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The Impact of Open Sewerage Smell on House Rent in Rawalpindi

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INTRODUCTION

One of the basic problems of any developing country is to provide shelter to the low income groups. The housing does not mean shelter only but it includes the services related to it i.e. sanitation, sewerage, street conditions and water etc. The government policies related to the provision of such facilities have greater impact on the quality of life and standard of living. The demand for housing reflects the willingness to pay for a set of housing services.

The house is a set of many goods; the number of bedrooms, bathrooms, quality of local services and utilities, tidiness of the neighbourhood and quality of the local environment [Katherine (2006)]. The difference in value may be due to housing and neighbourhood characteristics with amenity or dis-amenity values.

> "It happened that a house with different structure in different locations might have same price and a similar house in different location have different value. It means that price structure reflects two separate though related sets of influences which for convenience are termed dwelling and location factors." [Wilkinson (1973)].

"Location has always been an important determinant of property's value and the land close to the city centre has the highest value." [James and Beth (2002)]. Before modern transportation, most people preferred to live close to work. Now days, it is the quality of the area which attracts the residents, workers and business managers to settle. Amenities (green field, fresh air etc.) and the dis-amenity (noise, dust, drain etc.) often influence the decisions of household.

In developing countries, it is experienced that the cause of low demand for environmental goods is poverty that is why households do not attach weight to amenity and ignore risk factor for health even when they were aware of the threat and perils for health and hygiene conditions. The low income of household creates a gap between demand and supply of environmental goods. Since there is no market for environmental goods therefore price (rent) of house captures the willingness of household for air quality, water quality and distance from a toxic site.

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This study estimates the demand for housing in Rawalpindi City and evaluates the impact of open sewerage system on house rent. Since two different types of sewerage systems i.e. open and ground sewerage systems exist at different locations of household therefore the rent of the house varies. This is due to the fact that open sewerage system causes bad smell, un-hygienic conditions and loss to aesthetic values. Bad smell seems to be the strongest factor that casts negative impact on house rent and reduces the willingness of household both for owner and tenant in the ground portion of the house. The owner and tenant ratio is 63 percent and 36 percent respectively.

The study is based on the survey of 1000 households. Out of which 702 houses have open sewerage system in front of their houses. Multi-stage stratified random sampling is used to drawn the sample. The stratum is based on the plot size of the house in square yard. Total population of the houses surveyed is 6750 showing a family size of 7 persons per house. (Table 1)

Table 1

Variables	Descriptive Statistics				Percittile		
	Min	Max	Sum	Mean	25	50	75
AGE_HD	0	98	46338	47.2355	38	45	55
AGE_SPS	0	80	33862	37.9194	30	39	46
HH_SIZ	1	23	6576	6.576	5	6	8
HH_WLTH	0.6	99.7	24543.45	24.5434	15.5472	22.6415	30.943

BACKGROUND

This study estimates the demand for housing in Rawalpindi City which is the third largest city of Pakistan and currently house population of two million approximately. According to 1998 the annual growth rate of the city population is about 2.49 percent. It is found that the 46.6 percent households are not natives of the Rawalpindi city while the migration within the city from one location to another location is 75 percent. (Table 2)

Table 2

	Frequency	Percent
Ground Sewerage	222	22.2
Front Side Nail	675	67.6
Front Side Nala	26	2.6
Back Side Nala	52	5.2
Nala Lai	24	2.4
Natives Rawalpindi	534	53.4
Non-natives	466	46.6

The city has historical Lai Nullah Basin (Tributary River / Stream), which has a catchment area of 73.6 Km^2 and a length of 15 Km. It flows through the city centre down to the River Soan in South-Eastern side of the city. Several side drains are connected with Nullah Lai and carry the rain water of the city through it to Soan River.

With passage of time the natural rain drains have been converted in to sewerage system hence the existing sewerage system covers only about 30 percent of the city area and has no treatment plant [ADB (2003)]. In remaining 70 percent of area of the city, open sewerage system with a net of stagnant water drains of different sizes provide the city facility of drainage and sewerage. The narrowest open drain is of one feet width on the other hand the maximum width of Lai Nulla is more then 300 feet. Out of total surveyed houses 67.6 percent houses have small drain in front side of the house while 2.4 percent (Table 2) houses are situated at the bank of the Nala Lai.

Lack of proper sewerage network, sewage disposal and treatment has worsened conditions, especially for poor people living in low-lying areas. Heavy rains cause extensive local flooding and storm water mixes with raw sewage, spreading contamination throughout the neighbourhood while low-lying areas remain flooded for a long time.

LITERATURE REVIEW

There is no published work in Pakistan on hedonic property value for examining the impact of environmental externality on house prices. However, Ministry of housing have reports on demand of housing units and according to House Building Finance Corporation of Pakistan, the demand of urban houses grows at a rate of 8 percent p.a. which creates a shortage of 7 million house units in urban areas [Rizvi (1998)]. The shortage of houses not only increases the capital price of the house but also causes increase in the rent.

Ridker and Henning (1967) provided the first empirical evidence that air pollution affects the property values. Freeman (1974), and Rosen (1974) used the hedonic price theory to interpret the derivative of hedonic property price function with respect to air pollution as a marginal implicit price and therefore the marginal value of air pollution improvement.

The literature found that several studies have been done in other developing countries like India about the estimation of demand of housing unit and measured the impact to reduce air pollution. Murty, *et al.* (2004) estimates the inverse demand function of urban air quality in the city of Hyderabad and Secunderabad in India. He found that a typical household in twin cities has revealed annual willingness to pay for reducing urban air pollution from the current level to the safe level is Rs 4,499.72.

Piyush, *et al.* (2000) found that it is important to measure adequately the demand for housing in the context of growth of cities, income expansion, and changes in relative prices. Effective policy requires knowledge of how market allocates resources to housing, how homeowners and renters bid for housing, how developers and contractors respond to housing demand, and how government regulations and actions stimulate or constrain the housing market activity.

The rent of the house depends on a schedule of amenities [Mitchell, *et al.* (1976)]. When the city is small and open, the property values at any location depend only on amenities at that location. In the limiting case when the city is closed, property values at any location depend on amenities through out the city. In the small open model, cross section regression results may be used to predict a new rent schedule. The rate of rent schedule must decline, as one move further from the central business district (CBD). The gain in utility form amenity at a far distance form CBD is less than the utility of transportation expense. Transportation costs are assumed to become so high at some distance from the CBD but at boundary of the city the rent tend to rise because of suburban city.

Hedonic prices are defined as the implicit prices of attributes or characteristics [Rosen (1974)]. Implicit prices are estimated by the first step regression analysis (product price regressed on characteristics) in the construction of hedonic price index. Any location on the plan explains the competitive equilibrium of buyers and sellers. Thus any location on the plan is represented by a vector with *i*th characteristics. The existence of product differentiation implies that a wide variety of alternative packages are available. Competition prevails because single agents add zero weight to the market and treat prices p(z) as parametric to their decision. It is assumed that a sufficiently large number of differentiated products are available so that choice among various combination of z is continuous for all practical purpose. As the taste (a) of each consumer varies therefore the equilibrium value depends on both income (y) and taste (a).

Murty, *et al.* (2003) found that urban air pollution causes health damages due to morbidity and mortality effects as also losses of environmental amenity benefits due to reduced visibility to the local residents. Measurement of these losses from air pollution is important form the view point of the environmental policy changes necessary which may involve considerable cost to government and to the agent of the economic activities contributing to air pollution.

Trudy (2006) estimate the localised environmental dis-amenity as a proxy for perceived risk and found that the magnitude of distance effect on housing prices, however, may depend upon the direction in which it is being measured. The distance effects may not be the same in all directions. The movement of surface or groundwater could conceivably propagate the damages from water pollution farther in some direction than others and visual and noise pollution can be affected by topography.

Janet (1991) estimate the impact of toxic waste site on housing prices in Boston colony of USA and found that the house which are closer to the toxic site face less marginal value of $4940 and $3476 if house is 1-mile, 2 mile distance range respectively.

Sergio, *et al.* (2002) found that apartments located in the proximities of the sewage treatment station have relatively smaller prices, in relation to similar ones located in more distant areas.

If there are no changes in environment then the households have the same utility. When there is little scope for the improvement in environmental values, then the consumer's utility and the hedonic price schedule remain the same. However, the owner of the house earns capital gain or loss due to change in environment. The analysis can also be done for a localised externality when there are transactions and moving costs with out estimating the bid functions in some cases [Palmquist 1992].

The existing literature on the hedonic property models found negative externality in the shape of bad smell and distance from sewerage treatment plant or toxic waste site on house rent. The open sewerage channels / system is the unique characteristics of Rawalpindi city. This paper incorporates the impact of bed smell originating from different types of open sewerage system in Rawalpindi city.

Hedonic Price Value Model

The HPM is derived from the theory of value developed by Lancaster (1966), Griliches (1971) and Rosen (1974), Apud Hanley and Spash (1993).

Assuming that each individual's utility is a function of his consumption of a composite commodity *X*, a vector of location specific environmental amenities *Q*, a vector of structural characteristics of the house (no of rooms, age and type of construction) denoted by *S*, and a vector of characteristics of the neighbourhood in which the house is located (quality of local schools, crime rate, accessibility to parks, stores and work places) denoted by N.

So, the rental price of the *J*th residential location is,

$$R_{hj} = R_h\ (S_j, N_j, Q_j,)$$

As all houses are not homogeneous in characteristics therefore, Equation 1 is non-linear. The utility from *j*th house is

$$u = u(X, Q_j, S_j, N_j,)$$

Where *X* is a Hicksion composite good with a price of 1. The budget constraint for *j* location is,

$$M - R_{hj} - X = 0$$

The first order conditions for environmental amenity *q* is,

$$\frac{\partial u / \partial q}{\partial u / \partial x} = \frac{\partial R_h}{\partial q}$$

The partial derivative of hedonic price function *Rh*(.) with respect to environmental variable i.e. '*q*', gives implicit marginal prices of the characteristics. Thus the implicit price allows or restricts the household to move from one location to another. The individual maximise the utility at that level where marginal implicit price of that house become equal to marginal willingness to pay [Freeman (1993)].

EMPIRICAL MODEL

The study estimates the impact of open sewerage smell on house rent, for this purpose OLS technique is used to estimate the demand for rent in Rawalpindi city. The dependent variable is the rent of the house.

rnt_hs = f (age_hs, psz_hs, brm_hs, drm_hs, tvl_hs, bth_hs, sto_hs, grg_hs_av, lwn_hs_av, mt_fl_ch, mt_bt_tl, cb_br_wd, cb_dr_wd, cb_kt_wd, vn_dr_wn, vn_kt_wn, str_cod, tim_hos, tim_sch, tme_col, tim_prk, wt_sp_me, hh_wlth, sw_op_li, sw_fr_la, sw_bk_la, ra_sc_la, sm_in_oc, sm_in_al.

The open sewerage system has different types due to the width and depth of the system. The intensity of smell varies according to the sewerage type, therefore we incorporated these types one by one in our model. To differentiate the impact of one type of sewerage with another we make dummies. It is assumed that if the sewerage system is open, it will generate bad smell. The models for different type of sewerage system are given below.

Model 1

In this model the variables which are related to structure, neighbourhood characteristics and facilities is used to explain the rent of the house.

Model 2

In this model the physical characteristics of open sewerage system is incorporated to explain their impact on house rent. The dummies for these variables are,

1=sw_op_li,	else is 0
1=sw_fr_la,	else is 0
1=sw_bk_la,	else is 0
1=ra_sc_la,	else is 0

Model 3

In this model intensity of smell from the open sewerage system is used to explain their impact on house rent. The dummies for these variables are,

1=sm_in_oc,	else is 0
1=sm_in_al,	else is 0

Model 4

In this model physical characteristics and smell intensity are used to explain the variation in house rent. This model is used all the variable of second and third model.

Survey Statistics

The study is based on the household survey both in the open and ground sewerage areas. One thousand households were selected on the basis of stratified random sampling. The stratum is developed on the basis of house size in square yard. The stratum is based on the 1998 census report. Twenty four localities are selected randomly and it is found that 261 houses have plot size of 100 square yards or less, 560 houses have plot size of 100 to 210 square yard and 169 houses have more than 210 square yard area (Table 3).

Table 3

Sampling Strata Framework

Strata Type for Sampling		
Less than 100 Square Yard	100 to 210 Square Yard	More than 210 Square Yard
26%	58%	16%

Source: Rawalpindi Housing Census Report 1998.

The survey is conducted in both open and ground areas. A total of 701 houses were selected in open sewerage area while 299 houses from ground sewerage area.[1] The household questionnaire is conducted both from the tenant as well as from the

[1]The division of open and ground sewerage area is based on ADB report.

owner of the house. The tenant households are 364 while 636 are the owner occupied houses.[2] Imputed value of rent is used as proxy for the owner occupied houses. The imputed rent of owner occupied houses is adjusted after cross checking with the local property dealers. (see Table 4)

Table 4

Descriptive Statistics

Variable		Frequency	Percent
OC_ST_D	Tenant	364	36.4
	Owner	636	63.6
SM_IN_OC	Yes	504	50.4
	No	372	37.2
SM_IN_AL	Yes	371	37.1
	No	420	42
SM_OP_LI	Yes	676	67.6
	No	324	32.4
SW_LA_DM	Yes	78	7.8
	No	922	92.2

Source: Own Estimation based on household survey Aug-Sep 2007.

RESULT AND DISCUSSIONS

Plot size, no of bed room, television lounge, bath room, store, garage, lawn, distance in time to park and household wealth have significant result in all four models at 1 percent level. Whereas, if the bathroom material is of tile, than it has a positive impact on house rent at 5 percent significance level. The distance to hospital in time by using any kind of transport also have a negative impact on house rent at 5 percent level in all four models.

The other variables also has positive and negative impact on house rent but none of them are significant except availability of drawing room and drawing room wood-cupboard shows significant impact on house rent at 10 percent level.

Among all the independent variables, availability of garage and lawn has bigger impact on the house rent by Rs 929 and Rs 1485 per moth respectively. (see Tables 5 and 6)

Model 1

In this model independent variables explain 63 percent variation in the dependent variable. The adjusted R-square is also 0.63 but the constant is significant at 10 percent significance level. The F-test value is significant at 1 percent level showing that model is highly significant.

Model 2

Physical characteristics of open sewerage systems are the main independent variable. The model shows that existence of open nali in front of house decreases the house rent by Rs 672 per month with 1 percent significance level. Open sewerage nala in front of house also decreases the house rent by Rs 760 per month but at 5 percent significance level. The open sewerage nala in back side of house have

[2]The Owner-Tenant ratio in Rawalpindi city is 58:42, according to the 1998 census.

Table 5

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
rnt_hs	1000.00	5177.60	2853.92	500.00	27000.00
age_hs	936.00	13.30	14.30	1.00	82.00
psz_hs	1000.00	146.48	71.88	30.00	600.00
brm_hs	1000.00	2.08	0.88	1.00	8.00
drm_hs	1000.00	0.72	0.45	0.00	1.00
tvl_hs	1000.00	0.37	0.49	0.00	2.00
bth_hs	995.00	1.30	0.56	0.00	4.00
sto_hs	1000.00	0.36	0.52	0.00	3.00
grg_hs_av	1000.00	0.29	0.46	0.00	1.00
lwn_hs_av	1000.00	0.04	0.19	0.00	1.00
mt_fl_ch	1000.00	0.56	0.50	0.00	1.00
mt_bt_tl	1000.00	0.20	0.40	0.00	1.00
cb_br_wd	1000.00	0.48	0.50	0.00	1.00
cb_dr_wd	944.00	0.35	0.48	0.00	1.00
cb_kt_wd	1000.00	0.43	0.50	0.00	1.00
vn_dr_wn	845.00	0.64	0.48	0.00	1.00
vn_kt_wn	934.00	0.44	0.50	0.00	1.00
str_cod	993.00	0.77	0.42	0.00	1.00
tim_hos	1000.00	19.93	10.99	0.00	90.00
tim_sch	996.00	14.31	10.91	0.00	60.00
tme_col	1000.00	15.76	11.64	0.00	90.00
tim_prk	1000.00	16.90	12.04	0.00	60.00
wt_sp_me	987.00	0.79	0.41	0.00	1.00
hh_wlth	1000.00	24.54	11.97	0.60	99.70
sw_op_li	1000.00	0.68	0.47	0.00	1.00
sw_fr_la	1000.00	0.03	0.16	0.00	1.00
sw_bk_la	1000.00	0.05	0.22	0.00	1.00
ra_sc_la	1000.00	0.08	0.27	0.00	1.00
sm_in_oc	1000.00	0.36	0.48	0.00	1.00
sm_in_al	1000.00	0.35	0.48	0.00	1.00

Source: Own Estimation based on household survey, Aug-sep 2007.

Table 6

Regression Results

Model -1		Model -2		Model -3		Model -4	
Variable	Coef.	Variable	Coef.	Variable	Coef.	Variable	Coef.
_cons	622.55*	_cons	1198.60***	_cons	795.10	_cons	1277.26***
	(1.56)		(2.83)		(1.85)		(2.87)
age_hs	2.69	age_hs	0.76	age_hs	2.65	age_hs	0.75
	(0.53)		(0.15)		(0.52)		(0.15)
psz_hs	15.19***	psz_hs	15.67***	psz_hs	15.20***	psz_hs	15.70***
	(12.47)		(12.81)		(12.42)		(12.74)
brm_hs	414.13***	brm_hs	385.77***	brm_hs	415.63***	brm_hs	386.02***
	(4.39)		(4.12)		(4.40)		(4.11)
drm_hs	289.92*	drm_hs	282.56*	drm_hs	307.12*	drm_hs	290.07*
	(1.41)		(1.38)		(1.49)		(1.41)
tvl_hs	651.15***	tvl_hs	661.52***	tvl_hs	631.57***	tvl_hs	649.54***
	(4.43)		(4.54)		(4.25)		(4.41)
bth_hs	476.21***	bth_hs	438.70***	bth_hs	458.67***	bth_hs	430.16***
	(3.48)		(3.23)		(3.33)		(3.14)
sto_hs	326.32***	sto_hs	357.84***	sto_hs	327.02***	sto_hs	357.33***
	(2.30)		(2.53)		(2.30		2.52
grg_hs_av	929.61***	grg_hs_av	798.83***	grg_hs_av	916.64***	grg_hs_av	795.49***
	5.32		4.53		5.22)		(4.50)
lwn_hs_av	1485.01***	lwn_hs_av	1389.21***	lwn_hs_av	1475.88***	lwn_hs_av	1382.26***
	(3.85)		(3.63)		(3.82)		(3.60)
mt_fl_ch	167.62	mt_fl_ch	155.68	mt_fl_ch	175.47	mt_fl_ch	159.04
	(1.11)		(1.04)		(1.16)		(1.06)
mt_bt_tl	349.34**	mt_bt_tl	293.19**	mt_bt_tl	347.35**	mt_bt_tl	293.75**
	(2.01)		(1.70)		(2.00)		(1.70)
cb_br_wd	130.02	cb_br_wd	172.65	cb_br_wd	125.49	cb_br_wd	169.46
	(0.73)		(0.97)		(0.71)		(0.95)
cb_dr_wd	284.82*	cb_dr_wd	287.36*	cb_dr_wd	280.12*	cb_dr_wd	286.20*
	(1.60)		(1.61)		(1.57)		(1.60)
cb_kt_wd	139.29	cb_kt_wd	101.27	cb_kt_wd	138.79	cb_kt_wd	98.54
	(0.78)		(0.57)		(0.77)		(0.55)
vn_dr_wn	–163.65	vn_dr_wn	–216.79*	vn_dr_wn	–169.71	vn_dr_wn	–217.92*
	(–1.06)		(–1.41)		(–1.10)		(–1.42)
vn_kt_wn	103.75	vn_kt_wn	46.28	vn_kt_wn	65.22	vn_kt_wn	27.71
	(0.73)		(0.33)		(0.45)		(0.19)
str_cod	109.04	str_cod	97.59	str_cod	111.16	str_cod	98.98
	(0.62)		(0.56)		(0.63)		(0.57)
tim_hos	–11.65**	tim_hos	–9.55*	tim_hos	–11.60**	tim_hos	–9.57*
	(–1.75)		(–1.44)		(–1.74)		(–1.44)
tim_sch	–1.28	tim_sch	–1.99	tim_sch	–1.59	tim_sch	–2.15
	(–0.19)		(–0.29)		(–0.23)		(–0.32)
tme_col	–6.73	tme_col	–6.14	tme_col	–6.32	tme_col	–5.82
	(–1.06)		(–0.98)		(–0.99)		(–0.92)
tim_prk	–25.69***	tim_prk	–22.46***	tim_prk	–25.13***	tim_prk	–22.21***
	(–4.20)		(–3.67)		(–4.09)		(–3.62)
wt_sp_me	–133.84	wt_sp_me	–221.66	wt_sp_me	–160.37	wt_sp_me	–235.15*
	(–0.77)		(–1.27)		(–0.91)		(–1.34)
hh_wlth	18.56***	hh_wlth	19.66***	hh_wlth	18.29***	hh_wlth	19.44***
	(2.58)		(2.76)		(2.54)		(2.72)
		sw_op_li	–672.89***	sm_in_oc	–139.02	sw_op_li	–663.03***
			(–3.92)		(–0.78)		(–3.82)
		sw_fr_la	–759.97**	sm_in_al	–204.30	sw_fr_la	–755.08**
			(–1.67)		(–1.09)		(–1.65)
		sw_bk_la	–177.44			sw_bk_la	–188.20
			(–0.53)				(–0.56)
		ra_sc_la	388.87*			ra_sc_la	383.52*
			(1.46)				(1.43)
						sm_in_oc	–53.38
							(–0.30)
						sm_in_al	–113.37
							(–0.61)
No of Obs	689.00	No of Obs	689.00	No of Obs	689.00	No of Obs	689.00
R-Sq	0.631	R-Sq	0.641	R-Sq	0.631	R-Sq	0.641
Adj-R-sq	0.618	Adj-R-sq	0.626	Adj-R-sq	0.617	Adj-R-sq	0.625
F-test	49.36	F-test	43.63	F-test	45.41	F-test	40.5

Source: Estimation based on own household survey; Aug-sep 2007.

Note: In the parenthesis are the values related to the *t*-test.

***Significant with less than1 percent of probability.

**Significant with 5 percent of probability.

*Significant with 10 percent of probability.

negative impact but not significant. The reason for insignificant impact of back side nala is that it is not visible all the time and hence household willingness does not affected by it. The existence of semi close rain drain increases the willingness of household by Rs 389 at 10 percent significance level. The rain drain does not carrying sewerage usually therefore its existence does not decrease the willingness of household.

The value of R-square is 0.641 and adjusted R-square is 0.626 which is higher than all the model showing that this model explained more variation in dependent variable i.e. house rent by the explanatory variables. The F-test is also significant at 1 percent level showing that model is highly significant. This model is more significant than the entire models as its Adjusted R-Square value is higher.

Model 3

Smell intensity from the open sewerage system are the main independent variables for this model. Open sewerage systems have three major types, i.e. small nali in front of house, small nala and nali for rain drain. Intensity of smell depends on the types of sewerage systems as well as the volume of sewerage. The paper divide the smell intensity into two categories i.e. always smell and occasional smell.

It is working hypothesis that the house which is close to open nala, nala lai and nali receive continuous smell and the household living in those areas are habitant to sewerage smell and hence they are less willing to sewerage smell in house rent. The households which are far from the sewerage systems or face rain drain sewerage system may face occasional smell and are more willing to pay for the smell free environment.

R-square for this model is 0.631 with adjusted R-square is 0.617 showing sixty three percent variations in dependent variable has been explained by the explanatory variables. The household willingness decreases by Rs.204 per month where the smell intensity is always. The willingness of household is not significant but the t-value is close to 10 percent significance level. Houses for occasional smell intensity have higher rent than always smell intensity as the willingness for the household is decreased by Rs 139 per month. The model is significant as the F-test value is significant at 1 percent level.

Model 4

In this model types of open sewerage system (nali, nala, back side nala and semi close nala) and intensity of smell (occasional and always smell) are the main independent variables. The purpose of this model is to justify the results of model-2 and model-3. The model shows that the expected signs and the significant value of main variables remain same as it is in model 2 and 3. The willingness of household is also remains same for main variables.

The value of R-square is 0.641 and adjusted R-square is 0.625 which is equal and less than model-2. As far as F-test is concerned it is significant at 1 percent level.

CONCLUSION

The household spends major share of its expenditure on housing and prefers to avail maximum facilities within the budget to maximise utility. The structure and the interior of the house plays vital role in decision making. The house which is newly constructed or has undergone major alteration in the form of chips, tiles and wood work would draw more money in the form of rent as compared to a similar house within the same locality. The neighbourhood such as market, bank and schools do not have significant impact on house rent because households have number of options within the locality. However Government College, Public Park and Hospital play an important role in determination of rent. Closer the distance to public neighbourhood more will be the house rent.

The location dis-amenity such as open sewerage system i.e. open nali decrease the willingness of household to pay more rent even though the interior of the house is good. Where as in those areas where local authority develops the sewerage system from open to semi closed one the willingness of the household will increase.

If the local authority improves the existing sewerage system it will not only increase the capital value of the property but also increase the atmosphere. The willingness of the household will be utilised to generate the revenue for public expenditure.

List of Variables

Variable Code	Description
AGE_HS	Age of house
BRM_HS	No. of bed room in house
BTH_HS	No. of bathroom in house
CB_BR_WD	Dummy for bed room's cupboard made of wood
CB_DR_WD	Dummy for drawing room’s cupboard made of wood
CB_KT_WD	Dummy for Kitchen’s cupboard made of wood
DRM_HS	No. of Drawing room in house
GRG_HS_AV	Dummy for Availability of garage in house
HH_WLTH	House hold wealth
LWN_HS_AV	Dummy for Availability of Lawn in house
MT_BT_TL	Dummy for bathroom’s wall material: Tile
MT_FL_CH	Dummy for floor’s material: Chips
OC_ST_DM	Dummy for occupation status:1=owner, 0=tenant
PSZ_HS	Plot size of house in square yard
RA_SC_LA	Dummy for semi close nala for rain drain
RNT_HS	Rent of ground portion of house per month
SM_IN_AL	Dummy for smell intensity always in surrounding of house
SM_IN_OC	Dummy for smell intensity occasional in surrounding of house
STO_HS	No. of store in house
STR_COD	Dummy for street condition: wide and concrete
SW_BK_LA	Dummy for availability of nala in back of house
SW_FR_LA	Dummy for availability of nala in front house
SW_OP_LI	Dummy for open nali in front of house
TIM_HOS	Distance in time to hospital: using any transport
TIM_PRK	Distance in time to Park: using any transport
TIM_SCH	Distance in time to school: using any transport
TME_COL	Distance in time to college: using any transport
TVL_HS	Dummy for availability of television lounge in house
VN_DR_WN	Dummy for drawing room’s ventilation: windows
VN_KT_WN	Dummy for kitchen’s ventilation: windows
WT_SP_ME	Dummy for availability of water: morning and evening

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