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Occupational Safety Training for Exploration Activities among Porter Workers in Mining-Affected Communities in Banyuwangi, Indonesia

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Abstract

Mining exploration activities involve various occupational hazards, particularly for porter workers who assist with the transportation of equipment, materials, and logistical supplies in challenging field conditions. Limited understanding of occupational safety procedures may increase the risk of accidents, injuries, and unsafe work practices. This community service program aimed to improve the knowledge, awareness, and practical understanding of occupational safety among porter workers supporting exploration activities in mining-affected communities in Banyuwangi, Indonesia. The program was implemented through participatory training involving lectures, interactive discussions, demonstrations, case studies, and practical simulations of safe working procedures. The training materials covered hazard identification, personal protective equipment, safe material handling, communication during field activities, emergency response, and basic accident prevention. The results indicated an improvement in participants' understanding of workplace hazards and their ability to apply basic safety procedures during exploration-related activities. Participants also demonstrated greater awareness of the importance of using appropriate personal protective equipment and maintaining effective communication while working in potentially hazardous environments. The program shows that community-based occupational safety training can strengthen the capacity of porter workers and contribute to safer exploration activities. Continuous safety education and periodic monitoring are recommended to sustain safe working practices in mining-affected communities.

Keywords Occupational Safety; Exploration Activities; Porter Workers; Mining Communities; Safety Training; Workplace Hazards; Banyuwangi; Community Service

INTRODUCTION

Occupational safety and health (OSH) is an essential component of decent work and sustainable community development, particularly in work environments characterized by physical hazards, difficult terrain, heavy loads, and unpredictable field conditions. The International Labour Organization (ILO) recognizes a safe and

healthy working environment as a fundamental principle and right at work. Since 2022, occupational safety and health has been formally included among the ILO's fundamental principles and rights at work through the recognition of Occupational Safety and Health Convention, 1981 (No. 155), and Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187), as fundamental conventions. This development emphasizes that workplace safety is not merely an organizational obligation but also a fundamental right that should be protected through preventive policies, appropriate systems, and worker participation.

The importance of occupational safety becomes increasingly evident in sectors involving exploration and mining activities. Exploration work is generally conducted in environments where workers may encounter uneven terrain, steep slopes, unstable ground, extreme weather, vegetation, limited accessibility, heavy equipment, and transportation-related risks. These conditions require workers to possess not only physical capacity but also adequate knowledge of hazard identification, safe work procedures, personal protective equipment, communication, and emergency response. The ILO reports that approximately 2.93 million workers die each year as a result of work-related factors, while around 395 million workers experience non-fatal work injuries globally. Such figures demonstrate that occupational accidents remain a significant international concern and reinforce the importance of preventive approaches rather than relying solely on responses after accidents occur.

In mining exploration areas, porter workers occupy a particularly important position in supporting field operations. They may be responsible for carrying equipment, food supplies, water, field materials, communication devices, and other logistical necessities from one location to another. Although their work is essential to the continuity of exploration activities, porter workers can face occupational risks that are sometimes underestimated because their roles are perceived as supporting or non-technical. The combination of manual handling, long-distance movement, difficult terrain, environmental exposure, and interaction with exploration teams creates a range of potential hazards. Without sufficient safety awareness, workers may be more vulnerable to slips and falls, musculoskeletal injuries, fatigue, falling objects, dehydration, heat exposure, and accidents resulting from inappropriate handling of equipment or materials.

The Indonesian mining sector has established a regulatory framework that emphasizes systematic management of mining safety. Decree of the Minister of Energy and Mineral Resources No. 1827 K/30/MEM/2018 provides guidelines for the

implementation of the Mining Safety Management System (SMKP Minerba), covering occupational safety and health as well as operational safety. The system applies to exploration and production activities as well as mining service companies. Its implementation includes policy, planning, organization and personnel, implementation, monitoring and evaluation, documentation, and management review and performance improvement. The regulation also emphasizes the importance of considering workers' input in the formulation of mining safety policies. This framework demonstrates that safety should be integrated into all levels of mining activity, including field-support workers whose tasks directly contribute to exploration operations.

Safety training is therefore an important instrument for developing workers' capacity to recognize and control occupational hazards. Effective OSH management cannot depend only on written regulations or the availability of protective equipment. Workers need to understand why safety procedures are necessary and how those procedures should be applied in actual working situations. The ILO emphasizes that workers should receive adequate training appropriate to the work they perform, including information about occupational hazards and methods to prevent or minimize exposure to risks. Training should also prepare workers and organizations to respond appropriately to accidents and emergencies. This perspective places education and practical competency at the center of preventive safety management.

The need for safety education is particularly relevant in communities surrounding mining and exploration activities. Local workers may participate in exploration-related activities because of economic opportunities created by resource development. Their involvement can contribute to household income and local economic activity, but it also creates a responsibility to ensure that employment opportunities are accompanied by adequate protection. The World Health Organization has emphasized that workers' health is influenced not only by workplace hazards but also by social and individual factors and access to occupational health services. Effective interventions for preventing occupational hazards and protecting workers' health are available, but access to appropriate occupational health measures remains uneven, particularly in developing-country contexts.

Banyuwangi provides a relevant setting for community-based occupational safety intervention because several areas of the regency are associated with natural-resource exploration and mining-related activities. Porter workers who support

exploration operations may work in geographically challenging environments and interact directly with exploration personnel and equipment. Their position makes them an important target for safety education. Strengthening their understanding of basic OSH principles can contribute to the development of a preventive safety culture at the community level. Such an approach is consistent with the ILO's emphasis on continuous improvement of occupational safety and the development of preventive safety cultures through cooperation among governments, employers, and workers.

Community service activities can provide a practical mechanism for translating occupational safety principles into knowledge and skills that are directly relevant to workers' everyday activities. Training can be designed around the actual conditions encountered by porter workers, including hazard identification, correct lifting and carrying techniques, use of personal protective equipment, safe movement across difficult terrain, communication with exploration teams, fatigue management, and basic emergency procedures. Participatory approaches are particularly valuable because they allow workers to share their experiences and identify risks based on situations they encounter in the field.

Based on this context, the occupational safety training program for porter workers in mining-affected communities in Banyuwangi was designed as a community-based intervention to strengthen workers' knowledge, awareness, and practical understanding of safety during exploration activities. The program seeks to bridge the gap between formal occupational safety requirements and their practical application at the community level. Through training, discussion, demonstrations, and practical simulations, the activity is expected to encourage safer work behavior and strengthen the capacity of porter workers to identify and respond to occupational hazards. Ultimately, improving the safety competence of local workers is expected to support safer exploration activities while contributing to the broader development of a sustainable and preventive occupational safety culture in Banyuwangi.

METHODS

This community service program employed a participatory community-based training approach to strengthen occupational safety knowledge and practical awareness among porter workers supporting exploration activities in mining-affected communities in Banyuwangi, Indonesia. The approach was selected because occupational safety training is most effective when workers are actively involved in identifying hazards, discussing their work experiences, practicing preventive

measures, and evaluating the applicability of safety procedures in their actual working environment. The International Labour Organization (ILO) emphasizes that workers should receive clear information, instruction, and adequate training concerning workplace hazards, risk-control measures, and emergency procedures.

The participants were porter workers involved in supporting exploration activities around the mining area in Banyuwangi. Participant selection was based on their direct involvement in field activities, particularly the transportation of equipment, materials, supplies, and other logistical needs during exploration. Their direct exposure to field conditions made them an appropriate target group for an intervention focused on occupational safety. The program was conducted through several sequential stages, beginning with preparation and initial assessment, followed by safety training, practical demonstration and simulation, and evaluation and follow-up. This sequence was designed to ensure that the training was not limited to the transfer of theoretical information but also encouraged participants to develop practical safety competencies.

The preparation stage involved coordination with local stakeholders and identification of the participants' principal occupational activities and potential safety risks. The facilitators gathered preliminary information concerning working conditions, transportation routes, material-handling activities, environmental conditions, and safety practices commonly encountered by the porters. This initial assessment was important for ensuring that the training materials reflected the participants' actual work situations. The ILO recommends that training needs should be linked to workplace risk assessment so that workers receive instruction that is relevant to the hazards associated with their specific tasks.

The training stage used a combination of interactive presentations, discussions, question-and-answer sessions, demonstrations, case-based learning, and practical simulations. The main topics included the basic principles of occupational safety and health, identification of hazards and risks, appropriate use of personal protective equipment (PPE), safe lifting and carrying techniques, movement across difficult terrain, communication among field workers, fatigue and environmental risks, accident prevention, and basic emergency response. The training emphasized simple and practical procedures that could be directly applied by porter workers in the field. This approach is consistent with ILO training materials, which emphasize hazard, risk, and prevention as central concepts for developing a sustained preventive safety culture.

The participatory component was implemented by encouraging participants to describe hazards that they had personally experienced during exploration-support activities. Facilitators then guided participants in analyzing the causes of these hazards and discussing appropriate preventive measures. Participants were also invited to identify unsafe practices and propose safer alternatives. Such an approach positioned workers not merely as recipients of safety information but as active contributors to the development of workplace safety practices. The ILO similarly emphasizes worker participation and cooperation as important elements of effective occupational safety and health management.

Practical demonstrations were conducted to reinforce the theoretical material. Participants practiced the correct use of PPE, safe methods for carrying loads, communication procedures during transportation, and appropriate responses to selected emergency situations. The facilitators provided direct feedback during the simulations and corrected unsafe practices when identified. Practical learning was considered important because occupational safety competence requires the ability to translate knowledge into appropriate behavior in real or simulated work situations. The ILO has also developed practical training materials intended to strengthen workers' capacity to identify hazards and implement prevention measures.

Program evaluation was conducted through observation, discussion, participant responses, and comparison of participants' understanding before and after the training. The evaluation focused on changes in participants' knowledge of occupational hazards, understanding of preventive measures, ability to identify unsafe conditions, proper use of PPE, and awareness of emergency procedures. Participants' responses during discussions and simulations were documented as qualitative evidence of learning. The facilitators also assessed participants' ability to explain and demonstrate safe working practices independently. This evaluation approach was intended to determine whether the intervention produced meaningful changes in safety awareness rather than merely measuring attendance or completion of the training.

The final stage involved reflection and follow-up recommendations. Participants were encouraged to apply the safety practices learned during the training and to communicate safety concerns encountered during exploration activities. Follow-up emphasized the importance of continuous safety education, supervision, and periodic refresher training. Such continuity is important because occupational safety should be treated as an ongoing process rather than a one-time intervention. The ILO notes that refresher training may be necessary when workers'

skills need updating and that safety training should be relevant, effective, and supported by adequate supervision. Through this method, the program sought to establish a practical and sustainable safety culture among porter workers and strengthen their capacity to participate actively in preventing occupational accidents during exploration activities in Banyuwangi.

FINDINGS AND DISCUSSION

The implementation of the occupational safety training program for porter workers supporting exploration activities in Banyuwangi demonstrated that community-based safety education can strengthen workers' understanding of hazards and encourage safer practices in field activities. The training was designed around the actual working conditions encountered by the participants, particularly the transportation of equipment and materials across challenging exploration areas. The results of observations, discussions, demonstrations, and practical simulations indicated that the participants were able to identify a wider range of occupational hazards after the training and showed greater awareness of the importance of preventive measures. The improvement was particularly visible in participants' ability to distinguish between ordinary work difficulties and conditions that could potentially result in accidents or injuries. This finding is important because effective occupational safety begins with the ability of workers to recognize hazards before accidents occur.

Picture 1 program preparation

During the initial discussions, participants generally understood that exploration activities involved physical risks, but their understanding of occupational safety was not always organized into a systematic risk-prevention framework. Several hazards were initially perceived as normal characteristics of the job rather than as risks requiring specific control measures. Difficult terrain, carrying heavy loads, fatigue, weather exposure, and movement through remote areas were regarded as part of everyday work. The training encouraged participants to reconsider these conditions through the concepts of hazard, risk, prevention, and

control. This shift in perspective represents an important outcome because safety culture develops when workers recognize that accidents are not an unavoidable consequence of demanding work. The ILO emphasizes that occupational safety training should introduce workers to hazard, risk, and prevention as interconnected concepts for developing a sustained preventive safety culture.

The participants demonstrated particular interest in identifying hazards associated with manual material handling. Porter workers frequently transport equipment, food supplies, water, and other materials required by exploration teams. Improper lifting techniques, excessive loads, unbalanced loads, and prolonged carrying can increase the possibility of muscle strain, falls, and other physical injuries. Through demonstrations and simulations, participants practiced safer techniques for lifting, carrying, placing, and transferring loads. The practical component helped participants understand that safety is not merely a matter of being careful but involves specific working techniques. The facilitators emphasized the importance of assessing the weight and shape of materials before lifting, maintaining body balance, using appropriate carrying positions, and requesting assistance when a load exceeds an individual's safe capacity. These practices are consistent with the broader principle that work organization and working conditions should be adapted to workers' physical capacities.

Another important result concerned the use of personal protective equipment (PPE). Before the intervention, participants were familiar with several forms of protective equipment, but familiarity did not necessarily mean consistent or correct use. The training therefore emphasized the function of PPE and the relationship between PPE and other forms of risk control. Participants were introduced to the appropriate use of protective footwear, helmets, gloves, and other equipment relevant to field conditions. Demonstrations allowed participants to practice wearing and adjusting equipment correctly. The discussion also clarified that PPE should not be regarded as a substitute for hazard elimination or other preventive controls. The ILO identifies adequate protective clothing and protective equipment as important elements of occupational accident prevention while emphasizing that workers should receive information and training concerning safety measures and their proper use.

The training also produced positive responses concerning communication and coordination during exploration activities. Porter workers frequently operate as part of a larger field team, meaning that their safety is influenced not only by their individual behavior but also by communication with supervisors, exploration

personnel, and other workers. Participants were encouraged to communicate clearly when carrying materials, crossing difficult terrain, encountering obstacles, or identifying potentially dangerous conditions. The simulations demonstrated how simple communication failures can create unnecessary risks, particularly when workers are moving equipment simultaneously or working in locations with limited visibility. The discussion therefore positioned communication as a component of occupational safety rather than merely an operational matter. This approach is consistent with the ILO's position that worker participation and cooperation are essential components of effective occupational safety and health management.

The participants also demonstrated increased awareness of environmental and fatigue-related risks. Exploration activities may take place in remote locations where workers are exposed to changing weather, heat, rain, slippery surfaces, uneven ground, and limited access to emergency services. Long working periods may further reduce concentration and physical capacity. The training encouraged participants to recognize fatigue and environmental exposure as safety issues that should be managed rather than simply tolerated. Participants discussed the importance of adequate rest, hydration, appropriate clothing, awareness of weather conditions, and communication when physical conditions become unsafe. This finding is particularly relevant to mining and exploration environments because the ILO has identified mining as one of the most hazardous occupational sectors and has highlighted the additional risks associated with long working hours and remote locations where access to health and emergency services may be limited.

The emergency-response simulation provided another important learning outcome. Participants were introduced to basic procedures for responding to accidents, injuries, and hazardous situations. The objective was not to transform porters into professional emergency responders but to ensure that they could take appropriate initial actions, communicate an emergency clearly, protect themselves from further danger, and seek assistance. Participants practiced identifying the safest immediate response rather than reacting impulsively to an incident. This aspect of the training strengthened the understanding that emergency preparedness should form part of routine safety planning. The ILO's occupational safety and health guidance likewise emphasizes that workers should be informed and trained regarding emergency arrangements associated with their work.

An important characteristic of the program was its participatory approach. Instead of delivering safety information exclusively through lectures, the facilitators encouraged participants to describe situations they had experienced in the field.

These experiences became the basis for discussions about potential hazards and preventive actions. Participants were able to identify locations, activities, and working practices that they considered risky and then discuss possible solutions collectively. This approach helped connect formal safety principles with the realities of porter work. It also strengthened the sense that safety is a shared responsibility. The ILO has specifically promoted Participatory Action-Oriented Training (PAOT) as an approach for improving occupational safety and health in rural mining sectors, emphasizing the importance of sector-specific strategies and worker involvement.

The findings also demonstrate the relevance of the program to Indonesia's mining safety framework. Decree of the Minister of Energy and Mineral Resources No. 1827 K/30/MEM/2018 establishes the Mining Safety Management System (SMKP Minerba), which includes occupational safety and health and operational safety and applies to exploration activities and mining service companies. The system encompasses policy, planning, organization and personnel, implementation, monitoring and evaluation, documentation, and management review and performance improvement. Importantly, the regulation states that mining safety policy development should consider input from mine workers. The training conducted in Banyuwangi can therefore be understood as a community-level effort that supports the broader objectives of the mining safety management framework by improving the competence and safety awareness of workers who contribute directly to exploration operations.

The findings are also consistent with Indonesia's broader national commitment to strengthening occupational safety and health. In 2024, the Indonesian Ministry of Manpower and the ILO launched the National Occupational Safety and Health Programme for 2024–2029, which aims to develop a resilient OSH culture across sectors, including informal and rural economic activities. The program highlights the importance of cooperation among government, employers, workers, and other stakeholders in strengthening occupational safety. The involvement of porter workers in community-based training is therefore significant because occupational safety improvement should not be limited to formally designated technical personnel. Workers occupying supporting positions also need access to appropriate safety information and practical training.

The training further illustrates that safety competence should be understood as a combination of knowledge, awareness, and practical behavior. A worker may know that PPE is required but still fail to use it appropriately; similarly, a worker may recognize that a heavy load is dangerous but continue carrying it alone because

of time pressure or work habits. The simulations addressed this gap by requiring participants to demonstrate appropriate responses rather than merely explain them. This distinction is important for community service programs because the ultimate objective is behavioral improvement that can be maintained after the training has ended. The ILO notes that effective OSH management involves building a safety culture, applying risk-management and control principles, and involving workers in safety management.

Picture 2 training

The program nevertheless indicates that one training session cannot by itself guarantee long-term behavioral change or eliminate occupational risks. Safety practices are influenced by supervision, availability of PPE, work organization, workload, field conditions, and the safety expectations established by the organizations responsible for exploration activities. Training should therefore be followed by periodic refresher sessions, field-based monitoring, regular hazard identification, and opportunities for workers to report unsafe conditions. The SMKP Minerba framework similarly incorporates monitoring, evaluation, follow-up, documentation, and continuous performance improvement as components of mining safety management.

Overall, the results indicate that occupational safety training can provide meaningful benefits for porter workers in mining-affected communities when the content is closely connected to their actual working conditions and delivered through participatory and practical methods. The improvement in hazard recognition, PPE awareness, safe material handling, communication, environmental risk awareness, and emergency preparedness demonstrates the value of combining knowledge transfer with demonstrations and simulations. More broadly, the program contributes to the development of a preventive safety culture by positioning local workers as active participants in occupational safety rather than passive recipients of safety instructions. This is consistent with international and Indonesian approaches

that place worker participation, training, prevention, and continuous improvement at the center of effective occupational safety management.

CONCLUSION

The occupational safety training program for porter workers supporting exploration activities in mining-affected communities in Banyuwangi, Indonesia, demonstrates the importance of strengthening workers' knowledge, awareness, and practical safety competencies. Porter workers perform essential supporting functions in exploration activities, but their work exposes them to various occupational hazards, including difficult terrain, manual material handling, fatigue, environmental conditions, falling objects, and transportation-related risks. These hazards require workers to understand not only the existence of risks but also appropriate methods for preventing and controlling them.

The implementation of participatory training, interactive discussions, demonstrations, case-based learning, and practical simulations provided participants with opportunities to connect occupational safety principles with their actual working experiences. The program contributed to improved understanding of hazard identification, appropriate use of personal protective equipment, safe lifting and carrying techniques, communication procedures, environmental risk awareness, fatigue management, and basic emergency response. The practical orientation of the training was particularly important because occupational safety competence requires the ability to translate knowledge into appropriate behavior in real working situations.

The program also demonstrates that community-based occupational safety education can contribute to the development of a preventive safety culture among local workers. Participants were encouraged to identify hazards based on their own experiences and to discuss appropriate preventive measures collectively. This approach positioned workers as active participants in safety management rather than merely as recipients of instructions. Such participation is consistent with international occupational safety principles and Indonesia's mining safety management framework, which emphasizes worker involvement, risk prevention, monitoring, and continuous improvement.

Despite these positive outcomes, the sustainability of safety improvements requires continuous support. Periodic refresher training, field supervision, availability and proper use of PPE, regular hazard identification, and effective communication between workers and exploration management should be maintained. Future community service programs should also incorporate measurable

pre-test and post-test assessments and longer-term observation of safety behavior. Overall, the program provides a practical contribution to strengthening occupational safety among porter workers and supports safer, more responsible, and sustainable exploration activities in Banyuwangi.

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