



## Investigating the Transition from Mining Dependency to a Sustainable Community in Rosh Pinah, Namibia

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### Abstract

This article explores the possibilities of developing sustainability in Rosh Pinah, a former mining town in Namibia. The study looks at the effects of completing this transition on the locality's economy, the preparedness level of the community, and the problems therein. This study explores economic diversification, community participation, and participatory governance approaches that aid in moving mining economies towards sustainable development. A survey research design was used to capture the magnitude of the

transition, and data were collected. Primary data were collected through a total of fourteen interviews, which included purposively sampled participants from an array of fields, including specialists in the environment, health, education, and other relevant fields. The Grounded Theory Approach was used to analyse the data to determine the pertinent features of the transition. This study was supplemented by a literature review of the sociological aspects of mining dependence and the sustainable development. The findings suggest that to achieve the desired change, Rosh Pinah must shift from a mining-based economy to a more diversified economy. Developing sustainable livelihoods involves creating alternative employment opportunities, local industrial development, and self-employment. A cohesive community should be shaped where project ownership, active participation in decision-making, and entrepreneurship are necessary conditions. The research highlights the need for collaborative governance through the effective engagement of mining firms, civil society organisations, and local communities to improve sustainability. It is advisable to consult governance mechanisms, conduct regular monitoring to accomplish transition targets, and assist with management adaptation over time. With empirical evidence, this mining research develops a theory on sustainable community development and offers suggestions for policy and community leadership in the context of structural changes in mining-reliant communities.

**Keywords:** Mining Dependency, Economic Diversification, Community Empowerment, Collaborative Governance, Sustainability.

## Introduction

Rosh Pinah is a small village in southern Namibia which has relied heavily on mining activities, particularly the Rosh Pinah zinc and lead mines. Mining provides job opportunities, infrastructure, and social amenities. Unfortunately, such dependence exposes the community to problems, such as volatility, resource

exhaustion, and mine closures. A slowdown in mining activity often has a negative correlation with socioeconomic parameters, such as unemployment levels, investments in the area, or social equality.

The shift to sustainable development has brought to the forefront problems faced by Rosh Pinah and similar communities that rely heavily on a single economic pillar. Sustainable development seeks to achieve economic growth along with environmental conservation and social equity. In the case of Rosh Pinah, the challenge is to identify new economic endeavours that are profitable, empower the community, and mitigate environmental risks.

Moving from a mining-dominated economy to a more self-sufficient community will require a focus on economic adaptability and socio-environmental sustainability. This change mandates the evaluation of social and economic conditions, the state of the environment, the challenges of mining dependency, and the possibility of sustainable development. The active involvement of local residents, business leaders, and politicians is required to effect this change. The adverse economic, social, and environmental effects of mining have harmed the Rosh Pinah community adversely.

The threat posed by the gradual decrease in mining activities is severe, especially in towns that rely heavily on this industry. Community reliance on mining firms leads to social disorganisation, inadequate representation, and restrictions on participation within the social decision-making context. In addition, mining is known to have destructive effects on the environment, such as soil and water pollution, air degradation, and resource wastage, all of which affect liveability and ecological health. For Rosh Pinah to achieve a sustainable community, it is important to address these challenges while developing coping strategies that can be sustained over time. This includes evaluating the socio-economic and environmental conditions that cause such shifts, examining the emerging trends of community capacity and collaborative governance for sustainable development, and determining what might assist in fostering a responsive, diversified, and sustainable economy.

## Methodology

The transformative paradigm's derivation from a mining-reliant economy poses challenges for Rosh Pinah. This is based on the premise that the out-migration of particular activities, in this case, mining, can have a disproportionately negative impact on certain people, leading to greater impoverishment (Cole et al., 2022). With this paradigm, the research aims to tackle social justice and power imbalances through the process of aiming for change (transformational approach).

### Research design

Rosh Pinah is impacted in other ways by this paradigm as well which, in this case, is positive. First, it allows for the inclusion of all possible heterogeneous actors, no matter how peripheral they are, even those who are usually sidelined in the processes of planning the transition (Creswell & Creswell, 2018). This means that the community as a whole is included, not only those who advocate for the elites. Second, it captures the redistribution of resources and responsibilities unearned during the transition. This is very important for a

As the goal of this study was to gain insights from various community groups,

mining town like Rosh Pinah, where the population and socio-cultural structure have been influenced by mining for a long time (Davis et al., 2022).

This also prevents passively accepting the form of power relations and the reality of Rosh Pinah, as it has been historically constructed with a lot of injustice (Mertens, 2018). Such analyses have the potential to identify systemic injustice and guide the change process. In this manner, the research seeks to tackle economic diversification and sustainability for Rosh Pinah to foster a fairer and just unrealistically sustainable future for all community members (Taylor & White, 2021).

### Target Population and Sampling

The sampling for the focus population of this study was executed through purposive sampling which implies the selection of participants based on certain predefined criteria. This sampling is ideal where research seeks to understand certain phenomena in great detail, as it allows the selection of subjects who have considerable understanding or experience of the issue at hand.

a sample was defined to capture the perspectives of different stakeholders

involved in the transition of Rosh Pinah. Considering the nature of qualitative research and its emphasis on gaining insight from rich and detailed data, as opposed to scope, smaller, refined samples are more suited for capturing complex social phenomena.

The percentage of the population used as a sample for this study was computed using the following formula:

$$\textbf{Sampling Ratio} = (\textbf{Sample Size} / \textbf{Total Population}) \times 100 = (14 / 2835) \times 100 \approx 0.49 \%$$

This ratio shows that the sample used comprises approximately 0.49 percent of the entire population.

Although this figure may seem low, it is considered sufficient in the context of qualitative research where the goal is data saturation, or the point where no new data can be found. This strategy guarantees that the study adequately understands the community dynamics without requiring a large sample size.

The choice of 14 participants through purposive sampling is, from a methodological perspective, a reasoned selection that guarantees that the research meets its goals by

concentrating on the depth of insight and quality of information gathered. This is consistent with Creswell and Creswell (2018), who stressed the need to choose those most likely to help answer the research problem and questions.

They included:

- 1) Teachers involved in sustainability education initiatives.
- 2) Former miners: Speaking of the challenges faced by individuals transitioning away from mining employment.
- 3) Businesspeople: Actively attempting to diversify the region's economy.
- 4) Youth workers: Understanding the impact of youth in the Developing World on sustainable development.
- 5) Community representatives: advocating residents of the area.
- 6) Environmental advocates: Focusing on environmental and conservation issues.
- 7) Other experts: Offering specialised knowledge of renewable energy, solar systems, or architecture.

Other respondents were included in this study because the research focused on obtaining a holistic understanding of

### Method of Data Collection

The study utilised two principal methods of data collection: semi-structured interviews and text analysis.

### Interviews

The semi-structured format of the interview made it easy for participants to respond as descriptively as possible because of the open-ended nature of some of the interview questions posed, while guaranteeing a degree of order (Kvale, 2022). The interviews were organised around central topics that mattered, including but not limited to:

- a) Economic Development and Mining-related Issues.
- b) Industrial or societal transformation.
- c) Possibility of harnessing renewable energy.
- d) Sustainable development efforts in communities.

information and served as a triangulation with the interview data (Bowen, 2020).

### Analysis of Data

Rosh Pinah's development over time (Patton, 2021).

The interviewees expressed their views on the obstacles and stimuli regarding sustainable development in Rosh Pinah.

### Document Review

Additional information was obtained by reviewing documents from local NGOs, government publications, web documents, and EMPs. These comprise plans for environmental management, such as operational EMPs for local landfill sites, policy documents on renewable energy, and mining socioeconomic impact assessment documents (Namibia Ministry of Mines and Energy, 2023). The documents supplied background

The qualitative information gathered from the interviews was analysed through grounded theory analysis using Microsoft

Excel. The grounded theory approach was chosen because it relies on concept development from data as opposed to operating in existing hypothesis contexts (Glaser & Strauss, 2020). The procedures were as follows.

### Open Coding

The first stage of coding involved subdividing the transcripts of the interviews into smaller parts that could be remembered for themes. For example, codes such as economic diversification, 'engagement in renewable energy', and 'local participation' were created.

### Axial Coding

Relationships among the codes were defined to cluster them into generalised themes. For instance, "economic diversification" was associated with the subthemes of "small-scale agriculture" and "tourism" development.

### Select Coding

Development of the core categories focused on central ideas which captured the process of the Rosh Pinah transition. The emerging narratives were "challenges in moving out of mining dependency" and "green energy development" opportunities.

### Constant comparison.

Other pieces of information were constantly compared from every participant to check the accuracy of the coding and the themes developed (Charmaz, 2021).

### Memo Writing

Reflexive memos are written as ideas, and theoretical representations change during different stages of the process (Corbin & Strauss, 2022).

### Theoretical Saturation

Data collection was stopped at the point where the target was reached, and scant new information was provided that was related to central themes, also referred to as theoretical saturation. Trend analyses and illustrations were performed using Excel, as it aided in ordering the codes and categories (Gibbs, 2023).

### Ethical Considerations

In the course of the study, ethical boundaries strictly adhered to the following:

**Informed Consent:** Before participants agreed to take part at any level, they were told the purpose of the study, what their role would be, and how that

information would be utilised (Resnik, 2021).

**Anonymity:** To protect the identity of the respondents, all documents containing identifiable information were kept anonymous throughout the transcription and analysis processes (Wiles et al., 2021).

**Voluntary Participation:** Respondents were provided with consent documentation which clearly indicated that their participation was voluntary, and they were free to leave the study at any point without any form of explanation. This fostered a greater willingness among participants to reveal sensitive information regarding their community's issues and possibilities.

## Strengths of Methodology

### Limitations

Despite all its strengths, this methodology has a few weaknesses.

Because of the limited sample size of 14 participants, the ability to generalise beyond Rosh Pinah is most likely narrowed. There is some degree of selection bias due to reliance on purposive sampling, whereby the selected respondents may not be actively

**Diverse Perspectives:** The selected participants from different disciplines, education, business, and environmental advocacy, guaranteed that the problem of Rosh Pinah's transformation was dealt with in a holistic manner.

**Flexibility in Data Collection:** Through use of semi-structured interviews, respondents were able to give their opinion on the most important issues while still working towards the set research objectives.

**Grounded Theory Approach:** This method enabled the corresponding ethnos of knowledge to form from the stories of the participants without having to impose any expectation of theoretical concepts

involved in sustainability initiatives but rather passively impacted by them. In future studies, incorporating larger sample populations, along with qualitative interviews and quantitative questionnaires, would help address these limitations.

## Results



The study achieved an outstanding participation rate of 93%, with 14 of 15 participants sharing their views. Such a high participation rate reflects the relevance and importance of the study to respondents. The respondents came from different fields, such as environmental management, health, and education, which helped to comprehensively understand socio-economic issues in Rosh Pinah.

### **Demographics and Social Composition**

The demographic study showed that 57.1% of the participants were women and 42.9% were men, suggesting a degree of gender balance. The employment situation was diverse, with 64.3% of the respondents in full-time employment and the rest in contract positions or internships. This pattern reveals reliance on stable jobs, which are mostly in the mining industry, while also indicating the vulnerability of contracts and temporary employment.

The duration of stay at Rosh Pinah varied widely. Of the respondents, 50% had lived in the town for between one and ten years, which shows a significant increase in new residents, and 14.3% had lived

there for over 40 years. This suggests that there is a mix of long-term residents and seasonal workers, which is greatly determined by job prospects. In addition, the modal age of the sample was the youngest, less than 32 years, which accounted for 35.7% of the sample.

This suggests that a significant proportion of the youth are beginning to participate in economic activities, which is very important for the sustainability of the town's economically active population.

### **Social Dynamics**

Mining remains the primary source of employment and economic activities in towns. Although relative inequality still exists between miners and non-miners, miners tend to have better pay, employment, and prospects. However, informal sector workers and service providers are in a much more vulnerable economic situation, which increases their poverty levels. These informal settlements are characterised by high unemployment, poverty, and drug abuse, which exacerbate the social problems of inequality. The combination of rapid population growth and lack of social or infrastructural services has increased

crime, alcoholism, and inadequate housing. Addressing these social issues should be accomplished through community development initiatives that seek to achieve adequate service provision, equity, and social integration.

### **Economic Vulnerability**

Rosh Pinah's economy comprises sectors that are heavily dependent on mining activities. This makes this economy particularly sensitive to negative influences such as economic recession or mine closures. Because there is no diversification of the economy, there are few job opportunities apart from mining, which aggravates dependency on the town economy. Mining has been closed in several periods, which has caused unemployment and high levels of poverty among people, especially those who are the most disadvantaged.

### **Need to promote other industries in the area to avoid dependence on mining.**

The expansion of sectors such as small-scale industries, agriculture, tourism, and renewable energy projects are potential substitutes. These sectors can create jobs and reduce their economic problems. Private sector participation,

along with government support, is required to create alternative sectors that can guarantee long-term job opportunities.

### **Environmental issues**

Unregulated pollution through Pb and dust in certain regions has become a public health hazard, especially in children and other vulnerable groups. The interviews conducted for the study indicate an increase in discontent as a result of inadequate treatment of environmental issues stemming from mining companies. The concentrations of Pb and other metals in the environment have serious effects on health, such as neurological damage, breathing difficulties, and impaired growth in children. Renewable energy investments, policy implementation, improved pollution management, and greater awareness of the community will aid in preventing these problems. Furthermore, they would serve to promote ecological well-being in the long run.

### **Population growth and its effect on the construction of infrastructure**

### **Infrastructure and Population Growth**

The economic growth attributed to mining has led to an increase in population. However, this was accompanied by the downsizing of the Skorpion mine, which fuelled emigration, unemployment, and economic instability, highlighting that the community was overly dependent on mining. In the absence of adequate infrastructure, this makes the economic dependency on the mining transition to a diversified economy very difficult. To encourage and sustain economic diversification and increasing population, social infrastructure, research and development, education, and health services should be prioritised. Enhancing urban planning and public service delivery can improve community resilience and long-term sustainability.

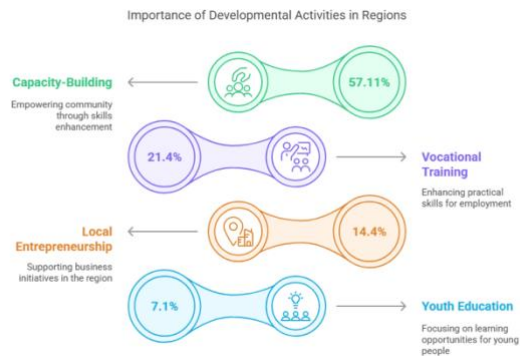
### **Business Development and Community Mindset**

The general view among residents is that Rosh Pinah is a stopping point in their journey rather than a place to establish a permanent home. This perception leads to reduced expenditure on local

businesses and infrastructure, which causes an outflow of investments and greater economic dependence on mining. By striking through these barriers, an uplifting entrepreneurial spirit can provide much-needed diversification. Small enterprises can be promoted by financially supporting entrepreneurial training and initiating synergistic relationships between local and foreign businesses, which can boost the economy. Relieving funding bottlenecks and improving business education will further strengthen small business development.

### **Plan to Become Self-Sufficient.**

To reduce economic dependency, it is critical to diversify the economy to create more jobs, improve the quality of life, and minimise social inequalities. Efforts to lessen reliance on mining also require a broad guiding policy, purposeful spending, and systematic retraining of the workforce. Having an all-in-one government, business, and community



approach is vital to achieving a self-reliant economy. Adopting less restrictive social spending policies and combining them with more aggressive and calculated policies aimed at stimulating investment in non-mining sectors will greatly enhance the rate of economic modernisation.

While building capacity continues to be a key concern in the community survey, 57.1% of the respondents emphasised that it is essential for empowering the community. Vocational training received 21.4% of support, 14.4% supported entrepreneurship, and 7.1% supported youth education. Expanding vocational training tailored to local economic demands will boost employability beyond that of mining. Additional strategies, such as financial literacy and leadership skills training, will enable self-sufficiency.



## Conservation of Resources and the Environment

As noted in the survey, 78.7% of the respondents stated their opinion

regarding the lack of pollution controls, renewable energy adoption, and conservation programs offered for implementation. Active participation from the community, together with the implementation of sustainable resource management policies, ensures ecological preservation.

## Economic Dependency and Transition Challenges.



Aside from that, 26.7% of respondents reported a lack of economic diversification as a major concern, while 17.7% commented on the negative impacts of mine closures on employment. In addition, the respondents noted slow economic growth, dependency on outside markets, and internal market concerns.

### Economic Issues Affecting Individuals and Organizations

These figures correlate with 37.5% of respondents who complained about the lack of available positions and the allowance of using external staff, together with 25% of selective job opportunities offered and low local business activity.

These challenges mirror the larger patterns seen in mining towns where there is overdependence on the industry, which consequently breeds economic dependency.

### Discussion

#### The Shift of Rosh Pinah: From Exploitation of Minerals to Sustainable Development

This study focuses on the evolution of Rosh Pinah as a locality that primarily depended on mining for economic activities. It places great emphasis on socioeconomic readiness, community preparedness, and key-takeaways. The results illustrate the importance of community economic participation and multi-tier government impacts on sustainability. These findings have been corroborated by studies performed in other mining communities (Brown & Green, 2022; Brown & Green, 2023).

### Economic diversification: Sustainability Strategies Deep Rooted in Change

Rosh Pinah has initiated changes to its economic structure making it a distinct feature in the town's sustainability approach. The town has been mining for

zinc and lead since it opened the mines in 1969. Although such mining activities have created job opportunities and improved the general infrastructure of the region, they have also caused the economy to over-rely on global market prices for commodities as well as the eventual closure of the mine (Jones & Taylor, 2021).

To reduce dependency on mining, this research recommends the establishment of new locally owned businesses. For instance:

**1. Energy Projects:** The enhancement of economy and solar energy utilisation within the Rosh Pinah region will be undertaken by the proposed photovoltaic solar plant, which will promote self-sufficiency (Wilson et al., 2023).

**2. Agriculture and ecotourism:** Some participants suggested small-scale farms and ecotourism as alternatives to mining. Investments can be made in areas that exploit the unique geography and biodiversity of the region to create more value and employment opportunities (Harris & White, 2020).

There is also an option to invest in creating new industries which provide long-term sustainable economic returns.

Such projects require financing from the private sector, the government, and even mining corporations. A number of these mining companies have started funding small businesses and internship programs aimed at teaching local people how to work outside of the mines (Greenwood & Patel, 2022).

### **A Community-Centred Approach: Bottom-Up**

**Theoretical Framework:** The approach argued in favour of local community engagement when it comes to sustainability which is in line with Community Empowerment Theory, which mandates community members to make decisions (Clark et al., 2021). When locals are proactive, chances are new initiatives that will be successful while nurturing a sense of responsibility towards the community (Wilson et al., 2023).

### **Strategies to increase community involvement are as follows:**

1. Building Trust through Participatory Planning: Trust is developed, and long-term commitment is fostered by residents' participation in the planning of sustainability projects.

2. Capacity Building: Community members have acquired welding and basic electrical skills as a result of training sponsored by mining companies, which has enhanced their levels of adaptability to different economic industries (Jones & Taylor, 2021).
3. Accountability and Transparency: Residents' trust and credibility are earned through open relations regarding project objectives, fund distributions, and the impact of undertakings on the environment (Harris & White, 2020).

Local knowledge, especially regarding environmental conservation, can pose a significant value to the community issues at hand (Smith et al., 2022). Pollution is granted more involvement by local residents to enhance ecological restoration efforts.

### **Collaborative Governance: Bridging Stakeholders**

Results-based effective collaborative governance is essential for Rosh Pinah's transition. This research calls for action from relevant actors.

- Residents of the area

- Representatives from the mining industry
- Non-governmental organizations
- Government officials

This ensures the protection of social equity and justice, reduction of pollution, and fair distribution of resources, while advancing the achievement of sustainability targets (Wilson et al. 2023). Collaborative governance makes it possible to combine the necessary capabilities and resources to respond effectively to complex issues (Greenwood & Patel, 2022).

An example of effective governance is the adoption of the polluter pay principle, which places responsibility on mining companies for the environmental damage caused by mining activities.

Community-centric environmental monitoring guarantees adherence to regulations, while minimising pollution and increasing environmental responsibility (Harris & White, 2020).

The construction of water treatment plants and renewable energy facilities is an infrastructure project that demonstrates the positive impact of the



cooperation between mining companies and local authorities.

The insights gathered from this study, as well as studies conducted in similar mining communities, reveal critical sustainability planning lessons.

#### 1. **Prepping for Mine Closure:**

Proactively shifting investments to alternative industries and developing local businesses are some strategies that mining firms should implement in order to not outlive their economic sustainability (Smith et al., 2022).

#### 2. **Business Development**

**Initiatives:** These strategies mirror those seen by mining Australian and Canadian firms which are aimed at fostering entrepreneurship in the region (Brown & Green, 2023):

**Enterprise Development Strategy:** Assisting small and medium-sized enterprises (SMEs) situated in mining towns to enhance their participation in the economy.

#### **Supplier Development Strategy:**

Enabling local businesses to participate in the mining industry as suppliers.

**Business Mentoring:** Offering mentorship, training, and financial aid to new business owners.

These initiatives also aim to lessen economic overreliance on mining in the region (Wilson et al., 2023):

- a) Organising trade exhibitions that allow established local firms to reach outside markets.
- b) Skills Development - The adaptable workforce is enhanced through non-mining sector training programs.
- c) Infrastructure Development: The initial step towards economic diversification. Investment in Industrial Infrastructure.
- d) Long-Term Planning: Economics as a substitute for mining should be put in place well in advance to help sustain the future.

These actions are examples of responsible best practice mining. As such, they guarantee that the communities do not become ghost towns post-mining operations (Jones & Taylor, 2021).

### **Economic Development and Conservation**



Mining operations have both economic and environmental impacts that must be addressed and managed. New developments include a large circular economy model and green energy implementation (Harris & White, 2020). Closed-loop water systems have been implemented by some mining companies and the results are astonishing. Freshwater usage is minimal and there is little harm to the environment.

Mining has a negative connotation owing to its impact. The Rosh Pinah 2.0 Expansion Project showcases advanced treatment and the positive impact of how mining can balance economic gain with environmental impacts (Wilson et al., 2023).

### **Driving Inclusion of Underrepresented Groups**

Rosh Pinah cannot be sustained without sustainable development that accommodates women, youth, and other disenfranchised groups in decision-making. To enhance social and economic resilience, inclusivity and equitable opportunity distribution approaches should be prioritised (Clark et al., 2021).

### **Building Strong Communities**

Sustainability requires social capital in addition to economic diversification. All the lessons learned from global mining communities suggest that self-sufficiency is realised through the following:

- Collaborative Governance: (Brown & Green, 2023)
- Planning the economy strategically (Jones & Taylor, 2021)
- Community-led projects (Wilson et al., 2023)

The above strategies guarantee an all-encompassing shift from reliance on mining to achieving economic diversification and resilience.

### **Conclusion**

From my observations, Rosh Pinah had to alter its approach to not only focus on the mining industry to shift into a sustainable, diversified economy, which exemplifies the complex challenges faced by resource-rich communities around the globe. As emphasised in the findings, a multi-pronged approach that includes economic diversification,

community integration, and collaborative governance is paramount.

As pointed out in the paper, “Investments in Rosh Pinah's agriculture, renewable energy production, and local businesses represent a fundamental shift in this economy's growth strategy.” If these steps are taken alongside proactive mine closures designed to curtail negative impacts on the region's natural environment, long-term economic sustainability can be achieved alongside ecological balance.

A Rosh Pinah case study revealed the extensiveness of sustainable community development, showing how the active participation of all stakeholders such as residents, mining firms, governmental constituent parts, and NGOs aims to build trust by involving them in decision-making and accountability processes as well as executing sustainability efforts.

Additionally, the encouragement of social inclusion, particularly for vulnerable groups, to achieve equitable development, as noted before, is just as important. The constant focus of Rosh Pinah on actively working towards building and developing resiliency skills

helps make the community more adaptive to changes.

The experiences and lessons learned by Pinah relate to what other mining-centred communities are going through and dealing with during this transition and reflect the need for the implementation of proactive policies and flexible approaches directed towards achieving sustainable community resilience and prosperity.

## Recommendations

### Contribution to Theory:

This study contributes to Sustainable Development Theory by offering empirical insights into the transition processes in a mining-dependent community. This emphasises the importance of public participation and economic diversification in achieving sustainable development. Additionally, it supports the Community Empowerment Theory, showing that community involvement in decision-making enhances the ability to cope and function independently.

### Contribution to Policy:

Future policies should emphasise the development of economic and

environmental diversification tools in the mining regions. This includes supporting enterprises in various economic sectors, fostering local business entities, and promoting comparative and competitive governance. Policymakers should implement measures that require mining firms to engage inclusively in the development of the communities in which they operate.

### **Contribution to Practice**

This study provides practitioners with insights into the importance of involving the community in decision-making processes and enhancing skills through capacity-building programs. Mining companies and civil society should establish transition programs to support the growth of other industries, including training, financial assistance, and conservation. By concentrating on these initiatives, communities such as Rosh Pinah can lessen their dependence on mining and articulate a vision for stable and less vulnerable development.

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### **Data Availability**

Data pertaining to this study are available from the author, but only aggregated data can be shared in line with Namibian data protection laws.

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