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CASE STUDY

Perception of road users on impact of delayed road construction projects on livelihoods in Ashanti Region

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Abstract

Road construction delays in Ghana's Ashanti Region have detrimental impacts on livelihoods and health risks for residents and road users. This study examines road users' perceptions (drivers, passengers, pedestrians, and residents) of construction delays and their effects on livelihoods. Data was collected from 2252 respondents using a structured questionnaire and purposive/random sampling across six road projects. This study employed both random sampling and purposive sampling methods, as it aimed to achieve a balance between ensuring representativeness within each category of road users while also targeting individuals with pertinent experiences and knowledge related to road construction delays. This approach allowed for a comprehensive understanding of the issues under investigation while maximizing the efficiency of data collection within the constraints of the study scope and resources. Principal component analysis identified poor management as a major cause of delays, resulting from inadequate project supervision, communication, contractor experience, financing, equipment breakdowns, delayed payments, and late project initiation. Users faced challenges in transportation, business, health, and the environment. However, no significant positive relationship was found between delays, economic activities, and livelihoods. Recommendations include merit-based project awards, proactive contractors with competent managers for effective planning and evaluation, improved communication among stakeholders, adequate funding to reduce delays, and long-term impact assessments through road user tracking. The limitation of this study is that it solely focusses only on Ashanti Region; therefore extending the research to other regions in Ghana is suggested.

Keywords: Road Construction, Delay, Principal Component Analysis, Sampling, Ashanti Region

Introduction

Road construction delays in the Ashanti region and Ghana are a common occurrence, often leading to extended construction timelines and cost overruns. The complex nature of stakeholder involvement further exacerbates the challenges, potentially neglecting the needs of road users who are key stakeholders in the construction process. As beneficiaries of the final infrastructure, the impact of delays on their daily activities and livelihoods cannot be underestimated. Given these constraints and the lack of comprehensive data, there is an urgent need to assess the specific impact of road construction delays on the livelihoods of road users in the Ashanti region. Understanding the challenges faced by road users at construction sites is crucial for analyzing and addressing the problem effectively. By investigating the relationships between road construction delays and economic activities as well as the livelihoods of road users, we can gain insights into the true extent of the impact.

The combination of quantitative data analysis with qualitative insights from diverse road users, ensures a comprehensive understanding of the causes and effects of road construction delays in Ghana's Ashanti Region, thereby providing nuanced insights essential for developing targeted interventions and policies to mitigate their impact on livelihoods and health risks.

Assessing the impact of road construction delays is crucial for the livelihoods of road users as it directly influences various aspects of their daily lives and economic activities. Road construction delays can lead to increased costs for road users due to extended travel times, detours, and reduced business productivity resulting from partial or full road closures during construction (Amoatey and Ankrah, 2017). These delays can have significant economic implications, affecting businesses that rely on efficient transportation networks for their operations (Stević *et al*., 2022). Understanding the causes of delays, such as financial issues, inadequate contractor experience, and changes in project scope, is essential to mitigate these impacts and ensure smoother project delivery (Stević *et al*., 2022).

Road user perceptions are closely linked to their experiences with road infrastructure, including the quality of roads, construction practices, and the level of disruptions caused by construction activities. Road user perceptions of road safety, comfort, and convenience are shaped by their interactions with the transportation system, making it essential to assess the impact of delays on these factors (Molina *et al*., 2021; Villa *et al*., 2014). Understanding road user perceptions usually provide valuable insights into their needs, preferences, and priorities, which can inform decision-making processes and improve the overall quality of road infrastructure (Muatan *et al*., 2023; Nofriyanti, 2020).

This research study aims to fill this knowledge gap by examining the consequences of road construction delays on economic activities and livelihoods of road users in the Ashanti region. By identifying and analyzing the challenges faced by road users during construction projects, we seek to shed light on the multifaceted nature of the problem. Through an in-depth exploration of the relationships between delays and the economic well-being of road users, we aim to provide valuable insights and recommendations for stakeholders and policymakers. Ultimately, by understanding the implications of road construction delays on the livelihoods of road users, we can pave the way for more effective strategies and interventions to mitigate the negative effects. By prioritizing the needs and concerns of road users, we can strive for a more inclusive and sustainable road construction process that supports both economic development and the well-being of local communities in the Ashanti region.

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This understanding is crucial for devising targeted interventions and policies to address these challenges effectively. Road users will gain insights into why delays occur, how they impact their daily lives and businesses, and what measures can be taken to mitigate these impacts.

Further, the study will provide actionable recommendations for policymakers and stakeholders to improve road construction practices, mitigate the negative impacts on livelihoods and health risks, and potentially inform future infrastructure development projects within the Ashanti Region and in similar contexts globally. The study also demonstrates the potential to drive positive change and address critical issues in transportation infrastructure planning and management.

Unveiling road construction realities: challenges, causes, and solutions

The construction industry plays a crucial role in economic development and the improvement of citizens' livelihoods, as evidenced by its impact on global road infrastructure development. This impact is highlighted in the works of Kamanga and Steyn (2013). According to Rosik *et al*. (2015), the implementation of infrastructure serves to address disparities in access to fundamental amenities, income, geographical positioning, educational standards, gender parity, social stratification, among other factors.

The process of constructing roads involves a complex interplay of various stakeholders, from the initial planning stages to the final implementation. This multifaceted undertaking significantly impacts the socio-economic landscape through the dynamic externalities it generates (Hammond and Jones, 2008). Ensuring that construction necessities adhere to projected budgets and timelines necessitate meticulous planning, ethical conduct, and prudent decision-making.

Road construction delays are a prevalent phenomenon worldwide and can result in significant repercussions. The occurrence of delays during project execution is frequently unforeseeable and tends to arise as the project advances, thereby posing a formidable obstacle to the achievement of predetermined completion deadlines (Kayelle *et al*., 2023). The occurrence of delays in construction projects often leads to additional costs, time overruns, and various challenges among the involved parties. These delays can result in the development of adversarial relationships, a lack of trust, litigation, and cash-flow issues Abdullah *et al*., 2018: Egila *et al*., 2020). Scholars have extensively studied the effects of delays in construction projects, highlighting how delays can lead to cost overruns, time overruns, disputes, and disruptions (Famiyeh *et al*., 2017; Wanjari and Dobariya, 2016). The impact of delays on both project owners and contractors is significant, affecting profits, increasing costs, and raising concerns about responsibility for the delays (Egila *et al*., 2020). There are multiple factors that contribute to delays in road construction. The factors that can contribute to project delays are multifaceted and may encompass political factors, lack of experience on the part of contractors, shortages of labor, materials, and equipment, inadequate communication, client-related issues, and delayed project initiation (Gandhak and Sabihuddin, 2014). Similar to numerous other nations, Ghana encounters notable setbacks in road construction. According to Amoatey and Ankrah (2017), it has been observed that roughly 70 % of road construction projects in Ghana encounter delays averaging around 18 months, coupled with cost overruns of 52 %.

The avoidance of delays and cost overruns in road construction projects necessitates the implementation of efficient coordination, effective communication, capacity growth in project management, and time management, as supported by Famiyeh *et al*. (2017), and Gbahabo and Samuel (2017). The implementation of programs aimed at planning, coordinating, managing, organizing, and motivating program resources can be advantageous for developing nations like Ghana in mitigating delays (Durdyev and Hosseini, 2020). Furthermore, delays in road construction can be attributed to design alterations, defective plans, and insufficient project management methodologies (Mahamid, 2017).

The challenges pertaining to funding and financing are of great significance in the context of road construction projects. The progress of a project can be impeded by inadequate funding, delayed distribution of funds, and challenges in acquiring land, as noted by Kwarteng *et al*. (2018). Various alternative financing options have been proposed to address funding difficulties, including public-private partnerships, bank funding, and community-based partnerships (Mahamid, 2017). Furthermore, delays can be exacerbated by material shortages and equipment malfunctions, as noted by Sambasivan and Soon (2007).

According to Horvat *et al.* (2021), road construction delays may also arise due to political instability and geopolitical risks. The occurrence of political instability and frequent alterations in power may impede the progress of construction operations through the nullification, renegotiation, or re-allocation of contracts, as noted by Aziz *et al*. (2016). Furthermore, road construction projects may encounter disruptions and delays due to weather conditions, including rainfall and flooding, as noted by Mejia *et al*. (2020).

In the realm of road construction, inadequate communication amongst collaborating parties has been identified as a significant contributor to project delays (Karami and Olatunji, 2020). The presence of a conflict of interest among the parties involved in a contract can lead to delays, as accountability and probity may be disregarded, as noted by Aibinu (2019).

The ramifications of construction delays on project delivery encompass an array of issues such as time and cost overruns, disputes, arbitration, litigation, and in extreme cases, project abandonment (Aibinu and Jagboro, 2002). The delays in question have negative impacts on both the residents and businesses, such as displacement, economic losses, noise, and air pollution, decreased employment prospects, and heightened traffic congestion. These effects have been documented in studies conducted by Hamzat (2016) and Ezenekwe and Uzonwanne (2017). According to Silva *et. al* (2016), the delay costs incurred by road users are manifested in various forms such as extended travel time, safety risks, discomfort, and elevated fuel consumption.

Additionally, a measure of the impact of road construction delays is crucial for the livelihoods of road users as it directly influences varied aspects of their daily lives and economic activities. Road construction delays can lead to increased costs for road users due to extended travel times, detours, and reduced business productivity resulting from partial or full road closures during construction (Amoatey and Ankrah, 2017). These delays can have dire negative economic implications on businesses that rely heavily on efficient transport networks to operate (Stević *et al*., 2022).

In summary, comprehending the origins and outcomes of road construction delays is imperative for proficient project administration and triumphant infrastructure advancement. Mitigating delays and ensuring timely completion of road construction projects can be achieved by addressing various

factors, including but not limited to political stability, funding and financing challenges, material and equipment availability, and effective communication among stakeholders. In addition, understanding the causes of delays, such as financial issues, inadequate contractor experience, and changes in project scope, is essential for mitigating these impacts and ensuring smoother project delivery (Stević *et al.*, 2022).

Methodology

Data collection, sampling, and sample size

Primary data was collected through a simple and purposive random sampling from a selection of respondents drawn from drivers, passengers, pedestrians, and inhabitants within six selected road construction sites in Ashanti Region in the year 2022.

The sampling method was chosen to allow for the inclusion of road projects from different areas within the Ashanti region which would be most relevant to the study. Thus, the sample captures a diverse range of experiences and perspectives regarding road construction delays within the region, though it may not fully represent the entire dataset of road construction projects in the region, especially since only a subset of projects meeting specific criteria was included. Further, this ensures richness of the data for a more meaningful and focused analysis. The sites have been described in Table 1 with the population and municipalities. Sample size was determined using Yamane (1967: 886) formula in Equation (1).

$$n = \frac{N}{1+N(e)^2} \qquad (1)$$

Where n = sample size, N = population size, and e = error term or minimum margin error (5%).

The sample size was broken down proportionally to obtain the samples for drivers (commercial and private), passengers, pedestrians, and inhabitants for each selected road. Thus, for each community, 17 drivers, 145 passengers, 68 pedestrians, and 170 inhabitants were interviewed. Participants under 18 years were excluded while those with knowledge on road delays at study sites were included in the study. Visits were made to study sites to administer and interview road users until the appropriate sample size was obtained. The first set of questions collected data on road user demographics (i.e., gender, age, category of road user, occupation, educational level, marital status, and how long one has lived at the place); the second set focused on road users' point of view on 17 factors that cause road construction delays; the third set asked questions on 10 challenges faced by road users along road construction projects; and the fourth set concentrated on 17 impacts of road construction delays on economic activities and livelihoods of road users.

Descriptive survey design through a standard structured questionnaire was administered to collect primary data from the sampled population while secondary data was obtained through a review of relevant literature from publications and a road list from the Ghana Highway Authority (GHA) which had 71 projects in progress. Out of the 71 projects, 34 (47.9%) had exceeded the end date, but only (8.5%) met the inclusion criteria. Information gathered included start and end dates, road lengths, funding source, contractor, physical progress, and remarks.

The study ensured that respondents' involvement was based on willingness to participate in the research and thus they were informed of their right to withdraw from the study and decline any questions. The ethical code of namelessness was enforced throughout the study. The Statistical Package for Social Science (SPSS) version 25 was used to conduct statistical analysis of the data to determine variabilities among observed variables. SPSS, being one of the latest versions available at the time of the study, offered advanced features, bug fixes, and improvements over earlier versions, enhancing the reliability and efficiency of the analysis process. Additionally, the choice of SPSS version 25 for data analysis in this study was based on its reputation for reliability, user-friendliness, and suitability for the specific analytical needs of this study.

Table 1 Selected road construction sites and their population

Selected Road Sites	Municipality	Population	Sample Size
Anwiankwanta-Abore-Adumasa Road	Bekwai	137,967	399
Obuasi-Anyamfuri Road	Obuasi	104,297	398
Trabuom-Toase Road	Atwima Kwanwoma	234,846	400
Banka-Gyadem Road	Asante-Akim South	123,633	399
Adankwame-Ntesere Road	Atwima Nwabiagya	161,893	399
Atimatim-Maase-Aboabogya Road	Afigya-Kwabre South	234,667	400

Table 2 Project start dates of selected road construction sites

Selected Road Sites	Project Description	Road Length (km)	Start Date	End Date	Percentage Completion (%)
Anwiankwanta-Abore-Adumasa Road	Rehabilitation	30	19th Nov 2008	24th Dec 2013	78
Obuasi-Anyamfuri Road	Partial Reconstruc-tion	24	6th May 2015	5th Nov 2016	89
Trabuom-Toase Road	Rehabilitation	9	26th Nov 2015	25th Jun 2017 (28th Dec 2020-extension)	78
Banka-Gyadem Road	Upgrading	7	7th Sept 2016	7th Mar 2018	48.9
Adankwame-Ntesere Road	Rehabilitation	4	21st Mar 2018	20th Mar 2019	54.7
Atimatim-Maase-Aboabogya Road	Emergency Reha-bilitation	9	19th Mar 2018	19th Dec 2018	80.7

A five-point Likert scale ranging from "1" - strongly disagree, "2" - disagree, "3" - neutral, "4" - agree and "5" - strongly agree was adopted to capture road user perception on road construction delays.

Inclusion and exclusion criteria for the study were based on purposive sampling. A road was included if had exceeded the completion or extension of time date, the physical progress of the road project is less than 90 %, and the initial completion date was before coronavirus pandemic (March 2020). The datum of March 2020 was to account for halting of projects due to lockdown effects. Conversely, a road was excluded if start time was before 2019, completion date was within the pandemic period, initial scheduled completion beyond 2020. In all, 2395 questionnaires were administered with an average of 400 per site. A total of 2252 completed questionnaires were returned representing a 94 % response rate.

Method of analysis and test

Factor analysis method is used in this study to determine the factors that impacts the adoption of "impact of delayed road construction on livelihood" in Ashanti region in Ghana. In the context of this study, Factor Analysis is appropriate for identifying the underlying factors that impact the adoption of the "impact of delayed road construction on livelihood" in the Ashanti region of Ghana. By reducing the dimensionality of the data and identifying common underlying factors, Factor Analysis helps in simplifying complex relationships and understanding the underlying structure of the variables related to road construction delays and their impacts on livelihoods. Furthermore, this method helped to uncover hidden patterns and relationships that may not be immediately apparent from the observed data, thereby providing a more comprehensive understanding of the factors influencing the adoption of measures to mitigate the impacts of delayed road construction.

This method can be traced back to the 1900s through the efforts of Charles Spearman and Karl Pearson. For purposes of this study, let, $Y_1, Y_2, \ldots Y_n$ be the observed perception of delayed road construction in Ashanti region. $X_1, X_2, \ldots X_n$ be the common factors that impact livelihoods in Ashanti region. Where $i = 1, 2, \ldots, n$; then the factor analysis model can be

$$
\begin{aligned}
Y_1 &= \lambda_{1l}X_1 + \ldots + \lambda_{1r}X_r + \psi_1 \varepsilon_1 \\
Y_2 &= \lambda_{2l}X_1 + \ldots + \lambda_{2r}X_r + \psi_2 \varepsilon_2 \\
Y_3 &= \lambda_{3l}X_1 + \ldots + \lambda_{3r}X_r + \psi_3 \varepsilon_3 \\
. &= \ldots\ldots + \ldots + \ldots + \ldots\ldots \\
. &= \ldots\ldots + \ldots + \ldots + \ldots\ldots \\
. &= \ldots\ldots + \ldots + \ldots + \ldots\ldots \\
Y_n &= \lambda_{n1}X_1 + \ldots + \lambda_{nr}X_r + \psi_n \varepsilon_n \qquad (2)
\end{aligned}
$$

Table 3 Demographic characteristics of respondents

	Anwiankwanta-Abore-Adumasa		Obuasi-Anyamfuri		Trabuom-Toase		Banka-Gyadem		Adankwame-Ntesere Road		Atimatim-Maase-Aboabogya	
Background	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**
Gender:												
Female	190	49.6	212	56.5	194	50.4	194	55	182	50.5	196	49.5
Male	193	50.4	163	43.5	191	49.6	159	45	178	49.5	200	50.5
Age Distribution:												
18-25 years	102	26.6	93	24.8	116	30.1	138	39.1	98	27.2	125	31.6
26-35 years	102	26.6	124	33.1	95	24.7	63	17.8	90	25	138	34.8
36-45 years	105	27.4	96	25.5	133	34.5	96	27.2	128	35.5	108	27.3
46-55 years	60	15.7	43	11.5	7	1.8	33	9.4	44	12.3	21	5.3
>56 years	14	3.7	19	5.1	34	8.9	23	6.5	0	0	4	1.0
Road User Distribution:												
Driver	16	4.2	17	4.5	17	4.4	17	4.8	17	4.7	17	4.3
Passenger	131	34.2	144	38.4	144	37.4	142	40.2	136	37.8	144	36.5
Pedestrian	65	17	55	14.7	65	16.9	50	14.2	55	15.3	67	16.9
Inhabitant	171	44.6	159	42.4	159	41.3	144	40.8	152	42.2	168	42.3
Occupation Status:												
Employed	231	60.3	168	44.8	194	50.4	248	70.3	249	69.2	225	56.8
Not Em-ployed	70	18.3	129	34.4	95	24.7	50	14.2	56	15.6	91	23
Student	82	21.4	78	20.8	96	24.9	55	15.5	55	15.2	80	20.2
Duration of Stay:												
I don't live here	28	7.3	43	11.5	30	7.8	35	9.9	21	5.8	31	7.8
<1 year	23	6	24	6.4	64	16.6	35	9.9	11	3.1	18	4.5
1-3 years	2	0.5	120	32	11	2.9	53	15	27	7.5	5	1.5
3-5 years	121	31.6	59	15.7	35	9.1	51	14.5	75	20.8	187	47.2
5-10 years	66	17.2	28	7.5	117	30.4	65	18.4	126	35	61	15.5
Over 10 years	143	37.4	101	26.9	128	33.2	114	32.3	100	27.8	94	23.8
Total	**383**	**100**	**375**	**100**	**385**	**100**	**353**	**100**	**360**	**100**	**396**	**100**

stated in mathematical form as follows:
It is assumed that the common factors and the unique factor variables have zero means and unit variances. Thus,

$E(Xj) = 0$, $E(X^2_j) = 1$ *and* $E(\varepsilon_j) = 0$, $E(\varepsilon^2_j) = 1$

Where $j = 1,2, ...r$ and $i = 1,2, ……,n$

Results and Discussion

Demographic characteristics of respondents

Table 3 shows demographic characteristics of respondents at all six study sites. On gender, a slight variation is seen at Obuasi-Anyamfuri which has 56.5 % females against 45 % males at Banka-Gyadem whereas the other four road sites have approximately a split of 50:50 male to female proportion. The highest representation of age group occurred at Banka-Gyadem for 18-25 years at 39.1 % while the least represented age group was 1.0 % for above 56 years group at Atimatim-Maase-Aboabogya. Interestingly, no record for the above 56 years group was obtained at Adankwame-Ntesere road. These results do not agree with the study by (Doan and Oduro, 2012) which recorded a high age category of 0-9 years in the six municipalities. This contrast may be due to the difference in age intervals used in the different studies.

All study sites had above 50 % employed respondents except for Obuasi-Anyamfuri which recorded 44.8 %. Therefore, most of the respondents were employed and it supports the GSS 2010 census report on economic activity status in the six municipalities which indicated that many are employed as skilled agricultural forestry and fishery workers, while the second main occupation is service and sales workers. Many respondents had lived in the area for more than 10 years except Atimatim-Maase-Aboabogya where the majority had lived there between 3-5 years.

Marital status

Summary of marital status is shown in Figure 1, and it is evident that many respondents are not married as opposed to co -habiting, divorced, or widowed. Only a small fraction was married. This does not align with the outcome of 2010 GSS PHC report which saw most of the residents in the municipalities to be married.

Educational background

The educational background of respondents is shown in Figure 2. Most respondents as evident had some education even up to the postgraduate level except Banka-Gyadem which recorded none. It is also interesting that Banka-Gyadem had the highest number of respondents (102 – 28.9 %) with no education. The result validates the United Nations Millennium Development Goal 2's achievement of universal literacy education by 2015 at most of the selected sites.

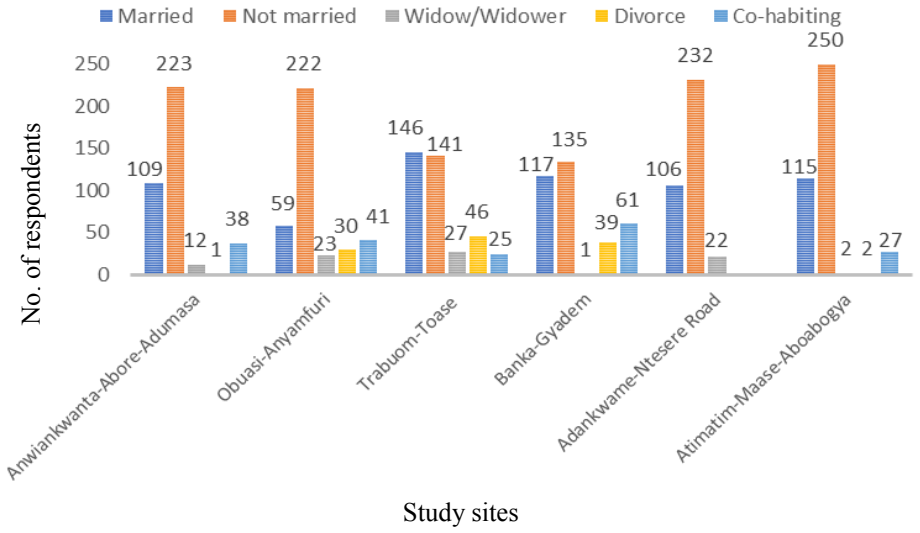

Figure 1 Marital status of respondents at selected project sites

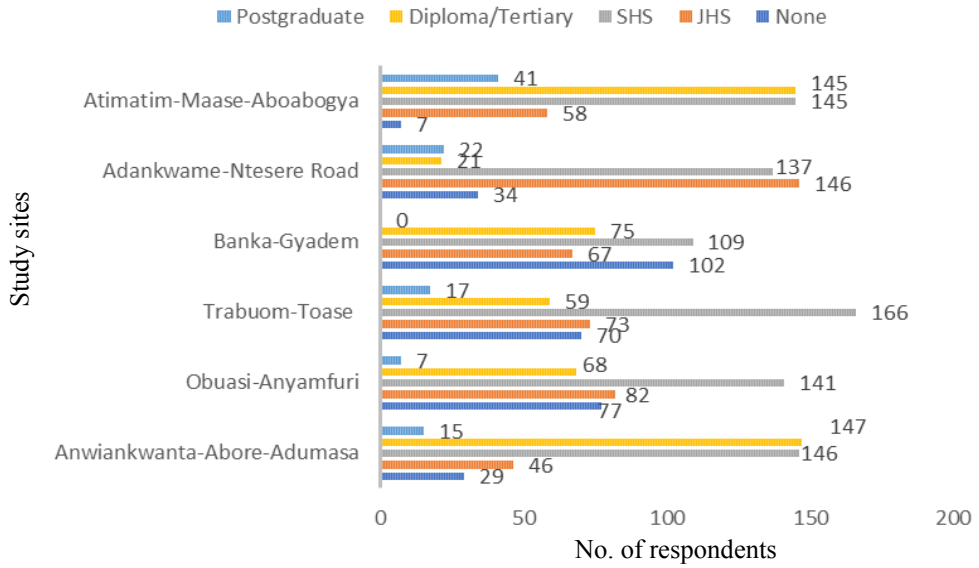

Figure 2 Educational background of respondents at the selected project sites

Table 4 KMO and bartlett's test for factor analysis suitability

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.962
Bartlett's Test of Sphericity	Approx. Chi-Square	65192.465
	df	136
	Sig.	.000

Perceptions on causes of road construction delay

Principal Component Analysis (PCA) and scree plots (SP) were used to ascertain the appropriate latent factors and only one component was extracted as a factor that caused road construction delay. In the context of this study, PCA was chosen to analyze the factors contributing to road construction delays and their impacts on livelihoods. By reducing the dimensionality of the data, PCA helps in identifying the most important factors that explain the variation in the observed variables related to delays and impacts. This allows for a more concise representation of the data, making it easier to interpret and understand the underlying structure of the variables.

To ascertain the appropriate latent perceptive factors, 17 indicators that cause road construction delays were subjected to PCA with varimax (orthogonal) rotation. The factors were confirmed based on factor loadings that exceeded 0.50; since, the greater the loading the higher the variable's status as a true measure of the factor. Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's Test of Sphericity were used to verify suitability of data for factor analysis on perception.

KMO is a statistic used to assess the suitability of data for factor analysis. It measures the proportion of variance among variables that might be caused by underlying factors. A high KMO value (typically above 0.6 or 0.7) indicates that the data are well-suited for factor analysis. In this study, KMO measures the sampling adequacy (which determines if the responses given with the sample are adequate or not) and must close to 0.5 for a satisfactory factor analysis to proceed. Kaiser (1974) recommended a KMO value of 0.5 as minimum (barely accepted), 0.7-0.8 as acceptable, and above 0.9 as superb. By confirming the adequacy of the data for factor analysis, there was confidence in the meaningfulness of the identified factors and their interpretation.

Additionally, in this study, Bartlett's Test of Sphericity assesses whether the variables in the dataset are interrelated, making them suitable for factor analysis. A significant result (usually with a p-value < 0.05) indicates that the variables are correlated, supporting the use of factor analysis.

Therefore, from Table 4, the values support the factorability of the data set (Ofori and Dampson, 2011) implying the appropriateness to extract the latent factors that cause road construction delays. On the number of factors to extract, Kaiser's criterion or Eigen value rule was used. A single factor (one component) explained 83.669 % of the variation of perception of road users with a greater Eigen value (14.224) extracted to represent the indicator of all factors that cause road delays (Table 5).

The scree plot, a graph of eigenvalues against all the factors, is useful in PCA to determine number of factors or optimal factors to retain. The point of interest is where the curve begins to flatten out or level off, indicating additional factors may not be meaningful. Thus, from Figure 3, only component 1 is useful for the analysis since the additional factors do not contribute substantially to the variance explained.

Using the Kaiser (1974) recommended minimum KMO value of 0.5 for the one component, all 17 items (Table 6) represent Poor Management and Leadership factor. This result is consistent with the studies by Mahamid et al. (2017), and Amoatey and Ankrah (2016).

Table 5 Total variance explained by factors that cause road construction delays

Component	Eigenvalues	% of Variance	Cumulative %
1	14.224	83.669	83.669
2	.445	2.615	86.284
3	.346	2.033	88.317
4	.334	1.966	90.283
5	.260	1.530	91.812
6	.231	1.356	93.169
7	.200	1.174	94.343
8	.164	.967	95.310
9	.135	.796	96.106
10	.133	.784	96.890
11	.115	.676	97.566
12	.103	.607	98.172
13	.085	.497	98.670
14	.076	.450	99.120
15	.056	.331	99.451
16	.049	.288	99.739
17	.044	.261	100.000

Challenges faced by road users along the road construction sites

Table 7 supports the factorability of the data set (Ofori and Dampson, 2011) implying the appropriateness to extract the latent factors on challenges faced by road users along road construction sites. Similarly, a single factor (one component) explained 80.770% of the variation of challenges faced by road users with an Eigen value (8.885) extracted to represent the indicator of all the challenges faced by road users in Ashanti Region (Table 8).

Impact of road construction delay on economic activities and livelihoods of road users

Impact of road delays on economic activities was tested and analyzed into means and percentages (Table 10). The majority (87.5 %) had a mean rating above 3.0 indicating agreement with the impact on economic activities.

The spread of the responses by respondents is interesting. About 29 % were neutral loss of life and property as an impact on the economy. Only 23% strongly agreed that the delays bring destruction of vehicles; some 26 % strongly agreed that road delays result in noise and air pollution. Similarly, 48% were of the view that people had relocated because of the delays; another 46 % had lost business and livelihoods due to delays. Some 34 % agreed that delays had caused a reduction in employment opportunities in the area yet 25 % strongly disagreed. A total of 47 % said delays cause time and cost overruns. Another 31 % opined that road construction delays had caused total abandonment of projects in the Ashanti Region.

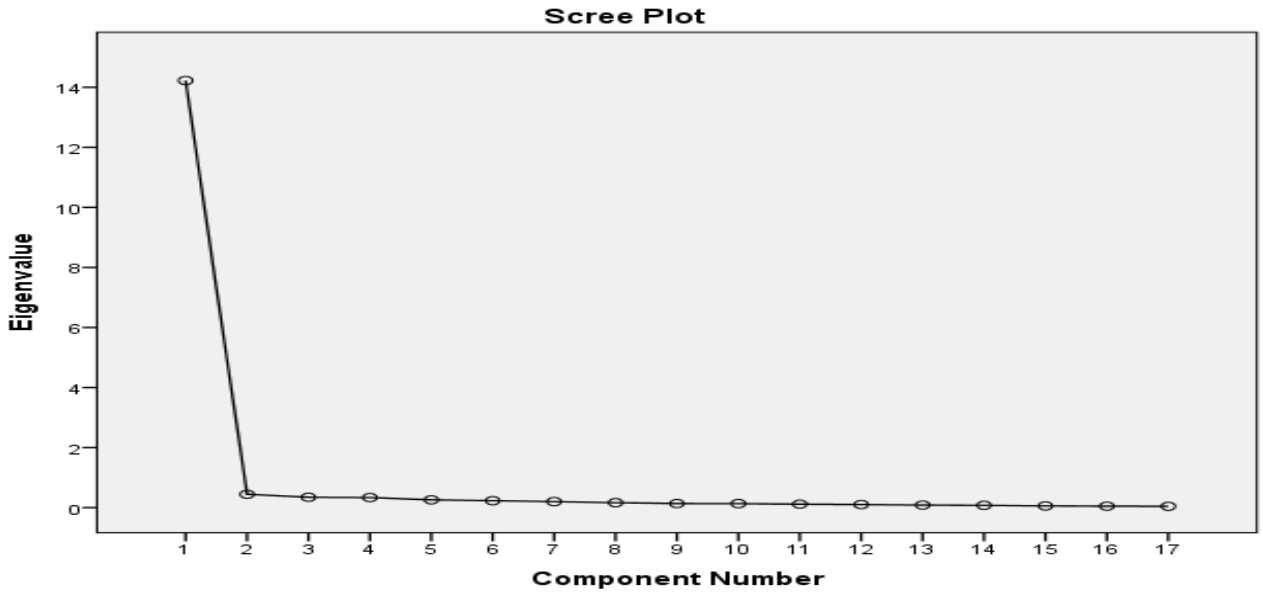

Figure 3 Scree plot on perception of road construction delays

Table 6 Rotated component matrix for factors that cause road delays

Factors that cause road delays	Component 1	Communalities
Contractor's incompetence contributed to road delay	.795	.632
Poor project supervision contributed to the road delay	.882	.778
Delayed payment contributed to road delay	.891	.794
Poor communication among key stakeholders	.894	.799
Late initiation of the project	.920	.847
Same contractor working on other projects	.931	.867
Insufficient contractor financing power	.932	.869
Project scope changes during road construction	.900	.811
Political climates	.932	.868
Economic volatility/crisis in the country	.953	.908
Weather disruptions	.934	.872
Litigation over the construction of the road	.924	.854
The insufficient experience of contractor	.930	.866
Equipment failure or breakdown	.926	.857
Shortages of materials on site or market	.933	.871
Corrupt bidding processes	.916	.840
Conflict of interest	.945	.893

Table 7 KMO and Bartlett's test for challenges faced by road users

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.952
Bartlett's Test of Sphericity	Approx. Chi-Square	33728.266
	Df	55
	Sig.	.000

Table 8 Total variance explained by the factor, challenges faced by road users

Component	Eigenvalues	% of Variance	Cumulative %
1	8.885	80.770	80.770
2	.493	4.485	85.255
3	.324	2.948	88.203
4	.317	2.878	91.081
5	.207	1.884	92.965
6	.198	1.796	94.761
7	.162	1.475	96.236
8	.138	1.255	97.491
9	.117	1.065	98.556
10	.088	.796	99.352
11	.071	.648	100.000

Table 9 Rotated component matrix for challenges faced by road users

Challenges faced by road users	Component 1	Communalities
Increased travel time	.899	.808
Mode of choice of travel	.881	.777
Low patronage for businesses along affected route	.919	.845
Displacement of locals	.913	.834
Change in route choice leading to increased distance or cost	.908	.825
Pollution from construction materials and machines leading to health challenges and increased risk of accidents	.921	.848
Increased migration in the region	.924	.854
Erosion	.936	
Destruction of vehicles	.901	.812
Noise and air pollution	.916	
Traffic congestion	.752	.566

Table 10 Impact of road construction delays on economic activities

Impact of Road Delays	SD (1)	D (2)	N (3)	A (4)	SA (5)	Mean Rating
(1) Loss of life and property	26%	14%	29%	20%	11%	2.78
(2) Environmental pollution	22%	14%	16%	20%	28%	3.20
(3) Destruction of vehicles	23%	15%	15%	24%	23%	3.11
(4) Erosion	25%	11%	13%	28%	23%	3.12
(5) Noise and air pollutions	19%	18%	14%	23%	26%	3.20
(6) Relocation	21%	15%	16%	26%	22%	3.15
(7) Loss of businesses and livelihoods	24%	12%	18%	27%	19%	3.05
(8) Increased road traffic	23%	26%	15%	20%	16%	2.81
(9) Armed robbery	22%	15%	19%	20%	24%	3.09
(10) Reduction in employment opportunities	25%	12%	13%	34%	16%	3.05
(11) Decrease in tempo of economic activities	25%	12%	17%	25%	21%	3.07
(12) Revenue reduction	21%	17%	15%	26%	21%	3.10
(13) Waste of resources	24%	12%	14%	23%	27%	3.16
(14) Low of living standards	21%	15%	18%	22%	24%	3.15
(15) Time and cost overruns	21%	15%	17%	27%	20%	3.10
(16) Total abandonment	25%	13%	14%	31%	17%	3.06

Table 11 Correlation of impact of road delays on economic activities and livelihoods in Ashanti Region

		Impact of Road Delays	Economic Activities
Road Delays	Pearson Correlation	1	.027
	Sig. (2-tailed)		.201
	N	2252	2252

Note: Correlation is significant at the 0.05 level (2-tailed); *Significant at p-value<0.05.*

Correlation analysis results

Correlation measures the strength of association between two variables. According to Cohen's criterion, correlation values greater than 0.3 are considered appropriate and therefore not a candidate for multicollinearity (Table 11). Pearson correlation coefficient was used to establish the relationship between the study variables because it is a parametric statistic and requires interval data for both variables.

Thus, there is no significant relationship between the impact of road construction delays and the economic activities/ livelihoods of the people ($r = .027$, $p > .05$). Although there is a very weak positive relationship between road construction delays and economic activities and livelihoods of the people in the Ashanti region, this association is not statistically significant. Therefore, it cannot be concluded that road construction delays have a meaningful impact on economic activities and livelihoods in this context.

Conclusions

The study investigated the impact of prolonged road construction on the livelihoods of inhabitants in the neighborhoods and on economic activities and found that 34 out of 71 ongoing projects in the Ashanti Region had experienced delays though only six qualified to be included in the study.

The study found that road construction delays impact local livelihoods and health negatively due to increased air pollution; thus, the urgent need for effective measures to mitigate delays and resultant adverse effects on communities. The study identifies critical gaps in data availability and current practices related to infrastructure development in Ghana, stressing the importance of thorough assessments and robust data collection to inform evidence-based strategies to improve project planning, execution, and management. Further, the study points out insufficient funding as a major cause of delay, underscoring the need to ensure adequate financial resources and explore alternative financing mechanisms to accelerate project timelines and reduce economic burdens. Effective governance and leadership are also crucial, as poor management and leadership is another primary cause of delay.

Managers and planners must therefore strengthen project management practices, enhance leadership capabilities, and promote accountability and transparency within the construction sector. Further, integrated and user-centric approaches are needed to tackle the multifaceted challenges faced by road users to improve public satisfaction and promote sustainable development. The study therefore recommends enhancing management and leadership of road construction projects as crucial to reducing delays and minimizing negative impacts on livelihoods by improved communication and collaboration among key stakeholders (government, contractors, and road users) to ensure efficient and effective project execution.

References

Abdullah, M. S., Alaloul, W. S., Liew, M. S., and Mohammed, B. S. (2018). Delays and cost overruns causes during construction of palm oil refinery projects. MATEC Web of Conferences, 203, 02004. https://doi.org/10.1051/matecconf/201820302004

Aibinu, A. A. (2009). Avoiding and mitigating delay and disruption claims conflict: role of precontract negotiation. Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 1(1), pp. 47-58. https://doi.org/10.1061/(asce)1943-4162(2009)1:1(47)

Aibinu, A. A., and Jagboro, G. O. (2002). The effects of construction delays on project delivery in Nigerian construction industry. International Journal of Project Management, 20(8), pp. 593-599. https://doi.org/10.1016/S0263-7863(02)00028-5

Amoatey, C.T. and Ankrah, A.N.O. (2017), "Exploring critical road project delay factors in Ghana", Journal of Facilities Management, 15(2), pp. 110-127. https://doi.org/10.1108/JFM-09-2016-0036

Aziz, R. F., and Abdel-Hakam, A. A. (2016). Exploring delay causes of road construction projects in Egypt. Alexandria Engineering Journal, 55(2), pp. 1515-1539. https://doi.org/10.1016/j.aej.2016.03.006

Brinkhoff, T. (2022). Further information about the population structure: Municipal district in Ghana. City Population, 1.

Doan, P., and Oduro, C. Y. (2012). Patterns of population growth in peri-urban Accra, Ghana. International journal of urban and regional research, 36(6), pp. 1306-1325. https://doi.org/10.1111/j.1468-2427.2011.01075.x

Durdyev, S. and Hosseini, M.R. (2020). Causes of delays on construction projects: a comprehensive list. International Journal of Managing Projects in Business, 13(1), pp. 20-46. https://doi.org/10.1108/IJMPB-09-2018-0178

Espinoza Molina, F. E., Arenas Ramirez, B. D. V., Aparicio Izquierdo, F., and Zúñiga Ortega, D. C. (2021). Road safety perception questionnaire (RSPQ) in Latin America: A development and validation study. International journal of environmental research and public health, 18(5), 2433. https://doi.org/10.3390/ijerph18052433

Ezenekwe, U., and Uzonwanne, M. (2017). Effects of abandoned highway construction project in the Nigerian economy: A case study of Enugu-Onitsha highway road. Journal of Economics and Sustainable Development, 8(10). https://ssrn.com/abstract=3007107

Famiyeh, S., Amoatey, C. T., Adaku, E., and Agbenohevi, C. S. (2017). Major causes of construction time and cost overruns. Journal of Engineering, Design and Technology, 15(2), pp. 181-198. https://doi.org/10.1108/jedt-11-2015-0075

Gandhak, P. S., & Sabihuddin, S. (2014). Stakeholders' perception of the causes and effect of construction delays on project delivery. International Journal of Modern Engineering Research (IJMER), 14(2), pp. 153-161. https://doi.org/10.6106/JCEPM.2014.4.4.041

Gbahabo, P., and Samuel, A. O. (2017). Effects of infrastructure project cost overruns and schedule delays in sub-saharan Africa. In 11th International Conference on Social Sciences Helsinki (pp. 20-21). https://ssrn.com/abstract=2965029

Ghana Statistical Service. (2014). 2010 Population & Housing Census; Summary Report of Final Results. Afigya-Kwabre South District Assembly.

Ghana Statistical Service. (2014). 2010 Population & Housing Census; Summary Report of Final Results. Asante-Akim South District Assembly.

Ghana Statistical Service. (2014). 2010 Population & Housing Census; Summary Report of Final Results. Atwima Kwanwoma Municipal Assembly.

Ghana Statistical Service. (2014). 2010 Population & Housing Census; Summary Report of Final Results. Atwima Nwabiagya Municipal Assembly.

Ghana Statistical Service. (2014). 2010 Population & Housing Census; Summary Report of Final Results. Bekwai Municipal Assembly.

Ghana Statistical Service. (2014). 2010 Population & Housing Census; Summary Report of Final Results. Obuasi Municipal Assembly.

Hammond, G. P. and Jones, C. I. (2008). Embodied energy and carbon in construction materials. Proceedings of the Institution of Civil Engineers - Energy, 161(2), pp. 87-98. https://doi.org/10.1680/ener.2008.161.2.87

Hamzat, Y. (2016). An assessment of road transport infrastructure development in Kaduna State, Nigeria. Unpublished master thesis, Department of Geography, Faculty of Science, Amadu Bello University, Zaria.

Horvat, T., Bendix, H., Bobek, V., and Skoko, H. (2021). Impacts of investments in infrastructure projects on emerging markets' growth: the case of East African countries. Economic research-Ekonomska istraživanja, 34 (1), pp. 2135-2161. https://doi.org/10.1080/1331677X.2020.1860799

Kaiser, H. F. (1974). An index of factorial simplicity. Psychometrika, 39(1), pp. 31-36. https://doi.org/10.1007/bf02291575

Kamanga, M. J., and V d M Steyn, W. J. (2013). Causes of delay in road construction projects in Malawi. Journal of the South African Institution of Civil Engineering= Joernaal van die Suid-Afrikaanse Instituut van Siviele Ingenieurswese, 55(3), pp. 79-85. https://hdl.handle.net/10520/EJC152557

Karami, H. and Olatunji, O. A. (2020). Critical overrun causations in marine projects. Engineering, Construction and Architectural Management, 27(7), pp. 1579-1594. https://doi.org/10.1108/ecam-09-2019-0477

Kayelle, E., Rabbani, E. K., and Macedo, M. (2023). Identifying the Causes of Delay Using the Analytic Hierarchy Process (AHP) Method in Brazilian Public Road Infrastructure Project. Journal of Management and Sustainability, 13, 45. https://doi.org/10.5539/jms.v13n2p45

Kwarteng, A. C., Iyer-Raniga, U., and Guillermo, A. (2018). Transport and accessibility challenges facing the rural people living along feeder roads in ghana. Civil Engineering and Architecture, 6(5), pp. 257-267. https://doi.org/10.13189/cea.2018.060505

Mahamid, I. (2017). Analysis of schedule deviations in road construction projects and the effects of project physical characteristics. Journal of Financial Management of Property and Construction, 22(2), pp.192-210. https://doi.org/10.1108/jfmpc-07-2016-0031

Mejía, G., Sánchez, O., Castañeda, K., and Pellicer, E. (2020). Delay causes in road infrastructure projects in developing countries. Revista De La Construcción, 19(2), pp. 220-234. https://doi.org/10.7764/rdlc.19.2.220-234

Muatan, J. A., Rifai, A. I., and Handayani, S. (2022). The Analysis of National Road User Satisfaction in Urban Area (Case Study of the PGC-Kramat Jati-Graha Cijantung Route, Jakarta). Indonesian Journal of Multidisciplinary Science, 1(1), pp. 397-408. https://doi.org/10.55324/ijoms.v1i1.397

Nofriyanti, E. (2020). Evaluation of concretization of local road in Padang city using the importance satisfaction analysis and customer satisfaction index methods. In E3S Web of Conferences (Vol. 156, p. 05007). EDP Sciences. https://doi.org/10.1051/e3sconf/202015605007

Rosik, P., Stępniak, M., and Komornicki, T. (2015). The decade of the big push to roads in Poland: Impact on improvement in accessibility and territorial cohesion from a policy perspective. Transport policy, 37, pp. 134-146. https://doi.org/10.1016/j.tranpol.2014.10.007

Sambasivan, M. and Soon, Y. W. (2007). Causes and effects of delays in malaysian construction industry. International Journal of Project Management, 25(5), pp. 517-526. https://doi.org/10.1016/j.ijproman.2006.11.007

Silva, R. J., Ferreira, A., and Flintsch, G. (2016). Incorporating road safety into pavement management (Doctoral dissertation, Ph. D. Thesis, Universidade de Coimbra, Coimbra). http://dx.doi.org/10.13140/RG.2.2.19920.61440

Stević, Ž., Bouraima, M. B., Subotić, M., Qiu, Y., Buah, P. A., Ndiema, K. M., and Ndjegwes, C. M. (2022). Assessment of causes of delays in the road construction projects in the Benin Republic using fuzzy PIPRECIA method. Mathematical Problems in Engineering, 2022, 1-18. https://doi.org/10.1155/2022/5323543

Villa, C., Bremond, R., and Saint Jacques, E. (2015). Visibility and discomfort glare of LED road studs. Lighting Research & Technology, 47(8), pp. 945-963. https://doi.org/10.1177/1477153514563637

Wanjari, S. P. and Dobariya, G. (2016). Identifying factors causing cost overrun of the construction projects in india. Sādhanā, 41(6), pp. 679-693. https://doi.org/10.1007/s12046-016-0498-3