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Geo-Spatial Analysis: Identification of the Central Business District of Peshawar, Pakistan

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Abstract

Likewise, other historic cities of Pakistan, Peshawar has two major commercial areas i.e. old city region and Saddar Bazaar. In commercial areas, the Central Business District (CBD) has prime importance, which is the retail heart of a city. Normally, dual cores of the city are present in each city. The cantonment area has suitable grid layout, wide streets & roads and land use planning which make it more dynamic for modern transportation and infrastructure modifications particularly for commercial commuters. The present study is an attempt to identify the CBD of Peshawar using basic characteristics of a CBD. These characteristics are land & rent values, retail volume of sales, vehicular & pedestrian flow, area etc. Using geo-spatial analysis techniques, these characteristics are measured and compared to identify the CBD of Peshawar. The aggregate value of all indicators shows that Saddar Bazaar has 68.25 % value with cumulative probability (% age) of 87.17 %. Saddar Bazaar in cantonment area has no match in these characteristics with old city region and identified as CBD of Peshawar.

Keywords: Geo-spatial, Central Business District (CBD), Commercial Activities, Land & Rent Values, Retailing.

1. Introduction

Central Business District (CBD) is the centre of investment, employment and focus of city transportation network due to large scale retailing activities and number of commuters (Alonso, 1964; Ratcliff, 1949; Zhu et al., 2017). The Peshawar has many commercial centres in which a large number is congested in Old City region i.e. Qissa Khwani Bazaar and Khyber Bazaar (W. Heston, 1986). Development in technology changes the means of transportation and mode of utility services due to which new commercial centres are developed particularly in colonial period (Ali et al., 2018; Arshad et al., 2018). Slowly and gradually, retailing along with other high profile commercial

and offices activities were shifted to the most accessible areas of the city (Lone & Mayer, 2018; Qi et al., 2019). With high potential for the developmental activities, the agglomeration of all sort of commercial activities take place in the Saddar bazaar of the Peshawar (Baig et al., 2016). Consequently, the old city region and Saddar bazaar in the cantonment area both are the commercial core of the city (Mugari & Thabana, 2018; Murphy, 2017). Certainly, the CBD has unique characteristics which distinguish it from the rest of the city area. However, there are no justified criteria to differentiate between CBD and other commercial centres. Geo-spatial analysis method is used for the characterization of CBD. The CBD is identified through cumulative probability technique using the prime characteristics of CBD. The study has major attention for city planners as it provides the basic information regarding site economics, accessibility, trading area, potential & growth, business interception, and land uses. The study the CBD's size, structure and nature has fundamental importance for the understanding of urban functions, forms, structures, morphology, and hierarchy in the city.

The Peshawar City is geographically located $33^{o}43^{/}$ $22.70^{//}$ to $34^{o}11^{/}$ $45.46^{//}$North latitude and $71^{o}21^{/}$ $54.39^{//}$to $71^{o}49^{/}$ $29.34^{//}$ East longitude. Geomorphologically, its soil is composed fluvial deposits of River Kabul and adjust rivers and streams. In North and North-Eastern side of the district Peshawar is situated on fertile flood plain while the South and South-Western part is situated on piedmont plain (Dani, 1995; Hart, 1985; Yousafzai et al., 2008). Peshawar has a semi-arid climate with hot summers & cool winters. In summer and winter, the temperature ranges from 25^{0} to 40^{0}C and 4^{0} to 18^{0}C, respectively (Pakistan Meteorological Department [PMD], 2018). Mostly, the rainfalls occur through western depression and monsoon systems. The population of the city was 4,269,079 in 2017 with an average annual growth rate 3.99% (Government of Pakistan [GoP], 1999; GOP, 2017a). Peshawar is a strategic city located at the entrance of the world famous, Khyber Pass (Hart, 1985). In 382 BC, Herodotus named Peshawar as "Kaspatryous". Peshawar was the centre of Gandhara civilization. It has witnessed the ruling of Afghans, Mughals, Durranis, Sikhs, and British (Rittenberg, 1988). The old city region of Peshawar was enclosed with medieval walls which were made of bricks. Presently due to expansion of city these walls along with their 16 gates have been disappeared. Qissa Khwani Bazaar and Saddar Bazaar are two important commercial centres in the city. Qissa Khwani Bazaar which is located in the old city region has East & Westwards expansion towards Khyber Bazaar, Bazaar Missgran, Chawk Yadgar, Sarfan Bazaar, Clock Tower, Mena Bazaar, Shaheen Bazaar, and Bazaar Kalan (W. L. Heston & Nasir, 1988). The Saddar Bazaar located in Cantonment area. This region has high attraction for the investors due to open roads, space availability, and potential business growth. The rapid vertical and horizontal physical development has been occurred. In West of Peshawar at the distance of 05 kilometres a new commercial area known as *Karkhano* Market has been emerged due to Afghan transit trade. Here, non-custom paid items are available in hundreds of shops. This *Karkhano* Market was a real threat to all commercial centres in the city until government introduced reform in tax system, recently. Consequently, its importance is rapidly declined (Ali et al., 2018). In the presence of these competitive commercial centres, the present study will identify the CBD of Peshawar by using the prime characteristics of CBD as selection parameters.

The dual core commercial centres are most common phenomena in colonial cities i.e. old city centre and cantonment area. The old cities centres were traditional centres of walled

cities with closed or narrow ends for ensuring security, control and limited access to the city's centre. The cantonments were planned in grids with easy accessibility to all corners and large vehicles. Commercial areas in cantonments rapidly developed due to advanced technologies, transportation and increasing needs of population of the cities (Cai et al., 2017; Tali et al., 2012). As a result, the core centre of the cities was transferred from old city centre to cantonment areas. Consequently, the nature and pattern of commercial activities in cities are changed with passage of time(Kachenje et al., 2010; Klotz et al., 2012). However, in absence of adequate data creates ambiguity about CBD of the city in minds of the residents, planners and administrators (Ma et al., 2017; Taubenböck et al., 2013). The present study will identify the CBD of Peshawar using the Geo-spatial analysis technique. In first step, major retail commercial centres in Peshawar will be identified through Geo-spatial analysis. In second step, selected commercial areas will be compared and CBD of the Peshawar city will be identified through spatial analyst in Geographic Information System (GIS). The present study will enhance the capacity of planners, administrators and investors to understand the nature & structure of commercial activities, land & rent value system, and traffic flow in commercial areas of Peshawar and ultimately, sustainable development in the Peshawar city.

2. Literature Review

Malcolm Proudfoot carried out the preliminary and fundamental research in 1937. He studied the city commercial structure and introduced five type of retail structure in U.S.A. These five types of have been named; CBD, the out-laying commercial centre, the commercial exhibitions, the commercial street in neighbourhood, and isolated commercial units. According to Proudfoot (1937), The CBD represents the retail heart of each American city. The CBD has maximum intra city retail sale per unit area (Carter & Rowley, 1966; Proudfoot, 1937). The Murphy definition is the basic essence of this study in which he described the detail Charteris tics of a CBD. "The Central Business District is the retail heart of the city and normally has the tallest buildings. It may be far from centrally located, especially in a seaport or a city logged on a substantial river. But it remains unique in drawing its customers from all parts of the city and areas bordering the city rather than from limited section of the urban area (Shi et al., 2017; Y. Wang & Zacharias, 2015). There are sharply defined intensity areas in the district. The point of maximum intensity, which usually is well known locally: the street intersection around which front-foot land values average highest. This peak land values intersection normally stands out because it is locality with the maximum pedestrian concentration, and, infrequently, the point of greatest vehicular congestion. From this centre, various measures of intensity ordinarily decline in value toward the edge of the city, though more sharply in some directions than in others" (Murphy, 2017; Murphy & Vance Jr, 1954). According to Raymond & Vance (1954), the American city has retail heart which is known as CBD. CBD has the characteristics of high number of offices and retail shops. Most commonly, the tallest buildings and highest land values are recorded in this region of the city (Murphy & Vance Jr, 1954). Similar definition by Briggs, 1974, "The Central Business District is the retail heart of the city and normally has the tallest buildings, drawing its customers from all parts of the city and areas bordering the city rather than from limited section of the urban area". There are sharply defined intensity areas in the district. The point of maximum intensity, which is usually well known locally: the street intersection around which front-foot land values average highest. This peak land values

intersection normally stands out, because it is the region where highest number of pedestrian and vehicular flow is observed (Briggs, 1974). But in general, the tendency is for intensity to decline with distance from the peak value points. In more simple words the CBD can be defined as the region or locality of a city, mostly located in the centre of a city has highest number of retail units, offices, and other commercial along with tallest building concentration and highest land values (Carter & Rowley, 1966).

The spatial layout of the CBD is framed by retailing activities which is found everywhere e.g. skyscraper buildings, frontal row of each street and specialized bazaars. These high raise buildings are prime concern of fire safety, wind storms and tsunami (Amrousi et al., 2018; Ramli et al., 2019; Sambah & Miura, 2019). Here large departmental stores, numerous women and men's clothing shops, furniture, shoe shops, jewellery shops, and similar small bazaars with retailing activities (Mitchell, 2001; Proudfoot, 1937; F. Wang et al., 2014). Added to these, though of subordinate importance, there are numerous drug stores, tobacco stores, restaurants and other store selling convenience goods (Harris & Ullman, 1945). In most cities, the CBD is found at the nodal points where accessibility is no problem for all residents of a city (Osoba, 2012). It is also the centre of social activities and crowd sourcing (Baig et al., 2016). It not necessary that geographically CBD may be located at the centre of the city but easy access and variety of retail services are mandatory in this region. The high land and rent values also attracted the real-estate businesses of the city to CBD (Ratcliff, 1949). Pedestrian and vehicular traffic congestions are very common in this area of the city. All mode of transportation networks is concentrated towards CBD. Commuters from the city and rural urban fringe use these routes for their shopping, offices and recreational activities(Säynäjoki et al., 2014; Zhu et al., 2017). Within CB, the spatial zonation of land uses follows the bid-rent theory, also. Easily accessible places either at ground floor and/or other floors occupied by retailing with highest bid-rent. The offices had low and residential at the lowest bid-rent places like upper floors of a building or corner locations in small streets(Law, 2017; Lia et al., 2015). Similarly, the ratio of land uses follows the same pattern in which retailing occupy most of the proportion, offices are at second and residential at least number (Osoba, 2012; Harris & Ullman, 1945).

3. Methodology

The aim of this study is to identify the CBD of Peshawar by using the prime characteristics as selection parameters through Geo-spatial analysis techniques. Geo-spatial analysis for identification of CBD of Peshawar is carried out in two major steps. In first step, Geo-spatial regions of commercial areas are identified, which were important commercial centres of the Peshawar city. The land values, rent values and volume of retail sale were assigned to these Geo-spatial regions of commercial activities. Using GIS spatial analyst tool, areas of high intensity of commercial activities in Peshawar city were identified. The values of these parameters for geo-spatial analysis are converted to averages of each types. The averages values are normalized in the range of 1 -10 by Norms and Vector Normalization formula (Equation 1).

$$\tilde{y} = \frac{y}{\|y\|} \quad \text{(Equation ...1)}$$

Whereas $\tilde{y}$ is the normalized value, y = a, b, c … n^{th} value,

and $\|y\| = \sqrt{y_a^2 + y_b^2 + y_c^2 + \cdots y_n^2} = 1$

Using Geo-spatial statistics, the probability for the normal distribution of Cumulative Distribution Function (CDF) of multivariate random variables is used for the identification of high retailing areas in the Peshawar City (Equation 2). To simple the process for GIS, the CDF value is converted to percentage value and more than 50% of probability value are selected for detail study of identification of CBD.

$$f(x,u,\sigma) = \frac{1}{\sqrt{2\pi\sigma}}\, e^{-\frac{(x-u)^2}{2\sigma^2}} \qquad \text{(Equation ...2)}$$

Whereas where μ is the mean of the distribution, σ^2 is the variance, and x is the independent variable to evaluate the function, f is normal probability distribution, for CDF calculation x, is the probability that X will take a value less than or equal to x.

In second step, the retail intensity and density, pedestrian and vehicular flow, and pervious parameters are used for selected areas to identify the CBD of Peshawar using the same GIS spatial analyst tool and statistical probability procedure. The highest values are normalized and highest value of CDF for a region is selected as CBD of Peshawar.

The primary data of land values in open market is collected from property dealers, shop owners, and shopkeepers through Focus Group Discussions (FGDs) and structured interviews. The secondary land values data is collected from revenue office, revenue registrar office, Municipal Corporation (MC) Peshawar, and Cantonment Board (CB) of Peshawar. From revenue office the valuation table is collected, which is the bases of all government revenue collection and this table directly influence the price of all sort of property and land. There are hundreds of individual cases of property and land registry in revenue registrar office during a month. A record of these cases particularly of commercial land and property is collected. Only commercial areas registry data is collected and initially two hundred samples were taken, which were rechecked and one hundred samples is tabulated, at last. The table is further modified and averages for each commercial region or bazaar are calculated. From MC Peshawar and CB Peshawar two types of data are collected i.e. details of some premium and valuation tables.

3. Results and Discussion

Based on the methodology, land values, rent values, retail volumes of sales, retail uses, pedestrian and vehicular flow are thoroughly analyzed in different sections. Each section has different steps of methodology and different outcomes. The results of land values, rent values and retail volume are combined in first stage. On described criteria the bazaars are selected which has more CBD characteristics. In second stage, retail volumes of sales, retail uses, pedestrian and vehicular flow as well as the previous characteristics are analyzed for identification of CBD. Results of each section are discussed in detail as follows.

3.1 Land Values

It is the prime principle of all urban land use models and important characteristic of central business district that the peak land values are observed in hard core of central business district. All activities in central business district are directly under influence of land values operating in a specified environment. It is general rule that commercial activities have top priority than other activities like residential, manufacturing, recreational, industrial etc. In commercial activities the retailing activities has top priority than whole-selling and commercial storage, in any operating land values system. From

revenue office Peshawar the valuation table is collected, which has number of localities of Peshawar district from which only commercial localities is selected. The Cantonment has the greatest average values of Rs. 4,776,758 per *Marla* (272 Sq. Feet) and the old city region has Rs. 3,520,555 per *Marla* average values (GOP, 2017b). The strength of the land value decreases from city centre towards outskirts. Although this table is very useful to understand the city land value system. For representation of data on a map, the values are used for whole region and not for specific commercial area. For example, not only the Saddar Bazaar but also the whole cantonment is represented for this value (Figure 1a).

According to Revenue Registrar Office, the Saddar bazaar has the highest land value recorded then the remaining city areas. The table show overall good picture of commercial land values in study area but the samples are directly influenced by valuation table and different location of each sample in different areas (Table 1a). The average land value of is used for whole bazaar and represented separately for Old City region and Saddar bazaar on maps (Figures1b&1c). Important commercial areas are the property of MC Peshawar or CB Peshawar, which gave their land, and property on lease system and the whole open market land value system is directly influenced by the rules and regulation of these authorities. The data is collected in different forms as relating to their shop size, location, agreement, and sailor interests. Most common samples are, taken in any particular area and remaining is excluded from data set. For example, large change in shops size, location most or least favourable and different from local operated land system is excluded from data set. The most similar situation is applied to those data sets, which are changed to present data set. For example, a shop in Qissa Khwani bazaar has price Rs. 15,00,000 with hundred years lease with MC Peshawar and a contiguous shop without lease has price Rs. 20,00,000, so the first shop price is also considered Rs. 20,00,000. Averages for each bazaar is calculated and represented in table (Table 1b). The Saddar bazaar areas of Liqat Bazaar and Saddar Road have the highest land values. Although, this table is the most important and reliable table but the data is influenced by sample size, location of samples, and availability of samples. The data is represented separately for Old City region and Saddar Bazaar on maps (Figures 1d & 1e).

Table 1: Commercial Land Values

S. No.	Location	No. of Registries / Respondents	Av. Price Rs. (000) / Sq. ft.
1	Saddar-Liqat Bazar	3	21.39
2	Saddar-Jinah Street	5	4.93
3	Mohalla Fazel Haq (Androon Sher)	1	4.41
4	Mohalla Shah WaliQital	1	3.75
5	QisaKhawni Bazar	9	3.70
6	Kaffi Market 3rd Floor	1	3.33
7	Namak Mandi	1	3.13
8	Ander Sher	3	3.02
9	Saddar Road	3	2.56
10	Saddar-Tipu Sultan Road	1	2.50
11	Serki Gate	1	2.32
12	Saddar-Mohali Street	2	2.24
13	Pepal Mandi	6	2.17
14	Saddar-Arbab Road	2	2.14
15	Khyber Bazar	8	2.07
16	ChawkYadgar	4	2.04
17	Numbaran Bazar	1	2.00
18	Chawk Nasir Khan	2	1.94
19	Dabgri	3	1.91
20	Jamrud Road	5	1.56
21	Batair Bazar	3	1.44
22	LawarsChawk	1	1.43
23	Jhangeer Pura	5	1.32
24	Shai Bagh Road	2	1.30
25	Saddar Road	3	1.26
26	Islamabad Bazar	1	1.25
27	Kareem Pura	4	1.19
28	Bajori Gate	4	1.19
29	Saddar-Bilour Plaza	3	1.07
30	Nothia	4	0.99
31	Ramdas	1	0.98
32	Ghanj	1	0.90
33	Rati Bazar	2	0.85
34	Mohalla Jhangi	1	0.83
35	TehkalBala	2	0.79
36	DilgaranLani Market	1	0.58
Commercial Land Values (Open Market)			
1	Saddar-Liqat Bazaar	2	30
2	Saddar Road	5	30
3	Ashraf Road Bazaar	2	28
4	QissaKhawani	6	25

5	Khyber Bazaar	7	22
6	Saddar-FawaraChawk	3	20
7	Saddar-Sonheri Masjid Road	2	18
8	Saddar-Tipu Sultan Road	2	18
9	Chowk Yadgar	2	15
10	Shoba Bazaar	3	15
11	Ander Sher Bazaar	4	13
12	Hashtnagri Bazaar	3	12
13	Misgran Bazaar	2	12
14	Bajori Bazaar	3	12
15	Lahore Bazaar	2	11
16	Pipal Mandi Bazaar	3	11
17	Jamrud Toad (town)	4	10
18	Shaheen Bazaar	2	10
19	Dabgari Bazaar	3	10
20	Peer Bazaar	2	8
21	Bazazan Bazaar	3	8
22	Jehangir Pur Bazaar	4	8
23	Sarki Bazaar	2	8
24	Gunj Bazaar	3	7
25	Kareem Pura	4	7
26	Shaheen Bazaar	2	7
27	Mochi Pura Bazaar	3	7
28	Ghanta Ghur	3	6
29	Kochi Bazaar	2	6
30	Qasban Bazaar	1	6
31	Tahir Wardi Bazaar	3	6
32	Barha Bazaar	1	6
33	Ramdass Bazaar	3	6
34	Jamrud Road (Tehkal)	5	5
35	Yaktoot Bazaar	3	5
36	Kalan Bazaar	2	5
37	Mochi Lara Bazaar	2	5
38	Batair Bazaar	2	5
39	Islamabad Bazaar	2	5
40	G.T.Road Bazaar	7	5
41	Jhonda Bazaar	3	4
42	Chani Koban Bazaar	3	4
43	BoriBafan Bazaar	1	4
44	Jattan Bazaar	2	4
45	Bacu Shah Bazaar	2	4
46	Muslim Mena Bazaar	3	3
47	Rati Bazaar Bazaar	2	3

Source: Field Survey Data, 2015 (Revenue Registrar Office & Open Market)

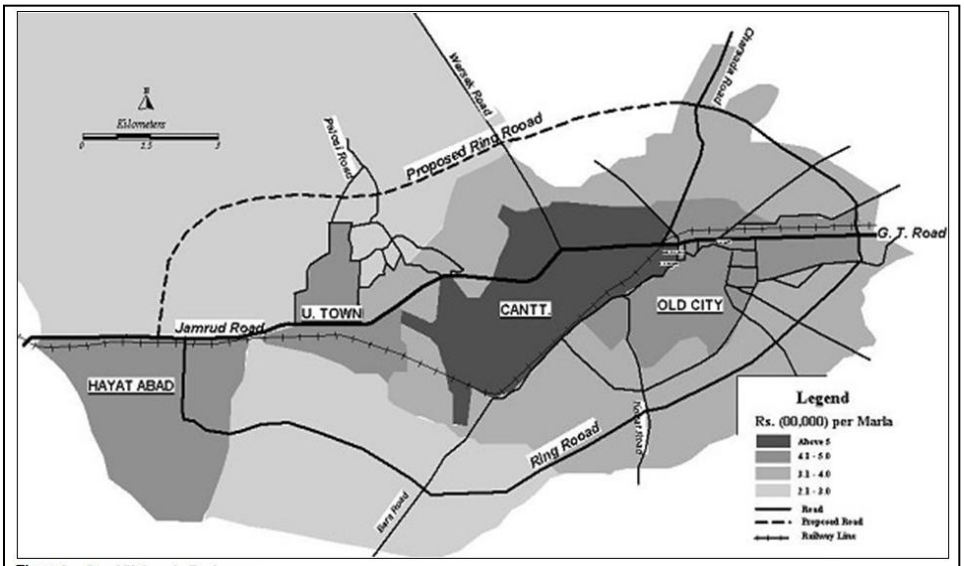

Figure 1a: Land Values in Peshawar
Source: Federal Board of Revenue (FBR), Islamabad, 2017

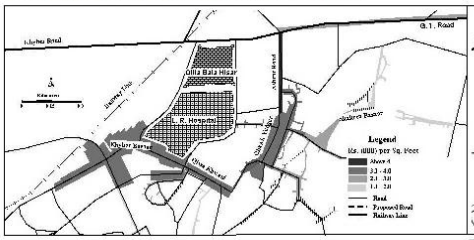

Figure 1b: Land Values Peshawar (Old City and Surrounding)
Source: Revenue Registrar Office Peshawar, 2015

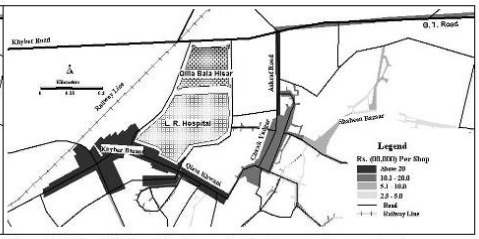

Figure 1d: Land Values Peshawar (Old City and Surrounding)
Source: Field Survey Data, 2015 (Open Market)

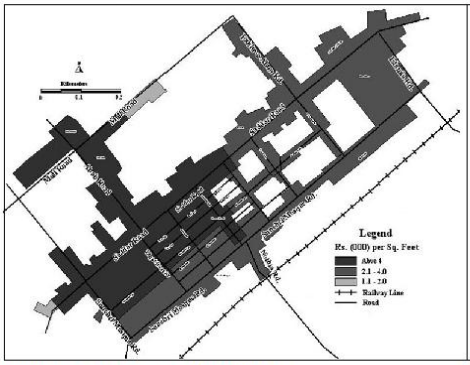

Figure 1c: Land Values Peshawar (Saddar)
Source: Revenue Registrar Office Peshawar, 2015

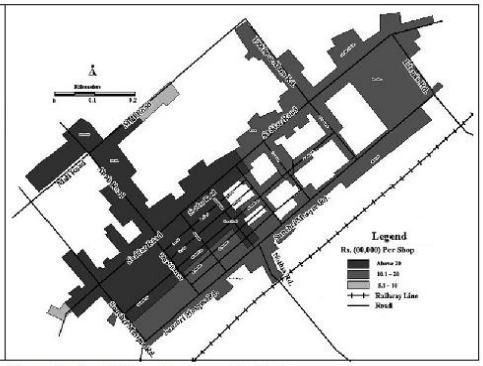

Figure 1e: Land Values Peshawar (Saddar)
Source: Field Survey Data, 2015 (Open Market)

3.2 Rent Values

Traditionally the location of economic activities in the city has been seen in terms of the bid-rent model, which shows the rent-paying abilities of different types of activities (Alonso, 1994). Rent is highest in the centre and decline with distance from centre. The rent values are collected from open market, MC Peshawar, and CB Peshawar. The open market data is collected from property dealers, shop owners, and shopkeepers. From MC

Peshawar and CB Peshawar, detail of some premium is collected in which land price, duration, and rent are present. The MC Peshawar and CB Peshawar rent values system is not applicable because there are various factors like premium, duration of premium, new developed areas, old customers benefit, and other relaxation for specific community, which influenced the rent value system of these authorities. The open market data is collected for different localities and most common samples are taken. The averages for each locality are calculated and represented in table (Table 2). The rent values are highest in Saddar bazaar and then in wholesaling centre i.e. Ashraf road. The advance, pagri, and premium systems are direct limitation of open market rent values system, which are co-related or substituted by different values. The data is represented separately for Old City region and Saddar bazaar on maps (Figures 2a, 2b, 2c, 2d, 2e).

Table 2: Rent Values Peshawar (Open Market)

S.No.	Location	No. of Respondents	Average Rent / Month Rs. (000)
1	Saddar- Bilour Plaza	2	30
2	Saddar-Road	6	30
3	Saddar-Arbab Road	4	27
4	Ashraf Road Bazaar	2	25
5	Khyber Bazar	7	25
6	Saddar-Shafi Market	7	25
7	Ander Sher Bazaar	6	20
8	Saddar-Tipu Sultan Road	3	20
9	Khyber Bazar-Karachi market	2	15
10	QissaKhawani Bazar	6	15
11	Saddar-FawaraChawk	3	15
12	Saddar-Sonheri Masjid road	4	15
13	Pipal Mandi Bazaar	2	15
14	Hashtnagri Bazaar	2	10
15	Khyber Bazar-Shoba	3	10
16	Saddar-Jinnah Street	5	10
17	Saddar-Liqat Bazar	4	10
18	Misgran Bazaar	2	10
19	Bajori Bazaar	3	8
20	Saddar-Road FawaraChawk	2	8
21	Shaheen Bazar	3	8
22	Chowk Yadgar	2	4
23	Dabgari Bazaar	3	4
24	Ghanta Ghur	4	4
25	Jamrud Road- Qazi Motors	5	4
26	Jhonda Bazar	3	4

27	Kareem Pura	3	4
28	Jamrud Road- City Tower	4	3
29	Kochi Bazar	2	3
30	Lahore Bazaar	2	3
31	Batair Bazaar	4	2
32	Chowk ShadiPir	2	2
33	Jamrud Road Spinzar-Plaza	4	2
34	Jehangir Pur Bazaar	4	2
35	Near Masjid Qasim Ali.	2	2
36	Mochi Pura Bazaar	4	2
37	Rati Bazaar Bazaar	3	2
38	Gunj Bazaar	3	1
39	Ramdass Bazaar	5	1

Source: Field Survey Data, 2015 (Open Market)

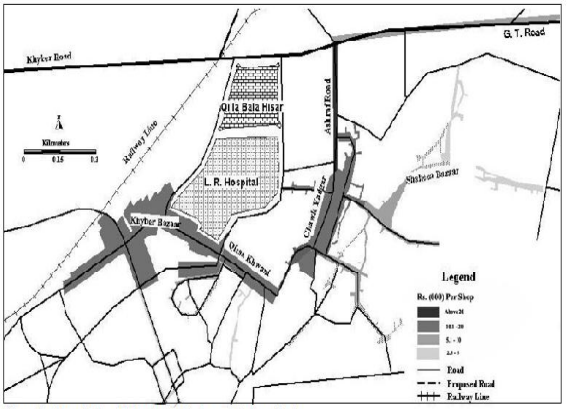

Figure 2a: Rent Values Peshawar (Old city and Surrounding)
Source: Field Survey Data. 2015 (Open Market)

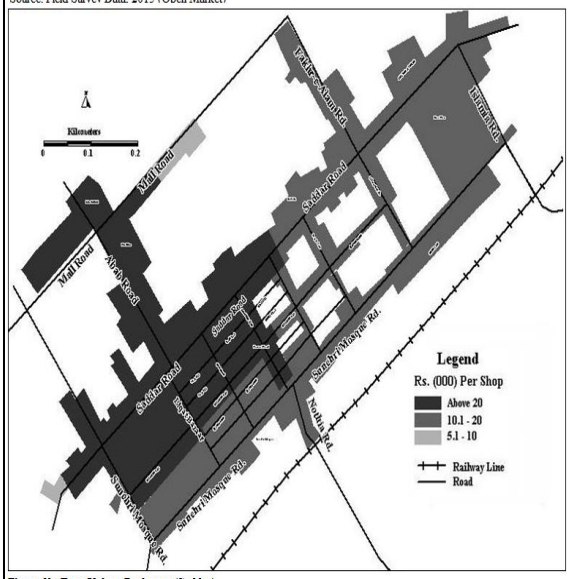

Figure 2b: Rent Values Peshawar (Saddar)
Source: Field Survey Data, 2015 (Open Market)

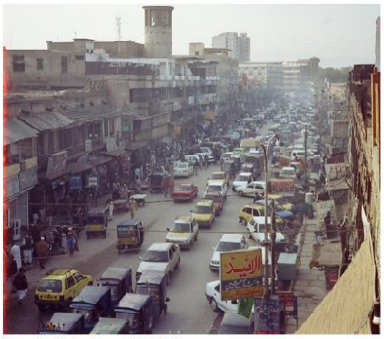

Figure 2c: Khyber Bazaar (Old City)

Figure 2d: Saddar Road

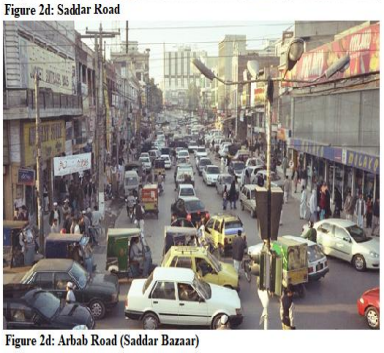

Figure 2d: Arbab Road (Saddar Bazaar)

3.3 Retail Volume of Sales

The city performed different types of commercial function in which the retail has the highest priority for any location. But the most suitable and compatible location is the CBD. Retail activity is present almost everywhere in the city but at highest scale in CBD. The retail volume of sale data is collected from two main sources i.e. the Federal Board of Revenue (FBR), Islamabad and Income Tax Office, Peshawar. From FBR Islamabad the general sale tax survey data is collected, which contain different categories of items of different location and nature. Only those areas data are tabulated that performed retail function and all that areas where mostly wholesale or light manufacturing is present are excluded from the table for example the Ashraf road has high sale value but the dominant function is wholesaling there, similarly in Jhangir Pura light manufacturing with seasonal shifting is dominantly practice. Separate table for important bazaar is made in which important retail activity with their average retail volume of sale and number of shops of

that activity is tabulated. At the end of table total shops number, total retail volume of each items and overall average for that bazaar is calculated (Table 3a, 3b, 3c, 3d, 3e, 3f& 3g). The choosing of important retail activity and converting of all units to an average value are major limitation of this table. However, high value difference between different bazaars retail volume of sale make negligible this limitation.

Table 3: Volume of Retail Sale (Annual)

S.No.	Retail Items	No. of Shops	Total Retail Sale (Rs.)	Average Retail Sale (Rs.)
3a: Volume of Retail Sale (Annual) of Sadar Bazaar				
1	Fashion Commodities Shops	11	50105000	4555000
2	Books & Stationary Shops	7	24171000	3453000
3	Shoes Shops	4	13308000	3327000
4	Automobile Shops	4	9424000	2356000
5	Cloth's & Garments Shops	15	30675000	2045000
6	Medicines Shops	3	4680600	1560200
7	Household-ware Shops	6	5410800	901800
8	Food Shops	8	6952000	869000
9	General Order	16	5619200	351200
10	Hotels	10	3205000	320500
11	Jewellery Shops	4	1221600	305400
12	Electronic Shops	5	1375000	275000
13	Travelling Agencies	3	750000	250000
14	Photo Labs.	2	388000	194000
	Total	**98**	**157285200**	**1604951.02**
3b: Volume of Retail Sale (Annual) of Khyber Bazaar				
1	General Order	10	33200000	3320000
2	Shoes Shops	2	3760000	1880000
3	Medicines Shops	8	14080000	1760000
4	Cloth's & Garments Shops	2	2420000	1210000
5	Household-ware Shops	5	5375000	1075000
6	Books & Stationary Shops	2	2040000	1020000
7	Hotels	2	418000	209000
8	Automobile Shops	18	3690000	205000
9	Travelling Agencies	3	585000	195000
10	Food Shops	4	492000	123000
11	Photo Labs.	1	103000	103000
	Total	**57**	**66163000**	**1160754.386**

3c: Volume of Retail Sale (Annual) of Qissa Khawani Bazaar				
1	Electronic Shops	4	12160000	3040000
2	Shoes Shops	4	5140000	1285000
3	Books & Stationary Shops	15	19200000	1280000
4	Cloth's & Garments Shops	2	2460000	1230000
5	Household-ware Shops	2	2180000	1090000
6	Medicines Shops	3	1410000	470000
7	Hotels	3	576000	192000
8	Food Shops	3	546000	182000
9	General Stores	6	900000	150000
10	Photo Labs.	2	290000	145000
	Total	**44**	**44862000**	**1019590.909**
3d: Volume of Retail Sale (Annual) of Ander Sher Bazaar				
1	Jewellery Shops	23	18515000	805000
2	Medicines Shops	2	900000	450000
	Total	**25**	**19415000**	**776600**
3e: Volume of Retail Sale (Annual) of Jhonda Bazaar				
1	Cloth's & Garments Shops	10	8060000	806000
2	Fashion Commodities Shops	3	1140000	380000
3	Shoes Shops	3	630000	210000
4	Food Shops	1	105000	105000
	Total	**17**	**9935000**	**584412**
3f: Volume of Retail Sale (Annual) of Jamurd Road Bazaar				
1	Automobile Shops	3	9210000	3070000
2	Fashion Commodities Shops	2	4160000	2080000
3	Books & Stationary Shops	2	2100000	1050000
4	General Stores	4	3720000	930000
5	Shoes Shops	4	2008000	502000
6	Jewellery Shops	2	900000	450000
7	Household-ware Shops	6	2490000	415000
8	Hotels	2	604000	302000
9	Cloth's & Garments Shops	5	1350000	270000
10	Food Shops	6	1380000	230000
11	Electronic Shops	8	1648000	206000
12	Medicines Shops	5	750000	150000

13	Travelling Agencies	2	300000	150000
14	Photo Labs.	2	214000	107000
	Total	**53**	**30834000**	**581774**
3g: Volume of Retail Sale (Annual) of All Selected Bazaars				
1	Saddar Bazaar	98	157285200	**1604951**
2	Khyber Bazaar	57	66163000	**1160754**
3	QissaKhawani Bazaar	44	44862000	**1019591**
4	Ander Sher Bazaar	25	19415000	**776600**
5	Jhonda Bazaar	17	9935000	**584412**
6	Jamrud Road	53	30834000	**581774**

Source: FBR, Islamabad and Income Tax Office, Peshawar, 2015

3.4 Selection of Bazaars for CBD of Peshawar

Each map of land values, rent values, and volume of retail sale are in equal strength for the selection of high intensity area. The high intensity area means where these values are present in highest level. The dark color of the region is the indicator of intensity level. After CDF value calculation for each bazaar, two levels are used in selection of high intensity area i.e. low and high. High intensity areas values are assigned with more than 50% of CDF value while less than 50% CDF value are assigned to low intensity areas. All the maps are simultaneously open into a single map in which two main areas of high intensity were identified i.e. Qissa Khawni & Khyber Bazaar and Sadder Bazaar (Figure 3). The extended analysis for the CBD of Peshawar is carried out for these two commercial areas.

Table 4a: Average Values of the Indicators for Selection of CBD (Rs.)

S N	Name of Bazaar	Revenue Land Values (/Sq. ft.)	Open Market Land Values (/Sq. ft.)	Rent Values / Month (Open Market)	Annual Retail Sale
1	Saddar	5800	29000	28000	1604951
2	Khyber	2500	22000	25000	1160754
3	Qissa Khawani	3700	25000	15000	1019591
4	Ander Sher	3020	13000	20000	776600
5	Jhonda	1300	6000	8000	584412
6	Jamrud	1600	6000	8000	581774
Table 4b: Normalized Values of the Indicators for Selection of CBD					
1	Saddar	5.02	3.84	3.63	4.12
2	Khyber	0.93	2.21	2.89	2.16
3	Qissa Khawani	2.04	2.85	1.04	1.66
4	Ander Sher	1.36	0.77	1.85	0.97
5	Jhonda	0.25	0.16	0.30	0.55
6	Jamrud	0.38	0.16	0.30	0.54

Table 4c: Cumulative Probability Analysis of the Indicators for Selection of CBD					
S N	**Name of Bazaar**	**Aggregate Values**	**Cumulative Probability**	**Probability (% age)**	Average of Aggregate Values = 6.67
1	Saddar	16.61	0.96	95.95	
2	Khyber	8.19	0.61	60.52	
3	Qissa Khawani	7.60	0.56	56.50	Standard Deviation of Agg. Values = 5.70
4	Ander Sher	4.95	0.38	38.14	
5	Jhonda	1.26	0.17	17.13	
6	Jamrud	1.38	0.18	17.69	

Source: FBR, Islamabad, Income Tax Office, Peshawar, Revenue Registrar Office & Open Market, 2015

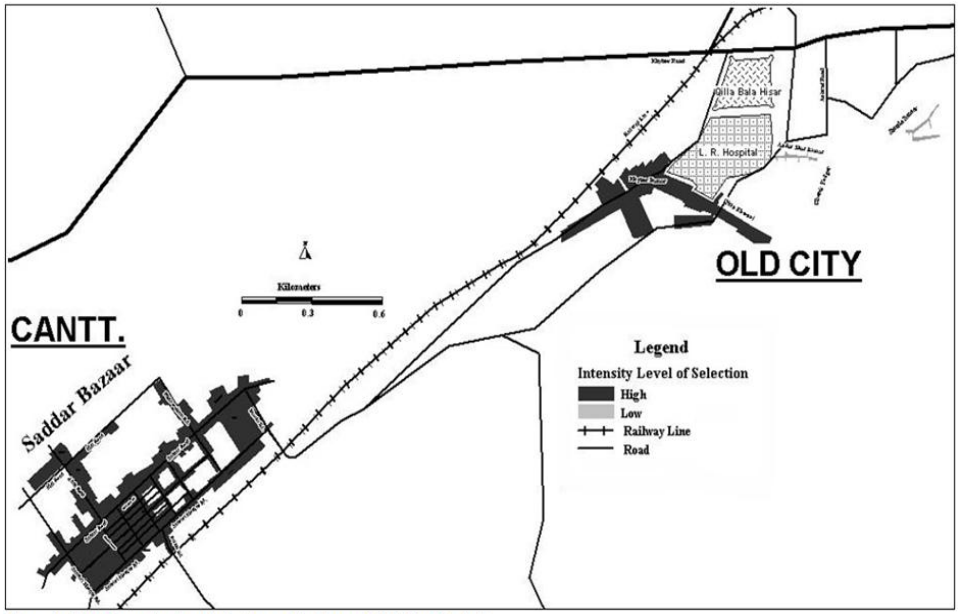

Figure 3: High Intensity Area in Peshawar (Saddar and Old City Region)

3.5 Retail Uses

For the retail use intensity and density profile method of survey of land use is carried out in which each building and blocks are mapped. The total number of units of CB uses and non-CB uses are calculated. Here the word retail is used for all CB uses activities. The intensity of both bazaars areas is calculated and tabulated in a table (Table 5a). The density of retail uses in each area of both bazaars is calculated by total number of CB uses units divided by total area of a region. The values of retail use density for both bazaars are tabulated in a table (Table 5b).

Table 5: Retail Use Density/ Intensity of Qissa Khawani, Khyber, and Saddar Bazaar

5a: Retail Use Density of Qissa Khawani, Khyber, and Saddar Bazaar			
S.No.	**Name of Bazaar**	**Total Units**	**C.B. Uses Units**

1	Qissa Khawani	203	166
2	Khyber	1167	785
3	Saddar	9375	6855

5b: Retail Use Intensity of Qissa Khawani, Khyber, and Saddar Bazaar

S.No.	Name of Bazaar	Total Area (sq. yards)	Total Area (*Marlas*)	C.B. Uses Units	Density (units / Marla)
1	Qissa Khawani	15463.22	511.65	166	0.32
2	Khyber	85060.10	2814.49	785	0.28
3	Saddar	309500.00	10240.81	6855	0.67

Source: Field Survey Data, 2015

3.6 Pedestrian and Vehicular Flow

The concepts of accessibility and interaction are closely linked to land value. For land to be useful for commercial purposes, accessibility is vital. Multipurpose shopping trips and comparison-shopping are done most efficiently when driving and walking are minimized. Minimization of effort occurs best in shopping centers, and the best location of centre is at points of convergence of connectivity in the street and highway network. These complementary conditions put a definite premium on more accessible locations that are essential for profitable in certain business. The CBD has the highest pedestrian and vehicular flow.

In the Khyber and Qissa Khwani bazaar, the vehicular and pedestrian was counted at six entrance-exit points. The Saddar Bazaar is in grid shape and has more entrance-exit points. Therefore, 10 enclosed points are selected for the survey. To avoid weekend and holyday rush, Tuesday, Wednesday, and Thursday are selected for the survey. Commuters peak hours are different for both bazaars and these peaks hours timings are selected for survey. In summer season, the commuter's peak hours in Saddar Bazaar was 6 - 7 p. m. and 10 - 11 a.m. in the Qissa Khwani and Khyber bazaar. Looking to the convenience, the traffic flow was recorded in camera for different time period. However, at the end, 5 minutes average value was calculated for each entrance point. These survey points are shown on two maps (Figure 4a & 4b). In pedestrian survey, male, female, and kids are counted separately. Similarly, the in and out data of pedestrian are also calculated separately (Table 6a & 6b). The most common type of vehicular in these bazaars are bus, motorcar, van, motorcycle, motor-rikshaw, *tanga*, etc. All survey points vehicular data for these three bazaars are calculated (Table 6a & 6b). At both end of a bazaar or a region the pedestrian and vehicular count is converted to an average value (Table 7). The pedestrian and vehicular flow is much higher in Saddar bazaar than in Qissa Khwani& Khyber bazaar.

Table 6: Pedestrian and Vehicular Flow

6a: Pedestrian and Vehicular Flow at Qissa Khawani And Khyber Bazaar					
Location	**Name**	**Status**	**Pedestrian**	**Female**	**Vehicular**
1	Qissa Khawani - Missgran End	In	100	10	10
1	Qissa Khawani - Missgran End	Out	80	20	55
2	Qissa Khawani - Jhangirpura	In	25	5	5
2	Qissa Khawani - Jhangirpura	Out	25	10	8
3	Qissa Khawani - Kabali Door	In	150	30	70
3	Qissa Khawani - Kabali Door	Out	120	20	0
3	Khyber Bazaar - Kabali Door	In	130	10	105
3	Khyber Bazaar - Kabali Door	Out	200	30	110
3	Cinema Road - Kabali Door	In	140	10	50
3	Cinema Road - Kabali Door	Out	70	20	20
4	Cinema Road - Last End	In	25	5	25
4	Cinema Road - Last End	Out	40	10	25
5	Khyber Bazaar - Shoba Chawk	In	120	20	115
5	Khyber Bazaar - Shoba Chawk	Out	100	20	125
5	Khyber Bazaar - Hospital Road	In	3	0	85
5	Khyber Bazaar - Hospital Road	Out	70	20	160
5	Shoba Chawk - Khyber Bazaar	In	140	20	120
5	Shoba Chawk - Khyber Bazaar	Out	90	20	230
6	Khyber Bazaar - Shoba Bazaar	In	30	0	10
6	Khyber Bazaar - Shoba Bazaar	Out	50	0	80
6	Khyber Bazaar - Sooray Bridge	In	5	0	160
6	Khyber Bazaar - Sooray Bridge	Out	5	0	10
6	Khyber Bazaar - Namak Mandi	In	40	5	10
6	Khyber Bazaar - Namak Mandi	Out	50	10	10
6b: Pedestrian and Vehicular Flow at Saddar Bazaar					
1	Arbab Road - Mall Road	In	15	5	70
1	Arbab Road - Mall Road	Out	15	7	60
2	Saddar Road - Stadium Road	In	210	80	85
2	Saddar Road - Stadium Road	Out	125	55	75
2	Stadium Chawk - Sunehri M. Rd.	In	120	60	125
2	Stadium Chawk - Sunehri M. Rd.	Out	120	55	100
2	Stadium Chawk - Stadium Road.	In	200	70	125
2	Stadium Chawk - Stadium Road.	Out	110	55	85
3	Tipu Sultan Rd. - Sunehri M. Rd.	In	130	70	0
3	Tipu Sultan Rd. - Sunehri M. Rd.	Out	140	75	0
4	Tipu Sultan Rd. - Sunehri M. Rd.	In	250	130	20
4	Tipu Sultan Rd. - Sunehri M. Rd.	Out	260	130	20
4	Tipu Sultan Rd. - FawaraChawk	In	155	75	25
4	Tipu Sultan Rd. - FawaraChawk	Out	160	75	10
4	Tipu Sultan Rd. - Kabari Bazaar	In	130	60	35

4	Tipu Sultan Rd. - Kabari Bazaar	Out	145	75	40
4	Tipu Sultan Rd. - Liqat Bazaar	In	225	125	55
4	Tipu Sultan Rd. - Liqat Bazaar	Out	230	125	50
5	Liqat Bazaar - Saddar Road	In	245	135	55
5	Liqat Bazaar - Saddar Road	Out	235	130	50
5	Arbab Road - Saddar Road	In	120	62	80
5	Arbab Road - Saddar Road	Out	110	52	65
5	Saddar Road - Arbab Road	In	210	115	90
5	Saddar Road - Arbab Road	Out	130	70	125
6	Tipu Sultan Rd. – Fawara Chawk	In	105	55	20
6	Tipu Sultan Rd. – Fawara Chawk	Out	90	40	0
6	Tipu Sultan Rd. - Liqat Bazaar	In	135	65	20
6	Tipu Sultan Rd. - Liqat Bazaar	Out	135	65	0
6	Tipu Sultan Rd. - Jinnah Street	In	175	95	0
6	Tipu Sultan Rd. - Jinnah Street	Out	105	50	0
6	Tipu Sultan Rd. - Kabari Bazaar	In	110	0	0
6	Tipu Sultan Rd. - Kabari Bazaar	Out	180	15	0
7	Jinnah Street - Tipu Sultan Rd.	In	150	70	0
7	Jinnah Street - Tipu Sultan Rd.	Out	140	70	0
7	Jinnah Street - Saddar Road	In	220	120	0
7	Jinnah Street - Saddar Road	Out	220	125	0
7	Jinnah Street - Liqat Bazaar	In	105	50	0
7	Jinnah Street - Liqat Bazaar	Out	100	50	0
7	Jinnah Street - Holy Street	In	150	85	0
7	Jinnah Street - Holy Street	Out	155	90	0
8	Sunehri M. Rd. - Nothia	In	225	150	20
8	Sunehri M. Rd. - Nothia	Out	210	105	25
9	Sunehri M. Rd. - Nothia (Stop)	In	270	150	120
9	Sunehri M. Rd. - Nothia (Stop)	Out	150	90	135
10	Saddar Road - F. Alam Road	In	90	40	100
10	Saddar Road - F. Alam Road	Out	70	30	130
6c: Average Pedestrian and Vehicular Flow					
1	**Qissa Khawani Bazaar**	In	275	46	85
		Out	225	50	63
		Average	**250**	**48**	**74**
2	**Khyber Bazaar**	In	233	20	395
		Out	415	70	395
		Average	**324**	**45**	**395**
3	**Saddar Bazaar**	In	1670	820	555
		Out	1530	722	565
		Average	**1600**	**771**	**560**

Source: Field Survey Data, 2015

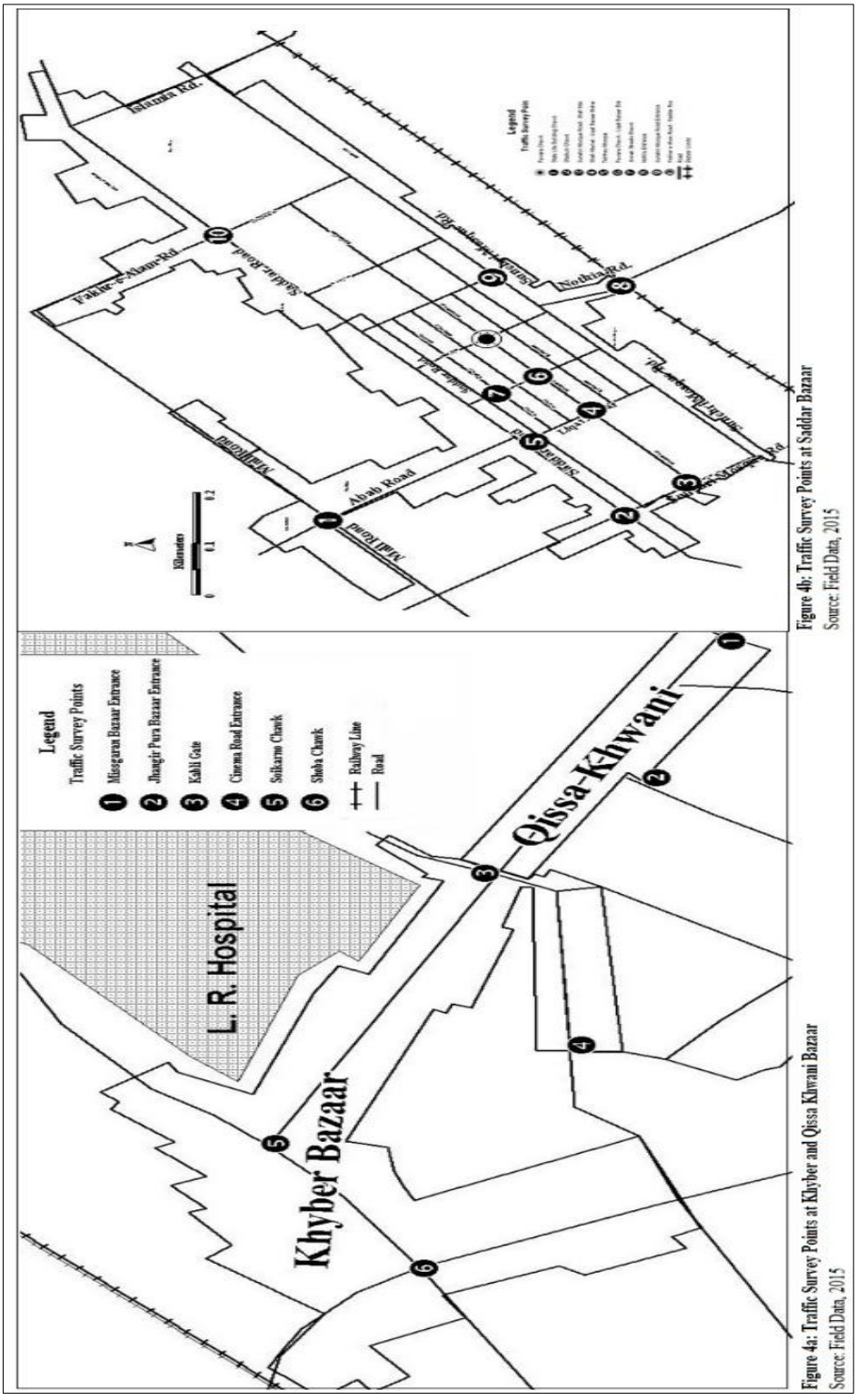

Figure 4a: Traffic Survey Points at Khyber and Qissa Khwani Bazaar
Source: Field Data, 2015

Figure 4b: Traffic Survey Points at Saddar Bazaar
Source: Field Data, 2015

3.7 The Central Business District of Peshawar

For the selection of CBD of Peshawar all parameters i.e. land values, rent values, volume of retail sale, intensity and density of retailing, pedestrian flow and vehicular flow are compared and area where these values are in highest number is selected. The comparative values of Saddar Bazaar with Qissa Khwani and Khyber Bazaar are given in a table (Table 7). All the values are normalized in the range of 1 – 10. The CDF of probability was calculated for all three bazaars then converted to age CDF values (Table 8). The highest CDF age value is assigned to high intensity area/region and rest of values to low intensity areas/regions in GIS. All the maps are simultaneously open into a single map (Figure 5) in which identified the area of high intensity i.e. the Sadder Bazaar. This Saddar Bazaar is the CBD of Peshawar. The Saddar Bazaar has highest values in all tables. Similarly, in all map layers it is the area of high intensity. The Saddar Bazaar has the largest commercial area, CB uses units, retail density, retail volume of sale, vehicular and pedestrian flow, rent values and land values.

Table 7: Comparison of Important Parameters of Selected Bazaars

S. No.	Parameters	Unit	**Saddar**	Khyber	Q. Khawani	Jhonda	A. Sher	Jamrud Rd.
1	Total Area	Sq. Yards	**309500**	85060	15463	1971	2905	131143
2	Total Retail Units	No. of Shop	**6855**	785	166	0	0	0
3	Open Market Land Value	Rs. Per Shop (Highest)	**3000000**	2200000	2500000	400000	1300000	1000000
4	Registrar Office Land Value	Rs. Per Sq. Feet (Highest)	**21390**	2070	3700	0	3020	1560
5	Open Market Rent Value	Rs. Per Shop (Highest)	**30000**	25000	15000	4000	20000	4000
6	Volume of Retail Sale	Av. Retail Sale (Annum)	**1604951**	1160754	1019591	584412	776600	581774
7	Total Pedestrian Flow	Av. Of In & Out (Per 5 min.)	**1600**	324	250	0	0	0
8	Total Vehicular Flow	Av. Of In & Out (Per 5 min.)	**560**	395	74	0	0	0

Table 8: Normalized Values and Cumulative Probability Analysis for CBD of Peshawar						
SN	Parameters	Unit	Saddar	Khyber	Q. Khawani	Average of Agg. Values = 38.51
1	Total Area	Sq. Yards	9.63	2.65	0.48	
2	Total Retail Units	No. of Shop	9.93	1.14	0.24	
3	Open Market Land Value	Commercial (Highest)	6.69	4.91	5.58	
4	Registrar Office Land Value	Rs. Per Sq. Feet (Highest)	9.81	0.95	1.70	
5	Open Market Rent Value	Commercial (Highest)	7.17	5.98	3.59	
6	Volume of Retail Sale	Av. Retail Sale (Annum)	7.20	5.21	4.58	Stand. Deviation of Agg. Values = 26.22
7	Total Pedestrian Flow	Av. Of In & Out (/5 min.)	9.69	1.96	1.51	
8	Total Vehicular Flow	Av. Of In & Out (/5 min.)	8.12	5.73	1.07	
		Aggregate Value	68.25	28.52	18.75	
		Cumulative Probability	0.87	0.35	0.23	
		Probability (% age)	**87.17**	35.16	22.55	

Source: FBR, Islamabad, Income Tax Office, Peshawar, Revenue Registrar Office & Open Market, 2015

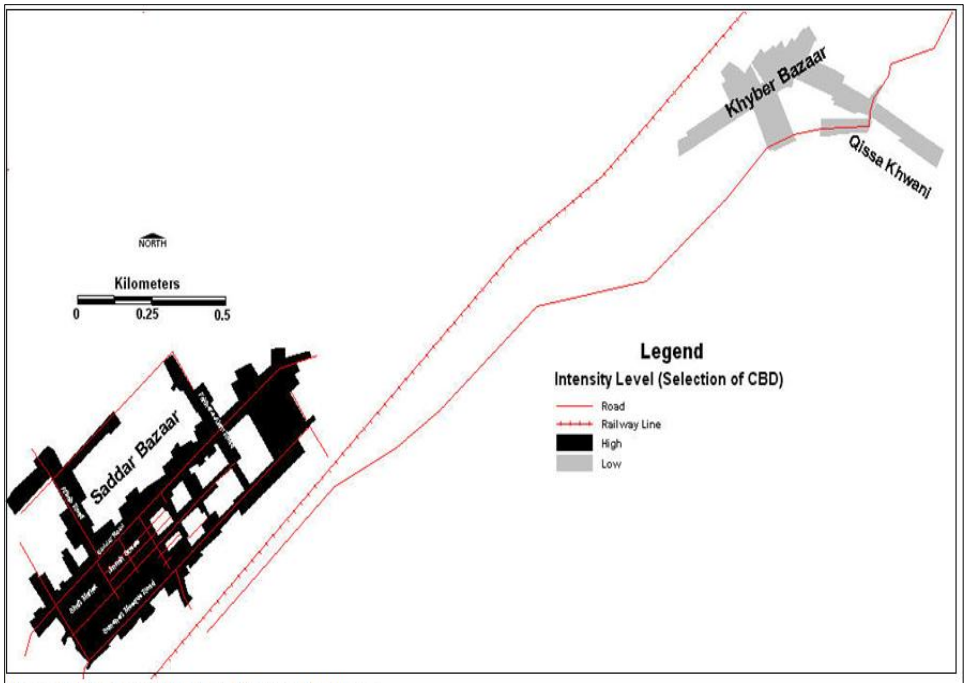

Figure 5: The Central Business District of Peshawar
Source: Field Data, 2015

4. Conclusion

CBD is the centre of employment, investment, and focus of city transportation network. The Peshawar has two major and other small commercial centres. The old city region has contiguous bazaars in small streets with poor accessibility. However, Qissa Khwani Bazaar and Khyber Bazaar had large area with better accessibility, comparatively. Industrial revolution brought major changes in cities. Most importantly, new commercial centres with better accessibility were emerged which has no match with old commercial centres. However, there are no justified criteria to differentiate between CBD and other commercial centres. The present study not only identify the CBD of Peshawar but also provides the basic information about trading area potential & growth, business interception, site economics and accessibility to central area. All the characteristics of the CBD i.e. land & rent values; retail uses & volume of sales; and pedestrian & vehicular flow were assessed by geo-spatial technique. With equal weightage of each indicator, cumulative probability was applied.

It was found that the operating land value system was very complex in Cantonment area and also in old city region. In majority areas land was the property of government, which is either in direct control of CB Peshawar and MC Peshawar or given to other person or party on lease. The personal property was present on small scale. The value of land was directly affected by these factors and their value is judged by the lease time, owner and purchaser agreement on these issues. The analysis revealed that two prominent type of rent value system is operating in the study area. In first type, advance of two or three years is given to owner and rent is fixed for these years. It is known as "advance rent system". This situation was most common in Jamrud road area and new rent agreement between land owner and tenants in Saddar area. In second type, which is old and

traditional system, the non-refundable advance is given to owner and there is small amount of monthly rent. The duration is unlimited in most cases. This system is known as "*pagri* system".

The data revealed that the Saddar bazaar has the largest bazaar area of 309500 Sq. yards as compare to Qissa Khwani (15463 sq. yards) and Khyber bazaar (85060 sq. yards). Under specific activity of retailing the area is much higher than these figures. The Saddar bazaar has the largest number of retail stores which shows a huge difference between this area and any other area. The total number was 6855, which was much higher than Khyber bazaar (785) and Qissa Khwani bazaar (166). This makes the major difference between Saddar bazaar, Qissa Khwani bazaar, and Khyber bazaar. The analysis revealed that most of the old city region has been converted into wholesale trading area. Each bazaar was popular for their own special trade. In Qissa Khwani the books and stationary wholesale business was predominant while in Khyber bazaar the medical, sanitary, electric tools, hardware, and carpet wholesale trade was very common. Retail activity was partially practised mostly through road side vendors. The highest pedestrian flow was observed in Saddar area. Per five minute the average 'in' and 'out' of Saddar bazaar was observed to be 1600 persons while the figure was much smaller in Khyber bazaar and Qissa Khwani bazaar which was 324 and 250 persons in each. The highest vehicular flow was observed in Saddar bazaar area, which were 560 vehicles per five minutes total average of 'in' and 'out'. The Khyber bazaar has the figure of 395 vehicles and Qissa Khwani has only 7.4 vehicles per five minutes of total average of 'in' and 'out'. If the public transport vehicles were excluded from count the difference was much higher than observed. The second important factor was the entrance point number, which was greater in Saddar, and has large parking capacity. The Saddar bazaar is easily accessible for the whole city.

The normalized values of all indicators were used in final analysis for the identification of the CBD of Peshawar. The Saddar bazaar has the highest normalized values for all indictors with highest cumulative probability of 0.87 (87.17%). The analysis identified Saddar bazaar as the Central Business District of Peshawar. It was the retail heart of the city where maximum retail activity was carried out. The highest pedestrian and vehicular flow were observed in this area. It is also the area of highest land and rent values.

4.1 Outcomes and Recommendations

The present study has two major outcomes i.e. identification of CBD of Peshawar and development of methodology for the analysis of commercial activities which is based on geospatial statistics. The first one has immediate interest for the city planners, economists, businessmen and investors as the CBD play vital role in the city daily commuter life. The second aspects of methodology provide a new platform for researcher to improve the knowledge regarding businesses, geospatial analysis, economic activities and city economic & physical development as well as their interrelationships. Based on Sustainable Development Goals (SDGs) of sustainable cities and economic growth, the CBD has prime role in achieving these two goals. Therefore, the CBD should be more intensively studies from multidisciplinary aspects to achieve the better understanding of city economics and their development.

4.2 Limitations / Future Research

The CBD has huge list of characteristics. All characteristics and/or indicators are not possible to be incorporated in a single study. Therefore, the basic criterion for the selection was its literature review for its definition. Similarly, equal weightage for all indicators was used which can be modified in future studies based on the structure and

nature of CBD. The technique used in this study will provide a new outlook for the hierarchy of city functions and understanding the bid-rent system in the CBD. This tool can be easily used in any multi-stakeholder system analysis.

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