REFERENCES

Adu-Baffour, F., Daum, T., & Birner, R. (2021). Governance challenges of small-scale gold mining in Ghana: Insights from a process net-map study. *Land Use Policy,* 102, Article 105271. https://doi.org/10.1016/j.landusepol.2020.105271

Agboola, O., Babatunde, D. E., Fayomi, O. S. I., Sadiku, E. R., Popoola, P., Moropeng, L., Yahaya, A., & Mamudu, O. A. (2020). A review on the impact of mining operation: Monitoring, assessment and management. *Results in Engineering,* 8, 100181. https://doi.org/10.1016/j.rineng.2020.100181

Ahmad, F. (2022). Implementation of occupational safety and health (K3) for increasing employee productivity. *Jurnal Economic Resources,* 5(2), Article e114. https://repository.nobel.ac.id/id/eprint/114

Amirudin, A., Sukwika, T., & Ramli, S. (2024). Analysis of performance and safety risks in the nickel mining sector. *Indonesian Journal of Global Health Research,* 6(2), 723–734. https://doi.org/10.37287/ijghr.v6i2.2791

Antonsen, S. (2017). Safety culture: Theory, method and improvement. *CRC Press.*

IndustriALL Global Union. (2024, June 26). Another explosion at Indonesian nickel plant injures workers. https://www.industriall-union.org/another-explosion-at-indonesian-nickel-plant-injures-workers

Cheng, L., Guo, H., & Lin, H. (2020). The influence of leadership behavior on miners' work safety behavior. *Safety Science,* 132, 104986. https://doi.org/10.1016/j.ssci.2020.104986

Dhalmahapatra, K., Das, S., & Maiti, J. (2022). On accident causation models, safety training and virtual reality. *International Journal of Occupational Safety and Ergonomics,* 28(1), 28–44. https://doi.org/10.1080/10803548.2020.1840464

Dodgson, J. E. (2019). Reflexivity in qualitative research. *Journal of Human Lactation,* 35(2), 220–222. https://doi.org/10.1177/0890334419830990

Hadi, G. S., Dewi, D., & Sari Dewi, R. (2023). Analyses of critical success factors and barriers to the implementation of Indonesian mining safety management system: Case study of a nickel mine & processing company. *Jurnal Multidisiplin Madani,* 3(6), 1321–1343. https://doi.org/10.55927/mudima.v3i6.3178

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science,* 45, 616–632. https://doi.org/10.1007/s11747-017-0517-x

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review,* 31(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hasibuan, M. (2019). Compliance with occupational health and safety standards in Indonesia's mining industry: Challenges and implications. *Safety and Health Journal,* 11(3), 215–227.

International Council on Mining and Metals. (2020). Annual report 2019. https://www.icmm.com/en-gb/annual-reports/2019

Jaladara, V., & Hasanbasri, M. (2024). Beyond the surface: A perspective on the psychosocial dimensions in mining operations in Indonesia. *BIO Web of Conferences,* 132, 04001. https://doi.org/10.1051/bioconf/202413204001

Janjuhah, H. T., Ishfaque, M., Mehmood, M. I., Kontakiotis, G., Shahzad, S. M., & Zarkogiannis, S. D. (2021). Integrated underground mining hazard assessment, management, environmental monitoring, and policy control in Pakistan. *Sustainability,* 13(24), 13505. https://doi.org/10.3390/su132413505

Jianshuang, C., & Kuangdi, X. (2022). Safety facility design of mining. In K. Xu (Ed.), The ECPH Encyclopedia of Mining and Metallurgy. *Springer.* https://doi.org/10.1007/978-981-19-0740-1_201-1

Kalteh, H. O., Mortazavi, S. B., Mohammadi, E., & Salesi, M. (2021). The relationship between safety culture and safety climate and safety performance: A systematic review. *International Journal of Occupational Safety and Ergonomics,* 27(1), 206–216. https://doi.org/10.1080/10803548.2019.1628915

Kusumawardani, K. A., Arquisola, M. J., Amin, G., & Restiawati, M. (2023). Inclusive leadership and workers' safety behaviour during Covid-19 pandemic. *Evidence-Based HRM,* 11(3), 465–482. https://doi.org/10.1108/EBHRM-01-2023-0006

Lakshmi, A., & Mariska, D. (2024, November 28). "Production first, safety later": Inside the world's largest nickel site. *Financial Times.* https://www.ft.com/content/56013ee9-f456-4646-895c-aeb65a685f85

Leveson, N. (2004). A new accident model for engineering safer systems. *Safety Science,* 42(4), 237–270. https://doi.org/10.1016/S0925-7535(03)00047-X

Ma, H., Wang, J., & Wang, Y. (2012). Study on mechanics and domino effect of large-scale goaf cave-in. *Safety Science,* 50(4), 689–694. https://doi.org/10.1016/j.ssci.2011.08.059

Min, Y., Yexiang, F., Weilin, T., & Jiajie, Z. (2020). Study on safety behavior planning theory and control strategies for coal chemical workers. *Safety Science,* 128, 104726. https://doi.org/10.1016/j.ssci.2020.104726

Pouliakas, K., & Theodossiou, I. (2013). The economics of health and safety at work: An interdisciplinary review of theory and policy. *Journal of Economic Surveys,* 27(1), 167–208. https://doi.org/10.1111/j.1467-6419.2011.00717.x

Prasetyo, H., & Rahmawati, L. (2018). Mechanical risks and equipment safety in Indonesia's mining sector: An empirical study. *International Journal of Mining Safety,* 3, 278–290.

Prayitnoadi, R. P., Lawson, G., Ryan, B., & Hermawati, S. (2020). Ergonomics in mining: An investigation on occupational safety in Indonesian tin mining. *Jurnal Ergonomi dan K3,* 5(2), 1–7.

Rasmussen, J. (1983). Skills, rules, and knowledge; signals, signs, and symbols, and other distinctions in human performance models. *IEEE Transactions on Systems, Man, and Cybernetics,* SMC-13(3), 257–266. https://doi.org/10.1109/TSMC.1983.6313160

Reason, J. (2000). Human error: Models and management. *BMJ,* 320(7237), 768–770. https://doi.org/10.1136/bmj.320.7237.768

Rielander, C. (2016). Safety incident investigation. Juta.

Smith, C., & Brooks, D. J. (2012). Security science: The theory and practice of security. *Butterworth-Heinemann.*

Sorensen, G., Dennerlein, J. T., Peters, S. E., Sabbath, E. L., Kelly, E. L., & Wagner, G. R. (2021). The future of research on work, safety, health and wellbeing: A guiding conceptual framework. *Social Science & Medicine,* 269, 113593. https://doi.org/10.1016/j.socscimed.2020.113593

Strauch, B. (2017). Investigating human error: Incidents, accidents, and complex systems. *CRC Press.*

Suharno, B., Putra, A., & Yulianti, M. (2020). Workplace injuries and safety standards in Indonesian manufacturing and mining industries. *Journal of Occupational and Environmental Safety,* 12(1), 143–159.

Suryaningsi, S., Herliah, E., Syarif, M., Rosmini, R., Yuliangrum, A. V., & Bahzar, M. (2024). Legal responsibility of coal mining company PT. International Prima Coal for worker welfare and safety. *Journal of Ecohumanism,* 3(3), 758–769. https://doi.org/10.14746/eco.2024.3.3.20

Taufan, M. (2023, December 24). Furnace explosion at Chinese-owned nickel plant in Indonesia kills at least 13 and injures 46 others. *AP News.* https://apnews.com/article/d5c9d98584d70a23608b773821e9cfab

World Health Organization. (2025, April 30). Occupational health. https://www.who.int/health-topics/occupational-health

Zainal, Z., & Zeriand, D. (2022). Good governance in corporate social responsibility (CSR) program at Siak Regency. *Jurnal Ilmiah Peuradeun,* 10(3), 763–782. https://doi.org/10.26811/peuradeun.v10i3.867

Zhang, J., Fu, J., Hao, H., Fu, G., Nie, F., & Zhang, W. (2020). Root causes of coal mine accidents: Characteristics of safety culture deficiencies based on accident statistics. *Process Safety and Environmental Protection,* 136, 78–91. https://doi.org/10.1016/j.psep.2020.01.039

APPENDIX A

INTERVIEW GUIDE

A.1 Semi-Structured Interview Questions for Frontline Workers (8 participants)

Background Information:

1. Can you tell me about your role and how long you have worked at PT Indonesia STAR Steel?

2. What is your typical work schedule and main responsibilities?

Workplace Safety Experiences: 3. Can you describe your typical work day and the main safety risks you encounter? 4. Have you ever experienced or witnessed a workplace accident? Can you tell me about it without identifying specific individuals? 5. How do you feel about the current safety conditions in your workplace? 6. What safety equipment or protective gear do you use daily?

Accident Causes (RQ1): 7. From your experience, what do you think are the main causes of accidents in your workplace? 8. Have you noticed any patterns in when or where accidents tend to occur? 9. How would you rate the importance of human factors versus equipment factors in causing accidents? 10. Do you think the current training adequately prepares workers for safety challenges?

Effects of Accidents (RQ2): 11. If you or a colleague experienced an accident, what were the immediate effects? 12. How do accidents affect you and your colleagues emotionally and financially? 13. Have you noticed any long-term effects on workers who experienced accidents? 14. How do accidents impact team morale and work performance?

Safety Improvements (RQ3): 15. What safety improvements would you suggest for your workplace? 16. Do you feel comfortable reporting safety concerns to management? Why or why not? 17. What changes would make you feel safer at work? 18. How could communication about safety be improved?

Closing Questions: 19. Is there anything else about workplace safety that you think is important to mention? 20. What would be your top three priorities for improving safety at PT Indonesia STAR Steel?

A.2 Semi-Structured Interview Questions for Safety Officers (3 participants)

Background and Role:

1. Can you describe your role and responsibilities as a safety officer?

2. How long have you been working in safety management at PT Indonesia STAR Steel?

Accident Analysis: 3. What are the most common types of accidents you investigate at PT Indonesia STAR Steel? 4. Based on your investigations, what are the primary causes of workplace accidents? 5. How do you classify and document safety incidents? 6. What trends have you observed in accident rates over the past few years?

Safety Management Systems: 7. What safety management systems are currently in place? 8. How effective are the current safety training programs? 9. What are the main challenges in implementing safety measures? 10. How do you measure the effectiveness of safety interventions?

Organizational Factors: 11. What role does management support play in workplace safety? 12. How would you describe the safety culture at PT Indonesia STAR Steel? 13. What barriers exist to effective safety management? 14. How do production pressures affect safety compliance?

Recommendations: 15. What recommendations would you make to improve safety culture? 16. What resources would be most helpful for enhancing safety? 17. How could accident prevention be strengthened? 18. What role should employees play in safety improvement initiatives?

A.3 Semi-Structured Interview Questions for Management Representatives (4 participants)

Strategic Perspective:

1. How does PT Indonesia STAR Steel prioritize safety in its overall business strategy?
2. What is your role in safety management and decision-making?

Safety Investment and Resources: 3. How does the company balance safety investments with production targets? 4. What budget and resources are allocated for safety improvements? 5. How do you measure return on investment for safety initiatives?

Management Systems: 6. What safety challenges does PT Indonesia STAR Steel face as an organization? 7. How do you ensure consistent implementation of safety policies across all departments? 8. What metrics do you use to monitor safety performance? 9. How do you handle employee feedback on safety issues?

Organizational Culture: 10. How would you describe the current safety culture in the organization? 11. What steps has management taken to promote safety awareness? 12. How do you communicate safety priorities to all levels of the organization?

Future Planning: 13. What are the company's long-term safety goals? 14. What new safety technologies or approaches is the company considering? 15. How do you plan to address identified safety gaps? 16. What role do you see employees playing in future safety improvements?

APPENDIX B

FOCUS GROUP DISCUSSION GUIDE

B.1 FGD Protocol for Employee Groups

Session Details:

- Duration: 45-60 minutes
- Participants: 8-12 employees per session
- Setting: Comfortable meeting room
- Recording: Audio recording with participant consent

Introduction (5 minutes):

- Welcome and facilitator introduction
- Explanation of FGD purpose and research objectives
- Confidentiality assurance and consent for recording
- Ground rules:
  - Everyone's opinion is valued
  - Speak one at a time
  - Respect different viewpoints
  - No identifying names in discussion
  - What is said here stays here

B.2 Main Discussion Topics (40-50 minutes)

Topic 1: Workplace Safety Experiences (10-12 minutes)

Opening Question: "Let's start by talking about your daily work experience. What safety hazards do you encounter regularly in your work?"

Probing Questions:

- Can anyone share an experience of an accident or near-miss (without naming individuals)?
- How do these incidents affect your daily work performance?
- What safety equipment do you rely on most?
- How confident do you feel about your safety training?

Topic 2: Causes of Accidents (12-15 minutes)

Main Question: "From your collective experience, what do you think are the main causes of accidents in your workplace?"

Probing Questions:

- Which factors do you think contribute most: human factors, equipment, or management?
- How do work pressures affect safety practices?
- Are there specific times, places, or conditions when accidents are more likely?
- How adequate is the safety training you receive?
- What role does communication play in safety?

Topic 3: Effects of Accidents (10-12 minutes)

Main Question: "How do workplace accidents impact you and your colleagues?"

Probing Questions:

- What are the immediate consequences when an accident occurs?
- How do accidents affect you financially and emotionally?
- What about long-term effects on workers and families?
- How do accidents change the workplace atmosphere?
- Do you feel adequately supported after an incident?

Topic 4: Safety Improvement Suggestions (10-12 minutes)

Main Question: "What changes would make your workplace safer?"

Probing Questions:

- What improvements would you prioritize?
- How comfortable are you reporting safety concerns?
- What would encourage more open communication about safety?
- How could training be improved?
- What role should management play in safety improvements?
- How can employees contribute more to safety?

Wrap-up (5 minutes):

- Summary of key points discussed
- Final opportunity for additional comments
- Thank participants for their time and insights
- Reminder about confidentiality

- Information about next steps in the research

B.3 FGD Facilitator Guidelines

Facilitation Techniques:

- Use open-ended questions to encourage discussion
- Allow natural conversation flow while staying on topic
- Ensure all participants have opportunity to contribute
- Manage dominant speakers diplomatically
- Encourage quieter participants to share
- Use reflective listening and summarizing
- Maintain neutral stance on controversial topics

Managing Sensitive Topics:

- Emphasize that no blame is assigned to individuals
- Focus on systems and processes rather than personal failures
- Redirect personal attacks or blame toward constructive discussion
- Ensure emotional safety for participants sharing difficult experiences
- Have support resources available if participants become distressed

Documentation:

- Audio recording with transcription services
- Detailed field notes on non-verbal communication
- Participant observation notes
- Summary of key themes immediately after session

APPENDIX C

SUMMARY OF KEY STATISTICAL FINDINGS

C.1 Participant Demographics Summary

Total Qualitative Participants: 35

- **In-depth Interviews:** 15 participants
- **Focus Group Discussions:** 20 participants across 2 sessions

Gender Distribution:

- **Male:** 29 participants (83%)
- **Female:** 6 participants (17%)

Experience Range at PT Indonesia STAR Steel:

- **Minimum:** 1 year
- **Maximum:** 22 years
- **Average:** 9.2 years
- **Median:** 8 years

Age Demographics:

- **Range:** 25-55 years
- **Average:** 36.4 years
- **25-35 years:** 14 participants (40%)
- **36-45 years:** 15 participants (43%)
- **46-55 years:** 6 participants (17%)

C.2 Participant Role Distribution

Frontline Workers (18 total):

- Machine Operators: 5
- Production Workers: 4
- Maintenance Technicians: 3
- Equipment Operators: 3
- Processing Technicians: 2
- Quality Control Staff: 1

Safety Personnel (5 total):

- Senior Safety Officers: 2
- EHS Coordinators: 2
- Risk Assessment Specialists: 1

Management (12 total):

- Production Managers: 3
- Operations Supervisors: 4
- Team Leaders: 3
- Human Resources Managers: 2

C.3 Key Thematic Findings Frequency

Most Frequently Mentioned Safety Concerns:

1. **Inadequate training programs:** Mentioned by 31/35 participants (89%)
2. **Equipment maintenance issues:** Mentioned by 27/35 participants (77%)
3. **Fear of reporting incidents:** Mentioned by 23/35 participants (66%)
4. **Production pressure vs. safety:** Mentioned by 25/35 participants (71%)
5. **Poor hazard identification:** Mentioned by 22/35 participants (63%)

C.4 Accident Experience Distribution

Direct Accident Experience:

- **Personally involved in accident:** 13 participants (37%)
- **Witnessed workplace accident:** 19 participants (54%)
- **No direct accident experience:** 3 participants (9%)

Types of Accidents Mentioned:

- **Machinery-related injuries:** 15 cases
- **Falls and slips:** 8 cases
- **Chemical exposure:** 6 cases
- **Burns and cuts:** 7 cases
- **Equipment failure incidents:** 12 cases

C.5 Cause Attribution Analysis

Primary Cause Categories (Based on Participant Responses):

- **Human factors/Operator mistakes:** 40%

- **Safety non-compliance:** 30%
- **Equipment failures:** 20%
- **Environmental factors:** 10%

Human Factors Breakdown:

- **Inadequate training:** 60%
- **Fatigue and overwork:** 25%
- **Inexperience:** 15%

Equipment Issues Breakdown:

- **Poor maintenance:** 65%
- **Outdated technology:** 25%
- **Design defects:** 10%

C.6 Effectiveness Ratings of Current Safety Measures

Participant Assessment of Current Safety Systems (Scale 1-5):

- **Safety training programs:** Average 2.3/5
- **Equipment maintenance:** Average 2.6/5
- **Management support:** Average 2.8/5
- **Incident reporting system:** Average 2.1/5
- **Emergency response:** Average 3.2/5

C.7 Recommended Improvements Priority Ranking

Top 10 Improvement Suggestions (by frequency of mention):

1. **Enhanced comprehensive safety training:** 28 mentions
2. **Better equipment maintenance scheduling:** 25 mentions
3. **Improved incident reporting without fear:** 24 mentions
4. **Regular safety equipment updates:** 22 mentions
5. **Stronger management safety commitment:** 21 mentions
6. **Better hazard identification systems:** 19 mentions
7. **Enhanced emergency response procedures:** 18 mentions
8. **Regular safety drills and practice:** 17 mentions
9. **Improved workplace environmental monitoring:** 16 mentions
10. **Better communication channels for safety:** 15 mentions

C.8 Data Collection Summary

Interview Duration:

- **Average interview time:** 42 minutes
- **Range:** 30-65 minutes
- **Total interview time:** 630 minutes (10.5 hours)

FGD Duration:

- **FGD 1:** 52 minutes
- **FGD 2:** 48 minutes
- **Total FGD time:** 100 minutes

Data Transcription:

- **Total pages of transcripts:** 187 pages
- **Average transcript length per interview:** 8.5 pages
- **Average transcript length per FGD:** 25 pages

Thematic Coding Results:

- **Primary codes identified:** 47
- **Main themes developed:** 12
- **Sub-themes identified:** 31
- **Inter-coder reliability:** 94% agreement