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Resettlement Implementation in Water Projects: A Case of Northern Collector Tunnel Murang'a County

[1]Grace Mathai, [2]Dr Anthony Ndung'u

[1,2]Department of Management Science and Project Planning Faculty of Business and Management Sciences University of Nairobi

Abstract:

Large-scale water projects threaten livelihood and disrupt communities due to demand for large tracts of land (Walelign & Lujala, 2022). Despite conducting social impact assessment, water projects carry unexpected twists that extend for years. This paper focused on Murang'a Northern Collector tunnel, Murang'a County in Kenya through an ex-post facto design with descriptive survey analysis. It described the impacts of resettlement restoration efforts in water projects. The total land affected by Phase 1 was about 10.766 acres disrupting around 657 people (World Bank Group, 2019). The study found that the affected persons were dissatisfied with the resettlement process. Stakeholders complained of delayed and insufficient compensation, lack of access to water in the project area, and limited public participation. A sample of 261 respondents was used to draw conclusions. The correlation coefficient for the study was R=0.886 with

$P<0.001$, $F=163.550$, and adjusted $R^2=0.779$. This indicated that the regression model was statistically significant and resettlement implementations contribute to variation in project outcomes. In examining the individual variables most of the participants disagreed or strongly disagreed they were satisfied with the process of resettlement. The paper proposed policy change, adequate multi-stakeholder engagement and harmonization of valuation for fair compensation of land acquired during projects and livelihood restoration.

Keywords: Livelihood restoration, resettlement implementation, water projects, affected persons

1. Introduction

According to Nguyen & Singer (2023), large-scale government or private developments require large tracts of land to implement. This need for land leads to the displacement of people or affects their income-generating activities. Around 10 to 15 million people globally are displaced annually by development projects, making resettlement implementation important (Chen et al., 2021). In the implementation of water projects, resettlement is a critical component in achieving project objectives. Resettlement implementation involves relocation and rehabilitation of project-affected persons while developing water infrastructure such as sewer systems, dams, irrigation systems, reservoirs, and water pipelines.

Water projects are essential and bring prosperity by serving a common good; however, despite the many advantages, when resettlement is not done appropriately, it can lead to the impoverishment of communities (Chen et al., 2021). For example, victims of large project displacement in China and India are estimated at 50 million people. In Africa, involuntary resettlement during the implementation of water projects has led to the displacement of over 80,000 people to construct the Akosombo Dam in Ghana. Around 57000 people were affected by the Kariba Dam in Zambia (Kieti, 2021).In Kenya, infrastructural developments to realize the Vision 2030 agenda have increased, displacing more than 100,000 households countrywide. Despite the good intentions, the population is displaced, and the social impact is less attended. Consistent with policy, some displaced people have been awarded cash compensation for resettlement due to sizeable infrastructural development. However, by and large, safeguarding the rights of people affected by the project has not been fully realized. According to Mucherera & Spiegel (2022), resettlement action plan (RAP) reports are not always ready during project approval. RAP presents livelihood restoration activities as an afterthought, sometimes hindering water project success and resettlement implementation (Schopps, 2020). Projects undertaken without knowledge of the extent of social and economic displacement of people lead to unintended hardships (Cernea, 2021). The gap between water demand and supply has widened as the population grows and climate change occurs. Approximately 2.1 billion people around the World wake up without access to clean water (Boretti & Rosa, 2019). This necessitates the implementation of bulk water and sanitation projects that make resettlement an essential public issue.

Large-scale water projects threaten livelihood, jeopardize the sustainability of traditional cultures, and disrupt communities through resettlement (Walelign & Lujala, 2022). The prioritization of economic interests and unequal participation of stakeholders shapes the impacts. The issues generated by bulk water projects are often contentious and complex (Piróg et al., 2019). Despite conducting social impact assessment of the complexity, the projects carry unexpected twists that may extend for years.

This paper refers to one bulk water supply project in Kenya, the Northern Collector Tunnel project in Murang'a County. The project is 98% complete and was set to add 140 million liters of water per day to serve Nairobi and its environment. The project involved

the construction of a river diversion weir and related hydraulic structures at the Maragua, Gikigie, and Irati Rivers. The project is a 12 km-long water transfer tunnel that intercepts the three rivers (Ndung'u, 2020). The Northern Collector Tunnel Phase 1 (NTC) had an estimated cost of around 65 Million USD. The construction started in 2015 and was expected to take 48months; however, the tunnel became functional in 2022 (Maina et al., 2020). The project took several years to complete and involved significant construction operations, including excavations and tunneling of broad tracts of the land. The total extent of land affected by Phase 1 was about 10.766 acres, creating new disturbances for around 657 people dwelling close to the construction area and thousands downstream (World Bank Group, 2019). Like any other massive construction project, the project involved land use; this affected the basic needs, shelter, and social relationships of individuals in the project area. The project had high social and environmental impacts, especially on land access, compensation, participation, and resettlement offering a proper sample space for this paper.

2. Problem Statement

Over 15 million people are affected yearly by infrastructural development worldwide, leading to physical and economic displacement, loss of quality land, services, jobs, and decreased standard of living (Chen et al., 2021). Inadequate resources within the government, improper implementation, and non-commitment to international standards contribute to these resettlement problems.

In Kenya, most Water Service Providers, Water Work Agencies, and The Ministry of Water, Sanitation, and Irrigation face unending crises and project delays due to poor resettlement plans. During the implementation of the Murang'a Northern Collector tunnel, stakeholders raised claims that public participation was limited and only done in six areas, which are Ichichi, Kinyona, Makomboki, Mairi, Kangari, Gacharage and Kanyenyaini (Nation Media Group, 2012). People in other areas, such as those downstream from the Tana River, Makuyu, Ithanga, Kandara, Kambiti, Kakuzi, and Kimoroi, were not involved.

Although the project would result in abundant water in Nairobi, areas downstream of the Tana River might experience drought. Differing feasibility reports, one by Howard Humphreys & Partners of 1998 and the one by Athi Water Works Development Agency of 2012, revealed no precision in implementing the Murang'a Northern Collector Tunnel. The ESIA report was also produced after the World Bank released money to pay the contractor to begin work. Water projects impact significantly on local communities. Most of the studies focus on developed countries and single case analysis. For example, Cernea (2021) cites the Saguling Reservoir in Indonesia and Jiang et al. (2021), and Vanclay (2020) cite the Danjangkou Reservoir in China as having brought hardships and loss of land during resettlement. Still, only a few studies have focused on developing countries.Studies by Jiang et al. (2021) and Vanclay (2020) do not provide practical applications of stakeholder engagement in water project implementation. Therefore, this study seeks to bridge gaps in knowledge on resettlement implementation, such as the role of stakeholder engagement, incomplete impact assessment, reconstruction efforts, and weak legal frameworks in developing countries.It addresses the resettlement challenges that lead to significant project delays, conflicts, and cost overruns by proposing sector-specific policy recommendations.

2.1 Research Objective

The research objective was to assess resettlement implementation in water projects a case of Murang'a Northern Collector Tunnel

3. Literature Review

3.1 Resettlement Implementation in Water Projects

According to studies by Downing et al. (2021), livelihood restoration may jumpstart but fail to restore the disrupted local economies. Aboda et al. (2019) argue that land and employment are some of the essential livelihood assets that lead to livelihood restoration. Kieti (2021) argues that losses on livelihood can be avoided when feasible and adequate compensation is provided.Cash compensation is the sole financial tool, and it is mythically assumed to cure dispossession, economic impoverishment, or emotional hurt inflicted by displacement; however, it is seen as impotent and misleading (Cernea, 2021;Hoogendam & Boelens, 2019).Mavhura (2020) employs mixed methods to examine the effects of Tokwe Mukorsi Dam Project in Zimbambwe and in his view cites that conflicts during project implementation are synonymous and have been witnessed across many water projects,such as the Vattenfall project at Beeskow in Germany. The primary cause of conflict is usually diverging views of interested parties and flawed enumeration process of people affected by the project. Inaccurate or incomplete assessments result in some affected persons being overlooked or not adequately compensated (Ogwang & Vanclay, 2019).

Lu & Shangguan (2023) argue that displacement caused by water conservancy projects results in poverty. The article surveyed households affected by the Yangtze Huai River Inter Basin Water Diversion Project construction for four years. The study used multiple poverty-measured methods to reassess the resettled community. The study noted a worsening trend of poverty in the resettled community due to insufficient compensation, loss of labor ability, and short-term benefits provided during compensation. The study suggests governments should adopt different compensation methods and include benefit sharing to ensure restoration of livelihood.

During project implementation, the rights of the people affected are fulfilled and transferred to private developers (Esteves, 2021). The involvement of people affected by projects fosters a collective agency for action and change. According to Nikuze, Sliuzas, and

Johannes (2020), poorly framed resettlement hinders community engagement. Factors such as a lack of clear policies and inadequate guidance on incorporating community interests and safeguarding their rights result in impoverished communities. Many financiers, such as the World Bank, Asian Development Bank, and African Development Bank, have developed resettlement policy guidelines to promote social justice (Kieti, 2021). However, this is never achieved due to insufficient enforcement of people-centred principles. In most cases, developing countries follow top-down approaches in decision-making closed doors or through pseudo-participation (Nikuze et al., 2020). This exclusionary decision-making often forces the people affected by the project to exhibit contestation against water projects.

According to Desalegn Solomon (2022), resettlement falls short of community interests, and there is a power imbalance. Lack of recognition of community engagement leads to slow response to the demands of dissatisfied affected people. For example, community members can claim customary tenure individually or collectively; their involvement is crucial. This kind of tenure may need to be more inclusive, and some people, such as women, may be excluded from having a stake if not properly engaged (Ogwang & Vanclay, 2019).

Hoogendam & Boelens (2019), systematically reviewed technical reports on the Misicuni Irrigation project. Through group interviews with the leaders of affected communities, the authors found that unequal power relations between project implementing agencies and affected communities lead to unfavorable negotiated arrangements for resettlement. The result of such exclusion can create tension during compensation. In the construction of the Danjangkou reservoir in China, most people affected were only given the right to know, but they did not have the right to choose their resettlement rights, and in the long run, they were left impoverished (Jiang et al., 2021). International agencies propose that a prior assessment of possible impoverishment is necessary. Maintaining social stability is crucial for economic development. According to Schopp (2020) and Vanclay (2020) a social framework tool that is based on community engagement, livelihood analysis, and an asset-based approach is essential in the restoration of people's capacities. The studies Schopp (2020) and Vanclay (2020) state adopting a holistic management plan for resettlement is critical to achieving water project success but fail clearly propose the model.

Cultivated land and rural residential land represent a people's livelihood. Such land provides the spatial foundation for agricultural production. Irrespective of the purpose, large-scale projects typically require land, leading to the dislocation of people and disruptions of livelihoods (Nguyen & Singer, 2023). According to Uwayezu & de Vries (2019), questions on whether expropriation promotes spacial justice have been raised several times when large projects are implemented. Compensation is either paid in monetary form, land for land, government bond issuance, equity shares in a government-owned entity, or transfer of development rights (Piróg et al., 2019). Land issues result in the petitioning of financiers by people affected by the project and can result in total abandonment of water projects. Hoogendam & Boelens (2019), in their article Dam and Damages, the author identifies that divergent knowledge systems in valuation lead to adverse compensation. Hoogendam & Boelens (2019) state that the lack of systematic plans make the compensation process difficult.

Problems may arise during land acquisition for water projects mainly because of reduced tenure security (Vanclay, 2020). People affected by the water project may feel their rights of ownership are being violated by the government, mainly when they are not compensated satisfactorily (Mucherera & Spiegel, 2022). Common gaps in ownership can affect the resettlement process, such as absentee landowners, informal landowners, joint ownership, outstanding loans, customary or communal land tenure, and successive inheritance of land (Mukirane, 2022). These issues lead to complications in identifying landowners to be compensated, legal claims, and delays in compensation implementation. Computation errors may arise for unregistered land, leading to complaints, litigation, and water project delays (Wiegink & García, 2022).

Resettlement areas may be remote and lack basic amenities such as hospitals and schools, leading to increased illiteracy, electricity, and water (Wiegink & García, 2022). The lack of these amenities means the communities have a poor quality of life. For example, the Hoa Binh hydropower project only successfully displaced people and left them highly impoverished because the compensation was inadequate (Dao, 2021). Most projects are implemented without rehabilitation or restoration programs of the resettlement.

Land access falls short of the expectations of displaced communities (Nguyen & Singer, 2023). Land prices and uses are changing, so finding quality and affordable replacement land for rural Resettlement is difficult with insufficient compensation (Fukui, 2021). Due to the unavailability of land, sometimes the resettled communities are forced to settle in smaller portions, unlike what they owned previously. For example, in the case of the Son La Dam project in Vietnam, people who owned 5 to 6 ha of land were forced to resettle in 0.3 ha portions.

Land regulations ensure that resettlement processes and projects are implemented appropriately (Ogwang & Vanclay, 2019). The International Finance Corporation (IFC) requires projects funded by the IFC to avoid, minimize, and reduce consequences of involuntary Resettlement that result from projects. The RAP report should identify all people affected by the project and all adverse impacts on livelihood during acquisition. Despite these provisions by international institutions, most developing countries have complicated resettlement processes. For example, in Uganda, land laws recognize customary, freehold, Mailo, and leasehold (Ogwang & Vanclay, 2019). Over 70% of land in Uganda is under customary tenure without a certificate of ownership.

In Kenya, Kieti,(2021) argue that although the Land Act (2012), Sessional Paper No. 3 of 2009, Constitution of Kenya, Land Amendment Act, Environment Management Coordination Act, Community Land Act, Land Value Index Act, Water Act provide provisions for compulsory acquisition, these laws are marginally applied. Complaints about livelihood restoration remain

unaddressed. Developed countries such as Spain, Germany, and Holland have regulation laws on valuation, but developing countries need more legal regulations to determine land values. There are issues with the quantum of compensation (Desalegn & Solomon, 2022). The results of the failure of land laws lead to weak compensation and limited consultation with people affected by the project, which may adversely affect the project. It creates uncertainties, prolonged court cases, inadequate compensation, and grievance redress mechanisms.

During Resettlement, the risk matrix comprises socio-economic, legal, information limitation, and cost overruns risks. According to Cernea, 2021, existing methods of project risk analysis overlook qualitative and social dimensions. Legal issues arise from the implementation of projects due to exclusionary processes that result in potential harm to resettled people. According to Chen et al. (2021), unjust practices, unfair compensation, and imbalance of land rights between women and men are leading causes of contestation of projects being implemented.Displaced persons are subjected to uncertainties such as inaccurate estimates of the height of post-flooding water levels and may experience floods in their farms. Resettled people may also find themselves in severe disputes with communities in areas where they move over land use and resources. Water projects may require people to move to higher grounds of reservoirs being built (Dao, 2021). In this case, people lose their houses and quality farming lands. For example, in implementing the Itaparica dam, the government changed its commitment, and a promise to complete irrigation districts needed to be honored. In such a case, the people affected by projects were left to bear the brunt of reconstruction. Although guidelines are laid out by the World Bank and project financiers such as AfDB, most project sponsors do not adhere to the set guidelines (Chen et al., 2021). Less incorporation of set policies often leads to less protection of the rights of people affected by the project. The consequence is increased resistance and violence during water project implementation. The discriminatory character of the law leads to ethical controversies on whether the existing resettlement implementation fully protects the rights of the resettled population.

Resettlement is a big deal, and costs can run into billions. Most social costs, which include rebuilding houses, severing personal ties, longer average commuting distances, and increased transportation costs, are often overlooked. The wholesale accounting of costs makes them fallacious. Monetized costs usually include the human costs of population displacement, environmental costs, or biodiversity loss (Desalegn & Solomon, 2022). The resultant effect of overlooking some costs leads to delay of projects. The resettled people are also forced to pay additional costs due to delays in compensation. Nguyen and Singer (2023) argue that most governments do not accept liability for indirect costs involved in resettlement. Costs budgeted for are always less than the actual costs. Development-induced displacement gives a tapestry of cultural and human rights issues (Cernea, 2021). Therefore, a proper resettlement risk mitigation matrix should be developed to address the risks.

3.2 Theoretical Frameworks

This study was guided by two theories: the political ecology theory and the impoverishment risk and reconstruction model.

Political ecology theory was developed by Julian Steward in the 1920s through to the 1950s. Steward called his model cultural ecology (Roberts, 2020). Steward explains human social organizations as a functional adaptation to local environments and requisite subsistence practice (Roberts, 2020). He argued that features related to subsistence activities and economic arrangements make up the cultural core of any society.

The theory states that power dynamics, social inequalities, capital accumulations, and social relationships influence environmental change and resource distribution (Mukherjee et al., 2021). He argues that environmental issues are not only technical but are also political. He argues that resource distribution is a factor of power dynamics and results in inequities associated with development. The model provides a holistic approach that advocates for social and environmental justice to promote fair and sustainable resource distribution. Although critiques argue that the model does not offer practical solutions to structural constraints, it serves as a guideline on how political power influences resettlement implementation and livelihood restoration.

Michael Cernea developed the impoverishment, risk, and reconstruction model in the 1990s. He argued that the onset of impoverishment comprises eight risks: landlessness, joblessness, marginalization, food insecurity, increased morbidity and mortality, loss of access to common property, and social disarticulation. Cernea argued that overcoming these risks requires achievable reversal through focused strategies such as financing (Cernea, 2021). According to the model, reconstruction entails land-based resettlement, reemployment, house reconstruction, social inclusion, improved health care, adequate nutrition, restoration of community assets, and social rebuilding (Cernea, 2021). The model summarizes its propositions into four functions: predictive, diagnostic, problem resolution, and research.

The predictive function identifies the risks and helps planners recognize the risks, especially when handling hidden new situations (Cernea, 2021). The diagnostic function reveals the risks to policymakers and affected communities and proposes how to counter them. The problem-resolution functions guide the reconstruction and reestablishment (Cernea, 2021). The research function formulates field investigations and compares how impoverishment has been handled in other areas. The model by Cernea has often been criticized as over simplifying the nature of displacement and might not capture the context. However, despite this, the model provides a guideline on how resettlement can be implemented to achieve livelihood restoration without affecting the implementation of the project. Abid et al. (2023) discussed the impacts of the resettlement of the Ghazi Barotha Hydro power project in Pakistan. The study utilized cross-sectional studies of 223 resettled persons, examining sustainable development and cultural resilience as mediating factors in resettlement satisfaction. The study identified dissatisfaction with the resettled population because of

joblessness, marginalization, food insecurity, increased morbidity and mortality, loss of access to common property, and social disarticulation. The study used partial least squares equation modeling to measure affected persons satisfaction. The study suggested that policies should focus on protecting the rights of resettled people. It means the creation of a framework that promotes collaborative efforts between the communities and governments to achieve sustainable development. Most of these studies are limited in scope, and they discuss at least one parameter, such as livelihood restoration and impoverishment risk, as discussed by Cernea (2021). Most studies are based on single case studies with limited comparative studies.

Conceptual Framework

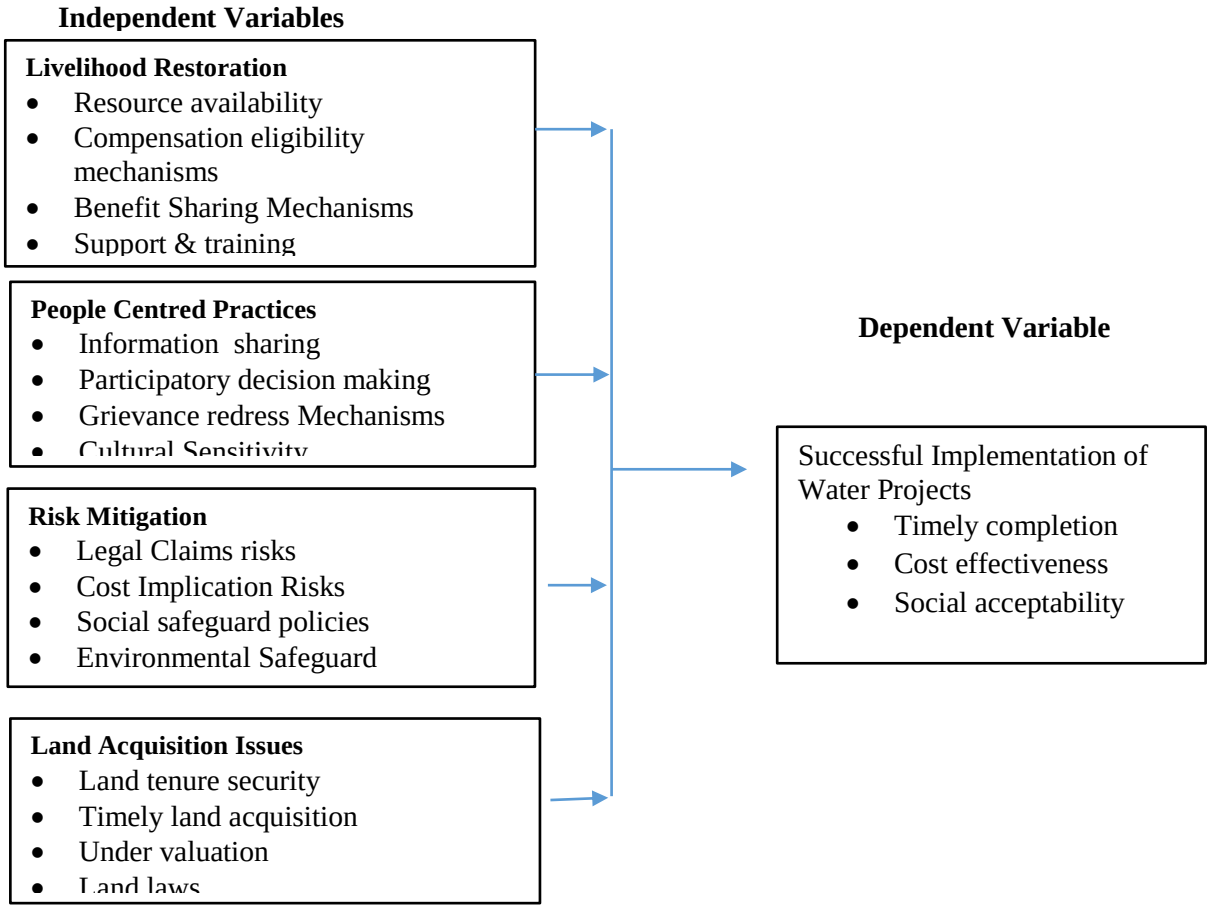

Figure 1: Conceptual Framework

4. Methodology

This study adopted an ex post facto research design with a descriptive survey methodology to provide evidence on resettlement implementation in water Projects: A Case of Northern Collector Tunnel Murang'a County. This technique was suitable for this study because it assisted in conducting social research where it is not possible or acceptable to manipulate characteristics of human participation (Siedlecki, 2020). The design is relevant because it attempts to look at the the problems facing a population within a unit or population by studying them in their natural state.This design is an after-the-fact that examines cause-and-effect relationships. The research targeted 747 people the target population was 747 persons affected by project in Kangema and Kigumo Sub Counties in Murang'a Kenya. A sample of 261 respondents was determined using Yamane formula with simple random sampling being used to select the actual sample. Raw data was collected using interviews and questionnaires. Reliability test was established and confirmed using Cronbach Alpha Coefficient where all the variables had a result above 0.7. Quantitative data was coded and results generated and summarized using SPSS (Statistical Packages for Social Sciences) to generate percentages, standard deviations, means, frequencies. Inferential statistics namely coefficients of correlation, regression and F statistic test at 95% confidence levels were generated.

5. Results and Discussions

The study on resettlement implementation in water projects: A case for Murang'a Northern Collector tunnel emphasize the following key findings.

Livelihood Restoration Efforts during Resettlement in Water Projects

Table 1: Livelihood Restoration Efforts Responses

Source: Field, 2024

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Timely_adequate_compensation	185	1	5	2.07	1.198
Fair_transparent_renumeration	185	1	5	1.90	1.064
Post_resettlement_support_training	185	1	5	2.10	1.189
Benefit_sharing_mechanisms	185	1	5	2.08	1.211
Valid N (listwise)	185				

The study results showed that on a scale of 1 to 5, with 1 representing strongly disagree and 5 strongly agree, the participants were dissatisfied with the process of livelihood restoration during resettlement implementation in the water project. The mean scores of all the indicators fell below 2.5. Fair enumeration had 1.90, timely compensation 2.07, direct benefits for affected persons 2.08, and adequate post-resettlement support and training 2.10. The standard deviations were also low, with timely and adequate compensation at 1.198, fair enumeration at 1.064, adequate post-resettlement support and training at 1.189, and benefit sharing for affected persons at 1.211 indicating that the participants' views on livelihood restoration concerns were consistent and indicated inadequacies of the livelihood restoration process and hence the need to improve resettlement processes.The findings of this study revealed that most of the respondents felt that resettlement measures that were put in place during implementation of Murang'a Northern Collector tunnel were inadequate.In their views measures to restore livelihood such as benefit sharing through water supply to the host community , adequate resources for compensation, provision of support and training and fair enumeration of affected persons were not adequate to restore livelihood. The mean were below 2.5 showing widespread dissatisfaction with the measures for livelihood restoration.

People Centred Practices during Resettlement Implementation

The paper revealed that people centred practices such as public engagement in decision making, grievance redress mechanisms, information sharing and sensitivity to cultural practices of the community were limited. The respondents agreed or disagreed on being adequately satisfied with the people centred practices as shown in the table 2.

Table 2: Analysis of People-Centred Practices Responses

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Grievance Management Mechanisms were effective	66(35.7%)	64(34.6%)	29(15.7%)	9(4.9%)	17(9.2%)
Information Sharing and disclosure of resettlement plans was effective	75(40.5%)	60(32.4%)	27(14.6%)	15(8.1%)	8(4.3%)
The project team was sensitive on affected persons culture and practices	71(38.4%)	53(28.6%)	26(14.1%)	23(12.4%)	12(6.5%)
Community was involved in decision making through public participation	75(40.5%)	61(33.0%)	31(16.8%)	13(7.0%)	5(2.7%)

Source: Field, 2024

The respondents' views revealed that the resettlement processes fell short of people-centred practices. In most cases, developing countries follow top-down approaches in decision-making closed doors or through pseudo-participation (Nikuze et al., 2020). This exclusionary decision-making often forces the people affected by the project to exhibit contestation, and this has been observed with various protests against water projects. During implementation of Murang'a Northern Collector tunnel the project faced similar

resistance from the local community and local authorities because they felt passive for non involvement especially those in lower Tana and areas such as Kangari.Table 4.2 displays the results as follows:

Land Issues during Resettlement in Water Projects

In table 3 the study findings indicated that the participants' average mean rating of land acquisition processes on a scale of 1- 5 with 1 representing strongly disagree and 5 strongly agree they were below 2.5. Compensation of Informal land owners had 2.04, Fair Market Valuation 2.03, Timely land acquisition 2.01, and Compliance with relevant laws 2.02. The standard deviations were also low, with Compensation of Informal land owners being 1.1190, Fair Market Valuation 1.213, Timely land acquisition 1.147, and Compliance with relevant laws 1.159. indicating that the participants' views were consistent and indicated inadequacies of the land acquisition processes during resettlement. The low standard error of mean revealed that the views of the respondents were consisted and could be relied on to deduce conclusions on resettlement implementation in water projects.

Table 3: Land Acquisition Efforts Responses

	Compensation of Informal land owners	Fair Market Valuation	Timely land acquisition	Compliance with relevant laws
Total Respondents	185	185	185	185
Mean	2.04	2.03	2.01	2.02
Std. Error of Mean	.088	.089	.084	.085
Std. Deviation	1.190	1.213	1.147	1.159
Variance	1.417	1.472	1.315	1.342

Source: (Field, 2024)

The paper identified that land issues such as under valuation of way leaves,failure to compensate informal land owners who had occupied parcels for more than 30 years on parcels with absentee land lords, untimely land acquisition and non compliance to laws on fair valuation and compensation were synonymous with Murang'a Northern collector tunnel. The results of the land tenancy issues, failure of land laws and lack of standardized valuation processes lead to weak compensation and limited consultation with people affected by the project, this adversely affect projects by creating uncertainties, prolonged court cases and inadequate compensation.

4.4 Resettlement Efforts and Success of Water projects

The regression model was utilized to present the results of resettlement implementation efforts and the success of water projects, as shown in Table 4. The regression equation was as follows:

$Y=b_0+b_1X_1$(land acquisition issues scores)$+ b_2X_2$ (people-centred practices scores) $+ b_3X_3$(risk mitigation scores) $+ b_4X_4$ (livelihood restoration scores) +£

Where Y is the dependent variable, which is the success of the water projects

b is the constant while b_1, b_2, b_3, and b_4 are regression coefficients. X_1 comprises land acquisition issues scores, X_2 people-centred practices scores, X_3 risk mitigation scores, and X_4 livelihood restoration scores, £ is the error

Table 4: Resettlement Implementation and Project Success Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.886[a]	.784	.779	1.10141

a. Predictors: (Constant), risk_management_scores, livelihood_scores, people_centred_practices_scores, land_issues_scores

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	793.618	4	198.405	163.550	.000[b]
	Residual	218.360	180	1.213		
	Total	1011.978	184			

a. Dependent Variable: project_success_scores

b. Predictors: (Constant), risk_management_scores, livelihood_scores, people_centred_practices_scores, land_issues_scores

Source: Field,2024

The multi linear coefficient of R=0.886 indicates a moderate positive relationship between risk management efforts in resettlement implementation and water projects. The R squared value of 0.784 means that 78.4% of total variations in project success can be addressed by factors such as risk management, livelihood restoration, people-centered practices, and land acquisition issues. A standard error of the estimate of 1.10141 indicates that resettlement efforts collectively influence the variability of project success scores. An adjusted square of 0.779 suggests that resettlement efforts account for 77.9% of water project success in terms of stakeholder satisfaction, timely implementation, cost variations, achievement of project objectives regarding resettlement, and social acceptability. The F statistic of 163.550 and significance level of 0.000 indicates that the overall regression model is statistically significant validating the key role that resettlement implementation plays in achievement of water projects such as timely implementation, social acceptability and effective cost management. The findings of this paper concur with Nikuze et al., (2019) that lack of accurate data on displaced households, inadequate resources and late payments results to uncertainties that lead to dissatisfaction of the affected persons with livelihood restoration efforts. Insufficient funding for resettlement and rehabilitation programs can hinder the effective restoration of livelihoods and the overall well-being of the affected communities. Therefore to achieve effective resettlement implementation there is need to ensure adequate resources are available for resettlement. Households being resettled should be key actors in the process of resettlement planning. Both the pre and post resettlement impacts should form the basis of the resettlement action plans.

6. Conclusions and Recommendations

The study established that resettlement implementation efforts for the Murang'a Northern Collector Tunnel water projects were inadequate causing public dissatisfaction and slow project delivery. Some of the issues were delayed and insufficient compensation, problems of undervaluation of land, non involvement of affected persons in decision-making, poor grievance handling mechanisms, and non-compliance with the provisions of the law. These disatisfaction resulted to project delays, resistance from the community and increased costs which rose from KES 6.5 billion to KES 9. 5 billion. The results suggest that resettlement planning should comprehensively, engage all the stakeholders equitably, observing the law, and balancing social, economic, and environmental issues in order to facilitate successful completion of the project.

In order to overcome these issues, the study recommended the use of human centered designs in the formulation of the resettlement Action Plans (RAPs). The government should work towards harmonizing the numerous land acquisition laws and creating a dependable national land value index. There is also need to develop sound resettlement action plans with specific focus on addressing complaints and implementing key stakeholder relations and sound social and environmental dimensions. Adoption of transdisciplinary collaboration in livelihood restoration is necessary. Therefore future research should focus on the influence of digital land management platforms such as Ardhisasa on the improvement of land acquisition processes. Researchers should also explore the effectiveness of integrated comparative risk management solutions in enhancing resettlement outcomes and provide methodological recommendations for extensive water projects in developing countries.

Conflict of Interest

The authors declare that they do not have conflict of interest.

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