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Impact of Special Economic Zones on Rural Communities in Pakistan: Infrastructure, Socio-Economic Transformation and Public Services

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ABSTRACT

The China-Pakistan Economic Corridor (CPEC) has emerged as a transformative initiative, reshaping Pakistan's economic landscape through the development of Special Economic Zones (SEZs). This study examines the socio-economic impact of infrastructural development within SEZs on rural communities, with a focus on key aspects such as road connectivity, electricity supply, sanitation, and access to public services. Using a quantitative approach, data were collected from 150 rural inhabitants through a structured questionnaire, and results were analyzed using chi-square tests. Findings indicate that road infrastructure under SEZs has significantly improved farmers' access to urban markets, with 44% of respondents reporting a major impact and 35% noting a moderate impact. Additionally, SEZs have contributed to the availability of quality public services and electricity, with 38% and 42% of respondents acknowledging significant improvements, respectively. Furthermore, 40% of respondents perceived SEZs as a major driver of rural development, while 48% reported a noticeable influence on local tourism. These insights underscore the role of SEZs in fostering regional economic integration and social upliftment, contributing to broader discussions on governance, development, and socio-economic transformation in South Asia.

Keywords: CPEC, SEZ, Rural Areas, Significant Impact, Transformative Initiative, Economic Development, Inhabitants.

INTRODUCTION

Infrastructure plays a pivotal role in economic development by directly influencing production, consumption, financial flows, and externalities, both positive and negative. The flow of infrastructure services is the primary indicator of economic benefits, emphasizing the need for effective demand-driven resource allocation (Irshad et al., 2015). Within this context, the China-Pakistan Economic Corridor (CPEC) has emerged as a transformative initiative aimed at boosting regional economic integration, improving infrastructure and fostering socio-economic growth. Governments of both Pakistan and China anticipate that the successful completion of CPEC will enhance the well-being of local populations while addressing Pakistan's financial and environmental crises. For China, CPEC offers the most cost-effective and efficient trade route for oil shipments, reinforcing the strategic significance of the

project (Ali et al., 2017).

A key component of CPEC is the development of Special Economic Zones (SEZs), which are designed to attract foreign and domestic investment by offering financial incentives, tax exemptions and reduced trade barriers. SEZs function as Free Trade Zones where regulatory restrictions on businesses, including customs duties and import-export tariffs, are either minimized or eliminated to promote industrial growth (Kanwal et al., 2019). These zones are particularly significant for developing economies, where they contribute to job creation, infrastructure expansion and increased trade flows. The global prevalence of SEZs continues to rise, playing an increasingly vital role in international trade and economic development (Ashraf, 2015).

Despite their economic potential, SEZs remain a subject of intense debate regarding their actual impact on industrialization, employment generation and regional

development. While some studies highlight their role in driving economic expansion, others argue that SEZs pose risks, including land displacement, income inequality and limited benefits for local populations. Moreover, the success of SEZs is contingent upon effective governance, transparent policies and community engagement (Mahmood et al., 2020).

Infrastructure development, particularly in the transportation and energy sectors, plays a crucial role in maximizing the benefits of SEZs. The expansion of road networks, transit systems and high-speed rail (HSR) under SEZ initiatives enhances regional connectivity, facilitating trade and tourism (Kang and Lee, 2018). Furthermore, improved access to urban centers fosters economic opportunities for rural populations by enabling better access to markets, healthcare, education and employment (Nazneen et al., 2021). However, the extent to which these infrastructural developments translate into tangible socio-economic benefits remains underexplored.

The economic impact of SEZs in Pakistan extends beyond infrastructure, with projections indicating that SEZ-related investments will generate approximately one million jobs while increasing the country's annual income by 2% to 2.5% between 2015 and 2030 (Hamid and Sarah, 2022). Additionally, SEZ development is expected to enhance market efficiency, reduce transportation costs and provide Pakistani firms with lifetime advantages through collaborative ventures with Chinese industries (Yolal et al., 2021). However, ensuring that these benefits are equitably distributed requires a deeper understanding of public perceptions, challenges and policy frameworks governing SEZ implementation.

Pakistan's SEZ program under CPEC spans all provinces, including Gwadar (Balochistan), Punjab, Sindh, Khyber Pakhtunkhwa and the Khunjerab region along the China-Pakistan border. The strategic placement of SEZs aims to facilitate industrialization, alleviate energy shortages and promote economic diversification (Richards and Wilson, 2020). While these zones are intended to function as engines of economic growth, their long-term success hinges on addressing socio-economic disparities, ensuring environmental sustainability and fostering inclusive development.

Beyond economic factors, SEZs also contribute to social and cultural transformations. Infrastructure projects associated with SEZs enhance community well-being by improving housing, education, healthcare and access to

modern amenities. Moreover, SEZs drive tourism and cultural exchange, strengthening local economies and providing opportunities for indigenous communities to engage in economic activities (Quinn, 2021). Despite these advantages, public sentiment toward SEZ development varies, with concerns over land acquisition, environmental degradation and limited local participation in decision-making processes.

Given the complex interplay between infrastructure, economic development and community well-being, this study seeks to assess the socio-economic impact of SEZs from a community perspective. Specifically, it aims to examine how infrastructural advancements such as transportation, sanitation, electricity and public services affect the lives of residents. Understanding these dynamics is crucial for identifying policy gaps, optimizing resource allocation and ensuring that SEZ benefits are equitably distributed. The findings will provide valuable insights for policymakers, corporate leaders and development practitioners, offering a framework for sustainable and inclusive SEZ implementation in Pakistan.

REVIEW OF LITERATURE

CPEC infrastructure projects have played a vital role in stimulating local investment opportunities. Du and Zhang (2018) highlighted that these projects have led to increased property purchases, car training courses and the establishment of small to medium-sized enterprises (SMEs). The enhancement of transportation infrastructure has improved living conditions, increased regional attractiveness and elevated residents' socioeconomic status.

Special Economic Zones (SEZs) are considered a major driver of economic transformation in Pakistan. Ahmad and Hong (2017) emphasized that SEZs contributed to poverty reduction by providing essential services such as banking, healthcare and education, while also addressing employment and energy shortages. Similarly, Kanwal et al. (2019) found that improved infrastructure under CPEC facilitated access to tourist destinations, boosting economic activity and local living standards.

The role of transportation infrastructure in tourism development has been widely studied. Mamirkulova et al. (2020) noted that improved road networks led to increased tourist activity in regions with scenic attractions, contributing to economic growth. However, Islamabad (2017) identified financial constraints and low

market demand as key barriers preventing rural inhabitants from starting businesses. CPEC's infrastructure projects have helped alleviate these challenges by enhancing economic opportunities for rural communities.

Saad et al. (2020) investigated the impact of road connectivity under CPEC, reporting that improved transportation facilitated access to education, healthcare and entrepreneurial opportunities. Additionally, Virkar and Mallya (2022) examined CPEC's role in knowledge transfer and its contribution to Pakistan's socioeconomic development, emphasizing structured information exchange as a key factor.

Pakistan's strategic geographic position makes it a hub for regional trade. Li et al. (2020) highlighted that SEZ projects, including energy initiatives and infrastructure expansion, leveraged Pakistan's natural and human resources. These developments were expected to drive industrialization, strengthen regional trade and improve economic stability. However, Pakistan's low Human Development Index (HDI) score in 2017 raised concerns about the country's progress compared to its regional counterparts (Saad et al., 2019).

The historical development of free trade zones and SEZs has provided valuable insights. Holton (2020) traced the evolution of SEZs, noting that their expansion in China during the late 20th century played a crucial role in economic growth. Hassan et al. (2022) observed that targeted workforce training in SEZs enhanced technical skills, fostering innovation and technology advancement. Shaikh (2016) developed a theoretical framework for Pakistan's economic potential under CPEC, projecting that the initiative could generate approximately 700,000 jobs. The project's large-scale infrastructure developments were expected to attract investment and improve economic conditions. However, Saad et al. (2020) pointed out that rural women had not yet experienced direct benefits from SEZ projects, as initial developments were primarily focused on infrastructure rather than socioeconomic advancements.

Hassan, K (2024) analyzed SEZs' contributions to employment, healthcare and infrastructure development. Improved road networks connected underdeveloped provinces with urban centers, expanding access to essential services. Additionally, Chinese settlements emerged in major cities and along infrastructure routes, facilitating economic integration. The establishment of a traditional Chinese medical hospital in Lahore was one

such example.

The impact of SEZ-linked infrastructure on rural communities has been extensively studied. Ali et al. (2018) found that improved transportation networks facilitated better access to education. Guo et al. (2020) highlighted the transformative role of High-Speed Rail (HSR) projects in both China and Pakistan, contributing to job creation, enhanced connectivity and economic stimulation.

Social Exchange Theory (SET) provides a framework for understanding community attitudes toward development projects. De-Bernardi and Bertello (2020) explained that SET examines reciprocal interactions between groups, shaping perceptions of tourism and infrastructure projects. Mustafa and Zafar (2017) applied SET to analyze community support for CPEC, emphasizing that residents must perceive tangible benefits from the projects to maintain positive attitudes.

METHODOLOGY

This study employed a quantitative research design to analyze the perceptions of residents regarding infrastructural changes in the Special Economic Zone of Faisalabad District. The quantitative approach facilitated systematic data collection and interpretation based on the target population's responses. Data was collected using a well-structured interview schedule to ensure consistency and accuracy. The target population comprised villagers residing near the industrial zone in the District of Faisalabad. The purposive sampling technique was used for selection, as the area had been designated as a Special Economic Zone. For data collection, two rural Union Councils were selected conveniently from which five villages were further chosen. In each village, 30 respondents were selected conveniently, resulting in a total sample size of 150 participants.

To accommodate the low literacy rate among rural residents, the interview guide was initially designed in simple English and later translated into the local language for better comprehension. Unlike a questionnaire, which is completed independently by respondents, a structured interview guide was used to facilitate face-to-face interactions between the interviewer and participants, ensuring more accurate and reliable data collection.

RESULTS

Socio-Economic Characteristics of Respondents

The socio-economic characteristics of the 150

respondents are summarized in Table 1. The majority of the respondents (33.3%) were between 26 to 35 years of age, followed by 28.7% aged 18 to 25 years, 24% aged 36 to 45 years and 14% above 45 years. Educational attainment varied, with half of the respondents (50%) having completed graduation or higher education, while 25.3% had completed intermediate, 14.7% had matriculation and 10% had only primary education. Regarding occupation, most respondents (48%) were laborers, followed by 32% engaged in agriculture. Business owners comprised 6.7%, private-sector employees 5.3%,

government employees 3.3% and unemployed individuals 4.7%. Monthly income distribution indicated that 44% of respondents earned up to 30,000 PKR, 40% earned between 30,000 to 60,000 PKR and 16% earned above 60,000 PKR. Household size analysis showed that 46% of families consisted of 6 to 10 members, 38% had 1 to 5 members and 15% had more than 10 members. In terms of gender, 64% of respondents were male, while 36% were female. Family structure analysis revealed that 49.4% belonged to nuclear families, 27.3% to joint families and 23.3% to extended families.

Table 1. Socio-economic characteristics of the Respondents N=150.

Variables	Description	No of Respondents	Percentage
Age	18 to 25	43	28.7
	26 to 35	50	33.3
	36 to 45	36	24.0
	Above 45	21	14.0
Education Level	Primary	15	10.0
	Matric	22	14.7
	Intermediate	38	25.3
	Graduation and above	75	50.0
Occupation	Government	5	3.3
	Private	8	5.3
	Businessman	10	6.7
	Agriculture	48	32.0
	Labor	72	48.0
	Unemployed	7	4.7
Monthly Income	Up to 30,000	66	44.0
	30,000 to 60,000	60	40.0
	Above 60,000	24	16.0
Household Size	1 to 5 members	58	38.0
	6 to 10 members	69	46.0
	Above 10 members	23	15.0
Gender	Male	96	64.0
	Female	54	36.0
Family Type	Extended Family	35	23.3
	Joint Family	41	27.3
	Nuclear Family	74	49.4

Impact of Infrastructural Development on Rural Communities

Respondents' perceptions of the impact of infrastructural development, particularly within Special Economic Zones (SEZs), on rural communities are detailed in Table 2. Awareness of CPEC and SEZs was reported by 50% and 54% of respondents, respectively. Awareness of the advantages and disadvantages of SEZs varied, with 38% being well aware and 36% having some knowledge.

Regarding infrastructural changes, 40% of respondents reported significant improvements in access to clean drinking water, while 38% noticed moderate improvements. Road development within SEZs was reported to have enhanced farmers' access to major cities, with 44% perceiving a major impact and 35% a moderate impact. Quality public services, including fire and police services, were perceived to have improved significantly by 38% of respondents and moderately by

36%. Similarly, improvements in electricity availability were reported by 42% of respondents, while 34% noticed moderate improvements. The SEZs were seen as a major driver of rural development by 40% of respondents, with

an additional 36% recognizing moderate contributions. The impact on tourism was also well-known, with 48% identifying a major impact and 30% observing a moderate impact.

Table 2. Impact of Infrastructural development on the lives of rural people.

Sr.	Infrastructural factors	To Great Extend	%	To some Extend	%	Don't Know	%
1	Do you know what the China-Pakistan Economic Corridor is?	75	50%	49	32%	26	18%
2	Do you know about the Special Economic Zone?	81	54%	40	26%	29	20%
3	Are you well aware of the advantages and disadvantages of a Special Economic Zone?	57	38%	53	36%	40	26%
4	How has the availability of clean drinking water in your village been affected by the development of the Special Economic Zone?	60	40%	56	38%	34	22%
5	How has the development of roads under the Special Economic Zone (SEZ) impacted farmers' access to big cities?	66	44%	52	35%	32	21%
6	How has the Special Economic Zone (SEZ) affected the access to quality public services (fire, police, etc.) for local communities?	56	38%	54	36%	40	26%
7	How has the development of the Special Economic Zone (SEZ) influenced the availability and quality of the sewerage system for local communities?	54	36%	60	40%	36	24%
8	How has the development of the Special Economic Zone (SEZ) affected the availability of electricity in your village?	62	42%	51	34%	37	24%
9	How has the Special Economic Zone (SEZ) contributed to the development of rural areas?	60	40%	53	36%	37	24%
10	How has the development of the Special Economic Zone (SEZ) impacted tourism?	72	48%	44	30%	34	22%

Hypothesis Testing

H1: Upgraded sanitation systems improve health and living conditions in SEZs

The chi-square test results, as shown in Table 3, indicate a significant association between sanitation system improvements and health outcomes (Pearson Chi-square = 216.883, p = 0.000). The likelihood ratio test (213.626, p = 0.000) and linear-by-linear association (109.376, p = 0.000) confirm this finding. Chi-square test results indicate a significant relationship between upgrading the sanitation system within Special Economic Zones (SEZs) and both health outcomes and overall living conditions among SEZ residents. Improved sanitation not only reduces diseases but also creates cleaner environments and better living conditions for SEZ residents. These

findings highlight the importance of sanitation infrastructure in improving public health and living standards for local communities.

H2: Improved sewerage systems enhance health in SEZs

There is a positive association between the enhancement of sewerage systems and the health of citizens within Special Economic Zones (SEZs). The chi-square test (Pearson Chi-square = 13.014, p = 0.011) demonstrates a significant relationship between improved sewerage and health. The likelihood ratio (14.043, p = 0.007) and linear-by-linear association (4.924, p = 0.026) further confirm this relationship, highlighting that better sewerage leads to remarkable health improvements in SEZ communities. Proper sewerage management is essential for maintaining public health and preventing waterborne diseases.

Table 3. Chi-square test results for the association between sanitation improvements and health outcomes in SEZs.

Chi-Square Tests	Value	DF	Sig. (2-sided)
Pearson Chi-Square	216.883	4	.000
Likelihood Ratio	213.626	4	.000
Linear-by-Linear Association	109.376	1	.000
N of Valid Cases	150		

Chi-Square Tests	Value	DF	Sig. (2-sided)
Pearson Chi-Square	13.014	4	.011
Likelihood Ratio	14.043	4	.007
Linear-by-Linear Association	4.924	1	.026
N of Valid Cases	150		

H3: Improved Health enhances overall living conditions in SEZs

Although the association illustrated in Table 4 is significant, the lower chi-square values indicate a relatively weaker relationship compared to previous hypotheses. Nevertheless, the findings suggest that

health improvements contribute to better living conditions in SEZs. This means better health helps improve living conditions, other factors also have an important role. The results highlight that improving healthcare is essential for better social and economic conditions in SEZs.

Table 4. Chi-square test results for the association between health improvements and living conditions in SEZs.

Chi-Square Tests	Value	DF	Sig. (2-sided)
Pearson Chi-Square	217.506	4	.000
Likelihood Ratio	213.229	4	.000
Linear-by-Linear Association	104.125	1	.000
N of Valid Cases	150		

H4: Rural development is positively associated with socio-economic indicators and quality of life

The statistical analysis presented in Table 5 shows that rural development has a positive link with socio-economic indicators and overall quality of life. A significant relationship was found between rural development and socio-economic indicators (Pearson Chi-square = 90.400, p = 0.000). The likelihood ratio

(84.961, p = 0.000) and linear-by-linear association (40.150, p = 0.000) support this conclusion, emphasizing the role of SEZs in enhancing economic and social well-being. By attracting investments, infrastructure development and easy access to resources, SEZs contribute to better living standards and overall socio-economic progress of the local citizens.

Table 5. Chi-square test results for the association between rural development and socio-economic indicators in SEZs.

Chi-Square Tests	Value	DF	Sig. (2-sided)
Pearson Chi-Square	90.400	4	.000
Likelihood Ratio	84.961	4	.000
Linear-by-Linear Association	40.150	1	.000
N of Valid Cases	150		

H5: Availability of electricity positively influences economic activities, social well-being and community development

The data in Table 6 illustrate that the availability of electricity significantly contributes to economic activities, social well-being, and overall community development. The chi-square test results indicate a strong association between electricity availability and economic/social

development (Pearson Chi-square = 212.956, p = 0.000). The likelihood ratio (213.900, p = 0.000) and linear-by-linear association (85.132, p = 0.000) endorse this finding, demonstrating that electricity access plays a crucial role in the development of economic growth and improving living standards. The fundamental role of electricity in the encouragement of economic growth, reducing poverty and ensuring sustainable development within communities.

Table 6. Chi-square test results for the association between electricity availability and economic, social and community development in SEZs.

Chi-Square Tests	Value	DF	Sig. (2-sided)
Pearson Chi-Square	212.956	4	.000
Likelihood Ratio	213.900	4	.000
Linear-by-Linear Association	85.132	1	.000
N of Valid Cases	150		

DISCUSSION

The findings highlight the multifaceted impact of SEZ development on rural communities in Pakistan. Enhanced infrastructure, particularly in sanitation, electricity and road networks, has significantly improved socio-economic conditions. The results align with previous studies indicating that infrastructure expansion under CPEC contributes to regional development, economic opportunities and improved quality of life (Mehmood et al., 2020).

However, while the majority of respondents acknowledged positive changes, a proportion expressed uncertainty regarding the extent of benefits. This suggests a need for further community engagement and policy interventions to maximize the potential of SEZs in rural development. The effectiveness of SEZs in addressing long-term socio-economic challenges remains a critical area for further investigation. It is imperative to assess whether infrastructure development leads to sustainable employment opportunities and equitable resource distribution among different socio-economic groups (Zeng, 2021).

These improvements have played a crucial role in connecting rural areas to markets and essential services, thereby encouraging economic growth and improving living standards. The accessibility of reliable electricity and better road networks has also contributed to increased business opportunities and improved productivity for local industries. Improved infrastructure has had a direct impact on education and healthcare services, making them more accessible to rural populations (Khan and Anwar, 2022).

Ahmad and Hong (2017) pointed out that SEZs contribute to poverty reduction by improving access to essential services and employment opportunities. Kanwal et al. (2019) also emphasized that infrastructure projects under CPEC have facilitated economic growth and improved living conditions in rural areas.

The effectiveness of SEZs in addressing long-term socio-economic challenges remains a critical area for further

investigation. It is imperative to assess whether infrastructure development leads to sustainable employment opportunities and equitable resource distribution among different socio-economic groups. Without careful planning, there is a risk that SEZs may primarily benefit certain sectors while leaving marginalized groups behind. A study by Wang et al. (2023) highlights that SEZ benefits are often concentrated in urban areas, raising concerns about unequal development across different regions (Rahman et al., 2023).

Another key issue is the quality of jobs created within SEZs. While SEZs often generate employment, there is a need to assess whether these jobs provide long-term security, fair wages and opportunities for career advancement. Research suggests that many SEZs worldwide tend to rely on low-wage labor with limited job security, which may not translate into sustainable economic upliftment for rural communities (Kolawole and Pusoetsile, 2022).

The role of governance in SEZ implementation is also crucial. Transparent and participatory decision-making processes can ensure that infrastructure projects align with local needs and priorities. Future research should examine the extent to which local communities are involved in planning and benefiting from SEZs. Furthermore, potential negative impacts, such as environmental degradation and displacement, should be explored to develop holistic development strategies. The rapid industrialization within SEZs can lead to environmental concerns, including deforestation, water pollution, and increased carbon emissions, which must be alleviated through sustainable planning (Owuondo, 2024).

SEZ-driven infrastructure development has played a pivotal role in enhancing the livelihoods of rural communities. However, ensuring that these benefits are equitably distributed and sustainable requires a multi-faceted approach involving community participation, governance reforms and continuous assessment of socio-

economic impacts.

Sustainable SEZ development should also incorporate education and skill development programs to ensure that local populations have the necessary expertise to take advantage of emerging economic opportunities.

Continued investment in infrastructure and social services, along with participatory governance mechanisms, will be essential to ensure the sustainable growth of these regions.

Efforts should be made to strengthen governance mechanisms, enhance transparency and ensure that local communities are active participants in SEZ-related decision-making processes. By adopting an inclusive, sustainable, and participatory approach, SEZs can serve as a powerful tool for rural development while minimizing potential risks and challenges.

CONCLUSION

The integration of Special Economic Zones (SEZs) within the China-Pakistan Economic Corridor (CPEC) marks a paradigm shift in regional development strategies, presenting a promising pathway for economic renewal and infrastructure enhancement in Pakistan. This study highlights the significant impact of SEZs on rural communities, showcasing improvements in essential infrastructure such as sanitation, electricity and transportation. These advancements have not only elevated living standards but also expanded access to critical public services and stimulated economic activities across various sectors. SEZs have positively influenced rural communities through improved infrastructure and economic opportunities, a comprehensive and inclusive approach is necessary to maximize their potential. The sustainable management of SEZs remains crucial, requiring ongoing investment in infrastructure resilience and community welfare. By prioritizing inclusive development and leveraging SEZs as drivers of innovation and prosperity, Pakistan can foster equitable growth and strengthen regional connectivity within the framework of CPEC.

AUTHORS CONTRIBUTIONS

Laraib Javaid conceptualized and designed the study, determined the research methodology, and contributed to data collection. She drafted the initial manuscript and served as the primary correspondent throughout the research process. Nasreen Akhter assisted in data collection and analysis, contributed to

data interpretation, and enhanced the manuscript through revisions and editing. Farkhanda Anjum provided research guidance and methodological advice. She also reviewed the manuscript to ensure accuracy and clarity for publication. Dr. Shabbar Iqbal validated the research findings and conducted a thorough review of the final manuscript prior to submission.

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