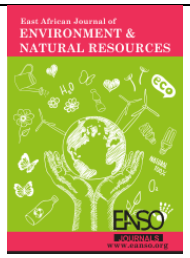

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Original Article

Assessing the Impact of Ecosystem Restoration on Community Livelihood: A Case of Gishwati-Mukura National Park in Rwanda

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Ecosystem Restoration, Community Livelihood, Biodiversity Recovery, Sustainable Land Management, Gishwati-Mukura National Park.

ABSTRACT

Ecosystem degradation, along with high population expansion, has had a substantial influence on community livelihoods, resulting in global ecosystem restoration projects. Using a feedback framework for strategic adaptive management, a research was done to analyze the impact of ecosystem restoration of Gishwati-Mukura National Park on community livelihoods. This assessment is critical to establishing successful strategic adaptive management. A mixed-methods approach was used, combining surveys and geographical analysis for quantitative data (analyzed with SPSS) and interviews for qualitative data (analyzed with ATLAS.ti). The findings show that, whereas restoration initiatives aimed largely to restore biodiversity, vegetation structure, and ecosystem services, there was little emphasis on livelihood-driven outcomes. As a result, a revised livelihood framework is provided, emphasizing a more inclusive approach to restoration that incorporates both ecological and human-centred goals. The updated framework highlights the importance of aligning ecosystem restoration activities with sustainable development goals in order to improve community livelihoods, promote climate change mitigation and adaptation, and assure long-term sustainability. Given the reliance of rural populations on ecosystem services for survival, balancing competing demands for resource allocation and livelihood sustenance is critical. It is proposed that adopting both the assessment-reflection-feedback framework and the livelihoods framework into restoration efforts will emphasize human well-being alongside ecological restoration.

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INTRODUCTION

Ecological restoration is a worldwide approach that responds directly to ecological degradation and damage. This has the potential to promote population health, economic well-being, and cultural integrity beyond its environmental impact. The United Nations (UN) recognizes the importance of restoration in ecosystem health. UN designated 2021-2030 as the Decade of Ecosystem Restoration. (Aronson et al. 2020). Anthropogenic impacts like deforestation, pollution, and landscape degradation are causing fast biodiversity and ecosystem loss worldwide. Some scholars have referred to the current ecological disaster as the "Sixth Mass Extinction". The last catastrophic event occurred 65 million years ago, resulting in the extinction of dinosaurs and other animals. (Rule et al. 2022). This backdrop is consistent with the study's purpose, which is to analyze the impact of ecosystem restoration on community livelihoods in Rwanda's Gishwati-Mukura National Park.

Ecosystem restoration aims to restore all of the previous functions and components of the degraded ecosystem, including the diversity of trees, the richness of biodiversity, and the symbiotic and functional relationships between various components of the degraded ecosystem. Restoring specific ecosystem components, such as planting trees alone, can restore some but not all of the lost ecological services. (Mirzabaev &Wuepper 2023). The current study aims to understand how such restoration initiatives affect local community livelihoods, therefore achieving its goal of measuring the impact of restoration on economic and social well-being in the Gishwati-Mukura region.

Ecosystem restoration has emerged as a promising solution to address both environmental degradation and community livelihood challenges. Large-scale restoration initiatives have the potential to deliver synergistic benefits for biodiversity, ecosystem services, agricultural production, and local livelihoods across extensive areas (Edwards et al., 2021). Protected areas may serve a crucial function in the execution of initiatives aimed at diminishing emissions resulting from deforestation and degradation (REDD) in developing nations, through either the enhancement of the current protected area network or the establishment of new designated regions. In addition to maximising the positive impact of ecosystem restoration on community livelihoods, a win-win-win strategy that balances ecological, hydrological, and agricultural dimensions is crucial (Jiang et al., 2021). This discussion contributes to the study's principal goal, which is to assess the extent to which restoration works in Gishwati-Mukura National Park improve community livelihoods in terms of economic prospects and environmental sustainability.

Ecosystem services are critical to supporting local lives in Kenya, particularly in rural and coastal regions. Forests, dry lands, and marine ecosystems provide a variety of provisioning, regulating, and cultural functions that considerably improve household income and well-being (Daw et al., 2023; Langat et al., 2016; Mutoko et al., 2015). Kenya's National Park System (NPS) covers 8% of the country's geographical area and comprises national

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parks, reserves, marine parks, conservancies, and national sanctuaries. The National Park System (NPS) plays a critical role in worldwide conservation efforts, preventing biodiversity and ecological degradation. Preserving biodiversity. The World Health Organization (WHO) emphasizes the importance of green spaces in urban ecosystems, including parks, forests, and wetlands. The park in the city serves as a considerable carbon sink due to its proximity to urban, industrial, and transportation activities. Nairobi National Park features eight distinct vegetation environments, including grassland, scattered trees, bushland, rocky terrain, rivers and streams, dams, and wetlands. (Mwangi, Zhang, and Wang 2022). These examples give background for the study's goal of investigating how ecosystem restoration, such as that at Gishwati-Mukura National Park, might benefit local livelihoods and provide ecological services.

Local communities in Kenyan forests such as the Kakamega rainforest and the Mt.Marsabit forest benefit significantly from ecological services. Fuel wood, food, construction supplies, and fodder account for up to 33% of total household income (Langat et al., 2016). In Uganda, Participatory management aimed at the restoration of natural forests guarantees that these ecosystems are rejuvenated to enhance carbon sequestration as they evolve into high conservation-value habitats. Since 1995, approximately 4,195 hectares (with 170 hectares restored during this management period) of Kibale Forest have transitioned into a closed canopy forest, thereby creating a habitat for significant forest species, which encompass 13 primate species and various ungulates (Omeja et al., 2016). Gishwati-Mukura has been the largest indigenous forest, covering approximately 253,000 ha, which has now been reduced to 3,558 ha due to anthropogenic activities such as human-wildlife conflicts (crop raiding), high poverty levels and population density, illegal mining in the park, low level of awareness of the importance of the park, very high degradation and loss of habitat, firewood extraction, and illegal tree cutting for timber. Factors contributing to habitat degradation include firewood extraction, illegal tree cutting for timber and charcoal, park encroachment from agriculture and livestock farming, poaching, and bushfires caused by honey extraction. (Park 2015). The study's goal is to evaluate the effectiveness of ecosystem restoration in resolving these concerns while supporting sustainable lifestyles for populations living near Gishwati-Mukura National Park.

Over the previous few decades, these dangers and their combined effects have continued to erode and limit the size, fauna, and flora of this park. (Humphrey, 2023), the fauna alone has decreased by 99%, while the flora, which plays a vital part in the life of the locals, such as medicinal plants, has also plummeted. According to the 2012 Rwanda Population and Housing Census, Rutsiro and Ngororero districts have population densities of 491 and 281 persons per km2, respectively. This high density and unsustainable agricultural techniques have resulted in lower crop yields, forcing neighbouring communities to seek alternate livelihoods in and around the forests to survive, putting the park under constant threat from anthropogenic activity. Despite its limited size and the challenges stated above, Gishwati-Mukura National Park is home to large, rich biodiversity and a variety of ecosystem services of national and global relevance. This is directly related to the study's purpose of investigating how the park restoration may protect biodiversity while also improving the socioeconomic situations of neighbouring populations.

Significant protection and conservation initiatives have been undertaken. The government of Rwanda designated Gishwati-Mukura as its fourth park in 2015, and UNESCO just added the woodlands to the Man and Biosphere Reserves. (Park 2015). Within this context, the restoration of Gishwati-Mukura National Park (GMNP) in Rwanda presents a valuable case study for examining the interplay between conservation efforts and community

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livelihoods. This review evaluates the restoration activities undertaken within GMNP and their impact on local communities, particularly in terms of economic opportunities, social cohesion, and environmental sustainability. This assessment assesses the restoration efforts carried out within the GMNP and their influence on local communities, notably in terms of economic opportunity, social cohesion, and environmental sustainability, which is the primary goal of this research.

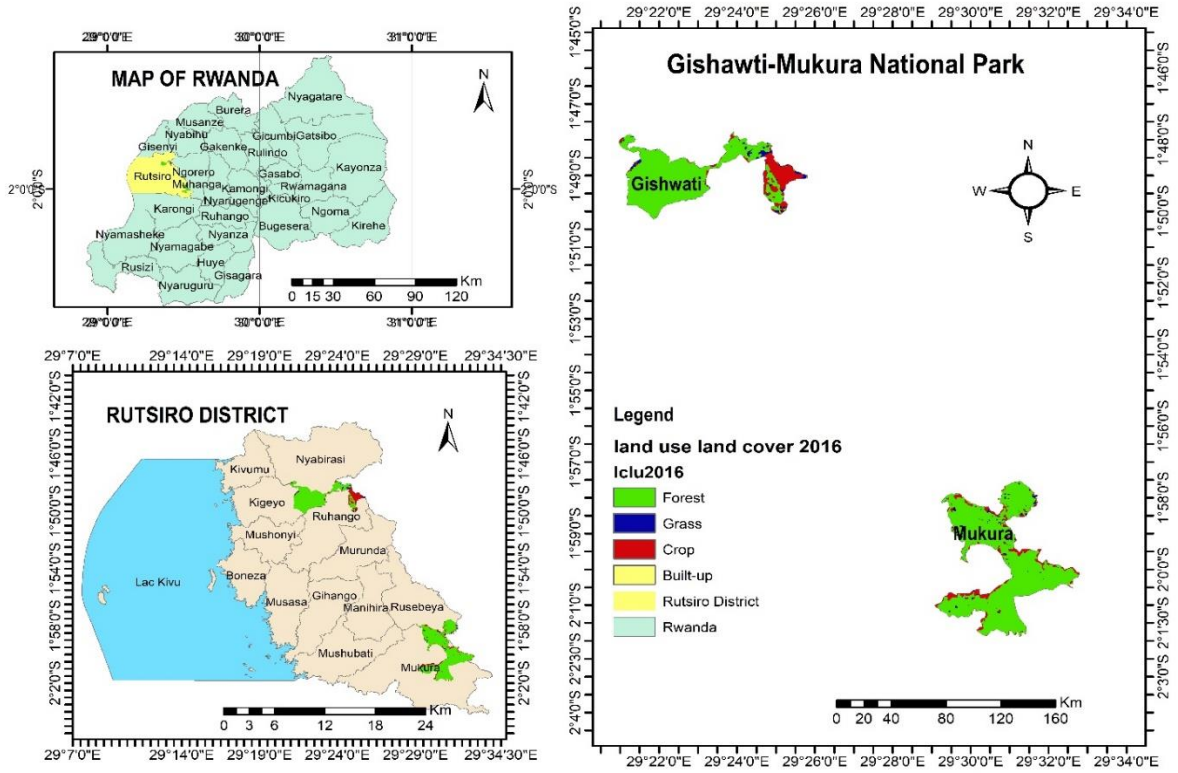
MATERIALS AND METHODS

Study Area

The area has long been Rwanda's largest indigenous forest, covering approximately 253,000 ha, but has now been reduced to 3,558 ha due to anthropogenic activities such as human-wildlife conflicts (crop raiding), high poverty levels and population density, illegal mining in the park, a lack of awareness of the park's importance, severe habitat degradation and loss, firewood extraction, and illegal tree cutting for timber. Firewood extraction, illegal tree cutting for timber and charcoal, park encroachment from agriculture and livestock farming, poaching, and honey extraction-caused bushfires are all significant factors in habitat deterioration. (Park 2015)

The adjacent communities predominantly rely on agriculture, with a particular emphasis on subsistence farming, while also engaging in the extraction of non-timber forest products (NTFPs). Over time, Gishwati-Mukura National Park has emerged as a pivotal site for both environmental conservation and community development, featuring a multitude of restoration initiatives aimed at achieving ecological sustainability whilst concurrently enhancing the livelihoods of the local populace.

Figure 1: Gishwati-Mukura National Park Map in Rwanda



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RESEARCH DESIGN

This study employed a descriptive research design using a mixed-methods approach to assess the impact of ecosystem restoration on community livelihoods in Gishwati-Mukura National Park (GMNP), located in Rwanda's Western Province. The objective of the study was to evaluate how restoration initiatives influence economic opportunities, social cohesion, and environmental sustainability within surrounding communities.

Quantitative data were collected using standardized questionnaires, while qualitative data were gathered through in-depth interviews and field observations. Furthermore, remote sensing data and spatial analysis using ArcGIS were utilized to examine land use changes and ecological restoration outcomes over time.

Sample Size and Sampling Techniques

The target population was comprised of about 153,339 Rutsiro District inhabitants who live near the GMNP and are directly affected by restoration operations (Rutsiro District, 2023). Household respondents were selected using stratified random sampling from five sectors (Nyabirasi, Kigeyo, Ruhango, Rusebeya, and Mukura). The Slovin algorithm was used to establish the sample size, which resulted in 399 household respondents, each with one representative.

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

$$n = \frac{153\,339}{1+153\,339(0.05)^2} = \quad 399$$

n=399

The formula shows **N** which is the target population which is 153 339 households, while **n** is the sample size which is 399 households that was represented by one respondent and **e** which is the margin error varies at 5% meaning that the confidence level was 95%. Hence, this implies that the respondents of this study were 399 respondents.

For key informants, snowball sampling was used to identify individuals with specialized knowledge and experience in conservation efforts including 3 park management offices and 3 district environmentalist offices. Key informants provided critical insights into biodiversity conservation, land management practices, and the socioeconomic effects of restoration initiatives.

Data Collection Techniques

A structured questionnaire was designed with closed-ended questions to collect quantitative data. It covered sociodemographic information, economic indicators, and attitudes toward ecological restoration efforts. In-depth interviews were conducted with selected key informants, including park employees and district environmental officials, to gain qualitative insights into biodiversity conservation, sustainable land management, and the implementation of policies related to ecosystem restoration in GMNP. ArcGIS-based spatial analysis was used to assess land cover changes between 2016 and 2023, providing visual and quantitative evidence of vegetation recovery and human-environment interactions. Field observations further validated findings by documenting observable restoration activities, such as erosion control measures and changes in vegetation cover.

Data Analysis

Quantitative data collected from 399 households were analyzed using SPSS to assess variables such as economic impact, resource accessibility, and livelihood diversification. Qualitative data from the six key informants (three park officials and three environmental officers) were analyzed thematically using *ATLAS.ti*, identifying key patterns and narratives related to ecological restoration and community well-being. Additionally, geospatial data were analyzed with *ArcGIS* to track vegetation regeneration and land use transformation over the period from 2016 to 2023. This triangulation of quantitative, qualitative, and spatial data offered a

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comprehensive understanding of the ecological and socioeconomic impacts of restoration efforts in GMNP.

Feedback Framework for Strategic Adaptive Management

This study uses a Strategic Adaptive Management (SAM) paradigm to assess how ecological restoration affects community livelihoods in Gishwati-Mukura National Park (GMNP). SAM is a flexible, feedback-driven method that promotes continual learning and adaptation in response to ecological and societal changes (Bennett, 2018). It stresses the regular collection of environmental and socioeconomic data, which informs decision-making and allows for timely adjustments to restoration techniques, assuring both ecological effectiveness and increased community well-being (Rule et al., 2022).

The SAM framework, which involves active involvement with local communities, park staff, and environmental specialists, aids in identifying successful practices, difficulties, and areas for improvement, such as resource allocation and habitat deterioration. This collaborative, iterative method links restoration efforts with community needs and values, which benefits both conservation and local livelihoods. It follows current conservation thinking, which favours adaptive, inclusive strategies over rigid plans for long-term ecological recovery and community empowerment (Holl & Aide, 2011; Edwards et al., 2021).

RESULTS AND DISCUSSION

The socioeconomic outcomes of restoration efforts are mixed. While ecotourism and restoration projects have provided alternative income streams for local communities, the benefits are not evenly distributed (Nkurunziza, Mbabazi, & Kamanzi, 2020). Some households have experienced increased access to water resources and non-timber forest products, yet restrictions on resource use within the park continue to pose challenges. Community engagement remains limited, with concerns regarding inadequate participation in decision-making processes that affect livelihoods. A more inclusive governance framework is necessary to enhance community ownership of restoration initiatives (Ibrahim et al, 2023).

Table 1. Land Cover Land Use of Gishwati-Mukura National Park in 1990, 2016 and 2023

LCLU Area 1990, 2016 and 2023	LCLU Area-skm 1990	LCLU Area_skm 2016	LCLU Area_skm 2023	Change of LCLU 1990-2023	Change of LCLU 2016-2023
Built-up Area	0	5.76E-04	0.003567	0	2.99E-03
Cropland	0.312226	3.696927542	0.324035	0.312226	-3.372892542
Forest	34.038812	29.94604605	33.577025	34.038812	3.630978953
Grassland/shrubland	0.094423	0.807697661	0.593809	0.094423	-0.213888661

Source: Land Caver Land Use, Arc GIS, 2025.

Table 1 of the analysis of land cover and land use (LCLU) in Gishwati-Mukura National Park (GMNP) between 1990, 2016, and 2023 shows considerable changes across all land types. Built-up areas increased from 5.76E-04 km² in 1990 to 0.003567 km² in 2016, indicating increased human activity in the region due to population growth and infrastructural development. However, a little decrease to 0.00299 km² by 2023 indicates that conservation initiatives, such as preventing construction near the park, may have been successful. This decline emphasizes the need to limit human settlements in protected areas, as demonstrated in other conservation regions, in order to promote ecological restoration (Kissinger et al. 2012).

The farmland area increased from 0.312226 km² in 1990 to 3.696927542 km² in 2016, showing significant land conversion for agriculture.

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However, by 2023, agricultural land dropped to 0.324035 km², similar to the 1990 value. This drop is most likely due to ecosystem restoration projects aimed at repairing degraded land and reforesting previously agricultural regions (Chazdon et al., 2017). Between 2016 and 2023, the park experienced a considerable reduction of -3.372892542 km² due to successful reclamation of agricultural land for ecological restoration. This has helped conserve biodiversity and reverse prior environmental degradation.

Gishwati's forest cover declined from 34.038812 km² in 1990 to 29.94604605 km² in 2016, possibly due to deforestation caused by agricultural development, logging, and human settlements. By 2023, forest cover increased to 33.577025 km², demonstrating the favorable impact of ecosystem restoration. The park's success in reversing deforestation and restoring biodiversity is demonstrated by a net gain of 3.630978953 km² in forest area between 2016 and 2023. This was achieved through restoration initiatives such as tree planting, rewilding, and community conservation programs (Brancalion & Chazdon, 2019).

The grassland and shrubland category grew from 0.094423 km² in 1990 to 0.807697661 km² in 2016, then decreased to 0.593809 km² by 2023. The reduction of -0.213888661 km² between 2016 and 2023 may be due to natural succession or continuous reforestation efforts. The drop in shrubland could signal a shift in vegetation structure, with degraded lands giving way to more stable ecosystems that support either forest regeneration or other forms of land use (Lamb et al., 2005).

These land use and land cover changes are crucial to our study because they give a tangible measure of the impact of restoration actions in GMNP. The great return of forest cover and reduction in cropland demonstrate the success of restoration efforts in reviving the park's ecosystems, ultimately increasing biodiversity and promoting sustainable land management practices. This analysis emphasizes the significance of ongoing conservation efforts to ensure the park's long-term ecological health.

Figure 2 shows that restoration activities have had a major ecological impact, with gains in biodiversity recovery, vegetation structure, and crop production. Wildlife populations have grown, and the park's ecological services have improved (Plumtre et al., 2016). Restoration initiatives have helped to increase soil retention and prevent erosion, boosting agricultural sustainability in surrounding areas (Valera et al., 2024).

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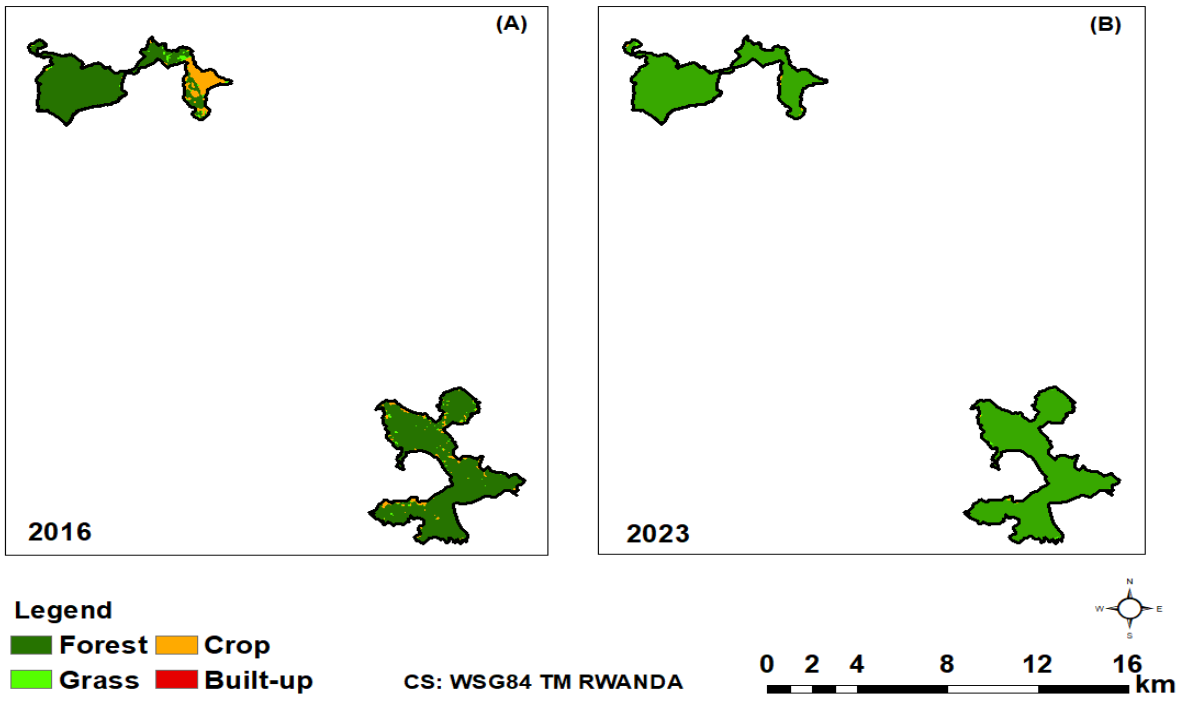
Figure 2: Land Cover Land Use of Gishwati-Mukura National Park in 2016 and 2023



Biodiversity Recovery

Biodiversity recovery is a key component of GMNP's restoration initiatives. Significant increases in species populations, such as the Eastern Chimpanzee and Golden Monkey, demonstrate the success of habitat restoration (Chazdon et al., 2017). The Eastern Chimpanzee population grew by 176.9%, indicating significant habitat restoration and increased food availability, which benefits other species (Holl and Aide, 2011). The Golden Monkey's number before 2015 is unknown, however, there are definite indicators of better habitat conditions as a result of reforestation initiatives.

The increase in plant diversity, with an increase in tree and shrub species from 40 to 58, demonstrates the efficacy of vegetation restoration (Chazdon et al. 2017). A more diversified plant community increases the habitat's structural complexity, which benefits wildlife and improves soil stability. These biodiversity enhancements are consistent with global restoration goals such as the Bonn Challenge and the UN Decade on Ecosystem Restoration (Aronson et al., 2020), emphasizing the importance of habitat restoration in promoting ecological health.

By focusing on biodiversity recovery, the study demonstrates how ecosystem restoration benefits not just the park's species but also the overall environmental sustainability. The increase in species populations and plant diversity demonstrates the successful implementation of global restoration strategies in GMNP, stressing the interdependence of habitat restoration and species conservation (Brancalion & Holl, 2020).

Vegetation Structure and Composition

Significant changes in vegetation structure and composition were found in GMNP between 2015 and 2023, with an increase in tree species from 40 to 58 and a 66.7% rise in vegetation cover (Aronson et al., 2020). These improvements demonstrate the efficacy of reforestation, natural regeneration, and native species introduction in improving ecosystem health. A more diverse tree species composition enhances habitat complexity, supports wildlife, and

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promotes soil health, carbon sequestration, and overall ecosystem resilience (Chazdon et al., 2017).

Vegetation restoration increased forest canopy density, improved microclimate regulation, and reduced soil erosion, all of which are critical for ecological and socioeconomic stability (Richardson & Rejmánek, 2011). The restoration of vegetation cover and increase of indigenous tree planting (2,000 hectares) are crucial for long-term ecological sustainability and local community resistance to the effects of climate change.

To summarize, the changes in vegetation structure and composition demonstrate the effectiveness of GMNP's restoration activities in promoting ecological recovery. These modifications benefit both the park's biodiversity and the well-being of surrounding populations by boosting soil health, water retention, and agricultural productivity (Brancalion & Holl, 2020).

Sustainable Land Management

Sustainable land management (SLM) approaches in the GMNP have helped to restore ecosystems and improve community livelihoods. Agroforestry on 2,000 hectares increases soil fertility, lowers erosion, and promotes climate resilience (Holl & Aide, 2011). This approach combines trees with crops, enhancing biodiversity and ensuring the long-term viability of agricultural land, hence helping food security and local economies (Aronson et al., 2020).

To minimize erosion and improve water retention, 350 hectares of soil were conserved using techniques such as terracing. These strategies are critical for sustaining soil productivity and promoting agricultural sustainability on the park's steep slopes (Chazdon et al. 2017). Similarly, silvopastoral techniques on 446 hectares increased land production and ecosystem resilience by combining livestock grazing with tree plantations, minimizing overgrazing, and improving forest management.

Community-based land management guarantees that locals participate in restoration activities, boosting environmental responsibility and increasing compliance. These participatory techniques strengthen communities by promoting local knowledge and skill development, hence contributing to ecological and socioeconomic resilience (Richardson & Rejmánek, 2011). Overall, GMNP's SLM techniques reflect a comprehensive approach to ecosystem restoration that helps both the environment and local residents by encouraging sustainable land-use practices.

Soil Conservation and Ecosystem Restoration

Major soil conservation measures were carried out in Gishwati-Mukura National Park (GMNP) between 2015 and 2023. These efforts to reduce soil erosion, improve soil fertility, and restore degraded lands have been critical to meeting the study's goal of analyzing the impact of ecosystem restoration on community livelihoods and biodiversity recovery. Important interventions include agroforestry, silvopastoral systems, terracing, land rehabilitation, and riverbank preservation. Agroforestry has been used on over 2,000 hectares, combining trees with agricultural operations to improve soil structure, prevent erosion, and increase fertility.

Silvopastoral methods incorporating trees and pasture have been introduced on 446 hectares, enhancing land productivity and reducing soil erosion (Holl & Aide, 2011). Terracing has been employed on 350 hectares to reduce runoff and promote water absorption, while 32 hectares of land rehabilitation and 250 kilometers of riverbank protection have helped to restore soil health and protect key water supplies.

These soil conservation measures directly benefit the park's ecological health and support long-term livelihoods by increasing land productivity and strengthening the local ecology. An integrated approach to land management addresses both environmental sustainability and community welfare (Aronson et al., 2020).

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Wildlife Populations and Ecosystem Services

Wildlife populations and ecological services improved significantly between 2015 and 2023. The park's protected wildlife habitat increased by 66.7%, from 1,500 hectares in 2015 to 2,500 hectares in 2023. Furthermore, the number of tree species grew to 58, which considerably improved biodiversity and habitat quality (Chazdon et al., 2017).

These modifications help to restore essential ecosystem functions like water and climate management, carbon sequestration, and soil conservation. The restoration operations, which included removing invasive species and planting 306 native trees, have aided in the recovery of wildlife populations, which is critical for the park's biological stability (Richardson & Rejmánek, 2011).

The success of these restoration initiatives demonstrates the benefits of ecosystem restoration, which contributes to ecological balance while also providing critical services to local residents. However, to maintain these advantages, ongoing community engagement and long-term monitoring are required (Brancalion & Holl, 2020).

Economic Opportunities and Income Diversification

The rehabilitation of Gishwati-Mukura National Park (GMNP) has had limited success in generating fresh revenue for local residents. According to the poll, only a tiny number (33.6%) of respondents reported an increase in household income as a result of eco-tourism or work on restoration projects. These data show that, while ecological restoration initiatives have resulted in economic activities such as tourism and specialized enterprises, their impact on the larger community has been negligible. This is consistent with previous research, which shows that the advantages of conservation-driven economic opportunities frequently reach just a tiny portion of the population (Snyman, 2017).

Although promising, the region's eco-tourism activities have yet to yield widespread financial advantages to the community. Many respondents were dissatisfied with the limited career options available, particularly in industries directly related to ecosystem restoration. Furthermore, community-based ventures like beekeeping and handcraft manufacturing have not provided enough revenue for most inhabitants. This represents a recurrent difficulty in conservation projects: the economic opportunities offered are frequently too specific or limited in scope to significantly enhance the lifestyles of local inhabitants (Oldekop et al., 2016).

To increase income diversification and economic prospects, it is critical to incorporate broader livelihood measures into conservation efforts. According to research, successful conservation initiatives frequently integrate economic activities with long-term development objectives such as agricultural improvements, sustainable land use practices, and resource management. Without these additional steps, the full economic potential of ecosystem restoration may go untapped, limiting benefits to those directly participating in conservation efforts.

Social Cohesion and Community Empowerment

Although ecosystem restoration in Gishwati-Mukura National Park (GMNP) has produced some beneficial results, its impact on social cohesion and community empowerment is still limited. According to survey results, 54.6% of respondents did not believe that restoration activities enhanced their household income. This implies that the economic benefits of eco-tourism and restoration programs are minimal and unevenly dispersed, providing little financial empowerment to the majority of community people. These differences raise questions about the restoration efforts' inclusivity and social impact (Bennett, 2018).

The lack of significant infrastructural improvements, such as improved roads, healthcare, or educational facilities, limits the park's ability to

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empower local residents. Although some community-driven projects have been implemented, their impact has been limited because the majority of inhabitants continue to encounter barriers to basic services. Previous research indicates that conservation programs are most effective when combined with investments in infrastructure and social services, which assist communities in better understanding the long-term advantages of such efforts (Benett et al., 2019). Without these additional inputs, rehabilitation initiatives may not result in significant increases in social cohesion or community empowerment.

Community involvement in decision-making processes is critical for encouraging ownership and cooperation in conservation activities. Empowering local communities to actively develop and implement conservation efforts ensures that their needs and priorities are met. This method could assist bridge the gap between ecosystem restoration and societal empowerment, resulting in a more inclusive and sustainable process (Pretty et al., 2009). Furthermore, creating collaborations between conservation organizations and local stakeholders can foster trust and collaboration, improve social cohesion, and boost community support for restoration efforts.

Education and Capacity Building

The success of education and capacity-building programs in the GMNP is still debatable. According to the survey results, 42.6% of respondents dispute that there are any environmental education initiatives in the area, while 40.4% agree. This indicates a lack of understanding or visibility for such programs, which can severely limit their usefulness. While some community members may be involved, the reach and impact of these educational programs remain limited. This is consistent with research indicating the value of accessible and relevant educational programs in building long-term environmental stewardship (Tilbury, 2011).

To be effective, environmental education must be adapted to the community's needs and interests. Many local inhabitants prioritize immediate economic demands over environmental concerns, which might dampen their enthusiasm for conservation education unless it is tied to practical, livelihood-enhancing opportunities. According to research, conservation education programs are most effective when combined with sustainable livelihood projects like eco-enterprise development or sustainable agricultural training (Ballard et al., 2017). This strategy helps to bridge the gap between environmental understanding and actual community benefits.

Furthermore, boosting the visibility and reach of educational activities is critical. A more proactive approach to raising conservation education awareness can assist in guaranteeing that these projects benefit all members of the community, not just those who are directly participating in conservation activities. Strengthening local networks and collaborations with NGOs, schools, and community leaders may increase the reach and efficacy of capacity-building efforts, ultimately leading to more community participation in conservation and sustainable resource management (Pretty et al., 2009).

Health and Well-Being

Ecosystem restoration activities in the GMNP have had varying effects on community health and well-being. The survey results suggest that 50.9% of respondents disagree that the park's restoration has resulted in long-term improvements in health and well-being, while only 40.6% agree. This suggests that, while environmental improvements, such as cleaner air and better water quality, are helpful, the community does not immediately view them as directly contributing to its health. These findings support the notion that ecological restoration provides indirect and long-term health benefits (Haines et al., 2017).

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While ecosystem restoration can lower the hazards associated with poor environmental health, such as air pollution and water poisoning, the benefits may take time to manifest. Many communities, particularly those in poverty and with limited access to healthcare, prioritize immediate socioeconomic needs over long-term environmental benefits. This emphasizes the significance of incorporating health and well-being improvements directly into restoration projects, such as providing healthcare services or promoting sustainable agriculture and nutrition (McElwee et al., 2020).

Furthermore, raising community understanding of the health advantages of ecosystem restoration can assist in closing the gap between environmental outcomes and community well-being. According to research, communities are more willing to support restoration initiatives when they understand how they benefit their health, such as disease prevention, increased nutrition, and better overall living circumstances (Nilsson et al., 2019). Strengthening health-focused activities within restoration projects may help to improve community perceptions of ecosystem restoration as a road to better health and well-being.

Access to Resources

Most respondents in the GMNP area do not believe that ecosystem restoration initiatives have increased their access to resources like water, firewood, and medicinal plants. This shows that, despite the park's restoration efforts, many community people continue to encounter difficulties in accessing critical resources. One possible explanation for this modest improvement is that severe conservation restrictions hinder local people from fully using recovered areas for resource extraction. While ecosystem restoration may result in long-term increases in resource availability, immediate benefits may be limited if access is restricted (Aronson et al., 2020).

Furthermore, while there were some short-term advantages, such as the dispersion of wood from eliminated invasive species, these resources were not sustainable over time. This underscores a typical difficulty in conservation initiatives: short-term advances may not result in long-term improvements in resource access for local communities. To solve this challenge, restoration initiatives must assess how to combine conservation objectives with the requirement for local resource access. Integrating sustainable resource management approaches and integrating communities in decision-making processes can assist ensure that conservation initiatives provide long-term results (Hagger et al., 2020).

To increase resource access, local communities must be involved in the administration of recovered lands. Allowing for appropriate harvesting and resource usage can assist ensure that ecosystem restoration initiatives benefit both biodiversity and community livelihoods. Furthermore, providing alternate sources of income and resources, such as eco-enterprise development or agroforestry, can alleviate strain on the park's natural resources while also promoting more equal access for all (Aronson et al., 2020).

CONCLUSION AND RECOMMENDATIONS

Ecosystem restoration is critical for improving community livelihoods because it increases biodiversity, creates economic opportunities, and promotes social welfare. However, for restoration projects to be truly effective, they must be inclusive, long-term, and backed by evidence-based policies and adaptive management approaches. Collaboration among policymakers, park administrators, and academics is critical to ensuring that conservation activities are both biologically and socially beneficial, building resilience and sustainable development in the communities surrounding Gishwati-Mukura National Park. Policies should prioritize reconciling conservation efforts with the economic demands of local populations by encouraging eco-friendly income-generating enterprises such as agroforestry, ecotourism, and sustainable farming. Park

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management should implement community-centered conservation measures that encourage local involvement in restoration efforts. Strengthening community engagement through capacity-building initiatives and job opportunities in the park can develop a sense of ownership and responsibility for conservation efforts. To maximize the impact of restoration, park management should put in place conflict resolution methods to resolve resource-use disputes between conservation authorities and local residents. Creating community outreach activities to create knowledge about the benefits of restoration and conservation compliance can improve collaboration. Furthermore, park administrators should work with local businesses and cooperatives to create nature-based business models, such as eco-lodges and sustainable handicrafts that can give alternative income while also supporting conservation efforts. For Future Researchers, there is a need for more research on the long-term socioeconomic impacts of ecosystem restoration, particularly how benefits are spread among different demographic groups within communities.

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