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Advancing Sustainable Housing and Infrastructure Development in Swabi District, Pakistan

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Abstract

The present study aims to investigate sustainable housing development in Swabi, Pakistan. This study seeks the impact of government planning and designing on sustainable housing and the influence of economy and cost-efficiency on sustainable housing. Moreover, this study also finds the impact of sustainable housing on residents' comfort. The data was collected through a self-designed survey questionnaire from construction and development professionals, such as architects, planners, and designers. A specific population was chosen through random sampling, and data was collected through an online survey using Google Forms. It was hypothesized that government policies of housing plan and design impact sustainable housing, and economy and cost-efficiency also significantly impact sustainable housing. Sustainable housing was also assumed to impact residents' comfort and environmental safety significantly. One sample t-test was applied to the data to explore the viewpoint of the same population on different aspects of sustainable housing. The statistical data analysis indicates a significant relationship between the government's role, economy, and cost-efficiency in sustainable housing in Pakistan. Moreover, it was also found that sustainable housing positively influences residents' comfort and protects the environment.

INTRODUCTION

The history of sustainable housing began in 1962 with the Findhorn Community in Scotland. The community introduced the housing structure by using environment-friendly materials such as timber for walls and coverings that were fixed with the minimum use of energy that was insulated with advanced methods with insulation of primarily renewable energy. The timber walls were known as breathing walls due to efficient fittings and carvings. The community developed its gas heating arrangements, giant turbines for

smooth winds, solar system for hot water resources, and garden-based sewerage systems. The construction of these buildings and architecture promoted healthy living in the natural ecosystem. Many houses had roof gardens and roof grass to strengthen the natural beauty and ecological system. The community had a cooperative social system where residents support each other in businesses such as the business of a hot water solar heating company. The community was also involved in spiritual education, setting up places for spiritual sermons. The community also educated their people to sustain nature and a healthy housing system to involve them in maintaining the development of the community. For all its efforts, it became part of the Global Eco-Village Network (Hopfe and McLeod, 2021). The Centre of Alternative Technology took another step towards promoting sustainable housing developed in Wales in 1972 to educate, inspire and enable people to participate in sustainable living. The contribution of this center was highly appreciable as they not only demonstrated the models for ideal sustainable housing that required low and renewable energy, but also they offered consultation and made publications regarding sustainable housing, good material, and formal living. The center also promoted using local timber as a replacement for cement, which negatively impacted CO2. Similarly, they focused on solar energy consumption and educated us that solar energy can be best utilized when thermal mass controls overheating issues.

CAT taught many other informative techniques to their clients to increase awareness of sustainable housing (Tabb and Deviren, 2017). Another significant contribution to sustainable housing and development was by Vales, Brenda Vale, and her husband, Robert Vale. They were famous for green architecture, the project they initiated in the UK to reduce thermal bridging and increase air tightening methods by consuming thermal mass to recover heat to protect space. They worked on a few more projects to secure the environment from massive outcomes of architectural designs and environmental decay. They mentioned their experiences and all experiments in the book named "Autonomous House" (Stickells, 2017). Another famous name was Bill Dunster, who contributed to sustainable housing in the 1990s by constructing a passive solar house named "Hope House." He then planned to develop an energy-saving village with rooftop gardens. He later further improved the physical features of housing by applying the zero fossils rule. These projects attracted many construction partners to promote sustainable housing. Later, Beddington Zero Energy Development also worked on developing sustainable housing projects similar to Vales projects, but the difference was that those projects were replicated in urban areas. They used a large quantity of recycled material at the time of construction.

The accessibility of roof gardens was very convenient for everyone. The gas, electricity, and heating systems were self-sufficient and developed thoughtfully to keep the environment safe (Mensah, 2019). Many factors are associated with sustainable housing. The present study captures the impact of government policy, economy, environment, and cost efficiency on sustainable housing. The role of government is very crucial in the planning of the growth and development of a country. Government is more than just the power to run a country through tailor-made policies and procedures. The government's contribution to setting up a sustainable system can be vast. A government can influence the structure of its housing and architectural forces by introducing an efficient public policy that helps people understand the importance of a healthy environment, sustainable development, and its impact on their health and well-being. Public policies

can also determine the rules and regulations for protecting nature by setting new rules for people that can guide them regarding acceptable behaviors and actions when exposed to nature. Sustainable development can also be promoted through government systems by assigning relevant duties and tasks to the different official levels so that they can be accountable for not preserving nature and the environment in development plans in their assigned areas. Good governance can also be beneficial in making efficient plans for construction and architectural growth by paying attention to the three critical components of sustainable housing; environmental, social, and economic. Hence, there is still a massive gap in exploring, planning, and implementing government policies in the development sector that can ensure sustainability. Governance can also ensure the efficient use of technology to enhance the resilience of urban areas and can promote safe technological implementation in architectural processes to control environmental pollution and climate extremities. Governments can also collaborate with NGOs working on eco-friendly projects and striving to enhance the natural environment by reducing the excessive use of energy and natural resources (Van der Waldt, 2016). The United Nations presented a report, "Our common future," 1987 on environment and development. This report emphasized the efficiency of sustainable development and environmental safety.

After the publication of this report, Western countries committed to establish sustainable housing and economic projects by using technology that could minimize harm to the natural environment. The issue of critical environmental damages due to economic development was again raised when the discussion took charge of global climate change and its hazards. The Politicians in the European Union started debating on the greenhouse gas causing extreme global warming due to a high range of gas emissions. It was discovered that greenhouse gas is an outcome of the utilization of fossil fuels. After disclosing this issue, a mutual consensus was drawn amongst politicians to take steps to reduce energy use. That is why European countries have considered the efficient use of energy since their consensus. Globally effective government policies are being made for efficient energy use to save natural resources and the environment (Yip, Mohamad, and Ching, 2017). The efforts of the European Union motivated the Swedish government to participate in sustainable housing development. Sweden is characterized by the most advanced and developed environmental policies. They have worked on greenhouse gas emissions faster than the European Union for years.

The Swedish government is making solid policies by implementing sustainable development to seek the position of the leading country in developing effective environmental policies and to be accepted worldwide as a role model for other countries. The Swedish government also emphasizes developing modern developmental policies to limit energy use. Sweden developed a renowned program to protect the environment: the Local Investment Program, which aims to enhance the ecological environment by using local means, such as promoting natural resources rather than artificial energy (Elander and Gustavsson, 2019). These efforts of different countries helped develop environmentally friendly policies adopted by the housing sector in various countries. Developing such applicable policies became necessary when it was discovered that most of the world's population lives in cities and Urban areas that reflect a high use of energy in fulfilling livelihood needs. The world could not handle this alarming situation due to limited natural resources. Another reason that made this reality

unbearable was the constant increase in the rates of energy prices constantly, which resulted in financial crises in countries and a significant stressor in running households with these expenses. Even higher energy rates could diminish people's affordability to buy houses. With the promotion of environmentally friendly policies and extensive educational awareness of natural resources, the idea of an eco-city was arrived at and was welcomed and studied by other developed countries. The eco-city concept promoted the elimination of waste and decreased energy resources from distant places. Instead, they emphasized local energy production using efficient technology and training and relied more on natural resources. Using local energy and recycling natural resources helped save more than 60% of energy consumption, which was a good sign for keeping the environment healthy and safe. These initiatives made Sweden the first country to introduce and implement environmentally friendly policies in their own country that promoted efficient energy use for commercial and household purposes (Scheller and Thorn, 2018). Similarly, the U.S. government also took the initiative to make its housing system more dynamic. The government designed and implemented policies to promote affordable housing for the public. A law was passed in 1949 called the "Housing Act" that emphasized the needs of its people regarding public housing. This act helped people understand that healthy living could only be possible by promoting low-rent houses, clearing emptied and dirty areas, and building more natural gardens and farmhouses (Gracia, 2019).

Singapore has also been working on sustainable housing projects for many years. The country is also known as "the garden city" for preserving natural resources and establishing green gardens. The country-built housing schemes for low-income people by utilizing natural resources to provide secure shelter for its people. The government of Singapore worked on the concept that "everyone has the right to adequate housing," which made Singapore a powerful country whose more than 90% of the population own their own houses and are satisfied with their living standards. The use of local energy and natural resources is evident in the construction and architecture of those public houses (Gan et al., 2017). The adaptation of sustainable practices is highly needed all around the world to improve society, the environment, and the economy. Similarly, a sustainable economy can play a remarkable role in improving the environment and society. Economic development is made in a country to fulfill human needs by preserving its natural resources and ecosystem to make it constructive for future generations. A sustainable economy creates opportunities to invest financial resources to develop strategies and implement sustainable projects, including reliable housing schemes.

But, in the case of recession, that is a cyclic process and refers to a decline in the profitability of business activities. This phenomenon hurts all economic happenings around the country. Lack of effective policies to uplift poor economic conditions can further deteriorate the situation and push the economy towards depression that does not only negatively influence GDP, investment ratio, imports, and exports, saving ratio, income, and capital flows that will cease the utilization of natural resources and capacities of people (Agri, Mailafia and Umejiaku, 2017). Amongst European countries, Ireland was the first to experience an economic decline in its real estate sector. It was a traumatic surprise for the country; before that, Ireland was counted among developed countries with high financial stability. The decline badly impacted housing prices over 1.5 years, further reducing the economy's dangerous state (O'Donoghue, Loughrey, and

Sologon, 2018). On the other hand, economic growth without considering the safety of natural resources and the environment is also a high risk for the sustainability of a country. Many conferences were held in different years in Stockholm, Rio de Janeiro, and Istanbul to look into rising environmental issues due to the exploitation of the environment and natural resources due to economic growth and industrial development worldwide. The conferences discussed the solution to protect inhabitants and natural resources of Urban areas when the production activities and energy consumption is at their peak to fulfill economic needs. China also experienced that Urbanization can enhance the economic growth of the country, but it can have a severely negative impact on the natural environment by increasing pollution (Liang and Yang, 2019). The example of the Lagos megacity that covers a large land area is relevant to economic growth and housing. The city has been developed to boost economic growth, but its infrastructure was not given attention. The city has newly built roads, water supply facilities for marine transport, a mainland bridge, highways, recreational parks, a long expressway, a ring road, and a waterway. This construction benefited the population and attracted the attention of investors, further boosting the area's economy. But the construction and all development were done without constructive planning that could not fulfill the accommodation needs of its total population. That revealed that not everyone wants only an increase in modern housing to meet economic needs.

People want a safe residence that positively influences their health (Dano et al., 2020). Just like an economic change influences sustainable housing, natural resources, and the ecosystem, constant environmental changes can also play a significant role in designing and implementing adequate housing. With the excessive usage of cement, fossil fuel, and concrete in building houses and commercial structures, the environment is getting unhealthy to a threatful condition. A rapid increase in residential buildings can be seen in different regions of Asia and Africa that are being constructed only to make shelter affordable for people, but the influence of these constructions on climate and environmental change is still unnoticed. A poor environment with loaded air, earth, and water pollution, deforestation, difficulty accessing health and social facilities, and poor infrastructure cannot promote sustainable housing (Patel and Padhya, 2021). Amongst other prominent factors, cost-efficiency is also a crucial factor that enhances the power of people to purchase houses. Cost efficiency is directly associated with sustainable housing as it promises to provide efficient houses without compromising natural resources and the environment. The constructive use of natural resources increases their sustainability and decreases their cost, which makes housing affordable.

A healthy environment maintains environmental stability by tolerating climate changes and reducing harmful environmental components. A good environment also helps keep the used material and prevents rotting. Recycling material and their long-lasting use can help decrease the energy use and consumption of other resources that are not only cost-effective but also provide an opportunity to enhance developmental sustainability. The environment is also responsible for the health of people. A good environment keeps people healthy and creates opportunities to work more actively, which is linked to financial stability and life satisfaction (Gan et al. 2017). Now the question arises how does sustainable housing influence residents' emotions and feelings and the surrounding environment? Residents' comfort or satisfaction can be achieved in many ways using sustainable housing, as it has already been discussed that residence reflects residents'

lifestyles and living standards. A healthy environment thus helps people to achieve satisfaction and happiness by living in a place of serenity where all resources are accessible, such as healthcare facilities, fresh food, pure water, etc. Residential satisfaction is also enhanced when people get opportunities to mingle with other people in their society. Social interactions, support, and mutual understanding of people also describe their comfort level, which can only be attainable in a peaceful locality and environment. The location features are also crucial in developing a comfort zone for residents. A location with parks, gyms, and recreational areas with a beautiful view can enhance satisfaction by enhancing mental health. Easy access to religious buildings is also essential in creating residents' satisfaction (Afacan, 2015). Sustainable housing equally provides resources to residents to live peacefully and protect the surrounding environment by effectively using energy, recycling natural resources, and maintaining natural greenery by abstaining from deforestation. Sustainable housing benefits individuals who become part of it, and its advantages at the national and global levels are remarkable.

Impact of Government Housing Policies, Economy, and Cost on Housing

The government (public sector) is a prominent player in the construction industry (particularly in the civil engineering market), and its primary goal is to ensure the best possible combination of input resources and effective technology utilization in order to minimize losses and maximize societal benefits (Wu & Li, 2018). A competitive market supported by the state, by definition, assures the efficient use of finite resources and long-term economic progress. As a construction market regulator, the government aims to remove market inefficiencies, which are a factor in creating ineffective competitive advantages for particular enterprises. It is in the best interests of the entire society to keep a continual eye on unethical business practices, anti- competitive agreements, and the potential for pricing coordination and cartel formation (Kelly, 2013). The government creates significant policies and initiatives on topics that directly and indirectly affect the building industry while also affecting other sectors, such as energy efficiency, waste management, and climate change (Clapham, 2018). All of the state's initiatives must be focused on the period leading up to the demolition of construction sites to encourage helpful and voluntary recycling in the industry.

The primary goal is to raise consumer confidence in recycled construction materials by improving quality (Olsen, 2019). In the construction and building business, the government is a big customer. Because it is responsible for the construction of public buildings and infrastructure, the government, as a client, can make the most progress in implementing the sustainable development program. The state and municipalities, primarily supported by the EU, account for over half of all construction orders. EU policy is to increase state institutions' obligations to follow the principles of sustainable construction governed by an EU directive (Boelhouwer, 2017). Because energy efficiency is such an essential aspect of the entire concept of sustainable construction, the government must ensure that the current old building stock is rehabilitated and renovated at a rate of 3% every year. Given that a 1% improvement in energy savings reduces gas imports by 2,6%, it is evident why the EU's and individual countries' aspirations in this area are so significant (Olsen, 2019). In the national long-term renovation strategy, financial mechanisms, incentives, and financial institution mobilization for building

renovations to improve energy efficiency should all play a key role. These measures should include encouraging energy-efficient mortgages, certifying energy-efficient refurbished buildings, encouraging public investment in energy-efficient buildings through public-private partnerships or signing energy-saving contracts with guaranteed results, lowering investment risk, and providing accessible and transparent tools for consultation and assistance (Tiwari & Rao, 2016). Because of the construction market's unpredictability and the significant macroeconomic impact of its growth, it is subject to a unique macroeconomic policy. It encompasses fiscal (conducted by the government as an economic entity) and monetary (conducted by the central bank) policy aimed at stimulating construction market activity and positively affecting overall economic development. However, these actions are objectively limited by each country's capabilities (Marichova, 2020). However, the more difficult question in the new dynamic environment is to what extent these activities will serve as a long-term incentive for supply modifications. Increased government spending and investment in education and research related to sustainable economic development and construction, support for innovation in small and medium enterprises, intellectual property protection, and building effective links between companies and the public sector are the main reasons for the change in supply.

These are factors that ensure the development of the construction firm's internal intangible assets, such as learning and development of knowledge, research, and development, a system of additional incentives and motivation for employees, incentives, and support for complementary and interconnected activities. In the vertical supply chain, support for venture capital in small innovative companies, and so on, and which, in the end, account for a decisive factor in the accelerated development of the construction firm (Edward & Turrent, 2002). The government's principal goal as a significant player in the construction industry should be to impose an obligatory requirement for using Building information modeling (BIM) in creating and implementing all public-sector projects/objects. BIM is a digital representation of their physical and functional qualities based on information and knowledge about the specific construction site, and it is a trustworthy basis for making effective decisions throughout the life cycle - from conception to demolition. Because it incorporates data relevant to cost, time, energy, and sustainability, "information" is vital in BIM. Building information modeling enables the creation of a virtual information model with the participation of the entire design team (architects, landscape architects, surveyors, constructors, civil engineers, and so on), as each specialist contributes specific data from their field to the unified model (Volk et al., 2014).

This model is available for research and review by the investor, suppliers, contractors, subcontractors, and the building owner/manager. Asymmetry and knowledge loss commonly occur when a new member in the vertical chain gets "ownership" of the projects/objects reduced because everyone involved in the construction process contributes precise information from the start. In other words, information modeling provides a complete picture and detailed analysis of the construction product's life cycle (from concept to demolition and reuse), increasing productivity in building design, construction, and management (Azhar, 2011). Furthermore, the system is an excellent tool for connecting and collaborating with the construction team to eliminate errors, unnecessary adjustments, and transaction costs in the vertical supply chain. It streamlines

and unifies the design, delivery, construction, asset management, waste management, recycling, and reuse processes, paving the way for circular buildings to flourish (Ashcraft, 2008). The government's main task as an economic entity responsible for ensuring sustainable development is to develop the necessary state standards and requirements for sustainable construction, as well as mechanisms, renovation models, guarantee funds, regulations, and fiscal incentives for investors and consumers of sustainable construction products. Accelerating the process of building certification based on well-established standards for evaluating sustainable construction is critical. These policies and the building standards that go with them must be backed up by financial incentives (tax breaks and loans on favorable terms for sustainable construction). Banks, insurance companies, and pension funds must step up their efforts, as they are currently highly passive participants in this process. There are impediments to sustainable construction being a dominant trend in the business (low awareness of conservatism, financial reasons, etc.). Projects and finished things that adhere to sustainable concepts and standards are still uncommon. The lack of an adopted uniform standard developed adequate legal norms and guidelines for designing, constructing, and maintaining sustainable construction sites prevents practical cooperation among all participants in the vertical chain of construction activities.

It demotivates all participants in the process - investor, owner, user, designer, builder, site manager, and so on ((Marichova, 2020). For these reasons, active government participation is required in the form of a well- defined and consistent policy that unites all stakeholders throughout the construction process Feedback on generating sustainable construction items, financial cost analysis for their construction, building care and management, and certification to assist the implementation of future projects are all needed. Housing is an economic sector that has direct and indirect multiplier impacts on other sectors and provides shelter for the people. The housing sector has been rated as one of the top economic sectors, particularly in metropolitan areas where employment and population demand are high. Numerous studies have revealed that the housing sector has a broader impact on economic growth in various ways. In terms of the economy, housing has backward and forward linkages as well as multiplier impacts. The housing sector increases a country's GDP and job prospects thanks to its input-output relationships with other economic sectors (Terzi and Bolen, 2008). Investments in housing are recognized as one of the primary economic indicators of a country. Research demonstrates that housing investment has overgrown in the long-term growth process compared to other sector investments.

However, it must be remembered that economic stability and growth allow a country to focus on its housing system by investing in this sector (Pan and Wang, 2013). The demand for housing-related items in the construction industry leads to a multiplier effect that encourages investment in other industries. All of these activities generate paid employment and the use of materials because the builders purchase the building's raw materials and hire transportation to transfer them; the homeowners purchase furnishings and fittings and pay for maintenance. This way, economic stability moves upward (Suglia et al., 2011). Green (1997) finds that housing investment contributes to GDP growth using data from the United States. He notes that housing leads, whereas other investment forms lag the economic cycle. He contends that his findings imply that policies should be created to avoid severe short-term policy disruptions or capital shifting from the housing

sector into the plant and equipment sectors. Trend and cycle analysis was used to investigate time series data from Canada, Finland, Germany, Japan, Sweden, the UK, and the USA. The findings highlight the significance of examining the long-term drivers of changes in housing investment (Thomson et al., 2013). One of Turkey's leading economic sectors has always been construction. Since 2010, the value of new house construction plus the net increase to the existing housing stock, or housing investment, has made up an average of 9% of GDP. Since 2002, Turkey has generated more housing units thanks to the enormous rise in the authority granted to the principal government agency in charge of housing production, the Housing Development Administration of Turkey. Although Turkey has created many homes since the government started to encourage the construction of public and private housing in 2002, home prices have continued to rise (both for the existing and new). After the pandemic, due to economic instability at the global level, the housing sector also suffered in Turkey. Even affordable houses have become challenging for low-income groups. Rising inequality, high unemployment, and housing insecurity contributed to this issue (Emekci, 2021). There are four ways that the property market is thought to influence an economy. The first real-side connections are the effects of housing policy on macroeconomic variables such as output, employment, income, consumption, savings & investment, prices, inflation, and the balance of payments.

The second category is financial ties, which examines the connections between the financial industry, which finances housing, and housing supply and demand. Third, fiscal links describe how the government contributes to the housing supply through tax and subsidy policies. Finally, socioeconomic linkages suggest that people are more inclined to engage in economic, social, and political activities in their communities if they have decent housing (Christie et al., 2008). In its Medium Term Development Framework, the Pakistani government identified housing and construction as priority industries with high potential for creating jobs for the underprivileged sections of society (Dowall and Ellis 2009). Nearly 40 industries in Pakistan's housing and building sector are interconnected, creating many extra job opportunities through a more substantial multiplier effect and various advantageous economic forward and backward linkages. The Government of Pakistan states that boosting the housing supply can alleviate housing shortages and increase the 40 associated businesses connected with it due to the robust employment prospects and growth rate (Ahmed et al., 2021).

The last several years have seen a rise in interest in sustainable community development, focusing on enhancing community lifestyle, supplying a better living environment, and creating more cost-effective housing options. Today, there is a crisis in affordable housing due to rising prices and subpar building practices that do not ensure high quality during a project. Shelter poverty, associated with a household's inability to cover non- housing requirements (such as food, clothing, medical care, transportation, etc.) at a minimal level after housing payment, is linked to a lack of affordability (Hardiman et al., 2010). According to this topic, affordable housing neighborhoods must embrace sustainability because it attempts to create a healthier environment and more cost-effective homes. This is easily understood by looking at the many tactics of Leadership in Energy and Environmental Design for Neighborhoods (LEED-ND), which advances smart growth and new urbanism. This was exemplified by reviving already-existing metropolitan districts, conserving land, reducing reliance on automobiles, encouraging pedestrian activity,

improving air quality, lowering polluting stormwater runoff, and creating more livable neighborhoods for individuals from all socioeconomic backgrounds (USGBC, 2009). Efficiency in affordable housing can be achieved through sustainability, but several obstacles could limit adoption and raise costs. As a result, it is imperative to evaluate the cost-effectiveness based on feedback from demand-side and supply-side stakeholders (architects, planners, and developers) (Nelson et al., 2004). Sustainable housing is one of the most critical trends in the real estate industry to lessen environmental effects and climate change. The design of individual structures and entire districts in sustainable architecture is one of the most avant-garde urban developments of the twenty-first century (Lehmann, 2010). Enhancing quality of life enables individuals to live in a safe environment with better social, economic, and environmental conditions, which is the philosophy behind sustainability. Additionally, this construction supports the area's most prestigious way of life, minimizing its ecological impact (Akadiri et al., 2012). A sustainable building is typically high-tech, eco-friendly architecture. By effectively conserving resources such as materials, energy, space, and the ecosystem, it aims to reduce the adverse effects on the environment.

Physical and Thematic Aspects of Sustainable Housing

Environmental protection, energy saving, and many other supporting issues are all emphasized in sustainable housing design. All city dwellers should have access to inexpensive, environmentally friendly housing (Sodagar et al., 2008). As a result, affordable housing is a topic of discussion and provision for sustainable housing. Initial construction expenditures, as well as ongoing building maintenance costs, are included in housing costs. Since high-quality housing must have good building quality and focus on giving users high-quality living circumstances, low-cost housing is affordable considering the complete life cycle. Ultimately, the house is for the people who live in it. The physical and emotional well-being of the residents is better supported by a healthy and livable indoor and outdoor environment (Moghayedi et al., 2021). Additionally, these dwelling forms lessen their ecological impact by encouraging the healthiest lifestyles and the environment. The term "house" refers to a place where one or more people reside continuously, such as a living room, apartment, or home. A house often has rooms for sleeping, bathing, and cooking. Additionally, they are frequent places for family life, socializing, and significant occasions (Almusaed and Almssad, 2022). The residence is enjoyable in addition to meeting the needs.

We are all deeply concerned about construction, from the child's brick-stacking to learning to master the sky and space to self- expression (Gyurkovich, 2019). Sustainable development depends heavily on the standard of housing and how well it performs on the social, economic, and environmental fronts. Based on study trends and perspectives, housing quality varies greatly. Providing housing that should satisfy the resident's requirements and expectations while upholding some exceptional standards is known as high-quality housing (Yip et al., 2017). The debate in the public and the research that has attracted attention has links between housing quality and people's well-being, happiness, and quality of life. Numerous types of research have revealed a connection between internal quality and quality traits (Ali, 2018). This idea includes interior design elements such as residence size, kind, number of rooms per person, appropriate and efficient circulation between spaces, ventilation, adequate sunlight, and so on as factors of housing quality (Chohan et al., 2015). Physical factors connected to housing design,

layout, and construction, such as house size, usable space, construction materials, look, and finishes, are crucial to livability. Aesthetics and house design significantly impact housing quality and can affect tenant contentment, aspirations, and quality of life (Kurian and Thampuran, 2011).

Social and Environmental Aspects of Sustainable Housing

The enhancements in life quality, health, and well-being are associated with the social advantages of sustainable design. Buildings, communities, and society can all reap these advantages. Research on the human advantages of sustainable design has primarily focused on three areas at the building level: health, comfort, and satisfaction (Almusaed and Almssad, 2022). The building environment can influence the quality of life of the residents in both positive and negative ways. The adverse effects of poor indoor air quality, inadequate thermal comfort, inadequate illumination, and particular interior space design elements include sickness, absenteeism, weariness, discomfort, stress, and distractions (e.g., materials selections, furnishings, and personnel densities). Sustainable design frequently improves health and performance by minimizing these issues. Strongly advantageous factors include better personal control over temperature and ventilation and improved indoor air quality. Buildings should include features and qualities that promote pleasant psychological and social experiences and minimize hazards and discomforts (Chohan et al., 2015). The social advantages of sustainable design at the community or societal level include information sharing, enhanced environmental quality, neighborhood rehabilitation, and decreased health risks from pollutants linked to building energy consumption.

A component of sustainability is social sustainability, which is correlated with user pleasure. It promotes interpersonal interaction and gives rise to "human-centered" architectural planning. It represents ties within society as well as those between nature and society that are mediated by employment. Work within a society and the related institutional arrangements that meet a broad range of human needs and are designed so that nature and its reproductive claims of social justice, human dignity, and participation are delighted are indicators of social sustainability (Carter and Fortune, 2007). Long-term sustainability strengthens the bond between nature, society, and humans to enhance environmental quality, social integration, and human equality. This enhances their participation, quality of life, and mental and physical health. The properties of sustainable housing are being measured by a self-developed questionnaire that is being utilized to understand professional opinions about the concept and implications of sustainable housing in Pakistan.

FINDINGS

This research work intends to represent the results of the statistical analysis in tabular form. The research work also consists of the questionnaire used to conduct the study through the survey. Then, a demographic table will be made, which will shed light on the attributes of the sample briefly, and then descriptive and inferential statistics will be presented in different tables. The research work will also represent the overall responses of participants to each item that will be explained in the discussion research work.

Details of Questionnaire: The questionnaire is replicated from previous relevant studies based on the same variables. The items of the scales were modified according to the

topic of our study. The researcher went through many studies based on the same concept, and many questions were highlighted that could help the researcher explore the purpose of the study. Then the most relevant questions/items were sorted out and applied to the study. This questionnaire has 5 sections that measure all variables separately to make it understandable for participants. The first part of the questionnaire identifies the ideas on the concept of sustainable housing from the viewpoint of architects and related professionals. Sustainable housing in Pakistan is still unfamiliar because many financial and economic constraints and instabilities do not allow concerned parties and government to look at this bright picture. However, the government initiated many housing programs in different eras to fulfill residents' needs, especially for low-income families. This section of the questionnaire consists of the following questions: This section sheds light on sustainable housing by addressing its different domains. As item 1 mentions, the cost efficiency and affordability feature of sustainable housing is a crucial component for residents, architects, and the government. However, items 2, 3, 4, 5, and 6 consist of the physical and aesthetic parts of sustainable housing. Whereas item 7 measures the utility of natural resources and energy so that professionals can view these two essential features of sustainable housing in Pakistan, Pakistan is already running out of its natural resources and power energy due to limited finances and a declining economy. Item 8 focuses on a safe and healthy environment, and item 9 explores the cultural aspect of sustainable housing. Item 10 measures the sustainability of buildings by asking respondents about their life span criteria.

Table1:
Sustainable Housing

1	A sustainable housing system should be inexpensive, meaning the housing and accommodation should
2	In a sustainable housing system, the type, size, and terms of accommodation should facilitate ecological, social, and economic sustainability policy goals for the region.
3	Accessibility and flexibility should be considered first in the sustainable housing system to cater to citizens' varying needs during their lifespan.
4	In sustainable housing, infrastructure, land, and energy should be utilized per dwellers' needs.
5	The place should be well-located to promote conveyance and transport services in a sustainable housing system compared to personal vehicles.
6	Design and house positions should consider the advantages of daylight, sunlight, and solar paybacks instead of using excessive electricity.
7	Renewable energy and natural resources should be consumed in moderation in sustainable housina.
8	A safe and healthy environment is the only outcome of sustainable housing.
9	The design of the buildings should enhance the vicinity and have a high regard for its cultural legacy.
10	The finest construction methods with a service lifespan of sixty years without repairs or replacements should be deployed.

This section of the questionnaire can give an overview of what professionals (architects, engineers, environmental specialists, etc.) believe about sustainable housing in Pakistan so that this concept can be implemented practically. This questionnaire section explicitly relates to government measures and services in sustainable housing. Items 1, 3, 4, and 7 of this section shed light on the importance of government funds and monetary plans to establish and manage sustainable buildings in Pakistan. Item 2 focuses on the collaboration of different parties and organizations to successfully implement the concept of sustainable housing in Pakistan. Item 5 is again related to the affordability features of government measures to make housing affordable. Whereas items 6 and 8 focus on housing adaptability and technological advancements that need to be made

by the Pakistan government to emphasize sustainable housing. This section is an eye-opener and helpful guide for the government officials working for the Pakistan housing department. By looking at professionals' responses, the government can focus on improving its services for the housing sector in Pakistan.The 3rd section of the questionnaire focuses explicitly on the economic fluctuation and its impact on the housing sector in Pakistan. There are a total of 8 items in this section that are given below: This section mainly deals with questions related to water consumption, energy nature, and energy to build and maintain sustainable houses. Items 3, 4, 5, and 6 are developed to address questions related to these factors. While item 7 focuses on the consumption of recycled material. Item 8 addresses an effective transport system in sustainable housing infrastructure.

Cost-efficiency: The total 7 items in this section are designed to focus on the importance of the cost- efficiency feature of sustainable housing.

Table 2:
Government Policy of House Planning and Design

1	Government fund greatly encourages sustainable housing development and management.
2	Local companies, organizations, and authorities must work together to create a sustainable housing community.
3	Many political policies state big promises but do little to combat the reality of issues like affordable housina.
4	Changing people's lifestyles by creating more resources for physical activities near houses should be enforced and regulated by government authorities.
5	Housing affordability should be considered when planning and designing a sustainable housing system.
6	Housing adaptability according to changing housing needs should be an objective of government planning.
7	Government incentives to cut down housing costs for low and middle-income earners can enhance housing sustainability.
8	Deploying appropriate modern technologies and innovations for a sustainable and affordable housing project should be part of government planning.

Table 3:
Cost-efficiency

1	House prices should be set in sustainable housing concerning the residents' incomes.
2	In sustainable housing, rental costs should be set concerning the residents' incomes.
3	A Access to employment and educational institutions is critical to saving excess transportation costs in
4	A Access to open green public spaces is an essential feature of a sustainable housing system that allows spending quality time without spending extra money.
5	A Access to public transport services compared to private transport is cost-efficient and helps boost a sustainable housing system.
6	Recycling building materials enhances cost-efficiency in sustainable housing.
7	The positive impact of housing quality on residents' physical and mental health saves money that could

In this section, the efficiency of effective cost is measured in items 1 and 2, while items 3, 4, 5, 6, and 7 shed lights on the measures that can play a significant role in managing costs in sustainable housing in Pakistan by adopting healthy ways to save money in different ways. This section of the study helps provide ideas for the architectures to develop effective designs so that maximum benefits can be achieved through infrastructure and unnecessary expenses can be controlled. This part consists of 8 items focusing on the facilities and factors that help enhance residential comfort. All items in the section describe the factors associated with residential comforts, such as physical

features, aesthetic components, and environmental enhancement. This section is quite helpful for engineers and architects when designing and planning to house so that all essential components crucial for residents' satisfaction can be kept in mind and implemented. Table 12 represents the overall responses of participants on the cost-efficiency scale, which shows that most participants strongly believe that green space is an essential feature of sustainable housing so that people can spend a good time together in a healthy space without spending money. At the same time, most believe that house prices and rent prices should be affordable in a sustainable housing system. Table 13 shows the items for residential comfort, which shows that most participants value the physical aspects of sustainable houses and firmly believe that windows and physical layout play a critical role in enhancing residential comfort in sustainable housing. Similarly, lighting and ventilation are at the top of the features that residents demand to enhance their satisfaction and comfort in sustainable housing.

Table 4:
Residential Comfort and Environmental Safety

1	The residential comfort of residents is the ultimate result of the sustainable housing system due to its human-friendly features.
2	Management and maintenance of houses enhance residents' comfort in the sustainable housing system.
3	Lighting and ventilation are critical in maintaining residents' comfort and satisfaction.
4	Convenience with access to working and studying facilities encourages residents to adopt sustainable housing systems.
5	Sustainable housing should provide environmental safety in the region due to its eco-friendly features.
6	Air quality and thermal comfort are essential for residents' comfort and satisfaction in sustainable housing.
7	In sustainable housing, windows and layouts that maximize views and natural ventilation opportunities
8	Adequate measures need to be taken to benefit from daylight and sunlight by properly designing houses

Table 5:
Results of the Study for Demographics Table 6 Demographics

Variables	Total Number	Percentage
Gender Male Female Profession	54	90%
Architects	06	10%
	60	100%

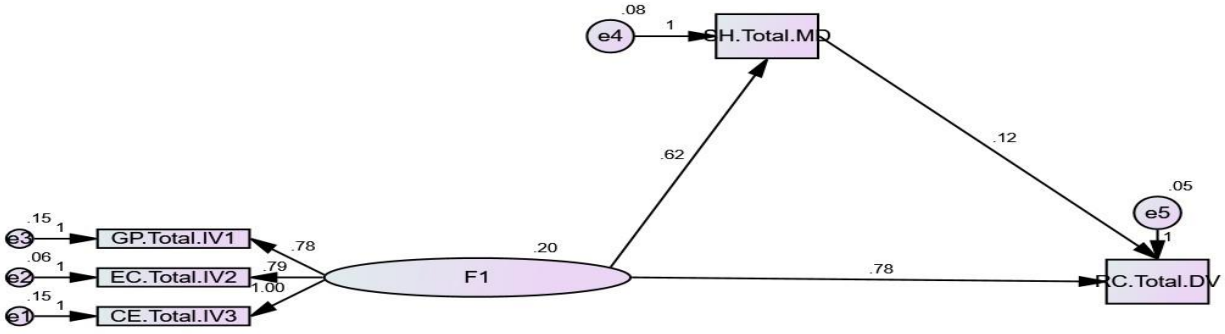

Figure 1:
Factor Analysis

Table 5.1 Elaborates on the demographic information of participants that indicates a high number of male participants compared to female participants. It needs to be mentioned again at this point that there were no gender biases on the researcher's part,

but unfortunately, a low number of females in architecture-related fields indicates a low percentage of females in this profession in Pakistan that will be discussed further in the next section of the study.

Table 6:
Results of the Study for Factor Analysis Table 7Factor Analysis

Sustainable housing system	ResidentialComfort and environmental efficien
BSEp-value	BSEp-value
Government .6	.129
Policy, economy, and cost 24	.000
efficiency	.776
	.18
Sustainable housing system 115162	
R^2 = .492 95% CI (LL = -.425 , UL = .235)	

Table 7:
Results of the Study for Correlation Analysis Table 8 Correlation Analysis

	Residential Comfort and Environmental Safety (R C and ES)	Sustainable Housing	Government Policies	Economy	Cost-Efficiency
R C and ES	-	.653**	.567**	.645*	.693**
Sustainable Housing	.653**	-	.506**	.560**	.512*
Government Policies	.567**	.506**	-	.539**	.462*
Economy	.645*	.560**	.539**	-	.625*
Cost-Efficiency	.693**	.512*	.462*	.625*	-

Note:
1. **.653**, **.567**, **.645**, **.693**, **.560**, **.539**, **.625** denote correlation coefficients.
2. An asterisk (*) indicates significance at the 0.05 level (2-tailed).
3. Double asterisks (**) indicate significance at the 0.01 level (2-tailed).

Results of the Study for the Responses of Participants on Each Scale

The results section also sheds light on the responses being calculated for each participant to analyze the frequency and percentage of responses on each item. The table is given below. Model 1 showed that the Government policy, economy, and cost efficiency had a significant impact on residential comfort and environmental efficiency (*B*=.776, *t*=4.218, *p<.005)* in the presence of the mediator (sustainable housing system). The sustainable housing system was insignificant in influencing residential comfort and environmental efficiency (*B*=.115, *t*=.712, *p>.476)*. The model accounted for 49.2% variance in residential comfort and environmental efficiency due to a sustainable housing system. Table 8 shows significant results in terms of the relationship between all variables with each other. According to this analysis, government policies, economy, and cost-efficiency are positively correlated, and these variables are also positively associated with sustainable housing.

At the same time, sustainable housing has a positive relationship with residential comfort and environmental safety. Table 9 shows the responses of participants to the questionnaire on sustainable housing. It can be seen that a significant percentage of participants strongly agree with the idea that sustainable housing should consider the advantage of daylight rather than depending on electricity. Most strongly believe that renewable energy and natural resources should be used in moderation in sustainable houses. On the other hand, some respondents strongly disagree with using public transport rather than private transport in the sustainable housing system. While some of

them strongly disagree that a safe and healthy environment is the only two outcomes of sustainable housing. Instead, they trust that sustainable buildings and societies have many more benefits.

Table 8:
Percentage of Responses on Sustainable Housing

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Sustainable Housing					
Sustainable housing system should be inexpensive that means the housing and accommodation should have been constructed and administered at a cheapest cost.			9.8%	40.9%	49.1%
In sustainable housing system, the type, size, and terms of accommodation should facilitate ecological, social, and economic sustainability policy goals for the region.			3.2%	36%	60%
Accessibility and flexibility should be considered first in the sustainable housing system to cater the varying needs of citizens during the course of their lifespan.			13.1%	49.1%	37.7%
In sustainable housing; infrastructure, land, and energy should be utilized as per dwellers' needs.		1.6%	13.1%	31.1%	54.2%
The place should be well-located to promote conveyance, and transport services in sustainable housing system as compared to personal vehicles.	7.71%	8.19%	9.8%	35%	39.3%
Design and house position should consider the advantages of daylight, sunlight, and solar paybacks instead of using excessive electricity.			9.9%	18.0%	72.1%
Renewable energy and natural resources should be consumed in moderation in sustainable housing.			14.9%	16.3%	68.8%
Safe and healthy environment is the only outcome of sustainable housing.	8.4%	13.1%	11.4%	32.7%	34.4%
The design of the buildings should enhance the vicinity, and have a high regard for its cultural legacy.			23.1%	36.0%	40.9%
The finest construction methods should be deployed that should have a service lifespan of sixty years without the repairs or replacements.			8.3%	52.4%	39.3%

Table 9:

Percentage of Responses on Government Policy of Planning and Design

	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Government Policy of Planning and Design					
1.	Government fund greatly encourages sustainable housing development and management.	7.52%	14.07%	8.01%	31.1%	39.3%
2.	It is necessary that local companies, organizations and authorities work together to create a sustainable housing community.		1.6%	6.5%	22.9%	63.9%
3.	Many political policies state big promises, but do little to combat the reality of issues like affordable housing.		6.64%	18.03%	18.03 %	57.3%
4.	Changing people's life style by creating more resources of physical activities nearby houses should be enforced and regulated by government authorities.		3.2%	9.8%	29.5%	45.9%
5.	Housing affordability should be kept in mind at the time of planning and design sustainable housing system.		3.2%	4.9%	29.5%	62.2%
6.	Housing adaptability according to changing housing needs should be an objective of government planning.			24.7%	40.9%	34.4%
7.	Provision of government incentives to cut down housing cost for low and middle-income earners can enhance housing sustainability.		1.6%	11.6%	45.9%	40.9%
8.	Deployment of appropriate modern technologies and innovations for a sustainable and affordable housing project should be the part of government planning.		1.6%	8.1%	51%	39.3%

Table 10 reflects respondents' opinions regarding the government's role in developing a sustainable housing system in Pakistan. Most (62.2%) strongly agree that the government should consider people's affordability capacity when planning and designing housing systems in any corner of Pakistan. When asked about the government's role in the housing sector, many respondents (57.3%) believed that government only makes big promises but little to develop and maintain this sector in Pakistan.

Table 10:

Percentage of Responses on Economy

Items		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Economy						
1.	Economic growth and development is considered to play an important role for sustainable housing development.			12%	25.6%	62.4%
2.	Improving people's health and opportunities for a good life can be achieved by sustainable housing and development.		5%	15.3%	32.5%	47.2%
3.	Reducing water consumption is necessary for sustainable housing system.		9%	13.8%	54.5%	22.7%
4.	Preserving nature can enhance the opportunities for sustainable housing and development.		11%	20.7%	46.2%	22.1%
5.	Sustainable housing system and development demands a reduction in all sorts of waste.	7.4%	11.2%	4%	26.9%	50.5%
6.	Energy efficiency is an economic friendly feature that is crucial for sustainable housing system.		2.9%	2.8%	23.2%	71.1%
7.	Building material recycling is highly appreciated in sustainable housing system.		7.9%	8.6%	46.5%	37%
8.	Provision of quality and serviceable transportation infrastructure in housing projects allows for easy access to and from place of job opportunities.	4.4%	2%	7.2%	53.9%	32.5%

Table 11 shows the responses of all participants on the scale of economy. Many of the population (71.1%) strongly agree that energy efficiency is an economy-friendly and crucial feature of sustainable housing. In comparison, many participants (54.5%) agree that water consumption should be reduced in sustainable housing through efficient measures and alternatives.

Table 11:
Percentage of Responses on Cost-Efficiency

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Cost-Efficiency					
In sustainable housing, house prices should be set in relation to incomes of the residents.			4.1%	53.5%	42.4%
In sustainable housing, rental costs should be set in relation to incomes of the residents.			2.7%	57.3%	40%
In sustainable housing system, access to employment and educational institutes is a critical feature to save excess transportation costs.		13.5%	16.2%	42.6%	27.7%
Access to open green public spaces is an important feature of sustainable housing system that allows spending quality time without spending extra money.			11%	37.2%	51.8%
Access to public transport services as compared to private transport is cost efficient that helps boosting sustainable housing system.	1.6%	19.8%	12.3%	27.5%	39.4%
Recycling of building material enhances cost-efficiency in sustainable housing.		11.9%	8.1%	41.3%	38.7%
Positive impact of housing quality on physical and mental health of residents saves money that could be used in medical treatments.		9.3%	24%	39.2%	27.5%

Table 12:
Percentage of Responses on Residential Comfort and Environmental Safety of Responses on Cost-Efficiency

	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Residential Comfort and Environmental Safety					
1.	Residential comfort of residents is the ultimate result of the sustainable housing system due to its human-friendly features.		14.7%	12.4%	49.3%	23.6%
2.	Management and maintenance of houses enhances residents' comfort in the sustainable housing system.	3.7%	6.4%	11.4%	51.1%	27.4%
3.	Lighting and ventilation plays a critical role in maintaining residents' comfort and satisfaction.				27.4%	72.6%
4.	Convenience with access to working and studying facilities encourages residents to adapt sustainable housing systems.		2.8%	1.7%	41.5%	54%
5.	Sustainable housing should provide environmental safety in the region due to its eco-friendly features.			16%	59.3%	24.7%
6.	Air quality and thermal comfort are important features for residents' comfort and satisfaction in sustainable housing.		1.6%	6.8%	25.3%	66.3%
7.	Windows and layouts that maximize views out and natural ventilation opportunities need to be considered in sustainable housing.			1.6%	19.2%	79.2%
8.	Effective measures need to be taken to get benefit from daylight and sunlight by proper designing of houses.			3.4%	32%	64.6%

DISCUSSION & RECOMMENDATIONS

The study intends to explain the results computed in the previous section by analyzing respondents' responses. The research work will also compare the present results with the previous studies. The study results show that three major factors; government policies of house planning and design, the country's economy, and cost efficiency significantly influence sustainable housing in Pakistan. If we discuss the factors in terms of their importance, the government policies on housing stand at the highest position. Policies are the pillar on which other factors and situations depend, usually because the policies are amended and developed by keeping the current political and economic situations in mind and can be altered from time to time as per the change in the country's situation. If we exclusively talk about Pakistan's policy of housing planning and design, we will explore their current status and the need for improvement in them to enhance the country's infrastructure. In contrast to many other nations, Pakistan's government took nearly 55 years to publish its 2001proposed housing strategy. Since then, Pakistan has gone 16 years without introducing a new or revised policy.

In Pakistan, there is a widespread belief that the government is ineffectively handling the problems relating to the housing sector, even though housing is a fundamental requirement of the people. Compared to population growth, the housing shortage is multiplying. According to the country's housing stock's average number of people per room index, there has been a sharp increase in the proportion of housing units, while the average number of people per room has steadily increased at the state and regional levels. According to the findings of the 1998 census, there are a total of 19.3 million housing units in the nation, of which 32.3% are found in urban regions and 67.7% are classified as rural housing. According to census data, there is a 4.3 million housing unit shortage. The country requires an additional 300,000 housing units per year, but because fewer homes are being built, the housing shortage is growing by 270,000 annually. According to the 2017 census, the nation's housing stock comprises 19,211,738 units (Hasan and Arif, 2018). A 9 million housing backlog and a 270,000- unit yearly housing shortage exist. With its present growth rate, Pakistan will have the fifth- highest population by 2050. Pakistan's National Housing Policy (NHP) 2001, which emphasizes the fundamental criteria of creating a positive environment to stimulate and advance the housing sector, is in effect now.

The goal of the policy is to support innovative concepts and their execution in order to ensure that all of its residents have access to livable and respectable housing. This policy tries to identify parcels of land, whether public or private, in rural and urban regions that can be developed for housing. In order to reduce litigation, the common holdup laws in the procurements practice will be eliminated and modified. The regularization of Katchi Abadis, the inclusion of low-cost incoming housing, the creation of new towns, and the regularization of housing taxes were the main achievements of the National Housing Policy of 2001. However, various reasons contributed to the ineffective and fruitless execution of the suggested steps by the housing strategy above. Such as, even the most affordable housing unit created by a public or private developer was out of reach for the low-income group. Another significant obstacle is failure to get revenue, whereas the difference between the supply and demand curves is constantly growing. Moreover, the housing plans lacked community involvement, and the delivered units proved to be not only pricey but also contrary to the requirements and preferences of people. The owners satisfy their demand by selling their properties because the dwelling has costly

maintenance and other fees. The failure of the National Housing Policy had many pitfalls discussed above. The government of Pakistan has so much focus on Katchi Abadis and, on the contrary, not controlling housing material and production costs that are causing a severe issue in developing cost-effective and sustainable housing in Pakistan. There is not a single city in any region of Pakistan that has sustainable architecture because the government and architects focus on increasing the number of houses on a limited budget to accommodate the increasing population, which makes them vulnerable to using low- quality materials and untrained labor. The increased number of housings is responsible for destroying Pakistan's natural resources and green areas, which are an integral part of human health. The increasing population and poor infrastructure are also damaging the roads and causing a shortage of public transport. The news of house collapsing has become usual, forcing residents to leave their homes within a few hours to save their lives, which is another traumatic experience. The main reason behind the house collapse is poor construction materials and the construction of multiple-story houses above a narrow and small area.

The residents of Pakistan are now fed up with housing expenses, poor quality construction materials, and lack of housing necessities and are forced to live around smelly sewerage water and Katchi abadis, making their life more problematic and riskier. So, most of the study's respondents believe that Pakistan now needs a sustainable housing structure that should be safe, secure, and environmentally friendly. Green buildings may help the government to make housing sustainable in Pakistan, which would also be linked with the excellent health of its residents. The term "green building" describes a structure as well as the use of methods that are resource- and environmentally conscious throughout the whole life cycle of a building, from planning to design, construction, operation, maintenance, renovation, and demolition. At all project stages, the client, the architect, the engineer, and the contractor must work closely together to accomplish this. The term "green building" indeed describes a procedure that is resource- and environmentally conscious throughout the life of the structure. All various phases of the building life cycle, including design, construction, operation, maintenance, renovation, and demolition, apply to the process. Green building infrastructure also addresses the lack of intelligence, the energy issue, the water deficit, and ineffective waste management.

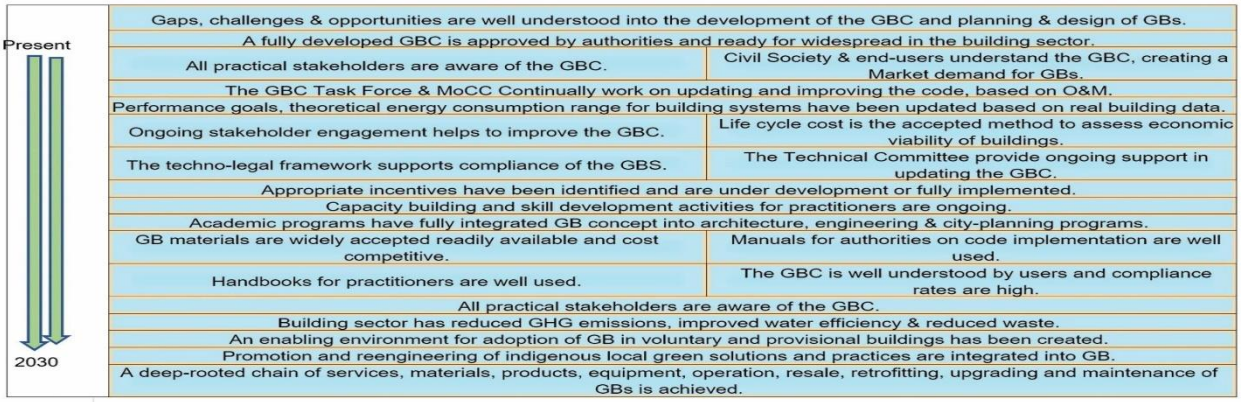

Figure 2:
Key Objectives for Green Building in Pakistan by 2030 (Source: Switch Asia, 2022)

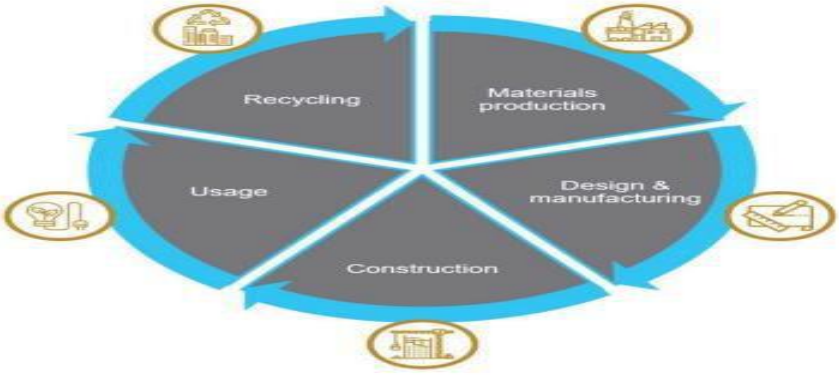

Figure 3:
Stages of a Building's Life Cycle (Source: Switch Asia, 2022)

Pakistan stands to gain significantly from quickly changing national green construction policies by creating a Green Building Code (GBC). The building sector in Pakistan is well on its way to becoming a wholly transformed green scenario by 2030, according to precedents and success stories from the international arena. The primary strategic goals, as depicted in Figure 3, are accomplished in this scenario. These aims are major turning points for the GBC's development and general objectives for GB in Pakistan. The roadmap should be followed appropriately, the code should be fully implemented, and the interim goals should be accomplished if these goals are to be met by 2030 (Switch Asia, 2022). To apply green building policy in Pakistan, it is crucial to consider these factors; always consider or locate, plan, and build the green building or dwelling except the following locations to ensure proper site selection and minimal environmental effects involving the loss of natural resources. In forests or on land where considerable deforestation is necessary:

1. On poorly-drained soils.
2. Nearby streams and bodies of water (rivers, water zones)
3. Where critical wildlife habitats are within a one-kilometer radius.
4. Extremely inclined slopes.
5. At the crest of mountains and hills.

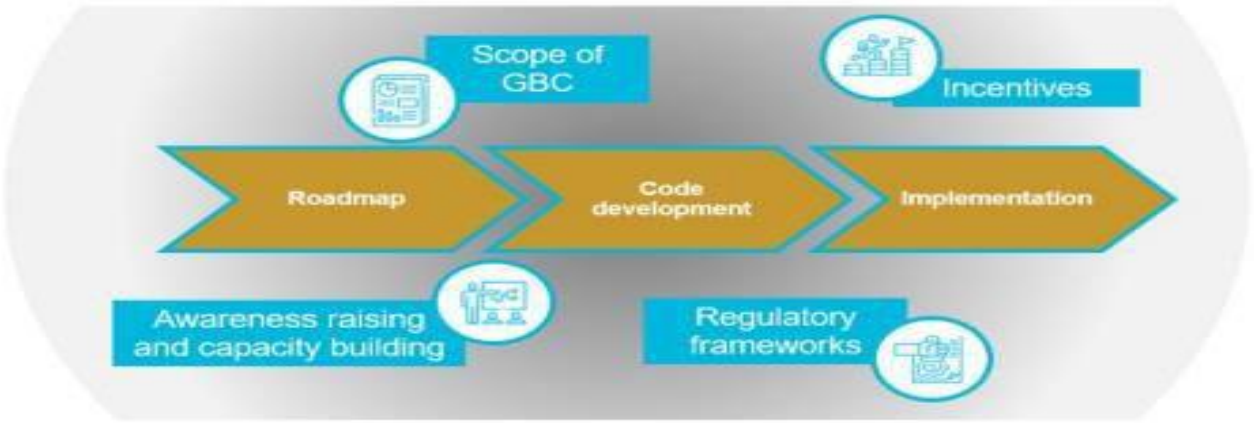

Figure 4:
Road Map for Promoting Green Building in Pakistan (Source: Switch Asia, 2022)

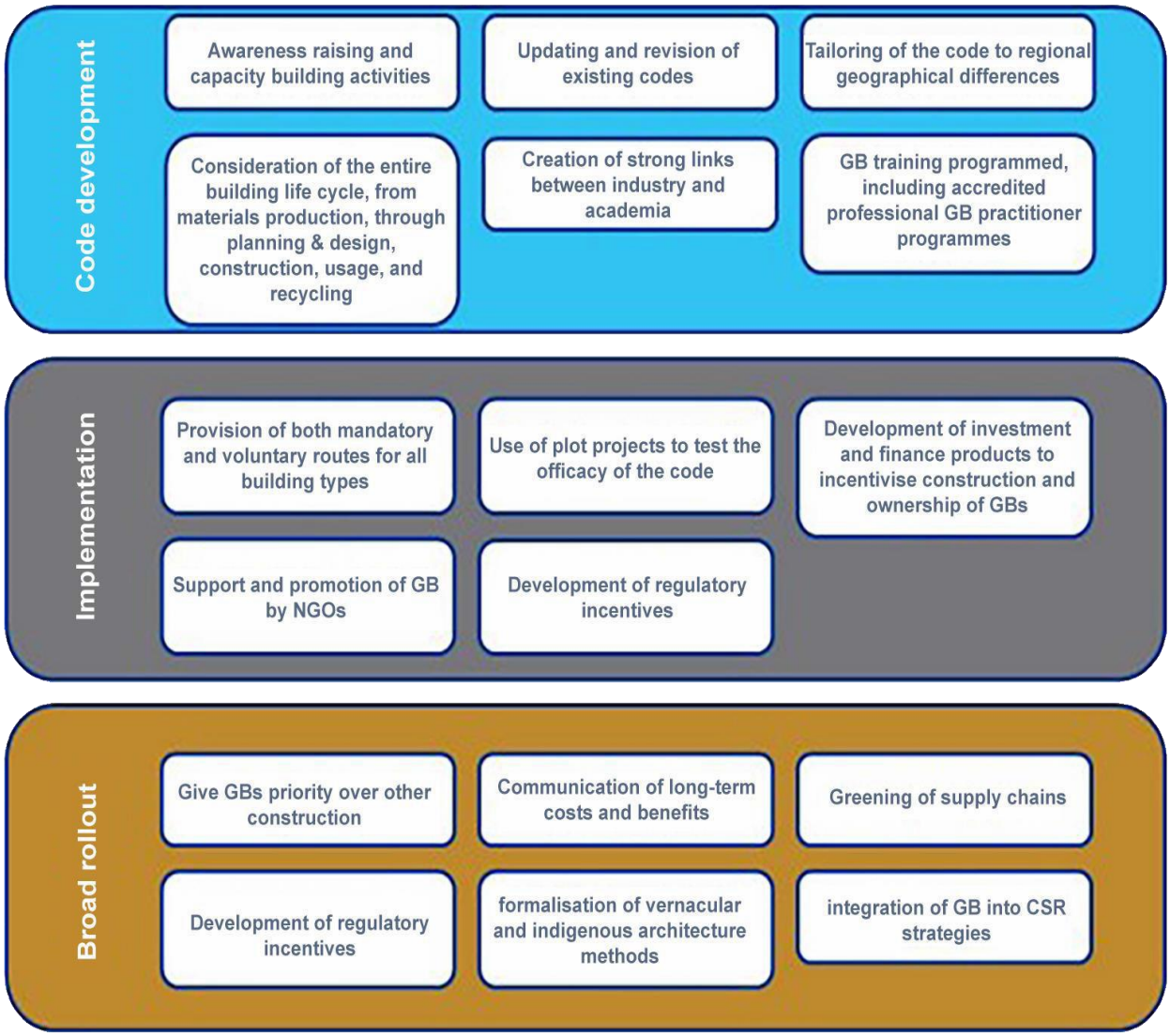

Figure 5:
Green House Building Implementation (Source: Switch Asia, 2022)

The study results show that the country's economy and cost-efficiency significantly impact sustainable housing. Most respondents believe that the economic situation of Pakistan plays a significant role in producing influential houses. Affordable housing initiatives are crucial for a healthy society and can significantly boost the economy. Low-cost housing programs, like the Naya Pakistan Housing Program launched by Prime Minister Imran Khan, can be a much-needed boon for small and large enterprises equally because consumers can afford to buy and invest in other areas when they aren't paying a large portion of their income on rent. This program aims to construct housing schemes that should be affordable and sustainable, especially for the low-income population. Such programs increase the community's purchasing power while expanding the employment market. Some of the most notable advantages of inexpensive housing include improved educational outcomes, access to healthcare, and housing stability.

The government must develop the following precise criteria for a comprehensive sustainable approach so that the construction firm can quickly adopt the core principles of sustainable construction.

Location: Promotion of construction on the previously utilized property for the same purpose on contaminated and low-value ecological terrains.

Water: promoting water conservation, implementing leak detection systems, and reusing drinking water for other purposes.

Energy: Improving the building's energy efficiency and lowering carbon dioxide emissions from energy production.

Transport: Construction near public transportation, as well as the presence of bike lanes and sidewalks, are all factors to consider.

Construction materials: Construction materials that are certified, renewable, and safe.

Tone and health: Considering the impact of internal and external elements on humans (light, noise, air quality, thermal comfort, etc.).

Waste: Waste recycling, disposal in a secure location, and utilizing recycled materials, among other things. The primary way that cheap housing benefits families and communities economically is through expanding work opportunities, both immediately after it is developed and built and subsequently as a result of the long-term development of society. The developer will need to work with construction firms once a low-cost housing project has been given the go-ahead by the relevant authorities. These firms will then hire architects, engineers, project and operations managers, site supervisors, accountants, HR staff, marketers, construction workers, maintenance staff, and security guards, enhancing skill-building and employment opportunities. Similarly to that, the beginning of such projects will be advantageous for the producers of steel, cement, and other tools and materials used in building. The government, whether at the national or local level, must (Malpass, 1999):

1. To ensure that all interested organizations cooperate, engage, and are treated equally, as well as to create circumstances for strategic partnership.
2. To guarantee that the various initiatives are coordinated, and that funding is allocated to related activities rather than isolated activities and projects.
3. Maintaining the necessary infrastructure - transportation, social, and opportunities for the requisite workforce's continual development, training, and retraining.
4. To assure money and incentives for research, development, and active engagement in this process by a building firm.
5. Building a construction waste sorting system to enhance waste management in the construction sector can substantially impact the development of the circular economy.
6. The dissemination and adoption of best practices in this industry allow the recovery of precious resources.
7. Buildings have a long-life cycle, so it's critical to support design innovations that reduce their negative environmental impact while also increasing the durability and recyclability of their components.

8. Develop a set of indicators for evaluating environmental, economic, and social indicators throughout the construction product's life cycle and advocating their use.

A more robust economy is ensured by the long-term economic impact of cheap housing by providing more employment opportunities in the future, which may result in significant societal transformation. In addition to promoting more mobility, densely populated and reasonably priced projects draw commercial firms to the area, resulting in more jobs for the locals. Moreover, Cost-effective housing can best describe as a green building phenomenon due to its cost-friendly features. Compared to conventional buildings, green buildings have a distinct advantage in conserving potable water and power through various methods. Over 20% of a building's electrical needs can be met by photovoltaic (PV) panels, which turn sunlight into electricity. Energy savers and sensors (devices that switch off the lights when a room is empty) can cut electricity use by about 20%. Wind turbines can meet 10% of the building's electrical needs by converting wind energy into electricity. Due to Karachi's strong winds in coastal locations, these gadgets can meet more than 40% of a building's electrical needs. In this regard, insulation and light-colored roofs, trees, and other flora can help keep indoor spaces cool, reducing the need for air conditioning and allowing thermostats to be set at lower temperatures. Together, these things can reduce electricity use by 10%.

Using less energy has other benefits. Fossil fuel combustion produces air pollutants like nitrogen oxides, particulates, sulfur dioxide, and carbon dioxide. In addition to contributing to smog, nitrogen oxides are a component of the pollution that causes respiratory sickness. Carbon dioxide is a significant greenhouse gas associated with climate change, while sulfur dioxide is the source of acid rain. According to recent estimates, the following annual emission reductions can be made by an average-sized green building: 1,200 pounds of nitrogen oxides, 150 pounds of particulate matter, 1,300 pounds of sulfur dioxide, and 585,000 pounds of carbon dioxide (Farooq and Yaqoob, 2019). Significant water savings are another benefit of green construction. Green buildings use various water conservation techniques that can reduce their potable water use by up to 40%. Different strategies are applied in green buildings to save water by consuming less and more effectively. The waste reduction in green buildings can be reduced by 50% to 75%. The use of building materials that are more durable and simpler to repair, the reuse of building detritus, and dimensional planning in design are just a few of the numerous waste reduction strategies employed by green buildings.

Rent payments are the most significant monthly expense for the population's lower- and middle-income groups. Most of the time, paying rent consumes up to half of a person's monthly salary, leaving them unable to pay for even their most basic needs, let alone other goods, which hurts the local economy. However, the practical rental and payment schedules of affordable housing projects raise the spending power of the residents, improving their quality of life. People are more inclined to spend money on wholesome foods, health care, education, recreation, and entertainment when the possibility of income loss does not endanger their capacity to pay their rent. The community's increased purchasing power can benefit large and small enterprises, further boosting the economy. Since individuals spend 90% of their time indoors, green buildings strongly emphasize indoor environmental quality. The indoor environment significantly impacts

building occupants' health, comfort, and productivity. The green building design has four characteristics: ventilation, temperature, lighting management, and day illumination. Low- emitting sealants, adhesives, paints, carpets, and composite wood are advantages of proper design and consideration, as are indoor chemical and pollutant source control, better lighting quality, increased daylighting in buildings, decreased health issues (respiratory illness, allergies, asthma, sick building syndrome), and occupant control over temperature, light, and glare. The Pakistani housing policy needs to be amended immediately based on the criteria mentioned above, and the redesigned policy must be executed impartially while ignoring any political, regional, and cultural disparities. The effective execution of this strategy can significantly increase the likelihood that all facets of society will have access to affordable housing. The government can readily adapt its policies in the future to the circumstances and requirements of its citizens through strict monitoring and regular evaluations.

RECOMMENDATIONS

Contrary to predictions, Pakistan's 2001 housing strategy fell short of addressing the nation's housing needs, leading to a rise in homelessness and housing backlog. The government or the housing ministry has not created any new regulations for the housing sector even after the failure of the policy, as mentioned earlier. The housing policy of Pakistan has to be immediately revised, and the following changes are suggested to be added to the current housing policy:

1. Although the housing supply must expand, the government should let the housing market run its course. The government needs to take a more active role and take the reins rather than merely acting as a facilitator for the builders and the private sector. The government may guarantee open and transparent housing transactions in this way.
2. The government should concentrate on raising citizen demand for homes in addition to increasing supply. The government should create options, including mortgage programs, equity loans, and joint ownership, to ensure that the most significant number of individuals may obtain homes.
3. The development authorities' planning guidelines must be reviewed, and livable areas should be encouraged through building bylaws. Open space must be kept to a fair minimum, and commercial building methods used by developers and contractors must be avoided. The size of planning and design must be human.
4. Above all, the government requires a cell that ensures impartial, apolitical, and prompt implementation of policies established by ministries. Eliminating corruption and inconsistencies in the housing industry should also fall under the purview of this unit.
5. This unit should also track and assess how well the housing policy works and suggest the next steps.
6. For low-income groups that cannot afford to take out larger loans from banks and other corporate sources, the government can also support the development of incremental housing and launch microfinance programs. The low-income group

can construct and upgrade their dwelling conditions with these microloans in stages.

7. Instead of merely assisting homeowners, the government should also create measures to aid and support tenants and should begin to subsidize rental housing. The English social housing scheme is a good illustration of this characteristic.
8. The government must ensure that housing is an essential requirement and should do away with the business and investment aspects. On-going plot sales should be subject to high taxes. Instead of using a filing system, plots should be available for immediate possession. Delivery of completed homes rather than unfinished plots can also help stop speculative behavior.
9. Government should focus on Green Building concepts more seriously than other housing projects to ensure environmental safety and residents' comfort. Green housing can also help the country maintain its natural beauty, as seen in Khyber Pakhtunkhwa, which is full of hilly areas and greenery.

CONCLUSION

This part of the study focuses on the summary of the whole research. This research will give the readers an idea of how the study was conducted, the objectives and hypotheses, and what findings were received from the whole study process. The present study aimed to explore the impact of different factors in developing sustainable housing in Pakistan. The study mainly emphasizes the Swabi district of Khyber Pakhtunkhwa, which is in dire need of better construction and residential buildings to improve the living standards of people there. The Swabi district is a part of Khyber Pakhtunkhwa and is still under development. People live in poor houses without major facilities due to lacking resources and finances, creating health hazards and dissatisfaction. Moreover, the district's environment worsens daily due to poor waste management and increasing pollution. The road conditions are also deplorable, which is another distress for the residents of Swabi, creating many problems in traveling from one place to another. All these issues are enough to say that the quality of life of people in different areas of Swabi is inferior and that should be considered seriously by the government and other stakeholders.

If we see the big picture, It is in the knowledge of every resident of Pakistan that the country is going through a housing crisis due to its increasing population and migrants from different underdeveloped countries of the world. The country's increased population and poverty make it difficult to afford quality housing. Even katchi abadis now have no space left to accommodate more population. New houses are made over sewerage lines and gutters by using poor-quality construction materials to make them affordable for poor people. Construction of multi-story buildings is causing severe risks to residents of building collapse. Similarly, district Swabi is also facing a troublesome situation due to poor infrastructure and lack of quality residential buildings that are making people's lives terrible by increasing health and safety risks. The present study is shedding light on the features that can assist the government of the Swabi district in developing affordable, quality, and sustainable housing. So, the study's results suggested that government policy on housing, the country's economy, and cost-efficiency can

significantly improve the housing status in Swabi. Several guidelines were also shared in the previous research work that the government can adopt to improve housing deficiency within the district. To attain the purpose of the study, the viewpoint of professionals, such as architects, engineers, etc., was gathered through a self-made questionnaire that the respondents completed through Google Survey. The sample size was 60, which was selected through convenient sampling. The data was cleaned and analyzed through descriptive statistics, and results were also discussed in the last sections of the study. It was found that the government policies on housing, economic fluctuations, and cost significantly impact the housing system in Pakistan, including the Swabi district, making its implementation the most difficult and a great challenge for Pakistan's government. A high rise in population daily is creating serious accommodation issues and forcing people to make temporary houses in kachi abadis or live on the roadside, which is again a hassle for old residents and a threat to the infrastructure. The present study is a great initiative to cater to housing issues in Pakistan; significantly underdeveloped cities full of resources like Swabi can make the most of this project. This study is also helpful for policymakers and architects to improve their construction planning and procedures. The idea of implementing green buildings can further be explored in future studies to address all the barriers and difficulties in improving the country's infrastructure and housing systems.

Hypotheses	Status
H1: Government Policy of house planning and design affects Sustainable Housing System.	Approved
H2: Country's Economy has an essential role in Sustainable Housing System.	Approved
H3: Cost Efficiency Leads to Sustainable Housing System.	Approved
H4: Sustainable Housing leads to Residential Comfort in the community.	Partially Approved
H5: Sustainable Housing leads to Environment Safety in the community.	Partially Approved

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