narwala* and *Jhang road*. In case of *Sargodha road*, the northern part of the road has lesser numbers of slums as compared to south of *Sargodha road*. The Northern part of *Sargodha road* is mostly covered with towns, like *Muslim Town*, *Gulshan-e-Madina town a*

and *Lasani town* which are the areas of high class residence. Moreover, Metro, city's biggest shopping mall is on North *Sargodha road*. Whereas the south *Sargodha road* is covered with slums like *Dhupsari* and *7 chak Kohala* due to industrial area like Small industrial Estate, *Dawood Exports*, and *Captain chemicals* etc.

Multiple buffers for distance from city center

To carry out a spatial analysis of the location of slums and distance from the city center, multiple buffers were marked. The multiple buffers divide the slums into three zones of 4, 6 and 8 Km radius as in Figure 3. The multiple buffers reveal that the slums tend to occur not too far from the city center. The sprawl of slums widens as the distance from the center is increased.

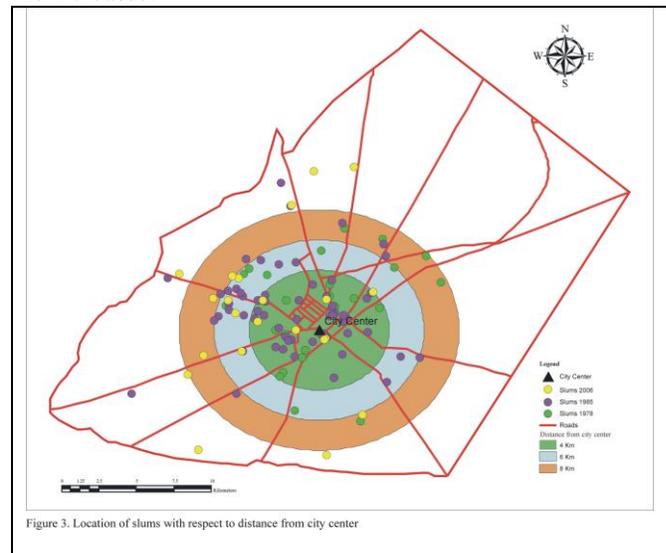


Figure 3. Location of slums with respect to distance from city center

A buffer of 4 Km radius covers, 44 (40%) out of total slums. The slums are clustered around the CBD due to access to the market. The CBD is surrounded by the low class residents like, *Gaushala*, *Railway Quarters*, *Gujjar Basti*, *Partab nagar* etc. This is same as *Burgess* indicated in his Concentric Zone Model that, after the CBD there is a zone of low class residents (De Blij 2009). The reason behind the establishment of slums in the surrounding of CBD is the market of yarn and textile which has a much larger hinterland and serves the surrounding cities therefore more labor force is required. In recent years the emergence of slums near the CBD is discouraged due to land use change from residential to commercial area. That is why the slum units established in recent years are only 18% of the total slums in the radius of 4 Km. In the zone of 6 Km radius, 69 out of 110 (62.7%) slums are present. This zone contains 22% more slum units as compared to the zone of 4 Km. The reason behind this is the presence of small scale industry and already inhabited areas. The concentration of the slums is high in western part. The eastern part is covered by the planned colonies and towns on *Jaranwala*, *Canal*, and *Sammundari road*. The zone of 8 Km contains 96 out of 110 (87%) slum units which is 25.5% more than the zone of 6 Km and 47% more than the zone of 4 Km radius. These slums are the result of industrial areas on the urban fringe such as Small Industrial Estate on *Sargodha Road* and the industrial area of *Khurrianwala* on *Faisalabad Shaikhupura*

road. The first 4 Km from the CBD contains 40% slums while the next 4 Km contains 47% slum units. This indicates that the area of 4 to 8 Km proved to be ideal for the establishment of slums due to low land values, core of small scale and cottage industry and already inhabited areas (See Table 2).

Distance from CBD	Year	Total No. of Slums	No. of Slums within 1 Km of major transport lines	Percentage
4KM	1978	25	10	40
	1985	63	30	47.6
	2006	22	4	18.2
	1978-2006	110	44	40
6KM	1978	25	23	92
	1985	63	58	92.1
	2006	22	15	68.2
	1978-2006	110	69	62.7
8KM	1978	25	16	64
	1985	63	44	69.8
	2006	22	9	40.9
	1978-2006	110	96	87.3

Source: Author 2012

CONCLUSION

The study reveals that transport lines, areas which are already inhabited and small scale and cottage industry play a significant role in the establishment of slums. Almost 80% slums in Faisalabad are present along major roads. The high concentration of slums is on *Narwala* road in western part of

the city. Small scale industry plays important role as compared to large scale industry. These were established in the form of clusters such as the areas of *Ghulam Muhammad Abad* or *Maddan Pura* which developed their own cottage industry in *situ*. The large investment in property by land developers and private enterprises effected the pattern of slums as the land values got higher in some specific areas which were in the neighborhood of the slums got developed as the areas of high class residence. The land use change in the vicinity of CBD discouraged the establishment of slums in these areas after the development of larger market. The area of 4 to 8 Km radius from the city center proved to be ideal to attract the establishment of slums.

REFERENCES

1. Kohli, D., Sliuzas, R., Kerle, N. & Stein, A. (2012) An ontology of slums for image-based classification. *Computers, Environment And Urban Systems*, 36, 154-163.
2. UNHSP (2003) The Challenge Of Slums. Global report on human settlement. United Nations Human Settlements Programme.
3. Kit, O., Lüdeke, M. & Reckien, D. (2012) Texture-based identification of urban slums in Hyderabad, India using remote sensing data. *Applied Geography*, 32, 660-667.
4. I. S. D. P. 2001. *Faisalabad city profile and selection of wards*. Integrated Slums Development Programme, Anjman Samaji Behbood (ASB) Faisalabad