JPPIPA 12(4) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Factors Influencing Shift of Livelihoods from the Agricultural to Non-Agricultural Sector in the Nickel Mining Area of Central Halmahera Regency

Mardiyani Sidayat[1*], Sartika Syafi[2], Eka Kusuma Dewi[1], Mukhlis[3]

[1] Agribusiness Department, The Faculty of Agriculture, Khairun University, Maluku Utara, Indonesia.
[2] Agrotechnology Department, The Faculty of Agriculture, Khairun University, Maluku Utara, Indonesia.
[3] Agribusiness Study Program, Department of Agriculture Business, Politeknik Pertanian Negeri Payakumbuh, Lima Puluh Kota, Indonesia.

Received: February 17, 2026
Revised: March 27, 2026
Accepted: April 25, 2026
Published: April 30, 2026

Corresponding Author:
Mardiyani Sidayat
mardiyani.sidayat@unkhair.ac.id

DOI: 10.29303/jppipa.v12i4.14832

Abstract: Indonesia has several leading sectors that support the national economy, one of which is the agricultural sector. However, over time, there has been a significant shift of labor from the agricultural sector to non-agricultural sectors. This large-scale labor migration has implications for the development and sustainability of the agricultural sector. In the context of North Maluku, the mining sector has emerged as a leading economic sector, particularly in regions such as Central Halmahera. The presence of the mining industry has contributed to changes in local livelihood structures, marked by a shift of labor from the agricultural sector to non agricultural sectors that develop as multiplier effects of mining activities. This study aims to identify the factors influencing the transition of livelihoods from the agricultural sector to non-agricultural sectors in mining areas surrounding Central Halmahera. The research employs descriptive analysis and multiple linear regression methods. The independent variables examined include the reduction of agricultural land (X1), income uncertainty in the agricultural sector (X2), job opportunities in non-agricultural sectors (X3), and income stability in non-agricultural sectors (X4). The results show that the partial regression analysis (t-test) indicate that the reduction of agricultural land (X1) and employment opportunities in the non-agricultural sector (X3) have a statistically significant influence on livelihood shifting (Y). In contrast, uncertainty in the agricultural sector (X2) and income stability in non-agricultural sectors (X4) do not demonstrate a statistically significant influence on livelihood shifting (Y). Furthermore, the results of the simultaneous analysis indicate that these variables collectively have a significant influence on the shift in livelihoods from the agricultural sector to non-agricultural sectors.

Keywords: Agricultural sector; Change of livelihoods; Mining areas; Non agricultural sector

Introduction

Agriculture continues being a key sector that supports Indonesia's national economy. Statistics Indonesia data indicate that the agricultural sector remains essential for employment and economic output. In February 2023, the sector accounted for approximately 29.36% of Indonesia's total workforce, highlighting its significance as a primary source of livelihood, especially in rural regions. The agricultural sector made a notable contribution to the national economy, representing approximately 12–13% of Indonesia's Gross Domestic Product (GDP) in 2023 (BPS, 2024). In addition to its macroeconomic contribution, agriculture plays a crucial role in ensuring food security, poverty reduction, and rural development, particularly during financial recession. Agriculture offers employment opportunities for low-skilled labor and

How to Cite:
Sidayat, M., Syafi, S., Dewi, E. K., & Mukhlis, M. (2026). Factors Influencing Shift of Livelihoods from the Agricultural to Non-Agricultural Sector in the Nickel Mining Area of Central Halmahera Regency. *Jurnal Penelitian Pendidikan IPA*, *12*(4), 936–941. https://doi.org/10.29303/jppipa.v12i4.14832

serves as a crucial income source for millions of smallholder farmers in developing nations. In Indonesia, the sector is closely associated with agro-industry, trade, and transportation using integrated agribusiness value chains, thus contributing to overall economic development (OECD, 2025).

Indeed, the transition of labor from agricultural to non-agricultural sectors has been substantial annually. The global decline in the availability of rural labor is a consequence of ongoing economic transformations (FAO, 2022). The global employment share in agrifood systems (AFS) has significantly declined, from 52.2 percent in 2000 to 39.2 percent in 2021, indicating a substantial transition to other sectors over the past two decades (FAO, 2024). Agricultural labor migration in Indonesia is significantly influenced by developments in non-agricultural sectors, comprising industry and services, educational attainment, and the extent of agricultural mechanization (Marpaung & Hubbansyah, 2025).

In the context of North Maluku, the mining sector has emerged as a leading sector, having been identified as a part of a national strategic project. This includes the PT Indonesia Weda Bay Industrial Park (IWIP), which is an integrated industrial area for integrated heavy metal processing for the nickel downstream process (IWIP, 2024). The mining industry has led to a transition of workers from agriculture to the mining, service, and trade sectors, indicating a multiplier effect. The agricultural sector is considered insufficient to fulfill the economic requirements of the community. Other reasons include the reduction of agricultural land and income uncertainty in the agricultural sector. This shift of labor from the agricultural to non-agricultural sectors is the result of various interrelated factors.

The transition from agriculture to mining has notably impacted socioeconomic conditions, resulting in increased incomes and more modern lifestyles. However, this shift has also led to a decline in cooperation, an increase in individualism, and a rise in socio-environmental risks (Khairani et al., 2025). Nickel investments exhibit dual effects, it substantially promote economic growth through industrial development and job creation in local communities, while simultaneously causing significant environmental degradation and disruptions to agricultural livelihoods (Pambudi, 2025). The analysis indicated that land remediation associated with nickel mining on national scale was minimal, whereas the land directly utilized by the nickel industry will more than double from 2020 to 2026 (Heijlen & Duhayon, 2024). Changes in economic structure, demographic changes, and changing working conditions influence individual and community decisions to seek alternative employment outside the traditional agricultural sector.

Method

Research Location

This research was conducted for 5 months, starting from June 2025 to October 2025. The research location, which was determined purposively (Mukhlis et al., 2019; Mukhlis et al., 2024; Asgaf et al., 2025). The research location was the nickel mining area around Central Halmahera which includes the villages of Sagea, Lelilef Sawai, Gemaf, Woekob and Woejerana.

Population and Sample

The collected research data comprised both primary and secondary sources. Primary data was collected directly from respondents chosen as the research sample, utilizing a questionnaire as the instrument for data collection. Primary data was collected directly from selected respondents using a questionnaire as the data collection instrument. Secondary data was collected from government agencies and literature studies related to the research topic.

The selected respondents comprised representatives from community groups who previously worked as farmers and have now shifted to non-agricultural sectors. Sampling was conducted using snowball sampling (Mukhlis et al., 2022). A sampling technique that initiates with a limited number of participants and subsequently expands to additional samples to fulfill the research data requirements (Sugiyono, 2020; Mukhlis et al., 2023). Initiating with a small group of key informants, which are including local leaders, government officials, and other relevant actors. Following that, researchers identified additional respondents based on suggestions from these informants according to established requirements set by the researcher. The total number of respondents in this study was 50 persons.

Data Analysis Method

The analyzed data consisted of scores measured on a five-level Likert scale representing various preferences, which are 1) strongly agree, 2) agree, 3) neutral, 4) disagree, and 5) strongly disagree. The data analysis proceeded with multiple linear regression. This study analyzed four independent variables, including the reduction of agricultural land (X1), income uncertainty in the agricultural sector (X2), job opportunities in non-agricultural sectors (X3), and income stability in non-agricultural sectors (X4). The dependent variable is Factors influencing changes in livelihoods from the agricultural sector to non agricultural sector (Y), which results in the following multiple regression equation:

$$Y = a + b_1X_1 + b_2X_2 + b3X3 + b4\ X4 + e \quad (1)$$

Result and Discussion

Analysis Result of Factors Influencing Livelihoods Shift from the Agricultural to Non-Agricultural Sectors
Multiple Regression Analysis

Table 1. Multiple Linear Regression Test Result

Variable	Beta
reduction of agricultural land	0.014
income uncertainty in the agricultural sector	0.200
job opportunities in non-agricultural sectors	0.597
income stability in non- agricultural sectors	0.196

Source: primary data analysis, 2025

Based on the regression test results obtained, the regression equation can be formulated as follows:

$$Y = 0.014\ X1 + 0.200\ X2 + 0.597\ X3 + 0{,}196\ X4 \quad (2)$$

From this equation, it can be explained that: The independent variable, reduction of agricultural land (X1), has a positive effect with a value of 0.014 on livelihoods shifting. Variable X1 are including perception of the community over 1) agricultural land in this region is decreasing annually; 2) some of the agricultural land in this region has been converted into mining sites; 3) The decline in agricultural land availability poses significant challenges to farming activities; 4) The current availability of land for cultivation is inadequate; 5) The decrease in agricultural land affects individuals' employment choices.

The independent variable of income uncertainty in the agricultural sector (X2), has a positive effect with a value of 0.200 on livelihoods shifting. Variable X2 are including perception of the community over 1) farming income frequently demonstrates uncertainty; 2) Agricultural yields are greatly influenced by weather conditions.; 3) The prices of agricultural products frequently fluctuate, resulting in unstable incomes for farmers; 4) Revenue generated from the agricultural sector is frequently below the level of fulfilling basic needs; 5) The potential for crop failure causes fluctuations in farmers' income.

The independent variable of job opportunities in non-agricultural sectors (X3), has a positive effect with a value of 0.597 on livelihoods shifting. Variable X3 are including perception of the community over 1) The region presents plenty employment opportunities within the non-agricultural sector; 2) Employment opportunities in the non-agricultural sector are easily accessible.; 3) Information about non-agricultural jobs is easily obtained by the public; 4) Have a suitability to work in the non-agricultural sector; 5) There is significant interest as numerous individuals in my region are seeking employment in the non-agricultural sector.

The independent variable of income stability in non- agricultural sectors (X4), has a positive effect with a value of 0.196 on livelihoods shifting. Variable X4 are including perception of the community over 1) Income derived from non-agricultural employment shows greater stability compared to that generated from agricultural activities; 2) Non-agricultural employment offers a more stable monthly income..; 3) Income derived from the non-agricultural sector is more reliable to supplying family needs; 4) The probability of income loss in the non-agricultural sector is lower compared to what occurs in the agricultural sector; 5) Income derived from the non-agricultural sector demonstrates more long-term stability

Goodness of Fit Test
Simultaneous Test (F Test)

The F test results indicate a calculated F value of 89.613 with a significance level of 0.000. This suggests that reduction of agricultural land (X1), income uncertainty in the agricultural sector (X2), job opportunities in non-agricultural sectors (X3) and income stability in non- agricultural sectors colectivelly influence livelihoods shifting.

Table 2. F Test Result

F Count	F Table	Significant
89.613	2.58	0.000[b]

Source: primary data analysis, 2025

Partial Test Results (T-Test)

From the Partial test result show the independent variable of reduction of agricultural land (X1) and job opportunities in non-agricultural sectors (X3) are significantly influence the dependent variable livelihoods shifting (Y) in the regression model.

Table 3. Partial Test Results (T-Test)

Variable	t count	t table	Significant
X1	5.867	1.678	.000b
X2	1.561	1.678	.126
X3	3.496	1.678	0.01
X4	1.064	1.678	2.93

Coefficient of Determination Test

The analysis provided a correlation coefficient (R) of 0.943, indicating a very strong relationship between the independent and dependent variables. Meanwhile, R Square (Coefficient of Determination) of 0,888 shows how much of the variation in the dependent variable is explained by the independent variable. About 88.8% of the variation in the dependent variable can be explained

by the independent variables in the model and the remaining of 11.2% is explained by other factors not included in the model.

Table 4. Coefficient of Determination Test

R	R square
0.943	0.888

Factors Influencing the Shift of Livelihoods from the Agricultural to Non-Agricultural Sectors

Reduction of Agricultural Land

The analysis indicates that the reduction of agricultural land is a significant factor driving the change of livelihoods from agricultural to non-agricultural sectors in the research area locations. The major cause of the land reduction is resulting from the conversion of agricultural land to development and mining purposes. This process diminishes the land available for cultivation and lowers agricultural productivity, particularly affecting smallholder farmers who rely significantly on land access for their income and food security. farmers often become landless and it also limits their capacity to sustain agricultural activities (Coulibaly & Li, 2020).

The expansion of mining operations often occurs into arable ground, making it unusable for farming and degrading the agricultural ecosystems in the surrounding area (Komba et al., 2023). The decrease in agricultural land weakens the economic sustainability of farming and limit employment opportunity in the agricultural sector. Consequently, the local community in the research areas are continually shifting to non-agricultural activities to sustain their livelihoods and enhance economic stability. Farmland conversion has reduced natural livelihood assets and agricultural production, causing farmers to shift their attention to non-agricultural activities (Tufa & Megento, 2022).

Income Uncertainty in The Agricultural Sector

Income uncertainty in the agricultural sector is widely recognized as a major factor driving farmers to shift from agriculture to non-agricultural sectors. Rural households normally allocate labor and resources to have multiple income sources. Agriculture is basically characterized by significant uncertainty due to its dependence on climatic conditions, market fluctuations, and biological production processes. Such uncertainties frequently result in fluctuating and unpredictable agricultural income. Agriculture is basically characterized by significant uncertainty due to its dependence on climatic conditions, market fluctuations, and biological production processes. Such uncertainties frequently result in fluctuating and unpredictable agricultural income. When agricultural income becomes unstable, households pursue alternative employment opportunities by reallocating labor to non-agricultural activities to ensure livelihood stability (Hastuti et al., 2025). The decline of labor number in agricultural sector impacted to several factors including low wage levels, income uncertainty, land conversion for industrial purposes (Utomo et al., 2025). Employment prospects in the industrial and service sectors provide better income stability compare to agricultural sector (Haviz et al, 2021)

Respondents indicated that employment in the agricultural sector, despite its variable income, offered long-term stability due to the presence of readily available natural resources. Nevertheless, the limited availability of agricultural land forced to shift to alternative occupations, including trade, services, home industries, and mining. Non-farm employment, including small trade, services, wage labor, offers alternative income sources that are not directly affected by agricultural shocks (Saba et al., 2022).

Job Opportunities in Non-Agricultural Sectors

Opportunities for employment in non-agricultural sectors at mining sites frequently arise from economic activities generated directly and indirectly by mining operations. The presence of mining companies fosters the development of related sectors, including transportation, construction, trade, services, and small-scale businesses, which require local labor that was previously dependent on agriculture. The expansion of mining activities stimulates economic growth in supporting sectors such as transport services, construction, trade, and development of micro, small, and medium enterprises, which in turn creates employment opportunities for local communities (Faisal Anwar et al., 2024).

This indicates that mining areas often experience economic diversification where local residents shift from farming to non-agricultural jobs that emerge around mining operations. The emergence of nickel mining activities stimulated the community to develop micro-economic enterprises within the small-scale trading sector, including the establishment of food stalls, local transportation services on both land and sea, and the rental of boarding residences or dormitories (Karsadi et al., 2023). Respondents indicated that the advancement of the mining industry in their region has facilitated access to employment opportunities outside the agricultural and fisheries sectors. The available job types are diverse, enabling individuals to pursue various opportunities. The mining sector employs millions globally and creates additional jobs in related sectors, establishing it as a crucial source of non-agricultural employment in mineral-rich rural areas. Effective mining, governance, and management of mineral resources lead to job creation, institutional

strengthening, and the facilitation of sustainable, inclusive growth in resource-rich countries (World Bank, 2025).

Income Stability in Non- Agricultural Sectors

Income derived from non-agricultural sectors is frequently regarded as more stable and dependable than agricultural income, especially in rural economies that heavily rely on climatic conditions and seasonal production. involvement in non-farm income activities significantly strengthens household welfare and financial stability. Diversification into non-agricultural sectors boosts livelihoods and increases resilience to economic shocks (Danso-Abbeam et al., 2020).

Participation in non-agricultural activities, including petty trade, handicrafts, and employment in the service sector, enhances household resilience to economic and climate-related shocks, while also increasing overall income levels and adaptive capacity (Degefu, 2025). Respondent express concerns regarding the long-term stability of employment outside the agricultural sector in which they are currently involved, particularly in the context of the extended period of mining activities. Currently, access to natural resources, particularly forests and agricultural land, is significantly limited.

Conclusion

In North Maluku, the mining sector has become a prominent economic sector. The mining industry has influenced local livelihood structures, characterized by a shift of labor from agriculture to non-agricultural sectors that emerge as multiplier effects of mining activities. The multiple regression analyses utilized four independent variables: the reduction of agricultural land (X1), income uncertainty in the agricultural sector (X2), job opportunities in non-agricultural sectors (X3), and income stability in non-agricultural sectors (X4). The results of the partial regression analysis (t-test) show that livelihood shifting (Y) is statistically significantly impacted by the loss of agricultural land (X1) and employment prospects in the non-agricultural sector (X3). However, the simultaneous analysis shows that in areas affected by the nickel mining industries in Central Halmahera regency, these four factors simultaneously have a considerable impact on the transition of livelihoods from the agricultural sector to non-agricultural sectors. In addition, future studies may may also look into how sustainable diversification initiatives such as the development of Agri-based industries, local entrepreneurship, and environmentally sustainable non-agricultural employment opportunities, can contribute to balanced regional economic growth while preserving food security and community welfare. Longitudinal and comparative studies across different mining regions are recommended to offer broader insights into the sustainability of livelihood transitions and policy interventions.

Acknowledgments

I express my sincere gratitude to the Faculty of Agriculture, Khairun University, for providing funding for this research through the PKUPT/Higher Education Competitive Research Grant 2025. and to the various parties that contributed to this research.

Author Contributions

M.S.: Developing ideas, analyzing, writing, reviewing, responding to reviewers' comments; S.S., E.K.D.: Analyzing data, overseeing data collection, reviewing scripts, and writing; M.K.: Reviewing scripts, and writing.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

References

Asgaf, K., Hifizah, A., Astati, Ananda, S., Jamili, M. A., & Mukhlis. (2025). Application of Fermented Feed Technology to Improve Beef Cattle Business Efficiency and Student Agribusiness Learning. *Jurnal Penelitian Pendidikan IPA*, *11*(5), 604–610. https://doi.org/10.29303/jppipa.v11i5.11135

BPS. (2024). *Laporan Perekonomian Indonesia 2024*. Retrieved from https://www.bps.go.id/id/publication/2024/09/20/3f6dbcd515737b5c8e40d497/laporan-perekonomian-indonesia-2024.html

Coulibaly, B., & Li, S. (2020). Impact of agricultural land loss on rural livelihoods in peri-urban areas: Empirical evidence from sebougou, mali. *Land*, *9*(12), 1–20. https://doi.org/10.3390/land9120470

Danso-Abbeam, G., Dagunga, G., & Ehiakpor, D. S. (2020). Rural non-farm income diversification: implications on smallholder farmers' welfare and agricultural technology adoption in Ghana. *Heliyon*, *6*(11). https://doi.org/10.1016/j.heliyon.2020.e05393

Degefu, S. (2025). Patterns, determinants and contributions of rural livelihood diversification strategies among smallholder farmers in Guliso District, Western Ethiopia. *Discover Sustainability*, *6*(1). https://doi.org/10.1007/s43621-025-02037-4

Faisal Anwar, A., Wulan Sari, D., Islamiya, H. A. T., Raja Ahmad, R. A., & Salimah Alias, N. (2024). Understanding the impact of mining activities and human capital improvement on achieving

sustainable development goals; evidence from East Luwu, Indonesia. *Cogent Economics and Finance*, *12*(1). https://doi.org/10.1080/23322039.2024.2386401

FAO. (2022). *Youth and Agrifood Systems Transformation, Food and Agriculture Organization of the United Nations, 2022*. The State of Food and Agriculture.

FAO. (2024). *FAO adds to data coverage of employment in agrifood systems*. The State of Food and Agriculture.

Hastuti, Dartanto, T., Halimatussadiah, A., & Rifin, A. (2025). Climate change and labor mobility: A longitudinal study of agricultural households in Indonesia. *World Development Perspectives*, *40*(March), 100750. https://doi.org/10.1016/j.wdp.2025.100750

Haviz, M., Suryaman, R., & Tri, R. (2021). Fenomena Alih Fungsi Lahan: Apakah Tenaga Kerja dapat Berpindah dari Sektor Pertanian Ke Sektor Lain? Studi Kasus Kabupaten Bekasi. *Jurnal Riset Ilmu Ekonomi, 1*(1), 1-11. https://doi.org/10.23969/jrie.v1i1.8

Heijlen, W., & Duhayon, C. (2024). An empirical estimate of the land footprint of nickel from laterite mining in Indonesia. *Extractive Industries and Society*, *17*(May), 101421. https://doi.org/10.1016/j.exis.2024.101421

Karsadi, & La, A. (2023). Multidimensional Impacts of Nickel Mining Exploitation towards the Lives of the Local Community. *Jurnal Ilmu Sosial Dan Humaniora*, *12*(2), 222–227. https://doi.org/10.23887/jish.v12i2.58881

Khairani, E., Yasin, F., & Rahmadani, S. (2025). Socioeconomic Changes In The Community After Switching To Mining In Jorong Tanjuang Bungo, Nagari Ganggo Hilia, Bonjol District, Pasaman Regency. *Jurnal Sosiologi Nusantara*, *11*(2), 298–317. https://doi.org/10.33369/jsn.11.2.298-317

Komba, B. P., Fatima, A., Mushtaq, K., & Hassan, S. (2023). Farmland Loss and Livelihood Effects: Diamond and Gold Mining Implications on Farmersâ€™ Sustainability in Sierra Leone. *Journal of Economic Impact, 5*(3), 238-245. https://doi.org/10.52223/econimpact.2023.5309

Marpaung, B., & Hubbansyah, A. K. (2025). Determinants of Sectoral Labor Migration and Their Contribution to Enhancing Labor Productivity: A Case Study from Indonesia. *Journal of Economics and Business*, *8*(2), 129–142. https://doi.org/10.31014/aior.1992.08.02.668

Mukhlis, Hendriani, R., Sari, N., Firsta Wisra, R., Fitrianti, S., & Lutfi, U. M. (2023). Analisis Pendapatan Petani Model Usahatani Terpadu Jagung-Sapi Di Kecamatan Payakumbuh. *Jurnal Penelitian Pertanian Terapan*, *23*(2), 254–261. http://dx.doi.org/10.25181/jppt.v23i2.2953

Mukhlis, Hendriani, R., Sari, R. I. K., & Sari, N. (2022). Analisis Produksi dan Faktor Produksi Usaha Tani Terpadu Tanaman Padi dan Ternak Sapi di Nagari Taram Kecamatan Harau. *Jurnal Penelitian Pertanian Terapan*, *22*(2), 104–110. https://doi.org/10.25181/jppt.v22i2.2581

Mukhlis, M., Ismawati, I., Sillia, N., Fitrianti, S., Ukrita, I., Wisra, R. F., Raflis, H., Hendriani, R., Hanum, L., Ibrahim, H., Nofianti, S., Marta, A., & Sari, N. (2024). Characteristics of Production Factors and Production of Zero Tillage System Rice Farming. *Jurnal Penelitian Pendidikan IPA*, *10*(8), 6013–6019. https://doi.org/10.29303/jppipa.v10i8.8542

Mukhlis, Noer, M., Nofialdi, & Mahdi. (2019). Analysis of income and feasibility of rice-cattle integration system farming based on enterprises scale. *Journal of Advanced Research in Dynamical and Control Systems*, *11*(7), 544–553. Retrieved from https://www.jardcs.org/abstract.php?id=2678

OECD. (2025). *Agricultural Policy Monitoring and Evaluation 2025: Indonesia country chapter*. OECD Publishing.

Pambudi. (2025). The Paradox of Nickel Investment in Indonesia. *Environmental Pollution Journal*, *5*(3), 299–319. Retrieved from https://ecotonjournal.id/index.php/epj/article/view/339

Saba, S., Sarker, M. A. R., & Gow, J. (2022). Determinants of non-farm income diversification strategies and decisions of Bangladesh farm households. *Economic Analysis and Policy*, *76*, 226–235. https://doi.org/10.1016/j.eap.2022.08.007

Sugiyono. (2020). *Metode Penelitian Kuantitatif, Kualitatif dan Kombinasi (mixed methods)*. Alfabeta.

Tufa, D. E., & Megento, T. L. (2022). The effects of farmland conversion on livelihood assets in peri-urban areas of Addis Ababa Metropolitan city, the case of Akaki Kaliti sub-city, Central Ethiopia. *Land Use Policy*, *119*(September), 106197. https://doi.org/10.1016/j.landusepol.2022.106197

Utomo, B. A., Darmawan, A., & Plamadeala, C. (2025). From Farms to Cities: Understanding Labor Migration Determinants in Indonesia's Agricultural Sector During Structural Transformation. *Media Analisa Masalah Administrasi*, *28*(01), 1–14. https://doi.org/10.30649/aamama.v28i1.280

World Bank. (2025). *Transforming Metals and Minerals into Jobs and Lasting Prosperity*. Retrieved from https://www.worldbank.org/en/news/immersive-story/2025/12/12/turning-minerals-and-metals-into-development