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Impact of Metro Rail Project on Nearby Residential Properties in Gujarat

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Abstract – *For the anyone their basic need is to settle in the city at in their own home so resident is first thing of any society and their valuation and pricing are fluctuated with variation and infrastructure development at surrounding of the properties. Main and important factor is the availability of the access to anywhere you want at your around your properties and place of work. In India most recommended option to transport in metro rail transit system. In the past few years, Gujarat was fastest growth in city development because of the development in highway and road system and also introduce the new public infrastructure that is Metro Rail System. Basically, in this study focuses on find out the effect of the new transportation like metro rail system on the dwelling properties which are held nearby the metro station. There are many factors which are located around the metro and it is give their impact on the property valuation in form of positive or negative. So, this research mainly focused on the find out this type of factors rank them with their importance and tries to forecast the which factor give more impact or which on give less impact on the property valuation. Hedonic Price Method, trend analysis and questionnaire survey are more helpful to find out the property price which is nearby metro stations.*

***Key Words*: Impact of Metro, Valuation, Residential Properties, Hedonic Price Method, Trend Analysis**

1.INTRODUCTION

1.1 In India Metro Rail System

In the world second number of India in population there are estimated population of about nearby 135 million (Geetesh Malhotra, 2020). It needs a transportation system that can accommodate a large population, and it needs to develop a faster and more efficient public transportation system, cleaner travel, and better Liquidity and strong economic growth. An authentic, safe, efficient and comfortable public transportation system is one of the prerequisites for a better life in the world today solution is called the Mass Rapid Transit System (MRTS), also known as the subway. Metro trains are usually defined as modern, automated, electric and environmentally friendly urban vehicles. Because they have completely independent tracks, they have a large passenger capacity and travel at very high speeds. From other lanes or pedestrians. There are multiple electrical units on the train tracks. They are usually combined with other public transportation systems such as buses, rickshaws and local cars to provide users with better last-mile mobility and connectivity.

For example, in India, there are currently 13 metro rail systems in 21 cities, and the Delhi Metro is joined to several other around cities within the NCR (Rohit Sharma, 2018). As of August 2019, 52 kilometers of active metro lines, 540 stations. More than 560 kilometers of lines are under construction. Most of the subway lines in India are of standard gauge. Kolkata Metro is the first rapid transit system in India to introduce Delhi Metro. It has the largest network in the country, and opened the latest subway-Nagpur Metro. Metro Ahmedabadad is an urban public transportation system (MRTS) built by Gujarat Metro Rail Corporation (GMRC) Limited. The system was formerly known as Gandhinagar and Ahmedabadad's Metro-Link Express (called MEGA). Services are provided in the largest city of Ahmedabad. The construction of the first phase of the Ahmedabad Metro in Gujarat State and its capital, Gandhinagar, will be 39,259 kilometers in length. Construction started in 2015 and is expected to be completed in 2024. The Surat Metro has 2 lines and 37 stations. It is a licensed S-Bahn system (Geetesh Malhotra, 2020).

According to the detailed project report (DPR) of the Gujarat Railway's Surat Phase I project counter, the network length is 40. In January 2017, the Gujarat government approved 35 kilometers, and the central government cabinet approved the project in March 2019.

Fig -1: Ahmedabad Metro Project Map

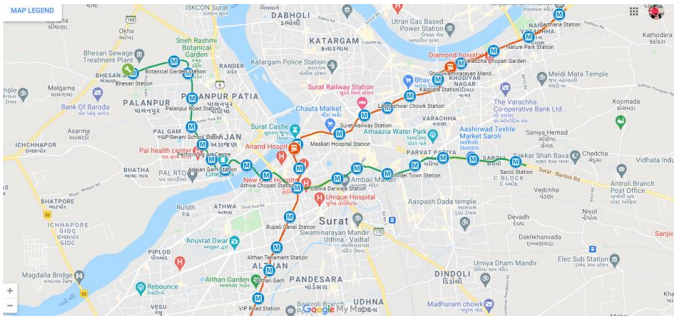


Fig -2: Surat Metro Project Map

1.2 Residential Properties in India

Housing is one of human's basic needs and accounts for a large part of the country's annual transactions. The real estate industry has become a boring topic. Even the smallest deviation can have a significant impact on the economic development of a country. These differences depend on the cost of owning a house and various external and internal factor that affect the house. Land and land are the main components of land, and their value varies according to needs and conditions.

Therefore, in the emerging real estate market, asset valuation for investment purposes often has a common problem. The real estate market is different from other markets in that the real estate value is 1999. In some markets, house prices rose by about 15-20% from 2008 to 2012. Housing prices have risen over the past decade, and income from information technology (IT), IT services (ITeS) and credit inflation have all increased. Due to strong demand, inflation has caused prices to rise excessively since 2005 (Geetesh Malhotra, 2020). The subsequent business opportunities and population migration increased the demand for retail space, and this demand was mainly driven by the development of vibrant real estate, retail, hotels and entertainment.

1.3 On Residential Properties Impact of the Metro

Housing is one of the basic needs of society, and its cost is affected by minimal changes in the environment. The change depends on several factors. They almost have to travel together for a day according to their needs. In major cities in India, the metro system is the most versatile travel option.

Therefore, the focus of this research is to determine the impact of light rail on the value of housing and community services. Real estate in the metro area. There are several properties of real estate near the metro that have a positive or negative impact on the value of the real estate.

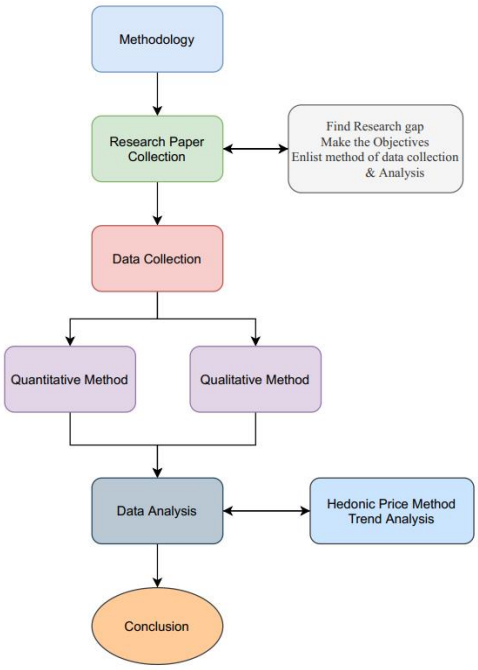
1.4 Need of Study

The existing literature is mainly based on international experience and may not be suitable for Indian cities with heavy subway traffic and high population density. India's metropolitan areas rely heavily on public transportation. Compared with the international environment, passengers in these metropolitan areas are more sensitive to small changes in transportation services. The subway corridor can be regarded as the basis for evaluating trends, because the price changes in the brokerage area over a period of time can be analysed and compared.

1.5 Objectives

Primary object of the research is to determine the effect of the metro rail system on the value of nearby residential properties and to study the real estate price trends nearby metro locations. And secondary objects are to identify select attributes that affect the value of residential real estate along the metro stations and to establish a connection between the value of house ownership and the selected property.

1.6 Methodology



2. LITERATURE REVIEW

From the literature papers studied found out that the residential properties valuation depends on the various factors but transportation and communication one place to other are mainly important factor so that's why this paper says that impact of the metro project on the residential properties it will be in form of positive or negative. Mainly in these papers focused on the Hedonic pricing method and Difference-in-Difference method to analysis the data and make the result how much impact will be given to the residential properties due to metro project. And for the analyze the different result paper will be take from the different country and different city like, Sydney, Dubai, Nepal, Bangalore, Delhi, China, etc.

3. DATA COLLECTION

Data will be collected by the two method one is Quantitative Research & Second is Qualitative Research. Where data was collected through the questionery Survey forms or personal interviews with the value engineers or related expert with this topic and also from the case studies.

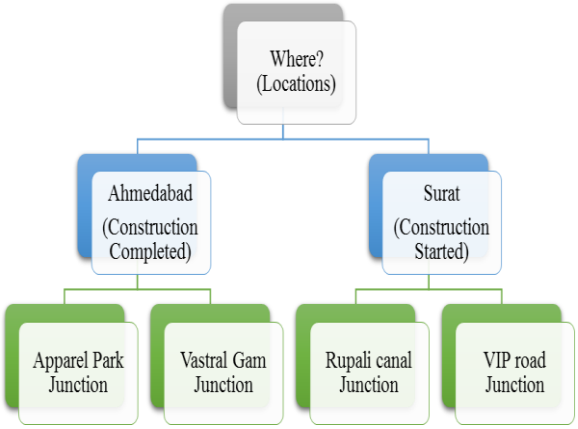
3.1 Data Collection Process

For the data collection there are mainly three key questions are coming in mind and that is Where we collect the data?

How data will be Collected? How much sample will be collected?

3.1.1 Where Collect the Data?

Data collection Basically done in Ahmedabad & Surat where in ahmedabad we take the station where metro project construction was completed and metro was started it is Vastral station to Apparel Park station and in the Surat we take the Rupali canal Junction to VIP road Junction where metro construction was started so this are the brief about the location of the construction. In this area was divided in to three peripheries from the station like 0-0.5km, 0.5-1.0km, 1.0-1.5km.



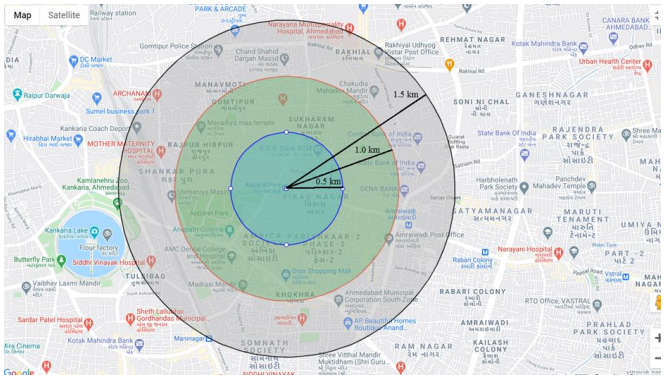


Fig -3: Apparel Park Junction

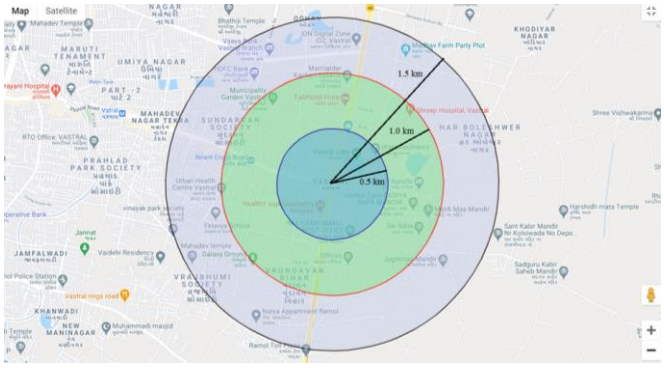


Fig -4: Vastral Gam Junction

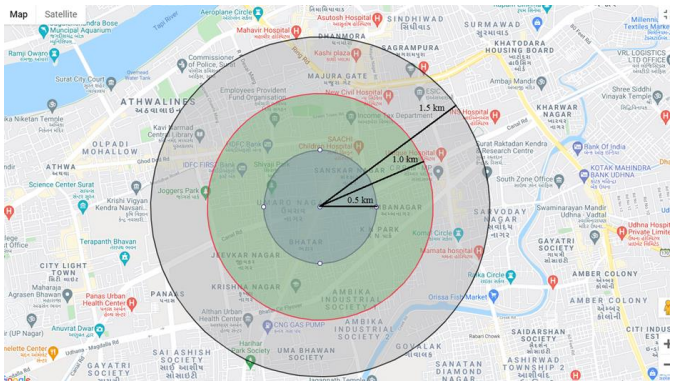


Fig -5: Rupali Canal Junction

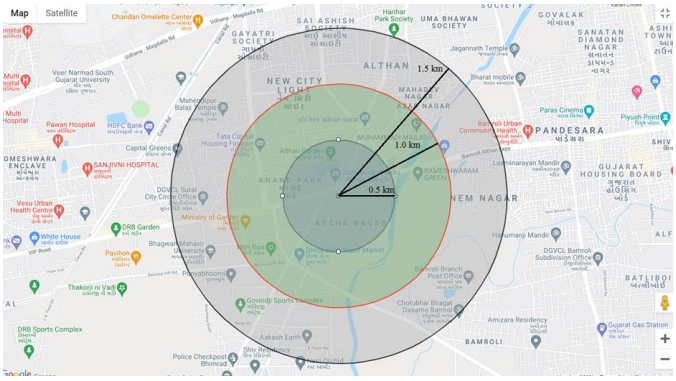


Fig -6: VIP Road Junction

3.1.2 How Data will be Collected?

Questionnaires was divided in to two part one was data collection and second was give the importance to the attributes in related with the valuation. Data collection form was collecting the data like, Total Income of the family, Size of the house, No of bed rooms, Age of the House, where going for Work/Shopping & which type of transportation you used etc., Distance from the metro station, CBD, Park, Grocery Store etc., Price of the house before the announcement of the metro project, during the construction of the metro project and after the completion of the project.

From this data it will be easy to compare the data and analysis of the data because it will be divided into different-different categories.

3.1.3 How much Sample Collected?

For the calculating sample size there is two equation which are used for the respectively one for the infinite population and second one for the require population for the required population N will be taken as 100 for the in any one TP scheme there are approximately 100 type off different societies are there. And Z-score was also determining from the confidence level table it was take as 95% and value is 1.96. Population proportion assumed as 50%. Generally, margin of error was taken between the 5-10 percent we take the 8 percent. And from this value and below equation helpful to find out the sample size for the questionnaires.

Equation 1: For infinite Population

$$\text{Sample Size} = S = \frac{Z^2 * P * (1-p)}{M^2}$$

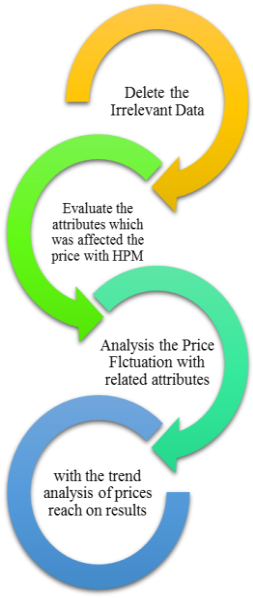
Equation 2: For Required Population

$$S = \frac{S}{1 + (S-1)/N}$$

4. DATA ANALYSIS

Data analysis is very critical part of any research study. Basically, data analysis summarizes the data collection and find out conclusion on the basis of the collected data. Data analysis include the internal relation of the data collection throughout the usage of the logical and analytical process to determine relationship, patterns and also trends etc.

4.1 Methodology



4.1.1 Hedonic Price Method

Hedonic Price Method basically used for the find out the value of the properties with respect to different attributes from this method we find out the which factor was mainly affected the price fluctuation at that location and find out the attributes which was help to give their impact on the valuation (Yuer Chen, 2019).

For example,

P = (Loc, Str, Acc, Env, Nei)

Where;

P is the price of a property

Loc is the location characteristics, i.e., urban, rural, distance from the city Centre, etc.

Str is the structure of the property, i.e., number and size of rooms, size of the stand, property age, etc.

Acc is the accessibility of the property, i.e., proximity to social amenities, public transport accessibility, etc.

Env is the environmental quality, i.e., quality of air, quality of water, etc.

Nei is the neighbourhood characteristics, i.e., crime rate, scenic views, quality of schools, etc.

From the Hedonic Price Model analysis, the Collected data any differentiate in the Three categories based on the size of the house and income of the house like, Group of Low-Income households, Group of Medium Income households, Group of High-Income households and also differentiate into the distance from the metro station like, 0.0-0.5 kilometers, 0.5-1.0 kilometers, 1.0-1.5 kilometers

Now there are shows the result data of the pricing fluctuating with the find of the different categories like income type group and in km groups.

4.1.1.1 Vastral Metro Station

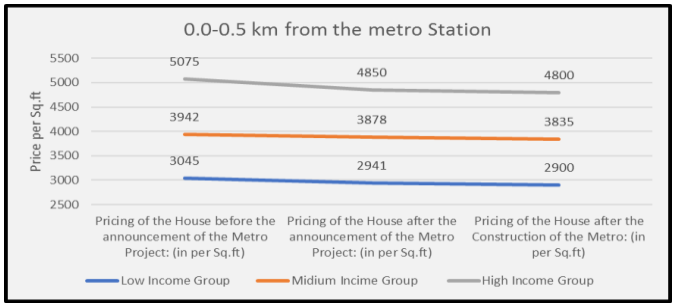


Chart -1: Pricing trend in 0.0-0.5 km at Vastral Metro Station

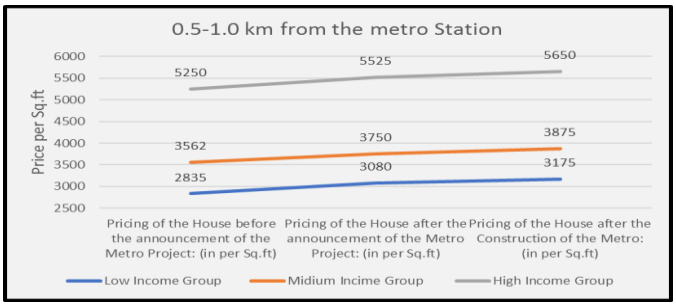


Chart -2: Pricing trend in 0.5-1.0 km at Vastral Metro Station

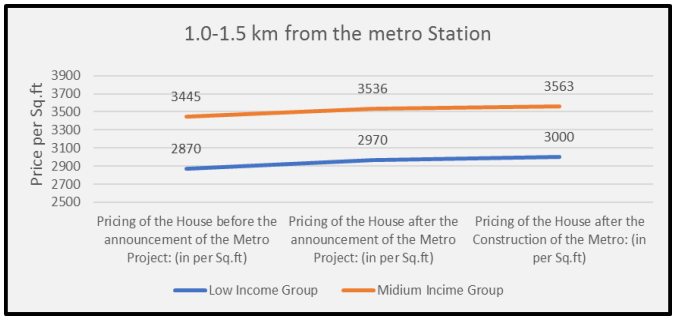


Chart -3: Pricing trend in 1.0-1.5 km at Vastral Metro Station

Table -1: Average of Price Fluctuation at Vastral Area

Distance from the Metro Station	Group	Price Fluctuation before to after announcement of metro Project	Price Fluctuation after announcement of metro Project to completion of Project
0.0-0.5 km	LIG	3.54% ↓	1.41% ↓
	MIG	1.65% ↓	1.12% ↓
	HIG	4.64% ↓	1.04% ↓
0.5-1.0 km	LIG	7.95% ↑	2.99% ↑
	MIG	5.01% ↑	3.23% ↑
	HIG	4.98% ↑	2.21% ↑
1.0-1.5 km	LIG	3.37% ↑	1.00% ↑
	MIG	2.57% ↑	0.76% ↑

Table -2: Average of Price Fluctuation at Apparel Park Area

Distance from the Metro Station	Group	Price Fluctuation before to after announcement of metro Project	Price Fluctuation after announcement of metro Project to completion of Project
0.0-0.5 km	LIG	2.24% ↓	1.81% ↓
	MIG	0.55% ↓	1.64% ↓
	HIG	1.85% ↓	1.41% ↓
0.5-1.0 km	LIG	9.82% ↑	3.23% ↑
	MIG	7.48% ↑	4.51% ↑
	HIG	6.94% ↑	3.34% ↑
1.0-1.5 km	LIG	2.17% ↑	1.48% ↑
	MIG	1.48% ↑	1.63% ↑

4.1.1.2 Apparel Park Metro Station

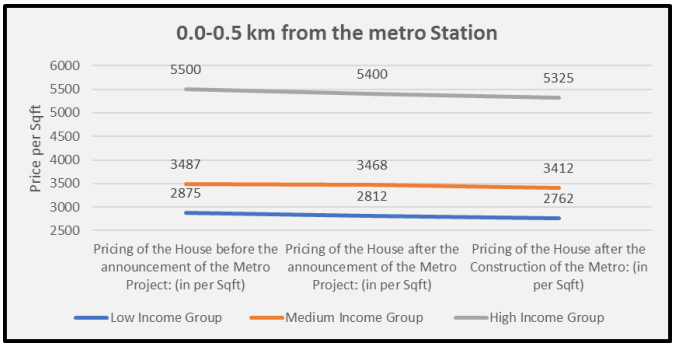


Chart -4: Pricing trend in 0.0-0.5 km at Apparel Metro Station

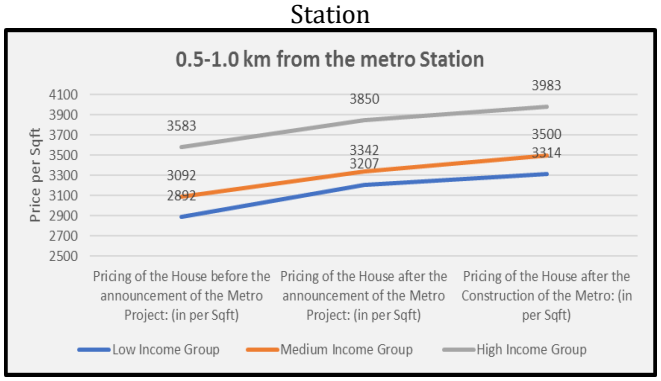


Chart -5: Pricing trend in 0.5-1.0 km at Apparel Metro Station

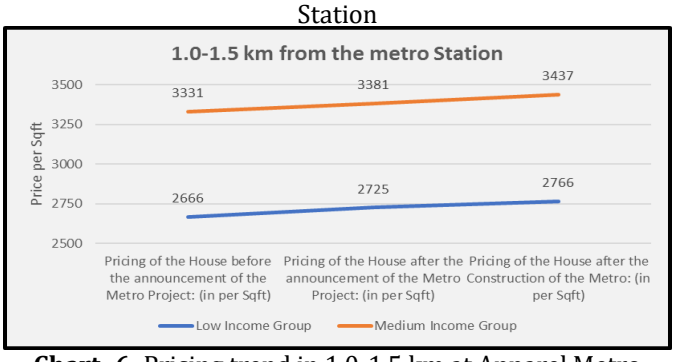


Chart -6: Pricing trend in 1.0-1.5 km at Apparel Metro Station

4.1.1.3 VIP Road Junction Metro Station

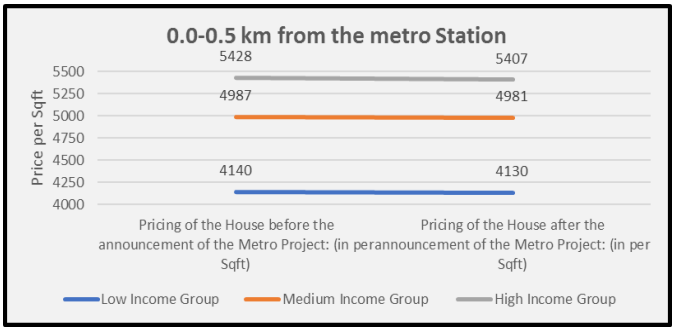


Chart -7: Pricing trend in 0.0-0.5 km at VIP Road Junction Station

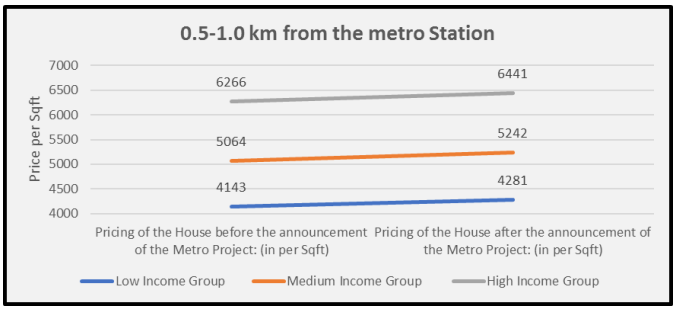


Chart -8: Pricing trend in 0.5-1.0 km at VIP Road Junction Station

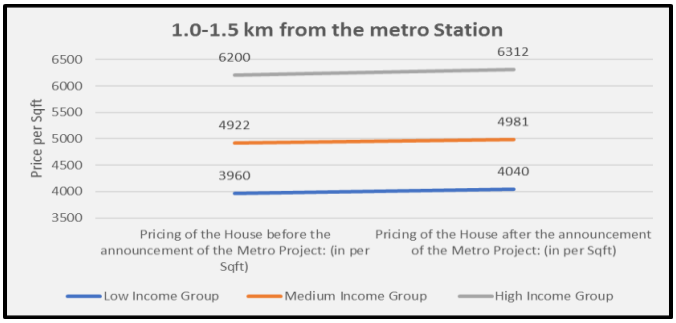


Chart -9: Pricing trend in 1.0-1.5 km at VIP Road Junction Station

Table -3: Average of Price Fluctuation at VIP Road Area

Distance from the Metro Station	Group	Price Fluctuation before to after announcement of metro Project
0.0-0.5 km	LIG	0.24% ↓
	MIG	0.12% ↓
	HIG	0.39% ↓
0.5-1.0 km	LIG	3.22% ↑
	MIG	3.40% ↑
	HIG	2.72% ↑
1.0-1.5 km	LIG	1.98% ↑
	MIG	1.18% ↑

Table -4: Average of Price Fluctuation at Rupali Canal Area

Distance from the Metro Station	Group	Price Fluctuation before to after announcement of metro Project
0.0-0.5 km	LIG	1.20% ↓
	MIG	1.08% ↓
	HIG	0.57% ↓
0.5-1.0 km	LIG	4.70% ↑
	MIG	3.39% ↑
	HIG	4.48% ↑
1.0-1.5 km	LIG	1.53% ↑
	MIG	1.64% ↑

4.1.1.4 Rupali Canal Junction Metro Station

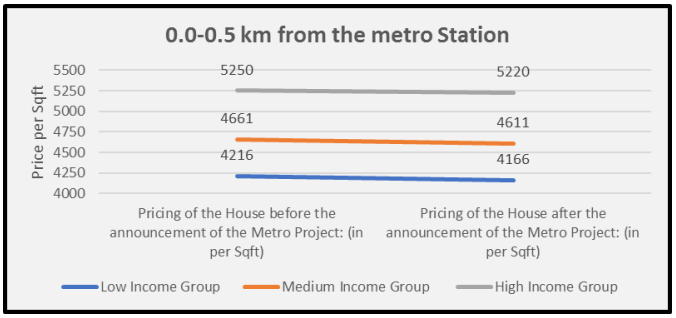


Chart -10: Pricing trend in 0.0-0.5 km at Rupali Canal Junction Station

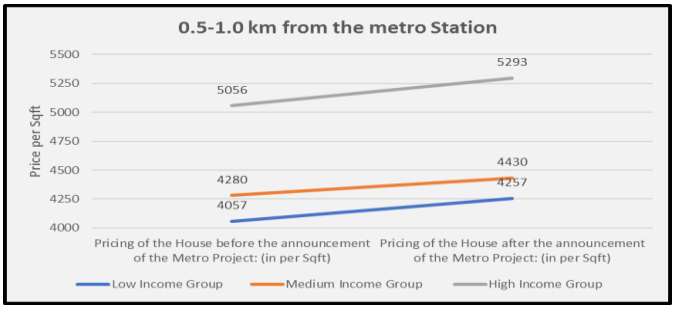


Chart -11: Pricing trend in 0.5-1.0 km at Rupali Canal Junction Station

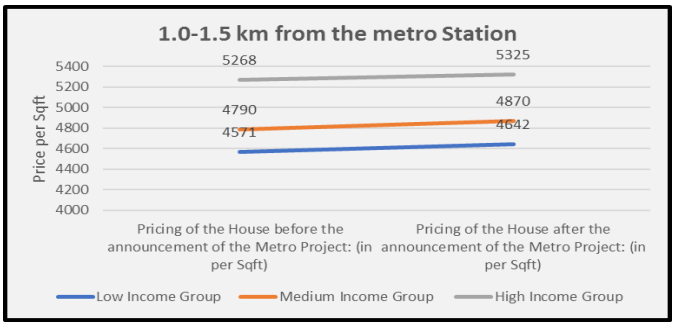


Chart -10: Pricing trend in 1.0-1.5 km at Rupali Canal Junction Station

4.1.2 Attributes affecting Properties value around the metro

Value Drivers are the attributes that generally add value to a product or service. The value added can be tangible or intangible. This will talk about the overview of different independent and dependent attributes of metro which affect the cost of residential properties. For the find out the attributes which was most affected the property value it was evaluated by the importance index method from this we get the which attributes affect the more and less for this we prepare the one questionnaire and in this questionnaire scale the attribute between the 1 to 5 where 1 is not affected and 5 is mostly affected.

$$Relative\ Importance\ Index = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{A * N}$$

Where;
n_1 to n_5 is ranking of the strongly not affected to affected
A is Highest weightage and N is total no of respondent

Table -5: Relative Importance Index of Different Attributes

Attributes	I-Index
Property Size	0.96
Distance from metro	0.92
Criminal Activities around metro	0.91
Accessibility Improvements due to metro	0.91
Nuisance due to metro	0.90
Traffic Congestion around metro	0.89
Parking Facility by Metro	0.87
Developments in neighbourhood due to metro	0.87
Location	0.87
Facilities by the municipal corporation	0.84
Last mile connectivity from Metro	0.84
Distance from School	0.82
Distance from Grocery Store	0.80
Distance from Recreational area	0.75

4.2 Closing Summary of Data Analysis

In closing summary of ahmedabad city data there was price will decrease in radius of 0.0-0.5 km and after that 0.5-1.5 km price of properties are increased and in the third radius price will increased but not as much like in second radius prices are increased. There are average percentage of decrease and increase is with respectively is 2-3% ↓, 7-9% ↑, 2-3% ↑. Same thing will happen in Surat data but there are percentage might be different but Price fluctuation are same as in ahmedabad city. There are average percentage of decrease and increase is with respectively is 0.5-1.0% ↓, 3-4% ↑, 1-2% ↑.

There are the attributes which of the some gave the positive impact on valuation and some are given negative impact on the nearby area's properties.

Positive Impact attributes: Property Size, Location, Accessibility Improvements due to metro, Development in nearby due to metro, Last mile connectivity, Parking facilities by metro. Negative Impact attributes: Criminal activities around metro, Nuisance due to metro, Traffic congestion around metro

5. CONCLUSIONS

5.1 General Conclusion

Residential property prices are affected which was near by the metro station with respect the various attributes or characteristics like, Distance from the metro station, Location, Last mile connectivity, accessibility upgraded due to metro, criminal activities, new development in nearby because of metro, A nuisance due to metro, traffic congestion, parking facilities provide at metro stations.

5.2 Research Specific Conclusion

From the hedonic price method and trend analysis it was easy to evaluated that effect of metro on trend of residential property value is high in low- and middle-class people group (smaller area of the houses) and in high class people group (larger area of houses) value is low as compared the other group. Behind this outcome there are reason for this type of effect that low- and middle- class people are more relay on the metro with compare the high-class people.

Another result derives with compare the distance from the metro station and for this result is property price per sqft was uplifted when property was located far from the metro station as compared with the property in the affected area of metro station. So, from this property values are increased with the increase the distance from the metro station and same thing are happening in opposite situation. Also, value of the property is also depending upon the location and property type. When changes in property happen different attribute effect of amount also changed.

5.3 Future Scope

India is developing country in next 15-20 years there are lot of metro project was implemented in different cities so this study will be more helpful to finding the property values and also getting help to invest in properties. It is also helpful to government where we need to give the metro station and for that particularly that area also became a developed in good manners.

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