Research Article

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The Social Value of Public Infrastructure Works

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Abstract

Public infrastructure projects hold significant social value as they provide essential services, spur economic development, create job opportunities, and enhance quality of life by facilitating access to basic amenities and reducing commute times. This study aimed to assess the social impact of public infrastructure projects in the northern region of Peru, focusing on indicators such as access to basic services, inequality reduction, poverty alleviation, economic growth, and citizen well-being. Employing a quantitative approach with a non-experimental and descriptive design, the research engaged a sample of 124 engineering professionals who were surveyed to gauge their perceptions of public infrastructure project management in the northern region of Peru. The findings reveal predominantly negative perceptions towards the management of public infrastructure projects in the northern region of Peru, indicating the presence of deficiencies or irregularities in project execution. It is recommended to propose measures aimed at enhancing transparency, fostering citizen participation, and promoting accountability in the management of public infrastructure projects.

Keywords: *Social value, public infrastructure, basic services, reduction of inequality*

1. Introduction

Public infrastructure encompasses a wide range of facilities, public services, utilities, and installations that are fundamental for the optimal performance of an economy and society (Farooki, 2012). It

includes roads, bridges, railways, airports, public transportation, telecommunications, sewage systems, healthcare, educational facilities, electricity, and water supply, among others. To develop and achieve significant growth, emerging countries must improve their essential public services and transportation infrastructure (Ogwang & Vanclay, 2021). Infrastructure projects are undertaken as ambitious plans aimed at achieving the socioeconomic objectives of communities in a short timeframe and, therefore, are delivered as works for the welfare of the citizenry (Söderlund et al., 2017).

Public infrastructure projects hold significant social value, as they contribute to economic development and societal well-being. These projects enhance not only connectivity and transportation efficiency but also improve people's quality of life by providing access to basic services such as education, healthcare, housing, recreation, and tourism (VQIngeniería, 2022).

According to a study by Marsh, the construction industry is poised to become a global engine for economic growth post-pandemic, with growth rates exceeding 5% in the coming years (EQUIPAR, 2022). Over the next 20 years, global investment in infrastructure is estimated to range between $79 and $94 trillion, representing approximately 3.5% of the global GDP. This investment will require the implementation of new technologies, management strategies, and delivery models (GiHub, 2022). Additionally, the Inter-American Development Bank emphasizes that public infrastructure is essential for economic growth and equality in Latin America and the Caribbean (Astesiano & Suárez-Alemán, 2020), and that public infrastructure has the potential to significantly improve people's quality of life, especially in the most disadvantaged sectors (Gonzalez-Navarro & Quintana-Domeque, 2016).

In the context of public administration, there is a growing concern about cost overruns, which are often perceived as a sign of project failure. A study conducted in Portugal empirically analyzed 4,305 projects developed between 1980 and 2014. The study found that electoral periods, institutional, legal, and regulatory frameworks, as well as economic cycles, influence cost overruns (Catalão et al., 2022).

Khadim et al. (2021) posit that corruption significantly hampers construction projects, particularly in underdeveloped nations. To underscore the gravity of this issue and combat corruption within construction endeavors, a thorough comprehension of its ramifications is imperative. Consequently, their research delved into the repercussions of corruption on public infrastructure projects within the context of a corrupt developing country.

At the national level, a report from the General Comptroller of the Republic of Peru reveals that as of June 2022, there were 2,346 stalled projects, generating an estimated economic impact of S/. 29.732 billion nationwide. Within this figure, 1,704 projects were assigned to local governments, 368 to state administrative units, and 274 to regional governments. The report noted that the most significant interruptions were primarily attributed to lack of funds and liquidity in 611 projects (27.2%), contract breaches in 314 projects (12.2%), climatic conditions in 245 projects (14.9%), and disagreements, disputes, and arbitration in 117 cases (4.3%), as well as other causes (Perú21, 2022).

In this context, the objective of the research is to analyze the social impact of public infrastructure works in the northern region of Peru, through the evaluation of indicators such as access to basic services, reduction of inequality and poverty, economic growth, and citizens' quality of life.

2. Methodology

2.1 Study design and population

The study employed a quantitative approach with a non-experimental design and a descriptive scope (Álvarez-Risco, 2020). The target population consisted of members of a professional engineering association in the northern region of Peru. A non-probabilistic convenience sampling method was employed, considering specific characteristics that aligned with the research objectives (Montesinos et

al., 2016). Ultimately, 124 professionals were selected. Sociodemographic characteristics included being engineers with experience in managing public infrastructure projects, aged between 25 and 80 years of both genders, and affiliated with one of the following chapters of the professional association.

2.2 Instruments

To evaluate the perception of public infrastructure project management in the northern region of Peru, a data collection instrument was utilized. It aimed to identify potential issues, deficiencies, or irregularities in the execution of public infrastructure projects. This instrument consists of 29 items with an ordinal response scale featuring 5 alternatives, ranked according to the Likert scale (Never, Rarely, Sometimes, Often, Always).

2.3 Procedure

In compliance with research ethics requirements, prior permission was obtained from the dean of the engineering association to proceed with contacting the professionals of the order and administering the instrument via email. The instrument was developed using the Google Forms platform. The questionnaire included the research objective and informed consent regarding their willingness to participate in the research or not. In this manner, the data were collected, organized, and tabulated for subsequent analysis and interpretation.

2.4 Data analysis

Once the information was obtained and collected, the following statistical measures were employed for analysis and processing. Skewness and kurtosis were used to assess the normality of the data, as they are more precise tests for this type of analysis. Relationships between items and the total scale were estimated using the Spearman statistic, for which statistical software such as JASP and SPSSv25 were utilized. Finally, reliability at the item level and overall was determined through the cronbach's alpha coefficient, indicating a high instrument reliability with a value of 0.97.

3. Results

In line with the objective of this research, the obtained data were processed, and the results are presented in the following order: First, sociodemographic variables are analyzed, followed by the statistical analysis of items such as mean, skewness and kurtosis. Subsequently, a correlation matrix of the items was elaborated to finally determine the levels of perception of public infrastructure project management.

Table 1: Descriptive analysis of sociodemographic variables

Variable	Description	Frequency	Percentage
Professional Chapters	Engineering Civil	59	48%
	Engineering Industrial and Systems	24	19%
	Engineering Zootomy	4	3%
	Engineering Chemical	7	6%
	Engineering Agricultural	3	2%
	Engineering Agronomic	18	15%
	Engineering Mechanical and Electrical	9	7%
Gender	Male	106	85%
	Female	18	15%
	Total	124	100%

Variable	Description	Frequency	Percentage
Age	Minimum	Maximum	Mean
	25	80	43.77

In the research, 124 engineering professionals participated, with the Civil Engineering chapter having the greatest influence in this field of study, comprising 48%. Additionally, 85% were male and 15% were female. This high percentage of male participants may be attributed to the historical trend of men pursuing professions related to various engineering disciplines. However, it is important to note that gender barriers are changing, and an increasing number of women are entering these fields. Finally, the average age was 44 years.

Table 2: Descriptive analysis of the items

	N	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
P1	124	1.00	5.00	3.0645	1.04952	-0.216	-0.398
P2	124	1.00	5.00	2.9677	1.03543	-0.113	-0.333
P3	124	1.00	5.00	3.0081	1.07821	0.023	-0.581
P4	124	1.00	5.00	2.6855	1.06203	0.164	-0.650
P5	124	1.00	5.00	3.4758	1.23935	-0.452	-0.701
P6	124	1.00	5.00	3.2500	1.13069	-0.199	-0.774
P7	124	1.00	5.00	3.4758	1.07797	-0.570	-0.098
P8	124	1.00	5.00	3.1532	0.97983	-0.261	-0.051
P9	124	1.00	5.00	2.8468	0.99629	-0.087	-0.325
P10	124	1.00	5.00	3.0242	1.09295	0.141	-0.847
P11	124	1.00	5.00	2.6774	0.93312	-0.043	-0.390
P12	124	1.00	5.00	3.1532	1.08234	-0.154	-0.554
P13	124	1.00	5.00	3.2823	1.04811	-0.289	-0.238
P14	124	1.00	5.00	3.0806	1.10134	0.024	-0.644
P15	124	1.00	5.00	2.9677	1.07398	0.065	-0.467
P16	124	1.00	5.00	2.9435	1.13555	0.078	-0.841
P17	124	1.00	5.00	2.8710	1.15447	0.192	-0.768
P18	124	1.00	5.00	3.1613	1.01523	-0.425	-0.175
P19	124	1.00	5.00	2.4516	1.06194	0.129	-0.877
P20	124	1.00	5.00	2.8952	1.07309	0.132	-0.461
P21	124	1.00	5.00	2.2903	0.98587	0.473	-0.102
P22	124	1.00	5.00	2.8387	1.00719	-0.203	-0.219
P23	124	1.00	5.00	2.6452	1.01368	0.239	0.056
P24	124	1.00	5.00	2.6532	1.21001	0.334	-0.755
P25	124	1.00	5.00	3.3710	1.03175	-0.437	0.027
P26	124	1.00	5.00	2.4194	1.03670	0.330	-0.533
P27	124	1.00	5.00	2.1935	1.05674	0.402	-0.894
P28	124	1.00	5.00	2.0565	0.99022	0.805	0.347
P29	124	1.00	5.00	2.2177	1.04811	0.412	-0.668

In the analysis of Table 2, it is evident that, on average, the responses provided by the participants show a strong inclination towards option (2) almost never. This pattern reflects a significant level of dissatisfaction with the management of public infrastructure projects in the northern region of Peru. From the evaluation of skewness and kurtosis, it can be specified that the collected data fall within the range of -1.5 to 1.5, implying that they adhere to a normal distribution.

Table 3: Correlation matrix between ítems

Ítem	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28	P29
P1	1.00																												
P2	0.70	1.00																											
P3	0.64	0.71	1.00																										
P4	0.51	0.56	0.58	1.00																									
P5	0.52	0.50	0.55	0.44	1.00																								
P6	0.56	0.48	0.56	0.58	0.67	1.00																							
P7	0.61	0.58	0.66	0.46	0.63	0.72	1.00																						
P8	0.63	0.56	0.58	0.68	0.62	0.66	0.65	1.00																					
P9	0.56	0.63	0.51	0.52	0.59	0.57	0.58	0.67	1.00																				
P10	0.52	0.65	0.59	0.55	0.61	0.51	0.60	0.61	0.63	1.00																			
P11	0.46	0.54	0.52	0.53	0.49	0.52	0.53	0.65	0.66	0.64	1.00																		
P12	0.50	0.61	0.65	0.52	0.58	0.60	0.65	0.59	0.69	0.62	0.69	1.00																	
P13	0.58	0.57	0.72	0.61	0.62	0.63	0.67	0.71	0.61	0.65	0.67	0.76	1.00																
P14	0.59	0.59	0.51	0.54	0.59	0.62	0.65	0.58	0.68	0.69	0.60	0.60	0.59	1.00															
P15	0.59	0.64	0.60	0.60	0.54	0.60	0.58	0.65	0.70	0.73	0.65	0.59	0.65	0.79	1.00														
P16	0.50	0.61	0.63	0.61	0.60	0.64	0.63	0.60	0.65	0.71	0.64	0.61	0.67	0.69	0.77	1.00													
P17	0.52	0.63	0.59	0.60	0.58	0.52	0.55	0.56	0.66	0.67	0.64	0.56	0.64	0.67	0.76	0.88	1.00												
P18	0.39	0.49	0.47	0.55	0.55	0.52	0.50	0.52	0.48	0.52	0.57	0.50	0.57	0.62	0.59	0.59	0.63	1.00											
P19	0.42	0.55	0.57	0.60	0.54	0.56	0.52	0.54	0.66	0.64	0.62	0.61	0.56	0.63	0.66	0.72	0.72	0.64	1.00										
P20	0.48	0.47	0.51	0.54	0.53	0.47	0.42	0.53	0.51	0.54	0.58	0.48	0.56	0.45	0.59	0.58	0.62	0.70	0.66	1.00									
P21	0.39	0.54	0.50	0.50	0.44	0.36	0.39	0.43	0.50	0.60	0.54	0.42	0.48	0.56	0.60	0.62	0.60	0.55	0.72	0.62	1.00								
P22	0.37	0.49	0.42	0.50	0.45	0.39	0.44	0.37	0.46	0.55	0.51	0.49	0.45	0.50	0.55	0.54	0.54	0.61	0.62	0.60	0.63	1.00							
P23	0.29	0.41	0.46	0.48	0.46	0.45	0.46	0.40	0.46	0.51	0.49	0.38	0.47	0.57	0.53	0.63	0.58	0.66	0.66	0.59	0.69	0.62	1.00						
P24	0.44	0.45	0.39	0.59	0.43	0.37	0.35	0.40	0.39	0.55	0.49	0.42	0.48	0.48	0.50	0.52	0.51	0.55	0.53	0.54	0.52	0.68	0.56	1.00					
P25	0.47	0.49	0.47	0.49	0.56	0.50	0.57	0.48	0.51	0.62	0.55	0.60	0.59	0.60	0.58	0.59	0.54	0.56	0.49	0.51	0.38	0.61	0.42	0.57	1.00				
P26	0.39	0.48	0.47	0.56	0.43	0.40	0.43	0.54	0.50	0.58	0.62	0.50	0.50	0.53	0.66	0.59	0.59	0.55	0.61	0.54	0.56	0.56	0.55	0.51	0.53	1.00			
P27	0.18	0.24	0.28	0.38	0.30	0.23	0.20	0.36	0.29	0.30	0.42	0.26	0.22	0.28	0.32	0.40	0.34	0.41	0.43	0.39	0.46	0.40	0.51	0.32	0.23	0.62	1.00		
P28	0.26	0.31	0.33	0.56	0.33	0.39	0.28	0.44	0.40	0.35	0.55	0.36	0.40	0.36	0.37	0.44	0.41	0.40	0.56	0.50	0.54	0.47	0.45	0.53	0.36	0.67	0.54	1.00	
P29	0.13	0.25	0.27	0.53	0.33	0.34	0.19	0.38	0.41	0.33	0.46	0.39	0.45	0.34	0.42	0.44	0.37	0.44	0.49	0.40	0.47	0.45	0.49	0.41	0.34	0.57	0.48	0.54	1.00

According to the analysis of the correlation matrix between items, most of the items show significant correlations with each other; however, some items, such as items 27 and 29, do not show significant correlations with the other items. This could indicate that these items may be measuring different or distinct aspects compared to the other items.

Table 4: Levels of perception of public infrastructure project management

Level	Frequency	Percentage
Poor Management	45	36%
Regular Management	38	31%
High Management	41	33%
Total	124	100%

The findings illustrated in the table demonstrate that the perception of public infrastructure project management in the northern region is largely unfavorable. A noteworthy 36% of the participants rated this management as poor, signaling a concerning assessment by the populace. Furthermore, 31% of the respondents viewed it as average, indicating that dissatisfaction or a perception of inefficiency in public infrastructure project management is prevalent among a significant portion of the sample.

4. Discussion

Based on the findings of this research, it can be deduced that there is a prevalent perception of dissatisfaction regarding the management of public infrastructure projects in the northern region. These findings underscore the necessity for a comprehensive evaluation of the planning, implementation, and upkeep procedures of infrastructure projects in this area. From a social impact standpoint, the results suggest that the negative perception of public infrastructure project management in the northern region may significantly impact the quality of life and welfare of the populace. Inadequate or perceived as such, management can impede access to essential services, jeopardize security, hinder mobility, and compromise the health of citizens. This scenario has the

potential to erode trust in authorities and the overall public system, consequently affecting social cohesion and civic engagement.

Public infrastructure projects in the northern region of Peru have the potential to significantly influence various key aspects, making their social impact crucial (Instituto de Ciencias Hegel, 2023). With adequate infrastructure, access to basic services such as clean water, electricity, transportation, and communications can be significantly improved (Ogwang & Vanclay, 2021). Providing equitable opportunities to all citizens, regardless of their geographical location, can contribute to reducing inequality and poverty. The social impact of public infrastructure projects in the northern region of Peru can be assessed through indicators such as access to basic services, reduction of inequality and poverty, economic growth, and citizens' quality of life.

4.1 Access to basic services

Infrastructure projects are fundamental as they allow for improved access to basic services. The enhancement of people's quality of life is made possible through the construction of roads, electrical networks, water supply systems, and sewage systems (Tagliari, 2022). These projects contribute to the economic and social development of a region by simplifying the transportation of goods and people, fostering job creation, and improving public health conditions. This contributes to satisfying the basic needs of the population and ensuring urban development (Varo et al., 2023).

In this regard, Vasquez and Araya (2021) point out that urban infrastructure systems play a crucial role in society by providing access to basic services such as clean water and transportation. The management of these systems ensures their maintenance to minimize failures and provide reliable services to users. Since urban infrastructure systems are interdependent, maintenance and rehabilitation activities carried out in one system can affect other infrastructure systems.

Access to basic services can be measured using indicators such as geographic coverage, service quality, equity, and population satisfaction. These indicators can provide information on access to basic services in different regions and areas of Peru and help assess the social impact of public infrastructure projects in the country (Banco Mundial, 2023; MIDIS, 2018).

4.2 Reduction of inequality and poverty

Infrastructure projects play a fundamental role in reducing inequality and poverty, as they improve living conditions and provide access to basic services in areas that were previously underserved (Nuru, 2019). According to Marques (2019), in Brazil, urban conditions have seen significant improvements over time, but there has not been an overall reduction in inequalities in access to better urban conditions. Their analysis reveals two recurring issues observed in other regions of South America. Firstly, difficulties persist in providing certain services, especially in sewerage networks, which still have very limited coverage. Secondly, significant regional and social inequalities persist in access to services, especially when considering the most important metropolitan regions and the social groups within them.

The challenge of reducing inequality and poverty in the northern region of Peru requires a comprehensive approach. Despite progress at the national level, the northern region faces significant challenges, especially in rural areas. Measures can be taken to address this situation, such as ensuring equitable access to basic services, investing in infrastructure, supporting agriculture, implementing social protection programs, and promoting a gender approach in the fight against inequalities. These actions could improve living conditions and reduce poverty in the region.

4.3 Economic growth

Cities must consider habitability, resident well-being, and environmental, economic, and infrastructure equity in their planning to ensure future sustainability. Rapid urbanization presents

challenges, but also offers the opportunity to develop infrastructure that supports both economic growth and the social aspects and services of cities (Cinderby et al., 2021).

The case of India, as a developing country, faces significant challenges with its demographic growth. The rapid increase in the economy and population has exerted great pressure on urban infrastructure and services. To modernize urban life in India, good strategies and creative planning are required (Jothimani et al., 2022).

Infrastructure construction has the potential to generate jobs and contribute to the sustainable development of the country. Additionally, they can attract private investments and foster the economic development of the region (FMI, 2020). In the northern region of Peru, various measures can be implemented that align with its potential and particular challenges to boost economic development. Economic diversification, investment in infrastructure, support for agriculture, promotion of trade, and development of the private sector are some strategies that could contribute to this goal. The northern region could experience sustainable economic growth through these actions.

4.4 Quality of life of citizens

Infrastructure projects have the potential to enhance the quality of life of citizens by providing essential services and improving overall living conditions (Tagliari, 2022). The imperative to enhance urban infrastructure, particularly in areas such as environmental health and public transportation, to bolster quality of life in cities necessitates investment in more efficient and sustainable public transit systems, the enhancement of air and water the quality, and the promotion of sustainable construction and design practices (Pazhuhan et al., 2020).

Over time, people's quality of life has improved due to various factors, including advancements in housing quality, access to essential services such as clean water, sanitation, electricity, and healthcare, the presence of schools and high-quality education, employment opportunities, and job stability, as well as access to technology and connectivity. Safety and satisfaction within the living environment, alongside health and education, are among how these factors can impact citizens' quality of life. To ensure an adequate quality of life for all citizens, it is imperative to focus on enhancing these services and achieving spatial equality (Hossain et al., 2021).

To improve the quality of life for citizens in the northern region of Peru, it is crucial to implement various strategies and policies. These may encompass ensuring equitable access to essential services, promoting investment in infrastructure, supporting agriculture, facilitating trade, fostering private sector development, and advancing gender equality. These measures, among others, could contribute to enhancing the quality of life of citizens in the northern region of Peru, thereby fostering more equitable and sustainable development.

Addressing the challenges identified in the management of public infrastructure projects in the northern region of Peru requires considering the implementation of measures that promote transparency, efficiency, and accountability in infrastructure endeavors. Additionally, mechanisms should be established to ensure citizen participation in project planning and execution, ensuring that the needs of all communities are adequately addressed.

The results of this research shed light on the predominant dissatisfaction regarding the management of public infrastructure projects in the northern region of Peru. However, it is essential to recognize the limitations of this study to provide a comprehensive interpretation of the results. A significant limitation is found in the sample used. Although a convenience sampling approach was chosen to select participants, it is important to note that this methodology may introduce bias into the results. For example, focusing on members of a professional association of engineers in a specific region of Peru may limit the generalizability of the findings to the broader population involved in public infrastructure projects in the country. Likewise, the predominance of male participants in the sample could affect the perceptions and evaluations collected, potentially limiting the representativeness of opinions on the management of public infrastructure projects from a

perspective of sexual diversity.

These limitations highlight the importance of caution when interpreting the results, and underscore areas requiring future research. It is crucial to explore more diverse and representative samples to gain a comprehensive understanding of perceptions about the management of public infrastructure-related projects. Furthermore, conducting qualitative research or using mixed methods approaches could provide a deeper understanding of the elements that impact perceptions and the complex interaction present in infrastructure project management.

5. Conclusions

The results reflect a predominantly negative perception towards the management of public infrastructure projects in the northern region of Peru, indicating issues, deficiencies, or irregularities in executing these projects. Given the social value of public infrastructure for societal well-being, this negative perception may have significant implications in terms of economic development and citizens' quality of life.

Ultimately, it is advisable to propose actions to increase transparency, citizen participation, and accountability in the management of public infrastructure projects. Likewise, fostering open dialogue between authorities and the community to identify local needs and priorities and ensure that infrastructure works effectively to meet the demands of the population is essential. Additionally, the implementation of training and supervision programs to enhance the quality of infrastructure project management and ensure that they effectively contribute to the region's development and welfare is necessary.

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