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Public Participation in Environmental Impact Assessment in Jharkhand: A Comparative Documentary Analysis of Four Coal-Mining Projects.

Shreya Sonal[1] , Sandeep Prasad2*

1p.G., Department Of Environmental Science, Dr Shyama Prasad Mukherjee University, Ranchi-834008, Jharkhand, India.
[2*] Assistant Professor, Department Of Environmental Science, Dr Shyama Prasad Mukherjee University, Ranchi-834008, Jharkhand, India.
Corresponding Author'S Email: Sndpkumar756@Gmail.Com | Orcid Id: 0000-0003-3025-4039

Abstract- Public hearings are intended to connect affected communities with environmental decision-making under India's Environmental Impact Assessment (EIA) framework. This paper examines whether that connection extends beyond the hearing itself. It compares four coal-mining projects in Jharkhand—Kotre–Basantpur–Pachmo, North-West Quarry of Pakri Barwadih, Chandragupta and Banhardih—using public-hearing proceedings, EIA and Environmental Management Plan documents, Expert Appraisal Committee records, environmental-clearance records and a state-wide study of 55 hearings. Concerns are coded thematically and traced through a Concern–Response–Action framework, supported by ten qualitative indicators of participation. Across the cases, communities raised not only pollution and ecological impacts but also employment, compensation, rehabilitation, health, drinking water, roads, education, electricity and local development. Official records show that some concerns entered time-bound action plans, environmental-management measures and project-specific clearance conditions. Yet the chain from an individual statement to a verified outcome is often incomplete, and public evidence of implementation is limited. The hearings therefore provide a substantive channel for community expression, but their influence varies with the quality of responses, the specificity of commitments and the transparency of follow-up. The paper recommends a mandatory Concern–Response–Action matrix, clear responsibilities and timelines, and publicly accessible compliance reporting to make participation more traceable and accountable.

Keywords: Environmental Impact Assessment; public hearings; public participation; environmental clearance; procedural justice; Jharkhand.

I. INTRODUCTION

1. Background Of Environmental Impact Assessment

Environmental Impact Assessment (EIA) is an established environmental governance instrument for integrating environmental and social considerations into decisions concerning proposed development activities. Its principal function is to identify, predict and evaluate potential impacts before project implementation and to provide a basis for avoiding, reducing or managing adverse consequences. International good-practice principles describe EIA as a process intended to be transparent, participatory and capable of informing decisions rather than merely documenting impacts after a project has effectively been designed [1].

In India, EIA is embedded within the environmental clearance regime administered under the Environment (Protection) Act, 1986. The EIA Notification, 2006 establishes a staged process that includes screening where applicable, scoping, preparation of an EIA/Environmental Management Plan, public consultation and appraisal. Public consultation is therefore situated within a wider decision-making chain rather than operating as an isolated event [2].

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The significance of this process is heightened by the scale and distribution of contemporary development. Mining, industrial, energy and infrastructure projects can generate employment and economic benefits while simultaneously altering land use, ecological systems, water resources, livelihoods and public health conditions. The people who experience these impacts may possess place-specific knowledge that is not fully captured through technical baseline studies. Public participation can consequently improve both the informational quality and legitimacy of environmental decisions [1,3].

2. Public Participation In Eia

Public participation refers broadly to the involvement of individuals and groups who may be affected by, or have an interest in, a proposed intervention. The International Association for Impact Assessment identifies participation as ranging from information provision and consultation to more interactive forms of engagement, with the appropriate level varying across stages of impact assessment [4]. The purpose is not simply to increase attendance at public meetings, but to create conditions in which relevant knowledge, values, concerns and rights can enter the decision-making process.

Participation is particularly important where environmental risks and benefits are unevenly distributed. Communities may raise issues relating to land, displacement, employment, pollution, water availability, health, biodiversity, infrastructure and access to common resources. Such concerns may reveal cumulative or locally experienced impacts that are difficult to detect through a purely technical assessment. At the same time, participation can be weakened by technical complexity, language barriers, limited access to documents, unequal bargaining power and inadequate opportunities for follow-up [4,5].

3. Public Hearings Under The Eia Process

Under the EIA Notification, 2006, public consultation includes a public hearing for applicable projects and an opportunity for written responses. The regulatory design therefore recognises public consultation as a source of information relevant to appraisal. The Notification also provides procedures concerning notice, venue, conduct, documentation and transmission of the proceedings [2].

The formal existence of these procedures, however, does not by itself establish the quality of participation. A public hearing can be procedurally compliant while providing limited opportunity for deliberation or influence. Conversely, a hearing can become an effective decision-support mechanism, where participants have access to intelligible information, can articulate concerns freely, receive reasoned responses and can identify how relevant concerns have affected subsequent project commitments. The critical analytical question is therefore what happens to public concerns after they are expressed.

4. Meaningful Participation Versus Procedural Formality

The central distinction of this study is between procedural participation and meaningful participation. Procedural participation concerns whether prescribed steps occurred: notice was issued, documents were made available, a hearing was held, participants were permitted to speak and proceedings were recorded. These are necessary conditions, but they do not necessarily demonstrate substantive influence.

Meaningful participation requires an additional chain of consideration. Participants need timely and accessible information; affected groups should have a realistic opportunity to participate; concerns should be accurately documented; project proponents and authorities should provide substantive responses; and decisions should be capable of being traced to the concerns raised. This does not mean that every public demand must be accepted. Rather, meaningfulness requires transparent consideration and a reasoned explanation for acceptance, modification or rejection [3,6].

The analytical pathway adopted in this paper is therefore:

Access to Information → Opportunity to Participate → Expression of Concerns → Consideration and Response → Influence on Decision-Making

5. Problem Statement

The central problem is the gap that can open between what communities say at an EIA hearing and what

happens afterwards. Hearings generate formal records, but it is often difficult to trace a particular concern through the proponent's response, project appraisal, mitigation commitments and final clearance conditions. This makes it hard to judge whether consultation has shaped environmental governance or simply completed a required step.

6. Research Gap

Indian scholarship has identified persistent problems of access to information, representation, technical capacity and consultation quality. For Jharkhand, Kumar and Sangeeta provide direct evidence from 55 public-hearing processes, identifying recurring socio-economic, land/soil and pollution-related concerns across districts and mining sectors [5]. Project-level records offer a further opportunity to trace how those concerns are treated during appraisal and environmental clearance [7–14].

Less attention has been paid to the full pathway from concern to response to action across different projects. This study addresses that gap by applying a common set of participation indicators and a Concern–Response–Action framework to four cases of Jharkhand.

7. Aim Of The Study

This study aims to assess whether public hearings within the EIA process enable meaningful public participation or primarily serve as procedural requirements for environmental clearance.

8. Research Objectives

- To examine the role and purpose of public hearings within the EIA process.
- To identify the major environmental and socio-economic concerns raised during public hearings.
- To examine how project proponents and regulatory authorities respond to these concerns.
- To assess whether public concerns lead to changes in project design, mitigation measures or environmental clearance conditions.
- To identify institutional, informational, technical, social and procedural barriers to meaningful participation.

9. Research Questions

Main research question: To what extent do public hearings in the EIA process provide meaningful opportunities for affected communities to influence environmental decision-making?

- What types of concerns are most frequently raised during public hearings?
- How are public concerns documented and responded to?
- Do public concerns lead to changes in project proposals or mitigation measures?
- Are concerns reflected in environmental clearance conditions?
- What institutional, technical and social barriers limit meaningful participation?
- What reforms could strengthen the effectiveness of public hearings?

10. Significance Of The Study

The study shifts attention from whether consultation occurred to what it changed. Its Concern–Response–Action approach gives communities, regulators and project proponents a practical way to examine whether public input received a reasoned response, produced an actionable commitment and remained visible during follow-up.

II. LITERATURE REVIEW

1. Concept And Evolution Of Environmental Impact Assessment

EIA emerged as a structured approach for anticipating environmental consequences before major decisions are implemented. Over time, its scope has expanded from biophysical impact prediction toward broader consideration of social effects, cumulative impacts, alternatives, public participation and follow-up. Contemporary best-practice principles emphasise that EIA should be purposeful, transparent, participatory and linked to decision-making [1].

The effectiveness of EIA nevertheless depends on the institutional context in which assessment findings are used. Where regulatory conditions are vague, monitoring is weak or decision-makers have limited capacity to enforce commitments, an assessment may have limited influence on project outcomes. This makes

follow-up and accountability important components of impact assessment rather than optional postscript activities [1].

2. Public Participation In Environmental Decision-Making

Public participation is commonly justified on informational, democratic and instrumental grounds. From an informational perspective, communities can provide local knowledge. From a democratic perspective, participation provides affected persons with a voice in decisions that may alter their environment and livelihoods. From an instrumental perspective, participation can identify conflicts and improve project design or mitigation [3].

However, participation is shaped by power relations. Arnstein's influential ladder conceptualised participation according to the degree of citizen power over decisions, distinguishing tokenistic forms from more substantive forms of influence [6]. While the ladder is not a direct legal test for EIA hearings, it remains useful for distinguishing participation as communication from participation that provides meaningful influence.

3. Theories And Models Of Public Participation

Three complementary perspectives inform this study. First, Arnstein's power-oriented model highlights the difference between consultation and actual influence [6]. Second, deliberative approaches emphasise informed dialogue, reason-giving and mutual consideration rather than one-way communication. Third, impact-assessment practice increasingly treats participation as a process that should extend from early engagement through appraisal and follow-up [3,9].

These perspectives converge on an important proposition: participation quality cannot be assessed solely through attendance or procedural completion. The quality of information, inclusiveness, responsiveness and subsequent influence must also be examined.

4. Public Hearings As A Mechanism Of Participation

Public hearings are among the most visible forms of EIA participation because they provide a formal occasion for affected people to address project proponents and regulatory representatives. Their strength lies in creating a documented interface between local concerns and the regulatory record. Their weakness is that a single meeting can compress complex technical and social issues into a short procedural event.

Jharkhand-specific evidence provides a particularly relevant empirical foundation for examining public hearings. Kumar and Sangeeta analysed 55 public-hearing processes covering coal and non-coal mining projects across Jharkhand and reported that socio-economic issues constituted approximately 62–79% of the issues identified in their dataset, followed by land/soil and air-pollution concerns. Their district-level analysis further identified recurring concerns relating to employment, compensation, drinking water, electricity, health, education, CSR and pollution. This evidence demonstrates that communities in Jharkhand commonly interpret environmental clearance through an integrated environmental and livelihood perspective [5].

5. Procedural Justice And Environmental Justice

Procedural justice concerns fairness in the processes through which environmental decisions are made, including access to information, participation, recognition and opportunities to influence outcomes. Environmental justice extends these concerns to the distribution of environmental benefits and burdens and the recognition of communities whose interests may otherwise be marginalised.

The Jharkhand evidence also demonstrates the importance of procedural justice. The state-wide analysis of public-hearing issues shows that socio-economic concerns dominate many mining-sector hearings and that the nature of concerns varies across coalfields and districts [5]. Recent project-level records further show that public concerns can enter the regulatory process through specific commitments, action plans and environmental management measures. These records provide an opportunity to examine whether procedural participation is subsequently converted into identifiable institutional action.

6. Public Participation And Environmental Governance

Participation can strengthen environmental governance when institutions are responsive and when public inputs are integrated into decisions. International best practice emphasises early and continuous engagement, transparency, inclusiveness, accessibility and culturally appropriate processes [1]. Follow-up is particularly important because participation can lose credibility if communities receive no information about what happened to their concerns after a decision is made [1].

7. Empirical Studies On Eia Public Hearings

Empirical evidence from Jharkhand provides a stronger basis for a state-specific comparative analysis than reliance on cases from other parts of India. The state-wide study of public-hearing issues demonstrates recurring concern categories across coalfields and districts [5,7–14]. Project-level records for Kotre–Basantpur–Pachmo, North-West Quarry of Pakri Barwadih, Chandragupta and Banhardih provide additional evidence concerning attendance, issues raised, responses, action plans and regulatory consideration [8–12]. Taken together, these sources allow the present study to examine both the expressive function of public hearings and the extent to which concerns become linked to subsequent environmental or socio-economic measures.

8. Evidence From The Indian Context

The Indian context is characterised by a formal statutory process combined with substantial variation in local institutional capacity. Public hearings may involve mining, infrastructure, industrial, energy and other projects with very different risk profiles. This variation makes cross-case analysis valuable because it can reveal whether recurring participation problems arise from the legal design itself, from implementation, or from the interaction between communities, proponents and regulatory institutions.

9. Critical Review Of Existing Literature

The literature provides strong evidence that public participation matters, but three limitations remain. First, studies often focus either on the hearing event or on broader environmental conflict rather than tracing the complete concern-to-action pathway. Second, empirical assessments frequently use different indicators, making comparison difficult. Third, the existence of a response is sometimes treated as equivalent to meaningful consideration even when the response is vague or not linked to an enforceable action.

The present study addresses these limitations through documentary evidence from Jharkhand. It combines a state-wide empirical analysis with four project-level cases, distinguishes four stages—documentation, response, action and decision linkage—and assesses ten indicators of participation quality. This common framework supports comparison while retaining each project's institutional and socio-economic context.

III. LEGAL AND INSTITUTIONAL FRAMEWORK IN INDIA

1. Evolution Of The Eia Framework In India

India's EIA regime has developed through a sequence of notifications and institutional arrangements under the Environment (Protection) Act, 1986. The EIA Notification, 2006 provides the central framework for environmental clearance of specified projects and activities and sets out requirements concerning screening, scoping, public consultation, appraisal and decision-making [2]. The current framework should be read together with subsequent amendments, circulars and sector-specific directions issued by the Ministry of Environment, Forest and Climate Change (MoEFCC).

2. Environmental Clearance Process

The EIA process generally involves project categorisation, screening where applicable, scoping and Terms of Reference, preparation of the EIA and Environmental Management Plan, public consultation where required, appraisal and the final environmental clearance decision. Expert Appraisal Committees provide technical appraisal at the appropriate level, while the relevant regulatory authority takes the decision. Public consultation is therefore one component of a multi-stage regulatory process rather than the sole basis for clearance [2].

3. Public Consultation And Public Hearing Requirements

Appendix IV of the EIA Notification, 2006 establishes the procedure for public consultation. For applicable projects, the process includes a public hearing conducted by the State Pollution Control Board or Union Territory Pollution Control Committee and an opportunity for written responses. The procedure is intended to ensure that concerns of affected persons are recorded and transmitted as part of the appraisal record [2].

4. Procedure For Conducting Public Hearings

The regulatory procedure addresses notice, venue, presiding authority, documentation and forwarding of proceedings. The underlying principle is that participants should have a reasonable opportunity to understand the proposal and communicate views. Subsequent judicial and regulatory scrutiny has repeatedly demonstrated that procedural details can become material where allegations concern inadequate notice, improper conduct, insufficient disclosure or incomplete recording of concerns.

5. Roles Of Project Proponents And Regulatory Authorities

Project proponents are responsible for preparing project information, EIA documentation and proposed mitigation measures and for responding to material concerns raised during public consultation. Regulatory authorities are responsible for administering the consultation, ensuring appropriate documentation, evaluating the EIA and determining whether conditions are necessary. Meaningful participation therefore depends on interaction between community participation and institutional responsiveness.

6. Role Of Pollution Control Authorities

State Pollution Control Boards and UT Pollution Control Committees have an important operational role in public hearings. Their responsibilities include organising the hearing, maintaining records and forwarding proceedings to the relevant regulatory authority. The credibility of the process depends partly on accurate recording and transparent handling of the views expressed.

7. Documentation Of Public Concerns And Responses

Documentation is a critical bridge between participation and accountability. A useful record should make it possible to identify what was raised, by whom or by which affected group, how the proponent responded, what action was proposed, and whether the matter was subsequently reflected in appraisal or clearance conditions. Without such traceability, post-hearing accountability becomes difficult.

8. Environmental Clearance And Consideration Of Public Concerns

Public concerns are not legally equivalent to vetoes. Environmental decision-making requires consideration of evidence, alternatives, mitigation feasibility and regulatory requirements. However, a credible participatory process requires that material concerns be considered and that the regulatory record provide an intelligible basis for the final decision. The distinction between rejecting a concern after consideration and ignoring a concern is therefore central to the concept of meaningful participation.

9. Evidence From Regulatory Appraisal In Jharkhand

Project records show how public hearings can feed into regulatory appraisal in Jharkhand. In the Kotre–Basantpur–Pachmo case, the EAC required a time-bound, budgeted action plan to address issues raised at the hearing [8]. In the North-West Quarry of Pakri Barwadih case, the appraisal record sought further information on such a plan and later included a specific condition on protecting Khora Nallah water quality [10]. The Chandragupta record also identifies public-hearing concerns and proposed expenditure for addressing them [11,12]. These examples show how concerns can travel from a hearing into technical appraisal and regulatory conditions.

IV. CONCEPTUAL FRAMEWORK

The conceptual framework of meaningful public participation is shown in the figure 1 below.

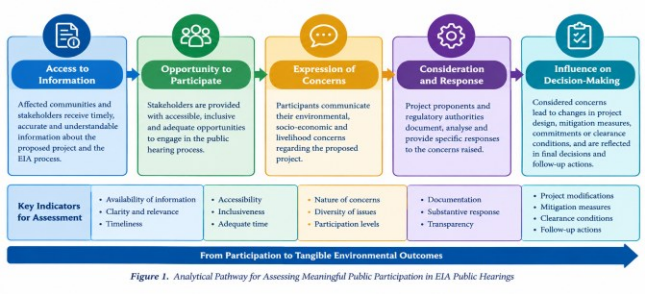


Figure 1. Analytical pathway for assessing meaningful public participation in EIA public hearings.

1. Procedural Participation

Procedural participation is defined in this study as the extent to which the minimum formal requirements of consultation are satisfied. It includes information availability, notice, opportunity to attend, opportunity to speak and documentation of proceedings. Procedural compliance is treated as a necessary but insufficient condition for meaningful participation.

2. Meaningful Participation

Meaningful participation is defined as participation that provides a credible opportunity for affected communities to access relevant information, express concerns, receive reasoned consideration and observe the consequences of that consideration in subsequent project or regulatory decisions. The definition is deliberately outcome-sensitive without assuming that all concerns must be accepted.

3. Analytical Proposition

The central proposition is that the quality of public participation increases as the institutional pathway from concern to response to action becomes more transparent and traceable. A hearing that records many concerns but produces no identifiable response may be procedurally active but substantively weak. Conversely, a hearing in which material concerns lead to specific, enforceable and monitored actions provides stronger evidence of meaningful participation.

V. MATERIALS AND METHODS

The flowchart of research design and analytical workflow is shown below in the figure 2.

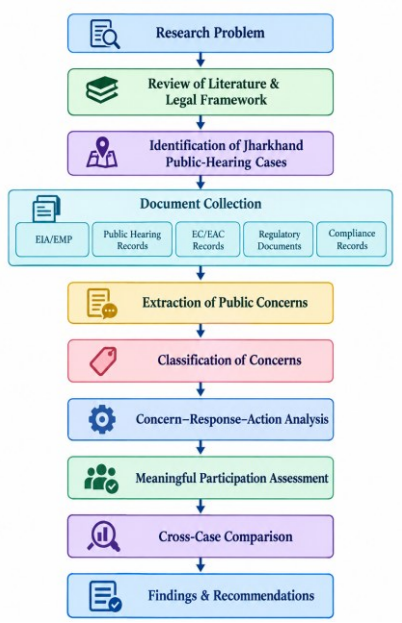


Figure 2. Research design and analytical workflow.

1. Research Design

The study uses a qualitative comparative documentary research design. It analyses publicly available legal records, peer-reviewed research, public-hearing records, EIA/EMP documents and environmental-clearance-related material. The study does not claim original field interviews or direct observation. Findings are therefore limited to what can be established from documentary evidence.

2. Study Scope

The scope is limited to public participation associated with EIA and environmental clearance for selected projects located in Jharkhand. The unit of analysis is the documented pathway from public concern to institutional response and action. Four evidence-rich cases were selected to represent major mining contexts within the state and to provide sufficiently detailed records for comparative analysis: Kotre–Basantpur–Pachmo OCP, North-West Quarry of Pakri Barwadih OCP, Chandragupta OCP and Banhardih Coal Mining Project.

3. Case-Study Approach

A multiple-case approach was adopted because participation quality is context-dependent. Cross-case comparison permits identification of recurring patterns

while retaining the institutional and project-specific characteristics of each case.

4. Criteria For Case Selection

Cases were selected using four criteria: (i) sufficient publicly accessible documentation; (ii) explicit evidence concerning public participation; (iii) identifiable information on responses or clearance outcomes; and (iv) relevance to the distinction between procedural and meaningful participation. The selected project cases are Kotre–Basantpur–Pachmo OCP, North-West Quarry of Pakri Barwadih OCP, Chandragupta OCP and Banhardih Coal Mining Project, supplemented by the Jharkhand-wide public-hearing dataset reported by Kumar and Sangeeta [5] as shown in table 1 and figure 3 below.

Table 1. The Case Study of some selected project areas of Jharkhand with selection rationale and evidence

.

Case / dataset	Sector / location	Evidence basis	Selection rationale
Jharkhand-wide public-hearing dataset	Mining projects across Jharkhand	Peer-reviewed Jharkhand-specific study	State-wide evidence on recurring concern categories
Kotre–Basantpur–Pachmo OCP	Coal mining; Ramgarh and Bokaro	Official PARIVESH/EAC records	Two public hearings and documented action-plan pathway
North-West Quarry, Pakri Barwadih	Coal mining; Hazaribagh	Official PARIVESH/EAC/compliance records	Large participation record and project-specific regulatory condition
Chandragupta OCP	Coal mining; Hazaribagh and Chatra	Official EAC/PARIVESH records	Detailed public-hearing concerns and financial/action commitments
Banhardih Coal Mining Project	Coal mining; Latehar	Official PARIVESH/EAC and public-hearing records	Documented public hearing and appraisal-stage action planning

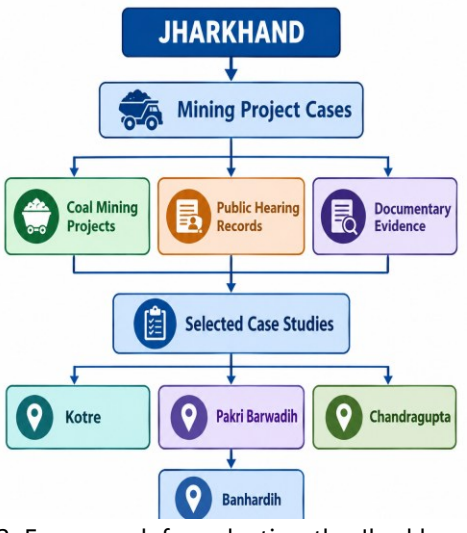


Figure 3. Framework for selecting the Jharkhand coal-mining case studies.

5. Data Sources

Primary and secondary documentary sources included the Environmental Impact Assessment Notification, 2006; official Jharkhand State Pollution Control Board public-hearing records; Ministry of Environment, Forest and Climate Change/PARIVESH records; Expert Appraisal Committee appraisal records; project EIA/EMP documents; and Jharkhand-specific peer-reviewed literature. All empirical case-study evidence analysed in this paper relates to projects located in Jharkhand.

6. Document Collection And Screening

Documents were screened for relevance to public participation and for evidence connecting public concerns to institutional responses or decisions. Documents that merely described a project without participation evidence were not used as primary evidence for the comparative findings.

7. Data Extraction

For each case, evidence was extracted under the following headings: project context; public-hearing context; major concerns; proponent response; regulatory response; actions or mitigation measures; reflection in environmental clearance conditions; and post-hearing follow-up.

8. Coding And Categorization Of Public Concerns

Concerns were grouped into broad categories: environmental pollution; land and natural resources; biodiversity; health and safety; livelihoods and compensation; employment and local development; infrastructure and public services; information and procedural issues; and governance/accountability. Coding was based on the terminology used in the underlying sources.

9. Concern–Response–Action Analysis

Each concern was examined through a four-stage chain: (1) concern documented; (2) response identifiable; (3) action or commitment identifiable; and (4) linkage to project design, mitigation or clearance conditions identifiable. The categories were: Addressed; Partially Addressed; Not Addressed; and Unclear/No Documented Response.

10. Meaningful Participation Assessment

Ten indicators were used: information accessibility, timeliness, practical accessibility, inclusiveness, opportunity to speak, documentation, response, modification, accountability and follow-up. Each indicator was rated qualitatively as limited/weak, moderate, strong or unclear, according to the specificity and consistency of the documentary evidence. "Unclear" denotes insufficient evidence, not the absence of the condition. These ratings are structured qualitative judgements, not statistically validated measurements; Section 6.5 provides an evidence note explaining their basis.

11. Comparative Analysis

Cases were compared using the same indicators and concern-response-action categories. The purpose was not to rank projects absolutely, but to identify differences in participation pathways and recurring institutional barriers.

12. Reliability, Validity And Triangulation

Reliability was strengthened by applying the same coding categories to every case. Validity was supported through triangulation among peer-reviewed research, official regulatory materials and project documentation. Incomplete or contradictory evidence was coded as unclear rather than resolved through inference.

13. Ethical Considerations

The study uses documentary material and does not report confidential personal information or original interviews. Community statements are treated as evidence of issues raised rather than as representative of all affected persons unless the underlying source explicitly establishes broader representation.

14. Limitations Of The Study

The principal limitation is the uneven availability of public-hearing and post-hearing documentation. The study cannot determine the full extent of informal negotiations or actions that are not recorded publicly. The scoring framework is therefore intended as a transparent analytical aid rather than a definitive quantitative measure of participation. In addition, the selected cases are purposive and should not be interpreted as statistically representative of all Indian public hearings.

VI. RESULTS AND CASE-STUDY FINDINGS

The selected case study is indicated below in the map of Jharkhand given in figure 4.



Figure 4. Locations of the selected public-hearing case studies in Jharkhand.

1. Case Study 1: Kotre–Basantpur–Pachmo Opencast Coal Project

Kotre–Basantpur–Pachmo Opencast Coal Project of Central Coalfields Limited is located across parts of Ramgarh and Bokaro districts of Jharkhand. The project proposes opencast coal mining at 5.0 MTPA over approximately 1,162.87 ha. Public consultation was conducted at two locations: Basantpur in Ramgarh district on 18 February 2021 and Pachmo in Bokaro district on 25 February 2021. The official environmental-clearance record reports 119 participants at the Basantpur hearing and 117 at the Pachmo hearing. The recorded issues included environment, employment, rehabilitation and resettlement, compensation, health, roads, electricity, education, afforestation and coordination between project-affected families and project management [7].

The case demonstrates that public participation extended well beyond conventional pollution concerns. The issues recorded encompass both environmental impacts and the distributional consequences of land acquisition and mining. The EAC subsequently required the project proponent to submit a time-bound action plan with allocated funds for addressing issues raised during the public hearing [8]. The project's compliance documentation states that public consultation was conducted in both affected districts and that the public-hearing material was incorporated into the EIA/EMP documentation. The documentary chain therefore provides comparatively clear evidence of concern documentation and institutional response, although the available records do not permit every individual concern to be followed through to verified implementation.

Under the Concern–Response–Action framework, Kotre–Basantpur–Pachmo provides strong evidence of documentation and formal response, moderate evidence of action linkage and limited evidence of independent post-hearing verification. It is therefore classified as partially addressed, with substantial institutional traceability.

2. Case Study 2: North-West Quarry Of Pakri Barwadih Opencast Coal Mine

The North-West Quarry of Pakri Barwadih Opencast Coal Mine of NTPC is located in Hazaribagh district of Jharkhand. The project's public hearing was conducted on 11 November 2022. The project's compliance record reports that approximately 1,145 people participated and that 23 persons expressed their views [9]. The project affects multiple villages and involves substantial rehabilitation and resettlement considerations. The documentary record identifies a public-hearing action-plan budget within the environmental management arrangements and records measures concerning project-affected families and compensation.

The case is particularly relevant to the response and regulatory-action stages of participation. The EAC record sought a time-bound action plan and budget for issues raised during the public hearing. The subsequent appraisal also imposed a specific condition requiring the project authorities to ensure that mining activities do not adversely affect the quality of Khora Nallah water [10]. The record therefore demonstrates movement from general public concerns to a project-specific environmental safeguard. At the same time, the large attendance figure compared with the smaller number of recorded speakers indicates that attendance alone should not be treated as evidence of substantive participation.

The North-West Quarry case is comparatively strong in documentation and regulatory follow-through, but incomplete in demonstrable post-hearing verification. It shows how a public concern can become visible in appraisal and clearance conditions, while also illustrating why attendance should not be equated with influence.

3. Case Study 3: Chandragupta Opencast Coal Mine

Chandragupta Opencast Coal Mine of Central Coalfields Limited is located across Hazaribagh and Chatra districts of Jharkhand and is proposed at a normative/peak capacity of 15/20 MTPA over approximately 1,495 ha. The regulatory record identifies several directly affected villages and specifically instructs that priority should be given to directly affected villages during public consultation and that the minutes should clearly highlight the problems raised by those villages [11]. This is significant because it recognises that numerical participation alone may not capture the interests of the most directly affected population.

The later appraisal record identifies major public-hearing issues relating to environmental protection,

employment, rehabilitation and resettlement, compensation, health, roads, electricity, education, afforestation and coordination between project-affected families and project management. The EAC record further notes a proposed expenditure of approximately Rs. 147.5 lakh towards compliance with issues raised during public consultation and identifies substantial environmental-management expenditure for pollution-control and ecological measures [12].

Chandragupta provides relatively strong evidence of institutional recognition and action planning. The records do not, however, show that each concern produced a discrete change in project design. The case is therefore classified as partially addressed, with strong response and action planning but incomplete concern-specific outcomes.

4. Case Study 4: Banhardih Coal Mining Project

The Banhardih Coal Mining Project is located in Latehar district of Jharkhand and is proposed for 12 MTPA opencast coal mining. The project's EIA documentation records that the Jharkhand State Pollution Control Board conducted the public hearing on 29 December 2021 at High School, Sasang, Ate village, Chandwa Tehsil, Latehar district [14]. The project documentation also records extensive interaction with project-affected families. These interactions identified concerns relating to livelihood disruption, compensation, employment, health, education, infrastructure and housing in rehabilitation and resettlement areas.

The Banhardih documentation is particularly useful because it connects public participation with a broader social-impact assessment. The project record identifies substantial agricultural and other land interests within the proposed project area and records expectations of compensation and livelihood support among affected families. It also incorporates an action plan for issues raised by participants during the public hearing within the EIA documentation [13]. This provides evidence that community concerns were not treated solely as statements made at the hearing but were incorporated into the project's environmental-management and community-development planning.

The available Banhardih record is less detailed on the implementation status of individual commitments. The case is therefore classified as partially addressed, with clear recognition and planning but limited publicly traceable evidence of post-hearing verification.

5. Cross-Case Comparative Analysis

The case studies were comparatively analysed with the help of various indicators and evidences and shown below in the table 2.

Table 2: The comparative analysis of the case study

Indicators	Jharkhand-wide evidence	Kotre–Basantpur–Pachmo	North-West Quarry, Pakri Barwadih	Banhardih	Chandragupta
Information accessibility	Moderate / variable	Moderate	Moderate	Moderate	Moderate
Timeliness	Unclear	Moderate	Moderate	Moderate	Moderate
Practical accessibility	Moderate	Moderate	Moderate	Moderate	Moderate
Inclusiveness	Variable	Moderate	Moderate	Moderate	Moderate
Opportunity to speak	Moderate	Moderate	Moderate	Strong	Moderate
Documentation	Strong	Strong	Moderate–Strong	Strong	Strong
Response	Variable	Moderate	Strong	Strong	Strong
Modification/action	Weak–Moderate	Moderate	Moderate–Strong	Moderate–Strong	Moderate–Strong

Indicators	Jharkhand-wide evidence	Kotre–Basantpur–Pachmo	North-West Quarry, Pakri Barwadih	Banhardih	Chandragupta
Accountability	Weak–Moderate	Moderate	Moderate–Strong	Moderate	Moderate
Follow-up	Limited	Limited–Moderate	Moderate	Limited–Moderate	Limited–Moderate

Evidence note for the comparative ratings: The Jharkhand-wide dataset is rated strong for documentation because it systematically records issues across 55 hearings, but weak to moderate for accountability and follow-up because implementation is not traced consistently. Kotre–Basantpur–Pachmo combines two hearing records with an EAC requirement for a time-bound, budgeted plan; this supports strong documentation and response ratings, while incomplete concern-specific verification limits the follow-up rating.

North-West Quarry receives a comparatively strong action rating because the appraisal record includes both an action-plan requirement and a specific Khora Nallah condition. Chandragupta's action rating reflects proposed financial provision and environmental-management commitments. Banhardih's documentation and response ratings reflect its public-hearing record, social-impact material and EIA action plan. Across all four cases, ratings for information access, timeliness, practical accessibility and inclusiveness remain cautious because the sources do not report these dimensions consistently.

6. Concern–Response–Action Matrix

The assessment of the case studies were analysed using the concern-response-action matrix as shown in table 3 below.

Table 3: The Concern-Response-Action Matrix of the case studies of Jharkhand

Case	Dominant concerns	Documented response	Action/decision linkage	Assessment
Jharkhand-wide dataset	Socio-economic, land/soil, air, water, health and development	Patterns identified; redressal model proposed	State-level intervention framework	Strong evidence of concern expression
Kotre–Basantpur–Pachmo	Environment, employment, R&R, compensation, health, roads, electricity, education, afforestation	Time-bound action plan with budget required	Public consultation incorporated into EIA/EMP and appraisal	Partially addressed / traceable
North-West Quarry, Pakri Barwadih	Environment, R&R, local impacts and water concerns	Action plan sought; specific Khora Nallah condition	Regulatory condition linked to environmental protection	Partially addressed / comparatively strong
Chandragupta	Environment, employment, R&R, compensation, health, roads, electricity, education, afforestation	Action plan and proposed financial provision	EAC appraisal linked concerns with EMP/CER measures	Partially addressed
Banhardih	Land, livelihood, employment, infrastructure and environmental concerns	Public-hearing issues incorporated into appraisal/action planning	EMP and project commitments linked to identified concerns	Partially addressed / traceable

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7. Classification Of Public Concerns

Across the four cases, concerns fall into five broad groups: environmental impacts; socio-economic issues; infrastructure and public services; resettlement and rehabilitation; and project-specific impacts. Employment, compensation, health, roads, drinking water, electricity, education and environmental protection recur across projects as shown in the figure 5. Some concerns are linked to specific action plans or regulatory conditions, while others appear in broader environmental-management or community-development commitments. The records rarely provide a complete one-to-one trail from each hearing statement to a verified action. The cases therefore show meaningful institutional consideration in several areas, alongside a persistent transparency gap after the hearing.

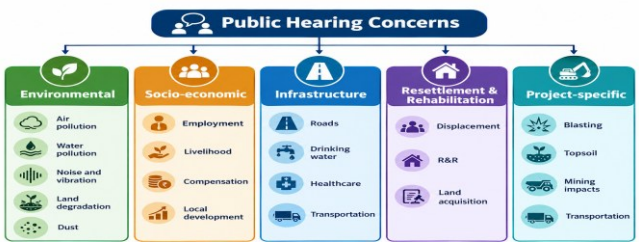


Figure 5. Major categories of concerns raised during the selected public hearings.

VII. ASSESSMENT OF MEANINGFUL PARTICIPATION

The comparative findings indicate that meaningful participation is multidimensional as shown in the table 4. A hearing can perform well on documentation but poorly on information accessibility; it can generate a large number of participants but provide weak evidence of influence; or it can produce formal clearance conditions that are too vague to ensure effective implementation. Accordingly, no single indicator is sufficient.

Table 4: The Meaningful Public Participation Assessment using Indicators

Indicator	Key question	Interpretation in this study
Information accessibility	Was relevant information available before participation?	Necessary for informed participation.
Timeliness	Was there sufficient time to understand the proposal?	Short notice or late disclosure weakens deliberation.
Accessibility	Could affected people practically participate?	Distance, language and social barriers matter.
Inclusiveness	Were affected groups represented?	Attendance alone does not establish representation.
Opportunity to speak	Could concerns be freely raised?	Formal invitation is insufficient if participation is discouraged.
Documentation	Were concerns accurately recorded?	Creates the evidence trail for accountability.
Response	Did proponents/authorities respond substantively?	A response should engage with the issue rather than merely acknowledge it.
Modification	Did concerns influence project measures?	Strongest evidence of substantive influence.
Accountability	Were reasons for decisions explained?	Explains acceptance or rejection.
Follow-up	Was implementation subsequently monitored?	Connects participation to project lifecycle.

The assessment supports the central proposition of the study: meaningful participation is best understood as a chain rather than an event. Breakage at any major link—especially information, response, accountability or follow-up—can reduce the practical influence of the hearing.

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VIII. DISCUSSION

The core processes of public participation are concern-response-action framework, which is a structured model to assess the effectiveness of public participation, shown below in the figure 6.

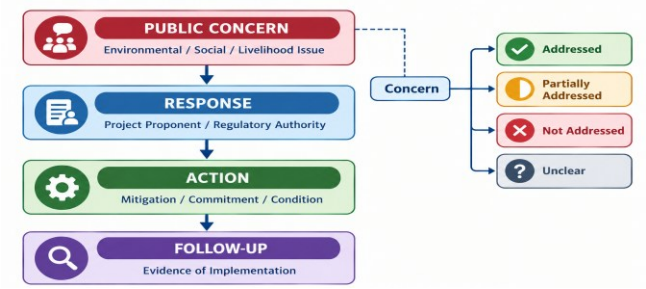


Figure 6. Concern–Response–Action framework used to assess public participation.

1. Meaningful Participation Versus Procedural Formality

The Jharkhand cases support a continuum rather than a binary distinction between meaningful participation and procedural formality. All four cases demonstrate that public hearings provide a recognised platform for affected communities to raise concerns, and all contain evidence that at least some concerns were subsequently considered in project appraisal, action plans, environmental management measures or regulatory conditions. The strength of participation varies according to the traceability of the concern-response-action chain.

2. Nature And Recurrence Of Community Concerns

The most consistent finding across Jharkhand is the prominence of socio-economic concerns. The state-wide analysis by Kumar and Sangeeta found that socio-economic issues constituted approximately 62–79% of issues across the examined public-hearing dataset [5]. The four project cases reinforce this pattern: employment, compensation, rehabilitation and resettlement, health, infrastructure, education, drinking water and local development repeatedly appear alongside pollution and ecological concerns. Public participation in Jharkhand therefore operates as a forum for both environmental and development-related claims.

3. Quality And Adequacy Of Official Responses

The quality of responses varies by case and by issue. Kotre–Basantpur–Pachmo, North-West Quarry and Chandragupta provide documentary evidence of formal action planning or regulatory requirements following the hearings. Banhardih incorporates an action plan and community-development measures within its project documentation. However, a substantive response requires more than a general assurance: it should identify the action, responsible agency, timeline, budget and means of verification. The available Jharkhand records do not consistently provide all of these elements for every individual concern.

4. Influence On Project Design And Mitigation

The strongest evidence of substantive influence is a documented change in project design, mitigation, rehabilitation arrangements or environmental safeguards attributable to a public concern. In the selected Jharkhand cases, the clearest evidence concerns project-specific mitigation and action commitments rather than fundamental changes to project configuration. The North-West Quarry condition on Khora Nallah and the action-plan requirements for Kotre and Chandragupta illustrate this pathway. Nevertheless, the records generally do not allow definitive causal attribution for every project decision.

5. Influence On Environmental Clearance Conditions

Environmental-clearance conditions provide an important route through which public concerns can become regulatory commitments. The Jharkhand cases show that public-hearing concerns can be carried forward into EAC appraisal and project-specific conditions or action plans. The North-West Quarry case provides a clear example through the condition relating to Khora Nallah water quality [10]. However, the effectiveness of such conditions depends on specificity, enforceability and subsequent compliance monitoring.

6. Information And Technical Barriers

Information and technical asymmetries can limit participation. Hearings in Jharkhand frequently address technically complex questions involving pollution control, rehabilitation, groundwater, ecological

protection and mine-related impacts, while the state-wide evidence shows substantial variation in concerns among districts and coalfields [5]. Meaningful participation therefore requires accessible communication and sufficient time and capacity for affected communities to assess the proposal.

7. Representation And Power Imbalances

The Jharkhand records also demonstrate that participation should not be measured solely by attendance. In the North-West Quarry hearing, approximately 1,145 people participated while 23 persons expressed views [9]. In Kotre–Basantpur–Pachmo, 119 and 117 participants were recorded at the two hearings [8]. These figures establish participation opportunity but do not, by themselves, reveal whether the full range of affected interests was represented. The Chandragupta record's instruction to prioritise directly affected villages is therefore analytically important because it recognises representation as a substantive issue [11].

8. Accountability And Post-Hearing Follow-Up

Post-hearing follow-up is the weakest documented element across the selected Jharkhand cases. The records demonstrate that concerns were carried into appraisal and that action plans or conditions were developed, but publicly accessible evidence of systematic verification of every commitment remains limited. This finding reinforces the importance of a transparent post-hearing mechanism through which communities can determine what commitments were made, who is responsible, what has been implemented and what remains outstanding.

9. Environmental Justice Implications

From an environmental-justice perspective, the Jharkhand evidence demonstrates why participation cannot be reduced to a formal meeting. Communities affected by mining projects raise questions concerning environmental quality as well as land, livelihoods, compensation, employment, health and access to public services. A participatory process that records these concerns but does not provide transparent responses risks reproducing existing information and power asymmetries. Conversely, documented responses and project-specific action plans create a stronger basis for procedural accountability.

10. Comparison With Existing Literature

The findings are consistent with the central insight of the Jharkhand-specific literature: public-hearing concerns are predominantly socio-economic but are closely connected with environmental issues [5]. The project-level cases further demonstrate that concerns can influence appraisal through action plans, mitigation measures and specific regulatory conditions [8–14]. The principal contribution of the present study is to connect these observations through a common Concern–Response–Action framework and to identify post-hearing traceability as a key determinant of meaningful participation as shown in figure 7.

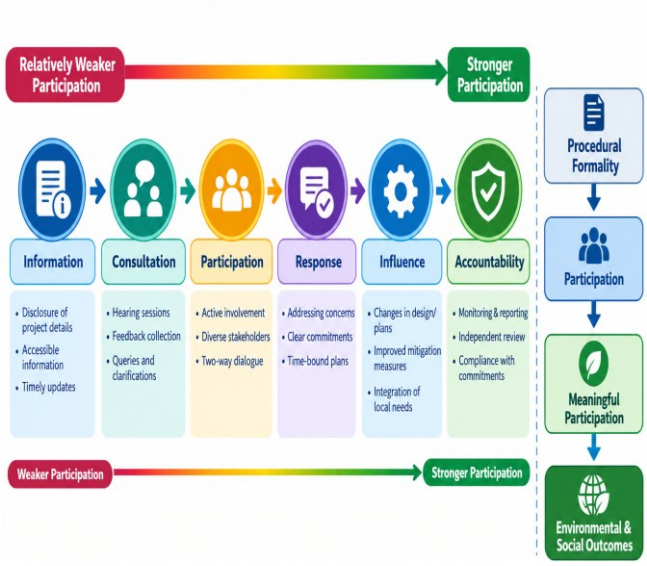


Figure 7. From procedural formality to meaningful participation.

Recommendations

- Improve accessibility and readability of EIA documents, particularly executive summaries and key risk information.
- Provide essential project information in relevant local languages and in formats appropriate to local literacy levels.
- Allow adequate time between disclosure and public consultation for communities to understand and discuss project information.

- Strengthen procedures for recording individual and collective concerns so that each material issue can be traced through subsequent appraisal.
- Introduce a mandatory Concern–Response–Action matrix identifying the issue raised, response, responsible entity, proposed action, timeline and verification mechanism.
- Require project proponents to distinguish clearly between concerns accepted, partially addressed and rejected, with reasons for each decision.
- Provide independent technical assistance for affected communities in complex or high-impact projects where substantial information asymmetry exists.
- Link material public concerns explicitly to project design changes, Environmental Management Plans and environmental clearance conditions where relevant.
- Make clearance conditions specific, measurable, time-bound and enforceable rather than relying on vague requirements to take "adequate" or "appropriate" measures.
- Strengthen post-hearing monitoring and public disclosure so communities can verify whether commitments have been implemented.
- Use participatory monitoring where appropriate, particularly for impacts on water, livelihoods, biodiversity and public health.
- Develop an accessible digital repository linking public-hearing proceedings, responses, clearance conditions and compliance reports for each project.

X. CONCLUSION

This study asked whether public hearings associated with selected mining projects in Jharkhand enable meaningful participation or primarily complete a procedural requirement. The evidence supports neither extreme. Hearings give communities a recognised forum to raise environmental and development concerns, including pollution, employment, compensation, rehabilitation, health, drinking water, roads, education, electricity and local development [7–14].

Concerns did not always end at the hearing. Kotre–Basantpur–Pachmo was followed by a requirement for a time-bound action plan [7,8]. North-West Quarry was followed by further appraisal requirements and a project-specific condition on Khora Nallah water quality [9,10]. Chandragupta linked hearing concerns with appraisal and proposed financial provision [11,12], while Banhardih incorporated community concerns into environmental and social planning and an EIA action plan [13,14].

Holding a hearing is therefore not, by itself, evidence of meaningful participation. The more demanding test is whether the chain from information and opportunity to participate, through documentation and reasoned response, to action and verification can be traced. The selected cases contain meaningful elements of that chain, but post-hearing implementation remains unevenly documented.

For Jharkhand, the priority is to make what happens after a hearing visible. A mandatory Concern–Response–Action matrix, project-specific timelines and budgets, named implementation responsibilities and public compliance reporting would make commitments easier to follow and verify. These measures would help turn hearings from a procedural stage of clearance into a more accountable instrument of environmental governance and procedural justice.

Statement

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Data Availability: All datasets generated and analysed during this study are available from the corresponding author upon reasonable request.

Declarations

Ethical Approval: All authors have read, understood, and have complied, as applicable, with the statement

on "Ethical responsibilities of Authors" as found in the Instructions for Authors.

Conflict of interest: The authors declare no competing interests.

Declaration of generative AI and AI-assisted technologies in the writing process: During the preparation of this work, the author(s) used OpenAI's ChatGPT and Anthropic's Claude large language models for debugging Python code for image generation and for language-related editing of the manuscript text. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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