Impact of Green Infrastructure on Value of Residential Properties in Twin-cities using Hedonic Model

By

Rida Bashir

NUML-F20-30666

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Department Of Management Sciences

National University of Modern Languages

H-9 Islamabad

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ABSTRACT:-

This study used the hedonic pricing model as a research methodology to determine the impact of green infrastructure on the value of residential properties in various societies of Islamabad. The number of green parks in the area and the distance from a property to its nearest green park are two main features of the green infrastructure that are taken into consideration, in addition to the other hedonic characteristics such as neighborhood, location and structure that are used to explain property values. The sample consists of 1402 observations collected from Islamabad's four different societies. Results of our research show the significant relationship of property values of residential properties in various societies of Islamabad to property characteristics such as structure, neighborhood, location, and green infrastructure. The number of green parks nearby and the distance between a property and the nearest green park are found to be highly significant variables that have the most impact on a property's value. There is an inverse relationship between a property value and the distance of the property from the nearest green park.

Keywords:-

Green infrastructure, Hedonic model, LASSO, OLS, Property value, Property Characteristics

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CHAPTER 01

1.1 Introduction:-

Green infrastructure leads to developing green ecosystems which further increases the value of property. If this relationship is significant, the results will help investors and end clients of private land at the cost evaluation and funding choice. Valuing property values in an economically nascent location is tougher due to the fact that there is no fixed benchmark for determining the market value of residential properties. Property values in emerging international locations are extremely sensitive due to the unstable profits and odd liquidity in those financial markets. Another barrier to the determination of the market value of residential property is that the prices are unstable, and it is tough to gauge marketplace sensibility. The reputations of resident lodging authorities and the financial growth in the area where the residential property is located are supposed to be significant with price factors in nations with local lodging authorities (Kajuth, 2016). Urban planners have made the point that recent ways of life consume a large number of natural resources, pollute environments, creates societal inequalities, and contributes to municipal heat land mass and temperature change. As a result, numerous municipal organizers support maintainable cities, as defined by (Sabates and Wheeler. 2004) as "development that promotes the long-term social and ecological health of cities and towns". Recommendations by him include cultural preservation and knowledge; the re-establishment of ordinary systems, healthy breathing conditions, and societal ecosystem, along with effective property usage, reduced vehicle usage, improved access to amenities, effective resource use, reduced pollution, and waste. Planners are increasingly holding similar ideas, with a focus on reducing the consumption of water and energy as well as reducind the amount of waste and pollution. Many studies have been conducted to look at the societal and psychological advantages of municipal nature, plants, and open spaces; for example, (Babak Raji, 2015). Another study by (J.B. Kirkpatrick, 2012), this research has all been concerned with deeper psychological connections between people and nature, the advantages of natural contact for human health and welfare, and the function of city vegetation in the development of community life. In accordance with the study by (Frances e. Kuo, 1998) that regular exposure to nature might be a requirement for healthy mental and social health. The author argues that spending time in green, natural settings can promote relaxation and enhance one's capacity for focusing when working on difficult tasks. Trees should be planted and kept up close to residences, schools, jobs, and

other locations where mental focus and strength are most needed. Spending time indoors should be done in locations with home windows that offer a view of greenery, and workstations at work and faculty should be organized to achieve the same thing. More green space should be developed, especially in urban areas. Recreational surroundings reduce ADHD symptoms. Kuo at the environmental and medical research laboratory at the University of Illinois has explored further advantages of GI with a focus on the different themes, such as children's attention deficit/hyperactivity disorder symptoms can be lessened by activities in green environments (Frances E. Kuo, 1998). In Islamabad Pakistan there are numerous residential societies that offer their residents a variety of services in addition to residential amenities, buyers and sellers can easily discover luxury houses in Islamabad. They are earning a huge income from the citizens of their societies by offering various utilities, including schools, colleges, markets, parks, hospitals, playgrounds, and other services. In a country such as Pakistan, everyone with rental properties, whether it's a house or a plot of land, can start a business. The majority of real estate agents and property sellers are unaware of current trends in local and international real estate. Due to consumer preferences regarding the various amenities provided in housing society, there is a price difference between residential plots of the same size and quality. According to recent statistics Pakistan spends over PKR 5 billion on real estate each year, the country's real estate market is crucial. The capital development authority has placed a variety of services in each residential district of the capital, which is what primarily attracts investors to Islamabad. Islamabad has a variety of facilities, including hospitals, pharmacies, five-star restaurants, schools, colleges, hotels, playgrounds, parks, and sanitation facilities, in addition to other initiatives targeted at attracting both domestic and foreign investment. Accessibility and connectivity are the most important factors that determine a land mass's value. We all understand that a society's availability of real estate makes all the difference, which is why it influences all big investment decisions. As a result of these investments, residential real estate property is becoming significantly more expensive, and demand for real estate is increasing. A variety of techniques are being used by researchers to figure out the factors that affect residential property values all around the world. For this purpose, the hedonic pricing model is the most commonly used and efficient approach for estimating the value of residential properties. When estimating the price of residential real estate, the hedonic pricing model is effective at tracking both explicit and implicit environmental costs (AyseCan, 1992) .In recent years; the number of housing societies is increasing as a result of the increased population in Islamabad. Estimating the number of dwellings in a cluster is challenging in any housing project. Even

within the same housing society, price discrepancies in residential plots occur because diverse quality standards are available. Unfortunately, due to the lack of public authority measures, there is a significant difference between district authorities, the Pakistan Revenue Department, the federal government, and market prices in Pakistan. On the other hand, the researchers reached the conclusion that the location of a residential unit in relation to a workplace, markets, schools and other utility factors affects its worth. In comparison to residential plots close to these utilities, the cost of a residential plot decreases as the distance from the job centers, city centers, railway stations, markets, and schools increases. Neighborhood parks are created to offer a variety of active and passive leisure activities, such as exercise, rest, and social interaction for kids, often in a natural setting (Bengochea Morancho, 2003). A study conducted in the UK found a correlation between older people's outings and leisure walking and specific neighborhood open space elements. It was found that while adequate access to open space and suitable amenities were associated with comfortable walking, attractive open space and a lack of discomfort were linked to transportation.

1.2 Rationale of the study:-

The purpose of this study was to explore the characteristics of a hedonic pricing model that are significant to property value in various residential housing societies in Islamabad. There are many investigations that think about the ecological and social advantages of green practices, yet the monetary valuation of property characteristics in Pakistan is uncommon. While the impact of property characteristics on property estimations can be challenging, a few examinations have shown that property characteristics in all actuality do expand property values. The rise in residential real estate in the area is also directly attributed to a few utilities. Additionally, the study will show and examine how these utilities will affect this price increase.

1.3 Problem statement:-

Pakistan is currently the fourth most polluted country in the world. Experts warn that inadequate movement to address the problem may prove disastrous for the residential real estate market in Pakistan. It is a common understanding that forests and other types of greenery serve as the foundation for the protection of the environment, moderate temperatures, absorb atmospheric carbon, and maintain a particular level of atmospheric humidity. The properties located in green areas are traded at higher prices as compared to the

properties traded in non-green areas. Keeping in the backdrop to it, this study will explore urban green spaces and their impact on the pricing premium of real estate. Moreover, this study used a hedonic pricing model to explore property characteristics such as location, structure, and neighborhood and the impact of these property characteristics on the valuation of residential real estate.

1.4 Research objectives:-

This study comprises the following objectives:

- To analyze the impact of green spaces on the value of a residential properties.
- To analyze the impact of property characteristics such as location, structure, and neighborhood on the value of residential properties.
- To measure the pricing premium based on greenness.

1.5 Research questions:-

This research highlights the following questions:

- What are the relationships between property value and property characteristics such as structure, location, neighborhood, and green infrastructure in four private residential housing societies in Islamabad?
- What is the impact of green spaces on the value of the residential properties?
- What is the pricing premium based on distance to the nearest green space?

1.6 Theoretical framework:-

The purpose of this research is to examine the relationship between residential property values and green infrastructure, including the number of green parks and the distance to the closest green park, as well as other property attributes like structure (house size, number of bedrooms and bathrooms, presence of a garden and garage, room size), location (proximity to an airport, metro bus station, city center, and railway station), and neighborhood (proximity to a market, schools, and job centers) in various societies of Islamabad. There are several studies on the advantages of green infrastructure as well as the monetary value of other property characteristics like location, structure, neighborhood, etc. However, there are few

studies on the monetary value of green infrastructure. In this study, the property value is the dependent variable, and the independent variables are the green infrastructure and other property characteristics.

1.7 Significance of the study:-

Given that the real estate sector is currently one of the most important sector in Pakistan and other international locations, this study will be essential in improving our understanding of the actual price and market price of residential properties located in various societies of Islamabad. This study could be helpful to immigrants who wish to settle in Islamabad since it will explore specific property characteristics and how they affect residential property values. The results of this study may even assist investors of real estate and end users in determining the marketplace price of real estate properties in Islamabad while taking into account a variety of property characteristics such as location, structure, neighborhood, and green infrastructure (green parks). The findings of this study will also find the various causes of the rise in the value of various residential housing societies in Islamabad and help in predicting how costs will change, such as distance from various amenities and green spaces, such as green parks, the metro, airport, school, bus station, city center, markets, and so on, increases or decreases. Furthermore, how do various utilities affect the price of residential properties? Our findings provide information on how green spaces increase the value of properties. It could be useful to planners as more cities implement GI orders for planning and construction to increase economic values.

1.8 Practical significance:-

Real estate and investment are frequently used interchangeably in Pakistan. Many studies have explained green infrastructure advantages and property attributes to quantify property values, but money valuation of greenness in Pakistan is uncommon. The findings of the study will give insight into how greenness affects property values. Additionally, the study is very helpful for investors who prefer to invest in real estate. According to the study's findings, investors will benefit from a greater knowledge of the quantitative components that influence residential real estate transaction prices. These discoveries will make it easier to enhance strategic plans so that residential real estate markets may achieve long-term returns on capital. With the help of these discoveries, strategic plans can be improved and sustainable rates of return can be attained in the residential real estate markets.

CHAPTER 02

2.1 Literature:-

This section provides a summary of the literature on the effects of green infrastructure and various utilities on the value of residential properties. The price of residential property is significantly influenced by how close the property is to certain locations. Before purchasing real estate, the buyer's main aim is to assess the area's location and amenities. Residential real estate is valued more when it is close to amenities like parks, workplaces, shopping centers, and bus stations than when it is farther away. The study of property value is a huge field all by itself and it is difficult to cover and a very small part of the section covered in this study. Hence, this survey focuses essentially on the studies that checked out the relationship between green infrastructure and property value. Most infrastructure investments, if well planned, generally tend to have an advantageous impact on property values. Numerous research and regression analyses have confirmed that public infrastructure investments tend to grow economic activity, productiveness, and asset values, even as they provide great spillover consequences that positively impact the exceptional lifestyles of groups like a monetary improvement, power efficiency, and public fitness protection. Most of the studies have centered on the more traditional sorts of infrastructure (roads, water, and telecommunication lines), at the same time as the fiscal impact of GI, being a pretty new shape of infrastructure, and has yet to be very well explored. A study that specifically looks at the relationship between the values of properties and green infrastructure is needed, according to the small number of studies that have been done. To develop a good understanding of the monetary benefits of green space, this research will examine this relationship while keeping other features such as neighborhood features (job centers, markets, schools), locational features (distance to railway station, airport, metro bus stop), and structural features (number of bedrooms and bathrooms, house size, presence of garden and garage).

2.2 Green infrastructure:-

Green infrastructure (GI) is an association of decentralized storm water management practices. For instance, inexperienced rooftops, timber, rain gardens, and porous asphalt that may trap and penetrate rain where it falls, consequently reducing storm water overflow and

operating at the power of encompassing streams. While there are numerous sizes of green infrastructure, for instance, massive regions of land positioned away for shielding, this guide centers on GI's advantages in the urban context. The size and distance from, GI conveniences affect individual evaluation, utility, and weighting in money-saving advantage investigation. Various examinations observed that individuals were able to pay a premium to build the inclusion of green regions and to diminish the distance between household and green metropolitan spaces. A network of the most diverse, high-quality green areas and other environmental elements is referred to as "green infrastructure" and is one that has been intentionally planned and implemented. It is crucial to ensure sustainable development that it is created and managed as a multipurpose resource that can offer the ecological benefits and improvements to the quality of life that the communities demand and support. The design and management of ecosystems and different types of landscapes should also acknowledge and enhance a location's exceptionality. Green infrastructure connects the urban region to its larger rural neighborhoods by incorporating both new and established green spaces into the built environment. It must therefore be used at many levels, from inter-city to neighborhood residential stages, while also taking into account the frequently much bigger sites outside of local communities, such as the broader region, and accessible natural green spaces inside them. The following two definitions provide additional examples of how green and blue spaces are often used. The green infrastructure report from the Australian Institute of Landscape Architects outlines the advantages of many kinds of green infrastructure, whiles the primary, recommended by (Neumann, 2017) and emphasizes biodiversity. "Green infrastructure" describes the set of green and natural places, functions, and undeveloped areas found in urban and rural, agricultural, freshwater, marine, and ocean zones. These areas, features, and green spaces together improve the health and resilience of ecosystems, aid in the conservation of biodiversity, and contribute to the maintenance and enhancement of ecological services that benefit human populations. The development of new regions and features, as well as the preservation, restoration, enhancement, and connection of currently existing locations and features, can boost green infrastructure. One type of green infrastructure strategy that can lower water expenses for non-potable water use and landscape irrigation is the use of rain barrels. Based on a property's non-potable water needs, local water price, and the frequency and severity of storms throughout the year, there are several opportunities to obtain these savings. Certain types of vegetation, such as grassy open spaces and tall trees, are linked to crime. This study tries to show that commercial property owners obtain a significantly higher return on their investment and have a stronger financial

justification for green infrastructure improvements when these benefits are taken into account than they would if they only considered decreased storm water fees. Some of the difficult-to-measure benefits include water bills, crime, improved health and job satisfaction for office workers, closeness, and side effects. According to recent studies, green infrastructure may even be able to lower crime on private property, particularly in urban areas. Reducing the scale of individual properties, green infrastructure can also offer a wide range of other beneficial outcomes that are challenging to quantify in a standardized approach. However, property owners should think about these advantages. Managing the frequency and severity of localized urban floods can be done in a cost-effective manner by reducing the amount of storm water runoff. Even though they cause less damage than larger events (which may be avoided by using green infrastructure), they are generally more common and extensive; even though they cause less damage than ever, their recurring nature can impose a heavier economic burden. Large floods with extensive damage and costs are comparatively uncommon. Reducing the probability of flooding lowers the costs associated with flood damage and may raise property values. Rain barrels are one example of a green infrastructure practice which could reduce water expenses for landscape irrigation and other non-potable water usage. Opportunities to realize these financial savings will range substantially based on the non-potable water requirements of a particular asset, nearby water charges, and the frequency and severity of storms at some stage in the year. According to recent studies, green infrastructure may even be able to lower crime on private property, particularly in urban areas. Certain types of vegetation, such as grassy open spaces and tall trees, are linked to crime reduction. In addition, green infrastructure can lower the lifetime cost of private property renovations. Green roofs typically have an expected lifespan of at least 40 years, as opposed to conventional roofs' 20-year lifespan; therefore, they do not need to be changed as frequently. A green roof in a mid-sized retail building with a 40,000 square foot roof, for example, could save more than $600,000 in roof replacement costs over the course of forty years; a green roof in a mid-sized office building with a roof half that size could save more than $270,000. According to (Naumann, 2017), "green infrastructure" refers to the environment, the network of natural properties that supports the financial, social-psychological, and environmental capability of our cities through the interspersion, connection, and provision of essential life for people and other organisms inside the natural environment. Different participants of this society are sometimes referred to as "green infrastructure assets," and they can be found at a variety of landscape scales, including private gardens, neighborhood parks, housing developments, streetscapes, highway medians,

service areas, and service roads, communication corridors, waterways, and regional recreation areas, among other landscape features. In general, GI consists of elements that are multifunctional, networked, and organic, providing a variety of advantages for both society and the environment. The advantages of greening urban infrastructure go beyond local and national boundaries to concerns like climate change being battled on a global scale. The serious problems caused by climate change are lessened and made more manageable by greening urban areas. As a result, the additional investments will be determined over a comparatively short period of time, making it more challenging to resolve the financial problem. The favourable long-term environmental impact of green efforts on cities is a significant outcome.

Advantages of green infrastructure for private and business land owners are:

• Reduced infrastructure prices

• Reduced water payments

• Energy savings

• Reduced expenses associated with flooding

• Increased rents and asset values

• Increased retail sales

• Storm water fee credit and other financial incentives

• Increased intellectual fitness and worker productivity for office personnel

Most infrastructure ventures, if very much planned, will more often positively affect property estimations. The idea that parks increase nearby property values is based on the fact that people are usually willing to pay more for a house that is closest to a park than they would for a house that is more distant from a park. The "capitalization" of parkland into higher property values for nearby landowners is what this essentially requires. Neighborhood parks establish a fundamental piece of the urban infrastructure. Current organizing norms normally recommend a minimum edge of figured square meters of green space per individual. Neighborhood parks are the essential units that are, in a genuine sense, provided at the backdoor of the local residents in the progressive urban green area infrastructure that ranges between the nearby area and city levels. The district or municipal administration can make an effort to meet or exceed the goal, which would be satisfying for the council members and

locals (Young. 1978). Limited studies were performed in this region, and little research on green infrastructure and property characteristics has included spatial econometric techniques. This technique is necessary considering that asset costs can be prompted with the aid of traits of nearby houses. The purpose of this research is to quantify the impact of green infrastructure using a hedonic model analysis of the relationship between property values and property characteristics around four residential housing societies in Islamabad. In Islamabad, there is a range of social orders for individuals to live in with their families, displaying the unification of the general public of the country. Since our coming to Pakistan's urban grounds, the land in Pakistan has overturned how living spaces were made. Each private society is significantly more focused on meeting their luxurious requirements, which provide an extraordinary way of life as well as more than one tremendous convenience, which are wealthy, open, and lavish. Breath-taking formats and standout design is a couple of the perspectives that determine the luxury of homes' lodgings in social orders. Highlights, for example, organized inlets, wellness offices, and so on, are conciliated as providing advantages that are critical for the demanding necessities of luxury living to make the inhabitant more pleasant.

Green infrastructure approaches:-

In the literature, (Ely and Pitman, 2015) found three key strategies for establishing green infrastructure, which are detailed below.

Ecosystem services approach (ESS):-

This strategy highlights the benefits of the environment and regular life cycles bring to the public (Robert Costanza, 2014). Both domestically, where they can be maintained and managed in urban environments to deliver benefits to that setting, or internationally, these services are available (for example, the carbon cycle).

Green spaces network approach:-

In order to develop the effectiveness of ecosystems, this method emphasizes the significance of preserving and connecting green spaces and natural corridors in cities. This strategy is aligned with the more conventional infrastructure approach, which focuses on building networks to enable cities to work (Benedict & Mcmahon, 2002).

Green engineering approach:-

According to this approach, GI is a subset of conventional technical infrastructure that incorporates green features to deliver ecosystem services like freshening through the use of green rooftops and living walls (Liat Margolis, 2007).

Although there are many different physical forms of GI, the primary categories are:

- City parks, natural areas, cemeteries, and formal gardens are examples of public gardens and parks.
- Greenways, such as those along rivers and creeks, bike lanes, and pathways along major transportation corridors (railway and roads).
- Housing and other roadways, including street borders and related open space compartments.
- Athletic fields at schools and other institutions, golf courses, and large parks are examples of sports and recreation facilities.
- Private or semi-private gardens, such as those found in balconies, roof gardens, and public areas adjacent to houses and apartments.
- Green rooftops and living walls, including the top country park.
- Wetlands, coastal borders, national parks, and nature reserves are examples of natural green areas.

2.2.1 Green finance:-

"Green finance" is defined differently by various articles. However, the phrase generally refers to financial flows and equities that work toward achieving environmental sustainability goals. Sustainable finance is a more specific subset of green finance; on the other hand, green finance is part of the greater preferred idea of sustainable finance, a term that expressly covers social issues. In this observation, we choose to refer to green infrastructure and green finance. Any structured financial activity—a good or service—that aims to improve environmental outcomes is referred to as "green finance." It includes an expansion of loans, debt systems, and investments that might be used to finance the increase of green initiatives or reduce the climate impact of extra-normal initiatives. Because it offers the required financial support for the development of green initiatives, including green real estate, from a global viewpoint, green financing is increasingly being used as a catalyst in the shift towards

a greener economy. People, governments, and businesses all over the world are working more closely together to create more awareness of "green" with affiliated groups and associations, endorse legislation, and offer green funding to conserve energy and natural resources. Given the significant contribution of the built environment to the restoration of natural resources and the deceleration of climate change, a growing number of property owners and users are now open to the idea of "going green," and many have implemented green technology on and in their structures to generate energy and/or conserve energy and natural resources and to increase property values.

Green and Blue infrastructure (GBI): Role of civil society organization (CSO):-

The promotion of climate change-adaptive governance in municipal contexts depends heavily on the GBI. The most recent and important strategy created by the Pakistani government is the "clean and green Pakistan strategy." There are many obstacles and problems for the CGPS to be implemented effectively. Following the 2015 Paris agreement, CSO's now play a greater role in overcoming these obstacles and assisting local institutions, particularly in urban areas, in preparing local communities to advance the GBI and effectively tackle climate change. According to a study by (Mumtaz M. 2021), in cooperation with the administration of Islamabad, CSO's are actively involved in promoting the GBI by educating people about it, planning training sessions for the neighborhood, providing advocacy assistance, and assisting the city government in creating GBI policies and action plans. The CSO's serve as the voice of the local community in creating the GBI policies and implementation strategies at the local level through regular interactions with the local administration and the local population in the city. As a result of their strong collaboration with institutions at all levels of government—local, provincial, and federal—they have emerged as mediators in managing intergovernmental contacts for implementing the GBI. The three main issues that CSO faces are: a lack of financial resources; a lack of local organization capacity; and inadequate links and cooperation between local and international groups. The CSO's role is still in its early stages, but it is developing at a reasonable rate for Pakistan's efficient adaptive governance regarding the GBI.

2.2.2 Impact of Neighborhood characteristics:-

A network in which people spend most of their lives is referred to as a "neighborhood." The residents of the area contribute significantly to the livability of the location in many different ways, whether they are focused on their family's safety or not. The cost of property is also

strongly influenced by the neighborhood. We utilize several proximities, such as closeness to the market, school and job facilities to check the effect of neighborhoods on the cost of real estate properties inside societies, and the results demonstrate a sizable impact. The proximity to exceptional utilities has a strong connection to the cost of private property analysis. Property close to conveniences, such as schools, colleges, metro transportation stops, emergency clinics, parks, and so on, has a high cost. However, as the distance between the conveniences and property grows, the cost of the property decreases. In Islamabad, social conveniences like schools, colleges, clinics, and parks are accessible in each area of society. Likewise, the private land property considered in this study is additionally situated in the various social orders of Islamabad. So these utilities are accessible close to every one of the private properties. The distances to these services, however, induce a shift in price. Private lands with easy access to parks, schools, colleges, universities, and essential care facilities are worth more than those located a distance from these services. In a research by (Sara Ishaq Mohammad, 2017), discovered that neighborhood and structural variables affect the value of residential homes in Dubai. Homes that are built close to metro station zones cost more money than the homes that are far from the metro station zone.

The selling price of the residence and its proximity to a green urban area has an inverse relationship when it comes to the hedonic variables. Neighborhood parks are a crucial component of the city's infrastructure. Neighborhood parks serve the aim of providing a range of active and passive leisure possibilities, such as play for kids, exercise, relaxation, and social interaction, often in a well-maintained setting. A study by (CY Jim & WY Chen, 2010) to assess the variations across neighborhood parks and other natural habitats, the dummy variables Harborview and Mountview (sea and mountain views) were included. Apartments with views of mount parker or Victoria harbor were classified as 1 and those without were coded as 0. Two distance factors, Dharbour, and Dmount, were used to assess how far an apartment was from the harbor and the mountain, which could have an impact on potential home buyers' perceptions. Additionally, the benefits of neighborhood parks were contrasted with key aspects of the urbanized landscape using street and building views (Streetview and Buildview) respectively.

(Zliobaite, 2015) discovered that the cost of housing increased as a result of transportation accessibility and distance from the city center decreases. They also studied that the value of property near the midtown region is higher considering the reality that all of the fundamental

comforts are successfully accessible. For instance, as distance to a market increases, the property value decreases and statistically significant.

The same empirical results still remain true for proximity to a school. As distance from a school increases, the property value decreases and is statistically significant. Studies have looked at the relationship between the cost of residential real estate and the closeness to employment possibilities and commercial activity (Peter Barrett, 2019). Their findings imply that the price of private houses will often rise as the distance from employment locations decreases.

The value of residential assets in Pakistan is supposed to be significantly influenced by the reputation of the local real estate authorities (Munneke, 2020). In general, it is believed that variations between the costs of similar properties situated in high-repute residential housing societies and those in low-repute residential housing societies are a feature of the reputation of housing society. We divide the pattern data into two categories in this analysis to represent the high reputation and low reputation of the housing societies.

According to (Netusil, 2000), public entities were more likely than private ones to permanently protect open spaces in Portland, Oregon. She, therefore, postulated that single-family homes with relatively substantial amounts of open space and water resources inside a 14 mile buffer of each property would have a larger effect on sales price if they were publicly held as compared to privately owned. She hypothesized that this might be due to disparities in resource accessibility, resource quality, and management-related beliefs. The effect on sale prices of public and private sector-owned natural areas, green parks, or country clubs, however, were not noticeably different.

According to (Rogers, 2010), hedonic models are used in Saint Louis, Missouri, to assess the real cost of residential houses. Homes close to the club are more expensive to purchase than those close to the pool. The relationship between home values and the distance to the nearest club is highly significant. Home value and the distance to the pool are poorly correlated.

A study conducted in Sydney, the distance of the road network is only recently being used as a substitute for central business district proximity. According to a study, housing prices fell by 0.51 percent for every 1 percent increase in distance from the central business district (Abelson et al. 2013). Another study conducted in Sydney by (Mcintosh et al, 2018), found that a 1 percent increase in distance from the central business district results in a 0.05 percent

decrease in land value. In a study of the transit impacts on home prices, they used road-network distance to account for Sydney central business district effects. Using the distance from the road network as a proxy for the central business district's closeness, a different study on the effect of distance to central district on Sydney's housing market discovered a bigger house price fall of 6.5 percent for every 1 km away from the central business district (Mulley et al. 2018).

(Mulley and Tsai, 2016) used the same distance matrix to examine the effects of bus rapid transit on home prices in Sydney, finding that values fall by 1.1 percent for every 1 km away from the central business district. These various central business district proximity effects give rise to questions concerning the application of various distance measurements.

In a hedonic model to determine the consequences of air pollution, (Gordon and Richardson, 1986) took into account "weighted average prospective employment," a measure of employment accessibility, coupled with distances to the central business district, the closest employment hub, and the Pacific Ocean. None of the accessibility to jobs or distance matrix had significance. Numerous hedonic tests, with estimates of either significant positive connections or non-significant relationships, were mentioned by (Bender and Hwang, 1985) as evidence that the mono-centric negative price increment was not supported by these studies.

According to a study by (Gaolu, 2015) in Sydney, the fall in land prices and consumption with increasing distance from the central business district has been difficult to demonstrate in past research, which also pointed out that estimating has frequently produced positive or insignificant results in testing of rent gradients. (When estimating a hedonic model in the simple, mono centric example of state college, Pennsylvania, he finds a negative rent gradient). In comparison to distance to the central business district, these measurements were significant and better predictors. Belfast travel times and employment accessibility were used to generate a hedonic model by (Adair et al. 2003). They discovered that the accessibility factor was important in some submarkets but not overall.

To anticipate housing costs, (Orford. 2000) combined distances to various employment areas with distances to other local attractions. Distances to secondary employment centers were found to be significant in all of these investigations, and their inclusion in the models led to better predictions than those that could be made using merely distances to the central business district.

As an illustration, (Vivian WY Tam, 2019) discovered that a variety of proximities may be utilized to evaluate the value of real estate properties in Shanghai. The sale price of properties has been positively impacted by a property's accessibility to amenities including hospitals, schools, and parks. On the other hand metro station and the growing distance between hotel units and the city center both have a negative impact on the price at which shanghai homes are sold.

Similarly, (Jennifer L. Black, 2008) argues that geographic distance significantly influences the evaluation of real estate assets in the United States of America. Apartments close to workplaces, universities, and educational institutions greatly boost the value of surrounding properties.

To evaluate land values in Los Angeles, (Giuliani, Gordon & Ji Young, 2010) utilized a hedonic model with various job hubs, while (Waddell et al. 1993) incorporated distances to additional regional amenities to predict house costs. The unexpected conclusion of these two studies is that distance to the central business district may no longer be a significant determinant of land values and house prices, even though distances to employment sub-centers were also found to be important predictors.

On the other hand, (Wang Wei, 2010) concludes that neighborhood amenities are an important aspect to consider while identifying residential homes in Harbin, China. Amenities like educational institutions, parks, and workplaces are among the most crucial considerations when choosing real estate sites. He found that, in contrast to other fundamental amenities like hospitals and parkland, housing facilities near academic institutions are comparatively more expensive.

Parents make an effort to keep their kids from going to remote places. People will pay more to live close to educational institutions. Furthermore, the rent for properties near educational institutions is expensive, (Ord, 2010) Found that in San Diego, homes close to educational institutions such as schools and colleges are much more expensive than homes farther away from schools and colleges.

Additionally, (Schlapfer, 2010) claims that the price of real estate is affected by the proximity of lodging units to educational institutions, mainly schools. Most parents prefer to buy a home close to their children's schools to save money on transportation. For instance (Haizhen Wen, 2014) found that real estate properties in China are more expensive when they are close

to schools and colleges. To cut down on travel time and costs, people prefer to invest in and buy real estate properties close to educational institutions. Another study in china by (Chi Y Jim, 2006), discovered that private homes near to schools in Guangzhou China are more valuable than apartments farther from schools.

For a few people who've scientific conditions or hypersensitive reactions to substances or chemical substances, it's vital to keep away from residential belongings or regions with high pollution, which includes nitrogen dioxide, carbon monoxide, and sulfur dioxide. For instance, (Thomas M. Carroll, 1988) discovered that a chemical factory explosion caused a decline in residential property values in Nevada, USA. The residential facilities in Seoul, South Korea which are nearest to the industrial area are less expensive as a result of harmful chemicals found in the environment (Downtown office location dynamics and transformation of central Seoul, Korea, 1999) due to the higher cost of properties outside the industrial zone.

In a study (Feng Lan, 2018), found that the natural environment in Hangzhou, China which featured a park, a mountain, and a lake favorably enhanced the price of residential homes. Another study by (Feng Lan, 2018) found that the residential units are very expensive compared to nearby amenities, especially schools, universities, and other educational institutions. He also found that the value of property near these amenities is much higher than the residential units which are apart from these amenities.

While many scientists have discovered that proximity to a lake, volcanic mountains, and forest has an impact on a home's price, other scientists have discovered that the same is not necessarily true. For instance, (Philippe Belanger, 2018) found that in the United Kingdom, private properties located next to a river, lake, or spilled stream determine property costs as the distance of the residential property from these amenities decreases and the value of property increases.

In addition (Yigiter, 2000) observed that the value of private residences in the surrounding area of Istanbul's Kocaeli mountain is incredibly low, given that the region is frequently affected by earthquakes. The interest in the land properties has decreased as a result of the seismic quake's damage to the real estate. The value of property near the kocaeli mountain is low than the property which is farther away from the mountain.

Property values in the area have decreased as a result of the various earthquakes that have hit San Francisco. Residential homes near the mountains in San Francisco were found to have a

low value the prices start to increase as you get farther from the mountains (Heather Sander, 2010).

Online shopping has, however, become a threat to traditional malls in recent years. Future shopping centers are anticipated to take on new forms and features. Because of this, malls now play a different part in people's everyday lives as a result of the worldwide trend. People today anticipate experiences that go well beyond simply purchasing the items they require and leaving the store before returning to the mall. Consumer spending on leisure and shopping has been enormous. Therefore, designers of shopping malls are looking for ways to make shopping and buying a more leisure activity. Several strategies are used by newly built shopping centers to try to meet these new expectations. These shopping centers are seen as places where the general public may go for both convenience and entertainment. Therefore, it makes sense to infer that having a shopping mall nearby gives consumers more flexibility and happiness. Therefore, ideally, it should have a favorable impact on house prices nearby. According to (Seago J, 2013), the relationship between commercial amenities like shopping malls and their consequences can still be unclear. This issue has been the subject of some prior investigations. However, the majority of earlier discoveries had a strong emphasis on other areas. For instance, (Osborne, 2009) studied location and rents, whereas other studies focus primarily on urban growth and the functioning of shopping malls play in society as a whole (Guldmann, 2013) and (Mukaddes Fasli, 2016). Furthermore (Feyzan Erkip, 2005) studied, how it has affected the urban lifestyle.

2.2.3 Impact of structural characteristics:-

According to (Atasya Osmadi, 2015), the accommodation and size of the residence are the first categories of dwelling qualities that affect property prices. The degree to which the accommodations met consumer preferences and tastes influenced the value to be assigned to the home. The number of bedrooms and bathrooms, size, and floors are among the factors that are primarily taken into account in this regard. The second category consists of material and structural modifications. The standard of building materials used and the extent of structural upgrades made to a structure may also play a significant role in determining the cost of a home. Physical aspects, such as the type, style, and quality of various building components, are taken into account in this regard. This category includes structural upgrades like fencing walls, gates, landscaping, swimming pools, gardens, and other attractive features inside the boundaries of the property. The age and condition of the home make up the third

group. A home's age and condition are also significant factors that could affect property values and prices.

The number of bathrooms, square footage, house type, building size, and other amenities offered within the dwellings like water, a pool, electricity, and natural gas was also found to have a significant impact on house rental prices in the study by (Selim, 2009)on the factors determining residential property values in turkey.

A study by (ChengjieHe, 2010) indicates that the floor area ratio (FAR), land transaction price, and distance from a city's center are the top three factors influencing residential housing prices. In this study he estimate that these three elements account for 98.8 percent of the price. To demonstrate this, the authors utilized a linear and semi-logarithmic regression model. Although there was a strong association between the structural factors, some variables performed better in regression analysis. As a consequence, factors like a park, access to public transportation, the presence of a hospital, and others were greatly outweighed by the transaction price, distance from the center, and other utilities.

On the other hand, (Cebula, 2009) argues that factors that mostly have to do with interior design and functionality showed beneficial effects on pricing. It was discovered that certain interior features, such as the number of bedrooms, square footage, fireplace, etc., were more statistically significant than certain exterior features, such as closeness to bus stops, the waterfront, stores, and other public amenities.

(Lan C. Mell, 2016) Found that transactions in scenarios with better indices of green infrastructure, for example, from small bushes to huge trees or from no grass to patches of grass, will increase customer willingness to pay for greenery.

According to several Australian research studies, such as those by (Dafna Merom, 2008) people will use walking pathways if they are available. The essential qualities of walk able communities, according to (South Worth, 2005), are road quality (paying attention to elements like width, paving, planting, and lighting), safety, connection, linkage with other transportation modes, as well as patterns of land use and road surroundings. The passenger is visually stimulated by the surroundings of the road. The path context is visually stimulating to the pedestrian.

In Peninsular Malaysia (Nur Hafizah Ismail, 2014) studied the effect of flood duration on residential property values using a hedonic pricing model. They used housing attributes such

as location, structural, and neighborhood attributes in their study. They established an interaction between flood duration and structural attributes to see if the effect of flood duration on residential property value varies by house age, land area size, and number of bedrooms. According to the findings, flooding reduces the sale price of residential property by 0.015 percent.

A study by (ChengjieHe, 2010) indicates that the floor area ratio (FAR), land transaction price, and distance from a city's center are the top three factors influencing residential housing prices. He used the hedonic pricing method to examine the effects of structural variables such as land transaction price, distance to the downtown area, central business district, railway station, and hospital, floor area ratio (FAR), number of bus lines nearby, and dichotomous variables such as proximity to rail transit, recreational facilities, and parks on housing transaction price. The results of the correlation analysis revealed that structural variables such as proximity to rail transit and the presence of recreational facilities had a significant positive correlation with housing transaction prices. However, the increase in distance from the downtown area lowers the flats' selling price and the overall value of the units declined by 18 percent as beach proximity increased.

The selling price of residential properties in South Africa that are in the vicinity of the delta plains has decreased by 12 percent. This is due to the distance between residences within a 100-meter radius. Similar to this, the change in real estate selling prices was less affected by proximity to wetlands (Morgan and Hamilton, 2010)

(Bengochea Morancho, 2003) Results suggest that the most important factor affecting pricing was the size of the home. When purchasing or renting residential assets, people observe the property size and range of bedrooms to suit their needs, as well as views from the belongings, the quality of constructing substances and electricity performance components. He found a significant positive relationship between the size and the property value. Another important factor is aesthetics (Shardul Agrawala, 2011), it has been demonstrated that having designated walking pathways for specific purposes may increase walking for refreshment.

2.2.4 Impact of locational characteristics:-

Other concerns in the decision to purchase or lease a house are locational, which include proximity to facilities consisting of faculties, administrative centers, shops, and health care. Retailers can benefit from green infrastructure enhancements, particularly the addition or

upkeep of wooden and the landscaping around their houses. There is a lot of research that indicates being close to various significant places improves the value of residential units. Many important scientific publications support this point of view. As a result, (Yanbing & Zhang, 2012) and (John & Ottensmann, 2008) imply that one of the most important price-forming elements in the real estate market is the distance to the city center. The price of a home is negatively impacted by increasing the distance from amenities such as city center, markets and educational institutions, whereas the price of a home is positively impacted by the smallest distance to the amenities (John Ottensmann, 2008).

For instance, (Ceccato, 2011)discovered that in Stockholm, residential homes close to shopping malls sold for more money than residences farther away from shopping malls. The cost of homes close to offices is higher than that of those farther away from them.

In a study, (Jud, 2003)discovered that the city center determines the genuine worth of each residential apartment in the United States. The distance from the downtown area is taken into account because of the valuation of housing prices, a home's value decreases as the distance increases. The value of private flats in the town or downtown area is high in Dalian, China.

In a research (Weng, 2011), found that real estate investments in Washington next to pipelines carrying oil and other hazardous materials were risky. The pipelines were destroyed by the bomb, and the property closest to them suffered the most damage. As a result, the selling price of residential properties fell by 13 percent.

According to (Tingting Liu, 2017) the low cost of housing near Narragansett Bay is a direct result of the problem of water pollution. The surrounding houses close to Narragansett Bay started making improvements in many places. As a result, there are a ton of homes available and the prices are inexpensive in the surrounding neighborhood.

Wildfires, on the other hand, have stopped property buyers from making investments close to the forest, which had a negative impact on the selling prices of residential homes in the surrounding districts. In a research (Julie M. Mueller, 2018) discovered that wildfires lower the value of property near risky locations in various US states. Residents and investors in the area have left as a result of this incident happening frequently.

According to research by (Hu Lirong, 2019), proximity plays a significant role in estimating the actual price of real estate in Fuzhou, china. Homes in residential areas that are close to

parks typically sell for more money. Because outdoor activities are popular among Chinese people, their primary efforts are directed toward buying real estate close to parks.

According to (Tsoyu Calvin Lin, 2019), residential properties in Taiwan that are close to unsafe sites and places without access to clean water are less valuable than those that are farther away from these locations. Taiwanese citizens consider the environment to be a big problem. As a result, they decided to make investments in locations with easy access to pure drinking water.

Sydney residents estimate the cost of housing based on travel time and distance between their home and the city center. Investors pay a premium price when purchasing real estate assets in locations where all amenities are easily accessible. Saving money on transportation and time is the main driving force for this choice (Shanaka Herath, 2021).

(Brian Saelens, 2008) examined several studies of the built environment that contained correlations for walking, separating walking for pleasure from walking for transportation. The authors come to the conclusion that suburban density, the distance to nonresidential destinations, and the diversity of land uses are all consistently connected with walking for transportation. Walking to school, closeness, density, the value of the green infrastructure, and traffic safety all seem to be beneficial to kids.

For instance, (Aliyu, 2016) found that noise issues close to the airport had a negative effect on home prices. Most North Carolinians prefer to invest in a peaceful setting. The noise effect caused a 10 percent reduction in the value of nearby real estate holdings in North Carolina. Similar findings were made by (Molly Espey, 2000) who found that the airport's noise lowers the value of nearby properties.

Air pollution is another factor affecting the city's real estate market. Prices rise as the distance between the airport and the homes increases. He also found that the property values in less desirable locations like cemeteries decrease and property values in areas with closer proximity to attractive green spaces like parks, lakes, or water bodies (Fabian & Waltert, 2010).

According to (Anderson and West, 2006), suburban residents who live farther from the central business district and in an area with a small number of people, the value of property with high proximity to green space is higher than urban residents who live in more densely populated neighborhoods near the central business district. Results of the study shows that the

benefit of having access to neighborhood parks is roughly three times greater than the average in areas that are twice as dense as the average neighborhood, whereas the benefit of having access to special parks is two-thirds higher. This finding indicates that estimates of the value of homes in various areas will either overestimate or underestimate the benefits of green space for the average home in a metropolitan area. Therefore, conclusions from research on city preferences shouldn't be applied to development in the suburbs.

According to (Elizabeth Howard, 2007), Neighborhood parks have an amenity value that is more than four times higher than normal in communities that are on average twice as wealthy, whereas special parks have an amenity value that is more than twice as high. The amenity value of living close to special parks and neighborhoods decreases as crime rates do, indicating that both kinds of parks act as protective barriers against the negative effects of crime. The value of green spaces was also found to be negatively significant with the number of crime rates in the area. Land prices are significantly impacted by the crime rate. The cost of land increases when the percentage of crime decreases and vice versa. Therefore, neighborhood parks have a favorable impact on house prices nearby.

2.2.5 Impact of green infrastructure:-

Business properties with an all-around planned green foundation can receive the benefits of higher rents and property estimations, expanded retail deals, energy investment funds, neighborhood monetary incentives (for example, tax breaks, reimbursements, and credits for storm water charges), lower life-cycle and maintenance costs, less flood damage, lower water payments, less crime, and increased workplace wellbeing and career fulfillment. In fact, because they outline an engineer's obligation to improve, green infrastructure and other green infrastructure practices are increasingly becoming a quality benchmark for the commercial sector, maintainable networks and spot making, while at the same time making quantifiable value-added for land owners and occupants the same. Green infrastructure is an association of decentralized tempest water board practices. As an example, green rooftops, bushes, gardens, and porous asphalt, that could trap and enter into downpour in which it falls, along those lines lessening tempest water overflow and working on the energy of encompassing streams. While there are numerous sizes of green foundations, for instance, large regions of green land placed for protection, this guides facilities around GI's advantages within the metropolitan setting. Based on proximity or adjacency, it has also been discovered that water features like rivers and lakes increase the value of nearby properties. The capability of these practices to

carry numerous biological, financial, and social blessings or administrations has made green foundation an unavoidably well-known trick recently. As nicely as the diminishing effect of tempest water overflow, GI practices can likewise emphatically affect power utilization, air pleasant, carbon lower and sequestration, belongings prices, diversion and distinct additives of nearby vicinity health and essentialness which have value associated or different social worth. Also, green infrastructure rehearses provide adaptability to networks confronted with the need to regulate the foundation of an evolving environment. Technological developments have led to numerous environmental problems during the past few decades. The concept of "green finance" was developed to tackle these problems and suggests that the public and private sectors integrate technological development, innovation, and the greening of the economy in order to discover untapped economic growth potential. This study examines urban green spaces and how they affect real estate valuations. The importance of green finance for developing nations has improved because the quality of their environment has deteriorated over time. In recent years, green finance has emerged as a commonly used method for managing environmental problems. Urban green parks offer the same social and natural functions as gardens and forest, on a micro level. City parks and gardens are primarily there to absorb carbon dioxide (CO_2) emissions. The use of private vehicles for urban transportation is mostly to blame for these emissions, which have considerably increased over the past few decades. From a monetary perspective, however, the gains of urban green areas take time to pay for because they are public goods without a market price. These open areas have no economic cost, so they cannot be effectively taken into account in cost-benefit valuations of public city planning. We face the risk of having less than average resources for urban green spaces as a result. Most of these examinations have focused on the more conventional types of infrastructure (streets, water and media transmission lines), while the monetary effect of GI, being a moderately new type of infrastructure, and presently can't seem to be entirely explored. Green infrastructure may attract tourists, purchasers, and ventures by improving ecological quality, carrying viable financial advantages to encompassing regions, and advancing the prosperity and sustainable advancement of the local economy. Due to slight variations in the quality of the plots, societies near green spaces like parks and gardens have various pricing patterns, even within the same society and sector. For instance, the pricing of residential plots in the various sectors/blocks of the community varies greatly in Bahria Town, DHA Islamabad. The other factors mentioned previously were considered in this study as well, although they did not have the same impact as those previously discussed. As cities continue to decentralize and grow towards their peripheries in

the twenty-first century, the trade-off between expanding and protecting green space becomes an increasingly important issue. Even though development can help meet a population's needs for more housing and commercial space as well as increase tax base revenue, green spaces offer a number of benefits.

According to (Robert Costanzo, 1997), green spaces provide vital environmental and recreational purposes. It is common understanding that forests and other types of greenery serve as the base for the protection of animals and plant life, regulate rainfall, moderate temperatures, absorb atmospheric carbon, and maintain a particular level of atmospheric humidity. Recreational examinations that focus on connecting with nature are growing in popularity.

According to (Kuo and Sullivan, 2002), the difference between non-green and moderately green buildings was bigger than the difference between moderately green and highly green buildings. Well-kept vegetation may serve as a sign of carefulness, since it suggests that the community is more observant and cares about the environment.

In a study of workers exposed to various types of roadside corridors, it was discovered that those who traveled through metropolitan areas with a high concentration of human artifacts experienced greater levels of stress than those who traveled through natural areas like forests or golf courses. The natural urges also appear to have a shielding effect against potential daytime pressures in the future (Parsons R Tassinary, 1998).

(Kaplan Stephen, 1995) reinforces the idea that green infrastructure can be evolved and placed into use in a manner that maximizes the applicable co-advantages. For instance, research proposes that both the presence of plants and the association of green components have a beneficial effect on people's choices, as evidenced with the aid of such signs as rising rents and property values. Both residential and industrial settings benefit from having access to green areas and natural surroundings. Similar to single-family homes, the qualities of a commercial property in an urban setting, such as the lot size and building's square footage, the proximity to natural amenities, such as parks, waterways, and open space, as well as other considerations, all affect the value of the property (e.g., crime rate, location relative to businesses, etc.).

Investments in green infrastructure can benefit retailers, particularly when it comes to establishing or maintaining landscaping and trees on their properties. Numerous studies on

urban commercial districts and shopping areas have shown that consumers are willing to spend more (or pay a premium) for goods, come more frequently, or travel further to buy them in locations with attractive landscaping, good tree cover, or green pathways (Burcu h. Ozuduru, 2013).

An ongoing frame of work focusing on city commercial enterprise districts and local shops has observed that consumers are willing to spend more or pay a premium on merchandise, go to greater frequency, or travel farther to save in regions with attractive landscaping, top tree cover, or green streets. According to (Tarran, j, 2009), who also found support for these findings, consumers are prepared to go further to make purchases in greener locations. Retailers can benefit from green infrastructure enhancements, particularly the addition or upkeep of timber and landscaping on their houses. Green pathways are another option for creating green infrastructure and "a new walk able, public location that will help attract more tourists".

According to (Newell et al, 2013) in areas with established tree tops, customers claimed they were willing to spend up to 12 percent more. Local greening projects have proven to be most effective when businesses collaborate, as they would in a formal business area, to provide customers with a more expansive shopping experience. In order to create a pleasant environment, green infrastructure modifications must be carefully maintained.

Numerous attempts have been made to calculate the value of the ecological system delivered by a public green space or the financial gains produced by a single tree (Bourdeau & Brien, 2017). Some of the advantages they have tried to quantify include the decline in air pollution, the decline in storm water runoff, the direct capture of carbon, the indirect reduction of emissions because of the cooling effects of trees, and increased property values in forested areas.

In view of recent trends toward increased property development, particularly in metropolitan areas, the capacity to evaluate the economic benefits of public parks and green spaces is essential to ensuring their presence and protection. According to preliminary research, green space boosts real estate costs because renters and homeowners are willing to pay more for the advantages they anticipate living nearby would provide. (Crompton, 2001) argues that it is critical to consider the nature and purpose of a green space. Early 1980s research in Worcester, Massachusetts examined the relationship between four parks and the values of all residences sold within 4,000 feet of each park for the preceding five years (n 1/4 170). The

multiple listing service that was utilized to compile the study's data recorded a home's actual sale price as well as information on the lot size, the number of rooms, the age, the garage, the taxes paid, and any other factors that would affect the price (Crompton J. L., 2001). Through regression analysis, the author came to the conclusion that location influenced property values in all seven areas. The impact of distance to the nearest park was also given in this document as well. According to the research, a home that was 20 feet from a park typically sold for $2,675 more than one that was 2,000 feet away. However, 80 percent of the entire increase in value was attributable to properties that were 500 feet or less from the parks. Beyond 2,000 feet from the parks, no effects could be found. These figures were used to calculate the $3.5 million total increase in property value due to these parks.

Because green space offers a range of advantages, including those that are environmental, recreational, transformational, aesthetic, and health-related, there is no way to quantify all of these advantages at once. Because not all green spaces are created equal or provide the same amenities, their effects on property value may vary. Certain city planners, urban developers, and government officials view any open or undeveloped area as a waste of resources. They believe that development leads to riches through greater tax revenues. According to those who oppose green spaces, the privacy of individuals whose homes directly surround greenways will be disturbed, there will be more strangers in the neighborhood, there will be more noise, more stealing and crime, and there will be more people walking around polluting,. According to some studies, all of these factors have the potential to diminish the commonly acknowledged positive impact that green spaces have on property values (Crompton S. N., 2005).

According to (Crompton D., 2001) theory of proximal principle, the price of residential properties "proximate" to a given amenity, like green space, at least somewhat reflects its value. If it is expected that homes or properties located close to open green space would be perceived to be desirable, the additional money that homebuyers and renters are willing to pay for this location implies a "capitalization" of the land into adjacent property values.

According to (Maharjan, 2019), when property prices increase, higher taxes paid by all nearby homes may cover or even exceed the cost of obtaining, building, and even maintaining the green space. As a result, many public parks, including central parks in New York City, were initially constructed with the hope that they would boost city tax revenues in

both a direct and indirect manner. Because of their potential to impact the local economy, green areas are therefore essential to urban and suburban development.

There are a number of earlier studies that support (Crompton J., 2004) proximal principle. For instance (S. N. Crompton, 2005) used Crompton's proximate principle in their study to quantify the property values in specific location. The relationship between green space and property values can also be influenced by a number of other elements, such as the many forms of desirability associated with green space and the physical qualities of the green space itself.

The study by (Anderson and West, 2006) looked at the relationship between property values and the proximity to various types of green areas including country clubs, cemeteries, neighborhood parks, and special parks, using data on house transactions in the Minneapolis-St. To distinguish them from neighborhood parks, which are frequently more urbanized and have fewer recreational opportunities and natural elements, arboretums, nature centers, natural areas, and wildlife refuges are referred to as special parks. Their hedonic model differs significantly from that of (Loomis, 2008) in that it allows the effects of proximity to depend on a completely different range of variables, including population density, income, crime, population age, and distance from the main commercial district. They also take into account neighborhood characteristics and any ignored spatial factors using local fixed effects. They found a significant positive relationship between the green areas and the property value.

(Nicholls S, 2020) and (Anderson and West, 2006), both studies provide quantitative measurements to pinpoint the numerous factors impacting Crompton's proximal principle, even if their research on fundamentally distinct green space zones (one more urban than the other). Understanding the impact of green space on property value will help in the development of better homes and more desirable neighborhoods, as well as assist regional developers and government officials in making better decisions regarding the provision, design, building regulations, and use of these public utilities.

Although many of the advantages of having public green spaces seem clear and simple to describe, it is frequently considerably more difficult to put a number on them. Urban and suburban green spaces are normally publicly funded assets without a fixed market price, but it is becoming more and more common to assess them in terms of the financial benefits they give to the neighborhoods in which they are located. Therefore, it is necessary to convert the numerous assumptions about the inherent benefits of green space into detailed, quantitative

evaluations of its value Studies on parks and open spaces have proven their beneficial effects on home values based on proximity. According to (Crompton L., 2005) work, properties that are closest to green parks or other open spaces typically see a 20 percent premium or rise in value over comparable properties.

Scientific evaluation of the inherent and external offerings of neighborhood parks may be able to provide convincing justification for investors to fund their asset and management fees (Johan k hanger, Stevens, Allen and T more, 1982). An ongoing frame of work focusing on city commercial enterprise districts and shops has observed that consumers are willing to spend more (or pay a premium) on merchandise, go to greater frequency, or travel farther to save in regions with attractive landscaping, top tree cover, or green streets. The inherent characteristics of neighborhood parks would undoubtedly define their benefits and thus the paybacks provided to the neighboring local area. Their overflow impacts would likewise offer inviting externalities for adjacent residents. Inside their visual effective range, the neighboring residents could appreciate wonderful perspectives and related mental health, and a nice deviation from the unchanged buildings. Although neighborhood parks are small, they play an important part in setting up acceptable living surroundings and pleasant lifestyles for adjacent citizens.

A study by (Takemi Sugiyama, 2009) included both a proportional and a distance measure of proximity when analyzing mixed-use developments in wake county, Britain, and found that prices were high "for houses that are closer to public parks or are located in neighborhoods with a relatively large percentage of land devoted to public parks". Therefore results suggest that the improved green spaces and parks in urban areas to encourage older individuals to lead more active lifestyles.

In Austin, Texas, Milwaukee and Wisconsin, for example, urban trees eliminated the requirement for additional maintenance, detainment, and treatment limits, resulting in storm water management benefits assessed at US$122 million and US$15.4 million, respectively (David J Nowak, 2018).

According to research conducted in Canberra, the city's trees save money every year through reducing energy use, pollution, and storm water runoff (Norman, 2020). A different study (Stringer, 2007) attempted to decide the gross yearly advantages of individual trees in Adelaide, with a typical four-year-old tree being projected to produce a gross yearly

advantage of generally $171 per tree. This included energy reserve funds from lower cooling costs, better air quality, storm water management, and different benefits.

Numerous studies demonstrate that the effect of distance on house prices decreases as the distance from open space increases. Analysis of Leipzig, Germany, on the city scale revealed that rent for flats increased in price with the size of the closest green space. The Paul metropolitan area house transaction data was used in the study to examine the association between property values and the proximity to various kinds of green areas. One year's worth of sales data in Singapore revealed a significant positive correlation between the vegetation and the value of public residences (Belcher, 2019).

Moreover, a critical relationship was found between psychological wellness and distance to GI. Extending distance to green metropolitan regions was found to essentially diminish life fulfilment. Various examinations and regression analysis have shown that green infrastructure projects will generally boost monetary movement, usefulness, and property estimations, while likewise giving huge overflow impacts that positively affect personal satisfaction on networks like financial turn of events and job change, energy productivity, and general safety wellness. According to certain studies, distance to green spaces and physical activity levels are related (W. Wendel-Vos, 2007) and (OwenDouglas, 2017). In 2007, a study by, (A.E. Bauman, 2007) identified links between park accessibility, perceived safety, aesthetic appeal, and physical activity. In their extensive assessment of data, (Kaczynski & Henderson, 2008) also discovered a beneficial relationship between the availability of recreational areas and physical activity.

According to research (Andrea Faber Taylor, 2002), young ladies who lived in flats with greenery and more natural surroundings performed better on tests of self-control than the people who lived in more dry convenience. Those who lived in flats with greenery and vegetation just outside reported better effectiveness and less fatigue in addressing their important life challenges.

Adding trees makes life more manageable. The presence of vegetation may reduce crime in urban areas. Far fewer crimes were reported in apartment complexes with surrounding trees and vegetation than in comparable apartment complexes without vegetation (Frances E. Kuo W. C., 2001). Results of the study show that property values and the availability of open green space are related.

An analysis of more than 30 research on the effect open spaces have on residential property values revealed an increase in sale prices; the magnitude of the increase depends greatly on the open space's area, proximity to housing, type, and analysis method. The analysis discovered boosts in home values about 200 meters away from the park (Nicholls, 2002).

The closeness to parks and playgrounds is taken into account in earlier literature when valuing residential real estate. For instance, proximity is an important factor in assessing whether the value of a housing unit has increased or dropped. A study in New York by (Hagerty, 1982) found that the price of homes in northwest Montana was positively impacted by how close they were to parks and golf courses.

In a study, (Lennon H.T. Choy, 2012) discovered that natural areas, such as parks near residential properties, help to raise the value of dwellings. Where trees are planted, communities grow; trees and other greenery in common residential areas help create safe, strong communities.

In comparison to residents of more dried but otherwise equivalent apartments, those who lived in buildings with more trees and greenery in surroundings said, they knew their neighbors better, interacted with them more frequently, felt a stronger sense of community, and were safer and better adjusted (Frances E. Kuo M. B., 1998).

In order to evaluate the impact of the percentage of public parks, private green areas, and country club areas within a quarter-mile of each property in the sample, the study author of the following Wake County used two different criteria. The coefficients for each of the six situations were positive. Every additional 1 percent of public parks within a quarter mile cost $11.26. For commercial green areas, the premium was $4.53, and for country clubs, it was $8.50. As a result, the premium for public parks was 250 times higher than the premium for private green areas, according to (Babak Raji, 2015).

While many scholars have focused on the area nearer the lake, the natural environment, mountains, and other factors affect how much a house costs. The cost of housing in the United Kingdom is negatively impacted by the private properties that are closest to streams, lakes, or overflowing streams. The total value of the units declined by 8 percent as a result of the increasing proximity to the ocean (Philippe Belanger, 2018).

In fact, (Ryan G. Miller, 2022) recognized that, in many American settings, the sale prices of private houses decline close to flooding zones. The particular distance from the flood zone increases the cost of flooding by 5 percent per meter, etc.

According to some studies, a built-environment design that incorporates GI can promote incidental interactions with other people and with green spaces, which can strengthen a sense of community. Urban parks and gardens that support elements like social connections, trading, community building, social networks, and mutual trust might improve social integration (Armstrong, 2000) and (Leyden, 2003).

According to some studies, urban trees have gained substantial cultural and symbolic significance (john f dwyer, 1991) suggesting increasing one's understands of urban trees to include factors beyond aesthetics, shade, and comfort, as well as the psychological bonds that exist between people and trees.

In addition to crosswalks, Athanasios looked into what makes roadways considered to be "excellent streets" for walking (AthanasiosVotsis, 2017). His findings were that, given a restricted budget, planting trees would be the most cost-effective investment for a wonderful street because they serve as more than just decorative features in such settings. GI may make neighborhoods more walk able, which promotes a sense of community by increasing neighborhood interaction and social wealth. It has been discovered that street trees, gardens, and parks play a significant role in enhancing the pedestrian appeal of roadways.

Urban areas' quality of life is decreased by noise from transportation and other sources. On the other hand, the value of residential units near major roads has decreased as a result of noise and pollution. In addition to increasing aesthetic value, green roofs significantly improve noise reduction (Botteldooren, 2014).

According to (Timothy Van Renterghem, 2016), sound can be filtered and dispersed by trees and other plants. Planting trees is the most economical approach to enhancing the climatic conditions in cities, claims Urban forests and trees support a variety of climatic benefits, including enhanced health, particularly for the elderly, reduced energy use and carbon emissions, and assistance with climate change adaptation.

According to (Loren P. Hopkins, 2022), there are two main natural ways for trees and other plants to alter urban microclimates and diminish the effects of the urban heat island effect:

- Vapor-transpiration, which cools and humidifies the air.
- Temperature reduction by protecting urban surfaces from solar radiation.

A city's temperature may be impacted by adding more green space, and estimations of the amount of cooling under various climate scenarios have been generated. Modeling in high-density residential areas and town centers in Manchester, UK, revealed that a 10 percent increase in green cover could keep maximum surface temperatures there at or below (Taleghani, 2019).

(Gill, Handley, Ennos, & Pauleit, 2007) Studies have also looked into the eventual acceptability of storm water collection as a substitute water supply (Tony H F Wong, 1999) in Wong's opinion; urban storm water collection can boost the availability of freshwater for cities while also enhancing the quality of the water in riverbanks and receiving bodies of water. Reduced heat stress, enhanced waterway flow equilibrium between slow and high flows, and improved landscape facilities are further benefits of storm water collection. Installing low-cost vegetated swales is the only exercise that satisfies this criterion, but swales are only suitable for a small part of all commercial sites based totally on standard value estimates (scaled to Philadelphia construction costs) for a range of green infrastructure control practices that may be used at business sites. The use of street pavement, rain gardens, green roofs, and flow-through planters, for example, has higher fixed costs and would no longer obtain a 10-year payback primarily based on avoided storm water expenses in the modern marketplace (Mont alto f, 2017).

(Nicholas S G Williams, 2010) looked into knowledge gaps and difficulties to examine the potential for greater adoption of green roofs. Exhaustive and widespread green rooftops are the two basic categories. At substrate depths greater than 20 cm, exhaustive green rooftops can support difficult undergrowth populations. They are frequently created as country parks for people to utilize and typically need irrigation, management, and additional roof operational strengthening (Erica Oberndorfer, 2007). Large-scale green roofs are often covered with plants that grow slowly, are drought and fire-resistant, and have a deep foundation thickness of less than 20 cm (Dunnett and Kingsbury, 2004) and (Erica Oberndorfer, 2007). Green roofs offer building residents several advantages, such as enhanced insulation that results in a reduction in the need for freshening in the summer season and warming in the winter (Sailor, 2008).

(Kosareo and Ries, 2007) describes the environmental cost characteristics of intensive and extensive green roofs versus conventional roofs over their life cycle. A life cycle inventory and environmental impact assessment are used to evaluate and compare the environmental impacts of all three roof systems' fabrication, transportation, installation, operation, maintenance, and disposal. A conventional ballasted roof, an extensive or shallow growing medium green roof, and an intensive or deep growing medium green roof are all part of the research. The results show that the energy use reduction is not significant in terms of overall building energy use, but it is significant in terms of environmental impact over the building's life cycle.

There is evidence that trees have an impact on real estate costs. (Wolf, 2005) surveys and numerous studies revealed a preference for investment centers with trees, which also affected how customers perceived selections and their belongings. Respondents to the survey said, they would spend more, travel further, and return more frequently.

Studies in Philadelphia's suburban areas have revealed that the presence of trees increases a residential unit's selling price by anywhere from 1.9 percent to 3 to 5 percent (Dombrow, Rodriguez, & Sirmans, 2000). Additionally, there was a strong correlation between increasing housing values in commercial districts and well-maintained greenery and trees (Dong, 2018).

(Butry, 2010) Estimated the impact of street trees on the sales price and the time-on-market (TOM) of homes in Portland, Oregon, using hedonic price modeling. They discovered that street trees reduced TOM by 1.7 days and increased the sales price by \$8,870 on average. Using hedonic property price modeling, they calculated the value of urban tree cover and concluded that neighborhood tree cover had a considerable beneficial impact.

Other empirical literature suggests that recreational areas, aesthetic appeal is equally important. For instance, (Kirsten Koehler. 2018) demonstrated that policies to protect green areas should have, as their desired outcomes increased mental activity, social connectivity, and improved physical health. As urban populations continue to increase, policies must concentrate on obtaining property for green space and working on the nature of existing green space networks beyond their traditional role as public activities.

Several epidemiological studies, such as by (Jolanda Maas, 2006), have examined the connections between nature and human health and welfare. This research discovered

favorable associations between green space and health, with aged people, stay-at-home mothers, and lower socioeconomic groups showing the largest associations. Less pollution, more exposure to green space, and increased physical exercise were all proposed as possible solutions, even if the precise causal process was not examined. The proportion of green space in a person's living area has a favorable correlation with how well the residents evaluate their general health. Green space development should therefore be given a more prominent place in spatial planning policy because it appears to be more than just a luxury.

(Noelwah R. Netusila, 2014) found that when the asset's distance from the closest green facility increases, there is a slight but statistically significant decrease in its sale price. However, facility type (sidewalk bio swale, nook reduced returned expansions, cut back expansions, or leafy bio swale) is not observed to have a statistically significant effect on an asset's sale price.

(Pretty, 2004) reviewed studies that connected exposure to nature with improved physical and mental health, and found a significant relationship between feeling better and being in or seeing the nature.

(Patil, 2009) looked at whether visual exposure to nature was enough to promote health and discovered that a lack of visual exposure was linked to adverse health impacts.

According to (Abraham, 2009), Various examinations that analyzed the benefits of nature and landscapes for health found that they can enhance social integration, physical health by encouraging regular physical activity, and mental health by restoring attention, reducing stress, and evoking positive emotions. They can also improve mental and physical health.

A meta-analysis of different studies (mostly from the United States) that valued green space (such as parks, forests, and agricultural areas) found that every 10 m decrease in distance to open space resulted in a 0.1 percent increase in house cost (Maslin, 2019). Additionally, communities outside of US also show a positive correlation between property values and green space.

A study was done on the benefits of green space for human health (Maheswaran, 2011). In contrast with previous studies, these researchers found "little" support for relationships between urban green space and overall physical and mental wellness. Instead of the region itself, they discovered that the level of green space and its accessibility were important factors. Other important factors that are essential in explaining any relationship include age,

gender, ethnicity, and the impression of safety. According to the review, many studies looking at the relationship between GI and health and other factors were poorly planned and neglected to take into consideration bias, inverse and weak relationships. The review came to the following conclusion: most research reported results that largely supported the idea that green space had a positive impact on health. Given the complexity of the link, determining a cause and effect is challenging. Therefore, basic urban solutions may be unsuccessful in addressing the fundamental urban wellbeing factors that landscape reform cannot change.

In contrast to (Pitman, 2015) who found that every 1 percent addition of greenery increased an apartment's sale price by 0.01 percent. He did not share these concerns regarding the validity of the research design and instead concluded that the suggestion was very solid to support the association between GI and better-quality health after thoroughly studying the works on the advantages of GI for health.

A study in the Finland district of Salo by (Miettinen, 2000) find that the market value of a home decreases by an average of 5.9 percent for every 1 km that is added to its distance from the nearest forested area.

(Noelwah R.Netusil, 2022) Discovered that creating large-scale green infrastructure applications could benefit locals in terms of actual savings on property costs, but that these applications also depend on the availability and characteristics of trees, the geographical location in which they grow, and the efforts made to ensure that they can be maintained at some point during the life of each facility.

According to (Czembrowski and Kronenberg , 2016), The surface area of urban parks and "natural" land (including trees and forests, farms, and water, but excluding parks) within a 1 km radius of apartment buildings was measured in Geneva to see how it affected monthly rental rates. Within a one-kilometer radius, each additional hectare of natural land used and an urban park increased rents by 0.07 percent and 0.06 percent, respectively. The amount of green space within a 500-meter radius, which was used to reflect the total environmental quality of a neighborhood, had a statistically significant influence in Lotz, Poland. Both characteristics indicate significant positive impacts.

According to Mahaneswaran (2011), in Jinan City, China, apartments with more green space within 300 meters increased property values by 2.1 percent more than those with less green

space. The amount of green space within 500 meters was used as an alternative metric, and the results were identical, providing evidence of the effect.

Results from Guangzhou, China, supported the idea that premiums may be connected to the level of plantation. The old and new parts of Guangzhou are significantly dissimilar to one another. In comparison to the highly populated old town, newer high-rise residents in new town zones enjoy significantly greater access to open space. A greater percentage of green space within a residential sector has a significant positive impact on apartment values because old town districts have a shortage of green space, whereas the impact is negligible in new town areas (Zhanqiang Zhu and Wei Lang, 2019).

2.2.6 Valuation techniques:-

Specific techniques have been established by economic research to quantify the worth of environmental assets. This value can sometimes be determined indirectly by observing how people behave, as in the case of the travel expense technique. The following are the primary techniques for calculating intangible values within total economic value:

Provisional valuation:-

Provisional valuation (PV) is a method of conducting surveys that gauges respondents' preferences for altering the way a good or service is delivered by measuring their readiness to pay or accept compensation. In fields such as the preservation of biodiversity, PV has been utilized to establish choice and presence values. The PV is a stated preference strategy, meaning that the applicant's choices are made clear. The PV technique has been used in numerous studies to determine the value of green infrastructure (Breffle, 2006).

The travel cost method:-

Another revealed preference method that has been discussed in the literature is the travel cost method. In this method, the value assigned to a commodity or service is determined by the cost of traveling there. Therefore, the amount of time and money spent traveling to and from an environmental space can be used to estimate its value. The argument that the cost of travel is a good substitute for the entry price is frequently made when using this strategy in national or state parks with no or low entry fees (Fabian Waltert, 2010). The revealed preference

method also uses the cost of travel. The travel cost approach has been used in numerous studies to determine values like (Crompton S. N., 2005).

Influence on production:-

An influence on production quantifies how a certain project may affect producers' output, costs, or productivity by affecting consumers' welfare and the environment. For instance, reservoirs could have the impact of establishing new fisheries, or beekeepers could benefit the gardens around them. This method is frequently used to look at a possible investment's drawbacks. The effect on production strategy is used in fewer studies than the earlier methods, although it is still used in studies like (Babak Raji, 2015).

Preventative expenditure:-

Comparing the advantages of adopting a green infrastructure strategy to conventional engineering solutions, such as reducing flood risk from rainwater, is frequently done using the preventative expenditure method. Although it is frequently used informally in industry, preventative spending has not received as much attention from scholars. However, a study revealed that green infrastructure initiatives are more cost-effective when avoidance cost and water-saving advantages are taken into account (A.C.K. Lee, The health benefits of urban green spaces: a review of the evidence, 2011).

Particular values:-

Certain values are monetary amounts that are assigned to specific commodities or services, typically to cover an external cost. The so-called "shadow price of carbon" is a frequently used specific figure. When doing cost-benefit evaluations for the public sector, this value, which is a shadow price set by the government, should be used. The social cost of carbon, or the marginal harm per ton of co2 emitted, is based on estimations in the UK, USA, and the World Bank. On Melbourne's waterways, shadow prices are really put to use for nitrogen removal and storm water interception.

Hedonic pricing model:-

The hedonic pricing model is a famous indirect valuation method that uses housing costs to measure the amenity value of environmental changes by observing how individuals interact

with the housing market. Therefore, the HPM is employed to determine the amenity advantages that residents of the area will experience as a result of improvements to the environmental variables that influence a home's market value. The methodology is based on the idea that the usefulness of a good or service to a person depends on the qualities that it possesses. According to consumer theory, a potential buyer's willingness to pay for a property depends on the availability and strength of a number of features, such as:

1. Information on the structural elements, such as the size of the property, the number of rooms, the garage, the heating system, the soundness of the structure, etc.

2. Particularities of the local socioeconomic and public sector, such as the unemployment rate, racial makeup, social conditions, economic discrepancies, standard of living, local taxation, etc.

3. Aspects of the environment and the neighborhood, such as the number of trees, the air's purity, the noise level, the proximity to water, etc.
4. Variables related to location or availability, such as proximity to markets, airports, employment centers, medical facilities, educational institutions, train stations, and city centers, among others.
5. Property rights and regulatory limitations on the use of property.
However, employing the hedonic pricing model, more recent studies have been able to more clearly illustrate the varying impacts. (Benefield, Allen and Rutherford, 2012) offered the first in-depth investigation of hedonic pricing modeling on variation of property value in real estate.

Congested travel times were used by (Franklin and Waddell, 2003) to construct a hedonic model employing accessibility to four different work kinds. All of their estimates were significant. (Steve Abley. 2010) utilized a common accessibility measure to determine how nearby stores and primary schools were correlated. They also factored in proximity (distance) to the central business district, transportation hubs, parks, and other attractions, but they omitted to show how well each predictor performed. Distances to numerous job centers were incorporated into models by (Gordon et al. 1986) and (McMillan and MacDonald. 1998) to forecast population and employment densities in suburban Chicago and Los Angeles, respectively. Although not in the context of a hedonic model, (McDonald and McMillan, 2000) used distances to several centers, as well as distances to transportation infrastructure, to

estimate land values in Chicago (interstate highways and commuter rail). The proximity of major Chicago job hubs was taken into account by (Bender and Hwang, 1985) while developing a hedonic model to forecast home values.

Furthermore, a wide range of factors and approach have been investigated, just like in the residential exploration of hedonic techniques. For instance, (Laverne & Winson. 2003) looked at how the cost of plantation and landscaping affected office rentals using data from commercial real estate, (Robinson and Reichert, 2015) demonstrated how hedonic grid regression may be used to determine the property cost. Structure: A recent phase of hedonic research focused on commercial real estate by (Fuerst Mcallister, 2008), and (Wiley, Benefield, and Johnson 2010), showed how model specification knowledge accumulates over time. These researchers made the case in their study on the impact of sustainability structures on office rentals that rents depend on more than simple structural characteristics, including functional and effective design, locality, operating costs, contract periods, and housing variables.

2.3 Literature gap:-

Many investigations think about the ecological and social advantages of green practices, yet the monetary valuation of property characteristics in Pakistan is rare. For instance, (Loren P. Hopkins, 2022) found that planting trees is the most economical approach to enhancing the climatic conditions in cities. In a recent study by (Noelwah R.Netusil, 2022) creating large-scale green infrastructure applications could benefit locals in terms of actual savings on property costs, but these applications also depend on the availability and characteristics of trees, the geographical location in which they grow, and the efforts made to ensure that they can be maintained at some point during the life of each facility. However, it is still an untapped area to explore the monetary valuation of green infrastructure in Pakistan. Our findings provide information on how green spaces increase the value of properties. It could be useful to planners as more cities implement GI orders for planning and construction to increase economic value. The second contribution of the study is to determine how proximity to different utilities such as schools, markets, job centers, city centers, airports, metro bus stations, and railway stations affects the price of residential properties.

2.4 Conceptual framework:-

Based on previous studies, the hedonic pricing model was employed to estimate the value of residential properties in four societies in Islamabad.

Price = f (structure, location, neighborhood, green infrastructure).

The functional model represents the idea that exogenous elements like location, structure, neighborhood, and green infrastructure, along with the property's attributes, can explain variances in residential property prices.

2.5 Proposed hypothesis development:-

H1: Green spaces positively affect the property values.

H2: Locational factor has an impact on property values.

H3: The structure of a property has an impact on property value.

H4: Neighborhoods have an impact on property values.

H5: There is a significant relationship between proximity to social amenities and property value.

H6: Property value increases as distance to the nearest green park decreases.

CHAPTER 03

3.1 Research methodology

The method utilized to conduct the entire study is clearly described in this chapter. The research methodology for the current study is covered in this chapter, together with information on the study's type, population, sample, unit of analysis, timelines, data collection methods, research methods, and research settings. The principal approach study, which was used for the research, is also included in this chapter, along with details on the sample, population, and data analysis techniques. The current study's content can be categorized as descriptive. In this study, the impact of green infrastructure on residential real estate value is examined, as well as the role played by utilities in generating residential real estate value. The various costs of residential plots in the various societies served as the study's data source. Many ideas were used to include relevant research in the paper. We started by conducting searches for terms like "utilities" and "green infrastructure," among others, in the major academic databases. Then, we searched through the list of references in each document for significant references and details. We also looked at some of the most prominent scientists around the globe. Instead of focusing on immediate conclusions, we focused on in-depth study, theoretical perspectives, and future opportunities. Only published articles were examined, and information was gathered from reliable sources. Each study of value concordance typically employs a unique collection of theoretical approaches. In order to better clarify the background and results of each study, we divided the investigations into a number of areas. This also contributes to explaining the theoretical process that supports it. We conducted in-depth research on each topic and then offered a model that would be useful in the study. We next looked at the empirical findings to determine if the model was accepted or rejected. These discussions brought to light research gaps and potential directions. Additionally, we selected various strategies to discover the data we were looking for in our study. We obtained information for data collection from a variety of offline and online sources. We use olx.com, ghraana.com, and zameen.com to collect data online. Additionally, we use Google maps to determine how far the various utilities are from residential units. Here, we first used a GIS system to draw residential units on a Google map, and then we used factors related to nearby utilities to determine how close the utilities actually were to the residential units. We obtained our information about the proximity in this manner. For offline sources, we used personal connections and various sources to contact several real estate

brokers, specialists, and dealers in order to ascertain the true cost of the residential units in four societies in Islamabad.

3.2 Study area:-

In this study, property values of four private residential housing societies (DHA, Bahria Town, Soan Garden, and PWD) in Islamabad are considered and how these property values are affected when green infrastructure practices are implemented. Variables relating to green infrastructure practices include location, structure, neighborhood, and green infrastructure.

Study area 1: DHA Islamabad is in no need of presentation as it's a well-perceived and inexhaustible title in the housing market. DHA defense housing authority is working on a project in Islamabad-Rawalpindi (DHA). The developer is credited with bringing a modern way of life to Pakistan through an open-minded and forward-thinking project. Within the twin cities of Islamabad and Rawalpindi metropolitan area, this project is situated in an outstanding neighborhood. DHA Islamabad is a great place to live and a wise choice for businesses and investments. Through the extension of comprehensive experience in living, housing, and many levels and opportunities for investments and commercial operations in a controlled and reliable environment, DHA Islamabad-Rawalpindi has a mission to change the face of living concepts in Pakistan. DHA's proprietor, Pakistan armed forces, and Habib Rafiq (Pvt) are the developers in Islamabad. The DHA homes Islamabad developers are world-class in every aspect of building, including infrastructure, design, and urban planning. The location of DHA homes, Islamabad, is in the heart of the DHA valley. Through Islamabad's DHA residence, this route reaches Rawalpindi. Additionally, Giga mall Islamabad is just a short drive from the community. It's set up fundamentally and extraordinarily in the vast majority of the towns in Pakistan while enjoying a much-regarded position. A prestigious gathering of developers has set it up in view of global principles and habits. DHA: Islamabad mirrors the goal-oriented vision of twin urban communities. DHA intends to become a location that works to become one of the most remarkable urban areas in terms of infrastructure, planning, and metropolitan preparation.

Study area 2: Bahria Town is located on GT road in Islamabad's zone v; Bahria Town Islamabad is a housing development that has received CDA approval. There are thousands of plots that may be purchased at a low cost, and there are eight phases to the project. The project was started at the beginning of the 2000s to offer the best investment opportunities in

Islamabad. Residential plot sizes in the project range from 5 Marla to 2 kanals. Bahria Town private limited is the company that constructed Bahria Town Islamabad. Due to the amazing and creative projects they have produced in the majority of Pakistan's main cities, the developers are quite well-known. They are also well known abroad. There are several amenities in the project that have never been present in the area previously. The project was designed by a highly skilled team of real estate developers and town planners to be a top-class society in Pakistan. Bahria Town Islamabad is deliberate through international standards of architecture with higher highlights than excellent dwellings, like international standards schools, colleges and universities, advanced healthcare units, resorts, sports complexes, entertainment offices, five star hotels, gymnasiums, lush green parks and lots more for residents. Bahria Town Islamabad is a safe haven with a glorious infrastructure, a street network of lavishly designed homes and villas, and a selective overseas block for outsiders. The founder and current chairman of Bahria Town is Malik Riaz Hussain, and the current CEO is his son, Ahmad Ali Riaz Malik. Since its founding in 1996, Bahria Town has completed residential and commercial projects in significant cities like Rawalpindi, Islamabad, Karachi, Lahore, and Nawabshah. With locations on both sides of the GT road, Rawalpindi and Bahria Town Islamabad enjoy a very desirable location. This project is among the top 3 residential projects in the twin cities because of its excellent location. Islamabad's Bahria Town is situated on GT road. It is almost 51 minutes by car from Islamabad international airport. A highly skilled team of professionals with years of experience prepared the Bahria Town Islamabad master plan. It was believed that the master plan would include all of the finest amenities. To offer the best lifestyle in the nation, almost 6,000 kanals of residential land have been set aside. In reality, Mr. Riaz kept his word on the stories.

Study area 3: Soan Garden is a legally recognized cooperative housing project, investing in it now will pay off in the long run. Being close to PWD and Bahria Town makes it a wonderful investment opportunity. Soan Garden Islamabad project has produced positive outcomes for the investors in the community. Soan Garden, a constructed housing society on the Islamabad express highway, is only 3 kilometers away from Sihala police station. The society is located close to other societies, including the PWD housing scheme and Bahria Town. It encompasses roughly 2985 kanals in total. The Islamabad express highway leads to the city. Society provides its citizens with both basic and luxurious amenities, such as: regular access to drinking water; natural gas; electricity; hospitals; schools, markets, restaurants,

hotels, and parks; a vast network of highways; and security. Each of the blocks in Soan Garden Islamabad has an alphabetical name, such as block a, block b, block c, block d, block e, block f, block g, and block h. The society offers plots with sizes ranging from 5 Marla to 1 and 2 kanal houses and plots. Half of the plots have already been turned into homes, and families are living there and taking advantage of the amenities, indicating that the community is fully formed. A respected housing project is offering a lucrative investment opportunity at extremely affordable prices. The location of civilization has had a considerable impact on the price index of land value across time. By selling or renting the property at a profit, investors who had previously invested in society have already seen positive outcomes.

Study area 4: PWD, the capital development authority of Islamabad, provided direction and approval for the PWD housing scheme project, which is a part of the larger Islamabad master plan. Additionally, the layout of the residential and commercial plots follows the city's master plan. According to CDA approval, blocks (A, B, C and D) each have their own markets, sports venues, mosques, hotels, flats, and villas. The Islamabad expressway divides society into eastern and western flanks at the crossing of the PWD double road, which runs through Bahria Town and Rawalpindi. A housing development funded by the government can be found in Islamabad between the lush green margalla hills and the potohar plateau. The Islamabad expressway, an easily navigable network of multidirectional carpeted roads, connects the appealing location and first-rate amenities with the capital city. In addition, the PWD double roads, the major street in Bahria Town, and other nearby housing societies all provide quick access to Rawalpindi. The PWD program is a viable option for the salaried class as well as for real estate investors and companies because of its good location and reasonable property prices. Investment opportunities for homes, businesses, and short-term and long-term real estate investments abound at PWD housing society. All four of the blocks' development projects have been finished, and they now house a vast influx of new people from both domestic and international locations. By way of developing multi-lane road networks and public transportation, PWD is connected to a number of housing communities, including Bahria Town, Soan Gardens, Koral town, and Pakistan town. The PWD double road also provides simple access to Islamabad via the Islamabad expressway and Koral chowk, as well as to Rawalpindi via Khanna pull into Faizabad. The PWD housing society is easily accessible from Rawalpindi or Islamabad due to its multidirectional entry through GT Road and the Islamabad expressway. Additionally, PWD residents have increased transportation options to and from PWD block c and block a due to Soan Gardens housing

society's proximity to these buildings. Pakistan Town approaches from the eastern end. Additionally, one can access the community via the Islamabad expressway at the PWD main entrance gate or via the main boulevard road of Bahria Town phase-ii from Rawalpindi. Dar-e-Arqam School and College, Siddiqee Public School, the City School, Islamabad Model School, Mazen Schools, Bloomfield International School, IIUI, Fast International School, Allied Schools, and Roots Millennium are the PWD society's leading educational institutions. The most well-known high schools in the region include Indus College, United Chenab College, and Islamabad Model College for girls, National School and college, Superior Sollege, Askari College, Bahria College, Concordia College, and the govt. Degree College of special education. The PWD food highway is renowned for serving delectable meals from the greatest restaurants in the area. All of these establishments—Broad way, Arabian Mandi, Hot n Spicy, Italian Pizza, and Habibi—are situated on PWD double road and are accessible from all nearby blocks.

3.3 Theoretical foundation of the hedonic pricing model:-

According to (Peter F. Colwell, 1999), the foundations of this method may have been found in earlier publications. (Griliches, 1990) and (Rosen, 1974) supplied the theoretical foundation for the development of hedonic models. Hedonic pricing methods link the market price of a good or service with its distinguishing characteristics, making it possible to quantify the monetary value of each characteristic by comparing the market values of items with related price characteristics. The basic presumption is that things are produced by a broad range of characteristics or attributes. As a result, when we buy something, we can think of the price as the sum of the costs associated with each of its qualities. This means that there is an implicit cost connected with each quality. Research that assesses the environmental externalities caused by waste, air pollution, traffic, and noise has made substantial use of the hedonic method. For instance, (Smith, 1995) examined 37 studies from 1967 to 1988 that employed the hedonic method to assess an improvement in air quality in specific us cities. (Nelson, 2008) Employed this methodology to evaluate the effects of noise pollution on housing values in New York. Similarly (John Ottensmann, 2008) employed the hedonic model in their study to determine the impact of urban green areas on housing prices. In the study, this method was utilized to assess the impact of urban green spaces on the value of

residential properties in Islamabad's housing societies. The hedonic pricing method was selected in this research because:

- Housing prices in the area appear to be related to proximity to amenities such as location,neighbourhood,stucture and green infrastructure.
- Data on real estate transactions and property characteristics are readily available, thus making this the least expensive and least complicated approach.

3.4 Type of study:-

The study is causal in nature. The aim of this causal study is to identify a statistical relationship between the value of residential real estate and green infrastructure and other property attributes. Causal research is a type of research method in which two or more variables are linked to establish a cause-and-effect relationship. Causal research, also known as explanatory research, is used to determine the magnitude and nature of cause-and-effect relationships. Data is obtained for those variables in order to establish the link among several available variables considered in a causal study. This method involved acquiring information from the research area as well as conducting investigations and processes.

3.5 Population:-

This study will explore green infrastructure practices and their consequences on real estate pricing and also the effect of utility variables on residential property values. For this, the property values of four private residential housing societies (DHA, Bahria Town, Soan Garden, and PWD) in Islamabad are considered as a data source for this study and how these property values are affected when green infrastructure practices are implemented. Variables relating to property characteristics include location, structure, neighborhood, and green infrastructure (green parks). The area was chosen because there were enough housing market transactions that occurred during the study period.

3.6 Sample:-

Our sample consists of transaction data of residential properties in four societies situated in Islamabad. 70 percent of the observations were from DHA and Bahria Town, while 30 percent were from Soan Garden and PWD housing societies. The findings include market

transaction values for properties gathered from various published and publicly available sources. The sources include zameen.com, olx.com, real estate agents, municipal housing agencies, and other systems for registering property ownership in Islamabad.

Table 1: Sources of data of residential properties in Islamabad

	Bahria Town	DHA	Soan Garden	PWD
Zameen.com	300	330	150	170
Olx.com	150	100	50	30
Property dealers	10	20	-	-
Graana.com	40	50	-	-
Total	500	500	202	200

20 percent of all the traded properties in Islamabad were represented by the sample. There is no administrative organization in Pakistan that keeps records of property values and current values. Hence, all the sources are privately owned and run. The contract of sale was utilized as the basis for matching the costs and features of the sample properties. These agreements specify the property's actual price, place, and local housing authority. The distance between the value of property and important infrastructure, including metro bus station, city centers, consumer markets, schools, job centers, railway stations, and airports, was calculated using Google maps.

3.7 Sampling technique:-

Simple random sampling will be used to select the properties of different societies. The information on property values is gathered from a variety of sources, including graana.com, zameen.com, olx.com, real estate agents, municipal housing authorities, and other property recording systems in Islamabad. 20 percent of all the properties that were traded in Islamabad will be represented by the sample. The distance between the property and important infrastructure, including megaprojects, consumer markets, hospitals, railway stations, and airports, was calculated using Google maps.

3.8 Data collection:-

Data collection is the method of acquiring, examining, and interpreting particular sorts of information for research needs. Regardless of the subject, gathering data is frequently the first and most important phase in the research process. The methods utilized to collect data may vary depending on the research topic. The element that is frequently mentioned is how much information is needed. Making sure that accurate and reliable data is acquired for statistical analysis so that judgments may be reached using data-driven reasoning is the most crucial purpose of data collection in the research process. Instead of online or in-person interviews, interviews are conducted over the phone. Data can be gathered using four different techniques: in-person interviews, mail, phone, and the internet. Each of these methods has its own set of advantages and disadvantages. In this study, it is to be determined how the property characteristics of four private residential housing societies in Islamabad have affected the property values. Variables relating to property characteristics include location, structure, neighborhood, and green infrastructure (green parks). Property dealers, olx.com, zameen.com, local housing authorities, and other property recording systems are some of the sources where data on property values is gathered (e.g., graana.com, olx.com, zameen.com, etc.). The distance between the property and important utilities, including metro bus station, consumer markets, city centers, railway stations, job centers, schools, and airports, was calculated using Google maps.

3.9 Mathematical model:-

The value of residential real estate is the dependent variable in this study. The independent variables include the size of the house, the number of bedrooms, bathrooms, and size of rooms; the presence of a garden and garage; and other utility factors such as a metro bus station, a railway station, an airport, a city center, a school, a market, a job center, and the number of parks in the neighborhood. The investigation was carried out using a mathematical model. The determinants of the value of residential properties in Islamabad were evaluated using the hedonic model.

Price = f (structure, location, neighborhood, green infrastructure).

The functional equation represents the idea that exogenous factors such as location, structure, neighborhood, and green infrastructure as well as the property's characteristics can explain

variations in residential property prices (green parks). The following equation represents the proxies for these characteristics and independent variables:

Property value = αi + ∂i (housesize) + ∂i (nobedr) + ∂i (nobatr) + ∂i (sizebedr) + ∂i (presencegar) + ∂i (presencegarg) + βi (proxbus) + βi (proxrail) + βi (proxairp) + βi (proxccen) + δi (proxmkt) + δi (proxsch) + δi (proxjob) + γi (nogreen parks) + γi (distancegreen parks) + μi

α is used is intercept and μ is error term.

3.10 Statistical techniques:-

We use OLS and LASSO to find the extremely robust variables in determining the value of residential properties. The purpose of adopting OLS is to overcome the limitations of most existing approaches, including their inability to account for outliers and offer accurate information about the relationship between the variables. Furthermore, it is challenging to identify the variables that are directly influencing the residential real estate market, the dependent variables that eventually influence the decisions of investors and end users with regard to residential property.

3.11 Variables and measurement scale description:-

Variables related to property characteristics include location, structure, neighborhood, and green infrastructure. The value of residential real estate property is the dependent variable in our study, whereas green infrastructure serves as the main independent variable. In addition, other variables, such as the property's structure and other utility characteristics, act as independent variables. The distance between the property and various utilities, including metro bus stations, consumer markets, railway stations, city centers, schools, job centers and airports, was calculated using Google maps.

Table 2: Description and measurement of independent variables

Variables	Property characteristic	Description
Location	Proximity to the metro bus station	Represents how close each specific property is to a metro bus station geographically (km).
	Proximity to the railway station	Represents how close each specific property is to a railway station geographically (km).
	Proximity to the airport	Represents the distance from an airport to each specific property (km).
	Proximity to city center	Represents how close to the city center each specific property is geographically (km).
Structure	House size	House size (Marla)
	Number of bedrooms	Total number of bedrooms in a house
	Number of bathrooms	Total number of bathrooms in a house
	Size of rooms	Size of rooms (square feet)
	Presence of garden	Availability of a garden in a house
	Presence of garage	Availability of a garage in a house
Neighborhood	Proximity to market	Refers to how close each individual property is to a market in Islamabad (km).
	Proximity to school	Refers to how close each individual property is to a school's branch (km).
	Proximity to the job centers	Refers to how close each individual property is to job centers in Islamabad (km).
Green Infrastructure	Number of green parks	Total number of green parks in society
	Distance from nearest green parks	Distance from nearest green park from the property(m)

CHAPTER 04

4.1 Data Analysis:-

The results of various statistical methods used to collect the collected data are thoroughly detailed in the following section. The findings of such a study are predictable, helpful to residential real estate investors looking to make investments in the various residential housing societies of Islamabad, and useful for end users making decisions about their future residence in Islamabad. Several respected academics have conducted studies in recent years on the factors that affect the value of residential properties. The size of the residential property and its proximity to the city center, the sustainability of a residential property, road transit, and other factors were taken into consideration while evaluating the value of residential properties. In our study, we used green infrastructure, such as the number of green parks and the distance to the nearest green park, as a key factor in determining the value of residential properties in Islamabad. As additional factors for determining the value of residential real estate, we also considered structural characteristics (house size, number of bedrooms, bathrooms, size of rooms, presence of garden, garage), locational characteristics (proximity to metro bus station, proximity to railway station, proximity to airport), and neighborhood characteristics (proximity to city center, proximity to market, proximity to school, and proximity to job centers). Three of Pakistan's most well-known real estate websites, zameen.com, gharana.com, and olx.com, were used to choose a sample of around 1402 residential properties in various societies of Islamabad. Additionally, we used local sources like property dealers and town offices to gather information about the locations and actual costs of residential real estate in major Islamabad societies. After the correlation and OLS tests were performed on the thesis hypothesis, the findings of the empirical investigation are presented in this chapter. Additionally, the lasso and post lasso-est tests were executed in order to obtain the real and shrinkable variables and to look into the study's best possible outcome.

4.2 Correlation matrix:-

Currently, we need to examine the unique relationship between the variables, and by tracing the connection, we may measure examples of responses to each variable. Additionally, by using relationships, we will discover how our elements are related to one another. The

Pearson-thing second relationship, or Pearson, is another name for this correlation. The correlation matrix shows the correlation values, which express how linearly correlated each pair of variables. It has a value between -1 and 1, with a range.

- A completely negative linear correlation between the two variables is indicated by a value of -1.

- No relationship between the two factors is demonstrated by a 0.
- A value of 1 shows a total positive and significant correlation between the two factors.

If the two variables tend to increase and decrease together, then the correlation value is positive. When one variable increases while the other decreases, the correlation value is negative.

Table 3: Coefficient of property attributes using correlation

	Property Value	House size	No. Bedrooms	No. Bathrooms	Size. Rooms	Presence. Garden	Presence. Garage	Prox. Metro bus station	Prox. Railway station	Prox. Airport	Prox. City center	Prox. Market	Prox. School	Prox. Job centers	No. Green parks	Dis. Nearest green parks
Property Value	1.0000															
House size	0.6835	1.0000														
No. Bedroom	0.4802	0.7613	1.0000													
No. Bathrooms	0.5433	0.6043	0.5196	1.0000												
Size. Rooms	0.4388	0.5854	0.1353	0.2731	1.0000											
Presence. Garden	0.2078	0.3028	0.3049	0.3290	0.1417	1.0000										
Presence. Garage	0.2435	0.3425	0.3322	0.3743	0.2422	0.5671	1.0000									
Prox. Metro bus station	-0.1486	-0.1073	-0.0666	-0.0763	-0.0777	-0.0182	-0.0838	1.0000								
Prox. Railway station	0.1485	0.1981	0.0511	0.1089	0.2407	0.0291	0.0534	-0.3464	1.0000							
Prox. Airport	0.1158	0.1086	0.0824	0.0379	0.0967	0.0304	0.0870	-0.1241	0.2221	1.0000						
Prox. City center	0.2573	0.1853	0.1139	0.1142	0.1649	-0.0903	-0.0738	-0.0362	0.3123	0.0439	1.0000					
Prox. Market	0.0842	0.0200	-0.0396	-0.0449	0.0997	-0.0249	0.0398	-0.0968	0.1996	0.1427	0.0495	1.0000				
Prox. School	-0.0723	-0.0735	-0.0711	-0.0102	-0.0293	-0.0555	0.0898	-0.0446	0.0894	0.1226	-0.0890	0.1999	1.0000			
Prox. Job centers	0.2172	0.1993	0.1418	0.1018	0.1451	-0.1071	-0.0522	-0.0589	0.3018	0.1197	0.7282	0.0423	-0.0376	1.0000		
No. Green parks	0.1662	0.0289	0.0882	0.0466	-0.0585	-0.1214	-0.0929	0.1212	-0.4470	-0.1209	0.4652	-0.1764	-0.1792	0.4910	1.0000	
Dis. Nearest green parks	-0.3579	-0.3279	-0.2318	-0.2488	-0.2304	-0.1358	-0.1326	0.0992	-0.2794	0.0685	-0.2504	0.0049	0.0496	-0.2068	0.2983	1.0000

We can determine the various relationships between the variables from the table above. As we can see, there is a considerable and strong correlation between the size of a house and the value of residential properties. The fact that the value of p from house size and residential property value is more than 0.05 serves as an indication. The value of a residential property rises as a house increases in size. Similar to this, there is a statistically strong positive relationship between the number of bedrooms and the value of a residential property. The p value between the number of bedrooms and the residential property value is higher than 0.05. The number of bedrooms and the size of a house were also significantly and strongly correlated with each other. The size of the house will also expand as the number of bedrooms increases, since the p-value is 0.7631, which is more than 0.05 and therefore significant. There is a strong, positive relationship between the number of bedrooms and the price of a property. The relationship between the number of bathrooms and property value has a p value of 0.5433, which is larger than 0.05; if the number of bathrooms rises by one unit, the property value will rise as well. The numbers of bathrooms and house size also have a positive significant link; if the number of bathrooms increases by one unit, the size of the house will likewise grow. Additionally, there is a one-unit rise in the number of bathrooms for every positive and significant relationship between the number of bedrooms and bathrooms. Additionally, if there was an addition of one bathroom unit, the number of bedrooms and property value are weakly positively correlated. The relationship between bedroom size and property value has a p value of 0.4388, which is higher than 0.05. Similar to this, there is a strong and positive relationship between house size and room size. The p value, which is greater than 0.05, between room size and house size is 0.5854. The p-value for the size of rooms to the number of bedrooms is 0.1353 and is greater than 0.05, indicating that there is a modest positive association between the two variables. There is a weak positive relationship between the size of rooms and the number of bathrooms, as indicated by the p value of 0.2731 between room size and the number of bathrooms. The p-value of the presence of a garden to property value is 0.2078, which is greater than 0.05, further demonstrating the existence of a weakly positive correlation between the presence of a garden and property value. Because the p-value for the relationship between the presence of a garden and house size is higher than 0.05, there is a similar positive weak association between the two variables. In addition, there is a marginally positive association (p = 0.3322) between the presence of a garden and the number of bedrooms. Because the p-value between them is greater than 0.05, there is a similar modest and significant relationship between the presence of a garden and the number of bathrooms. Because the p-value between them is less

than 0.05 and equal to 0.1417, the association between the presence of a garden and the size of the rooms is weakly positive. Additionally, there is a positive weak association between the presence of a garage and a property's value, as shown by the 0.2435 p-value, which is greater than 0.05 and indicates the presence of a garage. Furthermore, the p-value is greater than 0.05, indicating a weak positive association between the presence of a garage and house size. Given that the p-value is greater than 0.05, there is a slightly positive correlation between the presence of a garage and the number of bedrooms. Additionally, since the p-value between the two is greater than 0.05, there is a weak positive link between the presence of a garage and the number of bathrooms. Additionally, there is a slight positive link between the size of the rooms and the presence of a garage. Between them, the p value is higher than 0.05. Additionally, there is a highly significant correlation between having a garage and having a garden because their p-value (which is greater than 0.05) is 0.5671. Additionally, as the table indicates, there is a positive and significant correlation between residential property values and being close to a metro bus station. The significant correlation between them, however, is negative and the value of p between them is -0.1486, indicating that a 1-km increase in distance from a metro bus station will lower the value of residential properties in the area. Although there is a strong association between them, there is a negative correlation between house size and proximity to a metro bus station. Although the p value between them is -0.0666, the association between being close to a metro bus stop and the number of bedrooms is similarly significant. There is a significant and inverse relationship between the number of bathrooms and the distance to the metro bus station. The p value between the distance to the metro bus stop and the size of the rooms is -0.0763, which is likewise negatively significant. Additionally, there is a significant negative relationship between having a garden and having a garage, with p values of -0.0182 and -0.0838, respectively, in relation to proximity to the metro bus station. The value of residential units is in fact significantly connected with the distance from the railway station, with a p-value of 0.1485 showing that the value of residential plots will rise as the distance from the railway station increases. The presence of a garden and a garage is positively correlated with house size, number of bedrooms, and number of bathrooms, room size, and proximity to the railway station. The P values for these correlations are 0.1981, 0.0511, 0.1089, 0.281, and 0.0534, respectively. Additionally, there is a weak relationship between being close to a metro bus station and being close to a railway station. The distance from the railway station reduces as it gets farther away from the metro bus station. Additionally, as shown in the table, there is a considerable and positive correlation between the price of residential properties and their

proximity to the airport. A 1 km increase in distance from the location will enhance the value of residential properties in the area according to the value of p, which is 0.1158. There are considerable correlations between proximity to the airport and other elements like house size, number of bedrooms, bathrooms, room size, presence of a garden, presence of a garage, and distance to a railway station. The corresponding p values for these variables were 0.1086, 0.0824, 0.0379, 0.967, 0.304, 0.0870, and 0.2221. The distance between an airport and a metro bus station has a weak negative correlation. That means the farther you are from the airport, the smaller the distance is to the metro bus station. In addition, as indicated in the table, close proximity to the city center and the price of residential properties both have a sizable favorable effect. The considerable positive correlation between the value of p and the distance from the location is 0.1158, which means that a 1 km increase in distance will enhance the value of residential units in the area. There are substantial correlations between the distance to the city center and other elements, such as the size of the property, the number of bathrooms, the size of the rooms, the distance to the airport, and the distance to the railway station. The p-values for these variables were 0.2573, 0.1853, 0.1139, 0.1142, 0.16449, 0.3123, and 0.0439, respectively. Additionally, as is apparent from the table, there is a strong negative correlation between having a garden and a garage, being close to a metro bus stop, and being near the city center. With a p-value of 0.0842, which indicates that the variables are significantly correlated with one another and highlights the effects of increasing residential plot values as the distance from schools increases, it can be seen in the above table that there is a significant correlation between the value of residential units and their proximity to markets. Other factors that have similar positive impacts include house size, room size, and the inclusion of a garage, closeness to the airport, proximity to the railway station, and proximity to the city center. With a p-value of -0.0723, the correlation between residential unit pricing and proximity to schools is likewise highly significant. The value of residential plots will fall as they are further from the school and vice versa, as shown by this negative but significant correlation. With p values of -0.0735, -0.0711, -0.0102, -0.0293, -0.0555, -0.0446 and -0.0890, respectively, the relationships of proximity to school with other factors, such as house size, number of bedrooms, number of bathrooms, room size, presence of a garden, proximity to a metro bus station, and proximity to the city center, are also highly significant and have a negative correlation with these variables. With a p-value of 0.2172, it can be seen that there is a significant relationship between the price of residential units and how close they are to job centers. This suggests that the price of residential plots will rise as the distance from job centers decreases. The relationships of proximity to job centers with

other factors, such as house size, number of bedrooms, number of bathrooms, room size, proximity to a railway station, proximity to an airport, proximity to the city center, and proximity to market, are also significant and have a positive correlation with these variables, as shown by the p values of 0.1993, 0.1418, 0.018, 0.1451, 0.3018, 0.1197, 0.7282, and 0.0423. The proximity to the job center has a significant but negative relationship with other variables, including the presence of a garden, a garage, a metro bus stop, and a school. The number of green parks nearby and the distance to the nearest green park are the final two variables which are the main subjects of this research. The number of green parks and property value has a strong positive correlation; the p value of the number of green parks to property value is 0.1662, demonstrating this. Property values will increase if there are one or more park units in the area. There are also important correlations between the number of green parks and other factors. Since the value of p is less than 0.05 and indicates that there is a negative correlation between the distance from the nearest green park and the property value, the final variable—distance from the nearest green park—is likewise highly negative significant with the value of property. The value of the p between property value and the distance of property to its nearest green park is -0.3579. Property values in the neighborhood will fall if the distance to the nearest green park is increased by 1 km, and vice versa. The relationships between a home's size, number of bedrooms, bathrooms, room sizes, presence of a garden, and garage and its proximity to green parks, proximity to the metro bus station, the railway station, the airport, the city center, the market, the school, the job centers, and the number of green parks are also significant with p values of -0.3279, -0.2328, -0.2488, -0.2304, -0.1358, -0.1326, -0.0992, -0.2844, 0.0685,-0.249, 0.0496, -0.2068 and 0.2983. As a result, there is a correlation between the value of a residential unit's property and the number of green parks in the region as well as the distance to the nearest green park, showing that if these factors are present, the value will be higher than in areas without them. On the other hand, extra factors connected to various service locations are also important.

4.3 Descriptive statistics:-

The highlights of a dataset or example are summarized or depicted using illustrative tools like the mean, mini, and max. On the other hand, inferential insights can assist us in understanding the general features of entities within a data set. We can work with a lot of information objectively according to illustrative measures. Each expressive measurement combines a substantial amount of data into a brief summary. As shown in the table, each

development had a total of n = 1402. The information acted well, as revealed by the obvious features of information related to properties.

Table 4: Descriptive statistics

Variables	Observations	Mean	Min	Max
Property value	1402	30.10628	1.2	165
House size	1402	13.01969	1	40
No. Bedrooms	1402	6.769615	1	55
No. Bathrooms	1402	5.029957	1	9
Size of rooms	1402	514.0169	39.60015	2722.51
Presence. Garden	1402	.9172611	0	1
Presence. Garage	1402	.9215407	0	1
Prox. Metro bus station	1402	25.30107	12.5	207
Prox. Railway station	1402	14.0023	3.02	36.1
Prox. Airport	1402	30.44579	1.8	40.4
Prox. City center	1402	27.31819	10.5	40.4
Prox. Market	1402	2.951997	0.2	9.3
Prox. School	1402	2.847432	0.2	10
Prox. Job centers	1402	27.34123	1.8	40.4
No. Green parks	1402	13.27817	8	16
Distance. Nearest green parks	1402	12.37867	2.9	142

Additionally, the maximum residential plot value in the above table is PKR 165000000, and the minimum plot value from the 1402 values is PKR 1200000. Additionally, the mean average price for a residential unit in Islamabad is PKR 30106280, indicating the average price for real estate near green spaces. On average, the distance to the nearest green park from the housing units is 12.37867 km. The survey also found that there is an average distance of 25.30107 km between various metro bus stations and residential real estate properties. The normal distance from the airport to the property units is 30.44579km, while the average distance from the railway station to the study area is 14.0023km. Accordingly, the mean distance from the market to residential units is 2.951997 km, and the average distance from city centers to residential units is 27.31819 km. Finally, it is 2.847432 kilometers between the school and the residential units. Additionally, it is a maximum of 27.34123 kilometers from the residential unit to the job centers.

4.4 Ordinary least square (OLS):-

Table 5: Coefficient of property characteristics using OLS:-

Descriptive variables	OLS	P-values
House size	1.566	0.000
	(12.22)**	
No. Bedrooms	-0.679	0.096
	(2.77)**	
No. Bathrooms	2.974	0.000
	(9.36)**	
Size of rooms	0.005	0.826
	(1.37)	
Presence. Garden	0.724	0.256
	(0.44)	
Presence. Garage	-2.700	0.224
	(1.54)	
Prox. Metro bus station	-0.070	0.015
	(1.86)	
Prox. Railway station	0.250	0.104
	(2.51)*	
Prox. Airport	0.222	0.142
	(2.83)**	
Prox. City center	0.529	0.012
	(7.41)**	
Prox. Market	0.982	0.000
	(4.29)**	
Prox. School	-0.131	0.095
	(0.60)	
Prox. Job centers	0.010	0.012
	(0.15)	
No. Green parks	3.982	0.000
	(8.82)**	
Distance. Nearest green parks	-0.596	0.023
	(7.87)**	
_cons	-78.159	
	(8.52)**	
R^2	0.57	
N	1,402	

*$p<0.05$ **$p<0.01$

In accordance with the above table, the value of r-square values is 0.57 for the 1402 respondents, 57 percent of the changes were attributable to these variables. The provided model fits as a result of the higher than 2-tailed t-values. The r square value is 57 percent, showing that these variables better describe the price of real estate. The created combination is preferred since they are the actual determining variables that explain the worth of a residential real estate property. This model is very significant due to the probability value which is 0.000, less than 0.05. The size of a house, the number of bedrooms, the number of bathrooms, size of the rooms, presence of a garden, presence of a garage, proximity to the metro bus station, railway station, an airport, a city center, a market, a school, a job center, and the number of green parks all contribute to about 57 percent of changes in the value of residential property in four societies of Islamabad, according to the r-squared, which is 0.57. The house size is significant as the p-value is 0.000, which is less than 0.05. The additional number of bedrooms is not significant given that the p-value is 0.096, which is higher than 0.05. The number of bathrooms is important because it has a lower p-value of 0.000 or less than 0.05. The size of the rooms is not significant because the p-value, which is 0.826, is bigger than 0.05. The presence of a garden is also not significant, with a p-value of 0.256, which is more than 0.05. The presence of a garage is likewise unimportant; its p-value is 0.224, which is greater than 0.05. The p-value for proximity to the metro bus station is 0.015, which is less than 0.05, indicating that the metro bus station near to residential property is significant. Furthermore, given that the p-value for the railway station is 0.104, which is greater than 0.05, it indicates that the railway station is not significant. Additionally, airports near residential property are not significant because the p-value for airports is 0.142, which is higher than 0.05. Property near a city center is significant because the p-value is less than 0.05 and equal to 0.012. Additional marketplaces near residential property that have p-values of 0.000 or less than 0.05 are likewise significant. Schools are also not significant because the p-value for schools close to residential property is greater than 0.05 and is 0.095. Job centers close to residential property are significant since the p-value is less than 0.05 and equal to 0.012. An additional number of parks in the neighborhood is also important; their p-value is 0.000, which is less than 0.05. Parks near residential properties are significant as well, because their p-value is 0.023, which is less than 0.05. As a result, we believe that house size, number of bathrooms, proximity to the metro bus station, proximity to the city center, proximity to the market, proximity to job centers, number of green parks, and distance from the nearest green parks are important factors to consider when assessing the factors that contribute to changes in the value of residential real estate property in four different

Islamabad societies. Additionally, factors like the number of bedrooms, the presence of a garden, the presence of a garage, the size of the rooms, the proximity to a railway station, the proximity to an airport, and the proximity to a school are unimportant and contribute very little to defining the value of a residential property in the area.

4.5 Results of LASSO Regression and post EST OLS:-

The two most important regularization techniques are OLS regression and lasso regression. The two of them use different methods for treating the coefficients. In this model, shrinkage is used. Information values are constrained in the direction of a critical problem called the mean shrinkage. This particular type of regress is perfect for models with a lot of multi-collinearity or when researchers want to computerize variables and boundary expulsion as part of the model choice interaction. In lasso regression, the robust model components are found using the l1 regularization technique. It is utilized when there are many highlights because it makes additional choices appropriately. To reduce the number of unimportant variables in this model as well as to choose the best model and the most dependable variable among these factors, lasso regression is used. The main aspect of lasso regression is how it simultaneously reduces the variables, then eliminates the weaker ones, and ultimately chooses the model that best fits the data.

Table 6: Coefficient of property characteristics using LASSO

Descriptive variables	LASSO	Post-EST OLS	P-values
House size	1.5102315	1.5691933	0.000
	(12.22)**	(12.22)**	
No. Bedrooms	-0.5221105	-0.6756988	0.096
	(2.77)**	(2.77)**	
No. Bathrooms	2.9131717	2.9845508	0.000
	(9.36)**	(9.36)**	
Size of rooms	0.0053843	0.0045437	0.826
	(1.37)	(1.37)	
Presence. Garden			0.256
Presence. Garage	-1.8707283	-2.3269388	0.224
	(1.54)	(1.54)	
Prox. Metro bus station	-0.0715147	-0.0698273	0.015
	(1.86)	(1.86)	
Prox. Railway station	0.2023061	0.2492115	0.104
	(2.51)*	(2.51)*	
Prox. Airport	0.2090232	0.2236345	0.142
	(2.83)**	(2.83)**	
Prox. City center	0.5113970	0.5320853	0.012
	(7.41)**	(7.41)**	
Prox. Market	0.9331618	0.9800005	0.000
	(4.29)**	(4.29)**	
Prox. School	-0.1051504	-0.1423779	0.095
	(0.60)	(0.60)	
Prox. Job centers			0.012
No. Green parks	3.6461240	3.9631049	0.000
	(8.82)**	(8.82)**	
Distance. Nearest green parks	-0.5809128	-0.5974670	0.023
	(7.87)**	(7.87)**	
_cons	-71.9976097	-77.4336470	
R^2	0.57	0.57	
N	1402	1402	

The table above displays the values of 1402 residential real estate properties in Islamabad's various societies. The information was obtained from the website (zameen.com). Our dependent variable is the residential property value. The house size, the number of bedrooms, bathrooms, and the size of rooms, the proximity to the metro bus station, the railway station, the airport, the city centers, the markets, the job centers, the schools, the number of green parks, and the distance from the relatively close green parks are all independent variables in the study. The significant variables used to explain property prices in this study were discovered using lasso regression. The least absolute shrinkage and selection operator (LASSO) results indicate that the size of the house, the number of bedrooms, the number of bathrooms, the presence of a garage, the size of the rooms, the proximity to a city center, a market, a school, the number of green parks, and the distance from the relatively close green parks are all significant factors. Our research demonstrates that the proximity of job centers and the presence of a garden to residential real estate in Islamabad have little or no impact on the property values. Furthermore, if we focus on the value of each factor, the t-values for the robust factors are all high, showing how significant and highly robust these factors are in deciding the value of private property nearby. Further focusing on t values of variables, the t-values for the robust factors are all high, demonstrating how important and extremely robust these variables are in determining the cost of private property nearby. Considering that this model's t value is bigger than 2, the number of green parks is significant in the model due to the fact that the t value is more than 2. The t-value for the distance of a residential property to its nearest green park is 7.87, which indicates that the distance to the nearest green park is significant because it is more than 2. Further, the t-value of house size is 12.22, which is also greater than 2, making house size highly important. Due to higher t-values of the number of bedrooms and number of bathrooms, respectively, 2.77 and 9.36, the number of bedrooms and bathrooms are significant. Moreover, because the t-values of market and city centers nearby residential properties are greater than 2 and equivalent to 7.41 and 4.29, respectively, market and city centers are also very important. Additionally, the presence of a garden is excluded from the model by the lasso test because its t-value is below 2. The proximity of the residential property to airports and train stations is also important because the t-value is higher than 2 and is 2.83 and 2.51. However, job centers are also excluded from the model because their t-value is less than 0.15. Additionally, this model shows how various variables affect the dependent variable, which is the property value in various Islamabad residential housing societies. This model illustrates how much the dependent variable will change as a result of changes in the independent variables. The value of residential property will rise by

PKR 1566000 if a house's size is increased by one Marla. Similar to this, the number of green parks in a community will affect the value of residential real estate at a rate of PKR 3982000. This indicates that if there is one more park in the area, the value of the property will rise by PKR 3982000. Additionally, this model shows how various utilities contribute to changes in residential real estate values. For instance, when a residential property is one km away from a metro bus stop, the price of a Marla will change to PKR 70000. This illustrates how a one-kilometer increase in distance between a residential property and a metro bus stop will result in a PKR 71514.7 decrease in the property's price. The distance from a railway station to a residential property will also increase the property value by pkr.250000 in relation to a change in distance. As a result, residential property values will change by PKR 222000 per Marla depending on how close they are to the airport. A larger proximity between residential properties and the city center will result in a change in PKR 529000 with relation to a change in distance. As a result, residential plots will change in price at a rate of PKR 982000 per Marla depending on how close they are to the market. The distance from a school to a residential property will also change, increasing or decreasing by PKR 131000. As a result, if the distance between a residential property and a school is increased by 1 kilometer, the value of the residential property will decrease. The last variable that the model lasso identifies is the distance to the nearest green park. This distance will greatly impact a residential property's value, either increasing or decreasing it by PKR 580912.8. As a result, if there is an increase of 1 km in the distance from a residential property to the nearest green park, the value of the residential property will decrease.

CHAPTER 05

5.1 Findings and Discussions:-

This chapter thoroughly covers the study issues and hypotheses identified in chapter 4's findings. The third section examines the various findings, including possible results and decision making for the investment. Finally, the study's limitations are covered, along with a few suggestions. Our study used the hedonic pricing model to determine the impact of green infrastructure on the value of residential properties in various societies in Islamabad. Property characteristics such as structure, location, neighborhood, and green infrastructure are considered as independent variables. The other utility factors that are considered in the study include proximity to a job center, proximity to the market, house size, number of bedrooms, number of bathrooms, size of rooms, presence of garden and garage, proximity to the metro bus station, proximity to a railway station, proximity to the airport, proximity to school, and distance of property to its nearest green park. We found changes in property values for homes in various Islamabad societies using the hedonic pricing model. According to our findings, property characteristics such as location, neighborhood, and structural attributes were found to be significant to the value of residential property.

In accordance with the study's first question, "What are the relationships between property value and property characteristics such as structure, location, neighborhood, and green infrastructure in four private residential housing societies in Islamabad?" Depending on the various property characteristics, the study's results vary. There are some property characteristics that are positively correlated with the value of residential property, whereas others, such as proximity to job centers and the presence of a garden are not. Additional studies find a significant correlation between residential property values and distance from bus stops and schools. The property value increases as the distance between the residential property and these surrounding regions decreases, and as the distance between the residential property and the utilities increases, the property value decreases. Similarly, distance to a market, distance to a city center, a market, a railway station, and an airport have a negative impact on a residential unit's value. Additional structural characteristics that positively connect with residential property value include size of a house, number of bedrooms, bathrooms, room size, and garage presence. These results give support to hypotheses H2, H3, H4, and H5.

In accordance with the study's second question, "What is the impact of green spaces on the value of the residential properties?" the findings of the study revealed a significant and positive correlation between the value of residential real estate and green infrastructure practices (green parks). The results give support to H1, that the presence of green infrastructure in the area affects residential property values. In this case, when making investments in the residential sector, end users or investors take this factor into account.

Regarding the third question, " What is the pricing premium based on distance to the nearest green space? " regarding the last question, "how does the value of a residential property depend on the distance to the nearest green space?" according to an analysis, the proximity of a residential property to a green park correlates significantly to property values. Prices increase as the distance between residential property and the nearest green park decreases, whereas prices decrease as the distance between the nearest green park and a residential property increases. These results give support to the last hypothesis, H6.

Residents of Islamabad place high importance on the green parks in their neighborhoods. Apartments with a view of and within the green park service area could attract a sizable premium. The study's findings show that the addition of prices with regard to the number of green parks, distance to the nearest green park, and other factors is very high in various societies of Islamabad.

5.2 Conclusion:-

Researchers have done a number of studies over the years to determine the value of residential real estate. Across several societies in Islamabad, we have calculated a hedonic pricing function for properties, where the value of the property is significantly related to green infrastructure practices. The property values of 1402 residential units from various societies in Islamabad were used as the study data. Our study provides information on how the market value of surrounding properties is impacted by green infrastructure practices. The number of green parks and the distance between the property and the nearest green park were included in the model along with three other hedonic variables. The statistical methods utilized in the study are Correlation, OLS and LASSO. In order to determine which proximity influenced residential units the most, we examined the proximity between 1402 residential units and a metro bus station, railway station, airport, city center, market, job center, and

school. The findings show that the house size and number of bathrooms are the important structural factors influencing residential property values. A locational factor that is very important is proximity to the metro bus station. The only neighborhood factor that is highly significant is the proximity to a school. It would be advantageous for investors in Islamabad to invest in real estate properties near to schools and metro bus stations because the prices there are high and would result in a large return in the future. We find a highly positive significant correlation between the residential property values and the distance from the closest green park. Similarly, research findings indicate that due to green infrastructure practices such as green parks, the property value in the area increases. The number of green parks in the area and the distance between a property and the nearest green park are found to be highly significant. The price of a property is negatively correlated with the distance from the nearest green space.

5.3 Limitations and future recommendations:-

There are a number of residential housing societies in Pakistan. We measure the impact of property characteristics, such as location, structure, neighborhood, and green infrastructure, on the value of residential property in only four residential housing societies in Islamabad. However, in the future, researchers who wish to look deeper into the price of private land should make use of data from different Pakistani urban areas. The sample size for the study (N = 1402) is small because there was not enough time to investigate the topic and see if it improved or remained the same throughout time. The validity and significance of the study results will improve with a larger sample size. However, green spaces are not only beneficial for the environment but also bring a pricing advantage. In addition to these property features, there are other property characteristics and green infrastructure practices that can be used to estimate a residential property's value.

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