

Determinants of Property Values, Jaipur City

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Abstract- The study was based on Hedonic pricing model which explains the price variability in terms of various functional characteristics of various attributes. It is based on recent transactions that have been paid for that particular property; the model is carried out with the help of regression analysis which is used to calculate the proportion of the total value accounted for by each of a property's individual attributes. The model is very demanding on both assumptions and data.

Since in an urban area, the property values are a function of various physical, environmental and psychological factors. In this study, we explored the relative contribution of each of these factors on residential property values. One of the quantifiable attributes of these factors is proximity. Proximity of these amenities to the particular properties has revealed a range of influences on its property values. We further enquired the influence at two spatial scales – city level and neighborhood level. The first, employs the distance to city centre, major transportation facilities, land use and environment factors as the variables, and the second one, distance to office, environmental factors, distance to nearest transport facility, road width and traffic congestion and third that is property level employs factors like built up area, number of bedrooms and toilets, construction technique, etc.

Index Terms- Property values, Hedonic Pricing Model, Stepwise Regression, Jaipur, Rajasthan.

I. INTRODUCTION

Housing Market in India was initially a government enterprise when agencies like Housing board were actively supplying houses, but in due course of time in cities like Tamil Nadu, Gujarat etc the situation has changed due to high land prices, there is no more active agencies like Housing board or any agencies supplying houses from Government side thus inviting the private sector which in turn is shooting up the property prices.

The increasing rate of urbanization indicates to the fact that population in metropolitan areas are growing at a very fast pace and therefore demand of service land would be more in and around these urban centers. Due to the limited availability of such land within the urban areas, the land values are scaling new heights rapidly causing property values to increase beyond logical limits in both residential and commercial segments. Along with increasing high land values, cost of building materials and development charges having a “House” is a distant dream for majority of the population.

In urban areas, the property values are a function of various physical, environmental and psychological factors. Since, each

value of the property is unique; it is often difficult to identify the appropriate variables that will explain property value.

1.1 Aim of the Study

To study the factors influencing property values in a city and understand the mutual relationship between these factors.

1.2 Objective of the Study

1. To find what are the factors that influence the property values.
2. To find out what type of relation these factors have with respect to property value.
3. How the City of Jaipur's property values can be modeled using various statistical techniques?
- 4.

1.3 Research Questions

- 1 What are the various factors that influence the property value in an urban context?
- 2 How is the demand and supply influencing the property value?
- 3 Which way these factors influence – directly proportional or indirectly proportional?
- 4 How much (magnitude) is the influence of these factors on property value?
- 5 How the relationship derived from RQ1-4 is applied to Jaipur's case?
- 6

1.4 Scope and Limitations

Scope:

1. The study will only focus in JMC limit of Jaipur city.
2. The study will only focus on registered value and not on the market value.
3. Study various factors affecting the registered property values.

Limitation:

1. Will only consider values within 5 Yrs of transaction.
2. Various levels of factors will be studied within the time frame.
- 3.

II. METHODS FOR CALCULATING LAND VALUE

Accessibility and Proximity Levels –

It is operationalised through travel time thresholds with the use of a distance decay function, as the greatest impact is likely to be found closest to the public transport node. The distance thresholds are different for residential and commercial developments, with impact distances being larger for the residential than for commercial. Secondly, the impacts may be different on existing developments as compared with new developments, as it takes time for markets to react to change. In

addition, more than one location might have an accessibility improvement as a result of a transport investment.

Market Activity and Business Competitiveness Surveys:

Here the surveys are done to assess the property market, so it is important to take care while selecting the sample size and location, for the better accuracy, and then the sample selected can be used with other methods such as business interviews, focus groups discussion with stakeholders, attitudes to the investment, and in some cases local area surveys of speculative market.

Qualitative analysis,

This method includes information that will help balancing the more quantitative economic information and model outputs. The analysis include accessibility mapping, proximity analysis which includes distance to local facilities and catchment areas for a range of activities. But the actual value of qualitative studies is in the interpretation of results and the resolution of attribution.

Descriptive Statistics-

It gives a cross sectional view on market condition in terms of property and land value effects, and these factors can be further cross tabulated with measures of change in travel and modal split to check whether there is a statistical relationship (e.g. a correlation analysis).

Regression analysis

It is an analysis technique for establishing a relationship between different sets of data. It is performed on the available information on property transactions where property price act as dependant variable and the attributes of physical and neighborhood characteristics act as independent variables. The results of the regression will than give us how much change in the property price will be because of these particular attributes.

Hedonic pricing,

Hedonic price theory assumes that property price is actually a combination of different physical and neighborhood characteristics and that the overall transaction price can thus be decomposed into the component (or "hedonic") prices of each attribute. The model is based on the recent prices that have been paid for the property, a regression analysis is used to calculate the contribution of each feature or attribute in the property value.

Transactional analysis

This monitors the changes in property and land values from actual transactions for past few years. It is the time-series analysis of property and land values.

Projected ratable values

This method is based on growth assessment, which determines the way the market is likely to move in terms of yields, occupancy rates, the demand for different types of space, and the rents to be paid. This assessment is based on the knowledge of property and land market.

GIS mapping techniques,

ACCMAP is a GIS based software package that links the Ordnance Survey OSCAR base mapping of the road network

with a database of public transport information to give accessibility surfaces reflecting isochrones, which can be presented as changes over time.

Geographically Weighted regression (GWR)

The approaches to mapping the results of GWR have primarily employed an equal step classification and sequential no-hue color scheme for choropleth mapping of parameter estimates.

Linear Structural Relation (LISREL),

It is a multivariate type of analysis for property values designed for addressing the measurement problems associated with current tests of the sources of property value. The model is for examining the relationship between property prices and hypothesized determinants of value. The model was developed by Joreskog and Goldbergen (1972) and is a multivariate factor analytic technique, consisting of two concurrent procedures. LISREL combines two procedures to derive estimate from the two models simultaneously. Firstly, the model is used to extract composite factors from sets of variable proxying for different hypothesized determinants of values and secondly, the model is used to estimate a linear relationship between property prices and extracted factors.

III. FACTORS AFFECTING VALUE OF A PROPERTY

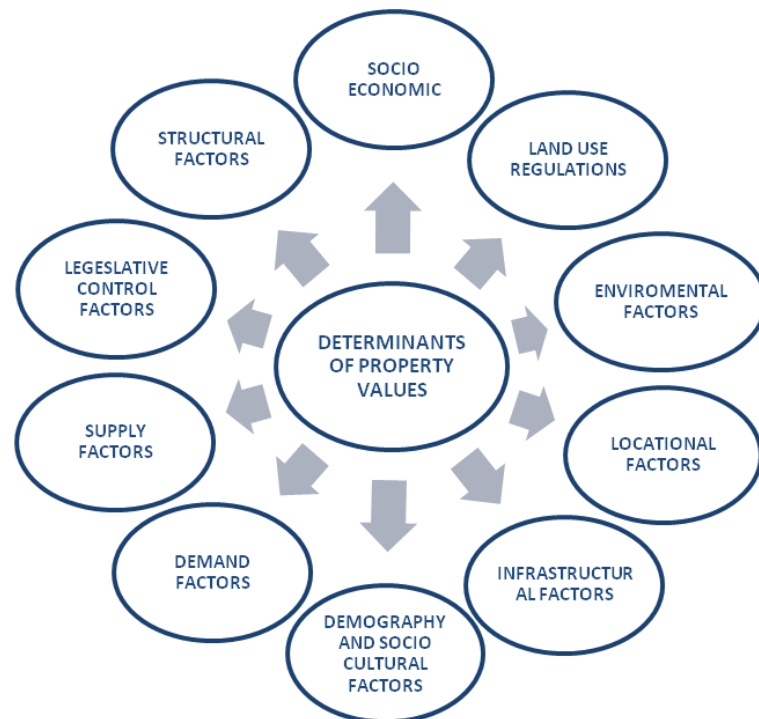


Figure 1: Determinants of Property Prices

The reaction of the man and the condition of environmental is not only a natural reaction, but also a regulatory action. Cities are a part of artificial environment where humans are formed.

The physical environmental of a structure is formed by natural and structured elements where, natural environment

elements are composed of elements like the city's sea, river, topographic structure, vegetation, air pollution and temperature. Nevertheless, built environment includes all the elements of the recreational areas, houses, working buildings, and the technical infrastructure connects all these different functions to each other. Housing lands is the most bulky elements of the built environment. In residential service areas and various networks which link them to each other forms the built environment and give a city a basic identity.

The evaluation of a housing land cannot be only done by its structural properties but also have to be evaluated by physiologically with other urban and spatial of environment. It is very important to produce a healthy environment for human community both socially and psychologically.

The value of a land is depended both on physical characteristics of a building but also on the built environment surrounds to that building. There are many variables associated with land that defined the value of that particular property such as the inner specificity of the housing, the unit of neighborliness the housing is included in, the distance of the housing land to the important centers and service areas in the city, the local characteristic of the neighborhood unit, the architectural and aesthetical structures and even the scenery factors, etc.

The Demand Factors

Like in any other product, demand and supply forces play a very important role in the valuation of a property. The demand factors could be influenced by many reasons. A change in demographic characteristics by in-migration could cause a big spurt in demand for housing and other facilities. Similarly, augmentation of paying capacity leads higher demand for land. The social factors include population growth or decline, changes in family sizes, typical ages, and attitudes toward law and order, prestige and education levels.

Speculation is fallout of demand in the market. In anticipation of a particular advantage that a site might have after a particular amount of time due to infrastructural or location advantages, land values tend to be artificially raised. As a result supply of land is discouraged by increasing prices to unjustifiable limits.

The Supply Factors

Development authorities have been following a trend of large scale land acquisition and thereby controlling the land supply. This procedure popularly known as land banking is good to in a way because the authority is able to release developed land for market use. Unfortunately, the development authorities have miserably failed in this regard due to various reasons. According to development authority this scarcity happens because of the following reasons that is high development cost, Scarcity of developable land, Standards that have to be met do not reflect ground realities of affordability, administrative delays and political considerations

This coupled with legal bottlenecks and inefficiency of government organizations are major reasons why supply of land is not being managed properly.

Public private partnerships signifies a step in the right direction and it is imperative for public authorities to involve the

private sector to share the burden of land provision otherwise the demand in the market creates abnormal price escalation.

The corollary situation is also unwanted one where supply exceeds demand to such an extent that the development cost is not met in the sale and the authority runs at tremendous losses. In such a situation too, the developer tries to keep his plots vacant for a long period so that an artificial scarcity can be created.

Physical Infrastructure Advantages

Traditionally, areas having high infrastructural provision have higher land values. This goes for both the physical and social infrastructure provisions. Physical infrastructure would include power supply and its backup, Water supply, sewerage network, drainage network, Solid waste disposal, traffic and transport elements.

Social Infrastructure Advantages

The facility supplied to a property plays an important role and has maximum effect on the real estate's price. Usually the closer the land is to commercial centers or recognized vacation spots, the more expensive the land becomes. Therefore the Social infrastructure includes educational facilities, medical facilities, commercial facilities and institutional elements.

Location Advantages

The location of land is still considered one of the most important factors in deciding its value. Urban areas have primarily three land uses-activity areas, non-activity areas and transportation areas. Activity areas are employment centers where people use the transportation areas to come from non-activity zones. The activity areas are most sought after because they provide opportunity for business. That is why property values are higher as we go towards the CBD area. Conversely, the areas which are in the vicinity of non preferable uses like drains, airports, railway lines, slums etc. are not preferred. Higher accessibility to work centers is a big factor affecting land values.

Transport Linkages

If location is a function of market linkages, then any adjustment in the cost or length of the linkages for a given parcel will alter its value. Improved transportation routes in cities have definitely changed the value of properties located near these routes.

- a) Accessibility to main road
- b) Nearness to bus transit system
- c) Distance to rail transit system
- d) Distance to Airport

Socio Economic Factors

People residing in the city fall prey to the social and economic transformations taking place in it. Due to variations in the political set up or due to legal or governmental forces particular areas face economic and social problems. All this might lead to distress sale thus making property values fall. Such factors are:

- a) Type and amount of taxation.
- b) Zoning and building laws, planning and restrictions.

Demography and socio cultural factors

Depending upon the distribution of population income and social class wise, land prices increase proportionately with income group (and higher social class). Thus these factors include:

- a) Population density and projected growth
- b) Demographic mix and resultant influence on property demand
- c) Socio cultural dynamics and influence on property class
- d) Nature of the residents: employment and social status, etc
- e) Presence of destitute in the neighborhood and the perceived menace
- f) Multi ethnic co-habitation and perceived social tension

Structural factors

Factors which are directly related to property are affecting the price of a property directly.

- a) Plot size.
- b) House size
- c) Built up area
- d) house size;
- e) Number of living room,
- f) Number of bedroom,
- g) Number of bathroom,
- h) Fireplaces,
- i) Garages;
- j) Age of structure;
- k) Other facilities available like garden, pool etc within.

Environmental factors

Environmental amenities such as air quality, level of noise in the neighborhood can be considered as resources with monetary value.

- a) Atmospheric pollution,
- b) Noise impact.
- c) Proximity to Residential area.
- d) Proximity to recreational ground and other landscape features.
- e) Surface water.

Land use regulations

The effect of a land-use regulation on property values can be positive or negative, whereas removing a land-use regulation from one property can be expected to have a positive effect.

1. Distance to industrial area
2. Distance to institutional area
3. Distance to commercial area
4. Nearness to other residential area

Legislative / Statutory Control Factors

The most influential sub-factors under this category are the various taxes relating to the sale, ownership and use of property, notably, Property Gains Tax Laws, municipality taxes and divergent tax rates (i.e. tax rates on service rates, electricity, water, telecommunications, etc). Planning controls were perceived to be the second most influential sub-factors influencing property values. (W. Britton 1989).

Property Gains Tax Laws, municipality taxes, divergent tax rates (tax rates on service rates, electricity, water, telecommunications etc

- a) Planning controls: Town planning / zoning and country planning act
- b) Legal requirements by the council, based on height restrictions, quality and class of residential property, etc
- c) Deregulation / Liberalization of property market, e.g. allowing foreign investors involvement in property business
- d) By - laws pertaining to safety, healthy working conditions, fire equipment, etc
- e) Tenure of the property (Price of property is valued in terms of the time of lease).
- f) Price paid on property on compulsory purchase (local authorities, statutory undertakings).
- g) Periodic valuation of residential property for taxation purposes.

These Factors affect the market at different levels, say At City level, and neighborhood level and at property level respectively, and are further sub divided into aspects, which affects the values of a property at different levels under following heads because all aspects are not applicable at every level.

3.1 City Level

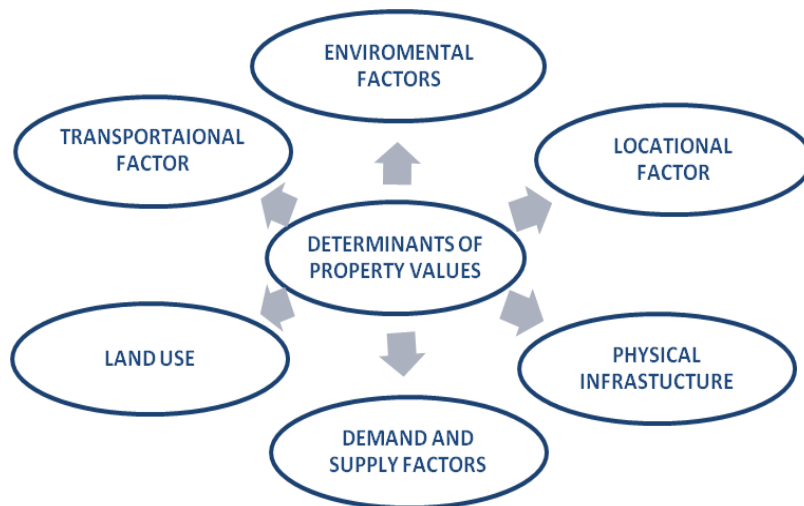


Figure 2: Determinants of Property values at city level

The Demand Factors

Like in any other product, demand and supply forces play a very important role in the valuation of a property. The demand factors could be influenced by many reasons. A change in demographic characteristics by in-migration could cause a big spurt in demand for housing and other facilities. Similarly, augmentation of paying capacity leads higher demand for land. The social factors include population growth or decline, changes

in family sizes, typical ages, and attitudes toward law and order, prestige and education levels.

Speculation is fallout of demand in the market. In anticipation of a particular advantage that a site might have after a particular amount of time due to infrastructural or location advantages, land values tend to be artificially raised. As a result supply of land is discouraged by increasing prices to unjustifiable limits.

Environmental factors

Property values are influenced by the environmental factors in a big way. Human being behaviors are not neutral to the environment surroundings for the simple reason that they adjust their quality of life and living according to the location and the environmental conditions of a particular area. These living conditions and quality of life determine and affect the real estate market. This also envisages the quality of social circle that crops out in a particular area. Greenery and landscape, water level condition, noise pollution are few factors which govern a property price in a given area.

Land use regulations

The effect of a land-use regulation on property values can be positive or negative, whereas removing a land-use regulation from one property can be expected to have a positive effect. Indeed, many land use regulations actually increase property values by creating positive “amenity effects” and “scarcity effects.”

Location Advantages

The location of land is still considered one of the most important factors in deciding its value. Urban areas have primarily three land uses-activity areas, non-activity areas and transportation areas. Activity areas are employment centers where people use the transportation areas to come from non-activity zones. The activity areas are most sought after because they provide opportunity for business. That is why property values are higher as we go towards the CBD area. Conversely, the areas which are in the vicinity of non preferable uses like drains, airports, railway lines, slums etc. are not preferred. Higher accessibility to work centers is a big factor affecting land values.

Transport Linkages

If location is a function of market linkages, then any adjustment in the cost or length of the linkages for a given parcel will alter its value. Improved transportation routes in cities have definitely changed the value of properties located near these routes.

3.2 Neighborhood Level

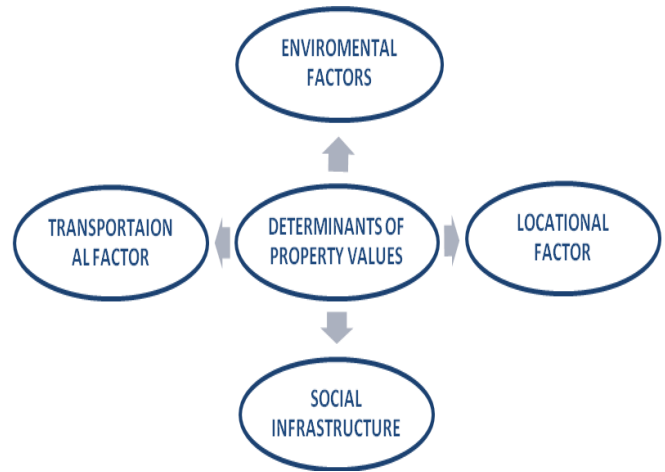


Figure 2: Determinants of Property values at neighborhood level

Environmental Factors:

Property values are influenced by the environmental factors in a big way. Human being behaviors are not neutral to the environment surroundings for the simple reason that they adjust their quality of life and living according to the location and the environmental conditions of a particular area. These living conditions and quality of life determine and affect the real estate market. This also envisages the quality of social circle that crops out in a particular area. Greenery and landscape, water level condition, noise pollution are few factors which govern a property price in a given area.

Social Infrastructure:

Traditionally, areas having high infrastructural provision have higher land values. This goes for both the physical and social infrastructure provisions. Social infrastructure includes educational, medical, commercial and institutional elements which are essential for a better quality life.

Location Factors:

Plots situated in the city and nearer to the work place will be more valuable as compared to plots in the suburbs and further from the work place. Distance to workplace also affects the price of a property, as the distance travelled to work is less the properties within an easy approachable distance will fetch more value that property which is far from the work place. As it reduced the time travelled by the commuters and traffic can be reduced as people would prefer to walk to their work places considering the health and environmental aspects.

Transportation Factors:

Location is within easy reach of, bus station or other means of transport is preferred by the tenants and they are usually prepared to pay higher rents as compared to similar premises situated away from the bus station in spite of the fact that there is disturbance at regular intervals and the premises are devoid of peaceful atmosphere at night.

If location is a function of market linkages, then any adjustment in the cost or length of the linkages for a given parcel

will alter its value. Improved transportation routes in cities have definitely changed the value of properties located near these routes. The changes in transportation routes have changed the effective cost of getting particular market, so land which was far from the CBD now commands a higher rent because of improved access to the market.

3.3 Property Level

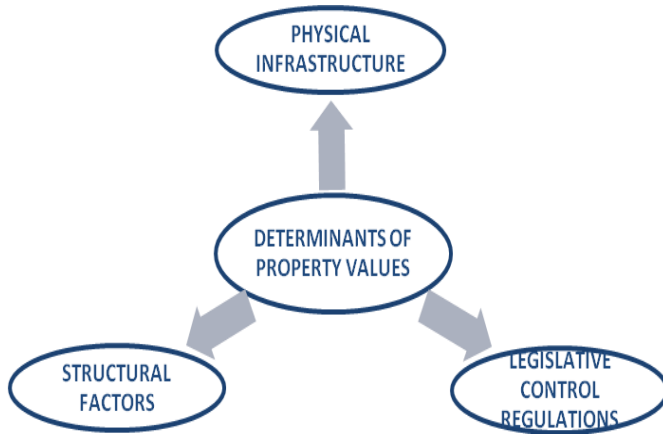


Figure 3: Determinants of Property Values at property level

Physical Infrastructure

Traditionally, areas having high infrastructural provision have higher land values. Here Physical infrastructure would include availability of amenities and facilities such as power supply and its backup, water supply, sewerage network, drainage network, solid waste disposal and traffic and transport elements.

Structural Factors

Factors such as Plot size ; house size and built up area affects the property price the most followed by; house size; number of living room, bedroom, bathroom, fireplaces, garages; age of structure; other facilities available like garden, pool etc within .

Legislative Control Regulations

The most influential sub-factors under this category are the various taxes relating to the sale, ownership and use of property, notably, Property Gains Tax Laws, municipality taxes and divergent tax rates (i.e. tax rates on service rates, electricity, water, telecommunications, etc). Planning controls were perceived to be the second most influential sub-factors influencing property values. (W. Britton 1989).

IV. METHODOLOGY

The methodology of the study can be divided into 2 parts: Primary data collection, Secondary research and Empirical research. Secondary research comprised of articles by various publications, books along with web search and data from various agencies, valuers and real estate agents.

To study the trend of housing and transaction taking place in Jaipur Housing market there was various data collected from Registration and stamping department and from valuers, brokers and Real estate agents.

Firstly, Past 5 yrs transaction was seen to get an idea about the trend of the city. The transactions studied are the transaction registered with Revenue department from 01-01-2007 to 31-12-2012. Since the study covers the changes in the land market for last 5 years.

Secondly collected were the DLC rates for all the DLC zone of the Respective Sub Registrar zone of the Jaipur city.

Thirdly collected was the Market value of the property, the actual price on which the transaction happens of a particular property. Usually this market value is very high as compared to the DLC rates available. This was collected from the various real estate brokers and a valuer available is that particular zone.

Once the secondary data was collected observations were made with reference to the prevailing values of the properties and market conditions. Factors were identified within the undertaken case studies through physical survey, where as recent property trends within Jaipur city and significance of identified factors are concluded from the replies of valuers and builders. This study is carried out at three levels.

1. Property Level
2. Neighborhood Level
3. City Level

The plan of action for the primary data collection happened in following manner:

1. Preparation of questionnaire.
2. Sampling.

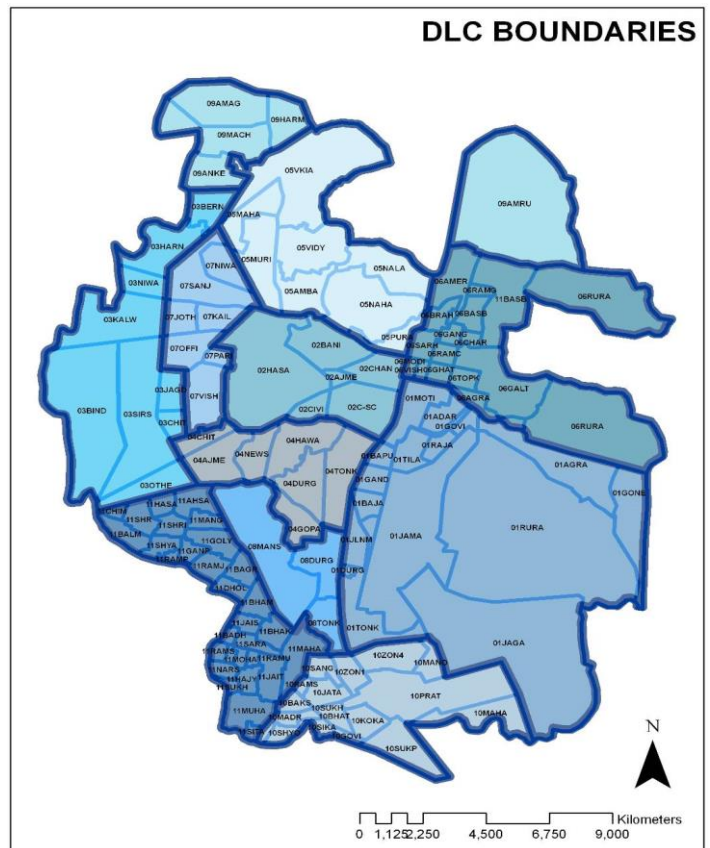


Figure 4: Map showing SR Boundaries and DLC Boundaries of Jaipur city.

The sampling started with identifying and selecting of samples where 3 samples each from every

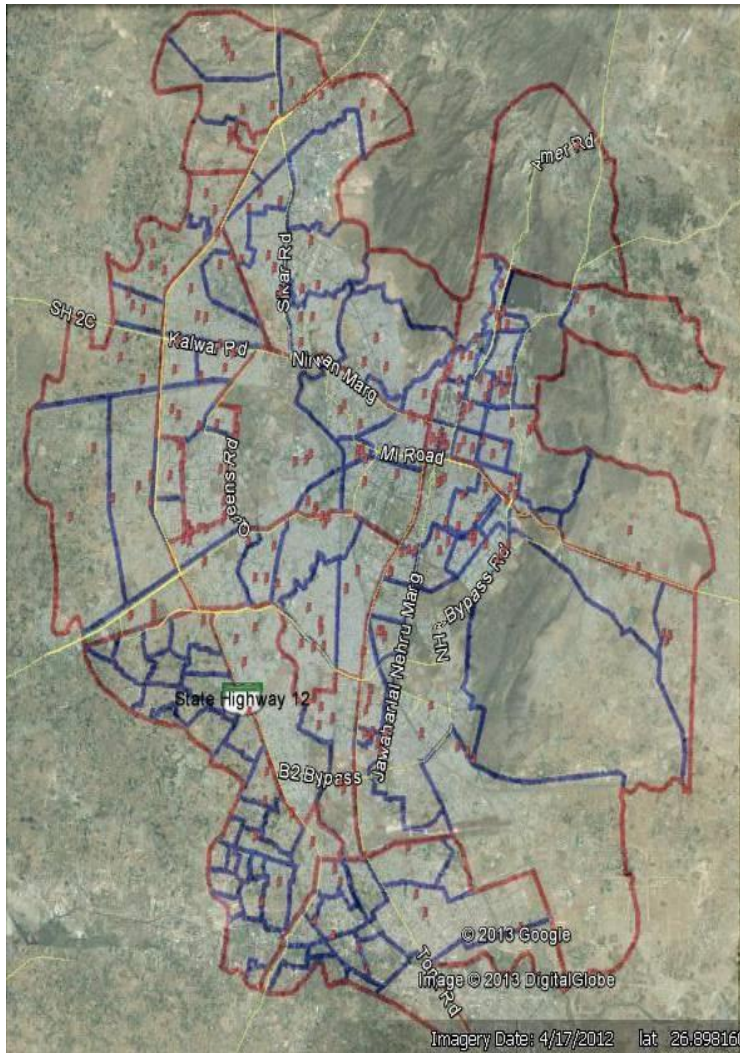


Figure 3: Map Showing Samples within the JMC Limit

Table 2: Total DLC in each SR Zone

SR Zone	Area SQ.Km	No. of DLC
Jaipur 1	98.93	16
Jaipur 2	28.49	6
Jaipur 3	42.31	9
Jaipur 4	22.41	7
Jaipur 5	38.37	8
Jaipur 6	40.83	16
Jaipur 7	16.22	7
Jaipur 8	18.24	3
Amer	33.03	5
Sanganear 1	28.19	17
Sanganear 2	27.06	31
Total	394.08	125

DLC zone were selected based upon the following considerations.

- a) The surveyed property should lie within the JMC limit.
 - b) The transaction of the surveyed property should have taken place in past 5 yrs.
 - c) The property should be a built property rather than a barren land.
3. Execution of data collected.
 4. Preliminary Data analysis.

For the computation of data following steps were followed:

- To start with the process firstly we have descriptive statistics analysis for all the factors and the one which doesn't show appropriate result are not considered
- Once the data is cleaned, the averages of each DLC were taken for all the factors and a new data was formed for the aggregated data.

This Data was further used for analysis at all the levels,

4.1 Tools for Analysis

There were two type of method used for analysis

Correlation analysis

It is performed and based on the co-efficient value the factors are grouped. The factors having co-efficient less than 0.05 are discarded. Through a correlation analysis an attempt is made to understand the relationship between the various factors and their influence on the property values. The basic objective of this exercise is to find out what are the other parameters which affect the residential property values across the city. The exercise is done to see which variables are significant and which are not, and the one which are significant are positively significant or negatively.

Step wise Regression

Once the significant variables are identified, a stepwise regression will be carried out on entire data set. Considering Property values as dependent variable (Y) and all the factors as independent variables (X). Stepwise regression when carried out in SPSS program, it removes the non significant variables automatically at the first stage and further subdivide the variables in to models that give the best fit result and hence a model with maximum number of significant variable with high R^2 value is achieved. This process is carried out for the dataset of both neighborhood and city level, to achieve significant results.

V. DATA COLLECTION

Housing in India has traditionally been the activity of private enterprise. The increasing rate of urbanization indicates to the fact that population in metropolitan areas are growing at a very fast pace and therefore demand of service land would be more in and around these urban centers. Due to the limited availability of such land within the urban areas, the land prices are scaling new heights rapidly causing property values to increase beyond logical limits in both residential and commercial segments. Along with sky rocketing land values, cost of building

materials and development charges of planning agencies have also raised alarmingly making “House” a dream for majority of population.

The methodology of the study can be divided into 2 parts: Primary data collection, Secondary research and Empirical research. Secondary research comprised of articles by various publications, books along with web search and data from various agencies, valuers and real estate agents.

The objective of this thesis is to find factors that affect residential property at property level and any distance-related externality effects of residential property values of neighborhoods and city level with in the Jaipur Municipal Limit in Jaipur city.

This chapter deals with the major findings derived from the undertaken case studies. The total chapter explains the process of

data collection and selection of major indicators affecting property values.

5.1. Property Transactions

To study the trend of housing and transaction taking place in Jaipur Housing market there was various data collected from Registration and stamping department and from valuers, brokers and Real estate agents.

5.2. SR Transactions

Firstly, Past 5 yrs transaction was seen to get an idea about the trend of the city.

In Jaipur any one can register his/her document anywhere in the city i.e. a person having property in the zone , say Jaipur –VII can register his/her property with Jaipur-I.

Table 2: Total transaction of each SR zone in 2012

	SR1	SR2	SR3	SR4	SR5	SR6	SR7	SR8	SR9	SR10	SR11
SR1	6.84	1.14	0.04	1.16	2.03	0.75	0.08	0.77	0.02	0.31	0.16
SR2	0.13	9.80	0.07	0.08	1.11	0.32	0.06	0.03	0.00	0.01	0.01
SR3	0.64	1.76	7.67	0.42	3.84	0.15	2.59	0.34	0.03	0.08	0.07
SR4	0.63	1.06	0.08	3.04	1.63	0.22	0.65	0.47	0.01	0.06	0.03
SR5	0.17	0.89	0.35	0.04	27.11	0.30	0.08	0.04	0.02	0.00	0.01
SR6	0.49	0.72	0.05	0.13	1.62	3.51	0.01	0.04	0.22	0.01	0.01
SR7	0.23	0.81	1.23	0.14	1.47	0.13	2.52	0.08	0.01	0.02	0.01
SR8	0.17	0.18	0.01	0.10	0.31	0.09	0.02	3.19	0.01	0.08	0.03
SR 9	0.45	0.52	2.02	0.08	1.74	0.14	0.12	0.08	6.98	0.02	0.01
SR10	4.23	0.91	0.07	1.33	1.84	0.44	0.19	1.71	0.04	11.90	3.23
SR11	1.14	0.88	0.22	0.55	1.56	0.16	1.80	2.40	0.01	1.63	4.45
Total	15.12	18.67	11.81	7.07	44.27	6.20	8.11	9.15	7.37	14.12	8.00

That is the reason of many places having very high land registration of other places outside the jurisdiction of that revenue office, eg. Jaipur- V has maximum registrations and majority of them are outside area, only because it is centrally

located and many unseen reasons. Similarly with Jaipur – II and Jaipur – I.

The transactions studied are registrations with Revenue department from 01-01-2007 to 31-12-2012. Since the study covers the changes in the land market for last 5 years.

Table 3: Last Five year transactions in each SR's(In Thousands)

	2007	2008	2009	2010	2011	2012
SR1	9.39	9.08	7.91	9.20	10.68	13.31
SR2	3.53	3.88	2.52	2.61	2.55	11.61
SR3	10.17	7.97	6.99	9.01	11.46	17.59
SR4	5.12	5.52	3.88	5.03	5.94	7.88
SR5	8.46	10.55	4.86	6.11	6.17	29.00
SR6	4.05	4.24	3.82	4.41	5.07	6.81
SR7	5.59	4.13	3.48	4.57	4.76	6.63
SR8	4.87	3.55	3.14	4.39	3.46	4.18
Amer	8.51	6.94	6.07	6.87	4.97	12.15
Sanganer 1	11.50	11.87	12.56	15.92	18.90	25.91
Sanganer 2	7.08	6.84	7.00	10.08	11.21	14.79

The land registration are more in the peripheral areas of Jaipur i.e. Sanganer-I which itself has more than double of the second highest land registration area. Also the area under the jurisdiction is more.

Jaipur – V and Sanganer – I am areas having more transactions during the last 5 years. These areas include the major roads i.e. Area around Ajmer Road, Kalawar Road and Sikar Road in the west of the city (Jaipur – III) and Jagatpura and Sanganer on Tonk Road (Sanganer –I and II) on the South periphery of the city. This is also because they are the recently released land by the department, so a little cheap with more availability.

There are comparatively less land transactions on the north and east of the city due to physical barriers restricting the growth than the west and south periphery.

5.3. DLC Rates and Market Price

‘DLC (District level committee) Rates’, is the land valuation rate which is based on the average rates laid down by the District level committee (DLC) for registration of sale deeds under stamps and registration act.

The maps below shows the variation of the DLC rates in the DLC zone. The maximum value among the maximum value of each DLC zone is in JLN Marg and Tonk road zone of Jaipur-I where as minimum value in the minimum range is in Jaisinghpura of sanganeer II.

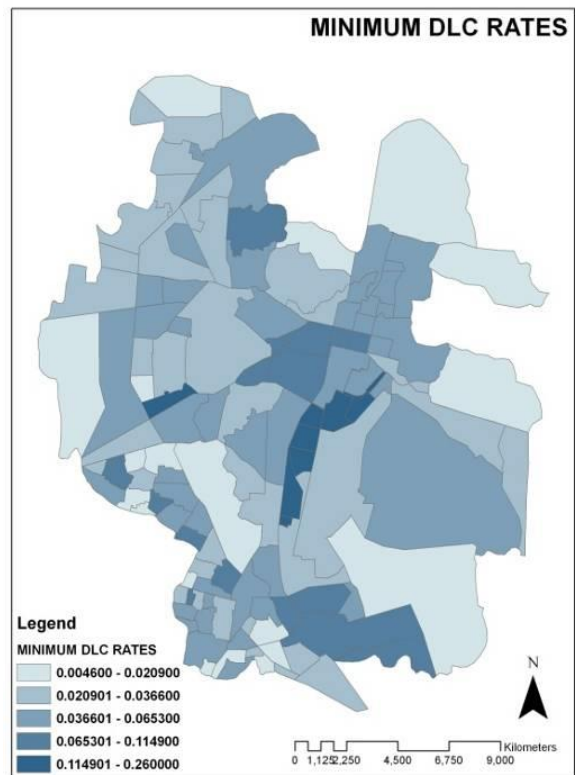


Figure 6: Minimum DLC Rates

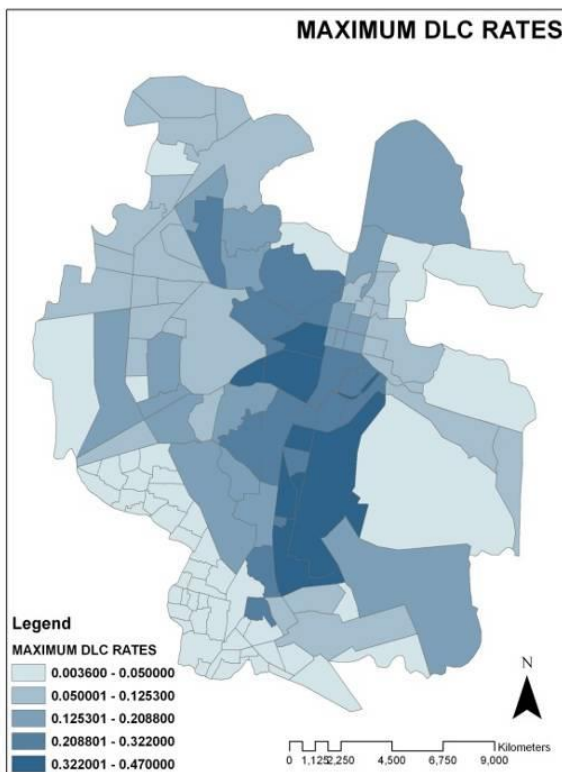


Figure 5: Maximum DLC Rates

Thirdly collected was the **Market value** of the property, the actual price on which the transaction happens of a particular property. Usually this market value is very high as compared to the DLC rates available. This was collected from the various real estate brokers and a valuer available is that particular zone.

The map below shows the maximum and minimum market value range with a given DLC zone. The DLC having the minimum value in the minimum value range is in Nala area DLC of Jaipur V region whereas the maximum value in the maximum range is of JLN Marg of Jaipur I zone.

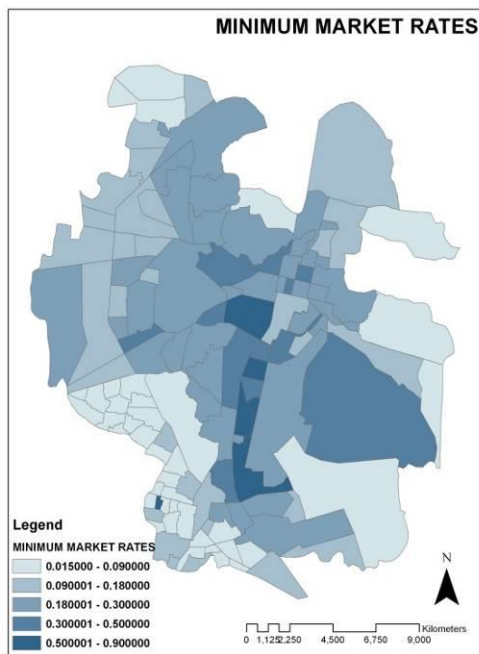


Figure 7: Minimum Market Rates

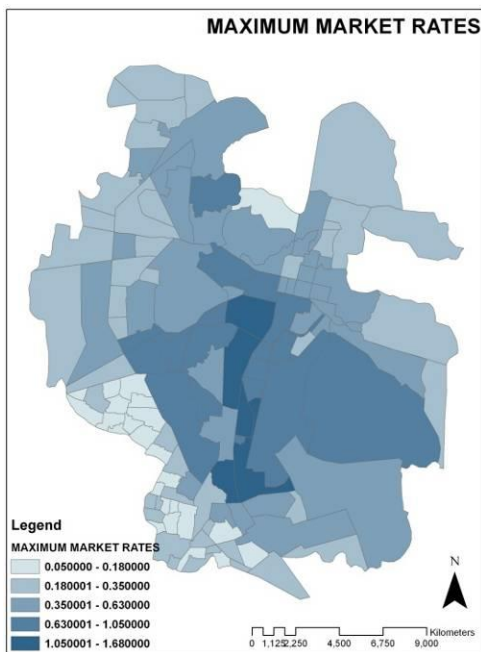


Figure 8: Maximum Market Rates

5.4 DLC Rates Vs Market Value

The DLC rates are an essential guideline for the assessment of the calculation of stamp duty. The Stamp Duty and Registration Fees are to be valued on the prescribed market rates as per the provisions of the relevant Act/Rules and Departmental instructions. The non-compliance of the relevant Act/Rules and Departmental instructions by the SRs resulted in short levy of Stamp Duty and Registration Fees.

Stamp Duty is payable at the time of transfer agreement according to the DLC Rates. In this document price of each land

is decided by revenue department of state government depending on its Location. Stamp Duty is the fixed percentage of tax payable to the government on registration of each property ownership transaction.

Table 4: Market price Vs DLC Rates

SR Zones	Market Price Vs DLC Price
SR-1	4.64
SR-2	4.92
SR-3	5.51
SR-4	5.31
SR-5	4.38
SR-6	4.78
SR-7	3.55
SR-8	5.64
SR-9	3.58
SR-10	8.92
SR-11	8.82

5.5 Inference

As the comparison table (Annexure1) above shows that prevailing market rates as well as market rates of 2012 are 6 times higher than the DLC Rates with maximum variation seen in Peripheral areas such as SR-10 and SR-11 because the growth is in that particular direction of the city rather than Amer which is also in periphery but is restricted by mountains. The DLC 2012, made effective from 01-04-2012 which was prepared as on market situation of 2011. Hence, DLC still needs to be updated to get exact current market prices of the property. With the latest computer technology it is possible to come to very close to realistic price of each and every plot of land within identified value zone, which will help to make the new and updated DLC Rates very scientific and simple in use and will not burden the end user.

VI. ANALYSIS

A qualitative and quantitative analysis is done from the data collected in the following areas:

- Identifying the factors that have major positive and negative impact on the value of the property.
- Computing price variation for under taken case studies
- To find out significant effect of each factor on the value of the property at:

Neighborhood Level

City Level

Statistical Analysis of Property Values

6.1. Neighborhood Level

Statistical methodology: Stepwise Linear Regression Analysis.

Dependent variable: Property Price in Rs./Sq.mt

Independent Variables Land use, Distance to main road, Quality of Air pollution, Traffic congestion, Distance to Kindergarten, Distance to School, Distance to office, Distance to temple, Distance to hospital, Distance to Police chowki, Distance to Park, Distance to convenient shopping, Distance to party plot, Distance to Bus stand, Distance to metro and auto stand.

We have considered that the following factors may or may not affect the, value of the property. As we move close to the following factors the property values will: +ve: increase or -ve: decrease.

So first correlation analysis is performed and then regression analysis is performed to understand the effect empirically.

Correlation Analysis

Through a correlation analysis is an attempt made to understand the relationship between the various factors and their influence on the property values. The basic objective of this exercise is to find out the parameters which affect the property values of residential properties within the JMC limit of Jaipur city. The exercise is done to see what variables are responsible for the impact on property values within the study area and to what level.

Table 5 : Variable significance at Neighborhood level

Independent Variables	(+ve or -ve value)	Significance
LANDUSE	Negative	Significant
DIST_MAINRD	Positive	Significant
TRAFFCONGEST	Negative	Non Significant
DIST_KG	Negative	Non Significant
DIST_SCH	Positive	Non Significant
DIST_OFFC	Positive	Non Significant
DIST_TEMPLE	Positive	Non Significant
DIST_HOSP	Positive	Significant
DIST_RECREAT	Positive	Significant
DIST_PC	Positive	Significant
DIST_PARK	Negative	Significant
DIST_SHPG	Positive	Significant
DIST_PARTY PLOT	Negative	Non Significant
DIST_BS	Positive	Non Significant
DIST_METRO	Positive	Significant
DIST_AUTO	Positive	Non Significant

A correlation matrix is compiled to find out the correlated variables and their degree of statistical significance. Only

significantly correlated variables are considered for further analysis i.e. for regression analysis.

Inference: From the correlation matrix (Annexure3) except distances from convenient shopping, recreational zone and metro station no other factor is showing significant correlation with current property price.

Hence the results are showing non-significance after performing correlation so we further expand our study and will do regression analysis for the above dataset. .

Step wise Linear Regression Analysis

A stepwise regression has been carried out on entire data set considering Property values as dependent variable (Y) and all the factors as independent variables (X). Stepwise regression when carried out in SPSS program, it removes the non significant variables automatically at the first stage and further subdivide the variables in to models that give the best fit result and hence a model with maximum number of significant variable with high R2 value is achieved. This process is carried out for the dataset of Neighborhood level, to achieve significant results. The table shows results of four models.

Table 6: Results of Regression at Neighborhood level

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	
dimension0	1	.734 ^a	.539	.534	154.239
	2	.824 ^b	.679	.671	129.560
	3	.877 ^c	.769	.761	110.370
	4	.886 ^d	.785	.775	107.267
a. Predictors: (Constant), DIST_METRO					
b. Predictors: (Constant), DIST_METRO, DIST_MAINRD					
c. Predictors: (Constant), DIST_METRO, DIST_MAINRD, DIST_RECREAT					
d. Predictors: (Constant), DIST_METRO, DIST_MAINRD, DIST_RECREAT, DIST_TEMPLE.					

Out the above mentioned models, Model 4 is considered to be the most significant model as its R² = 0.785 which means the model shows 78% of variation in property values is because of these four variables; Distance to Metro Station, Distance to Main Road , Distance to Temple and Distance to Recreational area. The equation we get here is:

$$\text{Property Price (Y)} = 234.98 + 0.180*(D_Metro Station) + 1.25*(D_Main Road) + 0.284*(D_Recreational) + .197*(D_Temple)$$

Equation 1: Regression equation for factors affecting property value at Neighborhood level

To see the significance of the individual independent variable t test is done. Results show significant results for all 4 selected factors. (Refer Annexure 4)

After achieving the results from the correlation and regression analysis, we can say that they are not completely matching the assumptions which were supposed and the result was inconclusive. Hence a clear result is not achieved which can help us to analyze the effect of the considered factors on the property values.

Now to get a clearer result of these factors and to understand the effect and check their significance spatially, Geographically Weighted Regression (GWR) method in GIS is applied for detailed analysis.

6.2. City Level

Statistical methodology: Correlation and Regression Analysis.

Dependent variable: Property Price in Rs./Sq.mt

Independent Variables: Distance from ISBT, Distance from open spaces, Distance form Railway station, Distance to Airport, Distance from Mall, Distance from National Highway, Distance from 4 main CBD of Jaipur that is Govind marg, JLN Road, MI Road and Sawai Man Singh road, Distance from Heritage structure and Distance from Hotel. We have considered that the following factors may or may not affect the value of the property. As we move close to the following factors the property values will: +ve: increase or -ve: decrease. So the correlation and regression analysis is performed to understand the effect empirically.

Correlation Analysis

Through a correlation analysis an attempt is made to understand the relationship between the various factors and their influence on the property values. The basic objective of this exercise is to find out what are the other parameters which affect the property values of residential properties at city level within the JMC limit of Jaipur city. The exercise is done to see what variables are responsible for the impact on property values within the study area.

Table 7: Significance of variables at city level

Independent Variables	(+ve or -ve value)	Significant / Non Significant
DISTOPENSACE	Positive	Non Significant
DIST_HOTEL	Positive	Significant
DIST_MALL	Positive	Significant
DIST_TOURIST	Positive	Non Significant
DIST_RS	Positive	Significant
DIST_ISBT	Positive	Significant
DIST_AIRPORT	Positive	Significant
DIST_NH	Negative	Non Significant
DIST_JLNRD	Positive	Significant
DISTMIRD	Positive	Significant

DIST_SRSRD	Positive	Significant
DIST_GOV MARG	Positive	Significant

A correlation matrix is compiled to find out the correlated variables and their degree of statistical significance. Only significantly correlated variables are considered for further analysis i.e. for regression analysis

Inference: From the correlation matrix (Annexure 5) except distances from open space, heritage structure and National Highway all other factors are showing significant correlation with current property price.

But to confirm the result we further expand our study and will do regression analysis for the above dataset

Linear Regression Analysis

A stepwise regression has been carried out on entire data set of city level parameters. Considering Property values as dependent variable (Y) and all other the factors as independent variables (X).

Stepwise regression when carried out in SPSS program, it removes the non significant variables automatically at the first stage and further subdivide the variables in to models that give the best fit result and hence a model with maximum number of significant variable with high R^2 value is achieved.

This process is carried out for the dataset at city level, to achieve significant results. The table shows results of four models.

Table 8: Regression result for variables at city level

Model Summary					
Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
dimension0	1	.743 ^a	.552	.547	160.409
	2	.859 ^b	.738	.732	123.363
	3	.905 ^c	.820	.813	102.930
	4	.910 ^d	.828	.820	101.018
a. Predictors: (Constant), DIST_SRSRD					
b. Predictors: (Constant), DIST_SRSRD, DIST_RS					
c. Predictors: (Constant), DIST_SRSRD, DIST_RS, DIST_AIRPORT					
d. Predictors: (Constant), DIST_SRSRD, DIST_RS, DIST_AIRPORT, DIST_HOTEL					

Out the above mentioned models, Model 4 is considered to be the most significant model as its $R^2 = 0.828$ which means the model shows 83% of variation in property values because of these four variables; Distance to Airport, Distance to CBD Sawai Ram Singh Road, Distance to Railway Station and Distance to Hotel.

The equation we get here is:
Property Price (Y) = 89.340 + 0.141*(D_Airport) + 0.179*(D_SRSRD) + 0.143*(D_Railway Station) + .095*(D_Hotel)

Equation 2: Equation showing relation between factors affecting and property value

To see the significance of the individual independent variable *t* test is done. Results show significant results for all 4 selected factors. (Refer Annexure 6)

After achieving the results from the correlation and regression analysis, we can say that they are not completely matching the assumptions which were supposed and the result was inconclusive. Hence a clear result is not achieved which can help as to analysis the effect of the considered factors on the property values.

This may be due to variation in property values from market values or some other factors may be included or excluded from the list of selected factors.

Now to get a clearer result of these factors and to understand the effect and check their significance spatially, Geographically Weighted Regression (GWR) method in GIS is applied for detailed analysis.

6.3. Comparative analysis

Conclusion for comparative analysis:

Table 9: Comparison Table

SR Zone	Predicted value/DLC	Predicted Value/Market Value
SR-1	7.48	0.83
SR-2	5.41	0.90
SR-3	48.48	0.91
SR-4	12.58	1.01
SR-5	14.65	0.83
SR-6	35.70	0.87
SR-7	47.18	0.92
SR-8	11.16	0.92
SR-9 (Amer)	58.61	0.91
SR-10 (Sanganear 1)	258.46	0.96
SR-11 (Sanganear 2)	294.57	0.94
Total	72.21	0.91

After getting the equation for determining the property value, the predicted values were calculated for the properties surveyed (Annexure), after calculating the values all the three values that is market value (value on which the property was bought), DLC value (value of the property based on the ASR rates), and Predicted values (calculated from the equation 2)

When evaluated it was seen that PV were on an average 72 times more than the DLC value. This may be due to variation in property values from market values or some other factors may be included or excluded from the list of selected factors. The maximum difference could be seen in the peripheral areas such as SR 10 and SR 11, this is mainly because the new development coming up and these are the areas where the recent release of land by JDA has taken place, which further in long run can give high returns in contrast to areas like SR-1 and SR-2 where there is hardly any land available and prices are very high.

The difference can also be seen in SR 3 and SR-7 which also lies in the peripheral areas, but the difference is less as compared to SR-10 and SR-11 because the development in these areas started long back thus leading to little high prices which might be out of affordability limits of many people.

The difference between the Market value and Predicted value (Annexure) doesn't vary much and more or less same in all the Sub registrar zones.

Thus it can be seen that the DLC revision is more required in the peripheral areas rather than in the core part of the city where the average difference is 250 times in comparison with the core city where the difference is 10 times on an average.

VII. CONCLUSIONS

The research is a pragmatic approach to the study of factors influencing values of residential properties. It also includes the study of recent trends in property values within city. The study is based on the physical survey, replies received from the valuers, builders and other observations made with reference to the prevailing property values and market conditions. Identified factors within the undertaken study areas are done through physical survey, where as recent property trends within Jaipur city and significance of identified factors are concluded.

The development of garden, provision of basic amenities, social infrastructure, housing quality, transportation connectivity, environmental quality, recreational facilities and future price appreciation are the governing factors for the skyrocketed prices within the study areas.

The study is indicative that prevailing market rates are very much higher than property rates given in the Annual Statement of Rates (DLC Rates). As per the DLC, property rates given are still need to be revised as per market values prevailing within the area. Findings indicate the rates provided in DLC needs have to be increased by 70-80 times more to achieve present market value.

At city level the factors that affect the residential property value revealed from the results of correlation and regression are distance from CBD SRS Road, distance from Hotel, distance from Railway Station and distance from Airport together showed a positive significance up to 83%, which suggests as the

distance between properties and these factors increases the prices also increases

These factors influence the market value of the properties taken in to consideration in a positive way. From the study it is evident that distance from these factors has a positive impact on the value.

At property level the factors that affect the residential property value revealed from the results of correlation and regression analysis are distance from temple, distance from metro stations, distance from recreational zone and distance of the property from main road together showed a positive significance up to 76%, which suggests as the distance between properties and these factors increases the prices also increases

In many case it is also observed that factors which can be seen as pull factors for high value of properties in prevailing market came out to be non significant after applying statistical methods of correlation and regression to calculate their impact.

VIII. SUGGESTIONS AND RECOMMENDATIONS

The valuation method discussed above is theoretical approaches to the question of value and help you estimate the worth of a property in accordance with your preferences and needs. In practice, however, it is the free market, i.e. the forces of supply and demand, which decide what amount of money a house changes hands for.

There may be a substantial gap between subjective valuations and the fluctuations of the free market. Thus, the subjective value of a property does not always correspond to its actual price. The forces of supply and demand cannot be scientifically predicted. Every property valuation can only ever be a guideline to what the house will eventually change hands for.

Thinking about to use for government, a standard valuation methodology should be derived from the in depth research of such topics, so that

- Difference in property price can be calculated, that is where the property price in a particular city is more and where it is less and what are the attributes contributions in this variation.
- Significance of each attribute on the value and finding out of magnitude of each factor affecting the property value can make the valuation of real property more precise and clear.
- Standard indicators should be setup, which can indicate by what amount the factor influence the value will control the property market. The objective behind it is to assist citizen to arrive at an appropriate methodology for their property valuation. It will enable to reveal the property values for every location or specified area within an administrative boundary.
- Significance of each factor should be minutely studies, since in case of every different property, the set of indicators affecting would be different, so that while performing such analysis will result in very appropriate factors that, affect the value of the property and minimize the inaccuracy in calculation or estimating the property values.

- To have a fair amount in the registration process, this study is also important, as it can further help in updating the DLC rates at regular interval, so that it can reach the real and actual market scenario.

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The author is a student of CEPT University, Ahmedabad, perusing masters in planning with specialization in Housing with her real roots in architecture from Aayojana School of Architecture, Jaipur. The interest of author lies in Real estate as this sector of industry is currently driving the economy.

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