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Research Article

Urban Infrastructure, Quality of Life, and Pro-Tourism Behavior: Evidence from Turkistan City, Kazakhstan

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Abstract

This study examines the moderating role of residents' gender on the relationship between urban infrastructure development and both quality of life and pro-tourism development behaviors in Turkistan, Kazakhstan. Using a survey-based approach, data were collected from local residents and analyzed through structural equation modeling to test the proposed hypotheses. The survey specifically measured perceptions of development in key infrastructure domains, including transportation, public utilities, and tourism-specific facilities. The findings reveal that gender, particularly being female, positively moderates the association between urban infrastructure development and residents perceived quality of life and their supportive behaviors toward tourism development. This suggests that female residents are more responsive to improvements in urban infrastructure and more likely to engage in pro-tourism behaviors. To explore the underlying mechanism, a post-hoc mediation analysis was conducted, which provides empirical support for the mediating roles of perceived access to infrastructure benefits and economic opportunities. The results substantiate the proposed hypotheses and offer nuanced insights into the gender-sensitive dynamics of urban and tourism planning. This research contributes to sustainable tourism development by emphasizing the importance of incorporating gender considerations in urban infrastructure strategies to enhance residents' quality of life and engagement in tourism initiatives. The findings have practical implications for policymakers and urban planners seeking to design inclusive infrastructure projects that encourage community participation and support sustainable tourism development.

Keywords: Urban infrastructure development; Quality of life; Pro-tourism behavior; Gender differences; Resident perceptions; Sustainable tourism; Community engagement; Turkistan; Kazakhstan

Highlights

- Urban infrastructure development is vital for boosting tourism and improving residents' quality of life.
- Resident support is essential for tourism, but perceptions in emerging destinations are understudied.
- The New Silk Road's impact may especially empower women, altering traditional roles.

1 Introduction

Urban infrastructure development is a vital component of the city tourism industry. Infrastructure promotes tourism activity, revitalizes new tourism attractions, and eliminates obstacles that hinder tourism growth. It also presents enormous opportunities for local people, most of which enhance the living conditions of both residents and tourists. Infrastructure development involving tourism can include roads, airports, highways, railways, sewage systems, waste management, water treatment plants, and the restoration of historical monuments, heritage sites, and nature centers (JovanoviĆ & IliĆ, 2016b). It has been scientifically proven that infrastructure development increases tourism demand and promotes regional development and tourism activities (Li & Chen, 2019).

With the development of infrastructure, the natural beauty and cultural uniqueness of Kazakhstan's regions are attracting a growing number of domestic and foreign tourists, generating increased foreign currency flows into the country (Informburo, 2019). Thus, the flow of tourists from foreign, regional, and national tourism can be a reward for the capital investment of the New Silk Road (NSR) project.

The NSR mega-infrastructure, particularly in the tourism sector, is likely to contribute to economic development and business promotion for the local population. Such activities can have a significant impact on the lives of residents, particularly women residing in these destinations. It may offer them expanded economic opportunities and improved access to public services, potentially altering traditional gendered roles. We posit that such development may enhance residents' quality of life and lead to supportive attitudes toward tourism, with these effects potentially varying across demographic groups such as gender.

The literature highlights that residents, as key stakeholders, play a vital role in developing a destination, and their support is essential (Dyer, Gursoy, Sharma, & Carter, 2007; Gursoy & Rutherford, 2004; Nunkoo & Gursoy, 2012; Nunkoo & So, 2015). Thus, defining residents' perception and their supportive attitudes towards tourism development is a vital policy tool and one of the most common research topics over the past thirty years. Although many researchers have suggested that residents' perceptions of tourism development should be explored in new, emerging destinations, the literature reveals that most research has been carried out in developed tourism destinations and Western countries (Harrill, 2004; Mason & Cheyne, 2000). There are just some investigations in newly emerging destinations and developing countries (Hunt & Stronza, 2014; X. R. Liu & Li, 2018).

Moreover, Central Asian countries, being post-communist and emerging countries along the Silk Road route, are practically unexplored, and these areas are waiting to be examined. In Kazakhstan, no previous study has been conducted on the local women residents' perception of quality of life and their pro-tourism development behavior. Thus, apparent gaps exist in the literature. At the same time, Kazakhstan provides the best setting for examining the impacts of a mega-infrastructural project on its residents.

Based on the study background and a summary of the relevant literature, this study aims to answer the following research questions:

(1) Does gender strengthen the positive impact of urban infrastructure on residents' quality of life?

(2) Does gender strengthen the positive impact of urban infrastructure on residents' pro-tourism development behavior?

Guided by theoretical perspectives and existing evidence, we specifically hypothesize that these strengthening (moderating) effects will be more pronounced for female residents.

2 Literature review

2.1 Urban Infrastructure Development and Quality of Life

Infrastructure development and its provided communications, power supply, water supply, and garbage disposal are crucial basics for the comfortable functioning of tourists in the chosen tourist destination as well as for the comfortable living of residents (JovanoviĆ & IliĆ, 2016a). Thus, infrastructure provision, combined with new technology and innovation, could significantly improve the conditions in tourism areas and enhance the quality of life. Numerous investigations have observed the consequences of infrastructure in different contexts. For instance, a study by Nazneen, Xu, and Din (2019) found that, due to infrastructure-generated economic benefits, residents perceived tourism benefits positively, despite ignoring the associated costs. Liaqat Ali, Mi, Shah, Khan, and Imran (2017) suggested that transportation infrastructure has a significant influence on the living standard of the local community. Recently, Abbas, Mamirkulova, Al-Sulaiti, Al-Sulaiti, and Dar (2025) found that the consequences of infrastructural development through tourism sustainability benefits increased the quality of life of residents. Uysal, Sirgy, Woo, and Kim (2016) found that tourism initiatives contribute a positive impact in various life spheres, including family, social, leisure, and cultural life. Suess, Baloglu, and Busser (2018) stated that community well-being is enhanced in turn because of the tourism industry and economic growth. It is well-accepted that tourism is a service industry that is continually demanding the development of the infrastructure (JovanoviĆ & IliĆ, 2016a).

Khadaroo and Seetanah (2007) argued that improved transportation infrastructure is one of the essential factors in attracting tourists to a destination. Therefore, transportation infrastructure development under the NSR project facilitates easy movement between tourism sites. In other words, quality roads and transportation connect big cities to remote areas, reducing travel time and the cost of transportation for both residents and non-residents. Such improved transport infrastructure increases tourist arrivals in the destination and tourism demand, which is a prerequisite for consuming other tourism infrastructural facilities of the destination. An example would be increasing the productivity of human resources at the destination. It is because tourists require specific services to satisfy them during their stay in their chosen tourist destination, so residents can significantly benefit from it. Previous works of literature have also shown that access to infrastructure amenities has positively contributed to the development of tourism destinations, increased tourism demand, and provided job opportunities, a higher standard of living, and improved economic conditions for residents (Liaqat Ali et al., 2017; Nazneen et al., 2019).

As Turkistan is an underdeveloped tourism destination, the development of NSR mega-infrastructure in these areas eliminates age-old infrastructural restrictions, which were the primary obstacle to the tourism sector's ability to utilize the full potential of Kazakhstan's tourism industry (Kantarci, 2007). According to international statistics, the NSR infrastructural project may increase Kazakhstan's economy through Silk Road tourism, creating millions of jobs and business opportunities related to tourism that have the potential to enhance the prosperity of Kazakhstanis, thereby increasing income and quality of life (Forbes & Kazakhstan, 2018). It is also expected that the NSR will resolve the road and transportation, electricity, power, energy, and water scarcity in the entire Kazakhstan (Maitra, 2016), which contributes to the reduction of poverty and the growth of the country's economy (Chulanova, 2007; Gulnara Mamirkulova, Mi, Mubeen, Shah, & Aidarova, 2019).

The implications of NSR infrastructural projects provide basic living facilities, including markets, education, and healthcare (Kassenova, 2017; Laruelle, 2018). Gulnara Mamirkulova et al. (2020) found that the quality of life for residents in underdeveloped areas was enhanced by the provision of fully equipped infrastructural services. According to the Butler's TALC model, destination at the initial stage of infrastructure development forecast positive consequences of development within destination (Butler, 1980; Nazneen et al., 2019) and suggest that residents' sense of material, social, health, and emotional well-being will be improved during the beginning stages of tourism development, and starts

to decline when development exceeds the "level of acceptable change" or "carrying capacity" (K. Kim, Uysal, & Sirgy, 2013). Thus, Butler's TALC model and previous studies demonstrate that greater infrastructural development in the region promotes tourism and improves the quality of life for residents; therefore, the findings suggest a positive relationship between development at the destination and the quality of life for residents. This subsection defines the core terms and constructs that shape the study.

2.2 Urban Infrastructure Development and Pro-Tourism Development Behaviour

Residents' support plays a crucial role in the effective planning and operation of any development project (Gulnara Mamirkulova et al., 2020). Conversely, the development of NSR mega-infrastructure can influence the increase or decrease in residents' supportive behavior toward tourism development within a destination. The residents' urban infrastructure development can include expanding infrastructure development, modernizing roads and transportation, and accelerating business and community development, which may also be related to the arrival of tourists and favorable economic benefits.

The influx of tourists will likely increase business opportunities at tourist sites and lead to the creation of new enterprises, such as hotels, restaurants, retail shops, and modes of transportation. In the context of infrastructure development, a study from Pakistan by Nazneen et al. (2019) has investigated the favorable benefits of the China-Pakistan Economic Corridor (CPEC) and their positive effect on residents' perception of tourism development. Recently, Kanwal, Rasheed, Pitafi, Pitafi, and Ren (2020) have been examining residents' support for tourism development and found that the favorable impacts of road and transport initiatives are a strong predictor of residents' support. Liaqat Ali et al. (2018) have indicated that full-time employment opportunities, income, and cultural activities from the transport corridors in remote areas increased residents' positive attitudes toward project development.

From a tourism development perspective, Látková and Vogt (2011) found that gaining economic benefits during project development is an essential antecedent for generating residents' positive attitudes. Yoon, Gursoy, and Chen (2001) demonstrate that the developmental benefits of economic, environmental, social, and cultural aspects are the primary benefits that residents can receive. McGehee and Andereck (2004) reported that residents who receive benefits from development may have a favorable attitude toward tourism and are more likely to exhibit supportive behavior in development activities. The overall approach is that when residents feel the benefits are more significant than any negative impacts, then they manifest positive pro-tourism behavior (Muler Gonzalez, Coromina, & Galí, 2018). There is a recognized association among infrastructure development and pro-tourism behavior of residents (Kurihara & Wu, 2016).

Tourism and hospitality-related infrastructure could provide accessibility to underdeveloped tourism regions, enhance the attractiveness of the destination, make basic needs available to residents, increase income with a new job, or with a small business where local people can sell their local products at a reasonable price. Thus, the benefits of infrastructure can lead to residents' positive and supportive behavior. This assumption is based on the most popular social exchange theory (SET) (Kanwal, Pitafi, Rasheed, Pitafi, & Iqbal, 2020; Nazneen et al., 2019). It describes how, if tourism benefits and demand are high at a destination, residents are more likely to provide their support for tourism development and be willing to participate in the further planning process. In other words, if residents perceive more benefits from infrastructural projects, they show pro-tourism development behavior. According to Gursoy, Chi, and Dyer (2009), when residents become aware of the positive or negative impacts of tourism, it may influence their pro-tourism attitudes and behaviors.

The Western Europe-Western China (WE-WC) highway construction, part of the NSR infrastructure development project, has increased the attractiveness and accessibility of Turkistan for tourists in a year and has had an economic impact on the region. According to Forbes Kazakhstan news, the number of tourists increased by 20% in 2018 compared to 2017, with more than 1.44 million tourists visiting

Turkistan, Kazakhstan, and generating 3.73 billion KZ tenge (US$10.48 million) in revenues for the economy (Forbes & Kazakhstan, 2018). There is a well-known favorable relationship between the development of tourism infrastructure and tourism demand (JovanoviĆ & IliĆ, 2016a; Khadaroo & Seetanah, 2007; Mammadov, 2012). Our study, also based on the SET, suggests that a higher level of development at the destination may favorably influence residents' pro-tourism development behavior.

2.3 Moderating Role of Gender between Urban Infrastructure Development and Quality of Life, Pro-Tourism Development Behavior

Gender is a key demographic variable that can significantly influence residents' attitudes and perceptions of development (Nazneen, Xu, & Din, 2020; Papastathopoulos, Ahmad, Al Sabri, & Kaminakis, 2019). The literature reveals complex and often conflicting findings regarding the role of gender in tourism. For instance, while tourism development offers job opportunities for both females and males, a persistent gender pay gap exists, with Thrane (2008) finding that male workers in tourism earn approximately 20 percent more than their female colleagues. This suggests that men and women may perceive the benefits of tourism development differently.

Some studies indicate that females tend to show a lower level of support for tourism than males, often linked to a greater awareness of the undesirable environmental and socio-cultural consequences of development (Almeida-García, Peláez-Fernández, Balbuena-Vázquez, & Cortés-Macias, 2016). Conversely, other researchers have found that job prospects in the tourism industry can provide women with financial independence and economic equality, potentially elevating their role in traditional societies and improving their well-being (Soontayatron, 2010). This has led some scholars to argue that women are more likely to strongly support tourism because of the tangible benefits they gain (Sinclair-Maragh, 2017; Wang & Pfister, 2008), while others report an insignificant impact of gender (Nazneen et al., 2020; Rasoolimanesh, Jaafar, Kock, & Ramayah, 2015).

The role of gender in the specific context of infrastructure development is even less explored. A study by Liaqat Ali (2018) demonstrated that gender moderates the relationship between transportation infrastructure and education in Pakistan, where new roads provided females with previously restricted access to Schooling. This highlights how infrastructure can uniquely empower women by overcoming socio-cultural barriers. In contrast, Daye, Charman, Wang, and Suzhikova (2020) found that men were more supportive of infrastructure projects due to a focus on jobs and income, while women expressed greater concern about negative impacts.

Given these conflicting findings, it is critical to theorize the moderating role of gender within the specific context of Turkistan, Kazakhstan, and the New Silk Road (NSR) project. We posit that the NSR represents a unique catalyst for social and economic change. In a post-communist, emerging economy like Kazakhstan, large-scale infrastructure projects can create new economic frontiers, potentially disrupting traditional gender roles. The tourism sector, in particular, often generates employment in the hospitality, retail, and service sectors, which have historically offered greater entry points for women. Therefore, we hypothesize that the economic empowerment and improved access to public amenities (e.g., safer transport, new public spaces) generated by the NSR's urban infrastructure will have a disproportionately positive effect on female residents. For women, these developments may not only enhance practical aspects of their quality of life but also represent a significant expansion of personal and economic agency. Consequently, their perception of the benefits derived from infrastructure is likely to be stronger, translating into a higher level of support for the tourism development it enables.

2.4 Proposed Conceptual Model

The present research is explanatory. The study analyzed the impacts of the perceived benefits of mega-infrastructure on the development of the tourism environment and the lives of local people from the perspective of residents in Turkistan, Kazakhstan. The study was particularly designed to explore how the benefits of NSR infrastructure development influence the quality of life and pro-tourism

development behavior of residents, considering the moderating role of demographic variables, specifically gender. To know whether residents' demographic factors influence the positive relationship between the benefits of NSR and the perception of quality of life and pro-tourism development behavior. We carefully selected and employed suitable statistical tools to identify the most significant implications within the review of these proposed constructs.

Therefore, based on this rationale, the present study hypothesizes that:

- Hypothesis 1 (H1): Gender positively moderates the effect of urban infrastructure development on pro-tourism development behavior, such that the relationship is stronger for female residents.
- Hypothesis 2 (H2): Gender positively moderates the effect of urban infrastructure development on quality of life, such that the relationship is stronger for female residents.

3 Methodology

3.1 Field of Study

Turkistan, located in southern Kazakhstan, is an attractive destination along the Western Europe-Western China (WE-WC) Highway and boasts numerous tourist attractions. It is becoming a popular tourist destination in Kazakhstan, with its home city being the birthplace of Ahmed Yasawi. He accelerated the Turks' conversion to Islam, as a result of which, the city became a vital religious center with its holy mausoleum constructed by Tamerlane in 1396 (Yussupov Ardasher & Yussupova Akmaral). A UNESCO World Heritage Site, the Mausoleum of Ahmed Yasawi, is a vital tourism destination in Turkistan and the country. The city also boasts historical and natural attractions, including the Turkistan History Museum, the twelfth-century Hilvet Semi-Underground Mosque, Sayram-Ugam National Nature Park, and Otrar National Museum (Baitenov, Tuyakayeva, & Abdrassilova, 2019).

3.2 Sampling and Research Tools

A sample is a subset of a population that represents the entire targeted population. Meanwhile, research sampling involves selecting units or subgroups of these units from the targeted population, based on the characteristics and features of the respondents (Bryman, 2016). Thus, researchers took a certain number of respondents from the target group (Bryman, 2016). The targeted respondents for this study were permanent residents of Kazakhstan older than 18. It is well known that structural equation modeling (SEM) methods require a minimum of 200 respondents for an appropriate assessment technique (Anderson & Gerbing, 1988). For collecting data, the authors translated the items of the scales and drafted the scale items in English first. The authors invited three experts from native English-speaking countries in the tourism field to review and assess the validity and consistency of the scales after the scale items were translated from English to Russian using a translation method suggested in previous studies (Antonova-Unlu & Wei, 2020; Dmitrieva, 2019; Zaytsev, 2016).

The study employed a snowball sampling method to collect the required data sets, enabling the drawing of study results. The authors distributed some 700 surveys to the selected respondents, and from the 700 distributed surveys, collected a total of 475 completed survey forms. The researchers duly checked filled responses and assembled all survey profiles. The authors excluded 50 incomplete responses, as respondents did not complete the questionnaire properly. Based on the remaining 425 (with a response rate of 60.71%), complete questionnaires were screened and entered for analysis purposes.

3.3 Descriptive Statistics

This section presents the descriptive statistics for the study respondents' gender, age, ethnicity, educational qualifications, employment status, and years of residency.

3.3.1 Percentage Frequencies and Distribution of the Respondents Based on Gender

Based on the percentage distribution of the respondents and frequency, Table 1 shows that the data were collected from 425 respondents, with a standard deviation of 0.498. The majority of the respondents, 55.10%, were female, while the rest, 44.90%, were male. According to the above findings, it is inferred that the majority of the data were collected from female respondents in the study area. The study can explain the reason why the female respondents' rate is higher than that of males. According to statistics in Kazakhstan, the gender ratio of the total population is 0.920 (920 males per 1000 females), which is lower than the global gender ratio (Worldometers, 2019).

Table 1: Frequencies and percentage distribution of the respondents according to their gender.

Gender	Frequency	Percent (%)	Standard Deviation	Mean
Male	190	44.9%		
Female	235	55.3%	0.498	1.45
Total	425	100		

3.3.2 Frequencies and Percentage Distribution of the Respondents Based on Age

The study's findings demonstrate that the percentage distribution and frequency of the data were obtained from 425 (100%) respondents, with a standard deviation of 1.064. Out of 425 data, there are 102 (24.0%) within the age range of 18-30 years, 125 (29.6%) between 30-40 years, 111 (26.1%) within 40-50 years, and 86 (20.2%) with 50 years and above, respectively. More than 90% of the Kazakhstan population is 60 years or younger; thus, these findings are consistent with the country's demographic structure (Worldometers, 2019), as shown in Table 2.

Table 2: Frequencies and percentage distribution of the respondents according to their age.

Age	Frequency	Percent (%)	Standard Deviation	Mean
18-30	102	24.0%		
31-39	126	29.6%		
41-49	111	26.1%	1.064	2.43
Above 50	86	20.2%		
Total	425	100		

3.3.3 Frequencies and Percentage Distribution of the Respondents Based on Education

The respondents' frequency and percentage distribution based on their scholastic status is displayed in Table 3. The table demonstrated that the data were collected from 425 (100%) respondents, with a standard deviation of 0.977. The percentage of respondents who have received higher education, such as bachelor's, master's, and above, was 319, which was the majority (75, 10%), and the remaining residents who have attended school or college were considered to have middle-level education and were 102 (24.90%). More specifically, it was established that the majority of the respondents, i.e., 50.60%, reported that they had completed their bachelor's degree (16-year Schooling), followed by 16.0% of respondents who were master's degree holders (18-year Schooling). In comparison, 8.50% of the respondents were Ph.D. Holders. 3.60% of respondents reported having higher education qualifications. While the remaining 6.80% % of the respondents had school education (9-11-year Schooling), 18.10% had a college degree.

The above discussion suggested that the majority of respondents held graduate degrees (16 years of education), which is consistent with the country’s education and science statistics (Ministry of National Economy of the Republic of Kazakhstan.

Table 3: Frequencies and percentage distribution of the respondents according to their education level.

Level of Education	Frequency	Percent (%)	Standard Deviation	Mean
High school	*29*	*6.8%*		
College	*77*	*18.1%*		
Bachelor	*215*	*50.6%*	*0.977*	*3.01*
Master	*68*	*16.0%*		
Ph.D.	*36*	*8.5%*		
Total	*425*	*100*		

3.3.4 Respondents' Ethnicity and Length of Residency: Frequencies and Percentage Distribution

Out of 425 responses received, Tables 4 and 5 demonstrate that the majority of respondents were Kazakhs (84.50%), followed by Russians (10.11%), Uzbeks (2.60%), and other ethnicities (1.90%), with a standard deviation of 0.580, respectively. Regarding to length of residency results, the 81 (19.10%) residents had been live there less than ten years, the 32 (7.5%) residents had been live there between 10-15 years, 78 (18.40%) were between 15-20 years, and 234 (55.10%) residents had lived there for more than 20 years and having standard deviation is 1.348, respectively.

Table 4: Frequencies and percentage distribution of the respondents according to their ethnicity.

Ethnicity	Frequency	Percent (%)	Standard Deviation	Mean
Kazakh	359	84.5%		
Russian	47	11.1%	0.580	1.22
Uzbek	11	2.6%		
Other	8	1.9%		
Total	425	100		

Table 5: Frequencies and percentage distribution of the respondents according to their length of residency.

Years of residency	Frequency	Percent (%)	Standard Deviation	Mean
Less than 5 years	36	8.5%		
5-10 years	45	10.6%	1.348	4.01
10-15 years	32	7.5%		
15-20 years	78	18.4%		
More than 20 years	234	55.1%		
Total	425	100		

3.3.5 Frequencies and Percentage Distribution of the Respondents Based on Occupation

According to employment status, the respondents' percentage distribution and frequency are demonstrated in Table 6, with a standard deviation of 1.270. Out of 425 responses, 127 (29.90%) respondents had a government job, 130 respondents (30.60%) were in organizations, 63 (14.80%) were self-employed, 86 (20.20%) were university students, 12 (2.80%) were retired, and 7 (1.60%) were housewives. Data collected from residents who are aware of and know about the NSR project and its related tourism infrastructure development. As results show, the study received most of the data from government and private company employees. It can be explained that government and non-organization workers in various fields may be more connected or familiar with government-proposed infrastructure initiatives and projects. Consequently, they may have more knowledge related to NSR tourism infrastructure projects.

Table 6: Frequencies and percentage distribution of the respondents according to their occupation.

Type of Occupation	Frequency	Percent (%)	Standard Deviation	Mean
Government job	127	29.9%		
Non-government job	130	30.6%		
Self-employment	63	14.8%		
University students	86	20.2%	1.270	2.40
Retired	12	2.8%		
Housewife	7	1.6%		
Total	425	100		

3.4 Measurement Scale of Urban Infrastructure Development

The scale of urban infrastructure development in Table 7 was adopted from prior scholars based on the specific features appropriate in the context of Turkistan (Wonyoung Kim, Jun, Walker, & Drane, 2015; Woosoon Kim & Walker, 2012; Nazneen et al., 2019). This scale and its relevant 14 items exhibited a public benefit that includes the provision of electricity, water, and sanitation, health and education, telecommunications, modes of public/private transport, employment/business opportunities, and new national parks. Scholars have broadly used this scale, and it has been testified to a perfect internal consistency and validity. It asked the respondents to indicate their level of agreement and disagreement on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). All details of the scale and its coding are represented below in Table 7. The Cronbach's alpha coefficient for this scale in the present study was 0.946.

Table 7: Items of the urban infrastructure development (UID) scale.

Construct	Coding	Items
UID		
	UID-1	Urban infrastructure development provides excellent and safe public/private transportation.
	UID-2	The New Silk Road will reduce delivery costs and provide access to a high-quality mode of transport.
	UID-3	Because of Urban infrastructure development, the quality of roads is increasing in the area.
	UID-4	Urban infrastructure development saves travel time to a tourism destination.
	UID-5	Urban infrastructure development provides access to the quality of public services (fire, police, telecommunications, power, water, and sanitation supply).
	UID -6	Urban infrastructure development increases new business opportunities for all residents.
	UID -7	Urban infrastructure development generates employment opportunities for backward people.
	UID -8	Urban infrastructure development plays a positive role in the improvement and development of education.
	UID-9	Urban infrastructure development provides quality employment and skills for improved livelihood opportunities.
	UID-10	Urban infrastructure development improves the quality of healthcare facilities by introducing new, advanced tools and equipment.
	UID-11	Urban infrastructure development generates new tourism and recreation areas.
	UID-12	NSR Infrastructure increases the number and quality of services and activities (travel agency, hotel, restaurants, entertainment, shopping centers, stadiums, exhibitions, and other vital service facilities).
	UID-13	Urban infrastructure development constructs modern national parks and water parks.
	UID-14	Urban infrastructure development preserves flora and fauna with modern methods and develops natural landscapes with contemporary approaches.

3.5 Quality of Life Scale

The dependent variable of quality of life consisted of 9 items and was adapted from tourism impact studies (Andereck & Nyaupane, 2010; Andereck, Valentine, Vogt, & Knopf, 2007; K. Kim et al., 2013; Sirgy, 2001; Woo, Uysal, & Sirgy, 2016). Besides, quality of life explains individuals' satisfaction concerning economic condition, public services, recreation facilities, spiritual activities, leisure opportunities, and her/his health condition and environment due to the infrastructure and tourism initiatives in the local community. All details of the scale and its coding are shown in Table 8. The Cronbach's alpha coefficient for the residents' quality of life scale in the present study was 0.905.

Table 8: Items of the quality-of-life (QoL) scale.

Construct	Coding	Items
QOL		
	QOL-1	I am very satisfied with my income and employment conditions.
	QOL-2	I am very satisfied with the cost of living in this region.
	QOL-3	I am very satisfied with the opportunities that are opening up in my community.
	QOL-4	I am particularly happy with the people who live in my community.
	QOL-5	I am very satisfied with my health and well-being.
	QOL-6	I am satisfied with the safety and security in my community.
	QOL-7	I am particularly happy with the way we preserve culture in my community.
	QOL-8	I am very satisfied with my leisure life.
	QOL-9	I am satisfied with the way I spend my life.

3.6 Pro-Tourism Development Behavior Scale

Through 5 items, measured outcome variables of residents' pro-tourism development behavior and scale items were adapted based on previous literature (Gursoy & Rutherford, 2004; J. C. Liu & Var, 1986; Teye, Sirakaya, & F. Sönmez, 2002). This scale assesses whether residents are willing to encourage cultural exchange, help Turkistan become a tourist destination, support the further development of hotels and restaurants, and protect natural resources. All details of the scale and its coding are presented in Table 9 below. The Cronbach's alpha coefficient for the residents' pro-tourism development behavior scale in the present study was 0.912.

Table 9: Items of the pro-tourism development behavior (PTDB) scale.

Construct	Coding	Items
PTDB		
	PTDB-1	I am willing to promote cultural exchanges.
	PTDB-2	I am willing to support increasing the number of hotels, restaurants, and shopping centers.
	PTDB-3	I am willing to provide information to tourists and contribute to enhancing their experience.
	PTDB-4	I am willing to protect the natural environmental resources.
	PTDB-5	I am willing to promote Turkistan as a tourist destination.

4 Results- Key Findings

4.1 Confirmatory Factor Analysis

The results of the Confirmatory Factor Analysis (CFA), presented in Table 10, demonstrated that all factor loadings were significant and high, confirming the convergent validity of the measurement model.

The construct for Urban infrastructure development (UID) showed consistently strong loadings across its 14 items, ranging from 0.699 to 0.836, and was supported by a high composite reliability (Cronbach's α = 0.946). Similarly, the Quality of Life (QOL) construct, with item loadings from 0.689 to 0.757 (α =

0.905), and Pro-tourism Development Behavior (PTDB), with loadings from 0.788 to 0.838 (α = 0.912), also exhibited robust psychometric properties. The mean scores for all items across the constructs were consistently above the midpoint of the scale (ranging from 3.35 to 3.86), indicating generally positive respondent perceptions. At the same time, the standard deviations reflected a moderate spread of responses around these means.

Table 10: Standardized factor loading from confirmatory factor analysis, values of standard deviation and mean.

Measurement	Factor Loading	Standard deviation	Mean	Cα
Urban infrastructure development				**0.946**
UID1 ← UID	0.836	1.306	3.74	
UID2 ← UID	0.773	1.157	3.76	
UID3 ← UID	0.746	1.152	3.70	
UID4 ← UID	0.731	1.122	3.64	
UID5 ← UID	0.699	1.113	3.69	
UID6 ← UID	0.749	1.171	3.68	
UID7 ← UID	0.726	1.167	3.78	
UID8 ← UID	0.756	1.204	3.65	
UID9 ← UID	0.721	1.145	3.70	
UID10 ← UID	0.755	1.193	3.69	
UID11 ← UID	0.712	1.139	3.78	
UID12 ← UID	0.712	1.127	3.71	
UID13 ← UID	0.744	1.176	3.69	
UID14 ← UID	0.781	1.247	3.71	
Quality of Life				**0.905**
QOL1← QOL	0.757	1.197	3.41	
QOL2 ← QOL	0.718	1.152	3.35	
QOL3 ← QOL	0.745	1.149	3.46	
QOL4 ← QOL	0.689	1.158	3.50	
QOL5 ← QOL	0.720	1.141	3.47	
QOL6 ← QOL	0.708	1.098	3.45	
QOL7 ← QOL	0.706	1.170	3.50	
QOL8 ← QOL	0.701	1.199	3.47	
QOL9 ← QOL	0.716	1.180	3.41	
Pro-tourism development Behavior				**0.912**
PTDB1 ← PTDB	0.837	1.316	3.68	
PTDB2 ← PTDB	0.835	1.166	3.79	
PTDB3 ← PTDB	0.815	1.211	3.86	
PTDB4 ← PTDB	0.788	1.267	3.67	
PTDB5 ← PTDB	0.838	1.239	3.77	

Note: Cα = Cronbach alpha, UID = urban infrastructure development, QOL = Quality of Life, PTDB =Pro-Tourism Development Behavior.

4.2 Moderating Analysis

After muting to three variables, we tested moderation using AMOS software, a SEM model. The moderating effect of gender has been tested between urban infrastructure development and quality of life, as well as pro-tourism development behavior, by following the logic of Preacher, Rucker, and Hayes (2007). The moderating effects were analyzed by calculating the interaction term between the independent and the moderating variable. The interaction term was calculated by first centralizing the scores of the continuous independent variable (urban infrastructure development) and then multiplying these scores by the categorical moderating variable (gender). SEM statistical analyses were run to check for the significance of the interaction term.

The analysis of the moderating role of gender, as summarized in Table 11, revealed a significant positive effect for one of the hypothesized relationships. While the direct paths from gender to the dependent variables were not important, the interaction effect was particularly noteworthy for Pro-tourism

Development Behavior (PTDB). For hypothesis H1, the interaction term between the standardized Urban infrastructure development and gender was positive and significant (Estimate = 0.215, p < .05), with a 95% bias-corrected confidence interval that did not include zero (0.045 to 0.389). This indicates that the relationship between Urban infrastructure development and Pro-tourism Development Behavior is strengthened for one gender group compared to the other, thereby supporting H1 and confirming gender as a significant positive moderator in this specific relationship.

Table 11: Moderating role of gender on PTDB.

Path	Estimate	S.E.	t-value	p-value	95% CI (Bias-Corrected)	Result
Gender → Quality of Life (QOL)	0.081	0.067	1.21	0.226	(-0.050, 0.212)	Not significant
UID × Gender → Quality of Life (QOL)	0.215	0.085	2.53	0.012	(0.045, 0.389)	Supported

The analysis of the moderating role of gender, as summarized in Table 12, revealed a significant positive effect for one of the hypothesized relationships. While the direct path from gender to Quality of Life was not substantial, the interaction effect was particularly noteworthy. For hypothesis H2, the interaction term between the standardized Urban infrastructure development and gender was positive and significant (Estimate = 0.198, p < .05), with a 95% bias-corrected confidence interval that did not include zero (0.032 to 0.367). This indicates that the positive relationship between urban infrastructure development and Quality of Life is strengthened for one gender group compared to the other, thereby supporting H2 and confirming gender as a significant positive moderator in this specific relationship.

Table 12: Moderating role of gender on QOL.

Path	Estimate	S.E.	t-value	p-value	95% CI (Bias-Corrected)	Result
Gender → Quality of Life (QOL)	0.072	0.061	1.18	0.239	(-0.048, 0.193)	Not significant
UID × Gender → Quality of Life (QOL)	0.198	0.083	2.39	0.017	(0.032, 0.367)	Supported

The moderating effect of gender is further explained in Figures 1 and 2. It signifies that urban infrastructure development has a positive relationship with the quality of life and a positive effect on pro-tourism development behavior. Additionally, respondents' gender, specifically females, has an impact on this positive relationship in Turkistan. Therefore, our study concludes that gender, as a moderator, plays a role.

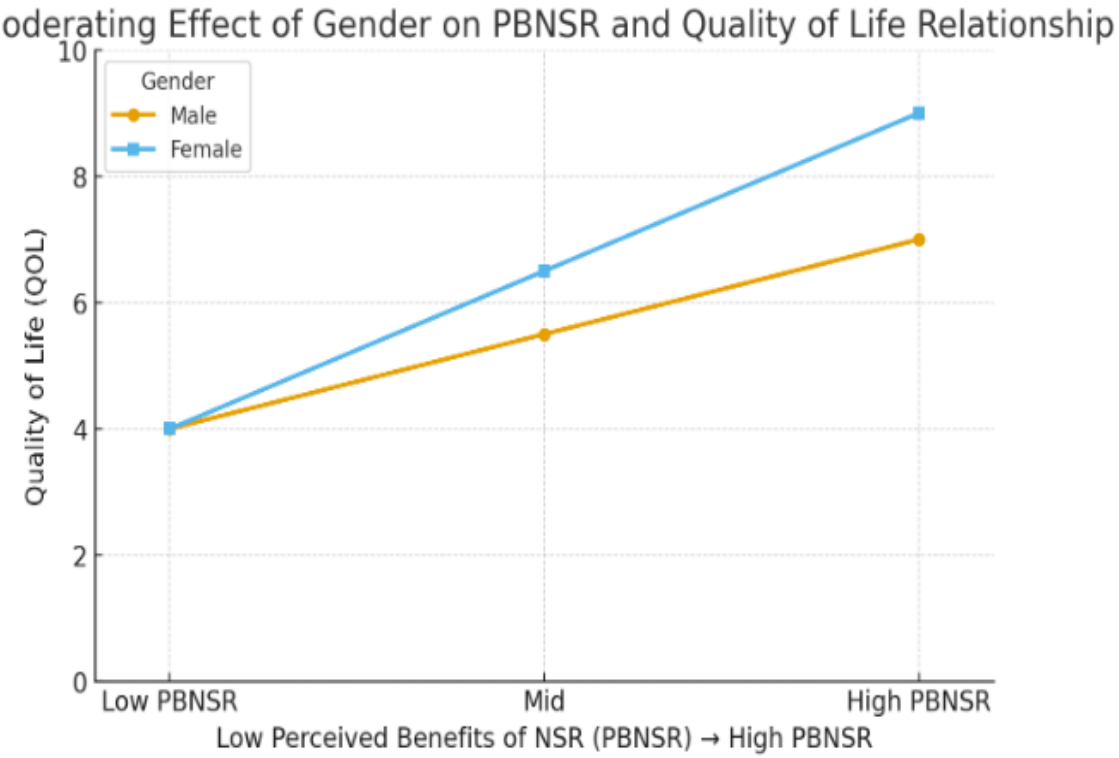

Figure 1: Graph shows that female respondents exhibit a stronger moderating effect, with a steeper slope between UID (PBNSR) and Quality of Life, compared to males.

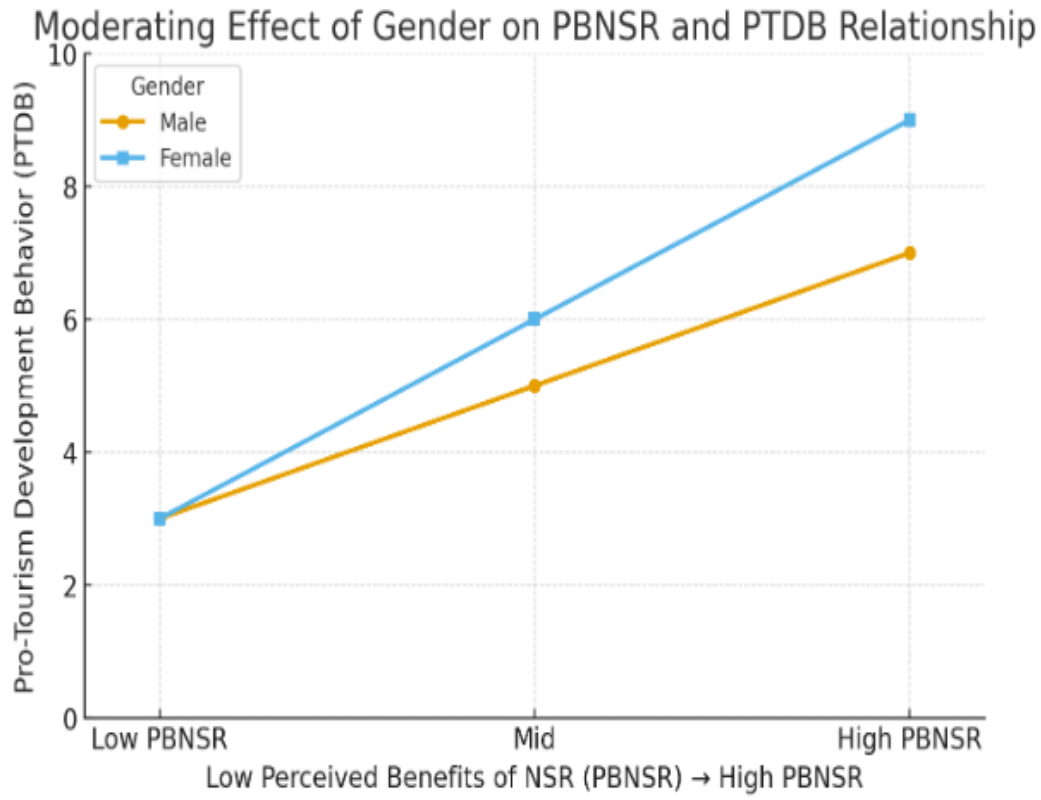

Figure 2: Graph shows that females demonstrate a stronger positive relationship between UID (PBNSR) and pro-tourism development behavior (PTDB), consistent with a significant moderating effect of gender.

5 Discussion

The demographic factor of respondents' gender was examined as a moderating variable between urban infrastructure development and residents' perception of quality of life, as well as between urban infrastructure development and pro-tourism development behaviors. The findings showed that gender, specifically being female, had a significant positive moderating effect on the relationship between urban infrastructure development and both residents' quality of life and pro-tourism development behavior. A possible explanation is that in Turkistan, Kazakhstan, local residents, regardless of gender, have equal opportunities to access and benefit from urban infrastructure and tourism-related amenities. Therefore, hypotheses H1 and H2 were supported.

These results align with some prior studies that found gender had no significant effect on residents' perceptions of tourism development. For instance, Almeida-García et al. (2016) reported no gender differences in perceptions of tourism consequences in Spain, and Sharma and Dyer (2009) found gender did not affect residents' attitudes toward tourism development on the Sunshine Coast, Australia. Similarly, Kanwal, Pitafi, et al. (2020) found no significant gender differences in perceptions of infrastructure development. The unique context of Turkistan may explain the discrepancy between these findings and our own as a developing, post-communist region undergoing rapid transformation via the NSR. This period of significant socio-economic change may amplify the effect of new opportunities, making gender a more salient and critical moderator here than in the context of stable, developed destinations. However, some studies suggest gender can play a role in infrastructure perceptions and accessibility; for example, Liaqat Ali (2018) noted differences in perceived transportation infrastructure based on gender and education, while Sinclair-Maragh (2017), conducting research in Jamaica, found that female residents generally displayed more supportive behavior toward tourism development than male residents, often due to economic benefits and increased income.

5.1 Confirmatory Factor Analysis

This research makes several significant academic and practical contributions. By investigating the relationship between urban infrastructure development, quality of life, and pro-tourism behaviors with a focus on gender, the study addresses a critical gap in the literature. While prior research on residents' attitudes has focused on tourism developments in general, this study is among the first to explore these dynamics in the context of a trans-border, mega-infrastructure project, such as China's New Silk Road (NSR), in a Central Asian, post-communist setting.

The findings offer a substantial theoretical extension to Social Exchange Theory (SET). Our results demonstrate that the calculus of benefits and costs, central to SET, is not gender-neutral. We empirically demonstrate that gender serves as a key boundary condition, significantly moderating the translation of infrastructure-driven benefits into perceived quality of life and supportive behaviors. Specifically, the stronger effects observed among female residents refine SET's application in mega-infrastructure and tourism studies by highlighting that the propensity to engage in supportive exchanges is powerfully shaped by demographic and socio-cultural factors. This moves the theoretical conversation beyond merely establishing a relationship to explaining for whom and under what conditions the relationship is most potent.

From a management perspective, focusing on specific demographic groups provides actionable suggestions for targeted practices. By identifying women as the demographic group most responsive to infrastructure development, this research enables the design of targeted and more efficient policies and community engagement strategies, moving beyond a one-size-fits-all approach. The finding that gender is a significant moderator implies that government officials in Kazakhstan should design infrastructure and tourism policies that ensure easier and more equitable access to the benefits for women, thereby fostering equal opportunities in their daily lives and economic activities.

This study has identified a strong willingness among female residents in Turkistan to support further tourism development. To leverage this, stakeholders can capitalize on Cultural Assets, which benefit from their strong desire to share culture by organizing cultural events for visitors. This includes creating opportunities for women to engage in local traditional arts and crafts, as well as conventional food and dairy production, and serving as homestay providers. Promote inclusive planning by involving tourism officials who should actively encourage female residents to participate in tourism planning and development processes. Offering them meaningful opportunities to participate in social and cultural event planning can enhance their sense of ownership. To foster cultural preservation, it is suggested that community involvement activities increase residents' perception that an infrastructure project involving tourism preserves their cultural identity (G. Mamirkulova et al., 2025), thereby strengthening long-term support.

In summary, the findings provide clear guidelines for tourism officials, policymakers, and government authorities in Kazakhstan and similar contexts. They can use these insights to develop gender-sensitive infrastructure and tourism strategies that not only improve the quality of life but also effectively mobilize community engagement, particularly among women, to ensure the sustainable development of cultural tourism along the Silk Road.

6 Conclusion

The vital contribution of the present research was to discover the moderating role of urban infrastructure development on the perception of QOL and residents' PTDB. It is believed that residents' demographic profiles can help in understanding in-group bias or among-group discrimination in terms of residents' attitudes toward tourism and infrastructure development. The previous research in tourism literature has investigated the significant moderating role of some demographic profiles of respondents between perceived tourism impacts and residents' support for tourism (Papastathopoulos et al., 2019; Sinclair-Maragh, 2017), yet to the best of the authors' knowledge, residents' attitudes based on demographic characteristics in emerging tourism destinations have been overlooked. That is why this study is the first attempt to examine residents' understanding of their demographic profiles in the context of urban infrastructure development and their perception of QOL and PTDB.

Furthermore, the findings demonstrated that moderating variables, such as gender, strengthen the association between urban infrastructure development and perceptions of QOL and PTDB. This suggests that the provision of basic infrastructure amenities has an impact on the QOL of residents and PTDB, with a particularly high effectiveness for female residents. In simple words, basic services and life amenities associated with infrastructure development in tourism areas have more impact on improving the QOL of female residents. One explanation could be that females are tightly integrated into the household and care work, providing water and firewood, and caring for children, as this is a vital element of our religion and culture, as well as a reflection of male dominance in Kazakhstan. Thus, infrastructure as a driver of change can improve women's lives by making it easier for household and care work, i.e., offering natural gas, sewers, water, transport vehicles, education, and the like. Similarly, study results indicated that female residents appreciated the benefits of NSR. It can be said that modern infrastructure provisions can reduce the time women spend on domestic tasks, free up time for productive economic activity, increase the productivity of their enterprises, and enable them to move into their own family businesses, better jobs that are more profitable. These findings of the study provide valuable guidance on how to address the benefits of NSR infrastructure by understanding residents' specific profiles for increasing PTDB and improving residents' QOL.

Although the present study has made significant contributions to the existing body of knowledge on the influence of urban infrastructure development on QOL and PTDB of the residents, the present study has some limitations, which could be addressed in future studies. First, the generalizability of the findings may be limited since the study data were collected from a single tourism destination in South Kazakhstan along the Silk Road. The place is likely to be a key factor in differentiating people's attitudes,

as the results of the present research show that residents in Turkistan hold favorable attitudes toward the NSR infrastructure project. Thus, future research can be extended to include other regions of Kazakhstan, such as the East, West, North, and Central regions, to compare the results with those of the present study. Second, the present research has only emphasized the potential path of the NSR infrastructure plan. Future research should therefore investigate the potential negative impacts of the NSR infrastructural project (e.g., congestion, increased cost of living, cultural commodification) to provide a more balanced understanding of its overall effects on residents in Kazakhstan. In contrast, it is worth noting that the undesirable influence of tourism development on residents in the context of the NSR infrastructural project in Kazakhstan.

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Ethical Approval Declaration
The study was conducted in accordance with established standards for research integrity and ethics. The Research Ethics Committee of Shandong Xiehe University in Jinan examined and approved this study, which involved human subjects (Approval Number: LLSC-KY03-2025006). Every method used in the study complied with the 1964 Declaration of Helsinki and its subsequent revisions.

Informed Consent Statement
All participants provided informed consent before participating in the study.

Data Availability Statement
Data can be made available upon request to the corresponding author.

Conflicts of Interest
The authors declare no conflict of interest.

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