

Indigenous Knowledge, Tribal Mobilization, and Green Innovation: A Holistic Approach Towards Development

Mr. Sachidananda Rath

Research Scholar (Sociology),
Rabindranath Tagore University, Bhopal Chiklod Road, Raisen, M.P.

Prof. (Dr.) Usha Vaidya

Research Guide and Professor of Sociology,
Department of Humanities and Liberal Arts, Rabindranath Tagore University, Bhopal Chiklod Road, Raisen, M.P.

Abstract: In line with the One Health concept, this study aimed to assess the long-term impact of the industrialization of mining in the tribal areas of Rayagada district, Odisha, on public knowledge and policymakers' knowledge. These areas have been inhabited by tribal people in the hills and forests for generations. The indigenous people have faced significant challenges in their lives, battling various health issues and struggling to access basic education for literacy, employment, and other essential needs. A fresh attempt to revive the bauxite mining project by Vedanta's refinery in the eco-sensitive areas has triggered a new round of mobilization by local tribals and the state machinery. It is pertinent to note that the mining area is a pristine ecosystem under severe threat from industrialization. There have been many explorations about their native networks, their living space, life, conviction, dissent, and so forth; however, there seems to be a research gap between the possible issues of tribal problems and the off-site mining areas affecting economic, cultural, livelihood, education, health, and other conditions etc. The objective of this study is to examine concerns related to their natural livelihood, as well as the impact on life on land, peace, and justice resulting from industrialization. An analytical approach is employed as a starting point for further research and discussion on the economic, sociological, ecological, and cultural significance of tribal peoples, as well as decisions related to their management and conservation, to validate the objectives and analyze developments and issues. Keeping the activities in mind, the Government has been implementing various schemes in the interest of tribals to promote their upliftment through green innovation and to address their problems. The outcomes of this research can offer potential benefits to tribal people and policymakers.

Key Words: Industrialization, Livelihood, Odisha, Health, Tribal, Niyamgiri.

Introduction: Indigenous knowledge plays a central role in shaping tribal mobilization in Odisha, particularly among communities such as the Dongria Kondh, Juang, Saura, and Kandha. Their traditional ecological wisdom, land-use practices, sacred geography, and community-

led governance systems form the foundation of collective identity and resistance. In recent decades, attempts to alter or exploit tribal landscapes—through mining, deforestation, and development projects—have led to strong mobilization movements rooted in the protection of indigenous knowledge and cultural heritage. Tribal organizations and youth groups have increasingly used both traditional methods of consensus-building and modern platforms of advocacy to assert rights over land, forests, and resources. This convergence of inherited wisdom and contemporary activism highlights how knowledge indigenous system not only preserves cultural continuity but also empowers tribal communities in Odisha to negotiate equitable development and safeguard their socio-ecological future.

The tribal population around Niyamgiri hill in the Rayagada district of Odisha, majorly relies on the natural resources of the hill for their traditional means of subsistence and believe in preserving the natural environment and their traditional values, forests, water, land, and other natural resources crucial for survival; the local tribes regard the forest and hill as a place of worship. Mining and industrial activities have caused significant losses to livelihoods, the natural environment, the ecological system, water resources, and animals, directly hindering the preservation of their traditional rights since the time of their ancestors. These activities also negatively impacted their cultural, religious beliefs, language, and holiness. The opposition to development projects by the tribals is primarily attributed to land acquisition, loss of livelihood, social inequality, health concerns, deforestation, displacement, environmental damage, and the loss of autonomy in agriculture, cultivation, and forest management. Resistance initially originated to support their livelihoods and biodiversity and later evolved into a protest cemented by environmentalists and human rights advocates at the national and international political levels. Due to ongoing land acquisition and alienation by state governments and investors, the situation surrounding tribal territories has become volatile. Irrespective of caste,

class, gender, and ethnicity, the tribal people would be compelled to protest the mining operations and industrialization.



Source: Google Map

Literature Reviews: The relevant literature reviews conducted from different sources are fundamentally supportive of analyzing the current development of this research. “Studies from the Scheduled Castes and Scheduled Tribes Research and Training Institute (SCSTRI) show that the photographic handbooks on Particularly Vulnerable Tribal Groups (PVTGs) serve as valuable visual records of Odisha’s tribal life. These handbooks not only support academic research but also help development workers, policymakers, and visitors understand the cultural practices and lived realities of PVTGs in a simple and accessible way.”

“Sahu (2008) highlights the conflict between industrial expansion and indigenous survival in the Niyamgiri region. His analysis reveals how corporate mining interests, backed by state mechanisms, compromise the ecological balance, cultural identity, and livelihood of the Dongria Kondh. This work underscores the role of tribal mobilization in resisting environmentally and socially harmful development projects.”

“Nayak (2009) examines educational progress among tribal villages in Odisha and notes that although some improvement has occurred since independence, overall development remains uneven. His study argues that despite multiple governmental initiatives, tribal communities continue to face educational and socio-economic gaps, indicating the need for more inclusive and culturally rooted development strategies.”

“Saxena et al. (2010) conducted a detailed committee investigation into the Niyamgiri mining proposal, assessing how the project would affect Forest Rights Act implementation, displacement risks, cultural survival of the Dongria Kondh, and the overall ecological balance of the region. Their report emphasized the deep cultural and environmental vulnerabilities of the area and highlighted serious shortcomings in the planning and approval process for mining.” “Padel and Das (2010) emphasize that tribal ecological knowledge—particularly among the Dongria Kondh—forms the backbone of community-led

mobilization against mining projects in regions like Niyamgiri. Their research shows that traditional beliefs associated with sacred hills, forest management practices, and clan-based decision-making systems strengthen solidarity and enable organized **protest movements.**”

“Jena (2013) documented the historic decision of twelve gram sabhas in Rayagada and Kalahandi districts that unanimously rejected the proposed bauxite extraction in Niyamgiri. Her study shows how grassroots democratic participation strengthened tribal voices and set a national precedent for community consent in resource governance.”

“Behera (2014) highlighted the significance of indigenous knowledge in sustaining cultural, ecological, and economic life among tribal communities in Rayagada. His study stressed that traditional practices, biodiversity preservation, and spiritual beliefs together form the foundation of sustainable livelihoods, especially at a time when deforestation and resource depletion threaten tribal ecosystems.”

“Borde (2017) examined how both local and global activists strategically represented Dongria Kondh religiosity during the Niyamgiri movement. Her analysis shows that these representations created international visibility for the tribe’s sacred connection to Niyamgiri, enabling the community to challenge powerful economic and political interests and successfully resist mining.”

“Bal (2020) provided a critical assessment of how development-induced industrialization generates environmental degradation and, consequently, mass protest movements. His analysis illustrates the interconnected nature of development pressures, ecological threats, and people’s resistance—especially visible in tribal regions facing extractive industries.”

“Rout (2022) explored the Niyamgiri resistance as a model of contemporary environmental activism that connects local struggles with global networks. His study explains how a village-level movement over land and livelihood evolved into a transnational campaign, demonstrating the power of alliances between tribal communities and international organizations in addressing ecological issues.”

Objective:

1. To examine how indigenous knowledge systems influence tribal mobilization efforts in Odisha, particularly in the context of protecting land, culture, and natural resources.
2. To examine concerns related to their natural livelihood, as well as the impact on life on land, peace, and justice resulting from industrialization.

Methodology of the Study:-The present study aims to focus on the ecological perspective, which advocates for the conservation of the environment, and the

developmental perspective to provide a more comprehensive understanding of the internal dynamics of the state, government policies, and dominance of environment in the area. The theoretical portion of this study within the paradigm of environmental sociology and its linkages to development, discourse, and social movement, would serve as the basic structure for this study. The data are collected for environmental studies, practical purposes, and qualitative methods are favoured with a major focus on movement. The proposed study will be based on primary and secondary sources of data. Participation and observation in village life, informal discussions, and free flow of interviews would provide great support in enriching the analysis. The study will explore secondary sources, including available literature such as books, articles, journals, newspaper reports, Government databases/reports, publications, e-sources, vernacular and library sources. The collection of data would primarily be from primary sources, collected firsthand through convenient sampling, surveys, interviews, questionnaires, and observations.

The study will primarily employ qualitative research methods and quantitative data will also be used in some instances to support arguments. Since the tribal people speak typical indigenous language hence, they also need to be 'interpreted'. The study will employ both explanatory and descriptive analytical tools to generate a clear understanding of the problem. Descriptive research focused on providing a detailed and systematic understanding of the current situation, perceptions, attitudes, and experiences of local communities in relation to mining activities and development.

Analysis:

Analysis of village-wise population (Table 1), so far, data collected:

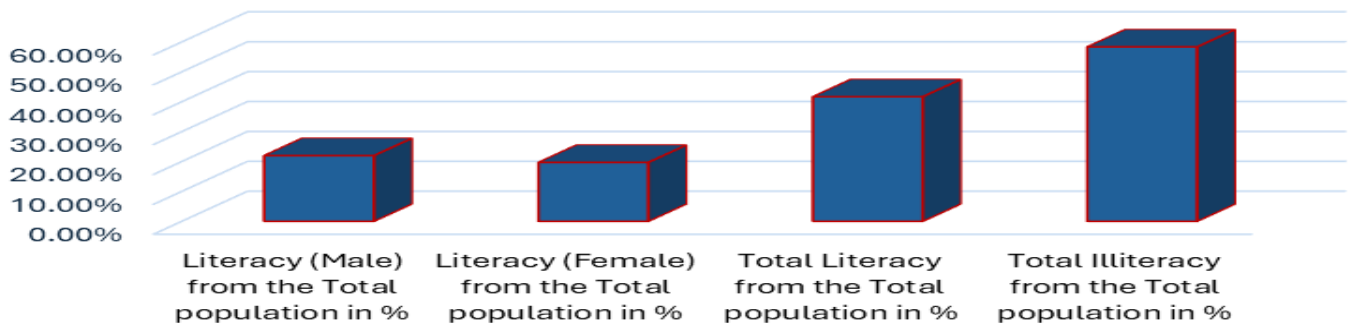
Village Name	Block	Tehsil	District	
Serkapadi	Muniguda	Muniguda	Rayagada	
Total Houses	Population (Age group)	Male	Female	Total
30	Below 18 Yrs	Total= 20	Total =10	30
		1) Below 10th Class = 14 (Literate=14)	1) Below 10th Class =06 (Literate=06)	
		2) 10th = 0	2) 10th =0	
		3) 10th to 12th/ITI=0	3) 10th to 12th/ITI=0	
		4) Above graduation=0	4) Above graduation=0	
		5) Illiterate =06	5) Illiterate =04	
	18-28 Years	Total =15	Total =20	35
		1) Below 10th Class = 09 (Literate=09)	1) Below 10th Class= 19 (Literate=19)	
		2) 10th= 02 (Literate=02)	2) 10th = 01 (Literate=01)	
		3) 10th to 12th/ITI=04 (Literate=04)	3) 10th to 12th/ITI=0	
		4) Above graduation=0	4) Above graduation=0	
		5) Illiterate =0	5) Illiterate =0	
	29-39 Years	Total =12	Total =10	22
		1) Below 10th Class = 12 (5 are up to Class 5th)	1) Below 10th Class = 10	
		2) 10th = 0	2) 10th = 0	
		3) 10th to 12th/ITI=0	3) 10th to 12th/ITI=0	
		4) Above graduation=0	4) Above graduation=0	
		5) Illiterate = 12	5) Illiterate =10	
	40-50 Years	Total =10	Total =15	25
		1) Below 10th Class = 0 (All Illiterate)	1) Below 10th Class = 0 (All Illiterate)	
	2) 10th = 0	2) 10th = 0		
	3) 10th to 12th/ITI=0	3) 10th to 12th/ITI=0		
	4) Above graduation=0	4) Above graduation=0		
	5) Illiterate = 10	5) Illiterate = 15		

51-60 Years	Total =8	Total =8	16
	1) Below 10th Class = 0 (All Illiterate)	1) Below 10th Class = 0 (All Illiterate)	
	2) 10th = 0	2) 10th = 0	
	3) 10th to 12th/ITI=0	3) 10th to 12th/ITI=0	
	4) Above graduation=0	4) Above graduation=0	
	5) Illiterate = 8	5) Illiterate = 8	
Above 60Years	Total =2	Total =2	4
	1) Below 10th Class =0	1) Below 10th Class =0	
	2) 10th = 0	2) 10th = 0	
	3) 10th to 12th/ITI=0	3) 10th to 12th/ITI=0	
	4) Above graduation=0	4) Above graduation=0	
	5) Illiterate = 2	5) Illiterate = 2	
Total	67	65	132
Literate	29	26	55
Illiterate	38	39	77

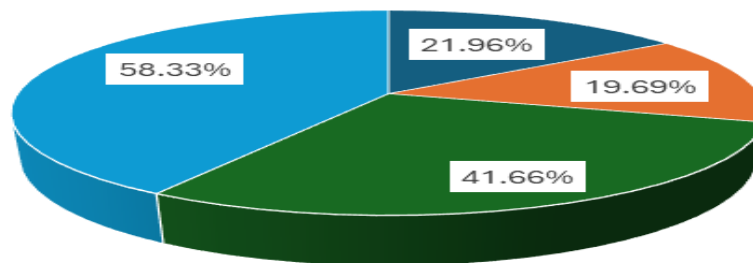
Table 2: Socio-cultural intellectual/literacy participation:

Gender Ratio (Male: Female)	67:65=1.03:1
Literacy (Male) from the Total population in %	21.96%
Literacy (Female) from the Total population in %	19.69%
Total Literacy from the Total population in %	41.66%
Total Illiteracy from the Total population in %	58.33%

Literacy Chart



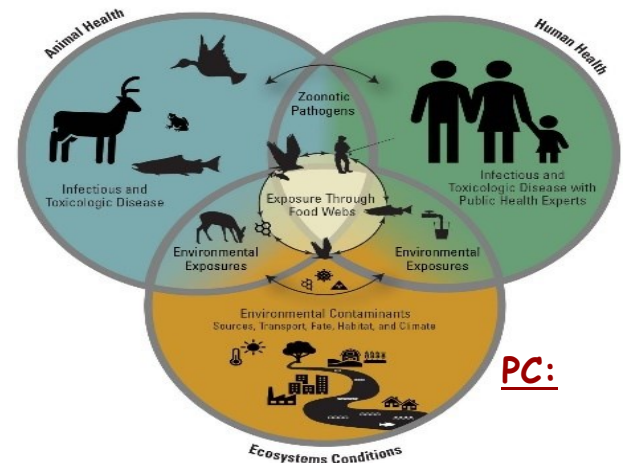
Literacy Vs Illiteracy



- Literacy (Male) from the Total population in %
- Literacy (Female) from the Total population in %
- Total Literacy from the Total population in %
- Total Illiteracy from the Total population in %

Analysis Framework and Scope of Improvements:

1.1 One Health: Post-pandemic, One Health is a unifying approach for optimizing the integration of the health of people, animals, and the environment. It has gained more importance, mobilizing multiple sectors, disciplines, and communities, particularly in food, water safety, fuel nutrition, disease control, pollution management, antimicrobial resistance, and generating robust and agile response systems. This comprehensive and integrated strategy unlocks opportunities for combating the issues endangering people, animals, and the environment, including plants, where they coexist. Coordination, communication, and cooperation are essential components of an efficient governance strategy. People find it easier to comprehend the co-benefits, adjustments, and possibilities to develop equitable and comprehensive solutions when the One Health approach is implemented.



PC:

1.2 Sustainable Development Goals (SDG): In this study, all such possible feasible parameters and remedial measures as well as the narratives from development and disadvantages associated with proposed mining in line with SDGs such as No Poverty, Good Health, Clean Water, Sanitation, Sustainable Cities and Communities, Life on Land, Responsible Consumption and Production, Climate Action, Peace and Justice Strong Institutions, etc are incorporated.

1.3 Impact of Industrialization on the Environment: The ecologically delicate Niyamgiri hill is preserved by the tribals and is filled with various natural habitats. Any form of industrialization in the area, particularly mining, has the potential to cause habitat destruction, soil erosion, and water pollution. The region's delicate ecosystem could suffer permanent harm, impacting local biodiversity and disrupting its balance.

1.4 Rights of Tribals: The tribes living in the Niyamgiri hill have a strong cultural and spiritual bond with the land. The natural resources that the hill provides are integral to their way of life. Any industrialization could cause these indigenous communities to be uprooted, resulting in the loss of their traditional means of subsistence, cultural heritage, and social stability.

1.5 Ethical view: The rights and voices of the tribes should be honored. To ensure that decisions regarding industrialization are made with the full understanding and consent of local communities, the principle of Free, Prior, and Informed Consent (FPIC) should be adhered to. Ensuring that the benefits of industrialization are fairly distributed among all parties is another ethical consideration.

1.6 Socioeconomic Impact: Industrialization may boost the region's economy; however, it can also cause inequality, social unrest, and resource depletion. The long-term effect on nearby communities, including potential employment opportunities, income sources, and overall quality of life, must be considered.

1.7 Legal and Regulatory Obligations: All industrial activities in the tribal areas must have a concrete mechanism and follow environmental rules and regulations. There should be adequate safeguards for the environmental lands and compensation for impacted communities. It's crucial to strike a delicate balance among environmental protection, the interests of tribal communities, and economic growth.

1.8 Global Perspective: The Niyamgiri hill case brings to light more general concerns about the conflict between environmental sustainability and economic growth, and the rights of indigenous communities. The importance of defending indigenous rights and preserving biodiversity is increasingly being acknowledged by the international community.

1.9 Green innovation/technology: Sustainable development models using natural resources for community-based initiatives, eco-tourism, and preserving traditional knowledge could be investigated as an alternative to resource-intensive industrialization. This strategy could reduce adverse effects while promoting inclusive growth.

1.10 Issues of Tribals: The indigenous communities at Niyamgiri hill, particularly, have socioeconomic, cultural, and environmental concerns. An analysis of the salient features, Livelihoods, and significance of culture; environmental concerns; displacement and Relocation of tribal communities; land rights; legal issues; protests; corporate social responsibility (CSR) and development; and government policies and regulations is necessary.

Conclusion: In conclusion, the tribal disputes in the Niyamgiri hills are a microcosm of the broader conflict between the rights of indigenous communities, environmental preservation, and development, all of which aim to preserve their land and culture. The literacy survey directly links to the awareness of the tribal people, and their awareness has substantially increased for their need for fair, long-term

development strategies that respect the rights and aspirations of tribal communities. The recent announcement by Vedanta to invest ₹1 lakh crore in Odisha's alumina and green aluminum projects has raised internal mobilization in the tribal areas. The conflict highlights the challenges in striking a balance between development objectives and the rights of indigenous communities. Making thoughtful policy decisions and upholding laws that defend tribal rights are necessary to strike a balance.

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