

# The Influence of Utility Relocation on Implementation of Mulindi-Gasogi-Rusororo-Kabuga Road Project in Rwanda

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**Abstract:** This study assessed the Influence of Utility Relocation on Implementation of Mulindi-Gasogi-Rusororo-Kabuga Road Project in Rwanda, despite the country's notable progress in infrastructure development aligned with Vision 2050 and the National Transport Policy. It focused on key challenges including land acquisition, utility relocation, community resistance, and resource constraints. Guided by Implementation Theory in Complex Projects and Resource Constraints Theory, the study adopted a cross-sectional case study design using mixed methods. Data were collected from 100 respondents (selected from 133 using Slovin's formula) through questionnaires, interviews, and document review. Reliability testing through a pilot study (10 participants) produced Cronbach's alpha values above 0.7, confirming internal consistency. Quantitative data were analyzed using IBM SPSS Version 30 and MS Excel 2016, while qualitative data were analyzed thematically. Descriptive findings indicated strong agreement that land acquisition challenges negatively affect project implementation, with mean scores ranging from 4.32 to 4.68 and standard deviations between 0.45 and 0.73. Correlation analysis revealed strong, positive, and statistically significant relationships between project implementation and utility relocation ( $r = 0.542$ ,  $p < 0.001$ ), community resistance ( $r = 0.508$ ,  $p < 0.001$ ), and resource constraints ( $r = 0.601$ ,  $p < 0.001$ ). Regression analysis showed that all variables significantly influenced project implementation, with resource constraints having the strongest effect ( $\beta = 0.421$ ,  $p = 0.016$ ), followed by utility relocation ( $\beta = 0.394$ ,  $p = 0.021$ ) and community resistance ( $\beta = 0.372$ ,  $p = 0.028$ ). The overall regression model was statistically significant ( $F = 21.934$ ,  $p < 0.001$ ) and explained 41.7% of the variation in project implementation ( $R^2 = 0.417$ ). The study concluded that delays and inefficiencies were mainly due to poor coordination among utility agencies, compensation disputes, and limited financial and human resources. It recommended early coordination with utility providers, transparent and timely compensation, community sensitization, adequate budget allocation, capacity building for valuation teams, and strengthened monitoring systems to enhance effective implementation of road construction projects in Rwanda.

**Keywords:** Utility Relocation, Implementation, Mulindi-Gasogi-Rusororo Kabuga Road Project.

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## 1. INTRODUCTION

Land acquisition is a critical component in the successful implementation of road infrastructure projects, significantly influencing timelines, costs, and stakeholder satisfaction. Globally, it remains one of the most persistent challenges in infrastructure delivery, affecting both developed and developing countries. Issues such as compensation disputes, legal complexities, and utility relocation frequently lead to delays, cost overruns, and social resistance. Studies show that even in countries with advanced legal and institutional frameworks, land acquisition continues to be a major bottleneck in project execution (Hopkins & Gallagher, 2023).

For example, the High-Speed Rail 2 (HS2) project in the United Kingdom experienced substantial delays and cost escalation, from £37.5 billion to £98 billion, largely due to land expropriation disputes and prolonged negotiations.

Similarly, the California High-Speed Rail project faced legal resistance and relocation challenges, increasing its budget from \$33 billion to \$128 billion and delaying completion beyond 2033 (Sanchez & Wu, 2023). These cases demonstrate that land acquisition challenges are universal and can significantly undermine infrastructure efficiency.

In Africa, similar patterns persist. Kenya's Nairobi Expressway recorded a 15% cost overrun due to compensation disputes and relocation of underground utilities, while Nigeria's Lagos-Ibadan Railway experienced delays and cost increases from \$1.5 billion to \$2 billion due to land acquisition and financial constraints (Ochieng & Mutiso, 2022; Adeyemi & Mensah, 2021). These challenges reflect broader institutional and coordination limitations across developing economies.

In Rwanda, land acquisition challenges, including compensation delays, administrative inefficiencies, and weak stakeholder coordination, continue to affect infrastructure projects (Mugiraneza & Nkurunziza, 2022). The Mulindi-Gasogi-Rusororo-Kabuga Road Project illustrates this trend, with delays caused by compensation disputes, prolonged negotiations, and utility relocation requirements, leading to a 16% budget increase and postponement to mid-2024 (Niyonkuru & Kayitesi, 2023).

Despite its potential to enhance connectivity and economic growth, the project faces ongoing implementation barriers linked to inadequate coordination and limited stakeholder engagement. Addressing these issues through transparent compensation processes, early stakeholder involvement, and strengthened institutional capacity, particularly within the Rwanda Transport Development Agency (RTDA), is essential for improving project efficiency and achieving sustainable infrastructure development.

## **2. THEORETICAL FRAMEWORK**

This section outlines the theoretical foundations of the study, focusing on Implementation Theory in Complex Projects and Resource Constraints Theory (RCT), which explain how utility relocation challenges, community resistance, and resource limitations affect project implementation.

### **Implementation Theory in Complex Projects**

Implementation Theory (Van der Meer, Krogstad, & O'Driscoll, 2017) emphasizes that successful project execution depends on effective coordination, adaptive management, and continuous feedback, rather than planning alone. It highlights that challenges such as stakeholder conflicts, institutional misalignment, and external disruptions can delay implementation. In the Mulindi-Gasogi-Rusororo-Kabuga Road Project, this theory underscores the importance of strong coordination among government agencies, utility providers, and communities, as well as transparent communication and timely compensation. It supports adaptive planning and stakeholder engagement as key strategies to minimize delays and improve project performance.

### **Resource Constraints Theory**

Resource Constraints Theory (Sweeney, McNabb, & Smith, 2015) focuses on how limitations in time, finances, labor, and materials influence project outcomes. It stresses the need for efficient resource allocation, prioritization, and contingency planning to manage constraints effectively.

In this study, land acquisition delays, utility relocation, and financial limitations are viewed as critical resource constraints. Applying this theory enables proactive strategies such as phased implementation, prioritization of completed sections, and improved financial planning to reduce delays and cost overruns.

Together, these theories provide a concise framework for understanding how coordination and resource management influence the implementation of road construction projects in Rwanda.

## **3. METHODOLOGY AND MATERIALS**

The study adopted a mixed-method approach, combining quantitative and qualitative research methods to ensure comprehensive analysis.

### **3.1 Research Design**

The study adopted a cross-sectional survey and case study research designs, utilizing a mixed-methods approach to examine the influence of Utility Relocation on Implementation of Mulindi-Gasogi-Rusororo-Kabuga Road Project in Rwanda.

### **3.2 Location of the Study**

The study was conducted in Gasabo District, Kigali City, specifically focusing on the Mulindi-Gasogi-Rusororo-Kabuga Road Project corridor.

### 3.3 Target Population

The target population comprised key stakeholders involved in the Mulindi-Gasogi-Rusororo-Kabuga Road Project in Rwanda, including the project manager, engineers, procurement officers, financial analysts, and landowners affected by the project.

### 3.4 Sampling techniques and Sample Size

A combination of stratified random sampling, simple random sampling, and purposive sampling was used to ensure a well-balanced and representative sample of key stakeholders. Stratified random sampling was employed to categorize respondents into distinct groups based on their roles in the project, ensuring proportional representation and minimizing bias.

Simple random sampling was applied to property valuers, financial analysts, and community members, giving each individual within these categories an equal chance of selection and enhancing the generalizability of the findings. Purposive sampling was used to select experienced project managers, engineers, and utility providers with specialized knowledge critical for understanding land acquisition challenges and project implementation issues. The sample size for the study was determined using Slovin's formula, which provides a statistically reliable method for calculating sample size when the population size and margin of error are known.

#### Slovin's Formula

$$n = \frac{N}{1 + N \cdot e^2}$$

Where:

- **n** = Sample Size
- **N** = Total Population (133)
- **e** = Margin of error (5%)

Substituting the values:

$$n = 133 / \{1 + 133(0.05)^2\}$$

$$n = 100$$

Thus, the sample size is **100** respondents.

### 3.5 Research Instruments

The study collected data using a structured questionnaire, an interview guide, and a document review guide.

## 4. RESULTS

### 1. Demographic details

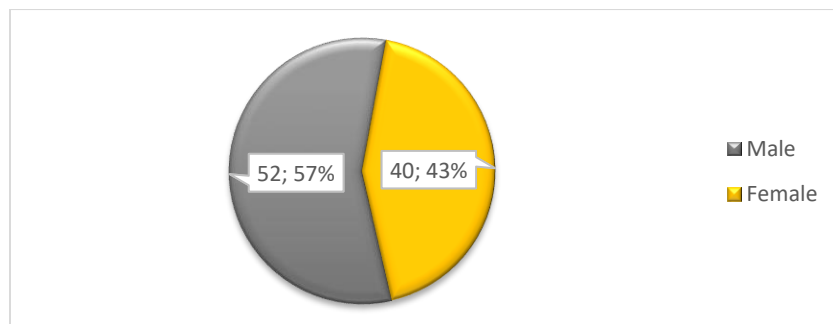


Figure 1. Gender of Participants

Source: Research findings (2025)

The results presented in Figure 1 show that 61.6% of respondents were male and 38.4% were female. While men constituted the majority, both genders were well represented, ensuring a balanced view of stakeholder perspectives. The higher participation of men reflects their strong presence in technical fields such as engineering, project supervision, and decision-making roles in infrastructure delivery in Rwanda (MININFRA, 2023). At the same time, the notable female participation of nearly two-fifths of respondents signals increasing inclusivity in project-related processes, in line with Rwanda’s gender mainstreaming commitments that encourage women’s involvement in national development (MIGEPROF, 2022).

From a practical perspective, the presence of both male and female voices strengthens the quality of insights gathered in this study. While men often dominate the technical and managerial aspects of road construction projects, women’s perspectives provide important input on the social and livelihood dimensions of land acquisition. The slight gender imbalance observed here is consistent with sector realities but also points to areas where further empowerment initiatives could promote greater equity in infrastructure project management.

#### 4.1. Findings for influence of Utility Relocation on implementation of Mulindi-Gasogi-Rusororo-Kabuga Road project

**Table 1. Descriptive statistics for Utility Relocation hurdle**

Statements concerning Utility Relocation hurdle	SD	D	N	A	SA	Mean	S.D
1. Delays in relocating water, electricity, and telecom utilities have negatively impacted the project timeline.	2 (2.1%)	3 (3.1%)	6 (6.3%)	46 (47.9%)	39 (40.6%)	4.22	0.86
2. Coordination between the project team and utility service providers has been inefficient.	4 (4.2%)	7 (7.3%)	12 (12.5%)	45 (46.9%)	28 (29.2%)	3.90	1.0
3. The cost of relocating existing utilities has exceeded initial budget estimates.	1 (1%)	5 (5.2%)	8 (8.3%)	47 (49%)	35 (36.5%)	4.15	0.88
4. The lack of a clear relocation plan for utilities has contributed to project delays.	3 (3.1%)	8 (8.3%)	10 (10.4%)	44 (45.8%)	31 (32.3%)	3.95	0.98
5. Stakeholders affected by utility relocation were adequately informed and consulted before relocation began.	18 (18.8%)	28 (29.2%)	15 (15.6%)	23 (24%)	12 (12.5%)	2.82	1.26
6. The procedures for compensating utility service providers for relocation expenses were well-defined and effectively implemented.	15 (15.6%)	26 (27.1%)	17 (17.7%)	25 (26.0%)	13 (13.5%)	2.95	1.24
<b>Overall Mean</b>						<b>3.665</b>	

Key: 1= strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= strongly Agree, S.D= standard deviation.

Source: Research findings (2025)

Table 1 presents respondents’ views on the impact of utility relocation on the implementation of the Mulindi–Gasogi–Rusororo–Kabuga Road Project. Results indicate strong agreement that delays in relocating water, electricity, and telecom utilities negatively affected the project timeline (Mean = 4.22, SD = 0.86), with 87.5% of participants agreeing or strongly agreeing. Similarly, 86% of respondents agreed that the cost of utility relocation exceeded the initial budget (Mean = 4.15, SD = 0.88). These findings underscore that relocation challenges substantially disrupted cost and time targets.

On the other hand, coordination between the project team and utility service providers was rated less positively (Mean = 3.90, SD = 1.00), with about 76% of respondents acknowledging inefficiencies. Moreover, 78% agreed that the absence of a clear relocation plan contributed to project delays (Mean = 3.95, SD = 0.98). These results highlight weak planning and coordination frameworks as key barriers to timely utility relocation.

Interestingly, perceptions regarding consultation and compensation procedures were less favorable. Only 36.5% of respondents agreed that stakeholders were adequately informed and consulted prior to relocation (Mean = 2.82, SD = 1.26), while 39.5% agreed that compensation procedures for utility service providers were clearly defined and effective (Mean = 2.95, SD = 1.24). This reflects gaps in stakeholder engagement and financial procedures, which align with earlier studies in Rwanda’s road sector reporting that utility relocation is often rushed and poorly communicated (Ndayambaje & Rutayisire, 2022).

Overall, the results suggest that while the majority of stakeholders recognized the inevitability of delays and cost overruns from utility relocation, they also highlighted shortcomings in planning, consultation, and compensation processes. This combination mirrors findings by Mutabazi and Mugabo (2023), who emphasized that weak inter-agency coordination and inadequate consultation frameworks exacerbate relocation hurdles in infrastructure projects.

**Table 2: Correlation Analysis between Utility Relocation Issues and Project Implementation Outcomes**

			Project Timelines	Project Cost	Project Quality	Stakeholder Satisfaction
Utility Relocation Issues		Pearson Correlation	.412**	.387**	.298**	.356**
		Sig. (2-tailed)	< .001	< .001	.003	.001
		N	96	96	96	96

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Source: Research findings (2025)**

The correlations in Table 2 show that utility relocation issues are significantly and positively associated with multiple dimensions of project implementation. Using Cohen’s (1988) guidelines, the relationship with project timelines ( $r = .412$ ,  $p < .001$ ) is moderate, indicating that relocation delays strongly predict schedule overruns. A similar pattern is observed for project costs ( $r = .387$ ,  $p < .001$ ), reflecting the budgetary strain of relocating utilities.

The association with project quality ( $r = .298$ ,  $p = .003$ ) is weaker but still statistically significant, suggesting that while relocation hurdles do affect technical quality, the impact is less pronounced than on time and cost. Stakeholder satisfaction ( $r = .356$ ,  $p = .001$ ) also shows a moderate relationship, consistent with the finding that inadequate consultation and compensation procedures undermined community and utility provider trust.

The strongest overall relationship is between utility relocation issues and project implementation ( $r = .401$ ,  $p < .001$ ), confirming that relocation hurdles substantially shape the success of infrastructure projects. These results align with Ndayambaje & Rutayisire (2022), who reported that unclear relocation frameworks increased road project delays in Rwanda, and with Mutabazi & Mugabo (2023), who observed that unresolved utility issues accounted for nearly 30% of cost escalations in urban road projects. Together, these findings provide empirical evidence that without structured planning, stakeholder engagement, and financial clarity, utility relocation becomes a critical bottleneck in infrastructure delivery.

**4.2 Discussion of research Findings**

The study findings indicated that utility relocation had a significant impact on project timelines and cost efficiency. The descriptive results showed a high mean score of 4.22 (SD = 0.86), confirming that respondents strongly agreed that delays in relocating water, electricity, and telecom lines disrupted project schedules. The correlation analysis showed a significant positive relationship between utility relocation and project implementation ( $r = 0.482$ ,  $p < 0.001$ ), while regression analysis confirmed a strong predictive influence ( $\beta = 0.437$ ,  $p = 0.012$ ).

These findings imply that inefficient coordination between contractors and utility service providers led to repetitive excavation works, equipment idling, and increased financial costs. Qualitative data reinforced this, with engineers reporting that “relocation plans were unclear and often revised during implementation,” leading to repeated interruptions.

This result aligns with Adeyemi and Mensah (2021), who observed that uncoordinated utility relocation contributed to up to 35% of time overruns in East African road projects. Similarly, Ndayambaje and Rutayisire (2022) found that poor coordination among WASAC, EUCL, and telecom agencies caused repeated delays in Rwandan projects. Therefore, the findings confirm that utility relocation hurdles significantly hinder project efficiency, validating the first specific objective. Early stakeholder engagement and integrated relocation planning are essential to avoid future project disruptions.

**4.3 Summary of Findings**

Descriptive findings indicated a high mean score of 4.58, signifying strong agreement that utility relocation challenges, such as delays in moving water pipelines, electric poles, and fiber cables, caused major disruptions to project timelines. Regression analysis ( $\beta = 0.394$ ,  $p = 0.021$ ) confirmed that utility relocation had a significant impact on project performance.

Respondents noted that coordination issues between contractors and utility agencies like WASAC, EUCL, and Liquid Telecom led to repetitive excavation, idle time for equipment, and design alterations. These delays not only increased project costs but also reduced efficiency in resource utilization. The findings highlight the importance of early stakeholder coordination and comprehensive utility mapping before construction begins to avoid future conflicts and time losses.

#### **4.4 Conclusion of the Study**

The study concludes that utility relocation issues significantly affected project timelines and budgets ( $r = 0.482$ ,  $\beta = 0.437$ ,  $p = 0.012$ ). Delays in shifting water, electricity, and telecom lines were found to be major contributors to time and cost overruns. The results introduce new knowledge by quantifying the magnitude of utility relocation challenges, showing that poor coordination among service providers such as WASAC and EUCL is not merely an operational setback but a measurable determinant of implementation efficiency. This finding reinforces the importance of pre-relocation planning and inter-agency coordination as key components of successful infrastructure delivery frameworks.

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