

Livelihood transition from mountain to the sea in Eastern Indonesia: A case study in Sambirampas District, East Manggarai

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Abstract. Coastal livelihoods in Indonesia have undergone significant transitions, communities historically reliant on forests have shifted their focus toward coastal and marine resources. However, research has largely overlooked the historical progression of these livelihoods and the persistent challenges. This study examines the historical transition from mountain to coastal and the current conditions of livelihoods in Eastern Indonesia. The study conducted in Nampar Sepang Village in Sambirampas District, East Manggarai. Using a qualitative approach, we conducted Focus Group Discussion (FGDs) and In-Depth Interviews with 12 randomly selected key informants to gather insights into the evolving nature of livelihood activities. The results reveal that while agriculture and forest-based activities remain vital, fishing has emerged as a significant livelihood component, especially during the fishing season. Households now strategically combine low-risk activities, like sea foraging, with higher-risk investments in commercial farming or livestock, allowing them to buffer against uncertainties while maximizing returns. This combination of livelihood strategies demonstrates an adaptive and forward-looking approach, where past experiences inform current practices. By fostering diverse yet complementary livelihood portfolios, rural households not only sustain themselves but also contribute to the broader goals of sustainable rural development.

1 Introduction

Indonesia, the world's largest archipelagic nation, boasts an extensive coastline of over 54,000 kilometers that provides a foundation for diverse coastal livelihoods. These livelihoods are critical to rural development, particularly in regions where communities rely heavily on natural resources for subsistence and economic activities. Coastal populations engage in a variety of practices, including small-scale fishing, aquaculture, seaweed farming, salt production, and coastal agriculture [1]. These activities not only ensure food security but also create employment opportunities and enhance social resilience, particularly in remote areas with limited infrastructure or access to urban markets. With an estimated 2.7 million

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households directly engaged in fisheries and marine activities across Indonesia, coastal livelihoods are indispensable to the nation's socio-economic framework [2].

Coastal livelihoods in Indonesia have undergone significant transitions due to environmental, economic, and policy-driven factors. In many areas, communities historically reliant on forests have shifted their focus toward coastal and marine resources. These changes are often driven by deforestation, agricultural inefficiencies, and market opportunities. For instance, forest degradation and the expansion of infrastructure in Java and Sulawesi have led to migration from upland forest regions to coastal settlements, where residents have embraced aquaculture, tourism, and small-scale fishing as alternative livelihoods [3]. Such transitions reflect a broader pattern of rural adaptation, where communities diversify their economic activities to mitigate risks associated with declining forest resources and environmental challenges [4].

In East Nusa Tenggara (NTT), the reliance on coastal livelihoods is particularly pronounced due to the region's arid climate, limited agricultural potential, and high levels of socio-economic vulnerability. Communities in NTT typically combine fishing, seaweed farming, and coastal trade with subsistence agriculture and livestock rearing to sustain their livelihoods. However, these communities face significant challenges, including climate variability, overfishing, and resource depletion [4]. Coastal livelihoods in NTT are not only a source of income but also a vital coping mechanism for households navigating economic and environmental uncertainties. Understanding the dynamics of these livelihood systems is crucial for informing sustainable development strategies and addressing vulnerabilities in coastal communities [5].

The Sambi Rampas District in East Manggarai provides a compelling case for studying the historical transitions of coastal livelihoods in East Nusa Tenggara. Traditionally, the district's communities relied on forest-based activities such as hunting, collecting non timber forest products, and shifting cultivation. However, a combination of economic pressures, declining forest resources, and evolving market demands has prompted a gradual shift toward marine-based livelihoods, including fishing and forage for subsistence needs. This transition highlights the adaptability of local communities in response to environmental degradation and socio-economic challenges. Moreover, Sambi Rampas illustrates the interplay between resource availability, market access, and social networks in shaping livelihood strategies. Documenting these changes offers valuable insights into how coastal communities can navigate transitions while maintaining sustainable resource use [6].

The long-term viability of coastal livelihoods in Sambi Rampas is intricately tied to the diversification of income streams and the community's ability to adjust to external changes. Despite this, research has largely overlooked the historical progression of these livelihoods and the persistent challenges, including poor infrastructure and restricted access to markets, that affect their development. Therefore, this study aims to explore the historical transitions and current patterns of livelihood diversification in Sambi Rampas contributing to a deeper understanding of sustainable development in East Nusa Tenggara. By examining the interplay of agriculture, forest resources, and marine activities, this research seeks to inform policies that promote resilience and sustainability in Indonesia's coastal regions.

2 Methodology

2.1 Study Area

The research was conducted in Nampar Sepang Village, Sambi Rampas District, East Manggarai Regency, East Nusa Tenggara Province. Geographically, the village is located at approximately 8°21'38.75"S, 120°50'57.68"E along the coastline of Flores Island. Nampar

Sepang encompasses a diverse range of ecosystems, including coastal zones, forests, and agricultural lands, making it an ideal case study to investigate the historical interplay between marine, forest, and agricultural-based livelihoods. The village's geographic and ecological diversity reflects the broader socio-economic and environmental dynamics prevalent in East Nusa Tenggara, a region characterized by high dependence on natural resources and adaptive livelihood strategies in response to socio-ecological changes [6,7]. These characteristics provide a microcosm of coastal livelihoods in Indonesia, underscoring the importance of examining historical transitions in this setting.

2.2 Data Collection and Analysis

The fieldwork of this preliminary survey was conducted in August 2024, employing qualitative research methods to explore the transformations in livelihood strategies over the past 80 years just before the village resettlement. Eighty years ago, the local people lived in a highly isolated area, far removed from major roads, markets, and infrastructure. This period marked the pre-resettlement phase of the village when the community relied heavily on subsistence practices like swidden agriculture and foraging in the forests their livelihoods were shaped by limited access to external resources and opportunities.

To further validate the timeline, we cross-referenced these oral histories with local records and environmental indicators through Focus Group Discussions (FGDs) and in-depth interviews. FGDs involved diverse groups of participants, including fishermen, farmers, traders, and community leaders with a total 12 respondents, enabling the collection of collective knowledge and shared experiences regarding livelihood transitions. In-depth interviews, on the other hand, were conducted with all participants who could provide rich, detailed narratives of the socio-economic changes and environmental challenges faced by the community. These interviews emphasized oral histories, capturing events and processes that have shaped livelihood adaptations across generations [5]. Observation of current activities, such as traditional weaving techniques or honey harvesting, also helped identify which activities were deeply rooted in the past.

The study also examined the interrelation of socio-cultural dynamics and resource utilization practices, focusing on how environmental changes, policy interventions, and market shifts influenced livelihood strategies. By combining these methods, the research aimed to build a comprehensive picture of both collective and individual experiences, highlighting the social and environmental factors driving livelihood changes in Nampar Sepang.

A qualitative descriptive approach was employed to analyze the data, with an emphasis on historical reconstruction and thematic analysis. Historical reconstruction involved synthesizing narratives from FGDs and interviews to map out key milestones in livelihood transitions, such as shifts from forest-based subsistence activities to marine and coastal resource exploitation. Thematic analysis categorized data into key themes, including environmental degradation, economic pressures, market integration, and social adaptations. This analytical framework facilitated an in-depth understanding of the factors driving livelihood diversification and sustainability within the community [3,4].

The analysis revealed significant transformations in livelihood strategies over the past 80 years, shaped by external factors such as infrastructure, declining agricultural productivity, and expanding market opportunities for agriculture and marine products. By tracing these transitions, the study underscores the adaptive capacities of coastal communities in response to socio-environmental challenges. The findings contribute to broader discussions on sustainable development and resilience in rural coastal settings, offering valuable insights for policymakers and stakeholders aiming to support livelihood diversification in resource-dependent communities.

2.3 Characteristic of respondents

Table 1 shows the characteristic of respondent in Nampar Sepang village. The participants in the village primarily engage in agricultural activities, with a considerable number actively involved in Farmer Groups. These groups are usually for coordinating agricultural activities and promoting collaboration especially in getting the subsidies among farmers. Leadership within these organizations is well delineated, with leaders supervising designated farmer collectives such Sepang Indah, Bato Masung, Baeng Koe, Sinar Tani, and Gurita Jaya. Mr. A, 36, the Head of the Village, is a pivotal player in agricultural development and planning within the village.

Table 1. Characteristic respondents in the village

No	Name	Status	Age	Number of Family Members	Total plot of Agricultural land (ha)	Total Area of Agricultural Land (ha)	No. of Cattle	No. of Goat
1	A	Head of Village	36	5	2	1	0	3
2	B	Head of Group Farmers of Sepang Indah	41	5	2	1.5	3	4
3	C	Head of Group Farmers of Bato Masung	32	3	4	1	0	0
4	D	Head of Group Farmers of Baeng Koe	50	7	2	6	0	0
5	E	Head of Group Farmers of Sinar Tani	28	3	2	1	0	0
6	F	Head of Group Farmers of Gurita Jaya	39	4	1	0.5	0	0
7	G	Group Farmers member of Gurita Jaya	55	7	2	4.5	0	2
8	H	Group Farmers member of Sepang Indah	70	1	1	2	3	3
9	I	Group Farmers member of Sepang Indah	36	4	2	1	0	2
10	J	Group Farmers member of Gurita Jaya	48	5	2	3	0	0
11	K	Group Farmers member of Sinar Tani	27	4	2	1.25	6	5
12	L	Group Farmers member of Tunas Baru	28	2	2	1.5	0	0

The respondents' ages span from 27 to 70 years, with an average household size of 4 to 7 individuals. Younger respondents, like E and K, engage in farming and raising livestock, demonstrating the involvement of younger generations in agricultural livelihoods and also how to managing their money. Conversely, older persons such as H (70 years) and G (55 years) contribute extensive experience to agricultural practice. This age diversity guarantees the preservation of traditional knowledge while facilitating the incorporation of contemporary practices within the community.

The village's agricultural operations are influenced by diverse land ownership patterns. The majority of respondents possess 1 to 4 plots of agricultural land, with total land areas varying from 0.5 hectares to 6 hectares. The most extensive landholding is attributed to D (6 hectares), whereas smaller parcels are overseen by others such as F (0.5 hectares). These agricultural fields are utilized for cultivating rice, red onion/shallot, and corn.

Livestock is an essential aspect of the respondents' livelihoods. Cattle ownership is restricted, with K possessing the largest quantity (6 cattle). Goat rearing is more common, with participants such as A (3 goats) and K (5 goats) actively involved. The emphasis on both agricultural cultivation and animals signifies a mixed farming system, crucial for saving and income diversification.

A significant characteristic of Nampar Sepang Village is the lack of documented migration among respondents. This stability underscores a robust connection to land and local economic systems. The role of active farmer groups in the village reinforces social unity, enabling the community to effectively navigate issues like shifting market demands or environmental changes. In addition, they also engaged in fisheries activities as a forager to meet their needs. The data of respondent characteristics highlights the community's dependence mainly on agriculture, organized within a cooperative framework that incorporates both individual and group endeavors in farming and livestock management.

3 Results and Discussions

3.1 Historical transition of local livelihoods from Mountain to coastal area in Nampar Sepang village

The figure 1 illustrates the historical transition of local livelihoods from Mountain to coastal area since 1940s to 2024, presenting a spectrum ranging from subsistence-based, isolated systems to more diversified, market-oriented income streams. This transition reflects significant changes in socio-economic and environmental dynamics over time, driven by various internal and external factors. These factors include technological advancements, market integration, environmental pressures, and policy interventions.

In the early stages of livelihood development, local communities in remote coastal regions, such as those adjacent to forests, relied heavily on subsistence activities to meet their daily needs. These communities practiced swidden agriculture—also known as shifting cultivation—to grow staple crops such as rice and corn. Swidden agriculture involved clearing small forest plots through slash-and-burn methods, cultivating the land for a few years, and then allowing it to regenerate naturally. This practice was well-suited to the limited technology and labor available at the time and enabled communities to maintain food security in resource-scarce environments [8]. Additionally, the collection of non-timber forest products (NTFPs), including honey, wild fruits, and medicinal plants, served as a supplementary source of food and income, while hunting provided protein to meet nutritional needs. These activities were deeply intertwined with traditional ecological knowledge, passed down through generations, which guided sustainable resource use and ensured the community's survival in isolation [9].

Economic activities during this subsistence period extended beyond local consumption, as communities engaged in small-scale maritime trade to distribute surplus products. Using traditional boats, they traded forest goods like honey, woven products, and dried fish with neighboring villages, establishing rudimentary trading routes that connected isolated communities. Despite the limited scope of these trade networks, they were vital for acquiring goods not available locally, such as salt or iron tools. The inauguration of Wayanambas Spring in 1945 marked a significant milestone for the community, providing a reliable water

source that enhanced agricultural productivity and improved overall living conditions. However, these isolated subsistence systems were inherently vulnerable to environmental changes, such as soil degradation or droughts, and lacked the resilience provided by diversified or market-oriented livelihoods [5].

In the 1960s, the introduction of an irrigation system marked a transformative period for livelihoods in the coastal region. The development of irrigation infrastructure allowed communities to transition from traditional swidden agriculture to more stable rice field production, which offered higher yields and greater food security. However, traditional practices such as maize cultivation in forested areas and red rice farming in rainfed zones were still maintained, highlighting a hybrid livelihood strategy that combined old and new systems [10]. This transition also encouraged the gradual relocation of individuals from remote forest regions to coastal areas, driven by the promise of better agricultural opportunities and improved living conditions. The inauguration of Tivorowan Springs in 1969 further enhanced the region's water availability, supporting both irrigation and household needs, and fostering a more settled lifestyle in the coastal areas. These changes represented an early adaptation to evolving environmental and socio-economic conditions [8,11].

By the 1990s, the construction of roads from 1995 to 1997 played a pivotal role in connecting isolated villages to broader markets and socio-economic networks. The improved accessibility facilitated gradual resettlement into coastal areas and diversified livelihood opportunities. The outsider came to the village by the truck not by boat anymore. Villagers began integrating fishing activities into their income strategies, particularly during full moon periods when fishing yields were traditionally higher. Women in the community also started engaging in artisanal weaving, attempting to sell their products in local markets, which reflected an early phase of semi-market engagement. Despite these advancements, the village's socio-economic structure remained relatively modest, influenced by limited exposure to globalization and constrained market access.

In the early 2000s, market dynamics began to shape local agricultural practices more prominently. Traders from Java introduced red onion seeds to the region, prompting a shift in agricultural production. Villagers adopted red onion cultivation as a primary income source, selling their harvest back to traders at prices determined by external markets. This phase highlighted both opportunities and challenges, as local producers gained access to more stable income streams but remained dependent on external market forces. While road access improved and market entry became unrestricted, villagers faced fluctuating prices and unequal power dynamics in trade negotiations [12,13].

In recent years, livelihoods in the coastal region have become increasingly diversified and market-oriented. The COVID-19 pandemic acted as a catalyst for local entrepreneurs to explore new avenues for income generation, including selling products at exhibitions and local events. Today, villagers rely on a combination of forest products, agricultural outputs, and fisheries as their primary income sources. This diversification reflects an adaptive strategy to mitigate risks associated with environmental, economic, and social uncertainties. Activities such as seaweed farming, aquaculture, and red onion production have become integral to household economies, while improved infrastructure has facilitated greater market access. Women, in particular, have played a significant role in diversifying household incomes through artisanal and small-scale entrepreneurial activities.

Despite the growing integration into regional and national markets, challenges persist. Market volatility, environmental degradation, and socio-economic inequalities remain barriers to achieving sustainable development in the region. Effective governance, institutional support, and sustainable resource management are essential to ensure long-term resilience and equity within these communities [4,7].

3.2 Current livelihood activities in Nampar Sepang village

The local people of Nampar Sepang Village maintain diverse livelihood activities. One of the unique practices in the community is sea foraging, which occurs during the full moon, one to two days. During this time, villagers collect various marine resources, such as shellfish, squid, shrimp, and local fishes, from the shallow coastal areas. This activity not only provides a source of income but also fulfils household food needs. It is usually collected by women and children in the village in the evening to night.

In addition to sea foraging, red onion or shallot cultivation has become a significant agricultural activity in the village. Farmers carefully prepare their fields and time their planting to align with the seasonal climate, ensuring optimal yields. Shallot farming serves as a primary source of cash income for many families. The crop is currently sold to the traders from Java. This reflects the villager is highly dependent on the traders for almost a decade.

The forest remains an integral part of the villagers' livelihoods. Many households engage in activities such as hunting and collecting non-timber forest products (NTFPs), particularly honey. Honey harvesting, which occurs twice a year, is both a source of income and a practice rooted in cultural heritage. In addition, hunting provides protein-rich food for households, while other forest products, such as medicinal plants and wild fruits, supplement their daily needs. These forest-based activities highlight the community's reliance on natural resources and their sustainable utilization of the surrounding environment.

Agriculture continues to be the primary livelihood activity in Nampar Sepang Village, with rice cultivation in paddies being the most dominant practice. In upland areas, farmers grow red rice and corn, which are vital for food security. The cultivation process is labor-intensive, involving planting, weeding, and harvesting, but it is central to the community's way of life. The rice and corn produced often suffice for household consumption, with any surplus being sold for additional income. These activities demonstrate the villagers' dependence on land-based resources and their traditional farming techniques.

Weaving is a daily activity for the women in the village and is deeply embedded in the cultural fabric of Nampar Sepang. Using traditional looms, women craft intricately designed textiles that reflect their identity and artistic heritage. These woven products are not only used domestically but also sold to visitors and traders, contributing to household income. This craft is a valuable skill passed down through generations and remains a steady source of economic empowerment for women in the community.

In addition, gathering coconuts is a common practice, with the fruit providing food, drink, and oil for domestic use or sale. Many households also raise livestock such as chickens, cattle, and goats, which serve as a financial safety net during emergencies. Off-farm activities, such as wage labor in agriculture, working as drivers, or trading agricultural produce, further diversify income sources. These additional activities reflect the villagers' resourcefulness and their efforts to mitigate risks associated with relying on a single livelihood. The livelihood activities in Nampar Sepang Village are a blend of tradition and adaptation which engage in a wide range of practices, from agriculture and forest-based activities to weaving and off-farm labor, ensuring resilience in the face of economic and environmental changes.

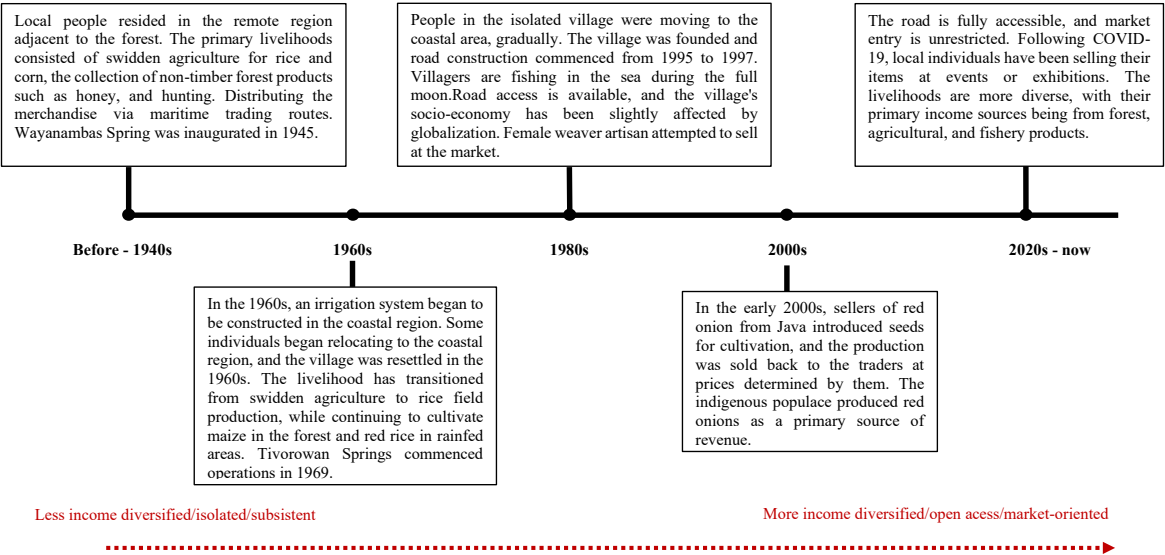


Fig. 1. Historical transition of local livelihood from Mountain to Sea since 1940s to 2024 in Nampar Sepang Village, Sambi Rampas District, East Manggarai, NTT

3.3 Sustainability and Resilience through Livelihood Diversification

Livelihood diversification is widely recognized as a critical strategy for promoting sustainability and resilience in rural areas, particularly in regions experiencing socio-economic and environmental transformations. Previous studies, such as those by Chambers and Conway [14] and Bennett et al. [15], emphasize that diversification is instrumental in enabling rural households to navigate uncertain environments, ensuring their long-term sustainability and well-being. By engaging in multiple livelihood activities, rural households reduce dependency on a single resource, thereby mitigating risks and enhancing adaptive capacity [11,16]. For instance, interviews with local households revealed that foraging, particularly sea foraging during full moon periods, represents an activity with low entry barriers and minimal risk but also leverages the coastal region's abundant resources, emphasizing the critical role of environmental diversity in supporting stable livelihoods during adaptation. It provides immediate food and income, making it an essential strategy for adaptation, particularly for households with limited financial or physical capital. Combining such low-risk, low-entry barrier activities with higher-risk, higher-return pursuits, such as red onion cultivation or livestock rearing, allows households to balance their livelihood portfolios [16], ensuring both stability and growth. This adaptive approach not only stabilizes household incomes but also fosters resilience by providing alternative strategies to confront unexpected challenges and uncertainties [16]. Furthermore, diversification aligns with sustainable development goals by ensuring that rural economies remain flexible and responsive to evolving conditions [13].

Over the past 80 years, as illustrated in the figure, livelihood systems in rural coastal regions, such as Nampar Sepang Village in East Manggarai, have evolved significantly, transitioning from subsistence-based and isolated economies to more diversified and market-oriented frameworks. Historically, the village was situated in a mountainous area, where communities primarily engaged in swidden agriculture, cultivating crops such as upland rice and corn, and relied on the forest for hunting and harvesting non-timber forest products like honey and medicinal plants. Following the resettlement to a coastal area, the community began integrating fishing and sea foraging into their livelihoods. The shift from a mountain-based to a coastal setting reflects both ecological adaptation and the community's response to improved infrastructure, such as road access, which facilitated market integration and the adoption of high-value crops like red onion. This transformation highlights the interplay between the village's geographical characteristics and its evolving livelihood strategies. This transition highlights a shift toward "progressive diversification," where rural households integrate sustainable and economically viable practices into their livelihoods, thereby enhancing their long-term stability and resilience [17].

Understanding the distinction between "progressive" and "distress" diversification is crucial for assessing the sustainability of livelihood transitions. Progressive diversification refers to the intentional broadening of livelihood strategies, driven by opportunities such as improved infrastructure, better education, and market access [11]. This form of diversification aligns with rural development objectives by enhancing income, reducing vulnerability, and fostering resilience. For example, the interviews revealed that the adoption of commercial agriculture, such as shallot farming, and small-scale entrepreneurial activities, like weaving, represents progressive diversification that leverages both local resources and external opportunities. These activities connect households to broader market systems while generating sustainable income. In contrast, distress diversification arises from necessity, often triggered by resource scarcity, environmental shocks, or socio-political instability. For example, early reliance on swidden agriculture, sea foraging, and forest resource utilization reflects distress-driven responses to isolation and limited resource availability. These

practices, while vital for survival, often offered low returns and limited long-term stability. However, the gradual shift toward market-oriented activities, supported by improved infrastructure and institutional frameworks, underscores an economically positive transition toward progressive diversification in recent decades [4,13]. Households now strategically combine low-risk activities, like sea foraging, with higher-risk investments in commercial farming or livestock, allowing them to buffer against uncertainties while maximizing returns. This combination of livelihood strategies demonstrates an adaptive and forward-looking approach, where past experiences inform current practices. By fostering diverse yet complementary livelihood portfolios, rural households not only sustain themselves but also contribute to the broader goals of sustainable rural development.

4 Conclusion

The transformation of livelihoods from mountain to the sea in the remote of Eastern Indonesian village highlights the interplay between environmental, socio-economic, and infrastructural changes. The community has shifted from subsistence-based systems reliant on swidden agriculture and forest resources to diversified, market-oriented livelihoods. This transition was driven by improvements in irrigation, infrastructure, and market access, demonstrating the importance of both opportunity-driven (progressive) and necessity-driven (distress) diversification. These findings underscore the critical need for policies that promote sustainable economic growth while preserving natural resources. Such dynamics emphasize the need for well-designed policies and interventions that balance economic growth with resource sustainability.

Creating an optimal strategy for sustainability in rural development necessitates addressing these issues. An effective approach must incorporate insights from this situation, emphasizing the establishment of conducive conditions via infrastructure, education, and institutional support. It should prioritize resilience-building through the promotion of diversification techniques that mitigate reliance on a singular resource, stimulate innovation, and enhance connectedness to broader markets. This strategy can guarantee that rural communities not only adjust to problems but also prosper amid continuous global transformations. By leveraging the experiences of isolated villages such as these, policymakers and researchers may formulate customized, sustainable development strategies that meet local requirements while advancing greater national and global goals for rural transformation.

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