Original Article

Informal Settlement Upgrading and Rehousing and Its Impact on Urban Resilience in Rwanda, A Case Study of Mpazi in Kigali City

Cesar Dusabeyezu[1,2], Richard Mind'Je[1], Domina Izabayo[3] & Gisele Uwizeye[1]*

[1] University of Lay Adventists of Kigali, P. O. Box 6392, Kigali, Rwanda.
[2] City of Kigali, P. O. Box 3527, Kigali, Rwanda.
[3] Engineering and Property Valuation Services, Kigali, Rwanda.
* Author for Correspondence Email: mindjerichard@gmail.com

ABSTRACT

Informal settlements are prevalent in rapidly urbanising regions, often characterised by inadequate infrastructure and services, rendering them vulnerable to various socio-economic and environmental challenges. This study examined the impacts of informal settlement upgrading and rehousing on urban resilience in Rwanda, taking Mpazi as the case study. To achieve this, a mixed-methods approach that integrated qualitative and quantitative data was utilised. With these approaches, questionnaires were administered to 400 randomly sampled residents to gather quantitative data on upgraded housing status, socioeconomic indicators, access to services, and perceptions of resilience. Moreover, in-depth interviews and focus group discussions were conducted with purposively sampled community leaders, local government officials, and NGOs to obtain rich qualitative insights into the upgrading processes and their impacts on community dynamics. In addition, a regression analysis was performed to establish the relationship between the informal settlement upgrade, housing, and the urban resilience of the community living in the upgraded settlements. The results revealed that constructed housing quality was of very good status as rated by the respondents considering the obtained high overall mean of 3.89 interpreted, access to socio-economic services rated at a high level considering an overall high mean of 3.71, a high level of social cohesion and empowerment with an overall mean of 3.75 and, rehabilitated and constructed basic infrastructures rated at a high level considering an overall mean of 3.95. Regarding the contribution of urban development initiatives in enhancing the community's capacity to cope with urban stresses, the findings revealed that upgrading and rehousing have been shown to have indisputable improvements, as agreed by respondents, with an overall high mean of 3.77. Finally, the findings indicate a positive relationship between informal settlement upgrading, rehousing, and urban community resilience as evidenced by an R^2 of 0.630, implying that informal settlement upgrading contributes to rehousing and thus, urban resilience. Conclusively, it can be said that if informal settlement upgrading is well implemented, it can have a great positive influence on rehousing and thus

contribute to the urban resilience of the community. The findings are anticipated to contribute to urban policy discussions and provide practical insights for sustainable development strategies in Rwanda and similar contexts, ultimately supporting the resilience of urban settlements in the face of ongoing global challenges.

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INTRODUCTION

Informal settlements have emerged as a critical issue in urban development worldwide, particularly in developing countries [1]. Rapid urbanisation, driven by economic migration and population growth, has led to significant housing deficits, pushing millions into precarious living conditions. About 30% of the urban population in developing regions lives in slums, where access to basic services is often limited [2]. Africa is experiencing unprecedented urban growth, with cities like Nairobi (Kenya) and Lagos (Nigeria) grappling with extensive informal settlements. Due to economic mobility, fast urbanisation, and insufficient housing regulations, informal settlements continue to pose a serious threat to urban development [3]. These salient features highlight the circumstances and difficulties encountered in African informal communities [4].

Many developing countries are convinced that the process of upgrading and rehousing informal settlements will help to improve a city's reputation and is a component that aims to draw in more investors and expand opportunities for economic growth. There are currently insufficient studies on the effects of recent "city-making" in Africa, particularly in Sub-Saharan Africa [4-5]. In Sub-Saharan Africa, an estimated 60% of urban dwellers reside in informal settlements. Cities with sizable populations and frequently inadequate infrastructure and services include Nairobi, Kenya; Lagos, Nigeria; and Johannesburg, South Africa. Sanitation facilities and clean water are often unavailable to residents of informal settlements [5]. High rates of infectious diseases like cholera and typhoid result from this, especially during the rainy season when flooding makes sanitary conditions worse. Living in unstable circumstances can be stressful, and many inhabitants experience anxiety and sadness as a result of their uncertain housing and employment prospects [6]. Inadequate dwelling structures, frequently constructed from impermanent materials, are a defining feature of many informal communities. As a result, they are vulnerable to environmental risks, including fire and floods [7].

Inadequate transportation systems in informal settlements might further cut off inhabitants from employment prospects and basic amenities like healthcare and education. Residents of informal settlements lack legal status and land rights since they are frequently left out of official urban planning procedures [8]. Conflict and instability may result from this marginalisation. In many instances, locals have spearheaded neighbourhood-based projects to enhance their quality of life while promoting improved infrastructure and services. To be successful, these initiatives frequently need assistance from NGOs and municipal governments. The complicated and multidimensional conditions of Africa's informal settlements necessitate all-encompassing approaches, including boosting access to services, guaranteeing stable land tenure, and building infrastructure. These issues must be resolved to promote sustainable urban growth and raise the standard of living for the millions of people who reside in these unstable areas [9].

Over 60% of Rwanda's urban population lives in informal settlements, which are frequently characterised by subpar housing, restricted access to essential services, and increased susceptibility to shocks related to the economy, society, and environment [10]. Kigali's three districts have different proportions of unplanned settlements; most unplanned homes are located in Nyarugenge district, followed by Kicukiro and Gasabo Districts [11]. As is the case in the City of Kigali, the Mpazi informal settlement is facing the challenge of dealing with uncontrolled rapid urban growth and unplanned development due to the absence of detailed physical plans for the respective urban areas. This area requires a huge investment in infrastructure [12].

This informal settlement area is even more challenging because its areas are built, and getting space for the much-needed infrastructure is a big challenge in informal areas [13]. Despite the critical issues at stake and their profound implications for urban sustainability, there remains a concerning lack of scientific research examining the comprehensive impacts of upgrading and rehousing initiatives on urban resilience in this context [14]. Therefore, the current study aimed to fill this evident research gap by evaluating how informal settlement interventions in Mpazi have influenced various dimensions of urban resilience, including social cohesion, economic stability, environmental sustainability, and institutional adaptation [15].

This research provided valuable insights for policymakers, urban planners, and development practitioners seeking to design more effective and holistic approaches to informal settlement challenges [16]. The findings contributed to the much-needed scientific understanding of urban transformation in Rwanda and offer practical recommendations that can inform future upgrading strategies throughout Kigali and other rapidly urbanising African cities [17]. The specific objectives of the study are to: (1) assess the current status of informal settlement upgrading and rehousing efforts in Mpazi. (2) To evaluate the contribution of urban development initiatives in enhancing urban Resilience in Mpazi. And (3) To analyse the relationship between the extent of informal settlement upgrades and the rehousing on urban resilience of the community in Mpazi.

MATERIALS AND METHODS

Study Area Description

Mpazi, an informal settlement in Rwanda's Kigali City, serves as an example of the challenges associated with resilience and urban growth in quickly evolving environments. Mpazi is known for informal housing and restricted access to necessary infrastructure (roads, clean water, sanitary facilities, etc.) [18]. The community's different socioeconomic classes struggle with poverty and high unemployment rates. This region serves as a dynamic case study for analysing how various urban upgrading programs affect urban resilience because

it has been the focus of numerous initiatives aiming at improving living circumstances [19]. The continuous community involvement in these initiatives underscores the significance of participatory approaches in promoting sustainable development by offering insightful information about local needs and attitudes [20]. Furthermore, since Kigali strives to become a model of sustainable urbanisation, the lessons learnt from Mpazi can feed broader policy frameworks, boosting resilience not only inside the settlement but also across similar urban settings in Rwanda. Mpazi is therefore a prime location for research into the relationship between urban resilience, rehousing, and upgrading of informal settlements [21].

Figure 1: Map Indicating the Location of Mpazi.
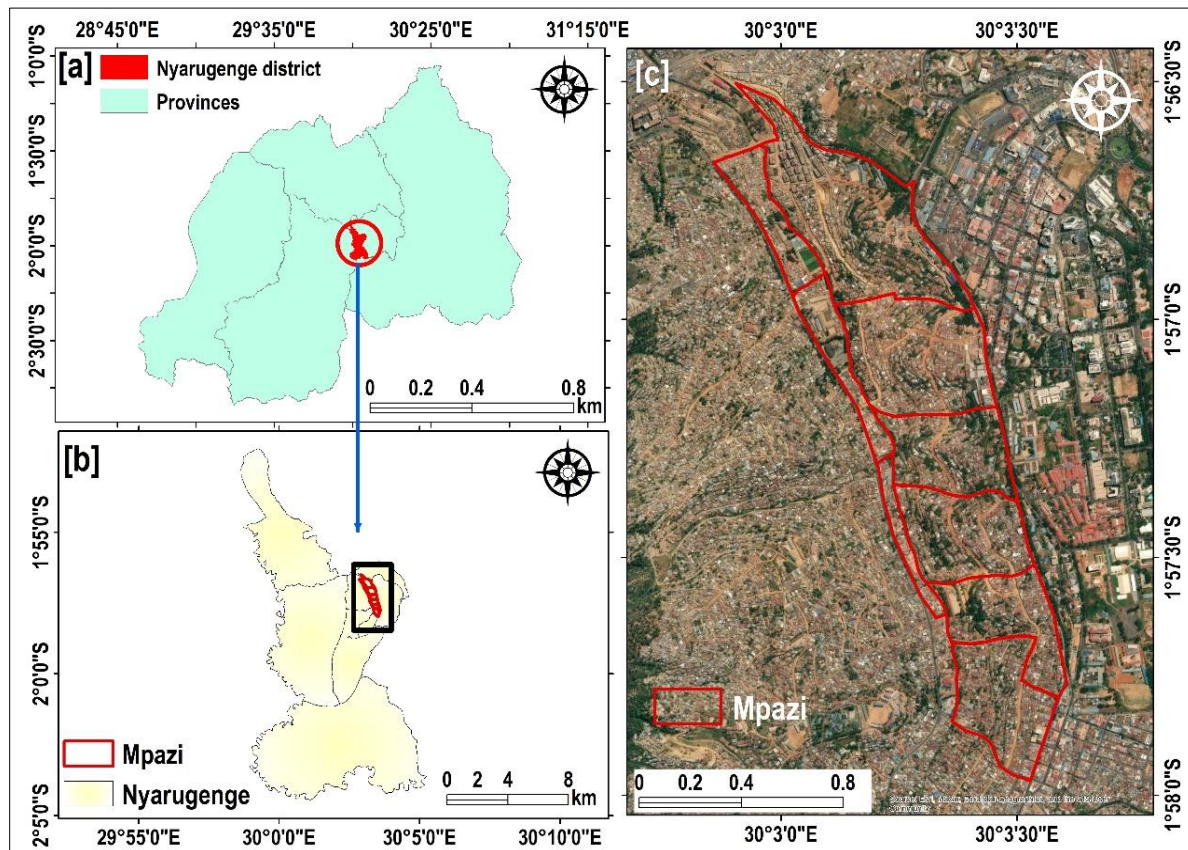
Sources: *Author, 2025*

Methods

This study combined qualitative and quantitative methods to investigate community perceptions, challenges, and benefits of urban upgrading in Kigali. Qualitative data provided insights into social and infrastructural changes from residents' perspectives, while quantitative analysis evaluated community participation and the effects on economic growth, health, and quality of life. Drawing on primary surveys, participatory planning, and secondary project reviews, the research highlighted the importance of inclusive, resident-focused approaches that address issues such as land acquisition and displacement.

Population and Sampling Design

Targeted Population

The study focused on Mpazi, Kigali, where informal settlement upgrades target approximately 34,817 residents across 137 hectares, though localised rehousing efforts in specific phases (e.g., Blocks A-W) involve smaller populations, such as 2,000 residents in a 4-hectare area [22]. The stratified sample of 400 residents was derived from a population of 34,817 using the Cochran formula for finite populations [23].

$$n = N.Z^2. \, p \cdot q$$

$$e^2(N-1) + Z^2 \cdot p \cdot q$$

where N=34,817, Z=1.96 (95% confidence level), p =0.5(maximum variability), q=1−p,
and e=0.05 (margin of error). This yielded a minimum sample of 381, rounded to 400 to ensure robustness. Stratification ensured proportional representation across age (18–65+), gender, and socioeconomic tiers, while purposive sampling included 30 key stakeholders (displaced residents, local leaders, and planners). Secondary data was drawn from prior studies on Kigali's resettlement impacts, including the 2019 journal analysis of pre- and post-relocation livelihood disruptions, and Skat Consulting's case studies on Mpazi's rehousing logistics [24].

Table 1: Mpazi Settlement Population Per Cell (18 to 51 and Above Years Old)

Sectors	Cells	Population	Sample size per cell
Kimisagara	Katabaro	418	25
	Kimisagara	501	29
	Kamuhoza	124	8
Subtotal	**3**	**1,043**	**62**
Gitega	Akabahizi	1,097	62
	Akabeza	924	56
	Gacyamo	1035	59
	Kigarama	1044	60
	Kinyange	802	46
	Kora	971	55
Subtotal	**6**	**5,873**	**381**
Total	**9**	**6,916**	**400**

Primary data collection combined household surveys (structured questionnaires), 45 semi-structured interviews, and 8 focus group discussions (7–9 participants each). Systematic observations tracked infrastructure changes, economic activity, and social cohesion during 10-week field visits. Quantitative data underwent correlation analysis (e.g., Pearson's r to link infrastructure access and income changes):

$$r = \frac{\sum(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum(X_i - \bar{X})^2 \, \sum(Y_i - \bar{Y})^2}}$$

The multivariate regression to isolate upgrade impacts was derived from the following equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \epsilon$$

Where Y represents dependent variables (e.g., quality of life) and X_k includes predictors like drainage improvements or job opportunities. Qualitative responses were thematically coded using SPSS and Microsoft Excel 2016, aligning with DFID's livelihood assets framework to categorise physical, financial, and social impacts. A

participatory approach integrated community feedback into planning, mirroring the City of Kigali's strategy to prioritise resident input in the Mpazi Rehousing Model. This mixed-methods design captured nuanced interactions between urban upgrades and community resilience, providing actionable insights for scaling equitable redevelopment.

RESULTS

Socio-demographic Characteristics of Respondents

The socio-demographic characteristics of the respondents in this study included gender, age, education level, and the primary occupation of the household head. Table 2 shows the socio-demographic profile of respondents, revealing a nearly balanced gender distribution with 52.8% female and 47.3% male participants, ensuring diverse perspectives. Most respondents were aged 51 and above (57.5%), followed by those aged 31-50 years (41%), and a small proportion aged 18-30 years (1.5%). Household sizes were predominantly large, with half having seven or more members (50.5%), and nearly as many with 4-6 members (47.5%). Educational attainment was mostly limited to primary education (67%), with fewer completing secondary (16.3%), no education (12.5%), or university (4.3%). Employment status showed a majority of self-employed (43.8%), a significant unemployed group (30.3%), employed individuals (24.5%), and a small number of students (1.5%), reflecting the urban economic reliance on trading activities. Regarding informal settlement upgrading and rehousing, these efforts focus on improving residential areas where occupants lack legal land claims or where housing does not meet planning and building standards; the study aims to assess the current status of such initiatives in Mpazi.

Table 2: Distribution of Respondents Per Socio-demographic Profile

Variable	Category	Frequency	Percentage (%)
Gender	Male	189	47.3
	Female	211	52.8
Age	18-30	6	1.5
	31-50	164	41
	51 and above	230	57.5
Household size	1-3 members	8	2
	4-6 members	190	47.5
	7 and more	202	50.5
Education level	No formal education	50	12.5
	Primary school	268	67
	Secondary school	65	16.3
	Higher education	17	4.3
Occupation	Employed	98	24.5
	Self-employed	175	43.8
	Unemployed	121	30.3
	Students	6	1.5

The Current Status of Informal Settlement Upgrading and Rehousing Efforts in Mpazi.

Informal settlements are residential areas where groups of housing units have been built without legal land tenure or in violation of planning and building regulations. Upgrading and rehousing initiatives aim to improve living conditions in these areas, either by enhancing existing infrastructure or by relocating residents to compliant housing.

Table 3: Views of Respondents on Constructed Housing Quality (N=400)

Statements	Mean	Std. Deviation	Comments
The houses have been constructed under the urban master plan approved by the City of Kigali	3.92	0.481	High mean
			Homogeneity
The houses constructed have channels of water and cannot be affected by landslides.	3.71	0.89	High mean
			Heterogeneity
The houses are constructed with high-quality materials.	4.01	0.499	High mean
			Homogeneity
There is supervision and inspection of the quality of houses constructed	3.93	0.397	High mean
			Homogeneity
Overall mean	**3.89**		

Source: *Primary data, 2025*

The respondents generally expressed a high level of agreement regarding the quality of the constructed houses, with all four statements receiving high mean scores: adherence to the City of Kigali's urban master plan (mean 3.92), presence of water channels preventing landslides (mean 3.71), use of high-quality materials (mean 4.01), and supervision and inspection of construction quality (mean 4.93). The overall mean score of 3.89 indicates a strong positive perception of housing quality, supported by homogeneous responses as indicated by low standard deviations.

Figure 2: Rehousing Appearance in Mpazi.

Before Rehousing   **After Rehousing**
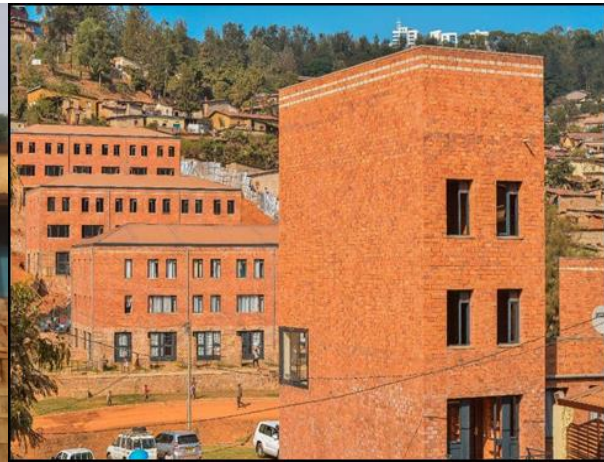
Source*: Rwanda Urban Development Project Phase II (2022)*

Table 4: Views of Respondents on Access to Socio-economic Services (N=400)

Socio-economic services	Mean	Std. Deviation	Comments
People come from rural areas to seek jobs from the riches of urban people	3.54	0.809	High mean
			Heterogeneity
There is a water supply in Mpazi as planned infrastructure	3.71	0.776	High mean
			Heterogeneity
It is easy to make internal roads and bridges in Mpazi for access to goods and other services required by people	3.76	0.563	High mean
			Heterogeneity
There is electricity accessibility in Mpazi	3.84	0.554	High mean
			Heterogeneity
Overall mean	**3.71**		

Source: *Primary data, 2025*

The findings from Table 4 show the views of respondents on access to socio-economic services. For the first statement, the respondents revealed that people move from rural areas to seek jobs in the riches of urban areas. The statement was agreed by the respondents with a high mean of 3.54. For the second statement, the respondents attested that there is water supply infrastructure in the village, as agreed by the respondents with a high mean of 3.71. The respondents reported that it is easy to make internal roads and bridges in Mpazi for access to goods and other services required by people, as agreed by respondents with a high mean of 3.76. Lastly, the respondents revealed that there is electricity accessibility in Mpazi, as agreed with a mean of 3.84, interpreted as a high mean. In partial conclusion, it is to say that access to socio-economic services was improved by considering the overall 3.71, which is interpreted as a high mean. These findings are supported by the observation in Figure 3 - 5.

Figure 3: Road of Upgrading in Mpazi.

Before Upgrading   **After Upgrading**

Source: *Rwanda Urban Development Project Phase II (2022)*

Figure 4: Bridge Upgrading in Mpazi.

Before Upgrading,   **After Upgrading**

Source: *Rwanda Urban Development Project Phase II (2022)*

Figure 5: Kora Cell Offices Constructed.

   Before upgrading,   **After upgrading**

Source: *Rwanda Urban Development Project Phase II (2022)*

Table 5: Views of Respondents on Social Cohesion and Empowerment (N=400)

	Mean	Std. Deviation	Comments
The mortality rate has diminished due to relocation from a high-risk zone to a formal settlement	3.96	0.247	High mean
			Heterogeneity
There is low-cost rental housing affordable for poor people.	3.25	0.974	Moderate mean
			Heterogeneity
The citizens participate actively in planning meetings	4.16	0.378	High mean
			Homogeneity
Overall mean	**3.75**		

Source: *Primary data, 2025*

The results presented in Table 5 show the views of respondents on social cohesion and empowerment, whereby in the first statement, the respondents attested that the mortality rate has diminished thanks to residents' relocation from high-risk zones to formal settlements. The respondents agreed with this statement, with a mean of 3.96 (high mean). For the second statement, the respondents attested that housing is affordable even for the poor through a low cost of rent, as agreed by respondents with a moderate mean of 3.25. Lastly, the respondents revealed that the citizens participate actively in planning meetings with a mean of 4.16, interpreted as a high mean. Social cohesion and empowerment provided to citizens by informal settlement upgrading are well appreciated since the overall mean was 3.91, which is interpreted as high.

Table 6: Views of Respondents on Basic Infrastructures Rehabilitated and Constructed (N=400)

	Mean	Std. Deviation	Comments
There are educational and sports infrastructures that have been rehabilitated.	3.86	0.6	High mean
			Heterogeneity
There are channels of water that have been rehabilitated	3.95	0.397	High mean
			Homogeneity
Some footpaths have been constructed	4.06	0.447	High mean
			Homogeneity
Overall mean	**3.95**		

Source: *Primary data, 2025*

The findings from Table 6 present the views of respondents on basic infrastructures that have been rehabilitated and constructed. The respondents revealed that there are education and sports infrastructures that were rehabilitated as agreed by respondents, with a mean of 3.86, interpreted as a high mean. Secondly, the respondents attested that there are channels of water that were rehabilitated, considering the mean of 3.95, interpreted as a high mean. For the third statement, the respondents revealed that there are footpaths that have been constructed with a high mean of 4.06. In brief, it is to say that the city of Kigali has good participation in providing basic infrastructures rehabilitated and constructed for citizens, considering the overall high mean of 3.95.

The Contribution of Urban Development Initiatives in Enhancing the Community's Capacity to Cope with Urban Stresses in Mpazi

The second specific objective of this study was the contribution of urban development initiatives in enhancing the community's capacity to cope with urban stresses in Mpazi. This was evaluated in terms of Physical and technological infrastructure, Local business support, and Mobility and transportation.

Table 7: Views of Respondents' Urban Resilience (N=400)

	Mean	Std. Deviation	Comments
There is an adequate road, sanitary, and electrical infrastructure in this area	3.61	0.772	High mean
			Heterogeneity
The environmental risks have been reduced	3.96	0.275	High mean
			Homogeneity
Rehousing is a governance measures that aim to prevent or mitigate the physical and social vulnerability of urban areas	3.97	0.211	High mean
			Homogeneity
Promoting social capital and partnerships between citizens can increase social resilience in Mpazi	4.05	0.24	High mean
			Homogeneity
The city of Kigali responds more quickly and more effectively to anticipate and minimise natural disasters	4.05	0.296	High mean
			Homogeneity
There is an improvement in well-being and quality of life	3.85	0.51	High mean
			Homogeneity
Overall mean	**3.91**		

Source: *Primary data, 2024*

For the first statement, the respondents revealed that there are adequate roads, sanitary, and electrical infrastructure in the area, considering the obtained high mean of 3.61. For the second statement, the respondents attested to the reduction of environmental risks such as pollution, flooding, and air pollution s agreed by the respondents with a high mean of 3. 90. For the third statement, the respondents reported rehousing is a governance measure that aim to prevent or mitigate the physical and social vulnerability of urban areas considering the obtained high mean of 3.97. This implies that urban growth has an impact on housing quality and safety, especially when governmental institutions and the private sector are unable to cope with the need for adequate and affordable urban housing. For the fourth statement, the respondents attested that promoting social capital and partnerships between citizens can increase social resilience in Mpazi, since the mean was 4.05, interpreted as a high mean.

For the fourth statement, the respondents revealed that the city of Kigali responds more quickly and more effectively to anticipate and minimise natural disasters by considering the mean of 4.5, interpreted as a high mean. Lastly, the respondents attested that there is an improvement in well-being and quality of life since the mean was 3.85, interpreted as a high mean. In partial conclusion, the urban resilience appreciated by respondents by considering the average mean of 3, 91 interpreted as a high mean.

Relationship between the Informal Settlement Upgrades and the Overall Urban Resilience

The third specific objective of this study was to analyse the relationship between the informal settlement upgrades and the overall urban resilience of the community in Mpazi. This was achieved using the correlation test. The third specific objective of this study was to analyse the

relationship between the informal settlement upgrades and the overall urban resilience of the community in Mpazi. This was achieved using the correlation test. The model yielded an R value of 0.794, indicating a strong positive correlation between the variables. The R Square value of 0.630 suggests that approximately 63% of the variance in urban resilience can be explained by the informal settlement upgrades. The Adjusted R Square of 0.563 accounts for the number of predictors and sample size, confirming a substantial explanatory power of the model. The standard error of the estimate was 0.05, reflecting a relatively low average distance between observed and predicted values, which indicates good model fit. The significance of the relationship was tested using the p-value (Sig. 2-tailed), and since it was below the conventional thresholds of 0.01 and 0.05, the positive relationship between informal settlement upgrades and urban resilience was found to be statistically significant, confirming that improvements in informal settlements contribute meaningfully to enhancing the community's overall urban resilience.

Table 8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	0.63	0.563	0.05

a. Predictors: (Constant), basic infrastructures rehabilitated and constructed, access to socio-economic services, constructed housing quality, social cohesion, and empowerment.

The findings indicate that the determination coefficient (R^2) of 0.630 implies that informal settlement upgrading contributes to rehousing on urban resilience by 63%, while 37% of rehousing on urban resilience is attributed to other variables not included in the model. Therefore, the study establishes that there is a strong positive relationship between informal settlement upgrading and rehousing on urban resilience.

Table 9: Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	9.46	4	2.365	74.588	.000[b]
Residual	5.496	395	0.014		
Total	**14.956**	**399**			

a. Dependent Variable: rehousing on urban resilience
b. Predictors: (Constant), Basic infrastructures rehabilitated and constructed, Access to socio-economic services, Constructed Housing quality, social cohesion, and empowerment.

The findings in Table 8 indicate that the overall model was significant. The F-test was found to equal 74.588, and this was significant at a p-value of 0.000, which is less than the predicted probability of 0.05 of a significant level. This means informal settlement upgrading has a positive and significant contribution to rehousing urban resilience. The findings indicated that variables such as constructed housing quality, access to socio-economic services, social cohesion and empowerment, and basic rehabilitated and constructed infrastructures are the predictors of rehousing on urban resilience.

Table 10: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	2.868	.185		15.518	.000
Constructed Housing Quality	.197	.022	.014	.348	.008
Access to socio-economic services	.425	.014	.593	14.959	.000
Social cohesion and empowerment	.033	.021	.170	3.971	.000
Basic infrastructures rehabilitated and constructed	.441	.024	.208	5.868	.000

a. Dependent Variable: rehousing on urban resilience

According to the result in Table 9, informal settlement upgrading has a positive influence on rehousing on urban resilience, considering the obtained coefficients of B= 0.197, B= 0.425, B= 0.033, B= 0.2441, and all P-values were statistically significant since they are less than 0.5. Therefore, there is a strong relationship between upgrading informal settlements and rehousing in terms of urban resilience.

DISCUSSION

The study's findings reveal that informal settlement upgrading and rehousing initiatives in Kigali's Mpazi area have significantly bolstered urban resilience by integrating improvements in housing quality, basic infrastructure, access to socio-economic services, and social cohesion. The high mean scores for constructed housing quality (3.89) and basic infrastructure (3.95) underscore substantial progress in Rwanda's urban development, with new dwellings providing not just better material conditions but also heightened physical safety, health, and psychological security for residents, which is increasingly recognised as foundational to resilience. Enhanced access to socio-economic services (mean 3.71) demonstrates that the upgrading initiative extends beyond physical improvements, enabling residents to better adapt to and recover from urban stresses through improved access to education, healthcare, and financial institutions, thus supporting a multidimensional and adaptive approach to resilience.

The strong rating for social cohesion and empowerment (mean 3.75) suggests that participatory planning and implementation have preserved or even strengthened community bonds and agency, countering common fears of social disruption from such interventions and fostering collective capacity for action. The integrated approach combining onsite upgrading, risk-reducing infrastructure, and capacity building has prevented large-scale displacement, improved living conditions, and created economic opportunities for residents, as seen in the construction of new apartment blocks, expanded roads, water supply, and stormwater systems. The overall high mean (3.77) for the contribution of these initiatives to community resilience, coupled with a strong positive relationship (R^2 = 0.630) between upgrading and resilience, provides robust empirical support for Rwanda's strategy, suggesting that about 63% of the variation in urban resilience can be attributed to these interventions, and reinforcing the value of integrated, context-specific approaches over narrow or standardized solutions. While the results are largely positive, the study acknowledges the need for future research on long-term sustainability, potential unintended

consequences like gentrification, and the evolution of resilience capacities over time, emphasizing that Rwanda's experience offers valuable lessons for other rapidly urbanizing African cities aiming to transform informal settlements into resilient, inclusive urban communities.

CONCLUSION

This research examined the effects of informal settlement upgrading and rehousing on urban resilience in Rwanda, using Mpazi as a case study. The findings indicate that well-implemented upgrading and rehousing initiatives can significantly enhance the resilience of urban communities, while poorly executed interventions may undermine these efforts. The study underscores the importance of combining physical improvements with community participation, as these approaches not only improve living conditions but also foster social and economic inclusion. These insights have important implications for urban planning in Rwanda and similar developing contexts, suggesting that targeted, participatory upgrading of informal settlements, such as those underway in Kigali, can reduce vulnerability, improve access to essential services, and support sustainable urban growth.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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REFERENCES

[1] W. Hendler & Fieuw, "Exploring partnerships with local government: A people-led approach to informal settlement upgrading," 2018.

[2] D. Satterthwaite, *Upgrading Informal Settlements*, vol. 7, no. January. Elsevier Ltd., 2011. doi: 10.1016/B978-0-08-047163-1.00276-9.

[3] T. U. Population, W. Bank, and W. P. Review, "Africa Unprecedented Urbanization is Shifting the Security Landscape Africa's Unprecedented Urbanization is Shifting the Security Landscape," pp. 1–8, 2025.

[4] K. R. Hope, "Urbanization and Urban Growth in Africa," *African Asian Stud.*, vol. 33, no. 4, pp. 345–358, 2008, doi: 10.1163/156852198x00104.

[5] I. Chirisa, "Population growth and rapid urbanization in Africa: Implications for sustainability POPULATION GROWTH AND RAPID URBANIZATION IN AFRICA: IMPLICATIONS FOR SUSTAINABILITY Introduction and Background," *J. Sustain. Dev. Africa*, vol. 10, no. 2, 2008, [Online]. Available: https://www.researchgate.net/publication/43090985

[6] E. F. Maria, "Urbanisation and Green Growth in China," *OECD Reg. Dev. Work. Pap.*, vol. 1, no. 1, pp. 0_1,2-4,7-101, 2013, [Online]. Available: http://0- search.proquest.com.pugwash.lib.warwick.ac.uk/docview/1368594599?accountid=14888%5Cnhttp://pugwash.lib.warwick.ac.uk:4550/resserv?genre=unknown&issn=&title=Urbanisation+and+Green+Growth+in+China&volume=&issue=&date=2013-05-01&atitle=&spage=0_1&au

[7] Africapolis, "Urban centres boom as rapid urbanisation redefines the urban geography of Africa," no. June, pp. 2022–2024, 2023, [Online]. Available: www.africapolis.org

[8] J. Saghir and J. Santoro, "Urbanization in sub-Saharan Africa." *Cent. Strateg. Int. Stud.*, no. April, pp. 1–7, 2018.

[9] United Nations, "UNITED NATIONS ECONOMIC COMMISSION FOR AFRICA Sustainable Urbanization in Africa," 2014.

[10] F. W. Davidson, "The World Bank The World Bank," no. December, p. 20433, 2015.

[11] S. Mushanga, "Assessment of informal settlement in Musanze District, Rwanda. Towards sustainable urban development," pp. 31–39, 2025, doi: 10.1201/9781003483519-4.

[12] K. City, "The state of population in Rwanda," pp. 1–14, 2012.

[13] Ministry of Infrastructure, "Rwanda 2019," *3Rd Natl. Urban Forum*, p. 9, 2019.

[14] A. Nikuze, R. Sliuzas, J. Flacke, and M. van Maarseveen, "Livelihood impacts of displacement and resettlement on informal households - A case study from Kigali, Rwanda," *Habitat Int.*, vol. 86, no. March, pp. 38–47, 2019, doi: 10.1016/j.habitatint.2019.02.006.

[15] MININFRA, "Urbanization and Rural Settlement Sector," *Minist. Infrastruct.*, pp. 1–20, 2012.

[16] UN-HABITAT, *Inclusive and Sustainable Urban Planning: A Guide for Municipalities*, vol. 1. 2007.

[17] ΥΠΕΝ, "Επικαιροποιημένο Master Plan Δίκαιης Αναπτυξιακής Μετάβασης των λιγνιτικών περιοχών Υπουργείο Περιβάλλοντος και Ενέργειας," no. October 2015, 2020.

[18] V. Manirakiza, "Promoting inclusive approaches to address urbanisation challenges in Kigali," vol. 6, no. 1, pp. 161–180, 2014.

[19] LTWP, "Resettlement Action Plan (RAP)," *LTWP*, no. 11, pp. 1–124, 2014.

[20] E. E. Benken, "ThinkIR : The University of Louisville's Institutional Repository Nowhere to go : informal settlement eradication in Kigali, Rwanda," 2017, [Online]. Available: https://ir.library.louisville.edu/cgi/viewcontent.cgi?article=1193&context=honors

[21] N. and R. WIKIPEDIANyarugenge district is divided into 10 sectors (imirenge): Gitega, Kanyinya, Kigali, Kimisagara, Mageragere, Muhima, Nyakabanda, Nyamirambo, "Nyarugenge District," no. November, p. 2017, 2017.

[22] R. Shipsey, "Making the 2022 Rwanda Census count." *Int. J. Popul. Data Sci.*, vol. 7, no. 3, p. 23889, 2022, doi: 10.23889/ijpds.v7i3.1846.

[23] L. Judes, "Chapter 4: Stratified Random Sampling," *Sampl. Tech. Proced.*, 2015.

[24] E. D. Mihigo, "The Concept of Compensation for Expropriated Real Properties and Livelihood Restoration of the Affected Persons. A Case Study Analysis of Batsinda Resettlement in Kigali, Rwanda," vol. 1, pp. 1–2, 2022, [Online]. Available: https://www.researchgate.net/publication/371125535