Determining Town Base Socioeconomic Indices to Sensitize Development in Lahore, Pakistan

A. Aziz[1], S. M. Mayo[2], I. Ahmad[3], M. Hussain[4], M. Nafees[5]

[1,2,3,4]City and Regional Planning Department, University of Engineering and Technology, Lahore, Pakistan
[5]Lahore Development Authority, Lahore, Pakistan
[1]dr.ameraziz@gmail.com

Abstract-Urban Population is increasing tremendously across the World with many cities struggling to reduce urban divides. Lahore, the second largest city of Pakistan and a provincial capital confronted with challenge of urban divides. Socioeconomic inequalities engrossed the city and have become unrelenting in the wake of absence of an effective mechanism to ensure equity of services and development priorities. Consequently, state/cities resources are misdirected from the real and cogent use. Area based socio-economic indices help to classify areas which require for setting priorities and compatible uses. This paper highlights application of Principle Component Analysis to make socioeconomic indices (SESI) for towns of Lahore with outlined extension to union council's level.

Keywords-Union Councils, Principal Component Analysis, Socio-economic Index, Towns and Districts.

I. INTRODUCTION

Urban Population is increasing tremendously across the World. By the year 2030, developing regions in the World will have more population living in cities than in rural areas. In 2008, the world reached a momentous point when, for the first time in history, more than half its population lived in urban areas around 3.3 billion people. By 2030 this number will grow to around 5 billion people, and in Africa and Asia urban populations will double between 2000 and 2030 [i].

At this time when some cities proved as engine of growth and prosperity, some are struggling to combat inequality prevailing in their different constituent areas. Different definitions associated with inequality but Asian Development Bank (2013), expressed inequality in simple term as 'Unequal access to income and consequently to good quality education, healthcare, sanitation, and other building blocks of a successful life'. The concept of inequality further explained with example of two low-income people. One was given a good education and health care but did not work hard and ended up with a low- income. The other worked hard but did not have a good education or adequate health care and therefore also ended up with a low-income. Ensuring equal treatment for the second individual is the primary focus of policy makers concerned with inequality [ii]. People migrate in cities with the hope to get better employment and education opportunities and to cut their poverty but their hopes turn into distresses when their youth cannot get equal education and employment openings.

Educational facilities are more commonly available in cities than in rural areas. In most countries of the South, the "urban advantage" is quite clear for both rich and poor in urban settings [iii]. However, there are cities which have different composition of education and employment. Social and cultural hurdles have taken away the right of basic educations from slums dwellers. The influx of these migrants who come to cities in hope to get suitable employment opportunities widens gaps between rich and poor as UN-HABITAT estimated more number of poor inhabitant to cities.

Many of the new urban inhabitants will be poor, living in precarious or polluted environments the number of slum dwellers is increasing at almost the same rate as city populations [iv]. Thus, 'Urban' includes a whole range of spatial structures and land uses, ranging from small towns to big cities. Many of the World's large cities labeled as dysfunctional and many tending towards it, mainly because of the urban divide and individual's priority oriented developments.

In developed World division of spaces for different uses are little observed, despite social and cultural diversity and mix uses. But in developing cities situation is altogether different. Rich people live in gated and well-built settlements whereas poor pushed to inner or peri-urban areas of the cities in informal settlements or slums. Paris (Ilde France) is experiencing disparity as low income people forced to live in peripheral areas due socioeconomic inequalities. Although the Paris region remains the richest in France, the socio-spatial contrasts in this area are on the increase [v]. These issues are not effectively coped with city managerial expertise. The dissimilitude development leads to urban degradation and creation of urban slums. These cities open a debate about spatial sustainability and equity in services to all parts.

Reference [6] have given four dimension of spatial segregation with illustration of the development made in their respective planes. Fig.1 shows that more sustainable growth can achieve in planes of Exposure-Evenness and Exposure-clustering.

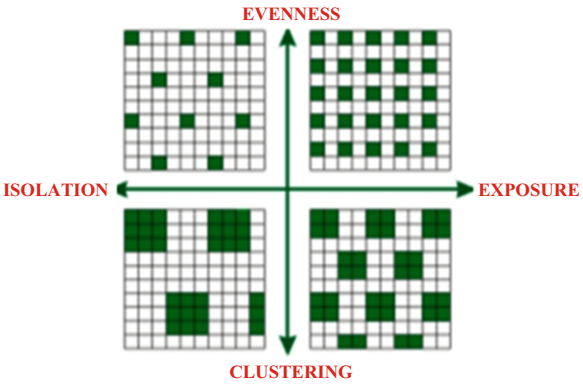


Fig. 1. Dimension of Spatial Segregation [vi]

A. Paradigm of Asian Urban Divide

The paradigm of spatial divide in Asian cities not only restricted to socio-economic inequalities but also spread over financial mechanism, institutional muddle and poor urban planning. Several organizations are working for urban planning in Asian cities which cause duplication of functions with little onus of responsibilities. Municipality of organizations is a problem in Bangladesh also. For instance, directly or indirectly about 42 agencies are involved in land development activities in Dhaka Metropolitan Area, of which four are national level agencies, 28 are sectoral, five are special agencies and five others which operate at local level [vii]. In an unprecedented move on Nov 2011, Dhaka Corporation split into two governing units called Dhaka North City Corporation (DNCC), with 36 wards, and Dhaka South City Corporation (DSCC). This move not only ignites inequalities of resources between North and South but also increases number of organizations directly or indirectly involve in urban planning and poverty alleviation functions. The south DCC will be deprived from resources. On the other hand, the north DCC, where powerful and rich people of the city live, would get more financial allocation [viii]

B. Situation in the Study Area

Pakistan, a prominent country of South Asia is experiencing socioeconomic inequalities in big cities. The growing inequalities provide impetus to growth of urban slums and increase in poverty. Purely based upon the food intake, i.e availability of two time meal, there are 24.2 percent poor in Pakistan. But the urban poverty added inadequate shelter also. Pakistan, India and Bangladesh house majority of the slums and preponderance of the urban population lives in slums. In Karachi, Pakistan, estimates suggest close to 50 per cent increase in slum population (from 3.4 to 5.0 million people) between 1988 and 2000. Estimates further suggest that about half of Karachi lives in *Katchi Abadis* [vii].

Lahore is the second largest city of Pakistan and a provincial capital, confronted with challenge of urban divide. Gigantic growth of metropolitan city continues without taking care of balanced socioeconomic opportunities among urbanites. District Lahore comprises of 1772 Sq. Km with growth rate of 3.35%. It comprised of nine towns and a cantonment area. Socioeconomic inequalities coined in Lahore by British in the twentieth century by constructing settlement of the lords and commoner. The gap of Socio-economic life style between two settlements widely filled by emerged middle class of that time. Intermediate settlements constructed by people of middle class now turned into slums areas. These settlements exist near around model constructed settlements, providing impetus to socioeconomic differences within towns.

Socioeconomic inequalities have become unrelenting in the wake of absence of an effective mechanism to ensure equity of services and development priorities. Consequently, state/cities resources are misdirected from the real and cogent use. Constituency Development Programs are very common in Developing Countries and are called Member National Assembly (MNA)/Member Provincial Assembly (MPA) Development Funds in Pakistan set a glaring example how the resources misused. Centre for Peace and Development Initiative (2011) highlighted one of such misuse as the constituencies of city area did not have much scope for up-gradation since most of the schools in these constituencies were already high/higher secondary schools. Moreover, people in the city districts have greater affinity for private schools. The result is that, the up-gradation of schools in city districts is seldom feasible. The resulted, on one hand in the loss of valuable time in identification process of schemes; and on the other the inter-sectoral allocation was disturbed [ix].

Social deprivation and inequalities determination in Lahore at town and union council level become more important as under Punjab Local Government Ordinance 2001, financial and administrative authority of key social services such as healthcare, schooling, sanitation, drinking water devolved to lower tiers of governments. There exist no effective, credible and comparable formula to allocate finances at local and even the provincial level to meet challenges of socioeconomic developments. In the Punjab, allocation of funds for local councils is made purely according to population. There is no credible formula for distribution of resources. In absence of credible and comparable data for designing an appropriate PFC distribution formula, transfer of funds to local

governments in the Punjab was made in accordance with historical shares determined by the allocations made in the past [x].

C. Emphases on Deprivation Studies

Reference [xi] socioeconomic opportunity index (SEOI) of Lahore reveals that 65% of population in slums and squatters deprived of basic and economic opportunities [xi]. Reference [xii] accentuated that after the devolution in Pakistan development strategies need to focus on poverty alleviation, equity in income distribution and social development [xii]. They pointed out that to bring any significant change; there is an acute need of profound analysis of poverty, prevailing income inequalities, and social development. Reference [xiii] prepared district poverty and deprivation indices pointed out high deprivation in the sectors of housing, education, health, residential services, and employment. Different studies carried out on inequality within districts proposed that deprivation studies within city of Lahore need to carry out [xiii].

Reference [xii] pointed out that investigation of income and social deprivation in the towns of Lahore is important for formulation of better policy regarding poverty alleviation, equitable income distribution and social service delivery by Punjab government and district management of Lahore.

II. Methodology of Research

Methodology of the research consists upon the following focused stages

A. Sample Size

Based upon the secondary data and featured parameters for socioeconomic status in Multiple Indicator Cluster Survey (MICS) Punjab 2007-2008 nine towns of Lahore and cantonment area selected for research.

Forty four parameters that contribute to socioeconomic status indices used for analysis. These parameters for all ten zones (towns) taken for analysis with no missing value.

B. Collection of Data and Development of Socio-economic Indices

For secondary data of Lahore, three main documents namely, Integrated Master Plan for Lahore-2021 and Lahore Urban Transport Master Plan(LUTMP) by JICA and Multiple Indicator Cluster Survey (MICS) Punjab 2007-2008 consulted. Principal component analysis applied to make socioeconomic components for towns of Lahore. Principal Component Analysis lead to the procurement of component score matrix which then used to get non standardized socioeconomic indices.

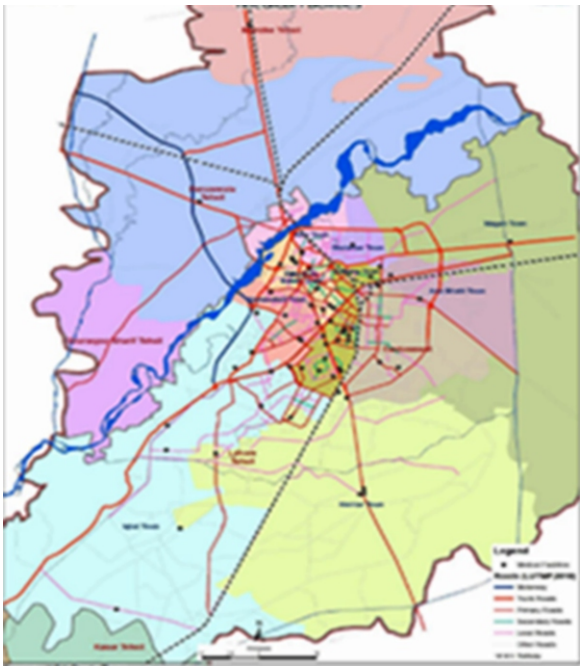
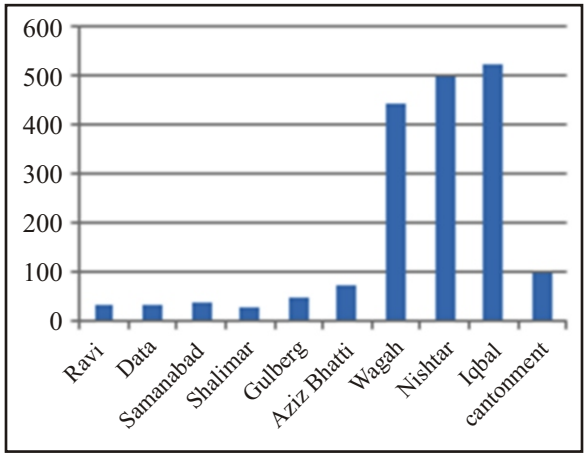


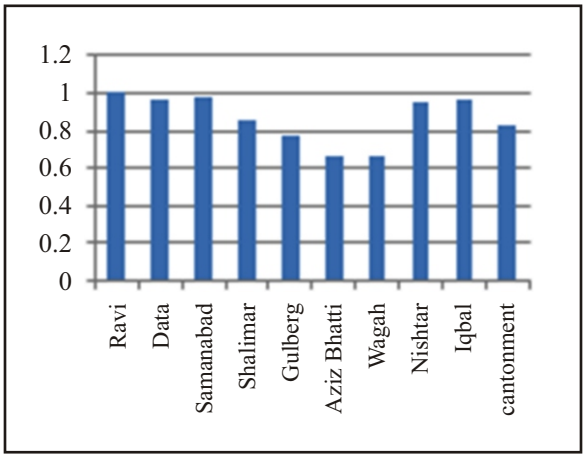
Fig. 2. Towns of Lahore [LUTMP]

III. ACTUALITIES OF STUDY AREA

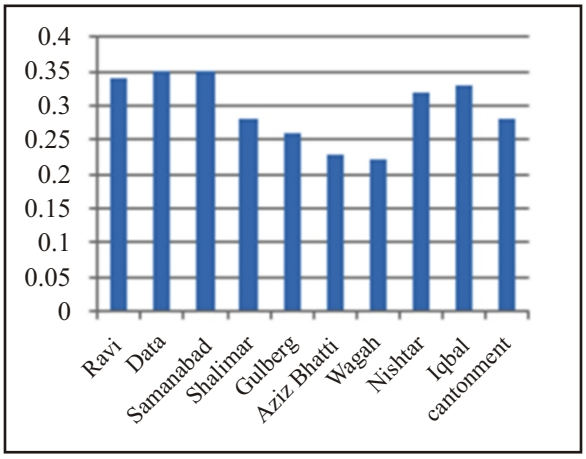
Statistical presentations of the key parameters that contribute in socioeconomic status of an area are highlighted below



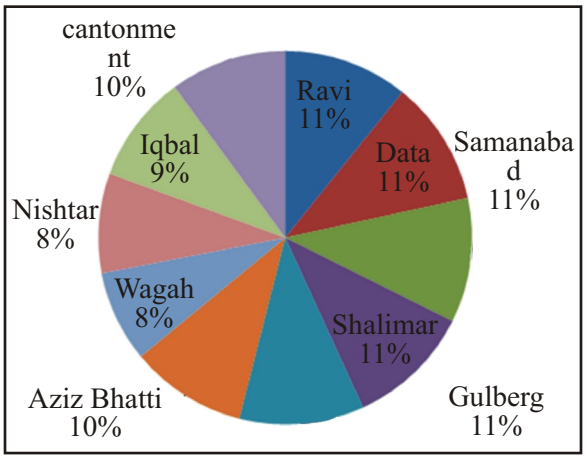
Total Area (Sq.Km)



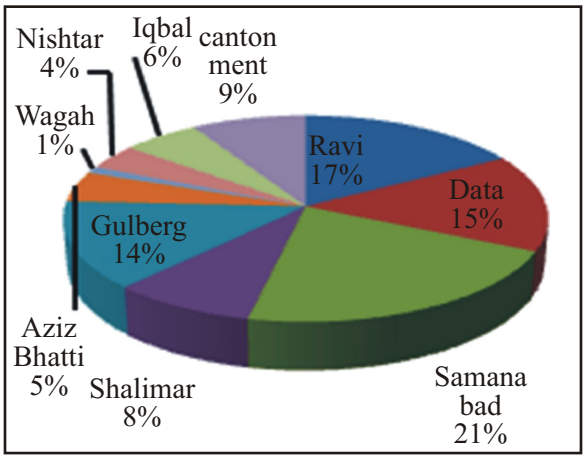
Total Population in M



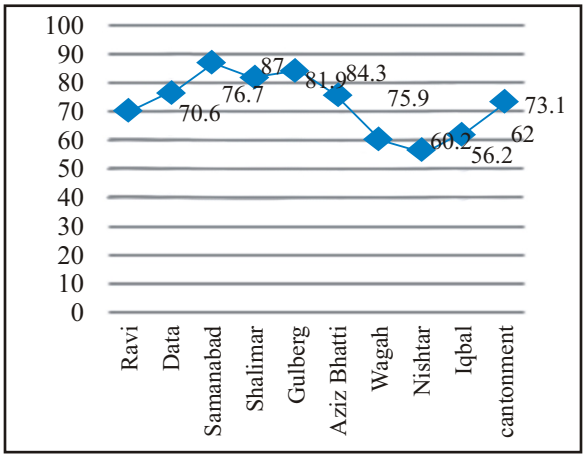
Unemployment in M



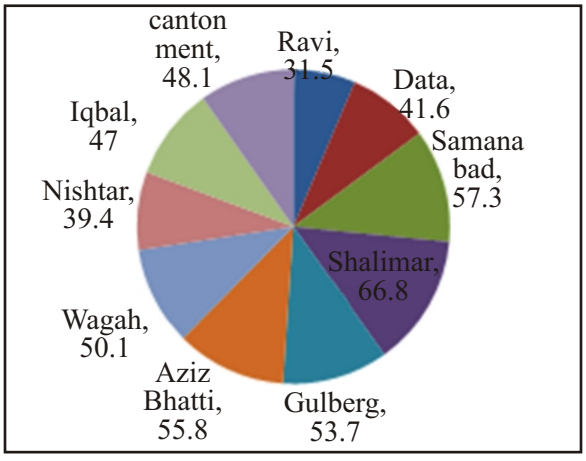
GDP



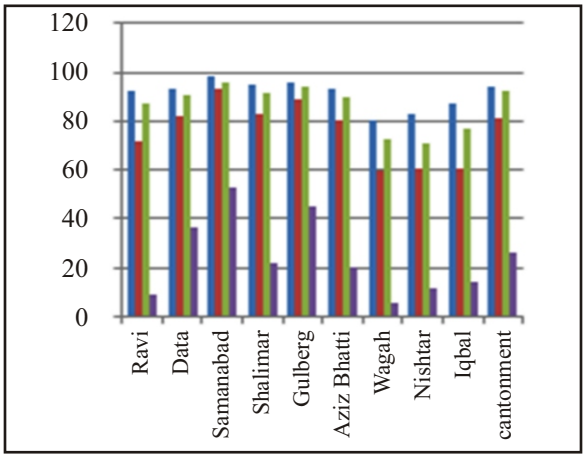
Solid Waste Management



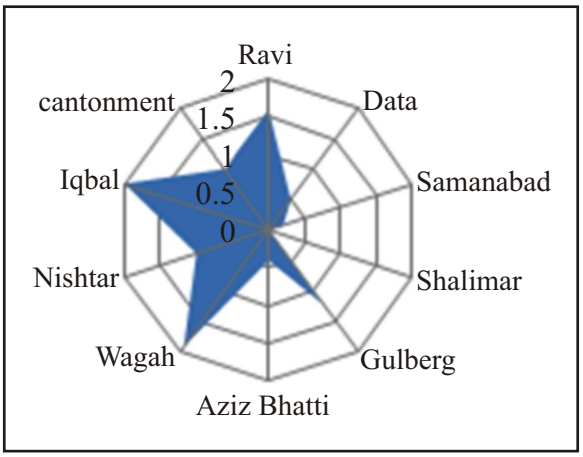
Literacy Rate



Percent Attendance to primary Schools



Possession of Household Items



Possession of No Household Item

Fig. 3. Socioeconomic Situation in the Study Area [MICS-2007]

IV. ANALYSIS OF DATA

Analysis of the data comprises upon numbers of SPSS tables, iterations and figures but due to the limited space only key or impact tables and figures shown below.

A. Use of Principal Component Analysis

Principal component analysis applied to make socioeconomic index of different towns of Lahore. Reference [xiv] used principal component analysis to make area based socio-economic status indices for different areas of Alberta. Reference [xv] used principal component analysis to make socioeconomic status indices of rural-urban Brazil and rural-urban Ethiopia. The World Bank, in its series of 'Socio-economic differences in health, nutrition, and population', has also constructed PCA-based asset indices using DHS constructing an index for each country as a whole. In our example, we construct a socio-economic index for each site, that is, households in urban and rural locations in both countries [xv]. Reference [xvi] used Principal Component Analysis to make Socio-economic Indexes For Areas (SEIFA). The same was also used by [xvii]. Principal Component Analysis comprises of the following steps

B. Suitability for Application of Principal Component Analysis (PCA)

Suitability of PCA for the given data checked through Bartlett's Test of Sphericity.

TABLE I
KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.790
Bartlett's Test of Sphericity	Approx. Chi-Square	1446.822
	Df	45
	Sig.	0.000

Table I shows that the value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy is more than 0.5 with 0.00 significance shows that PCA can be applied or significant to use for analysis.

C. Procuring Components Scores

a) Variable Loading without Rotation

TABLE II
COMMUNALITIES

Town	Initial	Extraction
Ravi	1.000	0.943
Data	1.000	0.969
Samanabad	1.000	0.976
Shalimar	1.000	0.951
Gulberg	1.000	0.962
Aziz B	1.000	0.885
Wagah	1.000	0.990
Nishtar	1.000	0.986
Iqbal	1.000	0.982
Cantonment	1.000	0.897

Table II indicates that all variable loaded above 0.5 which confirms the significance of PCA

TABLE III
TOTAL VARIANCE EXPLAINED

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.875	68.752	68.752	6.875	68.752	68.752
2	2.667	26.669	95.421	2.667	26.669	95.421
3	0.372	3.718	99.139			
4	0.065	0.648	99.787			
5	0.010	0.101	99.888			
6	0.004	0.045	99.933			
7	0.003	0.033	99.966			
8	0.002	0.017	99.983			
9	0.001	0.013	99.995			
10	0.000	0.005	100.000			

Table III shows that only two components with more than 1 Eigen value represent more than 95% of the total variance. The component 1 has 68.7% and component 2 has 26.6% of the variance respectively

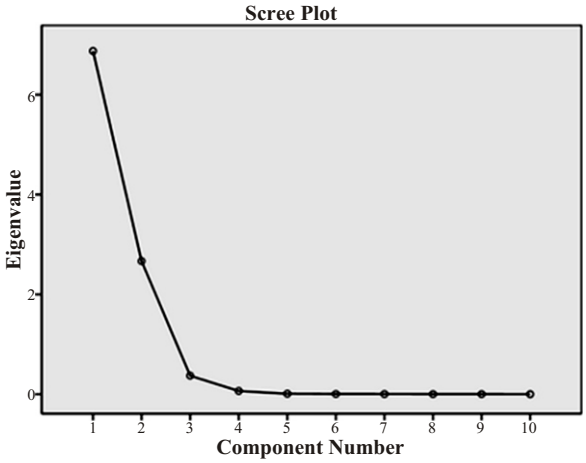


Fig. 4. Scree Plot for Variance

Fig. 4 Scree plot confirms that line is steeper between the component 1 and component 2. So there are two components only.

TABLE IV
COMPONENT MATRIX

Town	Component	
	1	2
Ravi	0.906	-0.350
Data	0.910	-0.376
Samanabad	0.927	-0.342
Shalimar	0.894	-0.389
Gulberg	0.955	-0.224
Aziz B	0.940	0.042
Wagah	0.564	0.820
Nishtar	0.544	0.831
Iqbal	0.532	0.836
Cantonment	0.935	0.149

Table IV shows that data divided into two components with different loading of the variables.

b) Deciding about Type Rotation

It is an important step in PCA. Before deciding about the rotation, it is important to take correlation between regression factor score 1 and regression factor score 2. Table V Indicates that no correlation exists between Regression Factor Score 1 and Regression Factor Score 2 which clearly shows that Varimax rotation requires to be taken for loading of variables.

TABLE V
CORRELATION MATRIX

		REGR factor score 1 for analysis 1	REGR factor score 2 for analysis 1
REGR factor score 1 for analysis 1	Pearson Correlation	1	0.000
	Sig. (2-tailed)		1.000
	N	44	44
REGR factor score 2 for analysis1	Pearson Correlation	0.000	1
	Sig. (2-tailed)	1.000	
	N	44	44

c) Loading of Variables after Varimax Rotation

TABLE VI
COMPONENT MATRIX

Town	Component	
	1	2
Ravi	0.176	-0.060
Data	0.181	-0.068
Samanabad	0.177	-0.056
Shalimar	0.181	-0.074
Gulberg	0.162	-0.015
Aziz B	0.116	0.074
Wagah	-0.061	0.312
Nishtar	-0.066	0.315
Iqbal	-0.068	0.316
Cantonment	0.098	0.110

Table VI show components scores for different variable (towns) help to build non-standardized indices for towns of Lahore.

V. CALCULATING NON STANDARDIZED INDICES (NSI)

NSI value is calculated by multiplying components with their variance after rotations.

NSI= (comp1x60.6) + (comp2x34.7)

Table VII show non saturated indices and their quintiles for towns of Lahore. Quintiles help to classify areas into different categories on basis of scores.

TABLE VII
NON STANDARDIZED INDICES

Name of Town	Comp 1	Comp 2	NSI	Quintiles
Ravi	0.176	-0.06	0.085836	
Data	0.181	-0.068	0.08609	0.204841
Samanabad	0.177	-0.056	0.08783	
Shalimar	0.181	-0.074	0.084008	0.204736
Gulberg	0.162	-0.015	0.092967	
Aziz B	0.116	0.074	0.095974	0.225114
Wagah	-0.061	0.312	0.071298	
Nishtar	-0.066	0.315	0.069309	0.167526
Iqbal	-0.068	0.316	0.068444	
Cantonment	0.098	0.11	0.097558	0.197783

VI. FINDING AND DISCUSSION

Socioeconomic index of cantonment area is the highest and Iqbal Town is the lowest. Lahore district divided into three broad categories namely, rich, middle and poor. Cantonment and Aziz Bhatti Town fall in SES class of rich whereas, Gulberg, Samanabad, Data Gunj Buksh and Ravi Towns are part of middle class, rest constitute poor class. There is a need of more development in poor class. Quintiles of these indices calculated to classify communities (areas) within respective status categories in Lahore. Filmer and Pritchett (2001) used arbitrary cut-off points are classification of the lowest 40% of households into 'poor', the highest 20% as 'rich' and the rest as the 'middle' group. Based on these criteria, town wise socioeconomic classification of Lahore is given in Table VII.

TABLE VIII
TOWN (AREA) BASED SOCIOECONOMIC CLASSIFICATION

Name of Town	SES Class
Cantonment	Rich
Aziz Bhatti	Rich
Gulberg	Middle
Samanabad	Middle
Data	Middle
Ravi	Middle
Shalimar	Poor
Wagah	Poor
Nishtar	Poor
Iqbal	Poor

The classification provides a tool to pay more attention on development of poor towns. It is not only can sensitize development initiatives but also facilitates City District Government Lahore in decision- making for utilization of Federal, Provincial and Local Grants and development funds. Furthermore, decisions for sustainable policy shelter, compatible urban planning and development can possible without any biased and political motives. Socioeconomic status indices quintiles provide basis to identify inequality and to classify areas at union council's (smallest tier of administrative division) level. It brings rationalization and equality in development by prioritizing areas of deprivation in Lahore. All UCs need to classify based on individual SES scores, particularly for urban services like health care, primary education and nutrition issues.

TABLE IX
AREA BASED CLASSIFICATION AT UNION COUNCIL LEVEL

Union Council	Poorest	Second	Middle	Fourth	Richest
	0.167526	0.197783	0.204736	0.204841	0.225114
A					
B					

VII. RECOMMENDATIONS

Government may revisit development priorities in light of classification of Towns to reduce urban inequality.

The classification may be used as basis for distribution of city resources by Provincial Finance Commission.

The classification of Towns may be extended at union council level in light of calculated quintiles to facilitate allocation of budget for lower tier of Local Government

Socioeconomic status indices may be used for rational utilization of MNA/MPA Development Grants

Town base socioeconomic indices should utilize to improve different services in particular health care, primary education etc.

REFERENCES

[i] United Nations Population Fund, "State of World Population 2007: Unleashing the Potential of Urban Growth", USA, 2007, pp-1

[ii] Asian Development Bank, "Deepening Divide Can Asia Beat Menace of Rising Inequality, Development Asia", Manila, 2013, pp-11

[iii] United Nations Human Settlements Programme, "State of the World Cities 2010/2011 Bridging the Urban Divide", London, 2008, pp-XV

[iv] United Nations Human Settlements Programme, "State of the World's Cites Report 2006/07: The Millennium Development Goals and Urban Sustainability", London, 2006, pp-49

[v] Fleury, et al., "Are socio-spatial inequalities increasing in the Paris region?", [Online] Available: Http://www.metropolitiques.eu/Are-socio-spatial-inequalities.html and assessed on 25.04.2013

[vi] F. Reardon & D. Sullivan, "Measures of Spatial Segregation", Sociological Methodology, Vol. 34, No. 1, pp-122, 2004

[vii] J. Ansari, "Revisiting Urban Planning in South Asia", Global Report on Human Settlements 2009, UN-HABITAT, pp.20,pp.55, 2009

[viii] Pakistan Policy Group, Splitting Dhaka: Should Megacities Divide? [Online] Available: http://pakistanpolicygroup.com/blog/2012/03/09/splitting-dhaka-should-megacities-divide/and assessed on 22.08.2012

[ix] Centre for Peace and Development Initiatives, "An Analysis of Punjab Government's MNA/MPA Package in District Rawalpindi 2010-11", Islamabad, 2011, pp-11

[x] S. Kardar, "Local Government Finance in Pakistan Post 2001", The Lahore Journal of Economics, Special Edition, Lahore, pp-95, 2008

[xi] R. Kalim & S. Bhatti (2006), "Quantification of Socio Economic Deprivations of Squatter Settlement's Inhabitants: A Case Study of Lahore", 6th Global Conference on Business & Economics, USA, 2006

[xii] Hyder, et al., "Poverty, Income Distribution and Social Development in Lahore", [Online] Available: Http://mpra.ub.uni-muenchen.de/30531/1/MPRA_paper_30531.pdf and assessed on 05.02.2007

[xiii] Jamal et al., "Mapping the Spatial Deprivation of Pakistan Research Report 52, Social Policy and Development Centre", Karachi, 2003

[xiv] V. Krishnan ., "Constructing An Area-Based Socioeconomic Status Index: A Principal Components Analysis Approach, Every Day In Every Way: Creating Learning Experiences For Every Child", Australia, 2010

[xv] S. Vyas . & L. Kumaranayake ., "Constructing Socio-Economic Status Indices: How to Use, Principal Components Analysis, Health Policy and Planning", 21 vol 6, pp-460, London, 2006

[xvi] Australian Bureau of Statistics, "Building on SEIFA: Finer Levels of Socio-Economic Summary Measures", Canberra, 2013

[xvii] J. Baker & P.Adhikari, , "Socio-Economic Indexes for Individuals and Families", Australian Bureau of Statistics, [Online] Available:http://www.abs.gov.au/ausstats/abs@.nsf/mf/1352.0.55.086 and assessed on 20.07.2014