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EDITED BY

Saranjam Baig,
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REVIEWED BY

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Karakoram International University, Pakistan
Muazzam Sabir,
University of Sargodha, Pakistan
Saima Kalwar,
Mehran University of Engineering and
Technology, Pakistan

*CORRESPONDENCE

Baoyu Cui
✉ cby00662003@aliyun.com

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Local community impact-attitudes-actions toward China–Pakistan economic corridor development in Pakistan

Shahrukh Khan¹, Sehresh Hena¹, Inam Ullah Khalil²,
Muhammad Haseeb Raza³, Li Hongwei⁴, Kong Deji⁴,
Reda Abdelfattah Mohammad⁵ and Baoyu Cui^{1*}

¹School of Economics, Anhui University, Hefei, China, ²College of Economics and Management, Anhui Agricultural University, Hefei, China, ³Department of Agribusiness and Entrepreneurship Development, MNS-University of Agriculture, Multan, Pakistan, ⁴Institute of Innovation and Development Strategy, Anhui University, Hefei, China, ⁵Department of Business Administration, Applied College, King Khalid University, Khams Mushait, Saudi Arabia

Introduction: Development initiatives can generate substantial economic, social, cultural, and environmental benefits for local communities, with their success largely contingent on residents' perceptions, attitudes, and levels of support. Within the context of the China-Pakistan Economic Corridor (CPEC), local community perspectives particularly in Gilgit-Baltistan remain underexplored due to limited empirical data. This study aims to examine how CPEC development influences resident attitudes and to identify the factors that shape both passive and active forms of support.

Methods: A total of 600 questionnaires were distributed over a two-month period, yielding 527 valid responses after excluding incomplete or invalid submissions (response rate: 85.83%). Structural Equation Modeling (SEM) was employed to analyze the complex interrelationships among perceived impacts, community attitudes, and supportive behaviors.

Results: Perceived economic and social benefits were found to positively influence residents' attitudes toward CPEC, while environmental concerns had a negative impact. Overall, the local community expressed strong support for the development of CPEC. Furthermore, a significant positive association was observed between favorable attitudes and both passive and active support behaviors.

Discussion: These findings highlight the multifaceted nature of community responses to large-scale development projects. The study contributes theoretical insight into the determinants of local support and offers practical guidance for policymakers involved in CPEC. Maximizing socio-economic gains while actively mitigating environmental concerns is crucial. Importantly, incorporating community input into the planning and implementation process is essential for ensuring the sustainability and long-term success of CPEC initiatives.

KEYWORDS

Gilgit-Baltistan, CPEC development, local support, development, structural equation modelling

Introduction

Development projects play a crucial role in a country's economic growth and are pivotal to the economic advancement of local communities. Such projects often bring radical changes to host regions, generating both positive and negative impacts on residents. Previous research highlights that the inclusion of local communities in development initiatives is essential for their success and sustainability (Ali et al., 2017; Kanwal et al., 2019a, 2019c, 2019d). Residents are not only key stakeholders but also active participants in identifying and shaping the impacts of development projects. Studies on residents' attitudes reveal that local support is frequently influenced by perceived economic, cultural, and social benefits (Nazneen et al., 2019; Li et al., 2011; Baig et al., 2020). Recently, there has been growing academic interest in understanding community perceptions and benefits related to large-scale projects to ensure their acceptance and long-term success. The China-Pakistan Economic Corridor (CPEC) represents one of the most significant infrastructure initiatives in Pakistan, profoundly affecting local communities. Understanding the attitudes of these communities toward CPEC is critical for assessing its social acceptance, effective implementation, and sustainability (Alam et al., 2021). While CPEC promises substantial economic growth, job creation, and infrastructure development, concerns remain about whether local populations fully benefit or face marginalization due to rapid socioeconomic changes. This research aims to explore the socioeconomic impacts of CPEC on local communities, focusing on employment opportunities, displacement, and changes in living standards. Previous research by Yoon et al. (2001) found that community support for tourism development is strongly linked to perceived economic, social, and cultural benefits. Similarly, Nazneen et al. (2019) identified a positive correlation between host community support and perceived benefits. However, the specific attitudes of local residents toward the development of transportation infrastructure, particularly within the context of the CPEC framework, remain underexplored. Road and transportation development are widely recognized as catalysts for improving local livelihoods by offering economic benefits and enhancing accessibility (Nazneen et al., 2022; Asomani-Boateng et al., 2015; Kanwal et al., 2019a, 2019c, 2019d). Economic factors, such as exchange rates and foreign investment flows, have been shown to impact large-scale projects like CPEC (Degong et al., 2020). Additionally, governance and political stability play vital roles in shaping economic outcomes and ensuring environmental sustainability within such projects (Ashraf, 2023).

CPEC aims to develop an economic corridor that enhances bilateral connectivity between Pakistan and China by facilitating investment, trade, logistics, and cultural exchanges. The project is expected to provide substantial economic benefits to Pakistan, attract diverse foreign investments beyond China—including multinational firms from East Asia, the US, and the EU—and improve the livelihoods of citizens in both countries (Anwar et al., 2024; Javed and Ismail, 2021; Karim et al., 2020). The article highlights political stability as a key factor in fostering economic growth and mitigating environmental harm. Understanding local community perspectives on CPEC is crucial, as their support can significantly impact the project's success. Although CPEC has generated thousands of jobs and improved infrastructure, these benefits are unevenly distributed. Many residents question whether the jobs match their skills, revealing a gap between employment opportunities and local workforce capabilities. Infrastructure upgrades have improved market access but also raised concerns about displacement and the loss of traditional livelihoods. Addressing these issues is essential for

polymakers to promote inclusive and equitable development, ensuring CPEC's long-term sustainability. This study aims to fill this gap by focusing on CPEC, a mega project connecting Gwadar Port in Pakistan's Balochistan with Kashgar in China's Xinjiang via highways, motorways, and railways (Ahmad and Hong, 2017; Kanwal et al., 2019a, 2019c, 2019d). During 2015, President of China started CPEC project by the expenditure of 46 billion US\$ (Ali et al., 2017; Kanwal et al., 2019a, 2019c, 2019d).

According to the CPEC assessment, both Pakistan and China will derive equal benefits from the development of this mega project (Raza et al., 2018; Tong, 2015). For Pakistan, the CPEC route offers advantages in economic, educational, energy, and infrastructure development. For China, CPEC route will be a substitute route which provides fast, cost-effective and secure method of oil transportation. CPEC officials have contended that the CPEC route can offer significant benefits to the local Pakistani community in areas such as the economy, income, education, and employment. Scholars reported that road and transportation developments can have both positive and negative impacts on local residents (Davis, 1997; Kanwal et al., 2019a, 2019c, 2019d). On one hand, the development of roads and transportation brings economic and social benefits to local communities (Asomani-Boateng et al., 2015). On the other hand, local communities also face negative environmental impacts from road and transport development, such as accidents, health issues, and harm to nature (Davis and Jones, 1996; Alam et al., 2019). Both positive and negative impacts influence the overall attitude of the local community and their support for further development. Consequently, this research explores the relationship between perceived impact, resident attitude, and supportive actions within the context of CPEC development in Pakistan. This research explored the connection between the impacts of CPEC projects and the attitudes of local residents. Based on social exchange theory, the study examined the relationship between residents' overall attitudes and their support for the projects. According to social exchange theory, residents are more likely to support road and transport initiatives if they perceive the benefits, both individually and socially, to outweigh their investments (Kang and Lee, 2018; Kanwal et al., 2019a, 2019c, 2019d). In this study, we applied Carmichael (2000) model to evaluate the relationship between the impacts on residents, their attitudes, and their support for development within the context of CPEC. The benefits of CPEC development are expected to change residents' attitudes, which will then influence their actions, either in support of or opposition to the project.

This research carries significant theoretical and practical implications. Theoretically, it contributes to the advancement of social exchange theory by examining how local communities' perceptions of CPEC's impacts shape their overall attitudes toward the project. This deepens the understanding of the dynamic and reciprocal relationship between community experiences and their levels of support or resistance to large-scale development initiatives. By linking perceived benefits and costs to attitudinal outcomes, the study offers a nuanced perspective on the social mechanisms driving community engagement with infrastructural projects. Practically, the study offers strategic insights and actionable recommendations for CPEC stakeholders, policymakers, and development planners. Firstly, it establishes a comprehensive framework for assessing local community perceptions, which can serve as an essential tool in designing more inclusive, participatory, and context-sensitive planning and implementation processes for ongoing and future CPEC endeavors. Secondly, by focusing on Gilgit-Baltistan an economically and geopolitically critical gateway between China and Pakistan the study sheds light on the socio-cultural and economic

realities of a region often underrepresented in existing CPEC literature. The findings demonstrate that the generally positive attitudes of local residents are closely tied to their perceptions of tangible benefits, including improved infrastructure, employment generation, and economic development, which collectively foster stronger community support.

Moreover, the research highlights the importance of raising awareness about CPEC projects among local populations, which can bridge communication gaps between project authorities and residents, enhancing transparency and trust. This increased community engagement not only empowers residents to participate meaningfully in development decisions but also helps mitigate potential conflicts or resistance by addressing concerns proactively. The broader significance of this study lies in its contribution to identifying critical community-level factors that influence the success or failure of large-scale infrastructure projects like CPEC. By pinpointing the determinants of local support and opposition, the research equips policymakers and development agencies with evidence-based guidance to craft strategies that promote equitable, sustainable, and socially inclusive growth. Additionally, the study enriches the understanding of the unique socio-political and cultural dynamics of Gilgit-Baltistan, providing a valuable knowledge base for targeted interventions in this strategically important region. Ultimately, the insights gained from this research can assist in developing tailored approaches to enhance local acceptance, minimize resistance, and ensure that the benefits of CPEC are widely and fairly distributed among all stakeholders. This holistic perspective is essential for fostering long-term sustainability, social cohesion, and the overall success of the corridor's development goals.

Hypothesis development

Social exchange theory (SET)

In recent years, several scholars have examined local community attitudes using various models and theories (Ap, 1992; Kanwal et al., 2019b; Yoon et al., 2001). Social exchange theory is the most widely used framework among these, frequently employed by previous researchers to analyze residents' behavior toward tourism development (Kang and Lee, 2018; Kanwal et al., 2019a, 2019c, 2019d; Nazneen et al., 2019; Baig and Zehra, 2020). Kang and Lee (2018) examined support for tourism development through social exchange theory and found that residents' support is linked to the benefits derived from tourism. Similarly, Kanwal et al. (2019a, 2019c, 2019d) reviewed both the positive and negative effects of transportation infrastructure and reported that local communities generally support the development of transport infrastructure due to its favorable impact. Interestingly, based on social exchange theory that local communities evaluate tourism development by weighing the benefits against the costs (Nazneen et al., 2019). The theory of social exchange suggests that residents will support further development if local communities receive higher benefits compared to costs otherwise, they oppose the project. Local community support is essential for the successful construction and development of a project. The greater the support from the local community, the more beneficial the project will be for the entire region. In this study, we examine the economic, environmental, and social/cultural impacts, and its impact on overall attitude affected by the supportive action for CPEC development. In the context of road and transportation, social exchange theory

suggests that the local community is willing to contribute to and support the development of transportation infrastructure that enhances their living standards and offers economic and social benefits, as long as these benefits outweigh the associated costs.

CPEC development impact and residence attitude

The CPEC project is a key component of China's One Belt and One Road (OBOR) initiative, introduced by the Chinese government to expand its global economic influence (Kanwal et al., 2019a, 2019c, 2019d). CPEC is recognized as Pakistan's economic game change project, CPEC will link western China to Pakistan's Gwadar port. According to officials, both nations have benefited from the development of the CPEC project. For example, approximately 80% of oil imported by China through the Malacca Strait, which has a long distance of approximately 16,000 km and takes about 32 days, this distance will be 3,218 km with CPEC development, which minimizes the time to a few days (Ali et al., 2017).

The CPEC project has also benefited Pakistan in terms of economic, social, and infrastructural development (Kousar et al., 2018). Local communities in Pakistan are the primary beneficiaries of the CPEC project, as it creates job opportunities, promotes business growth, and accessibility to big cities. Remote regions along the CPEC roads are connected with the capital city so local communities can do business on their household or agriculture item. CPEC route passes through all around Pakistan, and its impacts are perceived differently across various regions, populations, and communities. In general, the effects of CPEC development can be either positive or negative, with key categories of impact being economic, socio-cultural, and environmental. Economic impact refers to any change that positively or negatively affects the living standards of the local community (Kanwal et al., 2019a, 2019c, 2019d). Previous evidence suggests that economic development in a region is boosted by improvements in roads and transportation, creating job opportunities, business prospects, and enhancing agricultural production. Also, CPEC road projects improved connectivity that generate jobs and certain requirements of skills set also arise which cause change in employment pattern (Waqar et al., 2022; Alam et al., 2023a, 2023b). This is subject to a peaceful atmosphere in the territory and good governance. Furthermore, the development of road infrastructure will connect small local villages to larger cities, allowing villagers to buy and sell their agricultural products at fair prices (Ali et al., 2018; Kanwal et al., 2019a, 2019c, 2019d; Baig et al., 2021).

Gilgit-Baltistan, renowned globally for its major dry fruits such as apricots, almonds, and grapes, will have easier access to the Chinese market with the development of the CPEC route. This will allow residents of Gilgit-Baltistan to sell their dry fruits directly to Chinese consumers at competitive prices. Similarly, the development of the CPEC route will connect Gilgit-Baltistan to other towns in Pakistan, providing local businesses with opportunities to sell their products. Together with China's border, the Gilgit-Baltistan region will be a business hub with the development of the CPEC route, as the Chinese community can also sell their local electronics through Gilgit-Baltistan throughout Pakistan. The region's image is also influenced by the development of transportation infrastructure, which attracts both local and foreign investors (Kanwal et al., 2019a, 2019c, 2019d). According to authorities, CPEC has allocated millions

of dollars to build new highways and train connections, as well as improve existing networks, with over 2,000 km of extensive construction linking China to Gwadar (Beg et al., 2018; Wang, 2017). The attitude of the resident has been studied extensively in previous literature (Gursoy et al., 2002; Kanwal et al., 2019a, 2019c, 2019d). In the background of tourism development, scholars reported a significant relationship between residents' overall positive attitude and support for further development. Psychological literature defines attitude as "a learned tendency to evaluate things or issues in a particular way," which involves assessing people, objects, or events as either positive, negative, or mixed. In this study, the focus is on "CPEC development," and the resulting behavior is "support for the CPEC development." In the context of CPEC, when local communities benefited greater economic benefits (Wang, 2017; Xie et al., 2015), know the significance of CPEC in the region and their attitude will be more positive toward CPEC project. Based on the social exchange theory, the positive attitude of local communities is closely tied to economic benefits. If local communities recognize that the development of CPEC infrastructure is economically advantageous for them, their overall attitude will become more positive. Previous debate suggested that the favorable attitudes of host communities are driven by economic benefits, leading to the following hypothesis for this research:

H1a: The significant link among resident's economic impacts and their attitude for CPEC betterment.

Previous studies have reported mixed perceptions among residents regarding the environmental impact of tourism development. Scholars note that tourism is seen both positively and negatively in terms of its physical environmental effects (Yoon et al., 2001). While the positive effects of road and transportation development such as economic growth, social benefits, and employment opportunities are well recognized, scholars have also highlighted the negative environmental impacts on local communities (Carrier et al., 2016; Davis, 1997). Specifically, Davis (1997) reported that transportation negatively affects human health. Carrier et al. (2016) further explained that transportation contributes to air pollution and related health issues, including heart and lung problems, headaches, and nausea. Additionally, it leads to the destruction of natural environments and traffic congestion, which increases stress and anxiety among individuals. Similarly, Kanwal et al. (2019a, 2019c, 2019d) claimed that transportation in rural areas can lead to security issues and the destruction of farmland. For local residents, the CPEC project presents both positive and negative environmental impacts. Among the positive effects are the development of community parks and sports grounds along the CPEC route. Trade with China is growing alongside the development of the CPEC route, leading to increased traffic flow in the Gilgit-Baltistan region and a corresponding rise in noise and air pollution. Since the CPEC route primarily passes through the hilly areas of Gilgit-Baltistan, carbon emissions are significantly higher compared to flat roads or plains. For example, heavy trucks generate more noise and carbon emissions while driving uphill. Additionally, residents of Gilgit-Baltistan depend heavily on tourism and natural resources (Nazneen et al., 2019; Alam et al., 2023a, 2023b). Increase in tourism contributes to increased air pollution in the region. Constant heavy traffic along this route, operates day and night, which will harm nature and individual health. As a result, social exchange theory implies that the local community's overall attitude has shifted due to

the negative environmental impacts. Based on previous information and existing literature, the following hypothesis is proposed.

H1b: The negative link between resident's environmental impacts and their attitude for CPEC betterment.

The social and cultural impact refers to the effect that may have positively or negatively influenced the community's living standards. According to the literature, local communities have also experienced social and cultural benefits from the construction of road and transportation infrastructure (Ali et al., 2018; Dolo et al., 2016). Scholars reported that motorway and transportation systems have a significant impact on the culture of an area (Carnevale and Probst, 1998). With the development and improvement of transportation routes, tourism activities in the region are expected to increase, which gives global identity to the area (Jacob, 2018). Tourists from around the world can visit and explore the region's historical sites and local culture, which in turn enhances the positive image of the local community (Ali et al., 2017). Additionally, improved transportation facilitates communication within the local community by reducing travel time, distance, and freight costs. This helps bridge the cultural gap, as the development of transportation routes and infrastructure allows local communities to easily participate in various cultural activities. Gilgit-Baltistan's population is dispersed, with many individuals residing in remote areas or small villages (Kanwal et al., 2019a, 2019c, 2019d; Wolf, 2018). The development of the CPEC route has connected numerous villages, allowing people to easily access urban markets, visit their families, and engage in various cultural activities (Ali et al., 2017). Additionally, improved road and transportation networks can bring communities closer together through cultural activities, fostering social interactions and offering residents opportunities to make new connections (Asomani-Boateng et al., 2015). Previous literature indicates that local residents benefit socially and culturally from the development and enhancement of transportation infrastructure, which also contributes to changes in their overall attitude. Based on this, the following hypothesis is proposed in this study:

H1c: The positive linkage among residents' social and cultural affect and their attitude for CPEC betterment.

Residents' attitude and influence behavior toward CPEC development

Previous studies have indicated that residents' attitudes may be linked to behaviors or actions, which can be either passive or active (Balaguer and Cantavella-Jorda, 2002; Carmichael, 2000). In tourism research, scholars have examined the relationship between the impact of tourism, overall attitudes, and the resulting support for further development, yielding mixed results (Carmichael, 2000; Johnson et al., 1994; Nunkoo and Ramkissoon, 2010; Peters et al., 2018; Yoon et al., 2001). CPEC directly affects tourism development, its indirect impact on climate change is mediated through tourism activities. The study emphasizes the need for sustainable tourism planning to mitigate environmental degradation associated with increased tourism. Peters et al. (2018) reported that positive tourism impact can change the overall attitude of local and local community provides more support. Similarly, Yoon et al. (2001) suggested tourism benefits are positively linked to the attitude and support of the local community. It is known

fact that residents who benefited from development project, may have more positive attitude toward development project (Kanwal et al., 2019a, 2019c, 2019d; Nunkoo and Ramkissoon, 2010). By comparison, Johnson et al. (1994) noted that support for the development of tourism by the local community has declined over time, as residents negatively affected. Furthermore, scholars also noted that the overall attitude of inhabitants could change with costs and benefits (Kanwal et al., 2019b; Nazneen et al., 2019). Further, Jurowski et al. (1997) also proposed that the overall positive attitude of residents is positively associated to support for further development. Lee (2011) also highlighted a significant relationship between factors such as benefits, opportunities, attitudes, and encouragement, noting that greater benefits lead to more positive attitudes, thereby resulting in higher levels of support. Hurst et al. (2013) explored the relationship between benefits and attitudes, suggested that significant benefits can lead to more positive attitudes and increased support. According to Kanwal et al. (2019a, 2019c, 2019d), the framework of CPEC and the development of roads and transportation infrastructure offer numerous benefits to local communities, which in turn influence their perceptions. A multidisciplinary analysis of the China-Pakistan Economic Corridor (CPEC) delves into its historical foundations, economic implications, cultural interactions, and geopolitical relevance. The chapters offer comprehensive insights into how CPEC is transforming trade networks, encouraging tourism, driving urban development, and facilitating educational and cultural partnerships between China and Pakistan. The book also critically examines key challenges, including environmental issues, the function of special economic zones, and the strategic integration of Gilgit-Baltistan within the broader CPEC framework (Muhammad et al., 2024; Muhammad et al., 2023). Based on the theory of social exchange, residents “overall attitude toward CPEC is based on CPEC project costs and benefits.” The more positive

of inhabitant's attitudes the higher the support and the high the negative attitudes the decrease the passive support. Based on previous facts and literature support, the following hypothesis can be outlined.

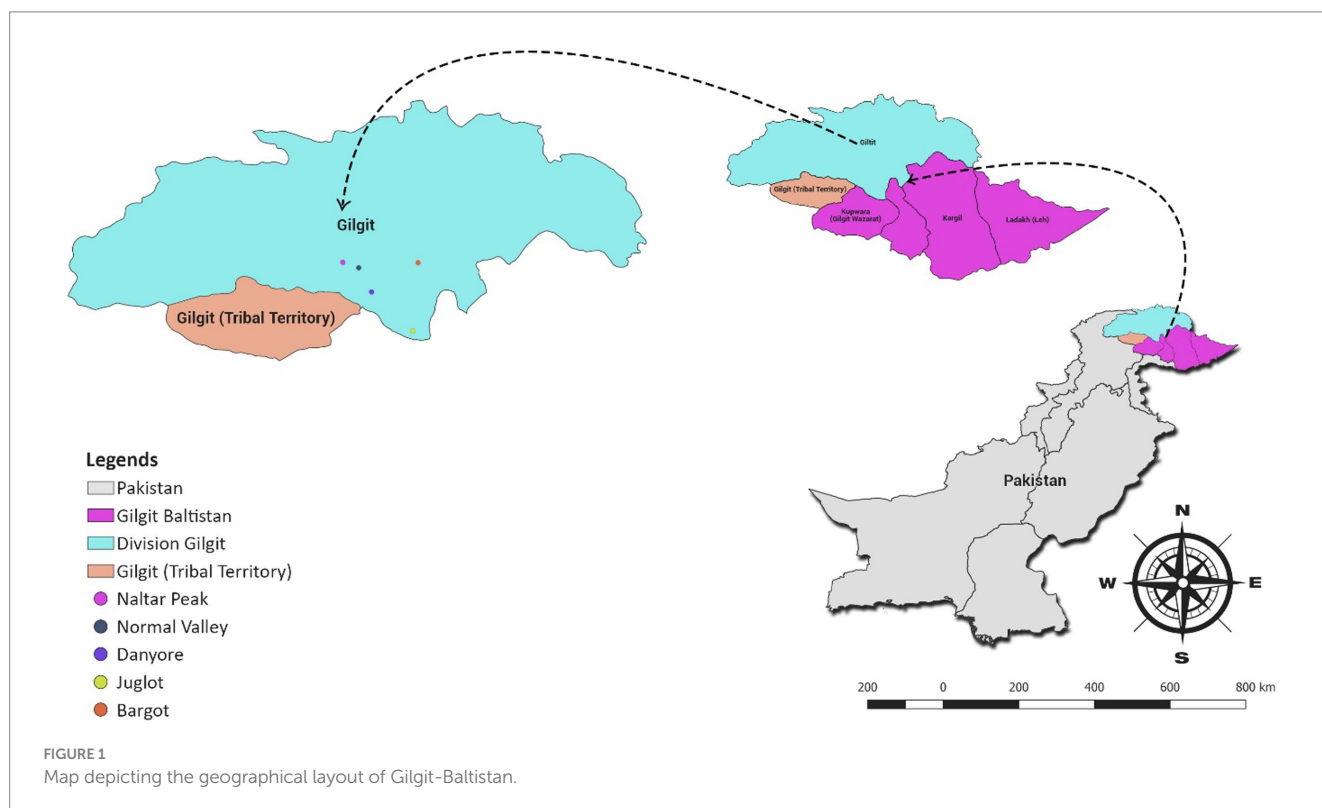
H2a: The more positive inhabitant's' attitudes are, the greater the support for CPEC betterment.

H2b: With more negative inhabitant's' attitudes are, the decrease in passive support for CPEC betterment.

Research methodology

Study area

This study focuses on Gilgit-Baltistan (GB), a strategically significant gateway between Pakistan and China. GB's unique geographic location as an entry point to Central Asia, coupled with its relatively underdeveloped infrastructure, makes it an important area for sustainable development enhancing both local livelihoods and national connectivity. It is expected that the Gilgit-Baltistan region will be a business hub with the development of the CPEC route, benefiting the host communities of both countries. For this study, data were collected from various regions of Gilgit-Baltistan, including Bagrot Valley, Juglot, Danyore, Naltar Peak, and the Nomal Valley (see Figure 1). In GB region due to mountainous geography and underdeveloped private sector exhibits labor market constraints. The region's employment pattern reveals emerging opportunities and traditional jobs with a significant employment generation in formal and informal sectors. Table 1 depicts GB's workforce distribution which reveals dominance in traditional sectors alongside service-oriented sectors. This pattern reflects the



region's mountainous terrain and developing economy, where subsistence farming and seasonal tourism dominate, while limited industrial development has resulted in a relatively large government sector and widespread informal employment. The sectoral distribution highlights both the vulnerability of GB's economy to climate shocks and seasonal fluctuations, as well as the need for economic diversification to create more stable employment opportunities.

Research instruments

The research model was constructed using previously validated instruments that have undergone rigorous testing and demonstrated reliability in their respective fields. These measurement tools include a series of statements designed to capture respondents' opinions and perceptions related to the study variables. Participants rated each statement using a 5-point Likert scale, ranging from "Strongly Agree" to "Strongly Disagree," allowing for nuanced assessment of their attitudes. This approach ensures consistency and comparability of data while effectively measuring the constructs of interest. The research model of this study includes ten variables, with four serving as control variables (see Figure 2). The research model comprises economic, environmental, social and cultural impact, attitude, as well as active and passive supportive actions. Economic impact was measured using six items adapted from (Ap and Crompton, 1998; Byrd et al., 2009; Peters et al., 2018; Weaver and Lawton, 2013). Economic impact measures the economic benefits of the local community with the construction of

CPEC. Environmental impact measure local community attitude related to environmental changes with the development of CPEC project. To measure environmental impact, a six-item instrument was adopted (Andereck et al., 2005; Hall and Lew, 2009; Peters et al., 2018).

The social and cultural impact evaluates residents' socio-cultural activities influenced by CPEC development, measured through eight items adapted from Gursoy et al. (2002), Lankford and Howard (1994), and Peters et al. (2018). Residents' overall attitudes toward CPEC projects were assessed using two items based on scales from Andereck et al. (2005), Ko and Stewart (2002), Peters et al. (2018), and Vargas-Sanchez et al. (2011). Residence supportive actions such as active and passive were measured using two items each and measured using (Carmichael, 2000; Peters et al., 2018; Vargas-Sanchez et al., 2011). However, analyzing actual supportive action, we used age, gender, education, as a control variable.

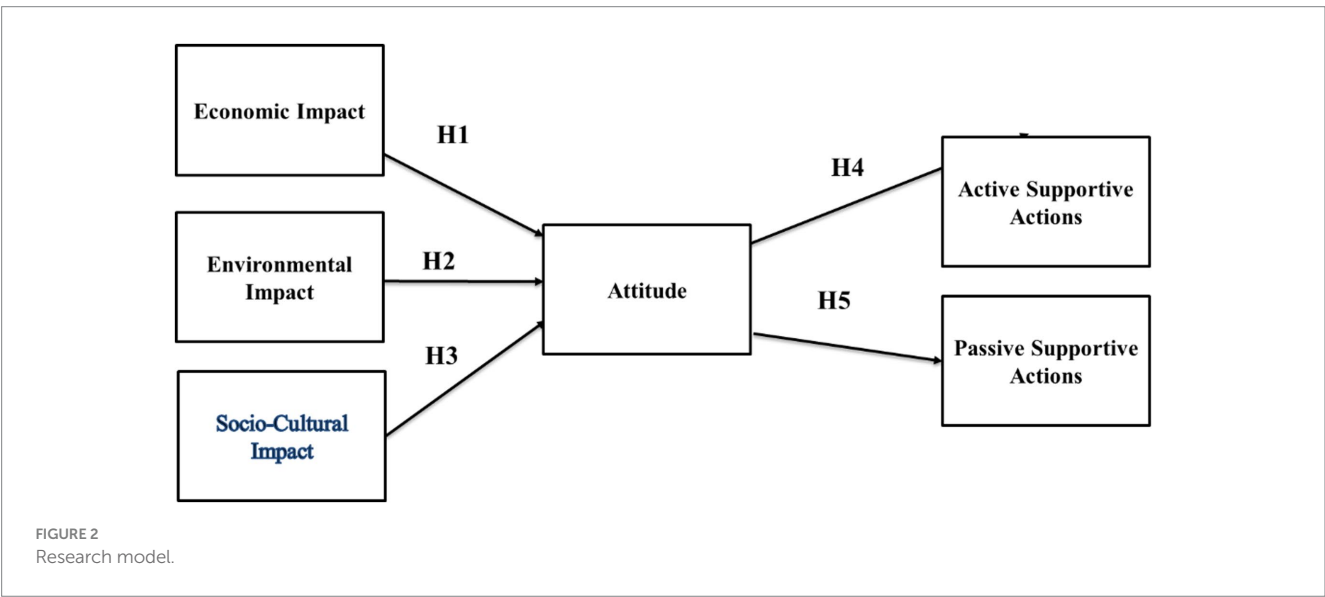
Data collection procedure

To gain a comprehensive understanding of the research topic, data were gathered from residents of Gilgit-Baltistan, Pakistan, through a structured survey approach. This method enabled the collection of firsthand information regarding community perceptions, attitudes, and experiences related to the subject matter, ensuring that the study reflects the views and realities of the local population (Pitafi et al., 2018). The study focuses on five distinct regions in Gilgit-Baltistan, namely Bagrot Valley, Juglot, Danyore, Naltar Peak, and the Nomal Valley. These diverse areas offer a comprehensive view of how CPEC development affects communities with varying degrees of proximity and involvement with the project. The rationale behind choosing these areas is to capture a range of community responses, from support to resistance, and to analyze the factors that influence these attitudes and actions in a detailed manner. Bagrot Valley and Juglot are known for their agricultural contributions, while Danyore and Naltar Peak have been pivotal in the development of tourism and infrastructure. The Nomal Valley, being closer to the main CPEC route, provides a significant case for studying the immediate impacts of the corridor on local communities. The author initially developed a questionnaire based on previous studies, customized

TABLE 1 Employment patterns in Gilgit-Baltistan.

Sector	Share in work force
Agriculture	35–40%
Tourism	20–25%
Government Sector	15%
Others	18–20%

Source: Asian Development Bank (ADB) (2020), International Labour Organization (ILO) (2021), Pakistan Bureau of Statistics (PBS) (2022), United Nations Development Programme (UNDP) (2019), and World Bank (2022).



to align with the objectives of the research. The primary focus of the study is to assess local residents' attitudes toward the construction of the CPEC route and their subsequent behaviors. Therefore, the questionnaire is designed to identify the factors influencing these attitudes and their effect on residents' actions. To achieve the study's objectives, several constructs including the economic and environmental impacts of CPEC development were formulated and discussed with the local community. Subsequently, the survey questionnaire was refined based on feedback and suggestions from professors with expertise in Economics and Management. The questionnaire was revised based on their feedback. A pilot study was conducted with 61 participants prior to the final data collection to identify and correct any errors, ambiguities, and grammatical issues, as well as to verify the accuracy of the survey items. The pilot study results indicated that all items were acceptable, and the responses from these 61 participants were excluded from the final dataset. Before starting the survey, the author assured participants of the anonymity of their responses to encourage honest and unbiased answers. Since the inhabitants of Gilgit-Baltistan are scattered in several locations, the author was assisted by five local residents in collecting data between October 5 and December 7, 2022. The author visited academic institutions (Karakoram International University (KIU) Gilgit, Agha Khan higher secondary school Gilgit, Learning Academy Gilgit, Army public school and college Gilgit), offices, educated housewives, self-employed individuals, businesses, the CPEC project, and other local communities across various districts to recruit study participants. Over the course of 2 months, 600 questionnaires were completed and returned.

After careful evaluation, 527 responses were deemed valid for final analysis, resulting in a response rate of 85.83%. Questionnaires that were incomplete or incorrectly filled out were excluded from the study. In this study, the structural equation modeling (SEM) approach was employed, which is highly relevant for this analysis as it allows for the examination of complex relationships between observed and latent variables. SEM is particularly useful when analyzing multiple interconnected variables, such as factors influencing decision-making processes or adoption behaviors in agriculture. It accounts for measurement errors and allows for the examination of both direct and indirect effects. SEM offers a robust framework for validating theoretical models, making it an excellent choice for detailed empirical research. Table 2 provides the demographic information of the sample, revealing that 60.27% of participants are female and 39.27% are male, with a range of occupational backgrounds. Since the CPEC projects have already been implemented, some residents are employed in these projects, as indicated in Table 1.

Results and data analysis

Model of measurement

Confirmatory Factor Analysis (CFA) was conducted to validate the research model. The CFA results indicated that the model fit indices met the acceptable criteria established by previous studies (Hair et al., 2017). The model fit values are (REMSA = 0.05,

TABLE 2 Sample's demographic information.

Demographic information	N	Percentage
Gender		
Male	207	39.27
Female	320	60.72
Age		
21–30 years old	199	37.76
31–40 years old	215	40.79
41–50 years old	113	21.44
Education of respondents		
Bachelors	257	48.76
Masters	189	35.86
PhD. Degree	81	15.37
Type of occupation		
Government Job	179	33.96
Private Job	123	23.33
Student	109	20.68
Business	116	22.01
Length of residence		
Less than 15 years	116	22.01
Greater than 15	411	77.98
How do you think your and the income of your family members has changed because of CPEC development?	237	44.97
	157	29.79
	133	25.23

SRMR = 0.05, NFI = 0.93, PNFI = 0.89, CFI = 0.96, IFI = 0.95, TLI = 0.95, $\chi^2 = 605.76$, DF = 264), within range indicating that this model is acceptable as shown in Table 2. After assessing the model fit criteria, we evaluated the convergent validity, reliability, and discriminant validity of the research model to ensure adequate relationships among the constructs. Convergent validity was examined using factor loadings, composite reliability (CR), Cronbach's alpha (CA), and average variance extracted (AVE). Hair et al. (2016) recommended that each item should have a factor loading >0.60, and the results showed that each item has loading >0.60. In practice, researchers have recommended that acceptable values for Cronbach's alpha (CA) and composite reliability (CR) should exceed 0.70 (Fornell and Larcker, 1981; Hair et al., 2016). The findings of the assessment stated that all CA and CR scores >0.70 are above the suggested limit. Bagozzi et al. (1991), suggested that AVE should be >0.50 for each item, results indicating that all AVE values are >0.50. In summary, the results presented in Table 3 for CA, CR, and AVE confirm the strong convergent validity and reliability of the research model.

Additionally, Table 4 presents the mean, standard deviation, and correlations of all the variables. To verify the discriminant validity of the research model, we applied the method recommended by Fornell and Larcker (1981). This method stipulates that the square root of the

AVE for each construct should be greater than the inter-correlations between constructs. The results presented in Table 4 indicate that the correlations among all variables are lower than the square root of their corresponding AVE values. Consequently, the combined results from Tables 3, 4 supports that the research model demonstrates a sufficient level of reliability and discriminant validity.

As the data were collected at a single point using the same procedure, two separate approaches were applied to address the potential impact of CMB in the dataset. Firstly, the approach proposed by Liang et al. (2007) was employed to evaluate the CMB. The results revealed that the average substantive factor accounted for 79% of the total variance, while the average method factor was only 0.041, with most method factor loadings being statistically insignificant. This indicates that there are no issues with CMB in the current dataset. Additionally, to further examine the potential presence of CMB, Harman's single-factor test was conducted (Podsakoff et al., 2012). Principal component analysis identified six factors with eigenvalues >1.0, collectively explaining 72.391% of the total variance. The first factor accounted for 24.72% of the variance, which is well below the 50% threshold. Overall, these findings confirm that CMB does not compromise the validity of this research. Furthermore, to evaluate the possibility of multicollinearity, variance inflation factor (VIF) values

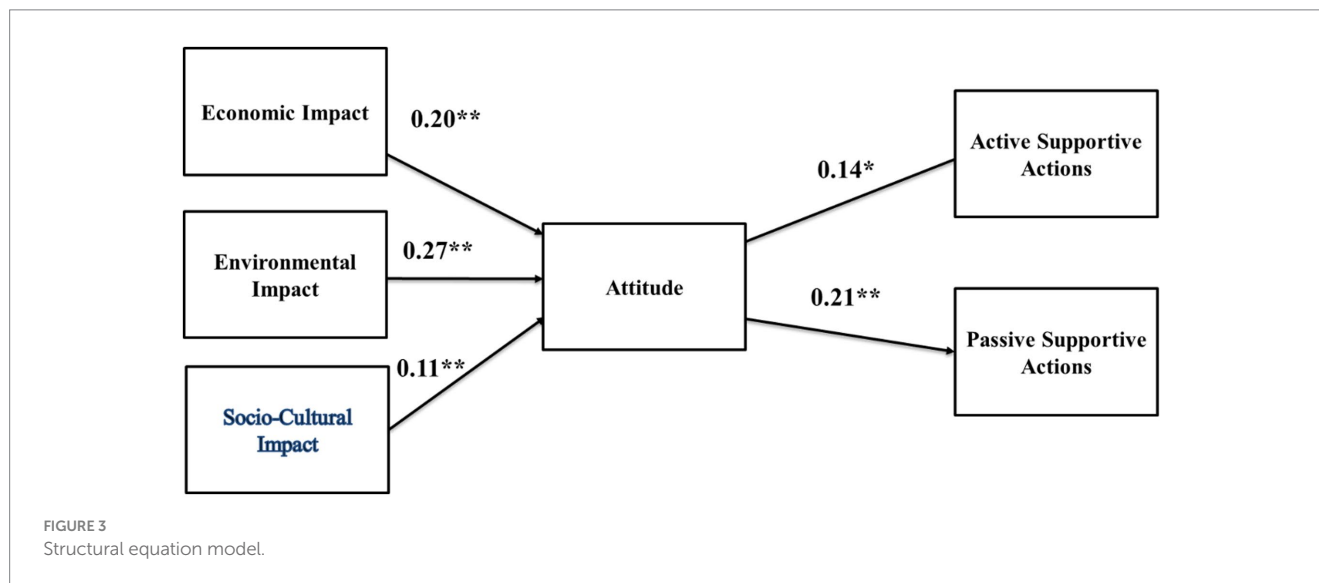
TABLE 3 Confirmatory factor analysis's (CFA) results.

Construct	Items	Loading	CA	CR	AVE
Economic impact	6	0.793	0.90	0.92	0.67
		0.873			
		0.796			
		0.798			
		0.831			
		0.815			
Social and cultural impact	8	0.906	0.94	0.96	0.74
		0.693			
		0.863			
		0.862			
		0.921			
		0.886			
		0.946			
		0.782			
Environmental impact	5	0.833	0.89	0.92	0.70
		0.863			
		0.841			
		0.857			
		0.783			
Attitude		0.887	0.72	0.84	0.73
		0.815			
Active supportive action	2	0.843	0.80	0.83	0.71
		0.852			
Passive supportive action	2	0.874	0.78	0.87	0.78
		0.889			

CA, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted.

TABLE 4 Means, standard deviation, and correlations.

Variable	M	SD	1	2	3	4	5	6
Economic impact	4.01	0.92	0.81					
Social and cultural impact	3.31	1.22	0.03	0.86				
Environmental impact	4.13	0.90	0.11	0.07	0.83			
Attitude	4.14	0.97	0.20	0.09	0.21	0.85		
Active supportive action	4.04	0.75	0.18	0.07	0.07	0.16	0.84	
Passive supportive action	3.99	0.79	0.13	0.12	0.03	0.11	0.68	0.88



were assessed. All VIF values were found to be <5 , aligning with the threshold recommended by Hair et al. (2011). Additionally, the highest inter-correlation observed was 0.68, which falls below the 0.71 cutoff suggested by MacKenzie et al. (2011). Hence, multicollinearity does not present a concern in this study.

Structural equation model (SEM)

After completing the validity and reliability analyses, the relationships among all variables were examined using structural equation modeling (SEM) (Hair et al., 2019). All the hypotheses were tested using the SEM in AMOS 24.0 version. Table 2 indicated the model fit estimated values in SEM model are within range as suggested by (Hair et al., 2017). The fit indices are (REMSA = 0.05, SRMR = 0.05, NFI = 0.90, PNFI = 0.87, CFI = 0.94, IFI = 0.94, TLI = 0.93, $\chi^2 = 874.65$, DF = 372).

All relationships were confirmed by the current dataset (Figure 3). The results showed that the economic impact has a significant relationship with overall attitude ($B = 0.20^{***}$, $t = 3.99$, $p < 0.001$), thereby validating Hypothesis 1. Hypothesis 2 proposed that environmental impact is positively related to the attitude of the local community. The results support this, showing a significant association between environmental impact and attitude ($B = 0.27$, $t = 4.41$, $p < 0.001$). Thus, hypothesis 2 is confirmed as expected. Table 5 also shows that social and cultural benefits are positively related to attitude ($B = 0.11$, $t = 2.32$, $p < 0.05$), thereby hypothesis 3 is validated. Additionally, the results demonstrated that the overall attitude of the

local community is positively associated with both active and passive supporting behaviors. Specifically, overall attitude showed a significant relationship with active action ($B = 0.14$, $t = 2.92$, $p < 0.05$) and passive action ($B = 0.21$, $t = 4.01$, $p < 0.01$). Besides, Table 5 indicates that all control variables have no significant relationship with either active or passive supporting actions.

Moderation analysis

To evaluate the moderating effects of economic, social, and environmental factors, we employed the PROCESS MACRO, as shown in Table 5. The findings reveal that these factors significantly moderate the relationship between residents' attitudes, with coefficients of ($\beta = 0.22$, $t = 3.99$, $p < 0.001$). Thereby supporting the validity of hypothesis H2 in this study.

Furthermore, to understand the moderating effect of community attitude, we employed graphical procedures. The regression line of moderating effect of community attitude with the link between economic, social effect and support for CPEC development (Figure 4; Table 6).

Discussion

The objective of this research is to explore the relationship between impact, attitude, and supportive actions within the context of

TABLE 5 Measure model and structural model comparison.

Model	Absolute fit measures			Incremental fit measures		Parsimonious fit measures		
	χ^2/DF	SRMR	RMSEA	NFI	PNFI	CFI	IFI	TLI
MM	2.29	0.05	0.05	0.93	0.89	0.96	0.95	0.95
SEM	2.36	0.06	0.05	0.90	0.87	0.94	0.94	0.93

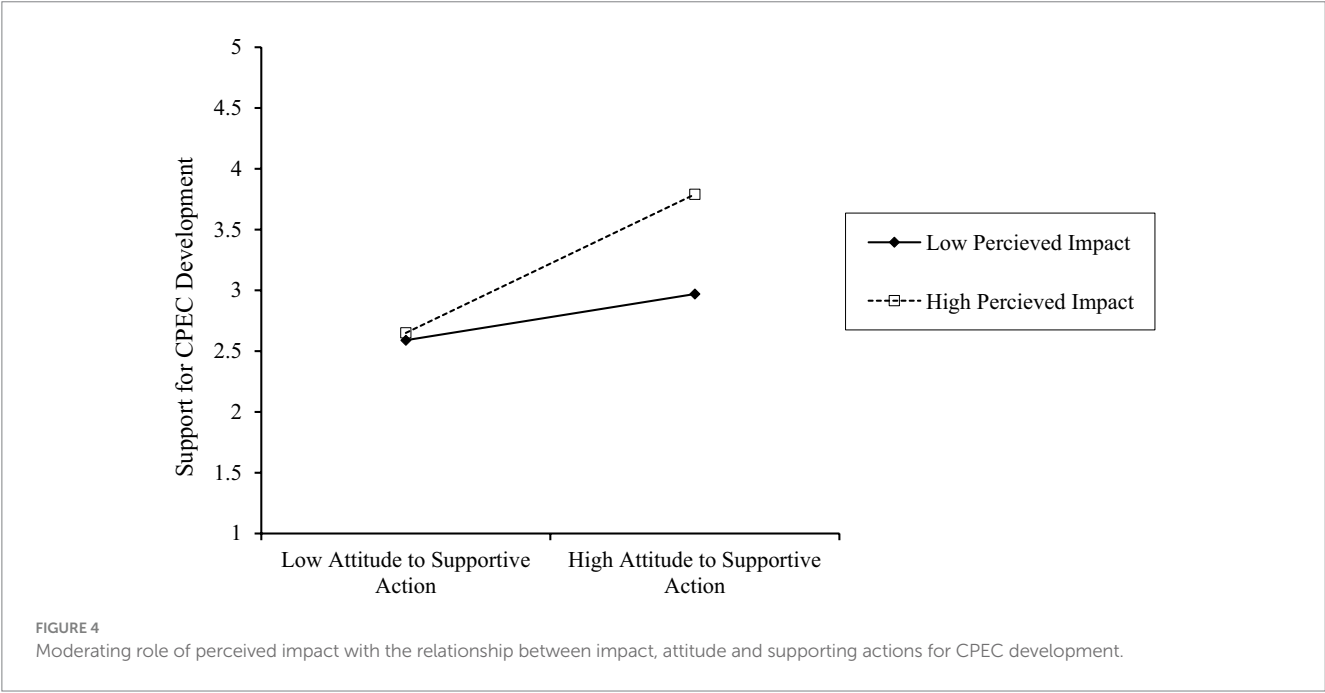


TABLE 6 Path analysis.

Path	Standard coefficient	t-value	Result
Economic impact to attitude	0.20***	3.99	Significant
Social and cultural impact to attitude	0.11*	2.32	–
Environmental impact to attitude	0.27***	4.41	–
Attitude to active supportive action	0.14*	2.92	–
Attitude to passive supportive action	0.21**	4.01	–
Type of occupation	–0.06	–1.67	0.07
Education	–0.07	–1.72	0.84
Gender	–0.05	–0.99	0.32
Age	0.04	1.27	0.20

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

the CPEC project. The results of the study indicate that residents of Gilgit-Baltistan hold an overall positive attitude toward the CPEC development, perceiving the benefits of the project to outweigh its disadvantages. Based on social exchange theory, the findings of this research support all the proposed hypotheses, indicating that residents have an overall positive attitude and strong support for the continued construction of the CPEC project. Specifically, according to our hypothesis, the economic impact plays a significant role in shaping the overall attitude of the local community. It is expected that the construction of CPEC will bring financial benefits to the residents of Gilgit-Baltistan, as the CPEC route serves as a gateway between China

and Pakistan, offering numerous business opportunities for the local community. As mentioned earlier, the dry fruits of Gilgit-Baltistan are renowned worldwide. With the development of CPEC, the local community will have direct access to the Chinese market, allowing them to sell their fruits directly to Chinese consumers at competitive prices (Table 7).

Previous studies have also shown that the development of road infrastructure will provide additional benefits to the local communities residing along the route (Ibrar et al., 2019; Kanwal et al., 2019a, 2019c, 2019d; Maparu and Mazumder, 2017). The environmental impact is negatively associated with the overall

TABLE 7 Measurement constructs, survey items, and scales for assessing CPEC impacts.

No.	Construct	Items	Scale	Scale
1	Impact of CPEC development	5	1. CPEC will develop the quality of Roads. 2. CPEC will provide transport facility. 3. CPEC will improve the quality of public facilities. 4. CPEC will improve the quality of restaurant and hotels in the area. 5. CPEC will improve the trade in the area.	Likert scale 1–5
2	Social and cultural impact to attitude	5	1. CPEC development will increases the Road networks in Pakistan. 2. CPEC development will increases the Public private transportation. 3. CPEC development will improve the Quality public facilities in Pakistan. 4. CPEC development increase trade in the Pakistan. 5. CPEC development accelerate community development in the Pakistan.	Likert scale 1–5
3	Environmental impact	4	1. PEC construction destroys the natural environment. 2. CPEC will Increase air pollution. 3. CPEC development disruption to local culture. 4. CPEC development causes traffic congestion.	Likert scale 1–5
4	Active supportive action	3	1. I am satisfied that CPEC has led to environmental development and change. 2. I am pleased that CPEC has brought about economic development in our area. 3. I'm pleased about the social opportunities and prospects that CPEC has brought to our area.	Likert scale 1–5
5	Passive supportive action	5	1. CPEC ought to progress. 2. CPEC brings more visitors to the region. 3. The area economy will be significantly impacted by CPEC. 4. Development of CPEC is vital to the area. 5. Supporting services development (travel agency, hotel, restaurants, entertainment, etc.)	Likert scale 1–5
6	Economic impact		1. CPEC is expected to enhance trade in the region 2. The development of CPEC is boosting trade within Pakistan 3. CPEC will have a substantial effect on the area's economy 4. CPEC is attracting more tourists to the region. 5. CPEC offers local products (such as dry fruits) direct access to the Chinese market 6. CPEC will foster small-business growth through enhanced market access	Likert scale 1–5

attitude of the local community, which aligns with findings from previous studies (Davis, 1997; Peters et al., 2018). Similarly, Prayag et al. (2013) also identified a negative relationship between environmental impact and residents' overall attitude. Social and cultural impact also demonstrates a significant relationship with overall attitude. Previous studies have shown that improved road and transportation networks enhance people-to-people interactions (Ali et al., 2017; Ali 2024; Almutairi and Subramanian, 2005; Asomani-Boateng et al., 2015; Stevenson and Mark, 1995). Ali et al. (2017) found that individuals are able to meet with friends and relatives and participate in various cultural events. Furthermore, the overall attitude of the local community positively influences support for the project. Clearly, the more favorable the local community's attitude toward CPEC development, the greater their willingness to support further construction. These findings align with previous studies (Ali et al., 2017; Ghanem et al., 2021; Saqib et al., 2023; Kanwal et al., 2019a, 2019c, 2019d; Yoon et al., 2001), and suggesting that if local society perceives CPEC to be useful to them, they may provide full support or they may reject project. The development of CPEC has significantly transformed local communities across Pakistan, affecting social, economic, environmental, and cultural aspects. Socially, improved infrastructure like roads, schools, and healthcare has enhanced quality of life and access to services, though displacement and unequal benefit distribution remain concerns (Bhat et al., 2023; Anwar et al., 2022). Economically, CPEC has generated jobs, boosted trade, and supported small businesses, with over 65% of locals benefiting, but rising inflation and living costs call for balanced policies (Ali, 2023; Khan et al., 2023). Environmentally, rapid development has caused deforestation, soil erosion, and water pollution in sensitive regions, with limited community involvement in mitigation efforts (Ali, 2023; Waheed et al., 2023). Culturally, increased intercultural exchange has fostered mutual understanding, yet fears of eroding traditions persist, emphasizing the importance of protecting heritage sites through culturally sensitive development (Ma, 2024; Shinwari, 2025; Khan, 2024).

Implication

The current study has several theoretical and practical implications. From a theoretical perspective, it contributes to the understanding of social exchange theory. According to this theory, if local communities perceive the benefits of the CPEC project to outweigh the costs, they are more likely to offer their full support in order to get more develop. This research highlights the overwhelmingly positive attitude of Gilgit-Baltistan residents toward CPEC development, with a perception that the benefits of CPEC outweigh its disadvantages. In terms of practical implications, the study offers valuable insights for both the local community and policymakers involved in the CPEC project. First, the research findings raise awareness within the local community by highlighting several advantages of the CPEC development project. These results can assist CPEC officials in fostering a more positive attitude among residents toward the project by focusing on its beneficial impacts. Second, to further support a favorable attitude toward CPEC construction, the benefits of the project should be identified and

promoted in the region through effective policies, such as utilizing local media and ensuring equitable distribution of funds among residents. Additionally, the valuable natural resources of Gilgit-Baltistan must be protected and maintained. Furthermore, environmentally sustainable alternatives should be communicated to the community and implemented with their involvement, consent, and acknowledgment. Third, increased engagement will provide the necessary incentives for the region's future development and prosperity. Many residents have a clear tendency toward either a positive or negative attitude (Kanwal et al., 2019a, 2019c, 2019d). However, these residents should not be ignored, as they may respond in various ways, such as through voting or negative word-of-mouth, which could spread unfavorable messages both within the community and to the outside world. Therefore, it is important to monitor and assess the behavior of these residents regularly, regardless of their intentions. Finally, it is recommended that CPEC officials address the environmental concerns associated with the project. For instance, to overcome air pollution and manage other environmental problems, officials could consider planting trees along the CPEC route.

Limitation

While the current study offers several implications, it also has some limitations that should be considered for future research. First, the study focuses solely on the Gilgit-Baltistan region, whereas the CPEC project has expanded across Pakistan. Our analysis was limited to the attitudes of communities in Gilgit-Baltistan toward the CPEC program. In addition, the participants in this study represent a diverse local community. Future research could gain from concentrating on specific communities throughout Pakistan. It would also be beneficial for researchers to involve particular groups, such as business leaders and politicians, to gather valuable and insightful perspectives. Second, this research is based on social exchange theory, which is widely recognized and commonly used in studies examining the impact of residential attitudes (Kanwal et al., 2019a, 2019c, 2019d; Yoon et al., 2001). However, other theories could also be applied to explore local residents' attitudes, including the theory of planned behavior, quality of life frameworks, and community attachment. Qualitative methodology could also be valuable in providing more detailed information related to the CPEC project. Additionally, a deeper investigation into other aspects of local community response could offer more information, such as a comprehensive understanding of the scope of supporting behaviors, including both passive and active actions. Third, this research focused on community support by examining the beneficial impacts of the CPEC route, while previous studies have also highlighted the negative effects of road and transportation development, including impacts on human health, climate, and the environment. Additionally, the research model in this study focused solely on the development of CPEC's transport infrastructure and its impact on support for further development. Future researchers could expand the model by including additional factors, such as employment, income, and education impacts in the context of CPEC, and explore how these elements influence local residents' support for continued development. Finally, we also addressed the negative environmental impact of the CPEC project and its effects on the living standards of local residents. As Pakistan is an underdeveloped country, and compared to nations like China

and Japan, it already lacks comprehensive environmental impact policies. Therefore, it is recommended that CPEC officials implement policies to mitigate the negative environmental effects of the project.

Conclusion

The present study offers valuable insights into the complex and multifaceted impacts of the China Pakistan Economic Corridor (CPEC) on local communities in Pakistan, reflecting a spectrum of attitudes and responses shaped by social, economic, environmental, and cultural factors. These findings underscore the importance for government officials and policymakers to design and implement inclusive strategies that maximize the benefits of CPEC while mitigating its adverse effects. Economically, it is crucial that development initiatives under CPEC prioritize equitable opportunities for employment and entrepreneurship, especially for marginalized and rural populations, ensuring that the economic growth generated does not remain concentrated within urban centers or elite groups. Socially, fostering meaningful community participation and engagement in decision-making processes can enhance trust and cooperation between project authorities and local populations. Establishing continuous dialogue platforms and social impact assessments alongside environmental evaluations will help address community concerns proactively and adaptively. Environmentally, the study highlights the pressing need for stringent regulatory frameworks to protect vulnerable ecosystems from degradation associated with large-scale infrastructure projects. Policymakers must enforce comprehensive environmental impact assessments that incorporate local ecological knowledge and prioritize sustainable development practices. Culturally, respecting the diverse traditions and identities of affected communities is essential to avoid social tensions and ensure harmonious integration of CPEC activities. Policies that protect cultural heritage sites and encourage intercultural dialogue between locals and incoming workforce can foster mutual understanding and preserve social fabric. Furthermore, the government should establish robust monitoring and evaluation mechanisms to track the socio-economic and environmental effects of CPEC continuously, allowing for timely adjustments in policies and interventions. Effective communication and transparency about project goals, benefits, and risks will also empower communities, reduce misinformation, and build local support for ongoing development. Overall, this study's findings emphasize that the long-term success of CPEC depends on a balanced, inclusive approach that integrates local community perspectives, promotes sustainable economic growth, safeguards the environment, and respects cultural diversity. By implementing these comprehensive policy recommendations, Pakistan can ensure that the transformative potential of CPEC translates into tangible improvements in the lives of its people, fostering equitable development and social cohesion throughout the corridor region.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the patients/ participants or patients/participants legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

SK: Data curation, Investigation, Writing – original draft, Writing – review & editing. SH: Methodology, Software, Visualization, Writing – original draft, Writing – review & editing. IK: Methodology, Validation, Writing – review & editing. MR: Writing – review & editing. LH: Project administration, Writing – review & editing. KD: Resources, Writing – review & editing. RM: Formal analysis, Writing – review & editing. BC: Conceptualization, Funding acquisition, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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