

A Study on Housing Affordability in Kolkata Urban Agglomeration (KUA), Based on Infrastructure Driven Housing Price Distribution and Household Income-Expenditure Pattern

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Abstract

The paper attempts to assess variations in basic and composite housing affordability across Kolkata Urban Agglomeration (KUA) with respect to housing price distribution, patterns of household income and expenditure, and variations in transportation cost. Composite housing affordability represents total cost of living in a house within a particular location, and is indicative of the impact of off-site infrastructure on housing price as well as household expenditure; whereas basic housing affordability projects the link between house price and household income ignoring locational characteristics. In this paper, housing affordability assessment has been carried out using Price-to-income ratio, Median Multiple method and Residual Income approach, for surveyed households residing in group housing projects for low-to-middle income groups, across KUA. The study on housing price distribution together with variations in household income and expenditure of surveyed households reveal significant differences between non-inclusive or basic housing affordability and composite housing affordability across KUA. The housing market within KUA is found to range from mild un-affordability to severe un-affordability, necessitating immediate government intervention in both ownership and rental housing development of smaller unit sizes, affordable to the low-to-middle income group population.

Keywords:Housing affordability, low-to-middle income group, sub-regional variation, patterns of household income and expenditure, distribution of housing price

1. INTRODUCTION

Housing sector has been significantly contributing to India's GDP, through asset creation and employment generation, directly and indirectly, by initiating multiplier effect, due to inter-linkage with other sectors. However, there exists huge housing shortage in India in urban areas (18.78 million housing units) particularly for the economically weaker section (EWS) (56%) and low income group (LIG) (39%) households (MHUPA, 2012).The Ministry of Housing and Poverty Alleviation (MHUPA), Government of India has focused on 'Affordable Housing for All' program since 2007 to promote affordable housing development, for meeting the housing demand of low-to-middle income earning population (MHUPA, 2007). Government impetus to the development of affordable housing is required to control the ever increasing housing shortage. There is a need to develop appropriate infrastructure to provide necessary amenities complementing the development of

affordable housing to match the future demand by low-to-middle income households, who are expected to constitute majority of the Indian income pyramid by 2020 (McKinsey & Company, 2007).

The term 'Housing Affordability' expresses the troubles faced by households in owning or renting adequate housing space. Price-to-income ratio and Rent-to-income ratio are ubiquitous approaches in determining housing affordability. 'Residual Income' and 'Median Multiple' are relatively newer approaches, utilized in housing affordability assessment. Standard measures of housing affordability are concerned with household income- expenditure pattern and housing price or rent, and usually overlook locational variations in housing expenditure and housing price (Lau & Li, 2006). Residential location choice by urban households are affected by household characteristics, household income, variations in housing prices and availability of physical and social infrastructure (Alonso, 1964; Muth, 1969; Kain & Quigley, 1970; Siegel, 1970; Hirsch, 1973; Smith, Rosen, & Fallis, 1988). Well planned urban areas provide amenities and facilities to the urban dwellers at lesser distance thus impacting household expenditure through transportation cost (CNT & CTOD, 2011). Also, the cost of infrastructure provision is realized through local taxes which affect household expenditure and housing price at local level (Tiebout, 1956; Mayo, 1973; Smith et al., 1988). Therefore, availability and accessibility of physical and social infrastructure impacts housing affordability, which is not taken into consideration by basic or non-inclusive measures of housing affordability.

This study attempts to assess composite housing affordability which represents total cost of living in a house within a particular sub-region of the Kolkata Urban Agglomeration (KUA). Composite assessment of housing affordability across KUA can be addressed in terms of four objectives –

1. To assess a) sub-regional variation in housing price distribution within KUA; b) sub-regional variation in housing income and expenditure pattern of surveyed households within KUA ; c) sub-regional variation in transportation cost of surveyed households within KUA;
2. To determine basic housing affordability by comparing housing price data with household income and expenditure data;
3. To evaluate composite housing affordability by comparing housing price data together with household transportation cost data and household income and expenditure data; and
4. To assess significance of variation between basic housing affordability and composite housing affordability across KUA.

In the following sections a brief literature review on housing affordability is given along with the description of methodology adopted for the study, discussions on major findings of the study, and conclusion.

2. LITERATURE REVIEW

This section presents a literature review on various definitions and measures of housing affordability and the housing market situation in KUA.

2.1 Housing Affordability

Literature on housing affordability offers wide-ranging definitions of housing affordability. Affordability has often been defined as a balance between housing and non-housing expenditure, and also as an indicator for accessing adequate housing.

The universally utilized definition of housing affordability applies ‘Rule of Thumb’ which states that housing expenditure should not be more than a certain percent of a household’s income (usually 25 – 30%). Housing affordability has also been defined as expressing the challenge that each household faces in balancing the cost of its actual or potential housing, on the one hand, and its non-housing expenditures, on the other, within the constraints of its income (Ho & Chiu, 2002; Stone, 2006). Also, the term housing affordability has been used to summarize the difficulties individual households face in accessing decent or adequate housing (Hulchanski, 1995; Hui, 2001).

Affordable housing standards, defined under the ‘affordable housing in partnership scheme’, as envisaged in the National Urban Housing & Habitat Policy (NUHHP) in MHUPA (2007), are –

1. Housing unit sizes ranging from 300 square feet (built up area) for Economically Weaker Section (EWS), and 500 square feet for Low Income Group (LIG) to 1200 square feet for Middle Income Group (MIG).
2. The minimum carpet area for EWS, LIG and MIG being a minimum of 25 square meters, 48 square meters and 80 square meters respectively.
3. The cost of monthly housing price/loan repayment not to exceed 30-40% of monthly income of the buyer, which conforms to the ‘rule of thumb’.

Table 1: Definition of Affordable housing in India

Income Categories	Size of unit	Affordability
EWS	300 square feet	Proportion of housing expenditure to monthly income – 30 to 40%
LIG	300 - 600 square feet	Proportion of housing expenditure to monthly income – 30 to 40%
MIG	600 - 1200 square feet	Ratio of house price to annual income – less than 5.1

Source: IBEF (2012)

Housing affordability is primarily determined by housing price and household income. Researchers have used different approaches in measuring affordability. Older approaches in determining affordability include housing price to income

ratio. Rent-to-income ratio is also a useful in assessing housing expenditure and affordability (Sen, Chattopadhyay, & Chatterjee, 2009). The range of rent-to-income ratio for a housing to be affordable is generally taken as 25%-30%. The Price-to-Income Ratio (PIR) has been developed following the rule of thumb and is most widely used to monitor housing affordability, all over the world. PIR or price to income ratio has been approved by the United Nations Commission on Human Settlements (UNCHS) as a key housing indicator (UN-HABITAT, 2003).

The threshold for PIR is not same universally. World Bank Standards state that PIR should range from 3:1 to 6:1 for a housing to be affordable in market economies. Significant differences in PIR have been found between developed and developing nations. PIR in developing countries have been found to be quite high (8:1 – 14:1) as compared to 3:1-4:1 threshold as used in developed countries (Suhaida et al., 2011). In Indian context, Housing Development Finance Corporation Limited (HDFC) and Ministry of Housing and Urban Poverty Alleviation (MHUPA) consider 'housing price at 5.1 times annual household income' as the maximum affordability of a household.

The Median Multiple (MM) method of assessing housing affordability is similar to PIR. The Demographia International Housing Affordability survey (2006 - 2013) utilized the 'Median Multiple' approach to create housing affordability index, for measuring housing affordability. The 'Median Multiple' is given by the ratio of median house price to median household income. The value of 3 is marked as the threshold in this measure. If calculated median multiple value exceeds this threshold, then housing is deemed unaffordable. Median Multiple has also been approved as possible indicators of housing affordability (UN-HABITAT, 2003).

Ratio measures of housing affordability are widely applied and yet they are not accurate measure of the difficulty faced by households in accessing housing (Hulchanski, 1995; Hui, 2001). Besides, acceptable thresholds of ratio measures are still debatable (Hulchanski, 1995; Hui, 2001; Suhaida et al., 2011).

Measures of housing affordability, focusing on housing adequacy and non-housing expenditure have been developed for more accurate evaluation of housing affordability (Stone, 1993; Thalmann, 1999; Thalmann, 2003; Kutty, 2005; Stone, 2006). Thalmann (1993, 2003) had proposed a measure to distinguish between apparent and actual affordability problems by forming hedonic rent indices for different housing unit sizes. This measure did not consider adequacy of income available, after paying for housing, to meet basic needs. Stone (1993) developed the notion of 'shelter poverty' by considering the sufficiency of income available for necessary non-housing expenditure. Residual Income approach of measuring housing affordability, originated from the above concept. Residual income approach (Stone, 2006) assesses whether, actual income available for meeting household expenses, after paying for rent or interest for housing loan, is sufficient or not (Ho & Chiu, 2002). This approach can be utilized both in the developed and the developing nation context. Kutty (2005) modified the

method developed by Stone (1993, 2006) and introduced a new measure in developing nation context, by fixing the standard for basic non-housing consumption at two-thirds of official poverty line. However, the particular fraction of two-third is arbitrary and the threshold for non-housing expenditure is also not universal but is context specific (Stone, 2006; Bramley, 2012).

Standard measures of affordability are concerned with household income and expenditure and housing price. They do not take into account other factors that influence living cost of a household in a particular place. There have been several criticisms of conventional measures in assessing housing affordability as they ignore housing quality, location quality, and tradeoffs made by households between more accessible location and more affordable housing price (Belsky, Goodman, & Drew, 2005). Appropriate measure of housing affordability should account for housing and location quality as well as housing preference based on household characteristics, with context specific thresholds of affordability measure (Belsky et al., 2005).

2.2 Housing Market in KUA

There is high demand for affordable housing in KUA as majority of the population belong in the Low-to-Middle Income Group (LMIG). The average annual housing need is estimated at 70,000 units currently to meet the housing demand of the population (Sengupta, 2006). Housing is becoming increasingly inaccessible to the LMIG, due to income poverty and problem in overall housing supply, on one hand, and scarcity of land resulting in high real estate value on the other. Government has implemented different housing schemes for meeting the housing demand of the population, but supply has been meager in comparison to housing need.

Growth of information technology & information technology enabled service industry and advent of private developers have led to lop sided growth of housing market with most residential developments aiming for higher income group users. The increase in high end housing has led to price spiral across all housing market segments jeopardizing the availability of affordable housing to the LMIG (Sengupta, 2006; Sengupta & Tipple, 2007; Sengupta, 2008; Chatterjee, Chattopadhyay, & Sen, 2009; Sen et al., 2009; Chattopadhyay, 2010). The demand supply imbalance is present in KUA across different house price segments. It is necessary to study the pattern of variation in affordability across KUA to find solutions to this problem. As affordability is primarily a function of income and expenditure, therefore it is also necessary to assess the variations in income and expenditure across KUA.

3. METHODOLOGY

Determination of sub-regional variations in basic and composite housing affordability within KUA begins with sub-regional demarcation of KUA. Initially a description of the sub-regions, with representative urban centres is forwarded,

followed by a discussion on survey design adopted for collection of primary data across KUA. Next, a study of housing price distribution is provided with a complementary study on patterns of household income and expenditure. Finally a discussion on different measures of basic and composite housing affordability in the context of KUA is presented.

3.1 Identification of Sub-regions within KUA

The Kolkata Urban Agglomeration (KUA) has been taken as the present study area. KUA comprises of areas belonging to the six districts, namely, South and North 24 paraganas, Nadia, Hooghly, Howrah and Kolkata. KUA has been divided into six sub-regions (SR) based on population density, distance from core city of Kolkata and geographical position with respect to river Hoogly. Demarcations of the sub-regions (SR) are given in Figure 1.

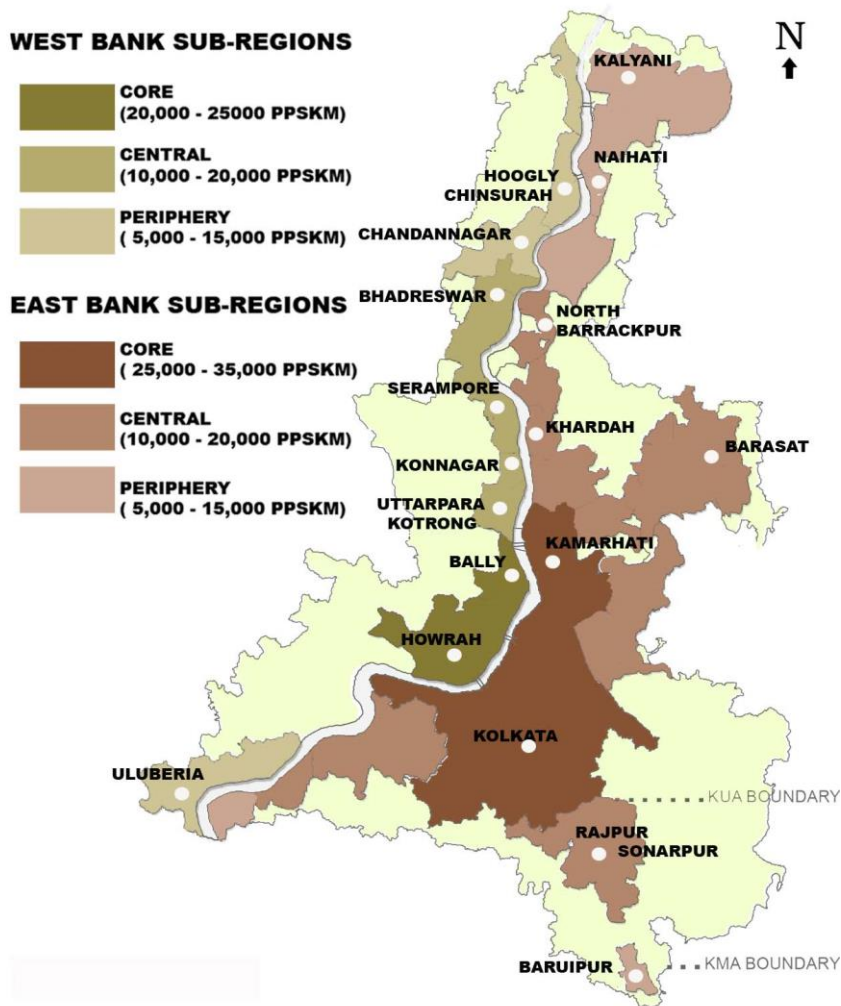


Figure 1: Delineation of sub-regions within KUA

Source : Kolkata Metropolitan Area Map (KMDA, 2001) sub-regions have been demarcated

Representative urban centres have been chosen from each sub-region for ease of analysis. The sub-regions with respective representative urban centres are – Kolkata and Kamarhati from the Core East Sub Region (C E SR); –Howrah and Bally from Core West Sub Region (C W SR); Rajpur-Sonarpur, Barasat, Khardah, and North-Barrackpur from Central East Sub Region (Ce E SR); Uttarpara-Kutrong, Konnagar, Bhadreswarand Serampore from Central West Sub Region (Ce W SR); Baruipur, Naihati and Kalyani from Periphery East Sub Region (P E SR); and Hoogly-Chinsurah, Chandannagar, and Uluberia, from the Periphery West Sub Region (P W SR).

3.2 Survey Design

A total of 190 households, residing in public or private group housing projects meant for low-to-middle income groups, across KUA, have been surveyed for primary data on housing income and expenditure. Household income data has been collated as per the income group classification by the National Council of Applied Economic Research in 2005 (NCAER, 2005). The four groups are listed as – Deprived (Household income below Rs90000 per annum); Aspirers (household income between Rs90000 and Rs200000 per annum); Middle Class comprising Seekers (household income between Rs200000 and Rs500000 per annum) and Strivers (household income between Rs500000 and Rs 1000000 per annum); and Rich (household income above Rs1000000 per annum) (Shukla, 2007). Among these income groups the ‘Aspirers’ represent the low-to-middle income earning population and are the focus of the present paper for affordability assessment. The ‘Seeker’ and ‘Striver’ together form the MIG. Existing minimum, maximum and median housing price for each urban centre has been collected through spot pilot survey. Median house price, household income, household expenditure and household transportation cost has been calculated for each urban centre, from primary data.

3.3 Housing Price Distribution within KUA

Table 2 represents the housing price distribution within KUA. Housing price is observed to decrease with distance from the core SR. The variation in housing price in the Central and Periphery SR is nearly equal and noticeably lesser than the core SR. Also, the East SR have higher housing price than the West SR. Housing price is distributed with a distinct core – periphery demarcation at sub-regional level. House price is extremely high in Core cities such as Kolkata and Howrah giving indication of housing unaffordability in core sub regions. However, the distribution is not very skewed or unequal if KUA is considered as a whole. Skewness (0.75121) and kurtosis (-0.52947) of the housing price distribution validates the above observations.

Table 2: Housing Price Distribution within KUA

Sub-region	Urban Centre	Housing Price Range (Rs. / square feet)	Median Housing Price (Rs. / square feet)
C E SR	Kolkata	3000 - 12000	4000
	Kamarhati	2500 - 4000	2800
	Sub-region total	2500 - 12000	3400
C W SR	Howrah	2500 - 5000	3200
	Bally	1800 - 3300	2800
	Sub-region total	1800 - 5000	3000
Ce E SR	North Barrackpur	1500 - 2600	2000
	Khardah	1800 - 2500	2200
	Barasat	1800 - 2250	2100
	Rajpur-Sonarpur	2200 - 3650	2700
	Sub-region total	1500 - 3650	2350
Ce W SR	Bhadreswar	1200 - 2000	1500
	Srirampore	1500 - 2500	1800
	Konnagar	1500 - 2500	1900
	Uttarpara – Kutrong	2000 - 3200	2800
	Sub-region total	1200 - 3200	2150
P E SR	Kalyani	2000 - 3000	2350
	Naihati	1500 - 2400	2000
	Baruipur	2000 - 2500	2100
	Sub-region total	1500 - 3000	2250
P W SR	Hoogly-Chinsurah	1800 - 2200	2000
	Chandannagar	1500 - 2500	2000
	Uluberia	1200 - 1800	1600
	Sub-region total	1200 - 2500	1850

3.4 Housing Income and Expenditure Pattern within KUA

Table 3 presents the proportion of surveyed households in each income group as classified by NCAER (2005). It can be seen that the surveyed households predominantly belong to the Seeker group throughout KUA. Ce E SR is the exception where Aspirers are found to be majority. Table 4 represents the household income and expenditure distribution in KUA, including household transportation cost. Median expenditure is found to be significantly lesser than median income throughout KUA, excluding Central East sub-region. Variation in household income is higher with respect to variation in household expenditure. Also, variation in household income is higher in eastern sub-region than western sub-region. In eastern sub-region, highest household income is recorded in Core sub-region, followed by Periphery sub-region. The Central east sub-region accounts for lowest median household income in KUA. In western sub-region, income is nearly similar, with highest value in Core sub-region, followed by Central and Periphery sub-region. Core-Central-Periphery demarcation can be observed in household income distribution with highest value in Core sub-regions.

Table 3: Income Group Distribution in Surveyed Households within KUA

Sub-region	Urban Centre	Deprived (%)	Aspirer (%)	Seeker (%)	Striver (%)
C E SR	Kolkata	-	25	50	25
	Kamarhati	-	20	70	10
	Sub-region total	-	22	60	18
C W SR	Howrah	-	20	60	20
	Bally	-	50	50	-
	Sub-region total	-	35	55	10
Ce E SR	North Barrackpur	-	10	40	50
	Khardah	15	55	30	-
	Barasat	10	60	30	-
	Rajpur-Sonarpur	30	60	10	-
	Sub-region total	14	46	28	12
Ce W SR	Bhadreswar	-	10	90	-
	Srirampore	-	50	40	10
	Konnagar	-	50	50	-
	Uttarpara – Kutrong	-	20	70	10
	Sub-region total	0	32	62	6
P E SR	Kalyani	10	30	60	-
	Naihati	-	30	60	10
	Baruipur	40	10	40	10
	Sub-region total	17	23	53	7
P W SR	Hoogly-Chinsurah	20	30	40	10
	Chandannagar	-	20	80	-
	Uluberia	10	40	50	-
	Sub-region total	10	30	53	3

Table 4: Income and Expenditure pattern of Surveyed Households within KUA

Sub-region	Urban Centre	Median Income (Rs./month)	Median Expenditure (Rs. / month)	Median Trans. cost (Rs. /month)	Proportion of Transportation cost in household expenditure
C E SR	Kolkata	29200	16500	4000	(18% – 30%)
	Kamarhati	27400	15000	1500	(4% – 10%)
	Sub-region total	28300	15750	2750	(11% – 21%)
C W SR	Howrah	29200	12000	2000	(13% – 17%)
	Bally	16500	12500	3000	(17% – 21%)
	Sub-region total	23000	12000	2500	(14% – 21%)
Ce E SR	North Barrackpur	45000	14500	1000	(5% – 7%)
	Khardah	13200	12500	2000	(8% – 15%)
	Barasat	13600	12500	1000	(8% – 11%)
	Rajpur-Sonarpur	11300	9000	1000	(9% – 11%)
	Sub-region total	13500	12500	1000	(8% – 11%)
CeW SR	Bhadreswar	27700	12000	1000	(7% – 8%)
	Srirampore	16500	14000	1000	(7% – 11%)
	Konnagar	16500	11500	2000	(9% – 17%)
	Uttarpara – Kutrong	27400	12000	2000	(15% – 17%)
	Sub-region total	22000	12000	1500	(7% – 11%)
P E SR	Kalyani	20800	10500	1200	(10% – 11%)
	Naihati	25000	13500	2000	(8% – 15%)
	Baruipur	16500	10000	1200	(5% – 7%)
	Sub-region total	21000	11000	1500	(8% – 11%)
P W SR	Hoogly-Chinsurah	16500	8000	1000	(6% – 7%)
	Chandannagar	26000	12500	2000	(13% – 16%)

	Uluberia	16500	10000	2000	(5% – 16%)
	Sub-region total	20000	10500	2000	(8% – 17%)

A similar pattern is observed for household expenditure with higher variation in eastern sub-region, than western sub-region. The highest and lowest household expenditure is present in Core east and Periphery east sub-regions respectively. Household expenditure is highest in Core sub-regions, followed by Central and Periphery sub-regions. However, household expenditure is found to range between Rs.12000 – 12500/month, for whole KUA.

The variation between the median income and expenditure level with respect to the prevalent housing price shall indicate the overall affordability in each urban centre in each sub-region. Core east, west and Central east sub-regions are indicated to be more vulnerable to affordability problems.

The impact of transportation cost in the overall living cost of the surveyed households within KUA is revealed in Table 4. Households staying in the core sub-regions bear the highest transportation costs. The overall disposable income in the core sub-region is greater than the central or periphery sub-region. Also, the Core sub-region includes the main Central Business District of KUA which attracts extreme population pressure. Further, traffic congestion on roads and use of different transportation modes leads to higher transportation cost. Minimum transportation cost is observed in Central sub-regions. Usually transportation cost increases as people move away from core city, with suburban areas displaying core oriented transit pattern. Presence of suburban railway system in KUA, contributes highly to the observed transportation cost distribution. Suburban railway system connects all of KUA together. However, owing to larger area and very high population density, population in core sub-regions is more dependent on road based transportation system. Since rail based transit system is cheaper than road based transit system, therefore transportation cost of Central and Periphery sub-regions are lesser than that of Core sub-regions. Moreover, though Periphery sub-regions have lesser population density, yet due to larger area, dispersed population and less developed transportation, Periphery sub-regions account for higher transportation cost than Central sub-regions.

The share of transportation cost in household expenditure is very high in KUA, as compared to National Sample Survey data for urban West Bengal (NSSO, 2013). The share of transportation cost in the household expenditure emphasizes the impact of transportation cost in the composite housing affordability.

3.5 Basic Housing Affordability

Basic housing affordability index has been calculated against minimum and maximum values of housing price corresponding to inner and outer urban areas for each representative urban centre. Standard measures of housing affordability

like – Price-to-income ratio (PIR), Residual Income (RI) and Median Multiple (MM) have been utilized for construction of basic housing affordability index. Housing market condition has been analyzed with respect to MIG as well as LMIG or ‘Aspirer’, in the study. Basic housing affordability has been assessed for different housing unit sizes – 400 square feet & 600 square feet. The particular unit sizes have been chosen from MHUPA specifications of affordable dwelling unit sizes for different income groups (MHUPA, 2007; MHUPA, 2008).

In PIR method the index is given by the formula: $PIR = \text{Housing Price} / \text{Annual household income}$. The threshold for PIR for housing affordability assessment has been taken as 6:1, in this paper, in accordance to World Bank standards as mentioned in Lau & Li (2006).

MM method rates housing affordability, based on the formula: $MM = \text{Median house price} / \text{Annual median household income}$. Housing affordability threshold for MM method, as set by the ‘Demographia International Housing Affordability Survey’ is three. Index value of three or less than three is considered affordable whereas index values higher up from three are rated as increasingly un-affordable (Demographia, 2007; Cox & Pavletich, 2012).

RI approach is concerned with sufficiency of household income, left after paying for housing rent or loan, in meeting necessary household expenses (Stone, 2006). RI approach uses the formula: $RI = \text{Annual Income} - \text{annual housing rent/loan}$. In this paper the existing practice of housing loan payment based on equal annual instalments (EAI), is employed for affordability index formation. Loan repayment period of 10 years, found to be most prevalent in primary survey, is considered in this paper, for RI approach. Median housing expenditure, estimated from primary survey data as well as from National Sample Survey data (NSSO, 2001; NSSO, 2006; NSSO, 2011), has been selected as threshold of housing affordability for RI approach. Official Poverty line for West Bengal has not been utilised here, as poverty thresholds are more applicable for Deprived Group than Aspirer or LMIG.

3.6 Composite Housing Affordability

Composite housing affordability seeks to measure the tradeoffs made by households, between locational amenities and facilities, and housing quality, in selecting a residence. Often households move out to the urban periphery or suburbs for habitation, as they cannot afford inner city residences due to monetary constraint. However increased distance from core city areas, which houses all major workplaces, educational centre, health facilities, markets, recreational centre etc., affects the transportation cost of a household. Transportation cost forms a considerable proportion of the household budget and is sensitive to fuel price fluctuation. Therefore transportation cost depends on the level of infrastructure development in a location and affects the total cost of living in there. Transportation cost, is thus associated with housing affordability and impacts the overall affordability of residential location choice. ‘H+T affordability index’ developed by the ‘Centre for

Neighborhood Technology' measures 'true affordability' and 'location efficiency' at neighborhood level. 'H+T affordability index' is an appropriate approach for composite affordability assessment (Urban Land Institute, 2009; CNT & CTOD, 2011). Transportation cost commands a considerable share of household expenditure throughout the home-ownership period. The true impact of transportation cost in composite housing affordability cannot be captured by considering annual household expenditure on transportation. Annual transportation cost when compared with total housing price appears insignificant, but gains importance while considering life-cycle costs. Therefore, the true nature of composite housing affordability can be measured by giving more weightage to transportation cost in affordability assessment procedure. Further detailed studies are required for incorporating changes in composite housing affordability measures, for a precise assessment of impact of transportation cost on total household expenditure. Since average dwelling time period for households have been found to be minimum 30 years as per primary survey, therefore transportation cost for 10 years has been considered for calculation of composite housing affordability. Basic as well as composite housing affordability assessment, together measure the tradeoffs by surveyed household between affordable housing and more accessible locations.

Composite housing affordability index using PIR approach is given by the formula: $PIR = (\text{Housing Price} + \text{annual household transportation cost}) / \text{Annual household income}$.

Composite affordability index by MM method uses the formula: $MM = (\text{Median house price} + \text{median household transportation cost}) / \text{Annual median household income}$.

In RI approach the composite affordability index is given by the formula: $RI = \text{Annual household Income} - (\text{housing price}/10) - \text{annual household transportation cost}$.

4. RESULTS

Table 5 presents the housing affordability index by PIR method. Housing unit of 400 square feet is found to range from affordable to moderately un-affordable for Aspirers, across KUA. In accordance with observations from Table 3, Urban Centres from eastern part of Central and Core sub-regions show severe un-affordability. Core SR is mostly found un-affordable though, some urban centres belonging to Central sub-region are revealed to be even more unaffordable. However few urban centres of Central and Periphery sub-region also show high affordability also. Similar variation is observed in composite housing affordability. Significant difference between basic and composite housing affordability is found by PIR method.

Table 5: Housing Affordability Index for Aspirers within KUA by Price to Income Ratio

Sub-region	Urban Centre	Basic affordability index	Composite affordability index
C E SR	Kolkata	6.6	9
	Kamarhati	5.8	5.83
	Sub-region total	6.35	7.49
C W SR	Howrah	6.67	7.38
	Bally	5.55	6.55
	Sub-region total	6.32	7.12
Ce E SR	North Barrackpur	4.2	4.6
	Khardah	5.1	5.9
	Barasat	4.8	5.5
	Rajpur-Sonarpur	7.37	8.1
	Sub-region total	6.18	7.07
Ce W SR	Bhadreswar	3.75	4.17
	Srirampore	3.9	4.6
	Konnagar	3.4	4
	Uttarpara – Kutrong	5.95	7.02
	Sub-region total	4.04	4.75
P E SR	Kalyani	5.2	5.7
	Naihati	3.6	4.4
	Baruipur	3.9	4.2
	Sub-region total	4.3	4.8
P W SR	Hoogly-Chinsurah	3.6	3.9
	Chandannagar	4.16	4.86
	Uluberia	3.2	4
	Sub-region total	3.6	4.1

Table 6 represents housing affordability situation utilizing MM method. Housing market is found to range from affordable to severely unaffordable within KUA. Urban centers of Core Sub-regions are found to be severely unaffordable, as compared to urban centers of Central and Periphery Sub-regions. Similar trend in housing affordability is observed in composite affordability assessment.

Table 7 provides housing affordability assessment for both LMIG and MIG by using Residual Income (RI) Approach. Low end housing of unit size 400 square feet is found to be affordable for Aspirers only in Periphery West sub-region and unaffordable in the rest. However, housing market situation is found to be much better for MIG, with housing unit size of 600 square feet proving mostly affordable all over KUA, excluding Core sub-regions. Composite housing affordability presents a similar picture of housing market.

Table 6: Housing Affordability Index by Median Multiple

Sub-region	Urban Centre	Basic affordability index	Composite affordability index
C E SR	Kolkata	6.85	7.85
	Kamarhati	5.1	5.15
	Sub-region total	6	6.9
C W SR	Howrah	5.5	6.18
	Bally	4.66	5.66
	Sub-region total	6.5	7.6
Ce E SR	North Barrackpur	2.4	2.64
	Khardah	8.3	9.8
	Barasat	7.7	8.4
	Rajpur-Sonarpur	12	12.7
	Sub-region total	10.38	11.3
Ce W SR	Bhadreswar	2.7	3.06
	Srirampore	5.45	6.06
	Konnagar	6.9	8.1
	Uttarpara – Kutrong	5.1	5.8
	Sub-region total	4.8	5.48
P E SR	Kalyani	5.76	6.33
	Naihati	4	4.8
	Baruipur	6.4	7.1
	Sub-region total	5.35	5.95
P W SR	Hoogly-Chinsurah	6.06	6.7
	Chandannagar	3.84	4.54
	Uluberia	2.8	3.1
	Sub-region total	4.75	5.55

The pattern of housing affordability as given by Table 7 is affected by variations in housing price and household income distribution. Urban Centres with very high or low affordability values have either high median income and low median housing price or low median income as compared with housing price. True nature of housing affordability variation within KUA is better understood when Tables 2, 4, 5, 6 and 7 are studied together.

The nature of variations of basic or non-inclusive housing affordability and composite housing affordability within KUA, as given in figure 2 and 3, establishes a distinct un-affordable core and moderately un-affordable central and affordable periphery region. Differences between basic affordability index and composite affordability index in the Core sub-region, emphasizes the necessity of composite or inclusive assessment of housing affordability.

Table 7: Housing Affordability Index by Residual Income Approach

Sub-region	Urban Centre	Aspirer Group		Middle Income Group	
		Basic affordability index	Composite affordability index	Basic affordability index	Composite affordability index
C E SR	Kolkata	RI < Req. I	CRI < Req. I	RI > Req. I	CRI < Req. I
	Kamarhati	RI < Req. I	CRI < Req. I	RI > Req. I	CRI > Req. I
	Sub-region total	RI < Req. I	CRI < Req. I	RI > Req. I	CRI < Req. I
C W SR	Howrah	RI < Req. I	CRI < Req. I	RI > Req. I	CRI > Req. I
	Bally	RI < Req. I	CRI < Req. I	RI > Req. I	CRI > Req. I
	Sub-region total	RI < Req. I	CRI < Req. I	RI > Req. I	CRI > Req. I

Ce E SR	North Barrackpur	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Khardah	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Barasat	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Rajpur-Sonarpur	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Sub-region total	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
Ce W SR	Bhadreswar	RI>Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Srirampore	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Konnagar	RI>Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Uttarpara – Kutrong	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Sub-region total	RI< Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
P E SR	Kalyani	RI< Reqd. I	CRI< Reqd. I	RI< Reqd. I	CRI< Reqd. I
	Naihati	RI>Reqd. I	CRI>Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Baruipur	RI> Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Sub-region total	RI< Reqd. I	CRI< Reqd. I	RI< Reqd. I	CRI< Reqd. I
P W SR	Hoogly-Chinsurah	RI> Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Chandannagar	RI< Reqd. I	CRI< Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Uluberia	RI> Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
	Sub-region total	RI> Reqd. I	CRI> Reqd. I	RI> Reqd. I	CRI> Reqd. I
R I – Residual Income, CRI- Composite Residual Income, Reqd. I – Required Income					

5. CONCLUSIONS

Significant variation is observed between the results obtained by the three affordability measures adopted in the study. Detailed studies on housing affordability are required to ascertain the most appropriate affordability measure in KUA's context. The variation in transportation cost across KUA as well as the proportion of transportation cost in household expenditure highlights the utility of composite housing affordability assessment. Results have revealed significant variation between basic housing affordability and composite housing affordability within KUA, which underscores the impact of level of infrastructure development on the overall affordability of living in a location. Moreover, the study on travel pattern behavior of households in conjunction with transportation cost distribution is required for accurate analysis of the impact of well planned social infrastructure on household expenditure.

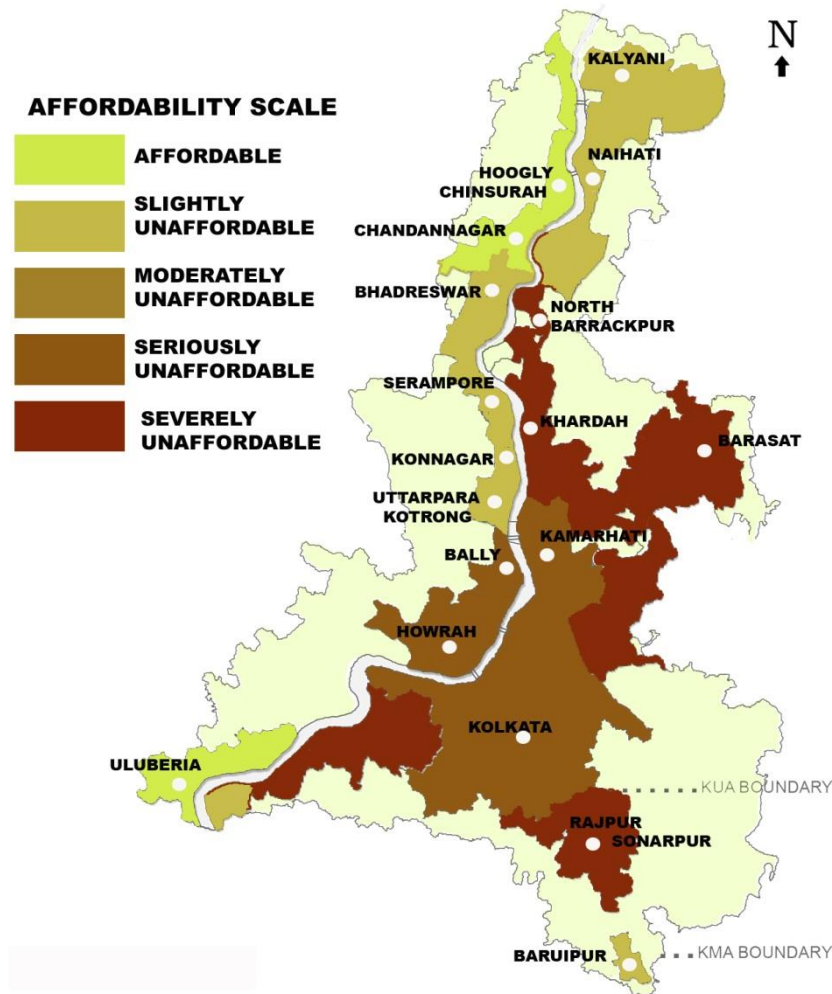


Figure 2: Variation in basic housing affordability within KUA

Source : Kolkata Metropolitan Area Map (KMDA, 2001), sub-regions have been demarcated into affordability zones

Significant difference between basic and composite housing affordability validates premise of the study. Sub-regional variations in housing affordability necessitate separate action plan formulation, for affordable housing and infrastructure development, for each sub-region. The findings advocate the development of integrated housing projects with adequate infrastructure for providing housing that is affordable in the life cycle.

Both public and private participation is necessary to meet the housing demand of low-to-middle income groups, given the scale of housing shortage. The high housing shortage coupled with high un-affordability of market rate housing requires development of rental housing. Rental housing can be developed in core SR, where land price is very high, making it near impossible to provide affordable housing on ownership basis, particularly for low-to-middle income groups. Ownership as well as rental housing targeting different income groups can be developed in the central and periphery sub-region, which have lower

land price and higher proportion of vacant lands. Housing units of 300 – 600 square feet should be developed to meet the demand of the low-to-middle income groups in KUA.

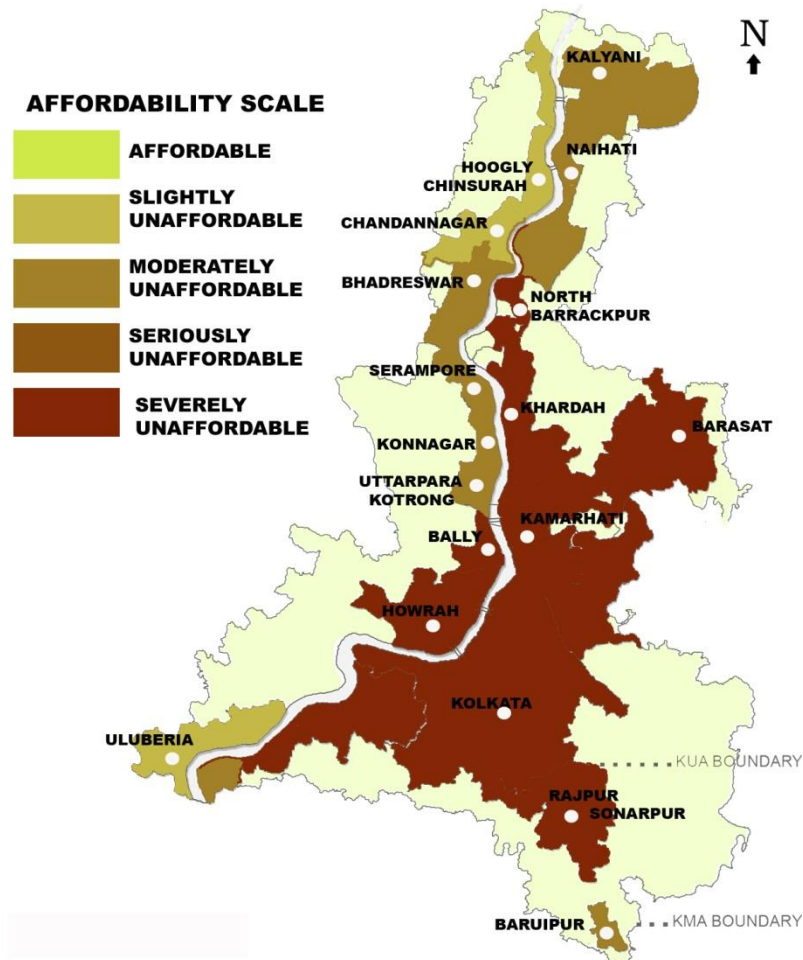


Figure 3: Variation in composite housing affordability within KUA

Source : Kolkata Metropolitan Area Map (KMDA, 2001), sub-regions have been demarcated into affordability zones

The paper recommends detailed studies on affordability, for developing accurate measures and standards of affordability thresholds in a developing nation like India, for promoting affordable housing development. Future studies exploring linkages between infrastructure development, housing price, land price, and investments by urban local bodies, are needed for extensive understanding of composite housing affordability within KUA. Housing affordability together with infrastructure development should be studied together for more insightful interpretation benefitting future infrastructure and affordable housing development strategies.

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