

## Empirical Evidence on Analysing the Quality of Life of Informal Settlement for Regeneration Project: Case Study of Boa Wala Settlement, Lahore



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**ABSTRACT:** The empirical evidence from literature has disclosed that the extensive share of world's population continues to live in informal settlements due to extensive economic, social, and welfare disparities. These informal settlements possess the attributes of poor infrastructure and utilities services. In reality, due to excessive housing prices, economic incapacity, and insufficient technical abilities among poor people, they are forced to live in such dilapidated settlements. However, over the times, governmental institutes have adopted several distinct strategies to enhance the quality of life (QOL) of inhabitants living in informal settlement. Therefore, this research study intends to examine the contemporary living conditions in informal settlement using multi-indicator analysis. To assess the QOL, five leading indicators including building density, utilities services, road infrastructure, urban furniture, and social services and their associated 29 sub-indicators was identified and Bao wala as informal settlement in Lahore, Pakistan has been selected as case study area. A semi structured questionnaire was formed and sample size of 99 was calculated to perform socio-economic surveys. In the surveys, proportionate and random sampling technique was used to gain diverse outcomes. In the data analysis, descriptive analysis technique was used to examine the public perceptions regarding contemporary utilities services and regression analysis techniques was used to explore the relation between perceived and dependent variables. The results outcomes have shown that majority of the population of Bao wala settlement express extreme dissatisfaction regarding all the perceived indicators based on the provision, maintenance, and operation quality; however, the regression analysis indicates that all the five leading indicators have strong and significant relation with the dependent variable.

**KEYWORDS:** Informal settlements, Quality of Life (QOL), Public Perception, Regression Analysis, Multi-indicator Analysis, Urban Regeneration

### I. INTRODUCTION

The past literature has revealed that only 13% of the world's populace lived in urban areas before the commencement of the industrial era, but these numbers have increased dramatically in the 20th and 21st centuries (Das, 2015). However, the world population that reached till 8 billion (Gan, et al. 2023) has only a small share of 3.1 billion people that live in the rural settlements (Ghaderpour, 2021). As a result, metropolitan regions have received significant attention, financial assistance, and services that leaved the rural communities more impoverished. The previous century has seen an increase in the economic, social, and welfare disparities between urban and rural regions, making the metropolitan atmosphere more appealing to immigrants. Most of these immigrants now prefer to reside in the city's shantytowns instead of in rural areas. In reality, because of excessive price of housing, economic incapacity, and insufficient technical abilities among immigrants, most immigrants unintentionally live in urban areas with poor infrastructure, utilities, and environmental quality (Sarkar, 2020).

The empirical evidence from literature has disclosed that the extensive share of world's population continues to live in informal settlements, served with the dilapidated facilities. According to an estimate of UN Habitat report, in 2015, about 25% (one quarter) of world's population was inhabited in slums which is approximate to one billion slum inhabitants (UN-Habitat, 2020); however, this proportion has continued to aggravate further. Across the world, just in past 3 decades (since 1990), 213 million dwellers have further been added to the slum's population (UN-Habitat, 2015). It is estimated that, based on the persistent proliferation of informal settlements, the number of people living in slums will nearly be 2 billion by 2030 and 3 billion by 2050 (UN-Habitat, 2020).

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In the one billion inhabitants of world's slum population, a predominant proportion of 881 million population lives in informal settlements of developing world, which was escalated from 689 and 791 million residents in 1990 and 2000, respectively (United Nations Habitat, 2015). Important thing to mention here is that about 50% of world's slums dwellers are still residing in the Asia-Pacific region of global south (Arif et al., 2022; UN-Habitat, 2004). Just in Asia, 30% of urban population is living in slums and informal areas (United Nations Habitat, 2015); however, in Africa, this proportion is even worse, where more than half of urban population (61.7%) is residing in slums, which is estimated to escalate from 400 million to 1.2 billion by 2050 (United Nations Habitat, 2015).

In current realities, such as large number of populations is still residing in informal areas due to their impoverishment and inability to transition to a formalized urban environment due to the city's competitive market dynamics (Okurut & Charles, 2014). Due to the impoverishment and inability to transition to a formalized urban environment due to the city's competitive market dynamics, many individuals still reside in subpar housing (Okurut & Charles, 2014). As a result, the massive growth of urban slums has been identified as a worldwide concern for decades since poor urban environmental variables and their continuous effects on the standard of living in informal housing have emerged as the most contentious issue in cities. Additionally, in slum areas, density of population, physical infrastructural developments, and environmental attributes have all surpassed the acceptance criteria for population safety, environmental protection, and long-term economic growth. As a result, the quality of life is much worse than it is elsewhere (Amao, 2012).

In order to deal with such challenges, over the times, governmental institutes have adopted several distinct strategies to enhance the living standard of the population living in slums and informal settlements. Distinct approaches were adopted by government institutes in different time eras with unique aim and objectives, such as, Reconstruction in 1950s, Revitalization in 1960s, Renewal in 1970s, Redevelopment in 1980s and Regeneration in 1990s (Roberts, 2017).

One of the primary objectives of urban regeneration strategies over the past few decades has been to pay close attention to uplift the quality of life and the surroundings in poor neighbourhoods. The phrase "quality of life" is utilized to measure people's overall wellbeing in communities, but it has a very broad and complicated definition that changes through time and with people's views (Amao, 2012). The idea of quality of life serves as a guide for meeting human needs and a yardstick for assessing satisfaction or dissatisfaction with many facets of life (Pourtaheri, et al. 2011). Therefore, the primary goal of this research is to examine the living conditions in unplanned settlements using multi-indicator analysis, as well as the influence of quality-of-life factors on improving the current situation in such neighbourhoods. To attain this goal, five leading indicators and 29 sub-indicators were used in this research project to investigate various aspects of quality of life in informal settlements.

### **II. CASE STUDY AREA**

This research's case study location is Bao Wala, an informal settlement in Lahore's metropolitan area. Lahore, Pakistan's second most populous city, has 11.12 million residents in 2017, with a 3% annual growth rate (Statistics, 2017), and is expected to reach 12.89 million by 2022. Lahore, Pakistan's largest city, has 1.7 million people living in more than 300 informal settlements, both legal and unregulated (Ahsan, 2019). In Pakistan, these informal settlements are known as Katchi Abadies. Out of the 300 informal communities, the Bao wala neighbourhood on Lahore's eastern outskirts has been chosen as a case study location. The spatial location of Bao wala is illustrated in Figure 1.

As a case study location, Bao wala has an estimated geographical size of 119.6 Acres (about 0.48 km<sup>2</sup>) and comprises of 2,720 property lots. Only a few informal communities in the Lahore metropolitan area are spread out on such a huge scale, and Bao walla is one of them. Bao wala is situated a few kilometres away from Lahore's main airport. The informal community of Bao walla is situated between two major roads in Lahore: The Lahore Ring Road and the Barki Road. Furthermore, the limits of the Bao wala informal community are shared with a diverse urban fabric of planned communities, including the Aksary X housing project, the DHA Defence Housing scheme, Eden City, Green City, and Paragon City (shown in Figure 2). All the above-mentioned characteristics of Bao wala settlement make it the finest case study region for investigating the quality of life on residents using multi-indicator analysis.

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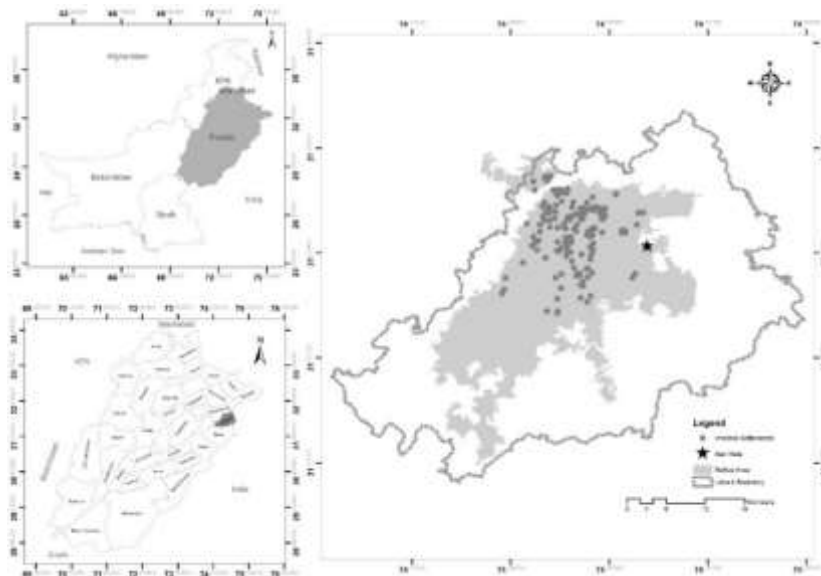


Figure 1. Spatial Location of Bao Wala in Lahore



Figure 2. Surrounding Characteristics of Bao Wala Settlement

### III. MATERIAL AND METHODS

After selecting Bao wala informal settlement as case study for this research, the next important task was the identification of diverse indicators to investigate the quality of life. Following that, the questionnaire was formed and socio-economic surveys of the selected settlement was conducted. To conduct survey, sample size was calculated. All these steps are discussed in detailed in below sections:

#### A. Indicators Identification

In this research study, wide range of indicators are selected to investigate the quality of life in Bao wala informal settlement. These identified indicators encompass the five leading indicators including building density, utilities services, road infrastructure, urban furniture, and social services and 29 sub-indicators.

Building density indicator has further been divided into three sub-indicators which are the fragility of building structures, floor area ratio (FAR) and living space as overcrowding. These indicators largely describe the quality and density of built-up structures in the neighborhood. The utilities service is the next key indicator created in this research, which is further subdivided into eight sub-indicators. Safe drinking water, electricity, solid waste management, and sanitation are major indicators proclaimed in the UN Habitat recommendations for upgrading slums and informal settlements, which are also mandated as fundamental human necessities (Winston, 2010). Aside from the improvement of these utility services, drainage flow management, gas supply, and firefighting have all been prioritized in the redevelopment of any location (reference are illustrated in

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TABLE 1).

Another key indicator used for this research study is road infrastructure, which is further subdivided into three sub-indicators: road pavement, pedestrian walkways, and parking space. It was vital to compute the qualities of road infrastructure since it connects different communities and determines our commuting routes; also, it has a substantial influence on the economic sustainability of the societies (Ben, 2019). Another significant indication of this research is urban furniture, which is divided into five sub-indicators: streetlights, street plantation, street cleanliness, sitting benches, and bus stops/ shelters. Incorporating urban furniture as a key indication in this research was critical because it helps enliven public areas, which is seen to be a construction technique for sustainable urban development.

The final indicator chosen in this study is social services, which is comprised of ten sub-indicators: health services, educational institutes, recreational places, parks and green spaces, public transportation, workplace, administrative centers (town hall), sport facilities, cultural and religious places, and shopping centers. The wide variety of variables listed above were chosen based on their significance and relevance to the urban regeneration process of any settlement and will thus help in the detailed investigation of the quality of life in Bao wala informal settlement.

**Table 1. Perceived Indicators To Investigate The Quality Of Place**

Main Indicators	Abb.	Sub-Indicators	Sources
Building Density	BD1	Fragile Building Structure	Samper, et. al, 2020; Shahraki, et. al, 2020; Habitat, U.N., 2018; Jones, P., 2017; Habitat, U.N., 2013; Ratti, et. al, 2005.
	BD2	Floor Area Ration (FAR)	
	BD3	Living Space (Person per Room)	
Utilities Services	US1	Safe Drinkable Water	Samper, et. al, 2020; Shahraki, et. al, 2020; Patel, 2019; Habitat, U.N., 2018; McCartney and Krishnamurthy, 2018; Numbeo, 2018; Jones, P., 2017; Taubenböck and Kraff, 2014; Dovey and King, 2011; Martinez, et.al, 2008; Njamwea, M.M., 2003
	US2	Electric Supply	
	US3	Solid Waste Management	
	US4	Sanitation and Sewerage	
	US5	Drainage Flow	
	US6	Gas Supply	
	US7	Telecommunication	
	US8	Firefighting	
Road Infrastructure	RI1	Road Pavement	Dovey, et. al, 2020; Kamalipour, H., 2020; Elfouly, H.A., 2017; Kamalipour, H., 2017; Dovey and King, 2011; Bhatt and Rybczynski, 2003.
	RI2	Walking Footpaths	
	RI3	Parking Space	
Urban Furniture	UF1	Streetlights	Allahdadi, M. (2017) , Kamalipour, H., 2020; Arora and Kalra, 2018; Dovey and King, 2011; El-Osta, H.S., 2007; Bhatt and Rybczynski, 2003.
	UF2	Street Plantation	
	UF3	Street Cleanliness	
	UF4	Sitting Benches	
	UF5	Bus Stops/ Shelters	
Social Services (Access to ...)	SS1	Health Services	Arora and Kalra, 2018; Faria, et al. 2018; Habitat, U.N., 2018; Kaklauskas et. al, 2018; Dovey, K., 2015; Sirgy, et. al, 2009; El-Osta, H.S., 2007; Njamwea, M.M., 2003; Hillier, et al, 2000.
	SS2	Educational Institutes	
	SS3	Recreational Places	
	SS4	Parks and Green Spaces	
	SS5	Public Transport	
	SS6	Workplace	
	SS7	Administrative Centers (Town Hall)	
	SS8	Sport Facilities	
	SS9	Cultural and Religious Places	

**B. Structured Questionnaire**

A HIGHLY STRUCTURED QUESTIONNAIRE WAS DEVISED FOR THIS STUDY TO COLLECT DETAILED DATA FROM THE BAO WALA SETTLEMENT. THIS STUDY'S QUESTIONNAIRE WAS BROKEN INTO THREE MAJOR SECTIONS. THE FIRST SECTION OF THE QUESTIONNAIRE FOCUSED ON THE RESPONDENTS' PERSONAL INFORMATION, THE SECOND SECTION GATHERED INFORMATION ABOUT THE RESPONDENTS' SOCIOECONOMIC STATUS, AND THE THIRD SECTION CONTAINED LIKERT SCALE-BASED QUESTIONS TO ASSESS THE RESPONDENTS' PERCEPTION OF THE EXISTING SERVICES IN THE SETTLEMENT IN ORDER TO UNDERSTAND THE QUALITY OF LIFE OF THE INHABITANTS.

**C. Sample Size Calculations**

The estimated population of Bao wala settlement is 16,947, which is calculated by multiplying the number of housing units of Bao wala with the average household size of the settlement. The sample size of Bao wala settlement has been quantified with the help of Slovin's formula, that is mentioned below:

$$n = \frac{N}{1 + Ne^2}$$

In the above-mentioned Slovin's formula, *n* indicates the sample size, *N* portray the estimated population of Bao wala settlement, and *e* denotes the marginal error. The calculated sample size of Bao wala settlement is 99, corresponds to the estimated population of 16,947 and 10% of marginal error.

**D. Socio-Economic Surveys**

To get diverse and realistic information from the various segments of the settlement, the combined method of proportional and random sampling techniques is used at the Bao wala colony to perform socioeconomic surveys. To accomplish this goal, the sample size was geographically dispersed over the settlement using GIS tools, as shown in Figure 3. Because the complete people of the particular settlement was simple to reach at this time period due to the winter holidays, socioeconomic surveys of Bao wala village were conducted in January and February 2022.

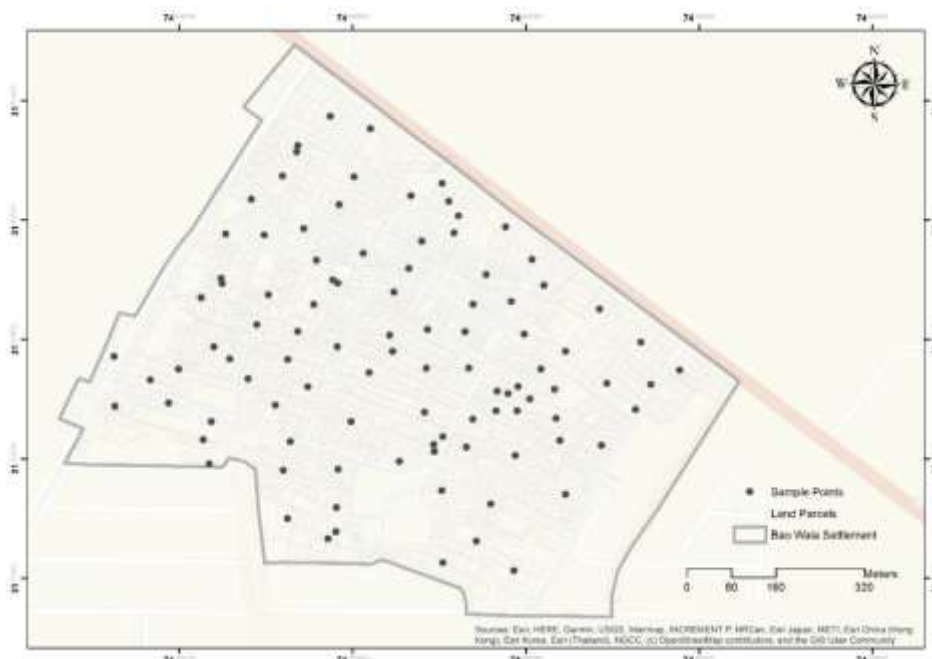


Figure 3. Spatial Distribution of Sample Size in Bao wala Settlement

**E. Data Analysis**

The data analysis in this research study is categorized in two different sections. In the first section, the respondent's characteristics have been analyzed and descriptively illustrated in the form of frequencies and percentages. The second section illustrates the quantitative analysis conducted in this study. The quantitative analysis initiates with descriptive illustrations of

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public perception regarding the perceived potential indicators. Following that, the linear regression analysis has been performed to understand the relation of perceived variables with the dependent variable of quality of life in Bao wala settlement.

### IV. RESULTS

The first section of results elaborates the respondent's characteristics, that participated as interviewee in the socio-economic surveys. In the second section, the results of quantitative analysis are explained, including descriptive calculations besides regression analysis.

In this study, the respondents with different age groups, educational and professional background participated in the surveys (which is shown in Table 2). The result shows that, in the socio-economic surveys, 56.6% male and 43% female population has participated. It also shows that 39.4% of the respondents belonging to 20 to 40 years of age bracket, whereas the 36% respondents had the age of more than 40 years. It has also shown in the results that 33% of the society have the education level of above graduation, while majority have their education level of below matriculation. 28.3% population of Bao wala settlement is working in the private section, 20.2% in government sector, and 17.2% have their own private business. It is also important to mention that a significant portion of this society (23.2%) is unemployed, either searching for work opportunities. Results shows that around 60.6% of the population belongs to the low-income class of the society, while 36.4% and 3% of the population of the Bao wala settlement belongs to middle-income and high-income classes, respectively.

**Table 2. Respondent's Characteristics Of Bao Wala Settlement**

Estimated Population of Bao Wala		16,947					
Sample Size		99					
Characteristics	Freq.	Perc.	Characteristics	Freq.	Perc.		
<b>Gender</b>	Male	56	56.6%	<b>Education</b>	Under Matric	22	22.2%
	Female	43	43.4%		Matriculation	23	23.2%
<b>Age</b>	Less than 20 years	24	24.2%	Under-Graduate	21	21.2%	
	20 - 40 year	39	39.4%	Graduate	16	16.2%	
	More than 40 years	36	36.4%	Post-Graduation	17	17.2%	
<b>Profession</b>	Government / Semi-Govt. Employee	20	20.2%	<b>Duration of Stay</b>	< 5 years	6	6.1%
	Private Employee	28	28.3%		6-10 years	21	21.2%
	Private Business	17	17.2%		11-15 years	18	18.2%
	Student	11	11.1%		16-20 years	15	15.2%
	Unemployed	23	23.2%		> 20 years	15	15.2%
<b>Income</b>	No Income	24	24.2%	<b>House Ownership Status</b>	Since Birth	24	24.2%
	<14,000	15	15.2%		Owned	62	62.6%
	14,001-30,000	21	21.2%		Rented	37	37.4%
	30,001 - 60,000	21	21.2%				
	60,001 - 120,000	15	15.2%				
	>120,000	3	3.0%				

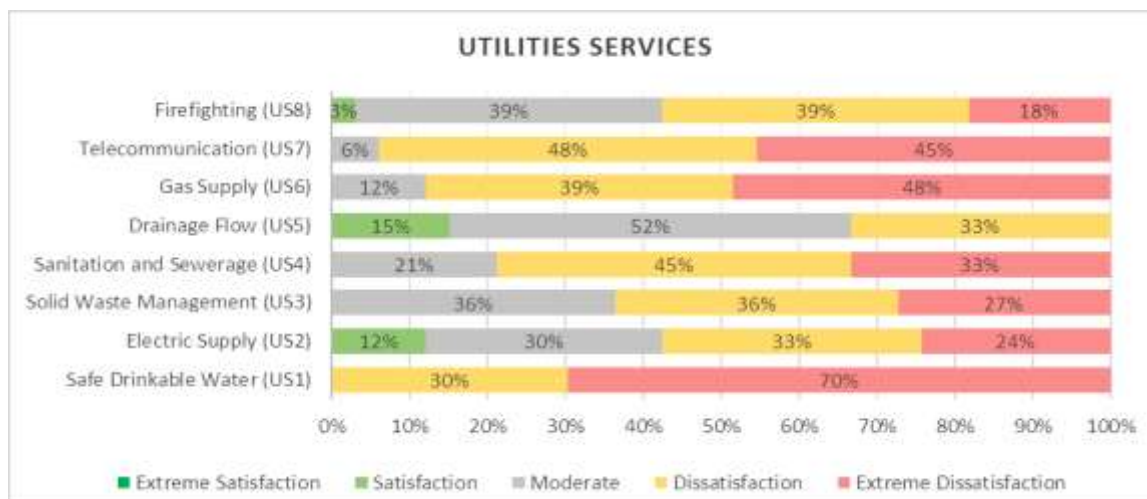
The below illustrated results illustrate the public perceptions regarding the provision, operation, maintenance, and quality of contemporary utilities services, road infrastructure, urban furniture, and social services in Bao wala settlement. These public perceptions are measured based on a 5-point Likert scale varies from extreme dissatisfaction to extreme satisfaction. The below illustrated results shows that majority of inhabitants in Bao wala settlement are either extremely dissatisfied or shows moderate behavior towards the contemporary conditions, however only minimal segment of the society shows satisfactory behavior toward existing services.

Figure 4 shown below demonstrate the public perception regarding existing utilities services in Bao wala settlement. For the facility of safe drinkable water, 70% inhabitants of Bao wala settlement shows extreme dissatisfaction while other 30% shows dissatisfaction and not express the satisfactory behavior toward this service due to the presence of extremely bad quality of water supply services. Moreover, 24% and 33% of the population of Bao wala settlement express extreme dissatisfaction and dissatisfactory behavior toward the presence and maintenance of electricity infrastructure in the locality. Whereas 30% portion



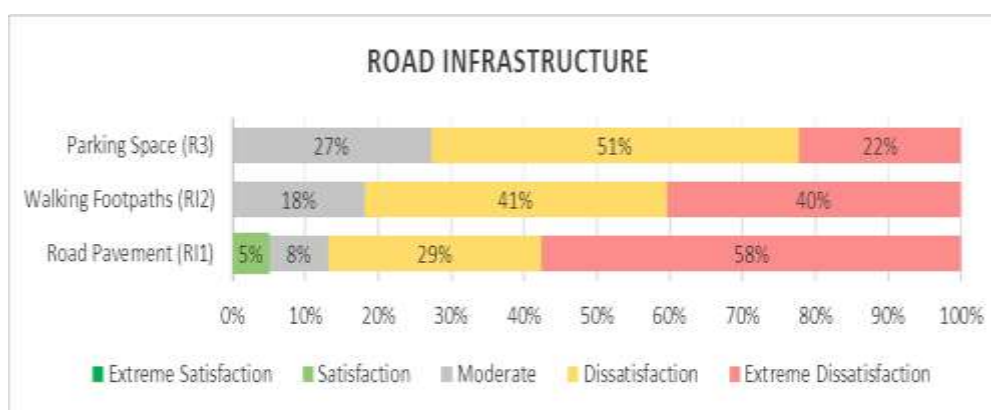
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of the settlement show moderate while only 12% population indicate satisfactory attitude towards this utility services. Almost 64% of the population of Bao wala settlement express extreme dissatisfactory and dissatisfactory while only 36% segment of the society shows moderate behavior toward solid waste management in the vicinity. However, for sanitation and sewerage facilities, 79% of the inhabitants in the settlement shows dissatisfactory while only 21% of the population express a moderate attitude. 88%, 94% and 57% of the population of Bao wala settlement shows either extreme dissatisfactory or dissatisfactory while 12%, 6% and 39% of inhabitants shows moderator perception towards gas supply, telecommunication, and firefighting services, respectively.



**Figure 4.** Public Perception Regarding Utilities Services in Bao Wala Settlement

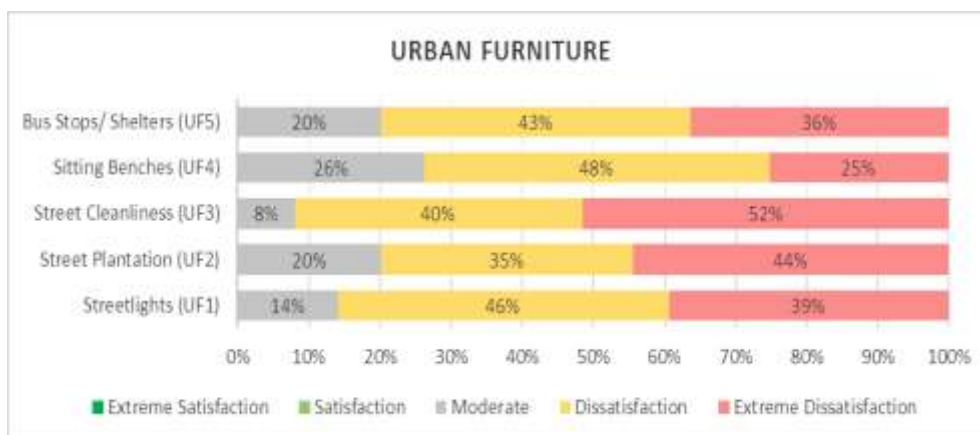
Similar to the public perception regarding utilities services, the public behavior towards the presence, quality, and maintenance of road infrastructure in Bao wala is experienced as extreme dissatisfactory. It has been observed in the result presented in Figure 5 that 58% and 29% of the population of Bao wala settlement expresses extreme dissatisfaction and dissatisfaction while only 8% and 5% inhabitants have shown the expression of moderate and satisfactory toward the presence of road pavement in their respective neighborhoods. Similarly, for the other sub-indicators of road infrastructure, 82% and 73% of the population expresses extreme dissatisfaction and dissatisfaction while only 18% and 27% inhabitant's express moderate behavior toward the presence, quality and maintenance of walking footpaths and parking space in the settlement, respectively.



**Figure 5.** Public Perception Regarding Road Infrastructure in Bao Wala Settlement

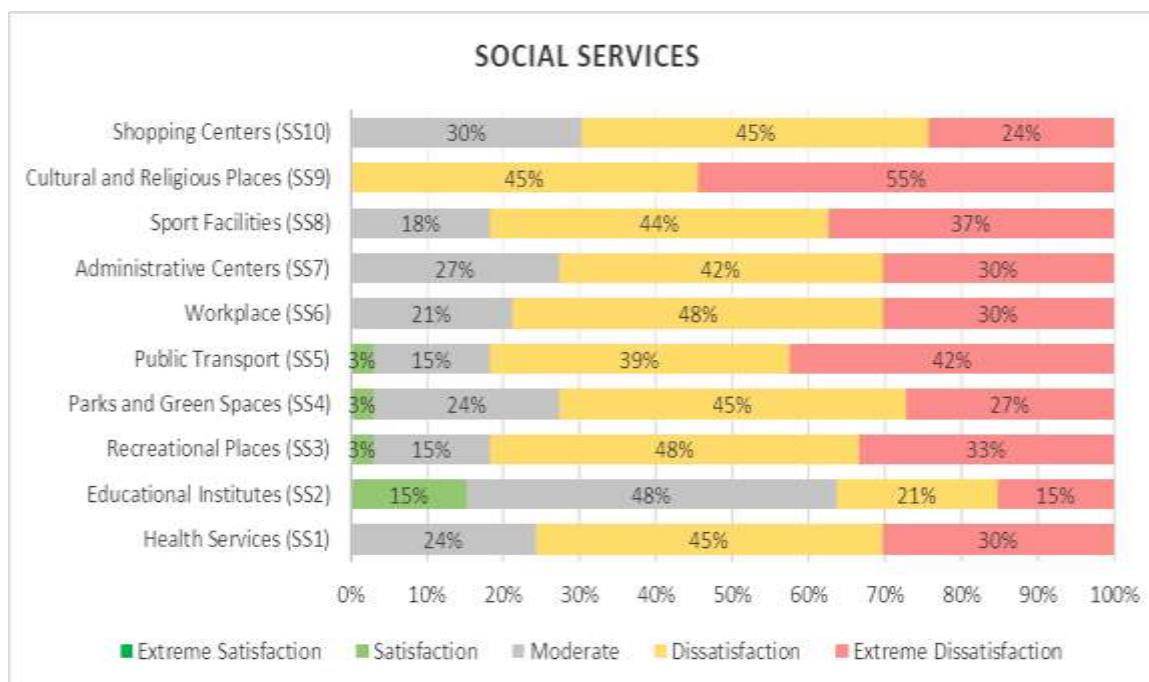
The alarming results presented in Figure 6 elucidate that none of the sub-indicator of urban furniture gained the satisfactory public perception in the Bao wala settlement. Results presented in Figure 6 illustrate that street cleanliness is the indicators toward which 92% of the residents shows extreme dissatisfaction while only 8% expresses the moderate expressions. Similarly, 86%, 80% 74% and 80% of the population of Bao wala settlement shows extreme dissatisfaction, and dissatisfaction while only 14%, 20%, 26% and 20% inhabitants express moderate opinions towards streetlights, street plantation, sitting benches and bus stops, respectively.

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**Figure 6.** Public Perception Regarding Urban Furniture in Bao Wala Settlement

Furthermore, the public perception regarding the indicators of social services is exhibited in Figure 7. The results presented in Figure 7 has also illustrated that most of the population of Bao wala settlement has again expressed dissatisfactory behavior for these indicators as well. For health service facilities in the settlement, 76% of the population expresses dissatisfaction while only 24% of residents have shown moderate behavior. While analyzing the quality and access to educational institutes, only 15% of the population from high-income class has shown the satisfactory while other 85% of the population belonging to low and middle-income group exhibited either moderate or dissatisfactory behavior, respectively. The presented results have shown that only 3% of the population of Bao wala settlement has shown satisfactory expression for access to recreational place, parks and green spaces and public transport, however, 81%, 72%, and 82% of residents has expressed dissatisfactory attitude towards these services, respectively. Similarly, a terrible public perception as dissatisfactory from the significant proportion of the population of Bao wala settlement has been observed for other sub-indicators of social services. It has been observed that 79%, 73%, 82%, 100% and 70% of the population of Bao wala has exhibited extreme dissatisfactory and dissatisfactory while only 21%, 27%, 18%, 0%, and 30% of the population has elucidated the moderate expressions toward the presence, quality and access to workplace, administrative centers, sports facilities, cultural and religious places, and shopping centers, respectively. It is essential to mention that none of the respondents from Bao wala settlement has conveyed satisfactory expressions for these mentioned services due to the bad quality and maintenance of these respective social services.



**Figure 7.** Public Perception Regarding Social Services in Bao Wala Settlement



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### V. REGRESSION ANALYSIS

In this section of quantitative analysis, linear regression method is used to determine the relation between perceived and dependent indicators. In this research study, the perceived indicators illustrated in Table 1 were independent variables while the quality of life is adopted as dependent indicator.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.883 <sup>a</sup>	.780	.774	.362

a. Predictors: (Constant), BD3, BD2, BD1

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.317	.274		1.155	.251
	BD1	.455	.047	.589	9.689	.000
	BD2	.200	.059	.187	3.417	.001
	BD3	.302	.056	.301	5.433	.000

a. Dependent Variable: QOL

Figure 8. Regression Analysis of Building Density with QOL

The regression analysis of building density with QOL is illustrated in Figure 8. The beta coefficient of the sub-indicators of building density varies from 0.20 to 0.45 which illustrate their greater impact on the quality of life whereas the R<sup>2</sup> value depicting the strong relationship between building density and quality of life.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.952 <sup>a</sup>	.906	.897	.244

a. Predictors: (Constant), US8, US1, US5, US3, US7, US4, US6, US2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.965	.326		-2.963	.004
	US1	.249	.096	.151	2.586	.011
	US2	-.030	.064	-.038	-.463	.644
	US3	.279	.055	.292	5.042	.000
	US4	.257	.060	.247	4.307	.000
	US5	.186	.058	.166	3.197	.002
	US6	.147	.084	.133	1.742	.085
	US7	.010	.070	.008	.146	.885
	US8	.178	.061	.185	2.905	.005

a. Dependent Variable: QOL

Figure 9. Regression Analysis of Utilities Services with QOL

The regression analysis of utilities services with quality of life of Bao wala settlement is shown in Figure 9, where R<sup>2</sup> value is showing the strong relation between utilities services and quality of place. However, the results have also depicted that all four sub-indicators of utilities services including US3, US4, US5, and US8 have highly significant while US1 has significant relation with the dependent variable, and their beta coefficient values varies from 0.178 to 0.279. However, the sub-indicator of gas supply (US6) and telecommunication (US7) has no significant relation with dependent variables, furthermore, have low value of beta coefficient.

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**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.905 <sup>a</sup>	.819	.813	.329

a. Predictors: (Constant), RI3, RI2, RI1

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.183	.216		-.849	.398
	RI1	.256	.058	.284	4.426	.000
	RI2	.299	.058	.289	5.116	.000
	RI3	.501	.070	.465	7.181	.000

a. Dependent Variable: QOL

**Figure 10.** Regression Analysis of Road Infrastructure with QOL

The relation of sub-indicators of road infrastructure with the dependent variable has also been analyzed, which are shown in Figure 10. In the results, R<sup>2</sup> value of 0.819 shows the strong relation between the perceived indicators of road infrastructure and quality of place of Bao wala settlement, whereas the values of Beta coefficient vary from 0.256 to 0.501 that shows the greatest impact of sub-indicators on the dependent variables.

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.913 <sup>a</sup>	.833	.824	.319

a. Predictors: (Constant), UF5, UF4, UF3, UF2, UF1

**Coefficients<sup>a</sup>**

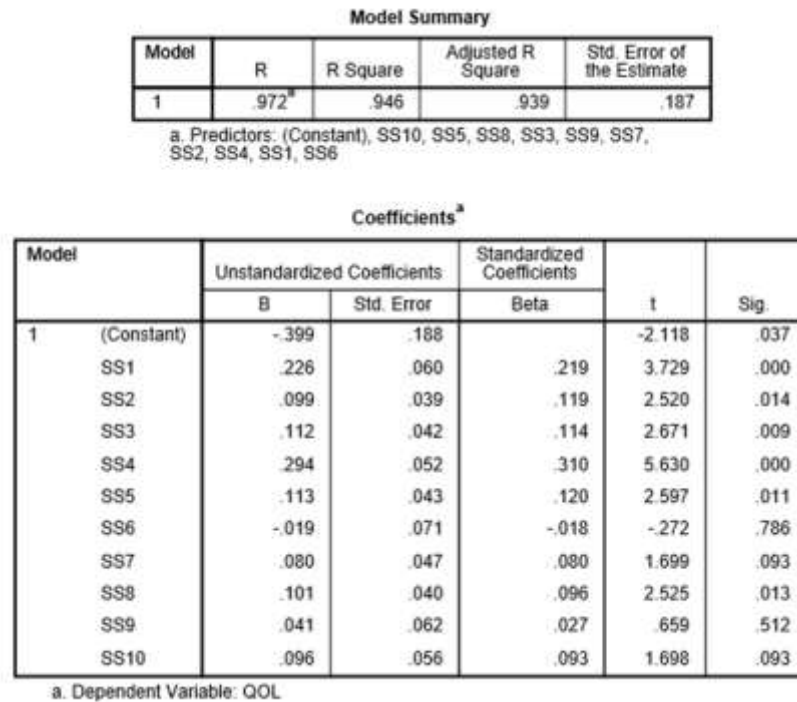
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.991	.264		-3.756	.000
	UF1	.362	.074	.328	4.880	.000
	UF2	.175	.054	.177	3.218	.002
	UF3	.185	.065	.156	2.827	.006
	UF4	.144	.057	.136	2.530	.013
	UF5	.361	.063	.350	5.701	.000

a. Dependent Variable: QOL

**Figure 11.** Regression Analysis of Urban Furniture with QOL

The regression analysis of urban furniture with QOL of Bao wala settlement is shown in Figure 11, and value of R<sup>2</sup> which is 0.833 depict the extremely strong relation between them. Furthermore, all these sub-indicators also have the strong impact on the quality of place of Bao wala settlement, possessing the high beta coefficient values that varies from 0.144 to 0.362.

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**Figure 12.** Regression Analysis of Social Services with QOL

The regression relation between social services and the dependent variables has shown in Figure 12. The value of  $R^2$  between social services and quality of place is highest (0.946) than the other leading indicators, that shows the extremely strong relation between the indicators of social services and dependent variable. However, the results have also shown that the three sub-indicators (SS1, SS3, and SS4) of social services have highly significant, further three sub-indicators (SS2, SS5, SS8) have significant relation, while indicators SS7, SS9 and SS10 have no significant relation with the dependent variable.

## VI. CONCLUSIONS

In this research study, quality of life of the inhabitants that live in informal settlements has been examined based on multi-indicator analysis. Bao wala an informal settlement has been selected as case study area in this study. To perform multi-indicator analysis, five leading indicators including building density, utilities services, road infrastructure, urban furniture and social services has been identified besides other 29 sub-indicators. Results has illustrated that majority of the population of Bao wala settlements have expressed extreme dissatisfaction with the provision, maintenance, and operation of all leading indicators. Furthermore, while summarizing the regression analysis of perceived and dependent variable, it has been observed that majority of sub-indicators of five leading indicators have highly significant and strong impact on the dependent variable, whereas few has significant and moderate impact on dependent variable. In the results, indicators having neither significant relation nor good impact on the dependent variable have also been observed, however the number of such perceived indicators are few. The results also depict that all the five leading indicators including building density, utilities services, road infrastructure, urban furniture and social services have strong relation with the quality of place of Bao wala settlement, possessing the  $R^2$  values varying from 0.780 to 0.946. Among all these five leading perceived indicators, access to social services has the strongest relation with the quality of place of Bao wala settlement. This also demonstrates that the quality of social services in the settlement is extremely poor due to inefficient provision and maintenance of these respective services.

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