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Editorial

Urban waste management is one of the most visible services among others falling under the responsibilities of Municipal Corporations and Municipal Committees. Often, waste management consumes the largest share of the municipal budget and yet large waste heaps seen unattended in streets and blocked drainage channels continue to be a major contributor to public health hazards. The unmanaged disposal of waste pollutes water resources and subjects those living nearby to significant environmental and health risks.

The quality and standard of the solid waste management service delivery varies from city to city and country to country and even within different urban areas of the same city. In low-income countries, most focus is centred in lifting the waste from cities and transporting it to the outskirts of the city for disposal with minimum considerations for the transported health and environmental risks. Whereas, in high-income countries, the focus of the authorities is to collect waste and recover renewables from it to contribute to sustainable service delivery.

As of late, waste management is a serious growing issue gaining high public profile and growing importance. Quality of waste management service delivery can be viewed under the framework of urban development and as an indicator of urban governance for measuring the performance of municipal corporations. Sustainable waste management requires a participatory approach addressing economic, environmental, political, social, and technical concerns. Waste management approaches with only technical solutions cannot be considered comprehensive if issues related to governance, urban management, and development are put aside.

If waste management services were to be effective, a municipal government must have the capacity to manage finances and services effectively and transparently, streamline management responsibilities and work effectively with communities. Areas where waste management is working is because of the municipalities tackling the underlying challenges relating to management structures, contracting procedures, labour practices, and cost recovery of services through the levy of taxes while excelling in the technical design of service delivery.

The current issue of PJUA discusses the determinants of household solid waste generation in urban Pakistan. Waste generation directly proportional to the household size requires policy interventions and governance restructuring in line with the interests of the public being served. Furthermore, the current issue of the PJUA is intended to promote broader discussions and debates regarding environmental sustainability and urban economic growth and initiate a dialogue on governance issues relating to the management of municipal services.

Research Article

Household Solid Waste Generation in Urban Pakistan: A Case Study of Rawalpindi

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Abstract

Nowhere else in Pakistan is the urban rot more pronounced than in the waste-littered streets. Apart from being an eyesore, ill-managed solid waste in Pakistan is one of the primary causes of health and environmental problems causing the state and the society to bear huge financial and other costs in lost productivity.

This paper examines the determinants of household solid waste generation by analysing data from 118 households in six urban neighbourhoods in Rawalpindi. The paper found substantial differences in household waste generation rates across the income groups. As expected, high-income households generated more waste than their mid- and low-income counterparts. The total waste generated by household increased with household size. However, the generated solid waste per capita declined with the increase in the household size.

The state of the solid waste collection was found to be poor across all income strata. The two low-income and one mid-income neighbourhoods did not have any municipal waste collection service. Fewer than 50% of the households in the high-income neighbourhoods reported access to municipal solid waste collection service. The rest self-disposed household solid waste mostly in empty lots in the neighbourhood. More than 65% of the households sold recyclables to waste collecting street hawkers, while another 25% handed recyclables to domestic workers.

Keywords: Solid Waste Management, Household Waste Generation, Urbanization, Pakistan

Introduction

Increased economic activity, greater prosperity, and an increase in consumption across all income classes has resulted in a significant increase in solid waste generation across the world (Leao et. al., 2001). Managing solid waste in urban areas requires reliable estimates of the quantity and the type of waste being generated. Household solid waste in urban areas constitutes a significant component of the municipal solid waste generated and therefore it has a direct bearing on the design of municipal waste management systems (Benitez et. al., 2008). For instance, municipal solid waste in Tehran, Iran, comprised 97% of the city's solid waste (Damghani et. al., 2008). The rest included hospital waste (1%), industrial waste (0.6%), and construction-related waste (0.5%). The household solid waste in Tehran accounted for 62.5% of the total municipal solid waste.

Household solid waste management (SWM) is an important concern for urban Pakistan where it remains largely unmanaged. According to Pakistan 2017 provincial census results, the population of Pakistan is 207 million with an old than share of 38%. As per rough estimate Pakistan generate 93000 tons per day of which 36000 is generated in urban areas. Often solid waste is left to litter or decompose on streets and empty lots. Even when municipal authorities collect household solid waste, it is incinerated in open lots, which is not consistent with the sustainable waste management principles. While solid waste directorates do exist in most large urban centres, the service offered by such directorates is irregular, inefficient, and inadequate. Moreover, the final disposal of solid waste by these authorities involves either dumping the waste in non-engineered landfills or incineration, which further pollutes the environment.

The household solid waste generation rate in Pakistan has been reported around 0.5 to 0.7 kg per capita per day, which is comparable to the rates reported for other developing countries. Even with a relatively low per capita waste generation rate, managing solid waste in Pakistan remains a formidable challenge. Traditionally, both formal and informal sectors have been involved in solid waste collection in Pakistan. The municipal authorities comprise the formal sector that collects waste from the city and dumps it in non-engineered landfills, which are essentially large open lots. The informal sector has two components: small entrepreneurs who purchase recyclables directly from households and the scavengers comprising mostly street children who sort through the formal and informal waste dumping sites scattered throughout the city to recover any recyclables, which they later sell to other intermediaries who in turn sell recyclables to the industry.

Other small-scale efforts include a market for recyclables where households sell their recyclable waste. One such project in Karachi, known as the Safai Kamal Bank, operated under the slogan garbage is gold. Another similar initiative in Karachi converts vegetable refuse into organic products.

Most solid waste in Pakistan (almost 77%) consists of vegetable and fruit residues along with dust, dirt, and residues from construction (Table 1).

The quantity and composition of household waste have a direct bearing on municipal Solid Waste Management (Qu et. al., 2009). The purpose of this paper is to develop a better understanding of the socio-economic determinants of solid waste generation at the household level in urban Pakistan to assist with the overall goal of improving municipal SWM.

Research Background and Significance

The breakdown of solid waste by type is known only for a select few cities in Pakistan. Even for those cities, solid waste estimates are not available for different household types. For instance, estimates for waste generation rates and waste types are not available for low- versus high-income households, thus creating a knowledge gap, which contributes to the lack of effective waste management policy making in urban Pakistan.

Despite their significance, the socio-economic determinants of solid waste are not well-understood in Pakistan. Thus, exploring the socio-economic determinants of household solid waste generation is necessary for informed and evidence-based waste management policy-making. This paper explores the determinants of household solid waste generation in six urban neighbourhoods in Rawalpindi.

Table 1: Breakdown of Solid Waste by Type in Lahore

Sr. No.	Description	% Weight	Tons / Day
1	Vegetables & Fruit Residues	30.72	1182.7
2	Paper	2.70	104.0
3	Plastics & Rubber	5.63	216.8
4	Leaves, Grass, straws etc.	20.02	770.8
5	Rags	7.45	286.8
6	Wood	1.24	47.7
7	Bones	1.03	39.7
8	Animal Waste	2.35	90.5
9	Glass	0.70	27.0
10	Metals	0.32	12.3
11	Dust, Dirt, Ashes, Stones, Bricks etc.	27.83	1071.5
12	Unclassified	0.01	0.4
13	Total	100.00	3850

Source: Hammad Naqi Khan, Director Freshwater and Toxics Programme WWF-Pakistan

Study Area

Rawalpindi is governed by two parallel, yet non-overlapping, administrative setups. The Rawalpindi City or the Municipal Government manages nearly one-half of the city, whereas a quasi-military administration, Cantonment Boards, manages the other half of Rawalpindi. In 2003, the Rawalpindi Cantonment Board was bifurcated into Rawalpindi Cantonment Board and Chaklala Cantonment Board.[1] Figure 1 highlights the area governed by the Cantonment Boards, which is bounded by the thick dotted line. It also presents a colour thematic map of household size spatially disaggregated at the neighbourhood level.

According to the 2017 Census, the total population of Rawalpindi is estimated at 2.1 million. The previous census in 1998 estimated the city's population at 1.4 million, resulting in a 50% increase over a 19-year period. The city is spread over nearly 92 square-km. The demographic details at the city level are not available for the 2017 census. Therefore, data presented here is from the census conducted in 1998, which revealed that the amalgamated Rawalpindi Cantonment Board reported a population of 627,841 and Rawalpindi City (areas governed by the Municipal government) reported a population of 781,927 residents. The average population density in Rawalpindi was estimated at 31,122 persons per square km (Table 2).

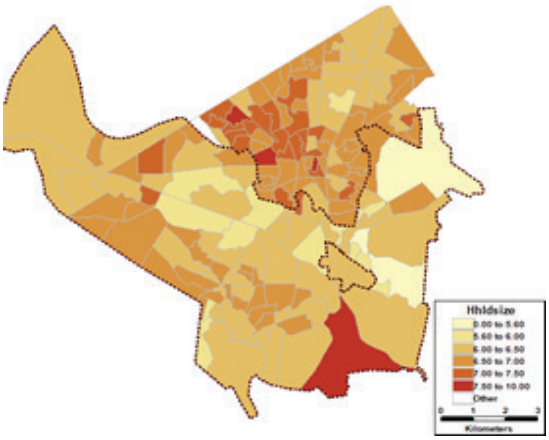

Figure 1: Map of Rawalpindi Identifying Areas Governed by the Municipal Corporation and the Cantonment Boards

Table 2: Basic Demographic and Municipal Service Characteristics

Development Indicator	Mean	Min	Max
Male to female ratio	1.14	1.01	2.08
Percentage of formal dwellings	95.35	74.28	99.94
Percentage of informal dwellings	2.98	0.06	20.37
Percentage of semi-formal dwellings	1.80	0.05	15.75
Percentage of households with access to toilet within the housing unit	62.09	9.10	94.51
Percentage of households with access to potable water within the housing unit	68.34	0.65	99.38
Percentage of households with access to electricity	98.60	89.71	100.00
Self-proclaimed literate (%)	76.58	37.10	95.90
Adult female with Grade 5 education (%)	42.93	20.51	57.14
Adult male with Grade 5 education (%)	46.80	21.21	61.43
Adult female with Grade 10 education (%)	39.25	7.17	90.89
Adult male with Grade 10 education (%)	49.75	12.14	92.79
Population Density (Persons/sq. km.)	31,122	1,337	111,309

[1] https://www.dawn.com/news/80468

According to 1998 Census data, only 62% of the households in Rawalpindi had a toilet located within their dwelling unit. In some low-income neighbourhoods, only 9% of households reported access to a toilet within the dwelling unit. Furthermore, 68% of households in Rawalpindi reported access to potable drinking water. However, fewer than 1% of residents in the lowest income neighbourhoods reported ready access to potable water. The Census did not collect information about access to other municipal services, such as solid waste collection, etc.

Literature Review

Solid Waste Management (SWM) literature covers waste generated by households as well as industrial and commercial establishments. Most literature focuses on the supply side of SWM including topics such as waste collection, landfill site location, waste vehicle routing and the like. Furthermore, the literature on residential waste is scarce and focuses mostly on recycling and disposal rather than solid waste generation and its determinants.

Given the scope of this paper, the literature reviewed here is restricted to residential waste generation and its determinants. Earlier research reviewed here has reported findings from small sample surveys of households. Analytical methods used in the past ranged from simple tabulations to advanced regression-based forecasting (Buenrostro et. al., 2001). The existing literature offers only a handful of examples of research in the household solid waste generation in developing countries (Dangi et. al., 2008). Estimates of waste generation rates are often unsubstantiated.

The household solid waste generation studies often differentiate households by size or income to account for the differences in waste generation rates (Ojeda-Benitez et. al., 2008; Sha'Ato et. al., 2007). A study of 125 households in Mexicali, for instance, differentiated households by their structure and characterized those as nuclear, extended, and lone parents (Ojeda-Benitez et. al., 2008). Household waste was collected for eight days from the sampled households. The results showed that households' structure (nuclear, extended, and lone-parent) had a direct bearing on the amount of waste generated. However, the household structure had no marked impact on the characteristics of the waste generated. Instead, the household lifestyles impacted the type of waste generated.

A waste generation study in Kathmandu estimated the household solid waste generation rate at 161.2 grams per capita per day (g/c/d). Most collected waste was organic with some hazardous waste as well (Dangi et. al., 2008). The authors determined that for a 95% confidence level, a sample size of 273 households was needed for Kathmandu for reliable estimates of household solid waste generation.

A similar study of 100 households in Makurdi, Nigeria, differentiated households into high, medium, and low-income groups. The study found that 82% of the municipal solid waste was generated by households with an average waste generation rate of 540 g/c/d (Sha'Ato et. al., 2007). The survey was conducted for 11 consecutive days.

A study of 73 households across five socio-economic groups in Chittagong, Bangladesh, determined the average solid waste generated at 250 g/c/d (Sujauddin, et. al., 2008). The results suggested that high-income, educated, and larger-sized households generated more waste. Similarly, a study of approximately 160 households in Oyo, Nigeria, also found a statistically significant correlation between generated waste and household size, income, and education levels (Afon, 2007). The Nigerian study was based on a larger sample of 648 households. However, waste data were collected from one in four of the 648 households in the sample.

The determinants of solid waste generation in Indian cities are similar to the ones reported for cities in developing countries. A summary of waste generation rates in 23 Indian cities suggested that the average daily household waste generated per person equalled 437 grams (Darshini Mahadevia and Jeanne M. Wolfe, 2008). The household waste generation varied between a minimum of 220 g/c/d and a maximum of 670 g/c/d (Table 3).

Table 3: Solid Waste Generation Rates for Indian Cities

Cities	Total Tons / Day	Grams / Capita / Day
Mumbai	5320	450
Dehli	5922	450
Kolkata	2653	580
Chennai	3036	620
Bangalore	1669	390
Ahmedabad	1302	370
Hyderabad	2187	570
Kanpur	1100	430
Lucknow	475	220
Surat	1000	410
Pune	1175	460
Jaipur	904	390
Bhopal	574	400
Nagpur	504	250
Varansi	425	390
Ludhiana	735	530
Vadodara	357	270
Madurai	275	300
Coimbatore	530	570
Indore	557	380
Jkochi	400	670
Patna	511	370
Vishakapatnam	584	590

Source: Central Pollution Control Board **(http://www.cpcb.nic.in/pcpdiv_plan4.htm)**
Cited in Solid Waste Management in Indian cities. Editors: Darshini Mahadevia and Jeanne M. Wolfe (2008) Concept Publishing Company, New Delhi

A survey of three neighbourhoods in New Delhi found that income had a significant impact on waste generation (Mani et. al., 2005). As expected, households residing in high-income neighbourhoods produced more solid waste than households living in mid- and lower-income neighbourhoods. The data were collected from 500 to 700 households in each neighbourhood. The study also found that the total waste generated per household increased with the size of the household. However, the waste generated per capita declined with the increase in household size.

While the studies mentioned above suggest that higher income and more educated households generate more waste per capita, data from Nigeria revealed that with the increase in education, income and social status, the per capita waste generated by households declined (Abel, 2007). Similarly, a small sample study of 47 households in Gaborone, Botswana, found no direct relationship between waste generation and income (Bolaane and Ali, 2004). An analysis of 113 households from six different neighbourhoods in Beijing, China, collected waste for ten days and found that the average waste generated per household averaged 230 grams per capita per day (Qu et. al., 2009). However, an increase in household size or income was found to be negatively correlated with the waste generated per capita per day. Similarly, waste generation rates were found to be lower for more educated families.

The afore-mentioned difference in findings suggests that one should exercise caution in making inferences about the impact of socio-economic factors on waste generated by households in different parts of the world, or even for the households residing in different parts of the same city.

The temporal variation in household solid waste generation has also been reported. The Nigerian study mentioned earlier reported twice as much waste generated in December than in January (Abel, 2007). Another study in Nigeria found that higher rates of solid waste were reported in October, whereas lower household waste generation rates were observed in February (Afon, 2007). On a day-to-day basis, Saturdays reported the highest waste generated while Thursdays reported the lowest.

Since the municipal authorities in Chittagong, Bangladesh, had failed in offering decent waste collection services, Sujauddin, et. al. (2008) also

computed the willingness-to-pay to the private sector for solid waste collection and management in Chittagong. The authors found that 44% of households were willing to pay US$ 0.3-0.4 per month to waste collectors. They also found a market for marginal pricing where households that generated more waste were willing to pay more for the service and vice versa.

Marginal pricing regimes are believed to work in reducing the waste generated by households. The underlying argument is that when households adhere to a pricing scheme where the disposal cost increases with the increase in waste generated the households generate less waste. A waste generation study in Taipei, Taiwan, showed a decline in generated waste after unit pricing was implemented. Such measures, however, are not without unintended consequences. The Taiwan study revealed that waste reduction resulted from households dumping their waste in neighbouring districts (Tsai and Sheu, 2009). Thus the recycling impact of the pricing regime was minimal since it only diverted the waste from one jurisdiction to another where waste management charges were not implemented.

The success of any pricing scheme depends upon a household's willingness to pay for solid waste collection and management. The household's willingness to pay for the SWM services was measured using a Likert scale in Mexicali, Mexico. It revealed that household's socio-economic attributes had a direct bearing on the waste generated by the household (Marquez et. al., 2008). Other research, especially in Pakistan, revealed that households in Gujranwala were not only interested in improved SWM, but were also willing to pay for improved services (Altaf and Deshazo, 1996).

While most household waste generated in developing countries comprises vegetable refuse and dust, some household solid waste is hazardous as well. Approximately 1.6% (7.1 tons) of the household waste in Morelia, Mexico was hazardous (Otoniel, 2008).

Municipal solid waste in Pakistan has long been known as a source of pollution. Studies conducted in Raiwind, Punjab, have shown that municipal waste has caused serious contamination of soils (Younes et. al., 1999).

Most studies previously mentioned were conducted in low-income economies where the reported waste generation rate was low. Similar situation in high income economies showed higher waste generation rates. A survey of 1,500 households in Kuwait reported much higher waste generation rates (Koushki et. al., 2004) averaging around 7.1 kg per household. The household waste generation rate was higher for larger households and also depended upon the number of guests visiting the household. The Kuwaiti study also found a 20% reduction over time in average household waste generated since the last estimates computed in the mid-nineties.

In the United States, where waste collection and management contracts are often awarded to private enterprises, statistically accurate estimates of solid waste generation rates are needed to determine the cost of such services. In Broward County, Florida, the estimated waste generated per household was initially believed to be 1,837 kg/year/residence. A statistically sound sample was drawn of the households in the County, and a waste generation survey was conducted. The revised estimates revealed an 18% lower waste generation rate than the one at which the contract was signed with the waste management firm (King and Murphy, 1996). The revised estimates revealed over-payment to the contractor over the years that could have been avoided, had a proper waste generation study been undertaken earlier.

The literature reviewed so far has revealed that solid waste generation rates vary by region (Table 4). Furthermore, the socio-demographic determinants of solid waste generation may not have the same relationship with the amount of waste generated. Consider that the literature has found waste generation to increase as well as decrease with household income. It is therefore important to have a closer look at the waste generation rates reported for cities in South Asia. Table 4 also reveals that most studies of household waste generation were based on a sample of approximately 100 households. Furthermore, waste collection was conducted for fewer than two weeks in most instances.

Table 4: Solid Waste Generation Rates for Selected Cities

Location	Sample Size	Duration of Survey (Days)	Waste Generation Rate (Grams / Capita / Day)	Year
Beijing	113 households in six districts	10	230	2009
Kathmandu	273 houeholds needed	14	161.2	2008
Chittagong	73 households in 5 different socio-economic groups		250	2008
Mexicali	125 households (67 nuclear, 45 extended, 13 single parents)	8	1100: nuclear, 702 extended, 1350 g lone-parents	2008
Oye, Nigeria	App. 160 households	84 days, a week per month over 12 months	129	2007
Makurdi, Nigeria	100	11	540	2007
Gaborone, Botsowana	47 households	21	330	2004

Research Methodology

Data Collection

We collected data on household demographics, housing characteristics, neighbourhood attributes, and the characteristics of household solid waste generated from a sample of households residing in parts of Rawalpindi managed by the Rawalpindi Cantonment Board.

We designed and executed three surveys for this study:

1. Household demographic survey
2. Household waste collection survey
3. Neighbourhood attribute survey to document the state of water supply, sanitation, and waste disposable practices

Sampling of Households

We have relied on a pseudo stratified random sample of convenience. The sampling decision was made after reviewing other published research on household solid waste generation in which samples of convenience had been used. In the first step, we selected six neighbourhoods in Rawalpindi Cantonment as follows:

- Two low-income neighbourhoods
  - Fazalabad and Naseerabad
- Two mid-income neighbourhoods
  - Mohammadi Colony (MC) and PIA Colony
- Two high-income neighbourhoods
  - Valley Road and Nisar Road

We selected at least 20 households from each neighbourhood. We sought households' consent for participation in advance. The selection of households within each neighbourhood was again quasi-random. We identified community leaders in each neighbourhood and relied on their knowledge of the community to enrol households for the survey.

Household and Neighbourhood Data Collection

We distributed invitation letters to the community inviting households to participate in the waste generation and management survey. Academics at the National University of Sciences and Technology (NUST) and the officials of the

Rawalpindi Cantonment Board co-signed invitation letters to encourage communities to participate in the study.

We surveyed each neighbourhood by foot and documented the state of solid waste disposal. We took photographs/notes and spoke with the community elders. Afterwards, we conducted face-to-face interviews with 118 households and filled the survey questionnaire about household demographics in their presence.

Selection of Sanitary Workers and Data Collection

We hired six municipal sanitary workers to collect household solid waste. The workers were employees of the Rawalpindi Cantonment Board's sanitation department. We trained them in waste collection, weighing, and waste sorting by running training workshops at NUST. Also, workers were trained in documenting waste characteristics of each household on a survey form. Each worker was assigned 20 households from whom waste was collected daily for two weeks. Each household was provided with durable waste collection bags in advance to store their solid waste.

Solid Waste Data Collection

Each day sanitary workers collected waste bags from households, sorted solid waste, and weighed individual waste types. Sanitary workers recorded details of waste for each household in a survey form. The final disposal of waste was out of the scope of this project. The workers disposed off the household solid waste afterwards according to the respective community norms.

We digitised the information and created an amalgamated dataset. We merged the solid waste generation data with the household and neighbourhood attribute database. Each row in the final data set represented the daily solid waste generated by an individual household. Some households withdrew their consent during the waste collection phase, while a few were away for travel and hence the data set is at times partial for some households.

Analytic Methods

We performed basic data analysis in the first stage including descriptive statistics, histograms, and other non-parametric tests. We developed a statistical profile of the six neighbourhoods. We estimated a regression model of solid waste generation rate. The model is of the following form:

$$Y_{ik} = f(X_{ik}, N_k) \qquad (1)$$

Where Yik is solid waste generated per day by a household i in neighbourhood k. Xik is a vector of household attributes for household i in neighbourhood k, such as household size, income, housing type, etc. N_k is a vector of neighbourhood attributes observed for the neighbourhood k to capture the heterogeneity in waste generation rates that exist across neighbourhoods.

We log-transformed the dependent variable to estimate a log-linear model. Some explanatory variables were also log transformed. Since the dependent variable, solid waste generated by each household, was repeated approximately 14 times for each household in the dataset, we need to account for the panel structure of the data. We clustered standard errors by household to adjust the standard errors. The clustering option allowed the observations to be independent across groups (i.e., households). However, the requirement for the observations to be independent within groups is relaxed. This technique affects only the variance-covariance matrix, and hence only the standard errors are adjusted.

Analysis and Results

This section presents the descriptive analysis of the household characteristics in the six neighbourhoods, which were selected based upon the socio-economic characteristics of the households, such that the six study areas consisted of two low-income neighbourhoods namely Fazalabad and Naseerabad, two middle-income neighbourhoods namely Mohammadi Colony and PIA Colony, and two high-income neighbourhoods namely Nisar road and Valley road.

Household Characteristics

Complete demographic details were available for 118 out of the total 120 households recruited for the study. Each neighbourhood provided data for approximately 20 households in the survey. Muhammadi Colony and Nisar Road provided data on 19 households each whereas the remaining neighbourhoods provided data for 20 households.

Table 5: Breakdown of Households by Neighbourhood

NHD	Count	Percent	Cum. Per
Fazalabad	20	16.95	16.95
Naseerabad	20	16.95	33.90
MC	19	16.10	50.00
PIA Colony	20	16.95	66.95
Nisar Road	19	16.10	83.05
Valley Road	20	16.95	100.00
Total	118	100.00	

In general, the household sizes across the six neighbourhoods varied between 5.7 persons per household to 6.8 persons per household. The household size did not vary between low, mid, and high-income neighbourhoods (using Anova at 5% significance).

Table 6 shows that the high-income Nisar Road neighbourhood returned an average household size of 6.1 persons compared to the low-income Fazalabad neighbourhood where the household size was roughly 5.9 persons.

The average number of males was higher in some neighbourhoods (Table 7). For instance, in the low-income neighbourhood of Fazalabad, the average number of males per household at 2.2 was higher than the average number of females at 1.9. On the other hand, the mid-income neighbourhood of Muhammadi Colony reported 2.3 females per household against 1.9 males. In total, the average number of males at 2.3 was slightly higher than the average number of females at 2.1.

The T-test comparing the number of males and females did not suggest a statistically significant difference between the two.

Table 6: Household Size Across The Six Neighbourhoods

NHD	Mean	Std. Dev.	Frequency
Fazalabad	5.9	1.9	20
Naseerabad	6.8	2.3	18
MC	5.6	1.6	16
PIA Colony	6.8	2.1	17
Nisar Road	6.1	2.6	18
Valley Road	5.7	2.2	20
Total	6.1	2.2	109

Table 7: Average Number of Males and Females in the Six Neighbourhoods

NHD	Male		Female	
	Mean	Std. Dev.	Mean	Std. Dev.
Fazalabad	2.2	1.1	1.9	1.0
Naseerabad	2.8	1.3	2.4	1.6
MC	1.9	1.1	2.3	1.3
PIA Colony	2.0	1.3	1.8	0.9
Nisar Road	2.7	1.6	2.2	1.4
Valley Road	2.1	1.2	2.2	1.2
Total	2.3	1.3	2.1	1.2

The number of children across the six neighbourhoods varied significantly (Table 8). The highest number of children was observed in mid-income neighbourhoods of Muhammadi Colony and PIA Colony with 3.0 and 3.7 children per household respectively. The lowest number of children was observed for high-income neighbourhoods of Nisar Road with 2.9 children per household and Valley Road with 1.9 children per household. The low-income neighbourhoods of Fazalabad and Naseerabad reported 2.8 and 3.0 children per household on average. In total, 68 of the 118 surveyed households had children living at home. Individuals under the age of 15 were deemed as minors in the survey.

Table 8: Average Number of Children in the Six Neighbourhoods

NHD	Mean	Percent	Cum. Per
Fazalabad	2.8	1.7	14
Naseerabad	3.0	1.8	10
MC	3.0	1.3	8
PIA Colony	3.7	1.6	15
Nisar Road	2.9	0.9	10
Valley Road	1.9	0.8	11
Total	2.9	1.5	68

As expected, home ownership was higher in high- and mid-income neighbourhoods as compared to low-income neighbourhoods (Table 9). The highest homeownership rate was observed for the mid-income neighbourhoods of PIA Colony and Muhammadi Colony. The lowest levels of ownership were observed for the low-income neighbourhood of Fazalabad where 45% of the households owned their homes. In the high-income neighbourhoods, rental households accounted for at least 1 in 5 households.

We used size of the dwelling unit and automobile ownership as proxies for the economic well-being of households surveyed for this study.

Table 10 shows that the average lot size reported in the sample was approximately 3,100 square feet. Low-income households reported smaller lot sizes of approximately 1,259 square feet for Fazalabad and 757 square feet for Naseerabad respectively. Mid-income neighbourhoods reported larger lot sizes ranging from 1,500 to 1,800 square feet. The high-income neighbourhoods reported lot sizes of over 6,000 square feet.

Table 10: Average Size of the Dwelling Unit in the Six Neighbourhoods

NHD	Mean	Std. Dev.	Frequency
Fazalabad	1259	481	20
Naseerabad	757	352	18
MC	1534	460	16
PIA Colony	1804	560	17
Nisar Road	6334	4714	18
Valley Road	6697	2917	20
Total	3137	3382	109

The number of rooms is another indicator of dwelling size. Table 11 shows that the smallest dwelling units were located in the low-income neighbourhoods averaging 2.5 rooms per dwelling whereas the largest size homes were located in high-income neighbourhoods with almost six rooms per household.

Similarly, the number of toilets or washrooms per house was much higher in high-income neighbourhoods at approximately 4.3 washrooms per house compared with low-income neighbourhoods with 1.3 washrooms or toilets per house.

Table 9: Housing Tenure in the Six Neighbourhoods

NHD	Own	Rent	Total	Own_per	Ren_per
Fazalabad	9	11	20	45%	55%
Naseerabad	11	6	17	65%	35%
MC	15	1	16	94%	6%
PIA Colony	16	0	16	100%	0%
Nisar Road	14	3	17	82%	18%
Valley Road	16	4	20	80%	20%
Total	81	25	106	76%	24%

Table 11: Average Number of Rooms in the Six Neighbourhoods

NHD	Mean	Std. Dev.	Frequency
Fazalabad	2.5	0.9	20
Naseerabad	2.6	1.7	18
MC	3.6	1.4	15
PIA Colony	4.4	2.1	16
Nisar Road	5.8	2.3	18
Valley Road	5.7	2.3	20
Total	4.1	2.5	107

Table 12: Average Number of Toilets in the Six Neighbourhoods

NHD	Mean	Std. Dev.	Frequency
Fazalabad	1.3	0.6	19
Naseerabad	1.4	0.5	18
MC	2.4	0.9	16
PIA Colony	3.4	1.4	17
Nisar Road	4.3	1.4	18
Valley Road	4.4	1.7	20
Total	2.9	1.7	108

Water Supply and Sanitation Services

We asked households about municipal services provided by the Rawalpindi Cantonment Board including water supply and solid waste collection.

Table 13 suggests that the source of water consumed in six neighbourhoods varied considerably. In the low-income neighbourhood of Fazalabad, 90% of households obtained water from municipal services whereas only 56% of households in the other low-income neighbourhood of Naseerabad received water from municipal services.

The mid-income neighbourhoods of Muhammadi and PIA Colonies did not receive water from municipal sources. Instead, groundwater was the primary source of water in Muhammadi and PIA colonies that was obtained by households digging water wells. In PIA Colony, almost 80% of households also relied on private vendors who used larger water tanks to supply water. Not so surprisingly, high-income neighbourhoods received municipal water where Nisar Road neighbourhood reported 100% water supply from municipal services and 90% of the households residing along Valley Road reported receiving water from municipal sources.

The low-income neighbourhoods lacked municipal services for solid waste collection or disposal. In Fazalabad and Naseerabad, 100% of the households reported disposing of solid waste by themselves. The same was true for the mid-income neighbourhood of Muhammadi Colony. In PIA Colony, 38% of households reported some municipal service for solid waste. In the high-income neighbourhoods, more than 50% of households reported disposing of solid waste by themselves and the rest was handled by the Cantonment Board (Table 14).

Table 13: Source of Water Supply in the Six Neighbourhoods (Percentages)

NHD	Municipal	Hand Pump	Boring Pump	Water Tank	Others	Total
Fazalabad	90.0	-	-	-	10.0	20
Naseerabad	55.6	-	5.6	5.6	33.3	18
MC	-	6.3	87.5	-	6.3	16
PIA Colony	-	-	82.4	17.6	-	17
Nisar Road	100.0	-	-	-	-	18
Valley Road	89.5	5.3	-	-	5.3	19
Total	58.3	1.9	26.9	3.7	9.3	108

Table 14: Solid Waste Collection Characteristics in the Six Neighbourhoods (Percentages)

NHD	Municipal	Self Disposal
Fazalabad	-	100
Naseerabad	-	100
MC	-	100
PIA Colony	38	63
Nisar Road	44	56
Valley Road	40	60
Total	21	79

Waste disposal across the six neighbourhoods is presented in Table 15. The table suggests that high-income neighbourhoods are more likely to dispose of solid waste in rubbish bins. Furthermore, there is some compliance of solid waste disposal in rubbish bins in low-income neighbourhoods.

The mid-income neighbourhoods predominantly dump solid waste in empty private plots. In Muhammadi Colony this practice is common amongst 88% of households. In the low-income neighbourhoods, most households reported no central facilities to collect solid waste. In the Naseerabad neighbourhood, 67% of households reported disposing of solid waste in empty private lots.

It is interesting to note that in the high-income neighbourhood of Nisar Road, 12% of the households reported dumping waste in the unguarded municipal lots. Similarly, 25% of households in the high-income Valley Road neighbourhood reported dumping waste either in empty lots or on street corners.

Across the six neighbourhoods, only 29% of households reported using waste collection bins whereas 40% of households reported dumping waste in empty lots and 8% on street corners.

Table 16 offers insight into how recyclables are dealt with across the six neighbourhoods. The low-income neighbourhoods of Fazalabad and Naseerabad reported recyclable material being sold to the waste collectors who purchase waste from houshold by going door to door. In the mid-income neighbourhoods, most households reported selling the waste to waste collectors and also giving the waste away to domestic help. In high-income neighbourhoods, only 1 in 4 households sold waste to waste collectors. Most households in the high-income neighbourhoods passed the recyclable waste to domestic workers who perhaps sold it later to earn additional revenue. Almost 29% of the households in Nisar Road and 20% households in the Valley Road neighbourhood reported throwing away recyclable materials along with solid waste.

Waste Generation Rates

Table 17 below suggests that the average solid waste collected from the six neighbourhoods was around 1.7 kilograms per household per day. The maximum waste recovered was approximately 19 kg.

Table 15: : Waste Disposal in the Six Neighbourhoods (Percentages)

NHD	Rubbish Bins	Empty Private Lot	Street Corner	Open Government Property	No Facility Available	Incinerator
Fazalabad	7	-	21	7	57	7
Naseerabad	6	67	-	-	28	-
MC	-	88	6	-	-	6
PIA Colony	-	69	6	-	19	6
Nisar Road	82	-	-	12	6	-
Valley Road	65	10	15	5	5	-
Total	29	39	8	4	18	3

Table 16: Recycling in the Six Neighbourhoods (Percentages)

NHD	Solid Junk Collectors	Domestic Workers	Throw Away in Waste	Others
Fazalabad	100	-	-	-
Naseerabad	100	-	-	-
MC	81	19	-	-
PIA Colony	65	24	6	6
Nisar Road	24	47	29	-
Valley Road	25	55	20	-
Total	66	24	9	1

Table 17: Descriptive Statistics of Generated Waste in Grams

Mean	1715
Std. Dev.	2120
Skewness	3
Kurtosis	15

The waste generation characteristics of the six neighbourhoods are reported as follows. The lowest waste generation rate was realised for low-income neighbourhoods and the highest waste generated was in the high-income neighbourhoods. In the low-income Fazalabad neighbourhood, the average waste generated was roughly 807 grams per household per day. The highest average waste generated was reported for the Nisar Road neighbourhood at 2.8 kg per day. Table 18 presents a clear trend of an increase in the generated waste with income. The per capita waste generated is also reported in the same table, which suggests that the high-income neighbourhoods reported more than 400 grams of solid waste per capita per day and the low-income neighbourhoods reported less than 200 grams per capita per day of solid waste.

The literature reviewed earlier in the paper revealed that household size influenced the amount of waste generated where the larger households were found to generate more waste than smaller households. This relationship is illustrated in Figure 2 where the blue line captures the average waste generated per day for households differentiated by size. The black line is the regression line fitted to the data. The regression model with a R square of 61% suggests that each additional household member contributes approximately 190 grams of solid waste.

The literature surveyed earlier also suggested that even though waste generated increased with household size, the per capita waste generated by

Table 18: Waste Generation Characteristics in the Six Neighbourhoods (excluding others)

NHD	Waste (Grams)	Std. Dev.	Freq.	Waste per Capita (Grams)	Size
Fazalabad	807	997	263	137	5.9
Naseerabad	1284	1547	211	188	6.8
MC	1582	1465	102	284	5.6
PIA Colony	1217	1971	192	178	6.8
Nisar Road	2786	2883	234	460	6.1
Valley Road	2391	2212	202	423	5.7
Total	1664	2123	1204	272	6.1

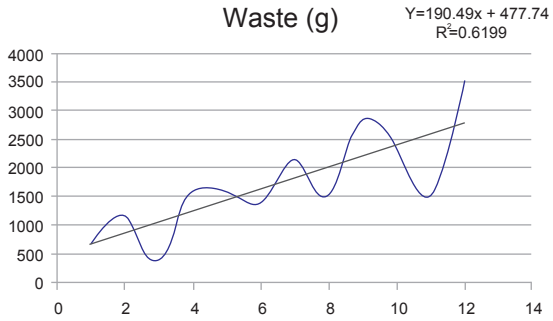

Figure 2: Waste Generation and Household Size

each household declined with the increase in household size. Our data support the earlier findings that per capita generated waste declines with an increase in household sizes. The blue line in Figure 3 represents the average per capita waste generated for varying household size. Also included is a regression line fitted to the aggregated data. Figure 3 confirms that an increase in household size is accompanied by a decline in per capita waste generated by each household.

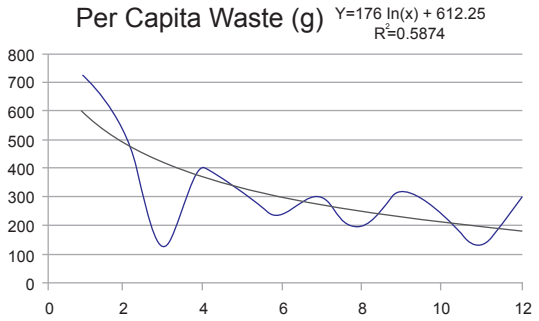

Figure 3: Per Capita Waste Generation and Household Size

The average waste generated per household in the raw data set was 1.715 kg per day, which is influenced by the extreme high and low values. For instance, one household generated 19 kg of solid waste on a single day. Once the extreme values were eliminated from the dataset, the revised average waste generation per household equalled 1.67 kg/ per day (Table 19).

Empirical Models of Domestic Waste Generation Rates

We log-transformed the waste_g variable, which offered a closer approximation to the normal distribution than the raw data. We estimated the model where the dependent variable (waste_g) was log transformed and the socio-demographic explanatory variables, were kept in their original form resulting in a log-linear specification.

Table 19: Descriptive Statistics of Variables Representing Collected Waste

Variable	Mean	Std. Dev.	Min	Max
weight_new	1715	2120	-	19000
waste_g	1672	2803	50	9900
ln_waste_g	6.8	1.2	3.9	9.2

Another key concern was the panel nature of the data set. Since waste was collected from each household for more than one day, each household is therefore repeated in the data set multiple times. This panel effect influences the estimated standard errors in the model, while not affecting the estimated parameters. If the panel effect is not accounted for, one may have models returning lower standard errors making certain relationships significant, while they may not be of statistical significance. We, therefore, report standard errors that account for intra-group correlation, thus relaxing the requirement that all observations must be independent. Thus, the observations are independent across households, but not for the same household. This allows us to appreciate the fact that the amount of waste collected from the same household may be similar from day to day, but different from other households.

The first set of variables introduced in the model were neighbourhood specific binary (1/0, either/or) variables to account for the neighbourhood-level effects. We have set the Fazalabad neighbourhood as the base case allowing us, therefore, to interpret other neighbourhoods in comparison with Fazalabad.

Model A in Table 20 is the first of the four models reported. Since Fazlabad is a low-income household, the coefficients in the Model reported in Column A suggest that all other neighbourhoods generate more waste per household. For instance, households living in Naseerabad generate 69% (0.69 in the model) more waste than those living in

Fazalabad. Whereas the high-income neighbourhoods of Nisar Road and Valley Road generate 1.46 and 1.3 times more waste per household than those in Fazalabad. All estimated coefficients were statistically significant at the 99% significance level and the model explained 19% variance in household waste generation.

The model reported in Column B suggested that the number of males (log-transformed) was not a significant predictor of waste generated by households. However, the model observed that a percentage increase in the number of women generated 0.23% more waste.

The model reported under Column C includes the impact of children on waste generation rates. The model suggests that a percentage increase in the number of children results in a .43% increase in the waste generation rates. The estimated coefficient for the number of children was statistically significant. However, a large number of observations were dropped from the model primarily because households with no children could not be entered into the model since log(0) is undefined. To address this limitation, we transformed the number of children variable into a categorical binary variable where households with children were coded as one, and those without children were coded as zero.

The estimated coefficients in the resulting model are presented in Column D. The model suggests that the households with children generate 21% more solid waste than those without children. This finding is also statistically significant. Also, note that we report robust standard errors after clustering the multiple observations obtained from each household. Furthermore, the model also suggested that a 10% increase in the size of the dwelling unit resulted in a 1.6% increase in solid waste generation.

The final model is presented in Table 21 below. The model explained 25% of the variance in the dependent variable (solid waste generated at the household level). The model is comparable, and in some instances much better, to the other studies reviewed for this paper.

Table 20: : Econometric Model of Solid Waste Generation (First Set)

Variable	A	B	C	D
Naseerabad	0.69***	0.61***	0.49***	0.70***
MC	0.82***	0.70***	0.49**	0.73***
PIA colony	0.42***	0.38***	0.06	0.30**
Nisar Road	1.46***	1.42***	1.22***	1.23***
Valley Road	1.30***	1.20***	1.25***	0.99***
In_males		0.11	0.29**	0.19*
In_females		0.23**	0.2	0.21**
In_kids			0.43***	
Kid_binary				0.21**
In_area				0.16*
constant	6.05***	5.89***	5.60***	4.56***
Observations	1148	1053	695	1053
Adjusted R2	19%	20%	20%	20%

Legend: * p<0.05; ** p<0.01; *** p<0.001

The final model suggests that high-income neighbourhoods generate significantly more solid waste than the low-income neighbourhood of Fazalabad. Similarly, mid-income neighbourhoods also reported higher waste generation rates than Fazalabad. The model suggests that a percentage increase in household size is correlated with a 0.8% increase in solid waste generation. Once the household size is controlled for, the presence of children does not report a statistically significant coefficient. Similarly, the variable controlling for housing tenure, i.e. owned vs. rented, also returned a statistically insignificant coefficient suggesting that homeownership status had no impact on the amount of generated waste, all else being equal. Furthermore, the size of the dwelling unit also returned a statistically insignificant coefficient along with the variable controlling for the education level of the head of the household.

In summary, the final model suggests that significant predictors of household waste generation are household size and neighbourhood specific binary variables that account for neighbourhood influences on solid waste generation. The number of children and the size of dwelling unit are not significant determinants of solid waste, all else being equal. The results reported here are based on robust standard errors, that account for household-specific heterogeneity.

Table 21: Statistical Model of Solid Waste Generation

Ln_waste_g	Coef.	Std. Err.	t	Prob.
Naseerabad	0.61	0.18	3.40	0.001
MC	0.75	0.21	3.58	0.001
PIA colony	0.25	0.20	1.23	0.221
Nisar Road	1.21	0.27	4.50	0.000
Valley Road	1.06	0.26	4.06	0.000
ln_hhld_size	0.81	0.15	5.60	0.000
Kids_bin	0.09	0.14	-0.62	0.535
ln_Area	0.18	0.12	1.46	0.147
Own	0.11	0.13	-0.81	0.419
Grade12_plus	0.02	0.12	0.18	0.861
Constant	3.51	0.95	3.71	0.000

Conclusions and Recommendations

This study focused on the determinants of household solid waste generation in urban Pakistan. Based on a case study of 118 households residing in Rawalpindi Cantonment, this study documents the socio-demographic determinants of household solid waste generation in Rawalpindi. Furthermore, detailed interviews with households also revealed how waste was disposed by households or collected by the municipal authorities. Information on how recyclables were disposed was also documented.

The empirical analysis of household demographics revealed that household size did not change systematically between the low, mid, and high-income households. The demographic data revealed that on average men outnumbered women across all income strata. The analysis also revealed that the number of children per household was higher for low-income households.

The predominant mode of water supply to the six neighbourhoods included local government tap water and wells dug on site by households. Households living in low-income neighbourhoods, without exception, disposed of solid waste by dumping it in empty lots. The middle-income households either disposed of solid waste by dumping it in empty lots or relied on waste pickup services offered by the Cantonment Board. The high-income households relied more on the Cantonment Board for waste collection.

The data presented here suggest that the Cantonment Board serves high-income neighbourhoods more proficiently than others. In interviews, the Cantonment Board officials could not offer any explanation for why they offered more services to high-income neighbourhoods than others.

In the absence of proper solid waste collection services, households are more inclined to dispose of household solid waste by dumping it in open lots or on publically-owned land. Even in the high-income neighbourhoods, where local government provided solid waste collection services, the practice of dumping waste in open lots was common, suggesting challenges in solid waste

collection cut across income strata.

On average, 1.6 kilograms of solid waste was produced daily per household in the six neighbourhoods. The average per capita solid waste produced equalled 272 g per person per day. A direct positive correlation was observed between income and solid waste generated. High-income neighbourhoods reported the highest solid waste generation rates. The total waste generated by a household increased with household size. However, waste generated per capita declined with an increase in household size. While this is an interesting observation, the reasons behind this are not fully explored in this research.

Statistical models of solid waste generation revealed that neighbourhood proxies turned out to be statistically significant suggesting the presence of neighbourhood specific heterogeneity in waste generation rates. A statistically significant coefficient for household size suggested that larger households indeed generate more solid waste, all else being equal. Furthermore, the size of dwelling unit also reported a statistically significant coefficient.

This study also validates the previously observed impact of household income on solid waste generation. High-income households produce more waste than others. Furthermore, a statistically significant and positive correlation is observed between household size and waste generated. While this relationship may seem obvious, research referenced earlier in the literature review observed that the correlation between solid waste generation and household size was not necessarily positive.

Recommendations

Based on the analysis presented in this study, we recommend the following:

1. A much larger survey is needed to develop statistically sound estimates for solid waste generation. It is recommended that a follow-up study with a large random sample of households sufficient to determine statistically significant estimates of solid waste for the entire city be undertaken.

2. The solid waste collection directorate in local governments should work in collaboration with citizen groups to ensure that waste collection services are extended to all neighbourhoods.

3. Private sector entrepreneurs should be encouraged to develop business propositions for waste collection and management. However, local governments should regulate the performance of private enterprises responsible for the collection, disposal, and management of solid waste.

4. Household surveys to determine willingness to pay for improved solid waste services should be undertaken to determine the quality and frequency of service demanded across various income groups.

5. Local and higher tiers of governments should entertain the idea of educating citizens through media about sustainable environmental practices for solid waste disposal. In neighbourhoods where solid waste collection facilities are available, campaigns should be run to educate households against the ills associated with improper disposal of waste.

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References

1) Abel, A. (2007) An analysis of solid waste generation in a traditional African city: the example of ogboMoSo, Nigeria. Environment and Urbanization, 19, 527-537.

2) Afon, A. O., and Okewole, A. (2007). Estimating the quantity of solid waste generation in Oyo, Nigeria. Waste Management & Research, 25, 371-379.

3) Altaf, M.A., and Deshazo, J.R. (1996) Household demand for improved solid waste management: A case study of Gujranwala, Pakistan. World Development, 24(5), 857-868.

4) Benitez, S. O., Lozano-Olvera, G., Morelos, R. A., and de Vega, C. A. (2008) Mathematical modeling to predict residential solid waste generation. Waste Management, 28, S7-S13.

5) Bolaane, B., and Ali, M. (2004) Sampling household waste at source: lessons learnt in Gaborone. Waste Management & Research, 22, 142-148.

6) Buenrostro, O., Bocco, G., and Vence, J. (2001) Forecasting generation of urban solid waste in developing countries - A case study in Mexico. Journal of the Air and Waste Management Association, 51, 86-93.

7) Damghani, A. M., Savarypour, G., Zand, E., and Deihimfard, R. (2008) Municipal solid waste management in Tehran: Current practices, opportunities and challenges. Waste Management, 28, 929-934.

8) Dangi, M. B., Urynowicz, M. A., Gerow, K. G., and Thapa, R. B. (2008) Use of stratified cluster sampling for efficient estimation of solid waste generation at household level. Waste Management & Research, 26, 493-499.

9) Darshini Mahadevia, and Jeanne M. Wolfe (2008) Editors. Solid waste management in Indian cities. Concept Publishing Company New Delhi.

10) King, B. F., and Murphy, R. C. (1996) Survey to estimate residential solid waste generation. Journal of Environmental Engineering-Asce, 122, 897-901.

11) Koushki, P. A., Alhumoud, J. M., and Al-Duaij, U. (2004) Municipal solid waste in Kuwait: Trends and attitudes on collection, separation and willingness to pay. Kuwait Journal of Science & Engineering, 31, 173-188.

12) Leao, S., Bishop, I., and Evans, D. (2001) Assessing the demand of solid waste disposal in urban region by urban dynamics modelling in a GIS environment. Resources Conservation and Recycling, 33(4), 289-313.

13) Mani, S., Kumar, A., Sardana, A., and Ray, A. (2005). "Little Drops of Water…" The Decentralized Path to Urban Renewal. Centre for Environment Education - Delhi. Accessed on March 15, 2009 from http://www.ceeindia.org/esf/download/paper41.pdf.

14) Marquez, M. Y., Ojeda, S., and Hidalgo, H. (2008) Identification of behavior patterns in household solid waste generation in Mexicali's city: Study case. Resources Conservation and Recycling, 52, 1299-1306.

15) Ojeda-Benitez, S., Vega, C. A. D., and Marquez-Montenegro, M. Y. (2008) Household solid waste characterization by family socioeconomic profile as unit of analysis. Resources Conservation and Recycling, 52, 992-999.

16) Otoniel, B. D., Liliana, M. B., and Francelia, P. G. (2008) Consumption patterns and household hazardous solid waste generation in an urban settlement in Mexico. Waste Management, 28, S2-S6.

17) Qu, X. Y., Li, Z. S., Xie, X. Y., Sui, Y. M., Yang, L., and Chen, Y. (2009) Survey of composition and China. Waste Management, 29, 2618-2624.

18) Sha'Ato, R., Aboho, S. Y., Oketunde, F. O., Eneji, I. S., Unazi, G., and Agwa, S. (2007) Survey of solid waste generation and composition in a rapidly growing urban area in Central Nigeria. Waste Management, 27, 352-358.

19) Sujauddin, M., Huda, S. M. S., and Hoque, A. T. M. R. (2008) Household solid waste characteristics and management in Chittagong, Bangladesh. Waste Management, 28, 1688-1695.

20) Tsai, T. H., and Sheu, S. J. (2009) Will unit-pricing enhance recycling? International Journal of Sustainable Development and World Ecology, 16, 102-108.

21) Younas, M., Afzal, S., Jaffery, I.H., and Farooq, M. (1999) Forms of Cd, Pb, Zn and Cr in contaminated soils from Raiwind, Lahore, Pakistan. Journal of the Chemical Society of Pakistan, 21(4), 393-399.

Research Article

Collaborative Planning, Governance and Resistance: Institutional Provision in Lahore

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Abstract

Growing criticisms of planning systems and their failures have cast an atmosphere of urgent recall for practitioners and scholars of the 'planning project'[1]. Most glaring of these failures have been the (increasingly pronounced) instances of socio-economic, spatial, and political marginalization and fragmentation that have emerged in cities across the developing world. These crevices of contradiction created by a longwinded bureaucratic promise of development have created a need for newer hybrid models of planning and governance. This paper examines the theoretical underpinnings of 'Collaborative Planning' as one such model of governance hybridity in cities. The mechanisms of Collaborative Planning are outlined herein and briefly analyzed using the example of the Pakistani city of Lahore. The paper aims to highlight the opportunities for transparency and inclusivity within Collaborative Planning approaches and attempts to identify the various manifestations they can take in a developing city. While Collaborative Planning permits the navigation of effective systems of multi stakeholder governance and the potential creation of a networked urban consciousness (Healey, 2010; Innes and Booher, 2002), this research finds that it is entirely dependent on localized socio-political realities.

Keywords: Collaborative Planning, Urban Governance, Planning Theory, Decision Making, Lahore, Citizen Awareness

Introduction

The global South has produced many examples of cities wherein traditional systems of urban planning and development have failed to address contemporary urban complexities. A worrying degree of fragmentation in the social and spatial realm has been observed in cities where planning approaches have been arguably centralized, arbitrary, and non-inclusive. Research and theoretical navigations of a 'good' city, participatory governance, and equitable power have seldom yielded a model for practical application. Therefore, from a planning and governance standpoint, it becomes increasingly essential to identify effective practices that can guide local governments and citizens towards a more inclusive, just, and harmonious city.

This need for redesigning the planning approach has been part and parcel to the post neo-liberal shift from 'government' to 'governance' and from 'citizens' to 'civil society'. Parallel to these shifts has been the rise of the information city and the network society (Castells, 1991; 2011). These changes highlight the multidimensional effects of development decisions taken by municipal authorities and urge planners to develop policy frameworks that take into account the socio-political complexities of the city. The need for engagement with the wider nonpartisan civil domain during decision-making has, thus, reached its meridian.

The Development of Collaboration in Planning Theory

In past few decades, planning theory has seen an increased emphasis on the communicative and interactive character of the planning practice. Ideas such as 'transactive' planning (Friedmann 1973), 'communicative' planning (Forester 1989; Healey 1992; Innes 1996), the 'Discourse Model' (Taylor, 1998), and Collaborative Planning (Healey 1997; Innes and Booher 1999) all speak to the 'communicative' and concerted approach to planning. Alongside, there is a rich body of literature from corresponding disciplines such as public policy and environmental management that offer contributions to the development of collaborative approaches in planning theory (Selin and Chevez, 1995; Moote, McClaran, and Chickering 1997; Margerum, 2002). Collaborative[2] Planning was thus not born in conceptual isolation,

[1] According to Patsy Healey, the 'Planning Project' is the century old practice of progressively 'modernizing' cities. This modernization was criticized as often being a reflection of the ambitions of the elite rather than the representation of the ordinary city dweller. As time went on, the planning project became more concerned with socio-economic dimensions of places and how development initiatives could alleviate economic hardships faced by cities. In the later part of the twentieth century, the planning project began to incorporate wider debates about the politics, community, and democratic life (Healey, 2010:14,15).

[2] Interchangeably termed as 'communicative' planning

but instead was a result of ongoing theoretical deliberations over the need for more democratic management and organization of urban environments (Harris, 2002).

In itself, the concept went into production in the 1980's as the new paradigm of planning theory began to develop based on Habermas's (1984) theory of Communicative Action (Harris, 2002; Allmendinger and Tewdwr-Jones, 2002). The institutional and urban policy changes occurring during the 1980's in governance structures across Europe invited revised scholarly insight into the nature and future of urban planning. 1980's Europe at the time was experiencing economic shifts due to significant political developments[3] in the region. A by-product of the economic change was the increasing role of the market in deliberating the future of city planning and resultant stakeholder dynamics. Additionally, the citizen sphere was also being strengthened due to the outset of a diverse and heterogeneous demographic. These changes highlighted the need for new kind of planning models.

For those involved with the monumental task of institutionalizing the emergence of new public and private actors in decision-making, imaginative and effective ways of achieving cooperation across all parties was a worthwhile topic for research[4]. The subsequent research and body of writing that addresses possibilities and methods for multiple stakeholder engagement in planning are referred to as 'Collaborative Planning Theory' (Harris, 2002; Allmendinger and Tewdwr-Jones, 2002).

Collaborative Planning hinges itself on the political realities acknowledged by Habermasian communicative reason and thus seeks to move past the traditional notion of planning as an activity carried out with scientific accuracy by experts claiming to embody impartiality on behalf of the public (Fainstein, 2000). The search for contemporary alternatives for planning thus involved not only sensitivity to the politics of the spatial, but also had an essentially democratic character.

Growing criticisms of planning systems and failures cast an atmosphere of urgent recall for practitioners and scholars of the 'planning project'[5]. Most glaring were the instances of marginalization and fragmentation that emerged in the crevices of contradiction created by the longwinded bureaucratic promise of development. The institutions and planning systems at work were criticized as being mechanisms working *"systematically to oppress minorities or, in some post-colonial situations, to allow urban political elites to cream off the benefits of urban development for themselves"* (Healey, 2010:15). The work of the prominent sociologist Manuel Castells also contributed significantly to the advancement of an elite profit based critique of city planning that created displacement of the working class (Castells, 1977). Such criticisms of systematic failures prompted essential development on the need for theoretical revision of urban governance models and ideologies. As previously stated, such a revision invited institutional reform to allow public consensus and active deliberation over plans for neighborhoods and localities. In 1997, the thought provoking publication of a book entitled Collaborative Planning - Shaping Places in Fragmented Societies generated a vast response by the new-institutionalist school of theorists.

Collaborative Planning: The Search for a Definition

In her book, Healey (1997) introduced the idea of collaborative planning as an endeavor to move beyond the conventional hierarchical and bureaucratic practices, to engage new factions and

[3] This is referring to the Margaret Thatcher era; also later known as the advent of 'neo-liberalism'.

[4] Understood herein as the practical adaptation of Jurgen Habermas's concept of communicative action whereby the public use of reason is based on ethic principles of communication. Policy makers keeping communicative theory at the core of their evaluations focused on issues such as respect for opposing opinions, viewpoints, compromise, and principles of fair public debate (Habermas, J., 1981/1984).

[5] According to Patsy Healey, the 'Planning Project' is the century old practice of progressively 'modernizing' cities. This modernization was criticized as often being a reflection of the ambitions of the elite rather than the representation of the ordinary city dweller. As time went on, the planning project became more concerned with socio-economic dimensions of places and how development initiatives could alleviate economic hardships faced by cities. In the later part of the twentieth century, the planning project began to incorporate wider debates about the politics, community, and democratic life (Healey, 2010:14,15).

networks, and allow for the creation of new partnerships. The increase in top down development plans and 'structure' plans in 1960's United Kingdom served as one of the lead impetus for initial work on collaborative methods of decision-making. Studying the idea of top-down mostly public sector implementation of plans, Healey argued that these 'development' and 'structure' plans had become *"statements of policy principles and regulatory norms to guide land and property development processes"* (Healey 2003:102). This served to illustrate how neo-liberal planning approaches had managed to exclude citizens and various stakeholders from the arena of deliberation. In fact, we can argue that the emergence of collaborative[6] approaches enabled the construction of an arena in which public and transparent deliberation over the production of place could occur – hence making the link between collaborative planning and the idea of a deliberative urban experience.

The increase in 'bottom-up' struggles and conflicts over 'top-down' planning decisions made it clear that land and property development processes in cities were shaped not only by the lever of government planning departments, but also by complex social dimensions (Healey 2003:103). These social dimensions consisted of, but were not limited to, the emergence of new actors and stakeholders representing a myriad of conditions related to the economy, environment, culture, and government policies. The integration and absorption of the potential private sector and the variety of choice and skill available was a key element of the collaborative approach. Healey's expansion of collaborative planning thus began to address the multi-scalar interactions and struggles (Brenner, 1999, Healey, 2003) involved in urban governance and decision-making, ultimately pointing towards the need for greater consensus building.

Similar to Healey, Innes and Booher (1999) contend, *"consensus building may be a fractal of the larger phenomenon of collaborative planning,"*(1999:421). The reference here is to the multiple socio-political and networked changes that can be generated through a collaborative decision making environment.

A significant difference to Healey, however, is the strong empirical foundation of Innes and Booher's argument, which is derived from 13 case studies of consensus building in California, the New Jersey State planning process, and others. The authors' primary focus is the development of a framework for the evaluation of collaborative planning and governance. In this framework we find that the phenomenon of consensus building can be understood through two main lines of thought: Complexity Theory and Communicative Rationality. Taken together, they help to argue why good decisions in a fragmented and uncertain world have to emerge from inclusive and open dialogue among equal partners rather than from top down authorities, litigation, or the often nepotistic bargaining around presupposed positions.

Therefore, benefitting from such a substantive theoretical pedagogy, Healey's critical evaluation of ongoing institutional practices and governance structures generated a wide reception in the world of both planning and policy. As Harris (2002) thus points out, the development of Collaborative Planning is a complex interweaving of communicative action theory as well as broader theories on institutionalist sociology and economic regionalism proved accurate. Laconically, the institutionalist and regionalist body of theory act as the analytical background of collaborative planning while the communicative planning theory provides the normative framework (Harris, 2002).

Collaborative Planning through the Healeyian lens enables a framework for the digestion of asymmetric conflictual encounters between culturally and structurally embedded relational networks. These networks (discussed later) transect the urban *'with their own time horizons and spatial reach'* (Healey, 2000). Additionally, Healey's work allows us to imagine new social dynamics within interactive governance processes that support the sustaining and/or transforming of the above networks (Healey, 1997: 2003).

Thus the work of Healey, taking foothold from the work of Habermas, and further elaborations from

[6] The term collaborative is more indicative of the deliberative and consensus-oriented approach that can be contrasted with adversarialism or managerialism; more so than terms like 'participatory' or 'interactive' (Ansell and Gash, 2007).

Innes and Booher, Allmendinger and Tewdwr-Jones form the theoretical framework upon which the concept of collaborative planning rests. Other theorists have sophisticated the notion in various works that are touched upon herein.

The Spatial Dimension in Collaborative Planning

Alongside the interactive and governance feature of Healeyian planning, there has also been particular attention paid to the spatial dimension in the *"ongoing flow of project development and implementation"* (Healey, 2003: 103). Healey (2003:103) explains how *"comprehensive spatial visions for an area were largely displaced by broad and general statements of goals"* creating a greater need for focusing on the spatial dimension of planning. Her work repeatedly stresses on the quality of place arguing that the planning interventions and development processes created injustices of a distributive nature. Research promoting collaborative approaches aimed to highlight aspects of socially sensitive aspects of planning policies that were strategically overlooked. Healeyian inquiry into the nature of neo-liberal urban planning revealed that despite policies to protect environmental and socio-cultural amenities in place, private investment projects could maneuver self-servingly. She found that in areas where development and planning depended on public sector investment, there was a decline in resources available. This public sector resource deficit, it was concluded, was primarily due to the non-aligned and disconnected management of various governmental branches. As a result, place quality was poorer in areas that were developed through public sector resources, while those that were being developed through the private sector were able to instill an arguable amount of quality. Those who could afford the end product of private development were seen benefiting from residential and commercial urban spaces that had a higher qualitative experience than those who only had access to state developed neighborhoods and public spaces (Healey, 2003). According to Healey, this disconnect in municipal management and lack of adherence to well formulated existing urban policies furthered the fragmentation that was emerging in the spatial landscape of many cities.

No wonder the need for greater coordination, equitable planning, and increased stakeholder dialogue was being encouraged by planners and scholars. The spatial realm was no longer conceived as a product of a centralized, hierarchical, and 'expert' vision. Instead, greater collaboration amongst municipal authorities, social workers, private service providers, community members, and relevant neighborhood initiatives was being encouraged and celebrated. Such a multi-actor interaction allowed not only for transparency, but also for a collective visioning and deliberation on the kinds of neighborhoods and cities suitable for inhabitation by future generations. This was the essence of focusing on the spatial in collaborative planning of bringing the every day dynamic of the neighborhood to the attention of planners and policy makers.

Building off of Healey's concern for the neglect of spatial quality in traditional planning systems, Yvonne Rydin[7] (2011) discusses the emergence of a heterogeneous kind of planning known as 'spatial planning'. For Rydin, spatial planning embodies the spirit of collaborative planning. Poignantly highlighting the gap between private-investment led urban development and government funded social infrastructure planning, Rydin explores how spatial planning can bridge this gap and make it a central agenda in urban change. By presenting infrastructure provision as the chief impetus for driving development activity, spatial planning ascertains the participation of providers and developers into the larger social impacts of their investments. In this way, spatial planning, in line with collaborative planning theory, is about coordination and integration (ibid, 2001). Therefore, this kind of planning is rooted in governance processes that emphasize, as mentioned above, stakeholder interaction and multi-level policy alignment (ibid, 2011).[8]

[7] The term collaborative is more indicative of the deliberative and consensus-oriented approach that can be contrasted with adversarialism or managerialism; more so than terms like 'participatory' or 'interactive' (Ansell and Gash, 2007).

[8] We can benefit from a simplified example here: Spatial Planning allows a greater a number of private investors to bargain for provision (or tenders) of infrastructure for both large and small-scale development projects. Opening the provision of infrastructure to a wider range of providers ensures quality through competitiveness thereby reducing risk of large deals being given to traditionally (or politically) favored companies.

The coordination and integration suggested through collaborative spatial planning requires well-monitored links between actors and plans. These links are often operating across sectoral and spatial boundaries and interweaving different interests and motivations. The practical need for such interests and motivations to be sustained within a political-economic atmosphere is discussed in more detail in the case analysis section of this paper. Section 1.3 below will examine the potential in relationships that are forged through such revised tactics of multi-stakeholder planning.

Governance, Networks and Power

In a broader effort to understand the dynamics of collaboration, the need to recognize how *"structural driving forces"*[9] *and "local governance capacity"*[10] greatly effect deliberative processes in planning is highlighted (Healey, 1997: 2003). Using Giddens' (1984) understanding of the continually cyclical interaction between 'structure and agency', Healey also developed what she hoped would be a framework for understanding certain elements of the planning practice (Healey 2003). Her reading of Giddens' work generated a greater understanding of the socially implanted nature of power and the qualities intrinsic of interactive relations (ibid.). Therefore, to augment the understanding of the situated interaction between structural driving forces and local governance capacity, the deliberations over collaborative planning and what it entailed began to develop an 'institutional account' of planning and practices, focusing in part on the interaction between development interests and institutional practices (Healey et al., 1988).[11]

The fulcrum of Healey's (1997; 2003) introduction of collaborative planning was that planning activity involved interaction with governance activity thereby creating the need to link the contexts of economic, social, and environmental dynamics with institutionalized processes. Process especially its design thus became central in trying to reconsider the way political practices unfolded and in the revision of their material consequences. Reimagining the design of process forms allowed deliberative freedom from traditional *"manipulative politics, the rational-technical process, top-down command-and-control practices and bureaucratic rule-governed behavior"* (Healey, 2003:107). In the Healeyian sense, social exclusion was due to the exclusion of people from processes of governance.

Furthermore, Agger and Lofgren (2008) make a poignant addition by stating that collaborative planning activities, with regard to their governance and organizational form, can best be described as a form of network governance. By using the term 'network', we can highlight that the style of governance within collaborative planning is distinguishable from the more common models of 'market' and 'hierarchy'. Moreover, these networks and partnerships also represent both a means and ends to collaborative planning (Healey, 2003; Agger and Lofgren 2008; Innes and Booher, 1999). As David E. Booher (2004) states:

"Collaborative planning often takes shape in the form of 'networks', or 'partnerships', composed of representatives of local governments, business and associations of the civil society, as well as ordinary citizens. Even though they are usually initiated by local authorities, they are fairly autonomous vis-à-vis public authorities and traditional representative institutions."

Network Power in Collaboration

Booher's claim of networks and partnerships serving as a manifestation of collaboration has generated scholarly interest in the social impact of collaboration in the wider system of planning (and society). While some scholars have tried to understand its impact on democratic values in society (Agger and Lofgren, 2008, Brand, 2007, Tewdwr-Jones, 1998), others have focused on collaborations' ability to foster influential networks. Innes and Booher (2002) elaborate on network power as being the dynamic force that

[9]Referring here to the bureaucratic practices and procedural systems that steer the political and administrative atmosphere of decision-making.

[10]Capacity entails the resources, financial and expertise based, within the reach of the local government. Capacity thus refers more simply to the ability of the local government to realize certain goals.

[11]Refer to Appendix for a transcribed interview from Patsy Healey wherein she explains, briefly, her views on collaborative planning and importance of local dynamics.

emerges as diverse participants deliberate over a common goal. The 'interdependencies' that are forged during collective decision-making further the potential of network power (ibid:2002:225).

The innovations that emerge through shared knowledge in a collaborative environment enable people's ability to adapt to change and value joint action. Intriguingly, Innes and Booher (2008) use a neural network model developed in cognitive science as their conceptual reference to network power. However, the central purpose of visually conceptualizing network power is to understand its promotion of an interdependent flow of ideas. Therefore, regardless of the conceptual apparatus employed, it is important to visualize interconnection and interdependencies between various participants across different institutional scales.

Following process, 'Power' thus becomes an important aspect of the networking that is enabled through collaboration. Power is an undoubtedly intrinsic element in the development of collaborative planning theory. Collaborative Planning seeks to alter the direction of power from being structured in a 'top-down' fashion to being an iterative, cyclical, equally distributed entity. As a result, power does not become a weapon for any particular participant but instead becomes a collectively generated resource for all participants (ibid: 2005). In this way, the notion of network power as it emerges through collaboration is aligned with Gidden's (1984) viewpoint on there being three kinds of power; power of action, power of ideas, modes, and methods, and power of deep structure. From this we can determine that in collaborative planning theory, power is not a traditionally defined dominating concept, but instead a reflexive, communicative, and softer reality that depends on the adaptive ability of individuals, organizations, and city agencies. For power to be mitigated and equally distributed during decision-making, participants in the collaborative planning project must be willing to adapt to change.

Moreover, this kind of power has the ability to affect deep structure in the long term. As Giddens (ibid) mentions, agents of power enact structure and through exercising their agency within constraints in the short term, can eventually alter structure. In this way, power is simultaneously enabled and constrained by an interactive process between individual interests.

"Citizen participation is about power and its exercise by different social actors in the spaces created for the interaction between citizens and local authorities. However, the control of the structure and processes for participation - defining spaces, actors, agendas, procedures - is usually in the hands of governmental institutions and can become a barrier for effective involvement of citizens" (Gaventa and Valderrama, 1999).

Despite the barriers addressed by Gaventa and Valderrama, we can conclude that a 'power of the collective' is envisioned in the collaborative planning project. This kind of power can be particularly persuasive in changing the practices of municipal decision-making. The recognition of the diversity of social worlds, 'wisdoms', and practices that coincide in an urban context is an essential component of successful collaborative efforts. Part Two looks at this idea more closely.

Searching Contemporary Examples of Collaboration

Collaborative planning, most distilled, has been understood as a call for collective action for the future of our cities; a call for the formal recognition of emerging stakeholders and the subsequent need for wider engagement and awareness of the citizenry. A big question thus arises:

"Could a collective process of 'imagining the city' have the potential to build governance capacity around a shared ground of debate about the multiple qualities of 'place' and the diverse ways these are experienced, in an era when urban life is often experienced as fragmented, atomized, conflictual and uncomfortable?" ey, 2002:1778, Bannister and Fyfe, 2001; Pile et al., 1999)?

As outlined in part one, the idea of collaboration in planning has generated myriad turn-of-the-century interpretations and suggestions from theorists. Today, collaboration is a multifaceted concept that is being appropriated in contextually specific ways in many parts of the world. At the heart of

contemporary collaborative planning is the constant emphasis on process - on the need for having an imaginative range in the designing of processes in planning (Healey, 2003). This part of the paper intends to highlight three salient points. Firstly, that collaborative planning is a wide-reaching contemporarily applicable concept of urban governance and decision-making. Secondly, fundamental to collaborative approaches to city planning is the unlocking of citizen awareness and participation. Finally that, following a theoretical inquiry, the need to understand the practical face of collaborative planning becomes essential.

Therefore, the next section examines the city of Lahore as an example of a complex urban reality in order to further the investigation into collaborative planning's potential and practices in the 21st century. This investigation is aided by looking at the broad spatial realities of Lahore, its urban governance structure, and the existing condition of deliberation by citizens.

Figure 1: Map of Lahore Showing Differing Planning Patterns

Before delving into the case example, central questions need to be asked. These questions begin with the uncertainty over Lahore having the social and institutional apparatus required to foster collaborative planning practices. Additionally, does a political culture need to be created in order to contest the dominant paradigms? Have the dominant paradigms been explicitly exclusive, or has an arena been made for the active negotiation of the deliberative urban? And ultimately, is the local government being able to engage with multiple stakeholders for the transformation towards a more just and equitably inhabited city?

Collaboration in Context: Introducing Lahore

With its sprawling and paradoxicalcartography of colonial power and neo-liberal planning, the map of modern day Lahore is immediately striking. The footprint of the city represents disconnected layers of planning and development thus acting as a physiographic vignette into the state of urban management in Lahore. The interstices of half-completed master plans have created liminal spaces for informal settlements (Baviskar, 2003) that emphasize the spatial contradictions resulting from insufficiently forecasted planning decisions. Multiple examples of conflicting planning patterns can be seen ranging from non-planned developments to exclusive gated communities (NESPAK, 2002). Road networks erratically intersect across the map in an attempt to bridge distances created through what can be viewed as inefficient development. Moreover, kilometre long transport projects are underway along with large-scale master planning of more "eco" communities on the fringes of the metropolitan boundary (ibid, 2002).

Running parallel to these rapid changes in the urban scape is a burgeoning electricity and water

[12]Lahore takes a 'master planning' approach to development, as explained by Hameed and Nadeem (2006). "Master plan is a tool to guide and manage the growth of cities in a planned manner. Its origin lies in the English Town and Country Planning Act of 1947. While it has long been discarded in UK, the Master Planning approach is still being followed in many developing countries including Pakistan. Unfortunately, Master Plans prepared for several major cities of Pakistan could not be fully implemented and Lahore is no exception" (Hameed & Nadeem, 2006).

crisis resulting in a socio-economically detrimental shortage of supply. The challenge of increasing urbanisation has engulfed the resources of Lahore's energy, housing, health, and education sectors like a wildfire (ibid, 2002). Despite fragmentation such as poverty and social exclusion on a fervent rise, urban development authorities in Lahore seem scattered and characteristically incongruous with regard to their focus areas. The map of Lahore is hence an illustration of the loss of metropolitan togetherness that has become the lived and spatial reality of its citizens.

Figure 2: Photograph Showing Lack of Pedestrian Facilities in Lahore

The intricacy of urban problems generates a demand for a coordinated effort – from governing institutions and the people. It is within this need for coordination that collaborative planning has the potential to bring about a transformation. Moreover, as suggested in the origins of collaborative planning in Part One, the concept is adequately suited for places where traditional systems of master planning have resulted in a disturbing mélange of socio-spatial configurations (Hameed and Nadeem, 2006).

Already weighed down by an inefficient regulatory framework, the planning and development of Lahore is further weakened by strong pressures from politically powerful private interest groups and a rigid bureaucracy (NESPAK, 2002). What is particularly alarming is that such realities exist despite a governance ordinance in place that seeks transparency and decentralization in local decision-making. Such an ordinance can be seen as the official response to the pressures of inefficiency stated in the Integrated Master Plan.

Also, as Rydin (2011) illustrates in her description of collaborative spatial planning, a city's social and spatial problems are best serviced in conjunction to each other.

The following section thus looks at the existing instances of collaborative approaches in Lahore and explores their success and shortcomings.

The Emergence of Collaboration in Lahore

While it's historical approach towards urban planning has been post-colonial and bureaucratic, the global antipathy towards such neoliberal development has forced a structural revision from Lahore. As mentioned earlier, central to this revision of policy and planning approaches, has been the gradual international shift towards more collaborative and communicative discourses.

A Situational Analysis report compiled for the World Bank in 2010, took a closer look at Lahore under the (now inactive) Punjab Local Government Ordinance (PLGO), enacted in 2002[13]. The PLGO represented a strategic transference from traditional methods of governance and emphasized more localized and representative approaches. In practice, the PLGO instituted local governments at the sub-provincial level, specifically the district, city district, tehsil, town[14] and union council level and transfers the monetary and administrative control employed by the provincial governments to these local governments (Ali, et. al., 2010).

The local governments, in their democratic principle, include administrations consisting of an elected representative and staffed by local and

[13]Pakistani cities have incorporated numerous local government schemes in the past, under different political regimes, but for Lahore the PLGO is the current system. The incumbent Chief Minister of Punjab has promised a revised local government system. The Nation, April 2012,

[14]It is pointed out that, in terms of hierarchy under the PLGO, tehsils and towns are the same. Tehsil is a sub-district and in terms of the PLGO is the local government unit in the 'common' district whereas towns are the local government unit in the city district (Ali et. al., 2010.

provincial government servants[15] as well as analogous bodies of elected representatives. The PLGO aims to manage a system of checks and balances ensuring that initiatives proposed by the administration are executed only upon the endorsement of the related council of elected representatives. In this way, centralized systems can be discarded and the bureaucracy is made subject to the directive of the local government (ibid, 2010).

Additionally, a key feature of the PLGO was the creation of Citizen Community Boards (CCB)[16]. These CCB's are meant to be established by the private sector but to be funded (up to 80 percent) by the local government (Ali, et. al., 2010, UN ESCAP, n.d.). According to the report from the World Bank, the PLGO enabled a balance whereby funds due to CCB's are protected from being spent elsewhere or expiring. In essence, the CCB's illustrate the local governments institutional provision for private social welfare work and subsequent avenues for aligning these efforts into mainstream policy. Such institutional arrangements within the legal framework of urban governance in Lahore appear to be sufficiently conducive to collaborative planning, as earlier understood. In this vein, it is worthwhile to ask: are the CCB's still active in Lahore? Are the elected representatives ensuring adequate representation of the needs and wishes of their communities? Unfortunately, research thus far shows that this is not the case.

Challenges in the System

As evident in the current structure of urban governance in Lahore, the space for these decentralized multi-actor processes is only on paper (Ali et. al, 2010). For example, are neighborhoods equipped with community centers? Is there is an active social infrastructure for congregation and discussion? Can mosques and religious centers play a part? Is the process simple or fraught with a discouraging paper trail? Additionally, there is insufficient documentation on the practical experience of these CCB's since the enactment of the PLGO in 2002. Such documentation would help gauge whether their working methodology is in line with collaborative planning.

Also, an amended section 16 of the PLGO states the authority and responsibility of District Governments has been made dependent on the overall policy of the Government of Punjab (Ali, 2005; Ali et. al., 2010). According to the said amendment, the "PLGO, inter alia, acts to move the operation of the machinery of the Government of Punjab down one level, to each District, so that it may be put to use by District Governments but within the overall policy of the Government of Punjab" (ibid, 2010). Such an inherent contradiction in "decentralization" presents an obstacle for the transparency and efficiency of collaborative approaches towards decision-making. In effect, the provincial policy may not be compatible with the contextual needs of a local neighborhood. Moreover, such an amendment illustrates the influence of embedded systems of power and structural driving forces discussed in Part One.

An Urban Awakening in Lahore

"In complex urban governance contexts, with multiple actors, arenas, and struggles over discourses and practices, strategic actors who can make a difference will be those who focus on real opportunities for innovation and who work with the 'grain' of the emergent properties of specific situations" (Healey, 2003: 117).

As debates over the future implications of urban development increase amongst planners and concerned citizens in Lahore, instances of concerted opposition to development decisions have been noted. These efforts, however, do not seem to take empowerment from the institutional apparatus for opposition (i.e. the CCB's, elected representatives, etc.), but instead appear to be operating autonomously. For example, in 2009 the cutting of trees along the city's historic canal for a road-widening project created an environmental and legal uproar thereby illustrating the presence of

[15]"The level of detail in the devolution was one of the PLGO's characteristics. Rules of Business framed under the PLGO dealt with the allocation of responsibilities at the district, tehsil, town and union council level" (Ali et. al., 2010)

[16]For detailed description and function of CCB refer to Appendix.

criticism by citizens against arbitrary development decisions (Pakistan Today, 2011)[17]. The objection of the canal-widening project resulted in the filing of a court case against the municipality by a coalition of citizens. While the filing of a legal petition against the project resulted in a temporarily halt of construction and substantial discussion over its environmental impact and counter-productivity[18] for the decongestion of traffic, the project was eventually resumed and completed by the Punjab[19] government (The Nation, 2011). Such practical concerns by citizens, many of whom are architects, environmentalists, and engineers (Pakistan Today, 2011), highlights the need for greater inclusion of voices in the collection of information and the subsequent requirement of a variety in local knowledge with regard to planning decisions.

Figure 3: Lahore Canal

However, a question arises from this example: where did the mechanisms of the PLGO collapse against these concerned citizens? Why were the institutional channels not used to rally concern? In more recent years, Lahore has witnessed a furthering of citizen opinion and concern regarding urban development. Newspaper articles, television programs, street protests, petitions and advocacy campaigns have sprung up in opposition to various city development projects. Most significant of this was a petition filed by citizens against alleged damage to heritage sites due to mega infrastructure planning.

Advocates of the collaborative approach have stressed repeatedly on the need for a wider range of participation in the generation of knowledge over local issues. In its descriptions (see appendices), the PLGO certainly makes room for this. So then, where did the decentralized and inclusive reforms remain ineffective and under utilized?

Prior to the community based resistance to the canal widening project in 2011, Lahore saw the inauguration of the Punjab Urban Resource Centre (PURC) in 2001. The PURC marked another important awakening in Lahore viz a viz its urban issues. Described best in its own words, the reason for the establishment of the PURC was because:

"Urban development planning in Pakistan is top down and takes place without consultation with interest groups, especially poor communities. As a result, urban development promotes the interests of the elite and formal sector developers" (http://www.purclhr.org/).

It should be noted that the enactment of the PLGO took place one year after the launch of the PURC in Lahore. Parallel to these urban governance reforms, the PURC maintained that its objectives were:

"To encourage transparency and accountability of government and private bodies in the development, planning, and policy making processes.

To advocate for the participation of public and academia as the stakeholders in all stages of development, through public hearings and consultations with citizens.

To encourage dialogue and information exchange between communities, local government, and professionals on development, planning and policy issues.

To develop, liaison with, and understand the work of active citizens, community-based organisations and NGOs throughout the city of Lahore.

[19]Further information has been taken from the Lahore Bachao Tehreek's (Save Lahore Movement) official blog: http://lahorebachao.blogspot.co.uk/

[20]Canal Road widening SC wants `practical suggestions`, 2011 (http://dawn.com/2011/08/12/canal-road-widening-sc-wants-practical-suggestions/),

[21]Urban Development decisions in Lahore fall under the larger provincial government, which in this case is the Punjab Government.

To strengthen common advocacy concerns through networking and liaison between country-wide Urban Resource Centre's (URCs) and peoples' organizations and citizen's groups" (http://www.purclhr.org/).

Essential to the objectives of the PURC was the reiteration of collective power through resources and knowledge that is discussed by Innes and Booher (2002; 2010) and mentioned earlier in Part One. However, politically effective resistance did not emerge from the PURC or it had gone unnoticed. Further questions thus arose as to the particularities that were deeming such efforts to be futile.

The civil society, academia and privatized planning community held gatherings and openly ruminated over its disappointment with Lahore's ability to incorporate voices into its growing urban development plan. In 2006[20], in the midst of these deliberations, came the inauguration of a specialized governmental department dedicated to urban research and management known as the Punjab Urban Unit. The Urban Unit, a project management initiative in line with the Planning and Development Department of the Government of Punjab began publishing reports and conducting public exhibitions related to pertinent issues facing metropolitan Lahore. The Unit hosted Lahore's first of its kind 'Urban Forum' in 2011 which promoted the gathering of large audiences to discuss and consider issues related to the city. The establishment of the Punjab Urban Unit showcased, in some ways, the birth of a critical awareness amongst the government to connect with and address concerns of the citizens. Responsible for urban sector planning and management, the Punjab Urban Unit became a quasi-information portal for those who wanted to stay informed about upcoming projects and events related to urban planning and development in Lahore.

The creation of the Punjab Urban Unit by the provincial government, demonstrated an institutional acknowledgement of concerns regarding transparency and information sharing in urban development and planning.

This section has aimed to illustrate the slow but gradual emergence of a political and social environment for dialogue and deliberation over urban development decisions. The examples of PURC and the Urban Unit can be explored as existing facilitators of a citywide move towards the 'deliberative urban'. However, the inclusion of a wider variety of voices in the deliberation processes over urban development projects is undoubtedly a measured and laborious process. This process has so far been met by strong administrative validation of large scale and costly mega projects[21].

Opportunities and Challenges

Taking into account the Collaborative Planning theory's self-acknowledged emphasis on situational variables, it is important to consider the challenges to complete governance reform in Lahore. While an encouraging room for maneuver is opening up in the decentralization of the local government structures, contradictions and inefficiencies due to lack of resources, capacity, and transparency continue to occur (Ali et. al., 2010; Hameed and Nadeem, 2006; NESPAK, 2002).

Along side the few organizations dedicated towards urban research and awareness, numerous NGOs are at work presently in Lahore (Nespak, 2002) and are conducting socio-economic work in low income communities. However, cities like Lahore have complex governing realities in the face of NGO work; work that can be understood as collaborative albeit outside the formal institutional structure[22]. The complexity of these realities lie in the disconnection between the agendas of social work organizations such as NGOs and the mandated and budgeted agendas of the municipal government (Planning Commission, 2011). As we have already understood, collaboration has to be 'scaled up' in order to have a wide-ranging impact. This means that efforts towards a more inclusive public realm for decision and place making must not occur in isolation. Such efforts must be assessed in terms of their value for citizen

[20]Dates taken from official websites.
[21]According to the "An Urban Planning Disaster in Lahore" The Express Tribune, March 11, 2011.
[22]See Appendix section on NGO's.

involvement and awareness of critical urban issues facing the modern day city. Moreover, such efforts can be collectively approached as part of a comprehensive project of imagining the city through its diverse voices.

Is Lahore fostering the network dynamic that is elemental to collaboration in the 21st century? If so, in the backdrop of the socio-structural poverty that has become characteristic of the global south, are these networks of information and participation accessible to all or some? Contextual specificities must be handled with caution so that collaboration builds trust and is institutionalized and regulated.

Despite constitutional provisions, the system of local governance has not been able to inspire widespread motivation for citizens to raise concerns on unified platforms. The examples of citizen's movements are scarce and infrequent.

Moreover, as highlighted by Hameed and Nadeem (2006), there is a need to generate awareness of existing plans and proposals for the city within the wider public. This need for awareness works in tandem with the unlocking of political will towards inclusion and management of citizen concerns. The responsibility of activating a deliberative arena via collaborative provisions in the system should, perhaps, in part falls on the elected representatives; along with the *"dissemination of progress of implementation of the plan, and creating awareness among the communities"* (Hameed and Nadeem, 2006).

The preceding analysis of collaborative planning and its relationship to urban governance has generated key questions in terms of contemporary applicability. For instance, what if multi stakeholder collaboration is not institutionalized and is practiced on a micro scale by private actors; at a scale that is considered bottom-up and has insurgent potential? In the example of Lahore, we have seen that despite institutional arrangements made for collaborative approaches to planning and governance, the deeply rooted structure of power has not been adequately transformed. Perhaps this is because the room for participation has inherently stringent parameters . While the policy narrative of the CCB does stipulate that residents assist in city-level decision-making, it is ambiguous practically what this might look like: how residents are actually included and the extent public deliberation is considered (Purcell, 2002).

Conclusion

Socio-economic strife particular to a developing city such as Lahore can also halt collaborative processes – for instance a lack of electricity, food security, employment, and an increased atmosphere of sectarian and extremist violence can arguably create a damper on a transformative process. Issues such as inclusion and participation do not get prioritized against the backdrop of demand for basic service provision; the local government finds itself preoccupied with project completion and management. The exercise of participatory citizenship is further affected by *"socio-cultural locally contingent factors such as history, religion, ethnicity, language, culture, and economy"* (Ghose, 2005:72). Moreover, the need for the leadership to commit itself to a regulated and sustained course of democratic and transparent governance reform, especially its scalar politics, is essential. In the case of Lahore and the PLGO, the legal and policy narrative seems to have embraced the collaborative approach to planning. However, this embrace remains on paper and its translation and effective execution on ground has so far seen a decade of constraints. Despite the slow evolution of an environment for dialogue amidst the expert planning community, power relations remain rigid in Lahore. As the Situational Analysis Report for the World Bank laboriously highlighted, and as evident from more recent civil society uproar over development projects, the process of decentralization has been shrouded in uncertainty and in the matter of what is best for Lahore, it remains unclear how and by whom, it is decided.

This paper started by questioning whether Collaborative Planning can unlock citizen awareness and achieve transformation in society; its analytical course has arrived at a lack of canonical certainty. While Collaborative Planning permits the navigation of effective systems of multi stakeholder governance and the potential creation of a networked urban consciousness (Healey, 2010; Innes and Booher, 2002), it is entirely dependent on localized socio-political realities. Examples of the

success of collaborative approach repeatedly come up in research; particularly in turn of the century approaches adopted by local governments in the United States.

As Ansell and Gash (2007) have outlined, Collaborative approaches to governance and planning require certain variables for success. These variables include stakeholder participation, the removal of power imbalances, political will and institutional redesign.

In case of Lahore, a collaborative approach to governance can shake the foundations of entrenched power bases. However, institutional and fiscal realities must be kept in mind. In the case of Lahore, the municipal taxation process can be reviewed. A municipality and its people can gain voice and power through a demonstrable monetary independence. A lack of fund generation plays a role in a lack of autonomy in the face of provincial dictation. The tax system currently benefits the provincial government and perhaps a focused revision from municipalities can allow for more weightage and decision making autonomy. In the absence of institutional reform, the benefits of collaborative planning and governance will remain lost on Lahore.

Moreover, the practice of collaborative governance can give voice to the hitherto diverse socio-economic realities and needs of the city. Citizen inclusion in decision making can give rise to greater social awareness and civic ownership. It can be suggested that the concept also helps catalyze the restructuring of dated governance approaches. This restructuring, intangibly, creates an institutional atmosphere that may in the future be less resistant to democratic participation by the citizens. Therefore, the collaborative planning approach, in its stated emphasis on the 'process', assists the gradual dilution of power in urban governance. Lahore shows us, through the ineffective and non-impactful implementation of the PLGO, that without awareness and knowledge about the systems provision for contestation, Collaborative Planning remains unrealized fully. Perhaps the 'expert' planning community needs to accept the challenge of facilitation and tactically educate the citizenry and the bureaucracy about the importance of deliberating a shared urban.

Bibliography

Agger, A., and Lofgren, K. (2008) Democratic Assessment of Collaborative Planning Processes, Sage, Vol 7(2): 145–164.

Allmendinger, P., and Tewdwr-Jones, M. (2002) Planning Futures: New Directions for Planning Theory. London: Routledge.

Ali et. al. (2010) "Situational Analysis of Urban Local Government in Punjab", Consultancy for The World Bank.

AusAid JIT Policy Facility for Decentralization, Local Governance and Service Delivery, Round 4
Ansell C., and Gash. A. (2007) 'Collaborative Governance in Theory and Practice', Oxford University Press.

Brenner, N. (1999) 'Globalisation as Reterritorialisation: The Re-scaling of Urban Governance in the European Union', Urban Studies 36(3): 431–52.

Brindley, T., Rydin, Y., and Stoker, G. (1989) Remaking Planning: The Politics of Urban Change in the Thatcher Years. London: Unwin Hyman.

Castells, M. (1977) The Urban Question: A Marxist Approach. London: Edward Arnold.

Dryzek, J. (2010) Foundations and Frontiers of Deliberative Governance. Oxford University Press. ISBN 0-19-956294-6.

Fainstein, S. (2000) 'New Directions in Planning Theory', Urban Affairs Review 34(4): 451–76.

Fishkin, J. (2011) When the People Speak. Oxford University Press. ISBN 978-0-19-960443-2.

Friedmann, J. (1987) Planning in the Public Domain: From Knowledge to Action, Princeton, NJ: Princeton University Press.

Giddens, A. (1984) The Constitution of Society: Outline of the Theory of Structuration, Cambridge: Polity Press.

Ghose, R. (2005) The Complexities of Citizen Particpation through Collaborative Governance, Space and Polity, 9:1, pg. 61-75.

Gaventa, J., and Valderrama, C. (1999) Partnership, Citizenship, and Local Governance, Institute of Development Studies.

Habermas, J. (1984) The Theory of Communicative Action Volume 1: Reason and the Rationalisation of Society. Cambridge: Polity Press.

Hameed, R., and Nadeem, O. (2006) Challenges of Implementing Urban Master Plans: The Lahore Experience, World Academy of Science, Engineering and Technology.

Healey, P. (2003) 'Collaborative Planning in Perspective', SAGE publications

Healey, P. (1998) 'Building Institutional Capacity through Collaborative Approaches to Urban Planning', Environment and Planning A 30(5): 1531–56.

Healey, P. (1999) 'Institutionalist Analysis, Communicative Planning and Shaping Places', Journal of Planning and Environment Research 19(2): 111–22.

Healey, P. (ed.) (2001) 'Planning Theory: The Interaction with Institutional Contexts', International Encylopedia of the Social and Behavioral Sciences, pp. 11485–91. Oxford: Elsevier.

Healey, P. (2002a) 'On Creating the "City" as a Collective Resource', Urban Studies 39(10): 1777–92.

Healey, P. (2002b) 'Place, Identity and Governance: Transforming Discourses and Practices', Habitus: A Sense of Place, pp. 173–202.
Healey, P. (2003) 'The New Institutionalism and the Transformative Goals of Planning', Center for Urban Policy Research.

Healey, P. (1992) Planning through debate: The communicative turn in planning theory. Town Planning Review 63 (2): 143-162.

Healey, P. (1997) Collaborative planning, Vancouver, Canada: University of British Columbia Press.

Healey, P. (1996) Consensus-building across Difficult Divisions: New Approaches to Collaborative Strategy Making, Planning Practice & Research, 11:2, 207-216.

Healey, P. (2004) Creativity and urban governance, Policy Studies, 25:2, 87-102.

Hillier, J. (2002) 'Direct Action and Agonism in Democratic Planning Practice', in Planning Futures: New Directions for Planning Theory, pp. 110–35. London: Routledge.

Huxley, M. (2000) 'The Limits of Communicative Planning', Journal of Planning Education and Research 19(4): 369–77.

Innes, J. (1992) 'Group Processes and the Social Construction of Growth Management', Journal of the American Planning Association 58(4): 440–54.

Innes, J. (1995) 'Planning Theory's Emerging Paradigm: Communicative Action and Interactive Practice', Journal of Planning Education and Research 14(4): 183–9.

Innes, J., and Booher, D. (2000) 'Planning Institutions in the Network Society: Theory for Collaborative Planning', in W. Salet and A. Faludi (eds) The Revival of Strategic Spatial Planning, pp. 175–89.

Innes, J., and Booher, D. (2002) Network Power in Collaborative Planning, Journal of Planning Education and Research, 21:221.

LDA, World Bank and IDA., "Lahore Urban Development and Traffic Study," Lahore Development Authority, Lahore, 1980, Vol. 1-A & 1-B.

Margerum, R. (2002) Collaborative Planning: Building Consensus and Building a Distinct Model for Practice, Journal of Planning Education and Research, 21: 237.

NESPAK and LDA., "Integrated Master Plan for Lahore-2021, Lahore Development Authority, Lahore, 2004, Vol. I, II & III.

Planning Commission of Pakistan, (2011) "Task Force Report on Urban Development".

Purcell, M. (2002) Exacavating Lefebvre: The Right to the City and its Urban Politics of the Inhabitant, GeoJournal, Volume 58.

Rii, E. (2007) Collaborative Planning in Practice, W20 Spatial Planning and Governance at Regional Level, International Conference, June 25-28.

Rydin, Y. (2011) The Purpose of Planning, The Policy Press.

Yasin, A. (2007) Citizen Community Board (CCB) for Local Development in Punjab - Pakistan, 43rd ISOCARP Congress.

NewsPapers/Websites

The Nation

1)http://www.nation.com.pk/pakistan-news-newspaper-daily-english-online/lahore/16-Aug-2011/Dr-Pervez-proposals-about-Canal-Road-prevail

Pakistan Today

1)http://www.pakistantoday.com.pk/2012/02/05/city/lahore/lahore-bachao-our-right-to-the-city/?printType=article

2)http://www.pakistantoday.com.pk/2011/03/08/city/lahore/tree-felling-on-ferozpur-road-enrages-activists/?printType=article

Punjab Urban Resource Centre

www.purclhr.org

Lahore Bachao Tehreek

www.lahorebachao.blogspot.co.uk

UN ESCAP
http://www.unescap.org/huset/lgstudy/country/pakistan/pakistan.html#functions

Poster Brevia

GIS Base Decision Making in Education Setor

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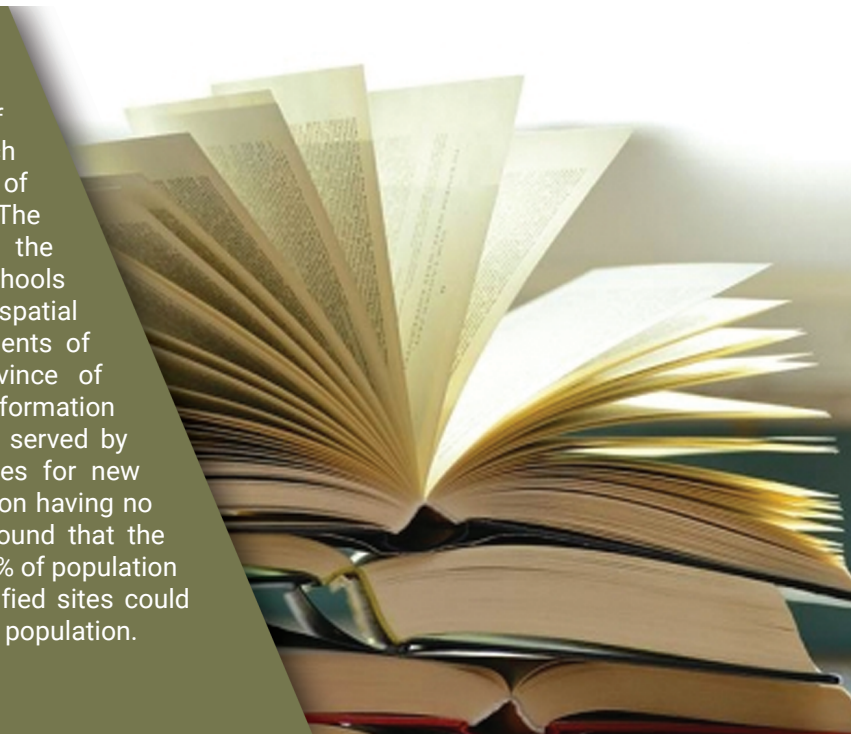
GIS Based Decision Making in Education Sector

Tahir Ali Akbar, Hira Jabbar, Ahmad Raza

Abstract

In Pakistan, there is ill-planned distribution of schools with respect to settlements due to which the students had to spend enormous amount of time in travelling to schools from their homes. The main objective of this study is to analyze the accessibility of population to existing high schools and provide better accessibility on the basis of spatial planning. The study area includes 73 settlements of District Sheikhupura located in Punjab Province of Pakistan. The advanced tools of Geographic Information System (GIS) was applied to obtain the areas served by existing schools and identify the suitable sites for new school facilities which could serve the population having no accessibility to the existing schools. It was found that the existing high schools provide accessibility to 63% of population and the construction of schools on new identified sites could help to provide better accessibility to 86% of the population.



Introduction

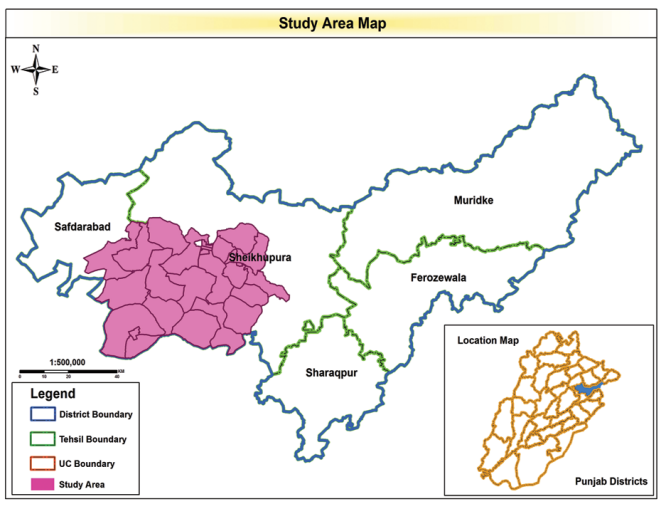
According to constitution, the State of Pakistan shall remove illiteracy and provide free and compulsory secondary education within minimum possible period. According to human development report, Pakistan is placed at 136th position on the basis of educated population. Pakistan is lacking in education sector due to various reasons like ignorance, poverty, finance, gender discrimination, untrained teachers etc1. In addition to other factors, the decisions for construction of schools are not taken on the basis of actual requirements of population which results in construction of schools in remote areas where accessibility becomes major limitation for students. GIS based spatial planning can address such issues by providing feasible solutions. It has proved to play a vital role in data collection and suitability analysis in education sector.

Objectives

To study the school facilities serving the existing settlements and identify the suitable sites for construction of new facilities on the basis of population and accessibility.

Study Area

The study area consists of 73 settlements in 23 union councils (UCs) of District Sheikhupura in Punjab Province of Pakistan as shown in Figure 1. The total area is 736 Sq.km. There are thirty three high schools serving the population of 0.7 million in the study area.



Materials and Methods

The data for school locations was obtained from Programme Monitoring & Implementation Unit (PMIU) of Government of Punjab. This point location data was imported and digitized in ArcGIS software 10.3 along with the administrative boundaries of union councils. The built-up areas and road network were extracted from high resolution satellite imageries. Landscan dataset, a finest resolution (1km) global population distribution data, was used to obtain the population of settlements. The methodology consists of: (i) application of network analyst extension of ArcGIS 10.3 to obtain the service area for each existing school at a road distance of 3km; (ii) identification of the served and un-served settlements on the basis of service area for each school and; (iii) identification of the suitable sites for new schools.

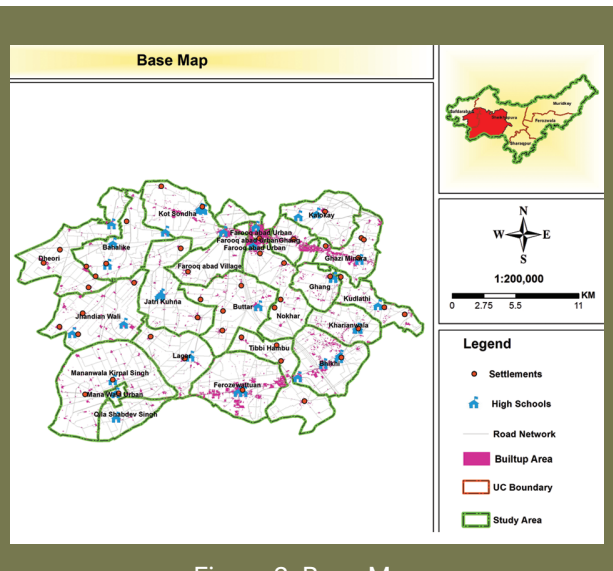


Figure 2: Base Map

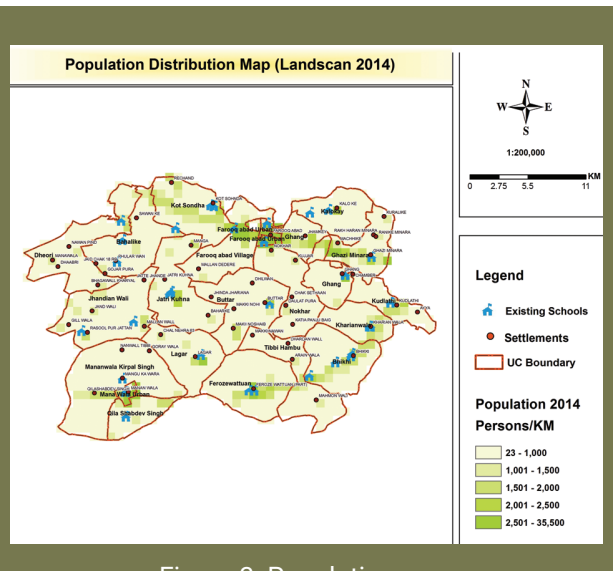


Figure 3: Population map

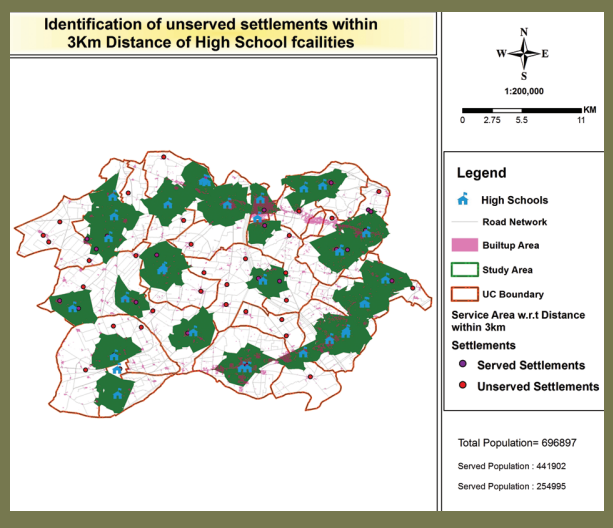


Figure 4: Identification of served and un-served area

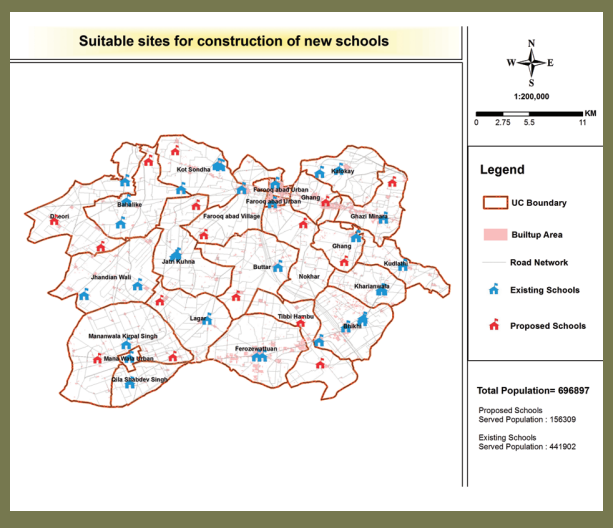


Figure 5: Identification of suitable sites for construction of new high schools

Results

Figure 2 indicates administrative boundaries of union councils, existing locations of high schools, road network, built up area, and settlements.

Figure 3 shows the population range for each settlement of study area with the locations of existing schools.

Figure 4 indicates the service area to highlight the settlements served by high schools within a road distance of 3 km. The network analysis in ArcGIS 10.3 was used to obtain the accessibility distance of students from various settlements to schools and it was found that the students from 37 % of population had to walk for more than 3 km to reach the closest schools whereas 63% of population had good accessibility to schools.

Figure 5 shows the suitable sites for construction of new schools. The locations for new schools were identified on the basis of: (i) un-served areas (i.e., area where students had to travel for more than 3 km distance); and (ii) presence of settlements with population greater than 1000 people. On the basis of this criteria, we identified 16 new sites for construction of schools which could help to increase the public accessibility to schools from 63% to 86% of population.

Conclusions

In this research a digital base data was prepared for boundaries of union councils, locations of schools, population distribution, detailed street level road network and built-up areas with settlements in GIS. The Landscan dataset for year 2014 was processed to obtain the population distribution and high resolution images were used to obtain the built-up areas. We proposed 16 suitable sites for construction of new schools to serve the un-served settlements. GIS proved to be an effective decision making tool for education sector. The user-friendly visual display with powerful analysis in GIS helped to identify problems and provide solutions on the basis of spatial planning.

References1: Pakistan Education: Problems and Solutions of Pakistan Education (http://www.einfopedia.com/pakistan-education-problems-and-solutions-of-pakistan education.php)

Urban Bulletin

Exploring Spatial Trends in Wealth Inequalities in Punjab, Pakistan

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Abstract

This study examines the disparities in wealth inequality across districts in Punjab, Pakistan. The paper documents Gini coefficients of wealth inequality using disaggregate household data to assess disparities at the district level as well as disaggregated by urban and rural areas for each district. Furthermore, the paper deploys spatial statistical tools to explore the spatial disparities in wealth inequality in Punjab.

This study finds the existence of spatial clustering in wealth inequality in districts at aggregate, urban, and rural area levels. The study emphasizes the need to allocate resources for eradication of disparities among regions and districts. Furthermore, policies and decision-making aimed at reducing regional disparities and in enhancing equity are needed. Given the spatial clustering in economic depravity, the remedial policies must be spatially aware and sensitive to spatial interdependencies discovered in this paper.

Keywords: Wealth Disparity, Wealth Inequality, Spatial Patterns, Spatial Clustering, Spatial Auto-Correlation, LISA, Moran's I, MICS, Punjab, Pakistan

Introduction

Wealth inequality or disparity, also termed as the wealth gap, is described as the unequal distribution of wealth or assets among the individuals, households, or residents of a country, region or a specific area. Income and wealth inequality is a serious concern not only for the developing world but for developed countries as well. For instance, income inequality between the rich and the poor is more acute in the United States than any other developed nation (Institute for Policy Studies, 2017). Similarly, more than 75 percent of the population in developing countries lives in communities where income was more unequally distributed recently than it was in the 1990s (United Nations, 2015).

Pakistan has historically been a serious victim of horizontal and vertical inequalities (Saboor, 2016). Bengali (2016) estimated that the income shares of the richest 20 percent of the population increased by 12 percent (from 43.5 percent in 1987-88 to 48.7 percent in 2010-11) whereas the income share of the poorest 20 percent declined by 21 percent (from 8.8 percent to 7.0 percent). A study of wealth disparity in a developing country like Pakistan is crucial to assist in devising policies and decision-making aimed at reducing regional disparities and in enhancing equity. The study of wealth disparities can inform policy makers and governments to prioritize and coordinate expenditures on social development projects to achieve equitable and balanced development.

Gini coefficient[1] is the most commonly used indicator for measuring income inequalities. It measures the distribution of income or wealth (Gini, 1912). This paper studies wealth disparities in the districts of Punjab in Pakistan. The paper estimates Gini Coefficient using the Multiple Indicator Cluster Survey (MICS) 2014 micro-data to rank and compare districts. Furthermore, it reports Global Moran's I and Local Indicators of Spatial Association (LISA), to examine the spatial patterns of disparities across the districts.

This paper is organized as follows. Section 2 describes data and methodology. Section 3 discusses results and findings. The concluding section presents policy recommendations.

Data and Methodology

Data Source and Unit of Analysis

Unit of Analysis and Area of Study

The study area comprises Punjab province. The unit of analysis is the district. The districts have been studied at the three levels:

1. Overall District (at administrative boundary level)

2. Urban areas in districts (as a proxy for cities)

3. Rural areas in districts (rural UCs/ villages)

[1]Gini coefficient ranges from 0 – 1, where 0 represents perfect equality and 1 represents perfect inequality. Sometimes, it is also referred as 'Gini Index.' For instance, World Bank terms it as index which ranges from 0 – 100 where 100 represents perfect inequality and 0 represents perfect equality.

Data Source and Sample Size

The present study uses the latest available survey data "Multiple Indicator Cluster Survey" (MICS) from 2014 covering all districts in Punjab. UNICEF (2016) provided access to the micro data set. The survey comprises three questionnaires: (i) household questionnaire; (ii) child questionnaire; and (iii) female questionnaire. This study uses data from the household survey covering 41,413 households. After eliminating the 3,008 missing records for wealth index, the valid sample size reduced to 38,405.

Measurement of Wealth Disparity: Gini Coefficient

Gini Coefficient is the ratio of the area between the Lorenz Curve (a wealth distribution curve) and the line of equal distribution to the total area under this equal distribution line. Basically, the Lorenz Curve is the cumulative distribution function (CDF) of wealth or income, arranged in ascending order. Each point on the Lorenz Curve shows what percentage of wealth is owned by what percentage of the population divided into groups. Mathematically, the formula for the Gini coefficient is presented in Eq. 1:

$$G = \left[\frac{n+1}{n} \quad \frac{2\sum_1^n (n+1-i)\ x_i}{2\sum_1^n x_i} \right] \quad \text{Eq.1}$$

Where;

G = Gini Coefficient
x_i = variable of interest (wealth index, in this case,) of the ith individual arranged in ascending order (from lowest to highest value)

n = Total number of individuals (sample population)

Spatial Pattern Analysis Wealth Disparity: Global and Local Measures of Spatial Autocorrelation

Global Measure of Spatial Autocorrelation

Global Moran's I is an aggregate measure of spatial autocorrelation and is a broadly used in statistics to test for the presence of spatial dependence in a variable of interest (Moran, 1950). It tests the null hypothesis that the data are independent and the rejection of the null hypothesis suggests the existence of spatial dependence (Li, Calder and Cressie, 2007). Moran's I is presented below

$$I^0 = \left[\frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \delta\ (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^{n} (x_i - \bar{x})^2} \right] \quad \text{Eq.2}$$

Where;

X_i = is the variable of interest (for which the spatial autocorrelation is to be checked)
δij = an indicator of Spatial Weight such that δij =1 if the ith and j^{th} locations are "adjacent" (neighbor), and δij =0 otherwise.

Local Measure of Spatial Autocorrelation

The global measure of spatial autocorrelation (Moran's I) provides a single summary measure of spatial autocorrelation (Sowunmi, 2012). Anselin (1995) developed the Local Moran's I as a local spatial autocorrelation measure to explore spatial clusters at the local level. The formula for Anselin (1995)'s Local Moran's I is given as:

$$I_i = \left[\frac{Z_i}{m_2} \quad \sum_{j=1}^{n} w_{ij} z_j \right] \quad \text{Eq.3}$$

Where;
z_i, z_j = deviations from the mean,
w_{ij} = the spatial weights between observations *i* and *j*,
m_2 = the second moment (a consistent, but not unbiased estimate of the variance).

Results and Discussions

Measurement of Wealth Disparity: Results of Gini Coefficient

Wealth Disparity at the Provincial Level

Table 1 present the Gini coefficient at three levels (aggregate, rural and urban) for Punjab.

Table 1: Wealth Disparity in Punjab at Provincial Level

Sr. No.	Area / Province	Std. Gini Coefficient
1	Punjab (Aggregate Level)	0.27
2	Punjab (Urban)	0.13
3	Punjab (Rural)	0.28

Source: Calculations Based on MICS 2014 Data

The province-wide Gini Coefficient for Punjab in 2013-14 is estimated at 0.27 suggesting a moderate distribution of wealth in the province. These estimates are similar to the findings from the Pakistan Demographic and Health Survey (DHS) 2012-13 for Punjab that reported Gini coefficients of 0.20 and 0.30 for urban and rural Punjab respectively (NIPS, 2013). Similarly, the World Bank (2014) reported the Gini Index of 30 (i.e. Gini coefficient of 0.30) for Pakistan in 2013.

Wealth Inequality at District Level

Wealth inequality across districts is presented in the Figure 1. The Gini Coefficient varies from a low of 0.09 for one district to a high of 0.32. Districts lying along the western provincial border (D.G. Khan, Muzzafargarh, Jhang, Khushab and Chiont) and some districts in Southern Punjab (Bahawalpur and Rahim Yar Khan) experience the most unequal distribution of wealth wherein the wealth Gini coefficients ranges from 0.30 to 0.32. Whereas, the northern districts (Lahore, Rawalpindi, Sialkot, Gujrat, Gujranwala, Chakwal and Sheikhupura) exhibit a more equitable distribution of wealth wherein the Gini coefficient ranges from 0.08 to 0.20. Spatial autocorrelation is evident from the figure such that neighbouring districts report similar Gini seems.

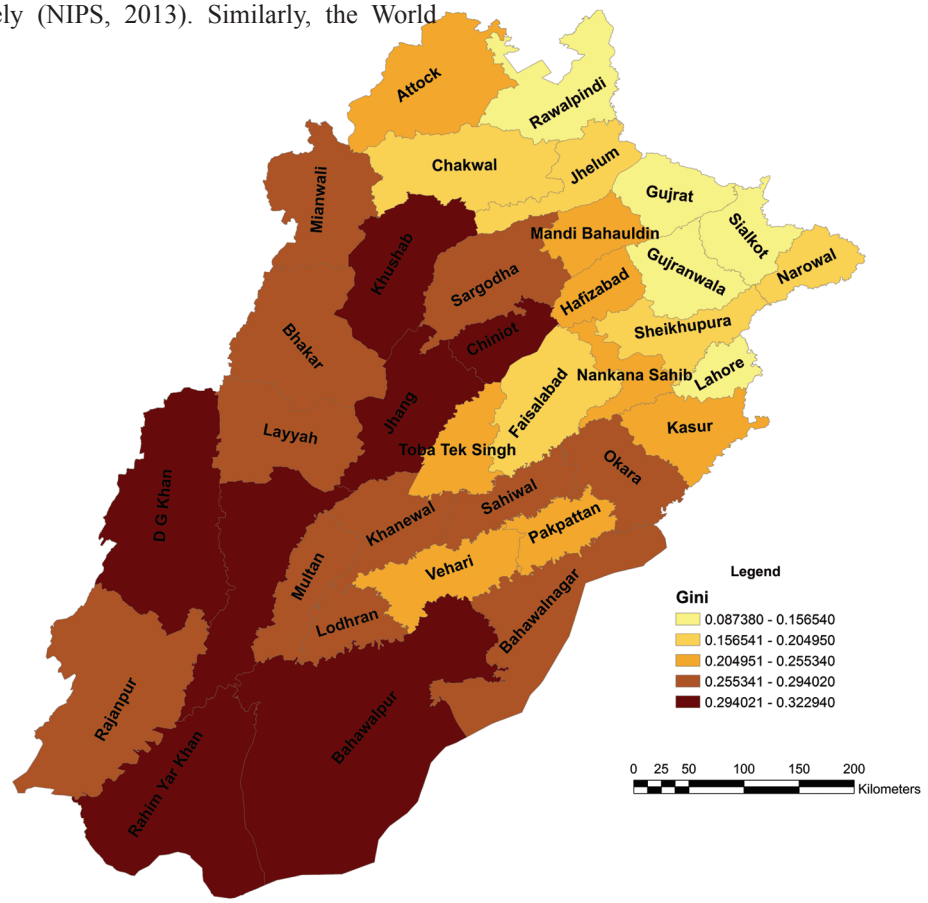


Figure 1: Spatial Representation of Wealth Gini Coefficients in Districts of Punjab
Source: Calculations Based on MICS 2014 Data

Wealth Inequaility in Urban Areas of Districts

The wealth inequality across urban areas of the districts is plotted in Figure 2. The Gini Coefficient ranges from 0.06 to 0.27 across the urban areas of districts and is lower than Gini coefficient at aggregate level.

It is evident from Figure 2 that some districts along the Western provincial border (Rajanpur, Muzzafargarh, Layyah, Bhakkar, Khushab and Miawali) and one district from Southern Punjab (Bahawalnagar) depict the most unequal distribution of wealth in urban parts of the districts wherein the wealth Gini coefficients range from 0.20 to 0.27. Whereas, the northern districts (Lahore, Rawalpindi, Attock, Gujrat, Sialkot) and some centrally located districts (Faisalabad, Sahiwal and Toba Tek Singh) depict a more equitable distribution of wealth wherein the wealth Gini coefficients range from 0.06 to 0.11. Figure 2 also reveals the same spatial clustering of wealth inequality as seen earlier in Figure 1.

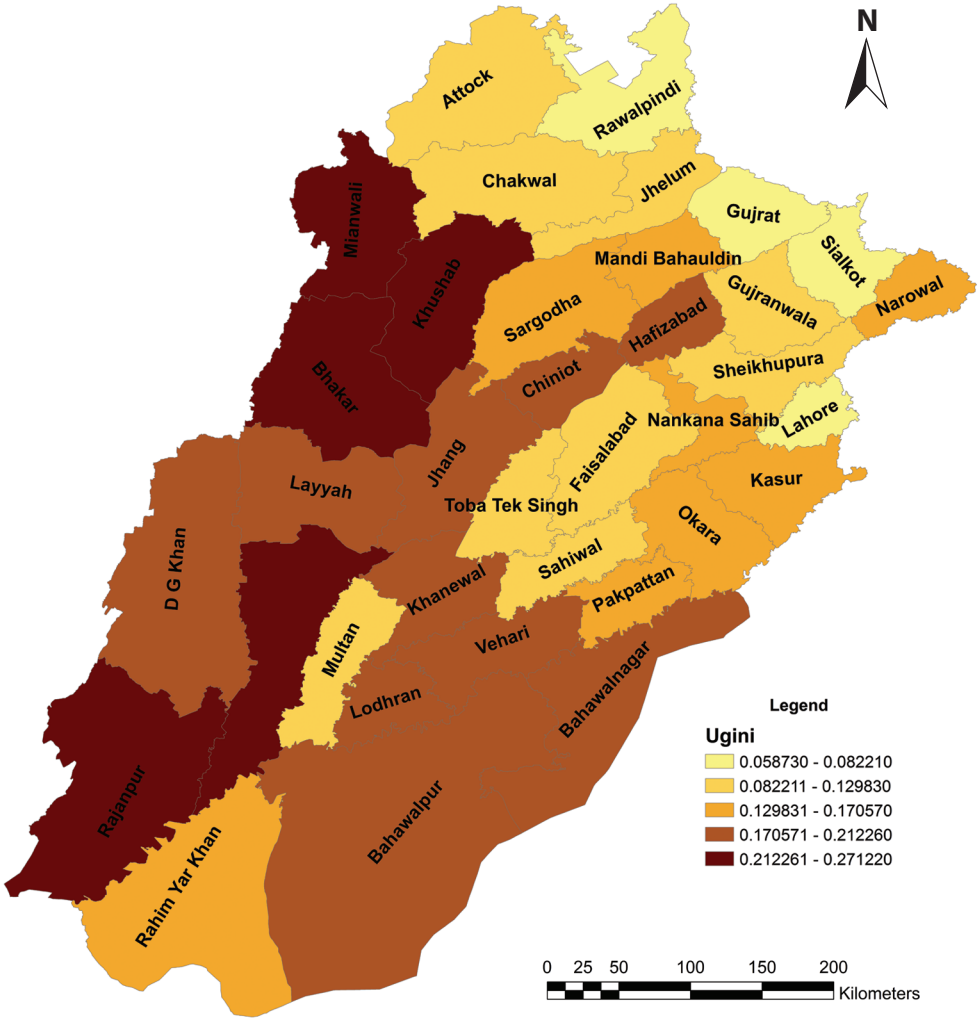


Figure 2: Spatial Representation of Wealth Gini Coefficients in Urban Areas of Districts (Punjab)
Source: Calculations Based on MICS 2014 Data

Wealth Inequaility in Rural Areas of Districts

The wealth inequality across districts (rural areas only) is presented in Figure 3, which depicts that wealth Gini Coefficients range from 0.15 to 0.30 in rural areas of districts. By comparing Figures 2 and 3 we can conclude that wealth inequalities are worse in rural areas than they are in urban areas. Figure 3 shows that some central districts, ones along the Southern belt (Bahawalpur, Lodhran, Multan, Khanewal, Jhang and Chiniot) and one district from Central Punjab (Okara) depict the most unequal distribution of wealth in rural Punjab wherein the wealth Gini coefficients range from 0.26 to 0.30. Whereas, Northern districts (Lahore, Jhelum, Chakwal, Gujrat, Sialkot, Narowal, Sheikhupura and Gujranwala) exhibit relatively equitable distribution of wealth wherein the wealth Gini coefficient ranges from 0.15 to 0.20. Similar to Figures 1 and 2, Figure 3 also reveals spatial clustering in wealth Gini coefficients in rural parts of districts.

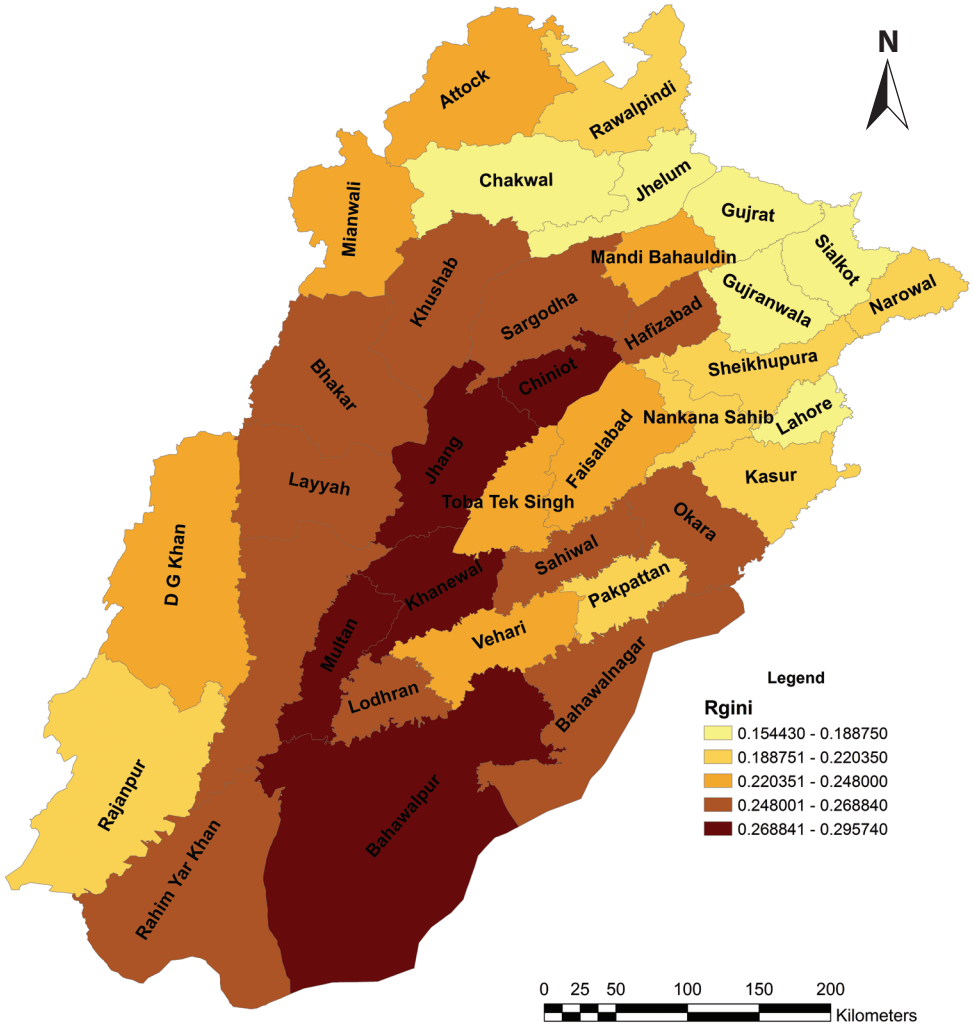


Figure 3: Spatial Representation of Wealth Gini Coefficients in Rural Areas of Districts (Punjab)
Source: Calculations Based on MICS 2014 Data

Spatial Pattern Analysis of Gini Coefficient

Global Measure of Spatial Autocorrelation: Global Moran's I Result

Table 2 shows the test statistics for the Global Moran's I, which confirms presence of spatial autocorrelation. Wealth inequality is more correlated spatially in rural areas than it is in urban areas.

Local Indicators of Spatial Association (LISA)

Local Moran's I presents a spatially disaggregate measure of spatial autocorrelation. Figure 4 shows a high-high cluster comprising of contiguous districts Bahawalpur, Rahim Yar Khan, Layyah and Jhang where there is high unequal distribution of wealth. Similarly, a low cluster of contiguous districts showing relatively equitable distribution of wealth comprises Lahore, Rawalpindi, Gujrat, Sialkot and Gujranwala districts. Both clusters show presence of spatial dependence.

Table 2: Global Moran's I Test Results

NHD	Variable	Moran's Index	Z- Score	P-Value
1	Aggregate District Level	0.560636	4.853065	0.000001
2	District (Urban Area only)	0.285496	3.136658	0.001709
3	District (Rural Area only)	0.489340	4.237583	0.000023

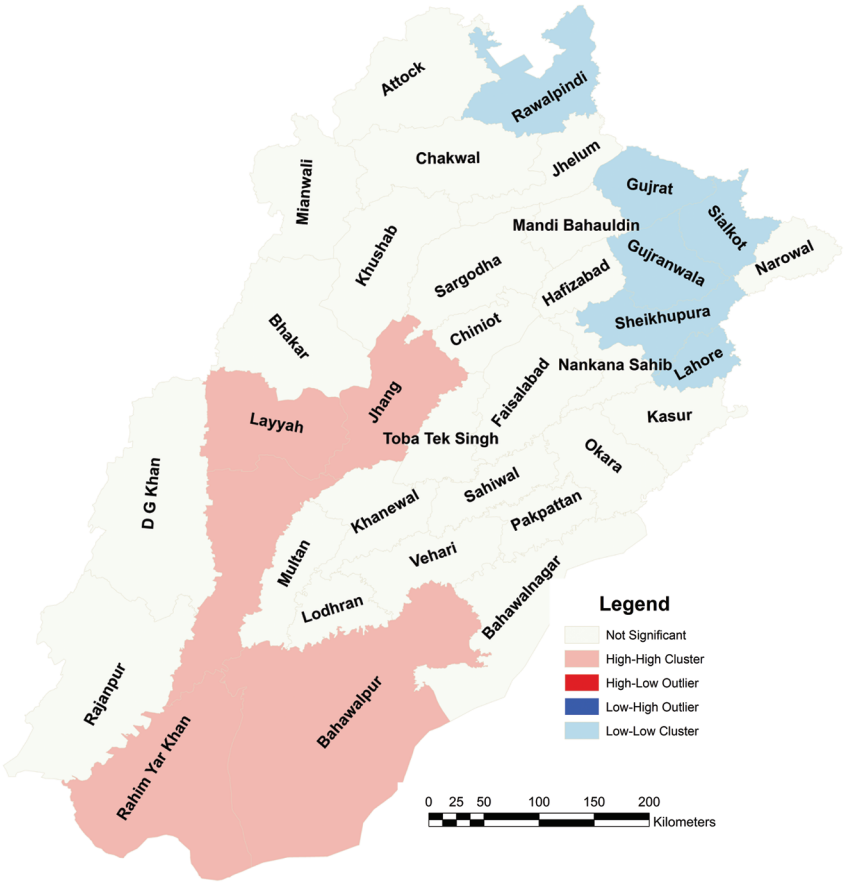


Figure 4: Local Moran`s I Punjab (Aggregate Level)
Source: Based on Anselin Local Moran`s I

Figure 5 shows that there exists a high cluster of high wealth inequality in urban parts of the districts that include Rajanpur, Layyah, Muzafargarh and Bhakkar. Similarly, there is also a low-low cluster of lower wealth inequality comprising urban areas in Rawalpindi, Gujrat, and Sialkot districts. Both clusters suggest presence of spatial dependence.

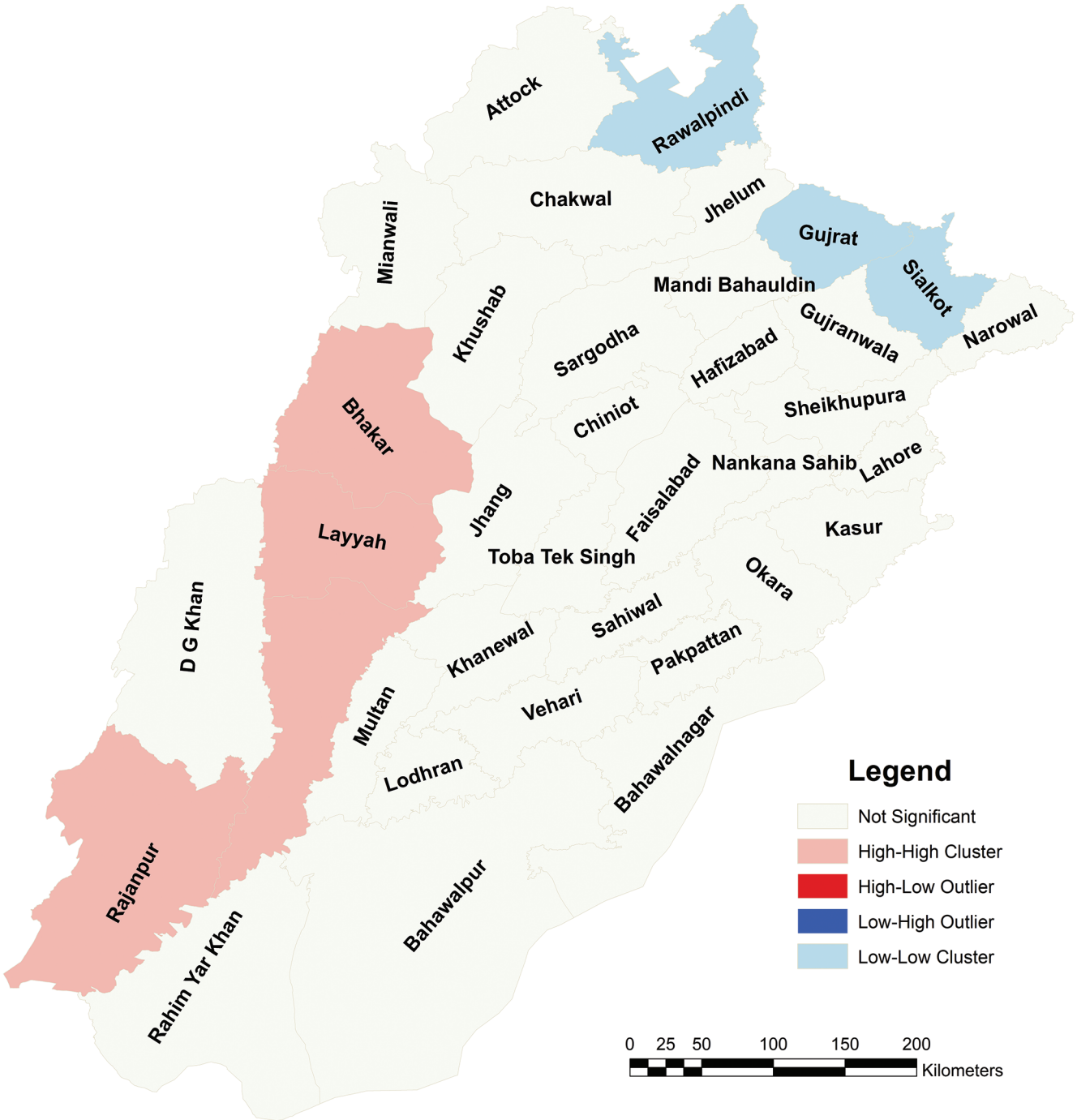


Figure 5: Local Moran`s I Punjab (Urban Area)
Source: Based on Anselin Local Moran`s I

Figure 6 also reveals a high cluster of higher wealth inequality in rural areas of Bahawalpur, Multan, Khanewal and Jhang districts. Similarly, a low-low cluster of lower wealth inequality in rural areas of Lahore, Gujranwala, Gujrat, Sialkot and Sheikhupura districts is also visible. Both clusters depict presence of spatial dependence.

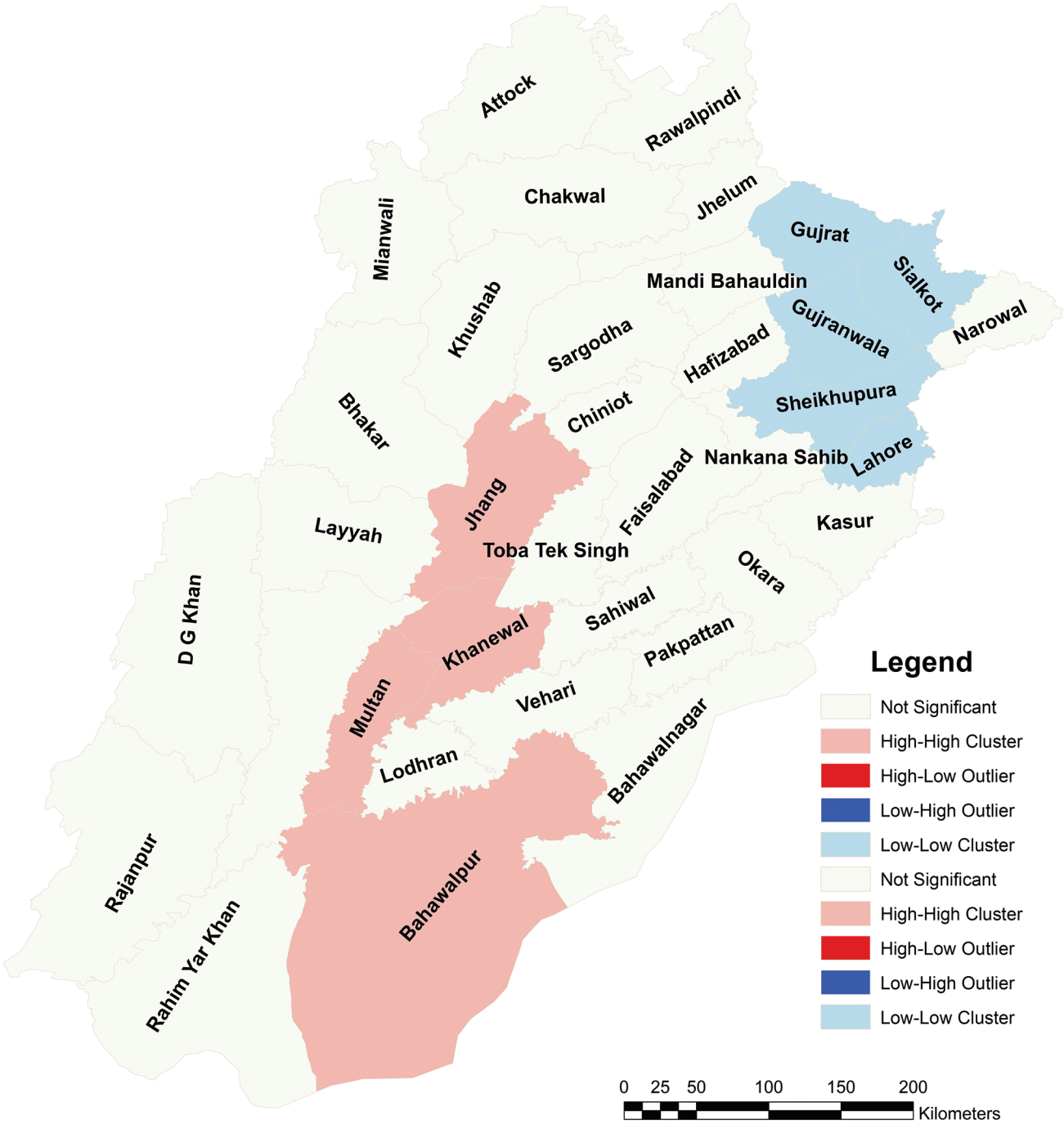


Figure 6: Local Moran`s I Punjab (Rural Area)
Source: Based on Anselin Local Moran`s I

Conclusion and Recommendations

This paper has presented an analysis of Gini Coefficients across districts in Punjab. Furthermore, the paper has examined spatial patterns in regional wealth disparity. This district level wealth inequality indicator provides a picture of intra-district distribution of wealth. The paper has also presented evidence in support of the presence of inter-district wealth inequalities. The study has found that wealth disparity estimated here is in moderate range and similar to the levels observed nationally (World Bank, 2014) and in other studies (NIPS, 2013). Disparity is significantly higher in rural areas compared to urban areas of districts. Using local indicators of spatial autocorrelation, this paper has found evidence in support of the presence of spatial clustering among high wealth inequality contiguous districts on one end and lower wealth inequality contiguous districts on the other end. These trends were obvious for the aggregate data, urban areas, as well as rural areas.

This study emphasizes the need to target resources for the eradication of disparities among regions and districts. The study also encourages policy makers to prioritize public investment in socio-economic development in economically lagging districts. Given the spatial clustering of wealth inequality that cuts across contiguous districts, the paper advocates the need to adopt a regional approach to target policies at similar and contiguous districts so that they may benefit from spatial spill overs.

References

Anselin, L. (1995) Local Indicators of Spatial Association – LISA. Geographical Analysis, 27(2), 93-115.

Bengali, K. (2016) Inequality and its Discontents. Development Advocate Pakistan, 3(2): 10-13.

Gini, C. (1912) Variabilità e mutabilità. Reprinted in Pizetti, E.; Salvemini, T., eds. (1955). Memorie di metodologica statistica. Rome: Libreria Eredi Virgilio Veschi.

Institute for Policy Studies (2017) Wealth Inequality. Inequality.org, a project of the Institute for Policy Studies. Retrieved from http://inequality.org/wealth-inequality/ on 05.01.2017.

Li, H., Calder, C. A., and Cressie, N. (2007) Beyond Moran's I : Testing for Spatial Dependence Based on the Spatial Autoregressive Model. Geographical Analysis, 39(4), 357–375.

Moran, P. A. P. (1950) Notes on Continuous Stochastic Phenomena. Biometrika, 37(1), 17-23.

NIPS (2013) Pakistan Demographic and Health Survey 2012-13. National Institute of Population Studies (NIPS), Islamabad, Pakistan.

Saboor, A. (2016) The Drivers and Policy Narratives of Income Inequality in Pakistan. Development Advocate Pakistan, 3(2): 10-13.

Sowunmi, F. A., Akinyosoye, V. O., Okoruwa, V. O., and Omonona, B. T. (2012) The Landscape of Poverty in Nigeria: A Spatial Analysis Using Senatorial Districts- level Data. American Journal of Economics, 2(5), 61-74.

United Nations (2015) Goal 10: Reduce inequality within and among countries. Sustainable Development Goals, United Nations. Retrieved from http://www.un.org/sustainabledevelopment/inequality/ on 22.12.2016.

World Bank (2014) World Development Indicators. The World Bank Group, Washington DC.

Appendix

Table A.1: Estimated Gini Coefficients (Districts of Punjab, Pakistan)

Sr. No.	District	Gini coefficient (Aggregate)	Gini coefficient (Urban Area)	Gini coefficient (Rural Area)
1	Attock	0.22	0.22	0.22
2	Bahawalnagar	0.29	0.29	0.29
3	Bahawalpur	0.30	0.30	0.30
4	Bhakar	0.29	0.29	0.29
5	Chakwal	0.19	0.19	0.19
6	Chiniot	0.30	0.30	0.30
7	Dera Ghazi Khan	0.32	0.32	0.32
8	Faisalabad	0.20	0.20	0.20
9	Gujranwala	0.16	0.16	0.16
10	Gujrat	0.15	0.15	0.15
11	Hafizabad	0.24	0.24	0.24
12	Jhang	0.31	0.31	0.31
13	Jhelum	0.18	0.18	0.18
14	Kasur	0.23	0.23	0.23
15	Khanewal	0.29	0.29	0.29
16	Khushab	0.31	0.31	0.31
17	Lahore	0.09	0.09	0.09
18	Layyah	0.29	0.29	0.29
19	Lodhran	0.28	0.28	0.28
20	Mandi Bahauddin	0.23	0.23	0.23
21	Mianwali	0.27	0.27	0.27
22	Multan	0.28	0.28	0.28
23	Muzaffargarh	0.30	0.30	0.30
24	Nankana	0.23	0.23	0.23
25	Narowal	0.20	0.20	0.20
26	Okara	0.28	0.28	0.28
27	Pakpattan	0.24	0.24	0.24
28	Rahim Yar Khan	0.32	0.32	0.32
29	Rajanpur	0.28	0.28	0.28
30	Rawalpindi	0.15	0.15	0.15
31	Sahiwal	0.27	0.27	0.27
32	Sargodha	0.28	0.28	0.28
33	Sheikhupura	0.20	0.20	0.20
34	Sialkot	0.15	0.15	0.15
35	Toba Tek Singh	0.24	0.24	0.24
36	Vehari	0.26	0.26	0.26

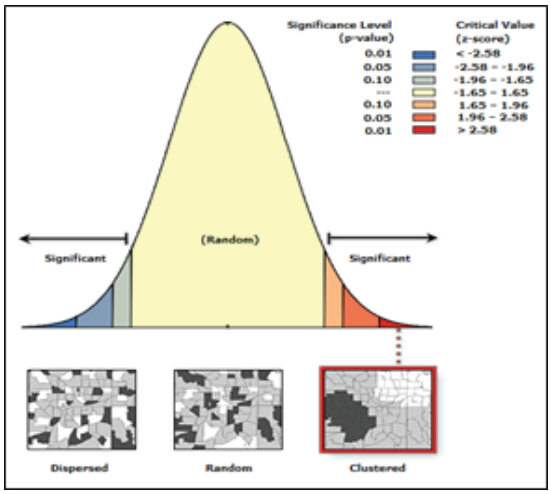


Figure 1: Figure A.1: Global Spatial Autocorrelation Report Aggregate District Level

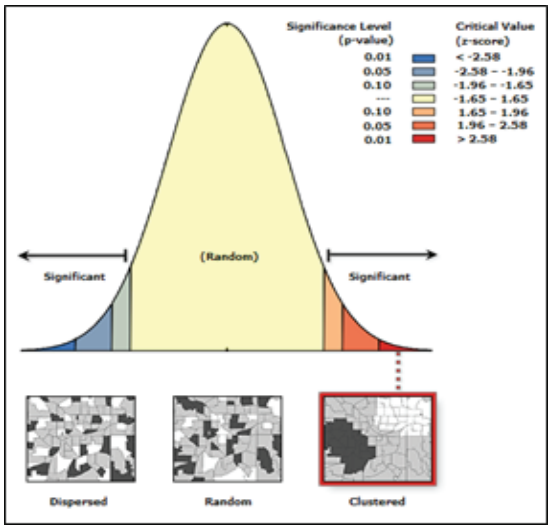


Figure A.2: Global Spatial Autocorrelation Report District (Urban) Level

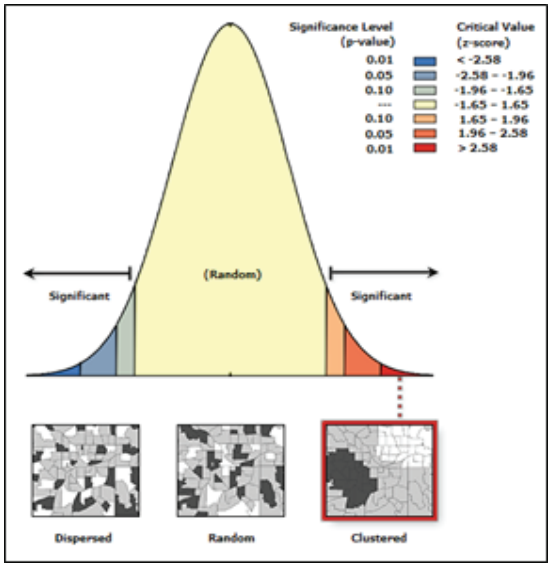


Figure A.3: Global Spatial Autocorrelation Report District (Rural) Level

Book Review

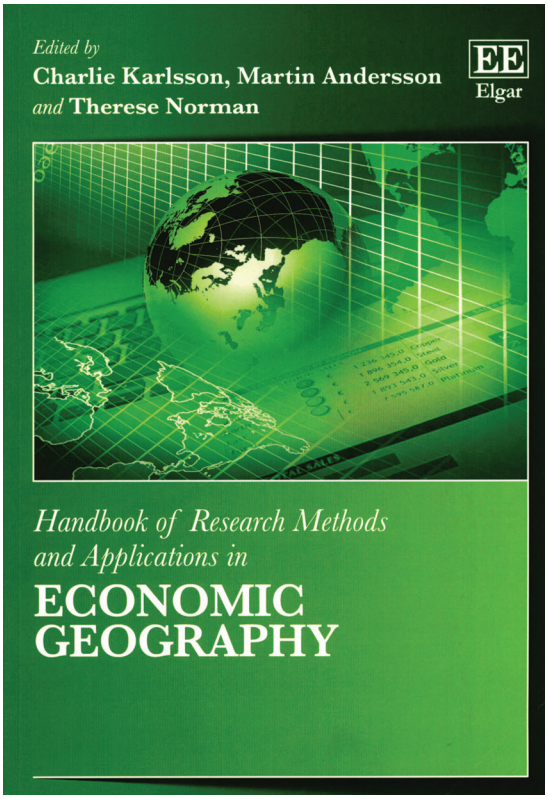
Handbook of Research Methods and Applications in Economic Geography

*Mutee-ul-Rehman**

*PhD Scholar, School of Economics, Quaid-i-Azam University, Islamabad

The Handbook of Research Methods and Applications in Economic Geography provides an overview and assessment of research methods, approaches, and applications used in economic geography. The overlap between economics and geography provides the foundation for Economic Geography as a subject, which has gained significant attention as of late. Economic geography has generated ample literature in theoretical and empirical domains to address issues, such as the "tyranny of distance."

Broadly, the Handbook is divided into four parts that encompass the methods in economic geography and regional sciences, methods and approaches of regional and interregional analyses, and specific issues in economic geography. The first part of the Handbook provides theoretical models developed in economics and geography and their extensions. An in-depth discussion of the implications of geography for standard neoclassical trade models, such as the factor price models of international trade, and agglomeration of economic activity follows.



It illustrates how changes in one region might affect the neighbouring regions and in the process creating sptio-economic interdependencies. Quantifying spatial spillovers is discussed using spatial regression models. Spatial regression models extend the reach of the traditional econometrics to spatially correlated data. Spatial models explicitly account for spatial autocorrelation in error specifications. It discusses several spatial econometrics tools to calculate the spatial dependence among regions. These tools include spatial autoregressive models, cross-sectional and panel estimations, and Geographic Information System (GIS) based systems.

In the second part, the Handbook introduces modem techniques and literature for the regional analysis of economic activities. Quantifying the economic base of any region is the focus in the second part as it explains multiple dimensions of the region regarding the economic base. It explains the nature of concentration of economic variables in the region through economic-base models and local multipliers such as location quotient analysis, which describes the nature and causes of the concentration of economic activity, i.e., industries and employment.

Neoclassical economic growth models are standard tools in economic theory and are used to understand the long-run growth patterns of a region. This section provides usefulness of growth models to understand regional growth and income disparities. This leads to the debate on agglomeration and diversity in the region. The benefits of economies of scale shared labour markets, and input-output relations lead to the agglomeration of economic activity which results in growth clusters. The combination of growth models and clusters provides policymakers with tools to develop regional innovation systems that provide the enabling environment for the competitiveness of the regions through knowledge creation and diffusion.

The interregional analysis of the economic activity, discussed in part three of the Handbook, explains the behaviour of firm's location decision, backwards-forward linkages of the industry, and the degree of agglomeration and liberalisation. Improved road and transport infrastructure,

accessibility, human capital and market potential are the main determinants of interregional exchange of economic activity. The third part of the Handbook describes the spatial interaction models to measure these determinants of interregional exchange. Interregional migration is another key feature of economic geography emanating from the uneven spatial distribution of resources across regions. Spatial interaction models of regions provide the foundation for public sector planning.

Fourth part discusses various extensions of economic geography, such as regional knowledge production function, use of qualitative research for economic geography, regional sustainable development, and entrepreneurship and regional labour market analysis. Various researchers have tried to quantify the regional knowledge production function through standard Cobb-Douglas production function and taking capital formation as the main determinant of regional knowledge production. Main determinants of interregional knowledge flow are inter-firm cooperation, agglomeration/specialization, social capital, scientific networks and labour force mobility.

Qualitative research methods, such as story-based approaches to qualitative evaluation, may be employed in economic geography if the ethical considerations are upheld. Entrepreneurship is another important dimension which needs to be further explored under economic geography. The linkages between entrepreneurship and interregional disparities need further exploration. It further discusses the gender dimensions of labour markets regarding hours worked. The Handbook reports that there has been a downward trend in hours worked over the past four decades.

The Handbook of Research Methods and Applications in Economic Geography offers a complete expose and is useful for academia and policymakers for regional and interregional analysis. The editors have collected relevant and influential research on economic geography to explain the theoretical and empirical sides of economic geography.

Guidelines for Preparation of Paper for Pakistan Journal of Urban Affairs

These guidelines are intended to help authors for submission of papers to the Journal.

GENERAL

Pakistan Journal of Urban Affairs published by The Urban Unit, under the flagship of Planning and Development Department, Government of the Punjab deals with worldwide aspects of urbanization and a broad range of environmental matters. The Urban Unit aims at publishing papers presented by national and international researchers, practitioners and officials involved directly with issues pertaining to urbanization and papers from national and international conferences and symposia.

Journal subscribers will be interested to hear about the cutting-edge research being undertaken by academics and professionals in their field. Operational, Scientific, Technical and Research papers are welcomed, and both short and full-length papers are encouraged.

Papers to be published in the Journal must be original and of a high standard – not only in respect of their subject matter and its treatment but also in the quality of writing. Particular attention must be paid to clarity and conciseness of expression. Authors are encouraged to draw out generic messages from their work in relation to urban affairs and environmental issues. This is particularly important for case study papers.

All papers are expected to have a literature review setting the work in its research and practical context, as appropriate. We will, sometimes, publish papers consisting entirely of review material, provided they provide a critical overview and demonstrate original thought. Those submitting papers derived from MSc and PhD theses should ensure they produce a concise summary of their work within the prescribed word limits.

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The title of the paper should be as short as possible with a clear indication of the subject matter. The name(s) and appointment(s) of the author(s) should be given. If the paper has been presented, the date and venue of the presentation should be given. In case of multi-author papers one author should agree to act as the corresponding author to whom queries and proofs will be sent. An e-mail address and other contact details for the corresponding author should be provided.

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Each word of the main headings should be typed, bold faced, and not numbered (Style: Heading 1).

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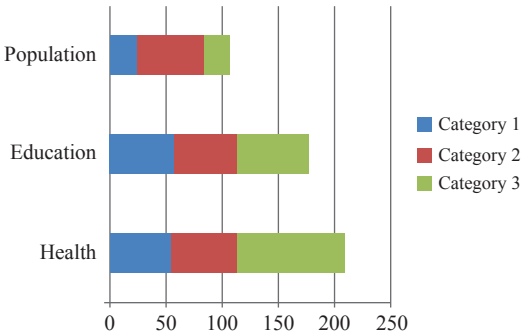

Figure 1: Economy of Pakistan (Source Details)

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Taylor's tool life model is, (1)

where, V is the cutting speed and T is the tool life. The model constants n and C depend on the tool and work material pair.

Citation

Citation of the references should be made within circular brackets for example, (Author Last Name, Year).

Acknowledgements

The author gratefully acknowledges ……..

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The editorial team of Pakistan Journal of Urban Affairs will encourage high quality papers based on empirical research contributed by a range of experts working in different fields, e.g. technical professionals (urban planners/architects/engineers and environmental scientists), policy makers, social scientists, private sector specialists, development practitioners, urban economists/economists, and academia from Pakistan and abroad. A concerted effort of researchers and experts belonging to different sectors will ensure that public and private sectors in Pakistan move toward sustainable urban development goals, in conjunction with economic and social development, 'without compromising the ability of future generations to meet their needs'(World Commission on Environment and Development, Our Common Future, 1987).

It is important to mention here that the premise of this research and development initiative is - to emphasize the multitude of urban development challenges; and to generate scientific discourse leading to sustainable strategic and policy options leading toward improved decision making and a better urban future. Moreover, the Pakistan Journal of Urban Affairs is being published by the Government of Punjab, yet the focus is national; because the current urban development issues faced by Pakistan call for an integrated and sustainable strategy for development.

Pakistan Journal of Urban Affairs welcomes submission of papers / poster from a broad spectrum of scholars, practitioners, researchers and public sector professionals. Research papers are expected to be - policy based; solution oriented; a sound critique/analysis of existing projects; and a platform to propose new strategies for tackling issues related to urbanization. Coverage of topics includes, but is not limited to:

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- Urban Growth and Development: political economy of urbanization, urban sprawl and suburbanization.
- Urban Economy: urban employment generation and issues, rural-urban migration, food security, poverty and urbanization.
- Urban Environment: Urban environment and impact assessment, urban pollution, urbanization and climate change, urban environment policy, sustainable urban ecology.
- Urban Living: urban housing, urban spatial management, preservation, conservation, restoration, rehabilitation, reconstruction of cultural heritage.
- Research and Development: Critical role of academic research and scholarship for R&D in urban issues, urbanization and education, social sustainability and urbanization.

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