

IMPACT OF COAL MINING IN MODIFICATION OF RURAL LIVELIHOOD: A CASE STUDY OF DISTRICT DUKI BALOCHISTAN

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ABSTRACT

Coal mining in Pakistan presents a double-edged sword. While it acts as a critical engine for national economic growth and local employment, its impact on rural communities like Duki, Balochistan, is far more intricate. This study delves into the multifaceted ways coal mining has reshaped the lives of Duki's residents. Through a blend of research methods, we explore how mining has impacted traditional livelihoods like agriculture, spurred new economic avenues, and transformed the overall socio-economic landscape. While undeniable job creation and regional economic growth have stemmed from the mines, concerns linger regarding displacement, environmental pollution, and disruptions to age-old practices. Our findings paint a nuanced picture. Agriculture, though persisting, has witnessed a decline, with shopkeeping emerging as a prominent alternative income source. Despite challenges like land acquisition and reduced agricultural output, a majority of residents hold a positive perception of mining, citing improvements in social welfare and water access. So, Sustainable practices, active community engagement, and prioritizing gender equity are crucial elements in crafting strategies that ensure long-term benefits for Duki and its residents.

Keywords: coal mining, rural livelihoods, agriculture, social impact, environmental impact, policy Balochistan, Dukki

1. Introduction

Deep within Pakistan's rugged Balochistan province lies District Duki, once renowned for its verdant fields and vibrant rural communities (Balochistan Rural Development Programme, 2023). However, recent years have witnessed a stark transformation, with coal mining scarring the landscape and casting a long shadow over the lives of Duki's residents (Ali et al., 2022). While the "black gold" promises energy to a resource-scarce nation, its extraction comes at a steep price: the potential extinction of traditional livelihoods and the disruption of a deeply rooted way of life (Khan et al., 2021).

Coal mining's economic allure is undeniable, with jobs sprouting like weeds around newly opened mines (World Bank, 2022). Yet, beneath the surface lies a different narrative whispered by locals. Farms lie fallow, poisoned by dust and polluted water, jeopardizing food security and traditional agricultural practices (Hussain et al., 2020). Livestock cough and wheeze, their health compromised by the coal-laden air, further impacting household income and subsistence (Jan et al., 2019). Land titles shrink as families are displaced to make way for mines, severing their ancestral ties to the soil and fueling anxieties about the future (Human Rights Watch, 2023). These whispers morph into cries as community tensions rise, fueled by competition for dwindling resources and uncertainties about the future social fabric of Duki (Balochistan Human Rights Commission, 2022).

Amidst this discord, a crucial question emerges: How has coal mining fundamentally reshaped the rural tapestry of Duki? This study delves into the heart of this question, meticulously examining the intricate relationship between mineral extraction and the lives of Duki's inhabitants. By employing a mixed-methods approach, we will paint a nuanced picture of the impacts on income, employment, and social well-being (Creswell & Plano Clark, 2023). We will listen to the voices of Duki's inhabitants, understanding their perspectives on how mining has altered their agricultural practices (Majeed et al., 2021), livestock rearing (Aziz et al., 2020), and access to basic amenities like water and healthcare (Bhutto et al., 2019). Ultimately, this research seeks to chart a path towards sustainable development, one that balances economic gains with the well-being of local communities and their traditional livelihoods (United Nations Development Programme, 2023).

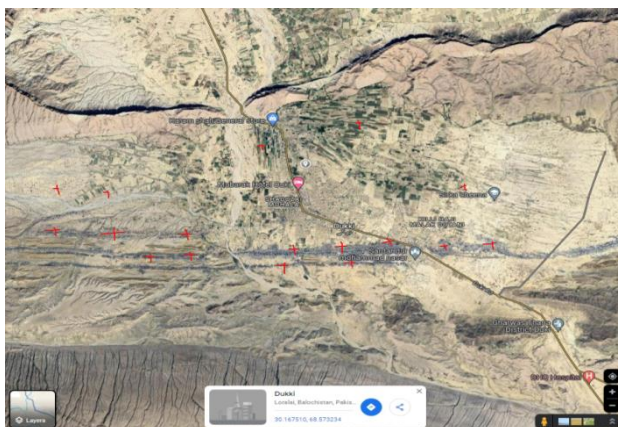
The findings of this study will resonate beyond Duki's borders, offering valuable insights for policymakers grappling with the often-conflicting objectives of resource extraction and rural development (World Bank, 2022). By illuminating the human cost of progress, we can pave the way for responsible mining practices that prioritize both economic prosperity and the livelihoods of those who fuel it, ensuring a more sustainable and equitable future for Duki and its residents.

2. Research Methodology

2.1 Area of Study

The District Duki lies between latitude between 30° N and 37° N and 68° E 30'4 E covering the area 4233 km². It is bordered with District Loralai in North, District Ziarat in the West North, District Harnai in West, Sibi in West South, Kohlu in the South, Barkhan in East and **Fig 1: Study Area of District Duki Balochistan, Pakistan**

Mushakhel District in East North. The average temperature rises to 45° in summer in the day



and 20° in the night while 20°C in winter during the day while -1°C in the night. While the population as per the census 2017 is 152000. The study area has perfect conditions for research to conduct as per statement of the problem it is densely covered with the coal mines and the activity of excessive mining posing severe impacts on its souring local communities can be thoroughly observed and studied. It provides all the indicator for paper's prerequisite so conduct this experiment like, rural communities, agricultural community, business community, e.tc as per the land revenue and mines department record of the district.

2.2 Research Design and Data Collection

Primary as well as secondary data collection will be utilized in this study. Firsthand data collection will be carried out on the field via one-to-one interviews, photographs, field visits, as well as statistical data if available during the Thursday and Friday, which is no workday at mines, the miners as well as the public will be available for any interviews and site visit during the daylight.

While secondary data will be collected from the newspaper reports, District Social Welfare Department the records of mines and mineral department, Basic health units working in the miner communities, schools as well madrassa. etc. the indicators for the secondary data will be number of coal miner communities registered, number of non-coal miners, frequency of coal miners settled vs non miners settled during the period of one year, acre of agricultural land converted into mines area, disputes occurred during the last 2 years over mining and mining areas, percentage of enrollment in mines communities, ratio of child labour, working hours of miners, status of employment.

Semi – structured type of interviews along with observation and conversation would be used in data collection. Using a snowballing sample technique, respondents will be repeatedly found through contacts and references. Convenience sampling involves identifying the target population's participants who are easiest to reach. The selection of the subjects is based on their willingness to engage and ease of recruitment (Marshall, 1996; Lunsford & Lunsford, 1995; Sedgwick, 2013). Regarding labor, time, and financial costs, this sample method also happens to be the least expensive (Lunsford and Lunsford., 1995., Marshal., 1996). The technique will follow random sampling of selection of 100-150 respondents out to 1000 population already summarized via snow balling and convincing techniques.

2.3 Respondent Profile

This study delves into the socio-economic features of both mining and non-mining communities in Duki, Pakistan. A striking gender disparity emerges in mining work, with a staggering 62% male participation compared to a mere 7.3% female involvement. This imbalance extends beyond the mines, with 26.7% male participation in non-mining work versus only 6% female. Overall, males comprise 69.3% of the surveyed population, highlighting a significant gender gap in both sectors. Notably, female participation stems from household headship due to absent or unavailable male spouses.

Furthermore, Household sizes also paint a contrasting picture. Mining communities predominantly consist of larger families, with 25.3% having 6-10 members compared to 8.7% in non-mining communities. This difference suggests a potential correlation between mining work and larger family structures. The average household size across the district is 5, with a higher concentration (69.3%) residing in mining areas, mirroring the gender distribution.

Additionally, Education levels further widen the gap between mining and non-mining communities. Within mining, the majority (55.3%) lack formal education, categorized as illiterate (26%) or possessing primary education (29.3%). In contrast, non-mining communities show a higher educational attainment, with 40.7% having primary education. This stark contrast underscores the need for educational initiatives within mining communities to bridge the knowledge gap and empower residents for diverse career paths beyond manual labor.

As well as, these findings reveal a complex interplay between gender, family structures, and education in Duki's mining landscape. Addressing the gender imbalance, promoting smaller

family sizes, and prioritizing education within mining communities are crucial steps towards achieving sustainable development and improving the overall well-being of its residents.

3. Results and Discussion

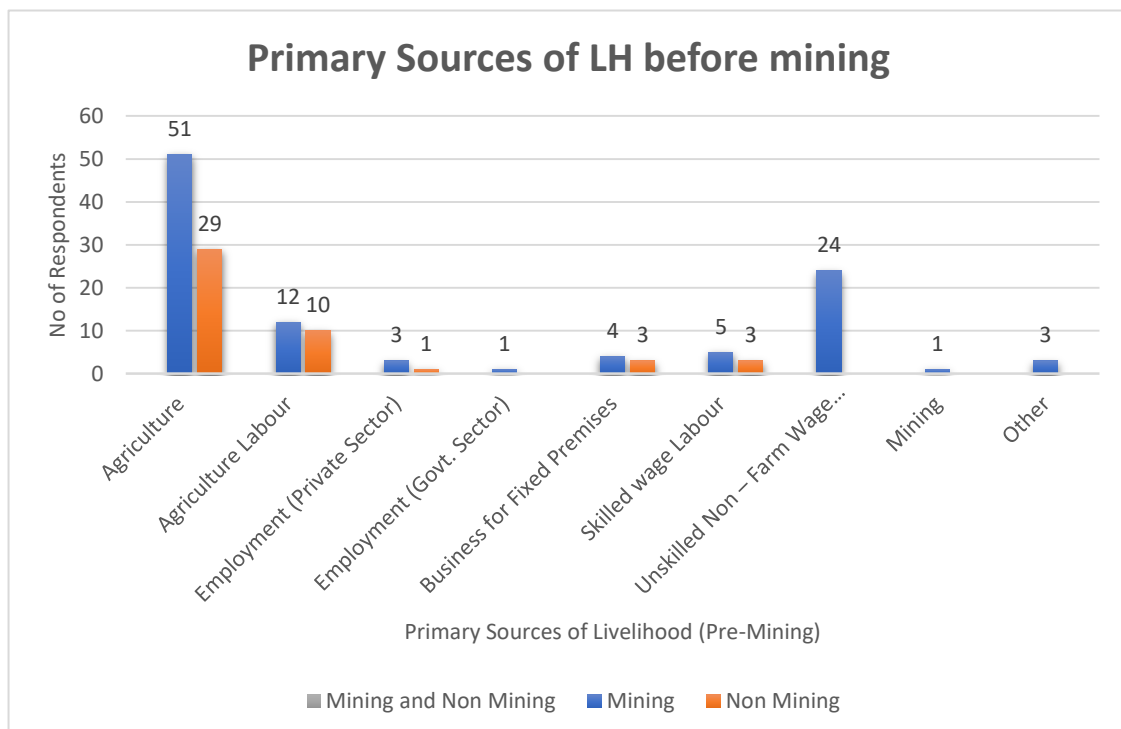
The following section will subsequently describe the impacts of coal mining on the overall rural livelihood and sources of these livelihood studied during the survey. Additionally, it has narrowed down the positive as well negative impacts the mining industry on the adjacent communities.

3.1 Analysis of Primary Sources of Livelihood before and after the commencement of mining in study the area

Before the mining industry's arrival, agriculture was the lifeblood of both mining and non-mining communities in Duki. Over 60% of residents relied on farming or agricultural labor for their primary income, highlighting its centrality in the pre-mining economy. While both communities shared this dependence on agriculture, mining communities had a higher proportion of agricultural laborers, suggesting a potential pre-existing difference in economic structure.

Fig 1: Primary sources of Livelihood in Pre-Mining period

Diversification beyond agriculture was limited, with unskilled non-farm labor being the only notable alternative for the non-mining community. Interestingly, mining itself barely featured as a primary source of income, hinting at the significant economic shift caused by the mining project's introduction. This shift necessitates support for skills development and training within



the mining community to ensure equitable access to these new opportunities and reduce dependence on a single industry. Understanding this pre-mining economic landscape is crucial for evaluating the project's impact on the communities' well-being and promoting sustainable development in the region.

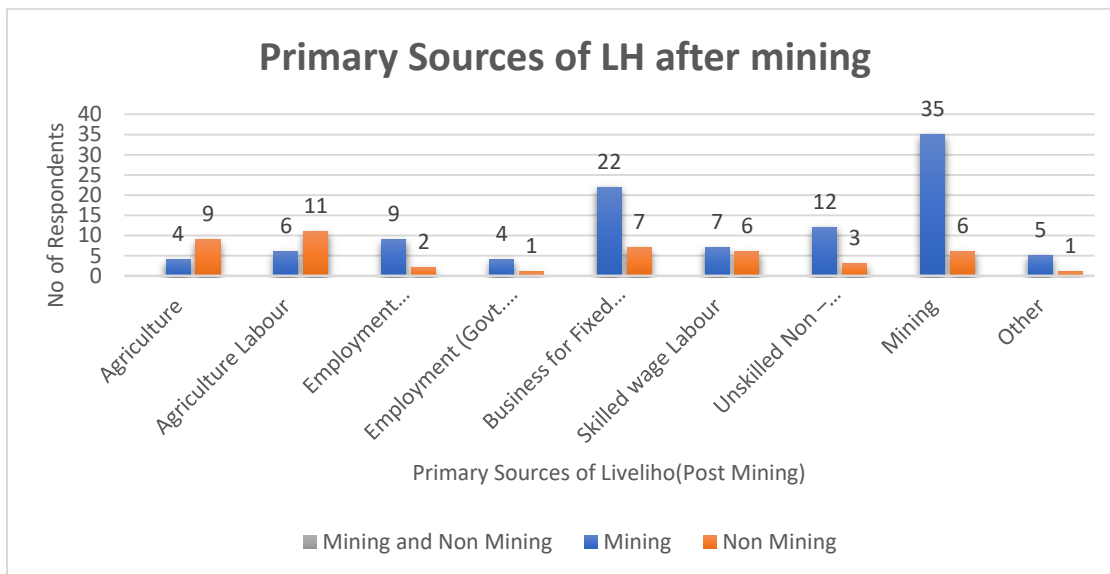


Fig 2: Primary sources of Livelihood in Post-Mining Period

The mining project in Duki reshaped local economies: agriculture declined while mining jobs surged, impacting both communities. While mining became the primary income for 23%, business and diverse sectors also gained traction, exhibiting diversification within communities. The non-mining community maintained a more varied livelihood structure, suggesting the project primarily benefited the mining community in terms of direct employment. This shift necessitates skills development for long-term mining jobs and broader economic diversification through supporting local businesses and entrepreneurship for sustainable community development.

3.2 Analysis of impacts on Secondary Sources before and after the mining industry

Before the mining project, both communities in Duki relied on diverse secondary income sources to supplement their primary livelihoods. Agriculture, through farming and common property resources, was the most common, followed by unskilled wage labor and various other activities like goat rearing and shopkeeping. This diversification helped ensure economic stability and resilience. The mining community seemed more reliant on common resources, while the non-mining community engaged more in shopkeeping and vending. Understanding these pre-existing income streams is crucial to assess the impact of the mining project and inform strategies for future development, like supporting diversified and sustainable income opportunities tailored to each community's specific needs.

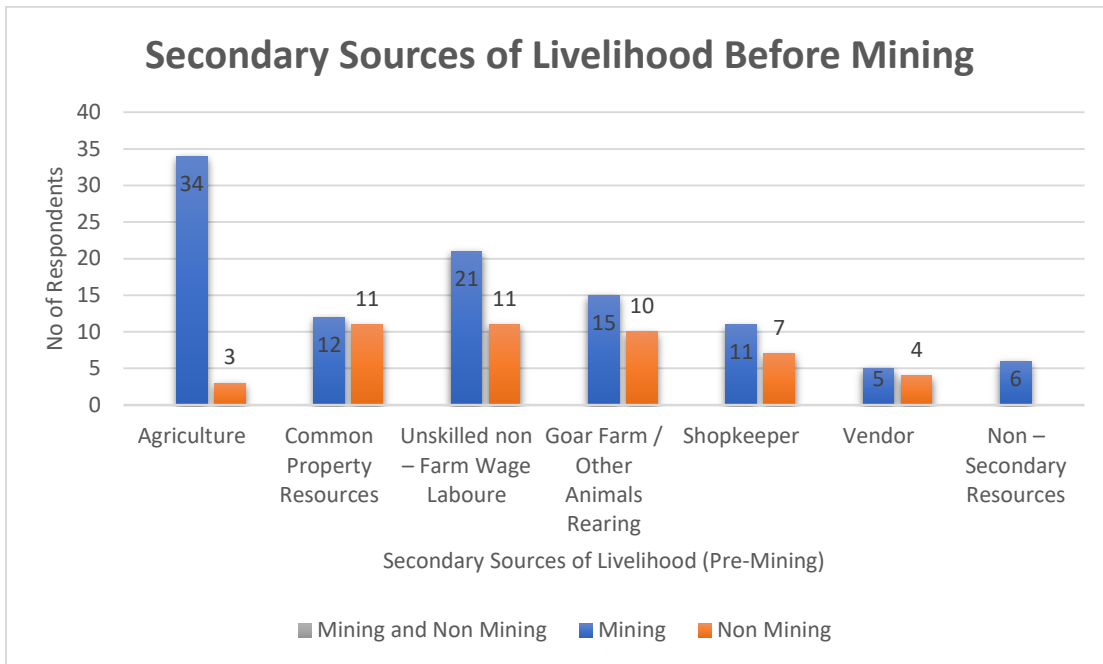


Fig 3:

Secondary sources of Livelihood in Pre-Mining Period

The mining project in Duki reshaped secondary income sources too. While agriculture declined, common property resources and shopkeeping gained prominence, suggesting diversification. The mining community relied less on agriculture but more on common resources and shopkeeping compared to the non-mining community, indicating a differential impact. This dynamism necessitates flexible livelihood strategies, sustainable resource management, and targeted support for local businesses for ensuring equitable development.

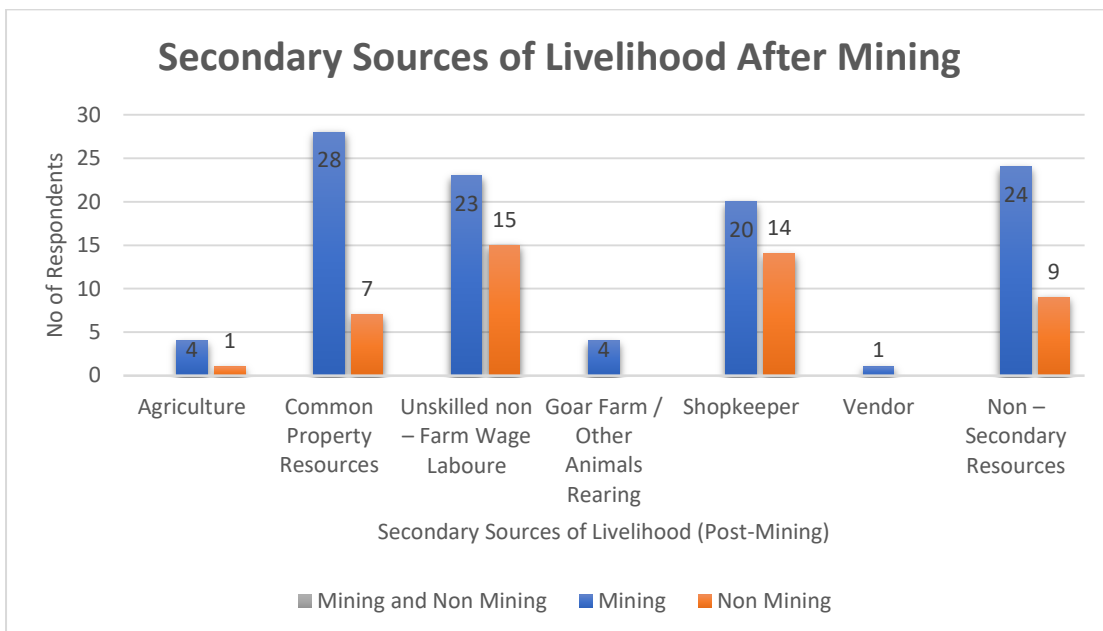


Fig 4: Secondary sources of Livelihood in Post-Mining Period

3.3 The perception of local communities on how the coal mining activities impacted major socio-economic activities in the study area.

While coal mining in the study area brings economic benefits like jobs and infrastructure development, it also casts a dark shadow on local communities. Despite a majority of residents perceiving positive impacts, significant concerns exist regarding land loss, disrupted livelihoods, and environmental degradation.

The research reveals both sides of the coin: mining creates jobs, wealth, and business opportunities, while also displacing communities, reducing agricultural productivity, and weakening food security. Women and men are impacted differently, with women experiencing more land and home loss while men report higher livestock loss.

To address these issues, the study suggests prioritizing compensation and rehabilitation for displaced communities, supporting sustainable agriculture and skills development, implementing gender-specific interventions, and closely monitoring social and environmental impacts. Additionally, investigating the severity of impacts, analyzing the reasons behind them, and integrating data with environmental and social assessments are crucial for developing comprehensive mitigation strategies.

Table 1 General Impacts of Mining on Major Socio-Economic Activities

Livelihood Opportunities	Gender		Total n=150	Chi-Sq Significance	p-Value Significance
	Male n=133	Female n=17			
Created new business opportunities	3	2	5	19	21
Created wealth	5		3	12	15
Created opportunities for women	5		3	78	80
Enlarge transportation	7	4	11	72	74
Increased food security	5	1	6	49	49
Creation of jobs	1		9	80	81
Created markets for agricultural produce	1	2	3	38	42
Enhanced security	0		9	69	72
Enabled buying of houses	9	1	10	74	77
Increased infrastructural developments	9	1	10	74	77
Increased incomes	0	0	00	66	70
Increased livestock ownership	1	0	11	27	30
Unable build a good house	0	3	3	92	94
Improved farming	3		3	1009	1009

In essence, coal mining's impact on local communities is a complex story with both positive and negative aspects. Understanding these nuances and implementing effective solutions are essential for ensuring sustainable development and the well-being of the people affected.

4. Conclusion and Policy Recommendation

4.1 Beyond Economic Gains: Ensuring Sustainable Development in Duki District's Coal Mining Landscape

While coal mining in Duki district, Balochistan, brings economic benefits like jobs and infrastructure development, it also casts a shadow on local communities. To navigate this complex landscape and ensure sustainable development, this research proposes crucial policy recommendations.

The study calls for deeper insights beyond quantitative data. Qualitative research methods like interviews and focus groups can capture individual experiences and perspectives. Comparing Duki with other mining regions can identify best practices and inform policy interventions. Disaggregating data by gender is crucial to identify and address potential disparities in impacts and opportunities for women. Empowering women through participation in decision-making and targeted interventions is vital.

Comprehensive environmental impact assessments are needed to examine air, water, soil, and biodiversity impacts. Promoting sustainable practices like land reclamation, waste management, and renewable energy use can minimize environmental damage. Empowering communities through participation in planning and decision-making related to mining projects is crucial. Capacity building programs can enhance skills and knowledge in resource management, negotiation, and advocacy, enabling communities to effectively engage with stakeholders.

Establishing robust monitoring and evaluation frameworks is essential to assess the effectiveness of interventions and policies. Regularly collecting and analyzing data on social, economic, and environmental indicators allows for tracking progress and identifying areas requiring further attention. Transparency and accountability in all aspects of mining operations and community development initiatives are vital for building trust and ensuring long-term well-being for Duki district and its residents.

By implementing these recommendations, stakeholders can move beyond simply mitigating negative impacts and work towards a future where coal mining benefits Duki district and its residents in a sustainable and equitable manner.

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