EIA in Strengthening Law Enforcement and Penalties: A Case of Corruption in Natural Resource Sector

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Abstract: Corruption in Indonesia's natural resource sector is a significant issue with far-reaching consequences for environmental sustainability. Despite the detrimental effects of corrupt practices on the environment, law enforcement penalties for corruption often fail to compensate for their environmental impact. The aim of the study is to explore how the use of Environmental Impact Assessments (EIAs) strengthens law enforcement efforts and increase penalties for corrupt practices in Indonesia's natural resource sector. The method used is to collect and analyze regulations, policies, and corruption study cases to examine the relationship between EIA and corruption penalties. The results showed that EIA can help corruption cases investigation and corruption cases involving EIA receive heavier penalties. This study concluded that the Indonesian government needs to reformulate its law enforcement approach by incorporating EIA into corruption investigations and using more severe penalties to deter corruption in the natural resource sector.

Keywords: Environmental Impact Assessment; Corruption; Environmental Law; Natural Resource

1. Introduction

Corruption has been a longstanding issue in Indonesia's natural resource sector and frequently reported with cases of bribery, extortion, and illegal practices in the industries of mining[1], logging[2], oil and gas[3]. While the natural resources in Indonesia have been a source of wealth and economic growth, it has also been the source of social conflicts and environmental problems. For example, the processes of issuing permits in the sector of

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[1] Mori, A. (2018). Impact of the china-induced coal boom in indonesia: A resource governance perspective. China's climate-energy policy: Domestic and international impacts (pp. 167-197) doi:10.4324/9781351037587-10

[2] Smith, J., Obidzinski, K., Subarudi, S., & Suramenggala, I. (2012). Illegal logging, collusive corruption and fragmented governments in kalimantan, indonesia. Illegal logging: Law enforcement, livelihoods and the timber trade (pp. 91-109) doi:10.4324/9781849771672

[3] Riyadi, B. S. (2020). Culture of abuse of power due to conflict of interest to corruption for too long on the management form resources of oil and gas in indonesia. International Journal of Criminology and Sociology, 9, 247-254. doi:10.6000/1929-4409.2020.09.23

mining, forestry[4], oil and gas[5] were often not transparent to the public. As a result, this situation led to the chance to do corruption. In addition, the weakness of enforcing the regulations and the lack of effective monitoring mechanisms worsened this problem.[6]

Corruption in the natural resource sector affects not only the environment but also the society. Deforestation, soil erosion, water pollution, and loss of biodiversity are some of the environmental consequences of corruption in the forestry and mining industries[7]. However, the depletion of natural resources also has negative social impacts, such as the displacement of indigenous communities[8] and the growing number of social conflicts9.

In response to these issues, the Indonesian government has introduced several measures to address corruption in the natural resource sector, including the establishment of the Anti-Corruption Commission[10] and the revision of the Mining Law[11]. However, corruption remains a significant challenge, and there is a need for stronger law enforcement and regulatory measures to ensure the sustainable use of Indonesia's natural resources.

Moreover, law enforcement penalties for corruption often fail to account for the environmental damage caused by corrupt practices so that this condition perpetuated the cycle of corruption and environmental degradation[12]. Therefore, this study aims to explore how the use of Environmental Impact Assessments (EIAs) strengthen law enforcement efforts and increase penalties for corrupt practices in Indonesia's natural resource sector.

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[4] Ifrani, & Nurhayati, Y. (2017). The enforcement of criminal law in the utilization and management of forest area having impact toward global warming. Sriwijaya Law Review, 1(2), 157-167. doi:10.28946/slrev.Vol1.Iss2.40.pp157-167

[5] Boyd, M., Devero, A., Frias, J., Meyer, J., & Ross, G. (2010). A note on policies for the oil and gas sector. Bulletin of Indonesian Economic Studies, 46(2), 237-248. doi:10.1080/00074918.2010.486111

[6] Palmer, C.; (2001) The extent and causes of illegal logging: an analysis of a major cause of tropical deforestation in Indonesia. (CSERGE Working Papers). Centre for Social and Economic Research on the Global Environment (CSERGE): London, UK

[7] Laurance, W. F. (2004). The perils of payoff: Corruption as a threat to global biodiversity. Trends in Ecology and Evolution, 19(8), 399-401. doi:10.1016/j.tree.2004.06.001

[8] Prakasa, S. U. W., Hariri, A., Arifin, S., & Asis, A. (2022). Forestry Sector Corruption and Oligarchy: A Case Study of the Laman Kinipan Indigenous People, Central Kalimantan. Unnes Law Journal: Jurnal Hukum Universitas Negeri Semarang, 8(1), 87- 104. https://doi.org/10.15294/ulj.v8i1.55904

[9] Navas, G., Mingorria, S. & Aguilar-González, B. (2018) Violence in environmental conflicts: the need for a multidimensional approach. Sustain Sci 13, 649–660. https://doi.org/10.1007/s11625-018-0551-8

[10] Umam, A. K., Whitehouse, G., Head, B., & Adil Khan, M. (2020). Addressing corruption in post-soeharto indonesia: The role of the corruption eradication commission. Journal of Contemporary Asia, 50(1), 125-143. doi:10.1080/00472336.2018.1552983

[11] Nasir, M., Bakker, L., & van Meijl, T. (2022). Coal mining governance in indonesia: Legal uncertainty and contestation. Australian Journal of Asian Law, 22(1), 53-67

[12] Zulaiha, A. R., & Angraeni, S. (2018). Menerapkan Biaya Sosial Korupsi Sebagai Hukuman Finansial dalam Kasus Korupsi Kehutanan. Integritas: Jurnal Antikorupsi, 2(1), 1–24. https://doi.org/10.32697/integritas.v2i1.136

2. Environmental Impact Assessment (EIA) and its Significance

Environmental Impact Assessment (EIA) is a process of evaluating the potential environmental impacts of a proposed project or development.[13] It is a critical tool for ensuring that environmental considerations are taken into account in decision-making processes, and it is widely used by governments, private companies, and non-governmental organizations around the world.[14] EIA is useful for ensuring compliance with national and international environmental and social standards, regulations, and policies. EIA also mitigates negative impacts by providing recommendations for monitoring, management, and mitigation measures implemented during project design and construction, operation, and closure phases.[15]

Overall, there are six techniques used in Environmental Impact Assessment (EIA). Firstly, the field survey[16] which involves collecting data directly at the project site through observations, interviews, and measurements to evaluate potential environmental impacts.[17] Secondly, the use of analysis of secondary data which involves collecting and analyzing existing data[18], such as meteorological data, land use data, and environmental data[19] that already existed[20] before the project began. Thirdly, the analysis of satellite

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[13] Glasson, J., & Therivel, R. (2019). Introduction To Environmental Impact Assessment (5th ed.). Routledge. https://doi.org/10.4324/9780429470738

[14] Arts, J., Runhaar, H. A., Fischer, T. B., Jha-Thakur, U., Van Laerhoven, F., Driessen, P. P., & Onyango, V. (2012). The effectiveness of EIA as an instrument for environmental governance: reflecting on 25 years of EIA practice in the Netherlands and the UK. Journal of Environmental Assessment Policy and Management, 14(04), 1250025.

[15] Pinto, E., Morrison-Saunders, A., Bond, A., Pope, J., & Retief, F. (2019). Distilling and applying criteria for best practice EIA follow-up. Journal of environmental assessment policy and management, 21(02), 1950008.

[16] Rodrigues, M. V. C., Guimarães, D. V., Galvao, R. B., Patrick, E., & Fernandes, F. (2022). Urban watershed management prioritization using the rapid impact assessment matrix (RIAM-UWMAP), GIS and field survey. Environmental Impact Assessment Review, 94, 106759.

[17] Dahal, B., Anup, K. C., & Sapkota, R. P. (2020). Environmental impacts of community-based home stay ecotourism in Nepal. The Gaze: Journal of Tourism and Hospitality, 11(1), 60-80.

[18] Crenna, E., Secchi, M., Benini, L., & Sala, S. (2019). Global environmental impacts: data sources and methodological choices for calculating normalization factors for LCA. The International Journal of Life Cycle Assessment, 24, 1851-1877.

[19] Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., & Hertwich, E. G. (2016). Environmental impact assessment of household consumption. Journal of Industrial Ecology, 20(3), 526-536.

[20] Nemecek, T., Jungbluth, N., i Canals, L. M., & Schenck, R. (2016). Environmental impacts of food consumption and nutrition: where are we and what is next?. The International Journal of Life Cycle Assessment, 21, 607-620.

image[21] or remote sensing,[22] where this technique uses satellite or aircraft imagery[23] to obtain information on environmental conditions before the project begins[24], map sensitive or important areas that need to be protected[25], and monitor the project's impact[26] on the environment. Fourthly, the model's simulation that involves using mathematical[27] or computer simulation[28] models to predict[29] the potential environmental impacts of the project. Fifthly, the risk analysis where it is used to identify and evaluate potential environmental and public health risks of the project.[30] Lastly, environmental economic analysis where it involves the use of economic analysis to financially evaluate the impacts of a project on the environment and public health.[31]

A combination of these techniques helps to obtain comprehensive information on the potential impacts of a project on the environment and public health. Choosing the most appropriate technique depends on the characteristics of the project and the environment that will be assessed.

EIA is important in natural resource corruption cases because it will determine the environmental impact caused by an act of corruption. Even though EIA is not used to

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[21] Kumar, V., & Yarrakula, K. (2022). Environmental impact assessment of limestone quarry using multispectral satellite imagery. Earth Science Informatics, 15(3), 1905-1923.

[22] Souza, A. P. D., Teodoro, P. E., Teodoro, L. P. R., Taveira, A. C., de Oliveira-Júnior, J. F., Della-Silva, J. L., ... & da Silva Junior, C. A. (2021). Application of remote sensing in environmental impact assessment: a case study of dam rupture in Brumadinho, Minas Gerais, Brazil. Environmental Monitoring and Assessment, 193(9), 606.

[23] Gillani, S. A., Saif-ul-Rehman, H. H. A., Rehman, A., Ali, S., Ahmad, A., Junaid, U., & Ateeq, Z. (2019). Appraisal of Urban Heat Island over Gujranwala and its Environmental Impact Assessment using Satellite Imagery (1995-2016). Science and Technology, 1(01), 1-14.

[24] Firozjaei, M. K., Sedighi, A., Firozjaei, H. K., Kiavarz, M., Homaee, M., Arsanjani, J. J., ... & Alavipanah, S. K. (2021). A historical and future impact assessment of mining activities on surface biophysical characteristics change: A remote sensing-based approach. Ecological Indicators, 122, 107264.

[25] Mohamed, M. M., & Elmahdy, S. I. (2017). Remote sensing of the Grand Ethiopian Renaissance Dam: a hazard and environmental impacts assessment. Geomatics, Natural Hazards and Risk, 8(2), 1225-1240.

[26] LaJeunesse Connette, K. J., Connette, G., Bernd, A., Phyo, P., Aung, K. H., Tun, Y. L., ... & Songer, M. (2016). Assessment of mining extent and expansion in Myanmar based on freely-available satellite imagery. Remote Sensing, 8(11), 912.

[27] Arabameri, A., Rezaei, K., Cerda, `A., Conoscenti, C., Kalantari, Z., 2019. A comparison of statistical methods and multi-criteria decision making to map flood hazard susceptibility in Northern Iran. Sci. Total Environ. 660, 443–458. https://doi.org/10.1016/j.scitoenv.2019.01.021.

[28] Alilou, H., Rahmati, O., Singh, V.P., Choubin, B., Pradhan, B., Keesstra, S., Ghiasi, S.S., Sadeghi, S.H., 2019. Evaluation of watershed health using Fuzzy-ANP approach considering geo-environmental and topo-hydrological criteria. J. Environ. Manag. 232, 22–36. https://doi.org/10.1016/j.envman.2018.11.019.

[29] Ayele, G.T., Teshale, E.Z., Yu, B., Rutherford, I.D., Jeong, J., 2017. Streamflow and sediment yield prediction for watershed prioritization in the upper Blue Nile river basin, Ethipia. Water 9 (10), 782. https://doi.org/10.3390/w9100782.

[30] Fischer, T. (2014). Disaster and risk management: The role of environmental assessment. Journal of Environmental Assessment Policy and Management, 16(03), 1401003

[31] Mohammed, E. Y. (2009). Measuring the benefits of river quality improvement using the Contingent Valuation Method: The case of the Ping River, Chiang Mai, Thailand. Journal of environmental assessment policy and management, 11(03), 349-367.

determine whether the environmental damage has occurred, it is used to identify and evaluate the potential environmental impacts of a project before the project is implemented and executed. Therefore, the main objective of EIA is to prevent or minimize environmental impacts that may occur due to project implementation.

Nonetheless, the results of an EIA provide useful information in determining whether the environmental damage has occurred. The EIA provides a description of the environmental conditions before the project is implemented, including the potential impacts that may occur if the project is implemented. After the project is implemented, monitoring and evaluation is used to assess whether the impacts are in line with the results of the EIA, and whether environmental damage has occurred.

3. Method

This study explores how EIA is used in handling corruption crimes. Namely by studying a case of corruption in the natural resources sector using EIA. The study was carried out by analyzing case dossier. Case Dossier is a document with limited access which contains the results of the entire series of investigative processes in the form of investigative administration which includes recording, reporting, making minutes, correspondence and data collection which are compiled, bound, covered, sealed/locked and stapled neatly to be handed over from the investigator to prosecutor. The important reports analyzed are the reports of expert witnesses who prepared reports on the EIA techniques used. The environmental analysis carried out is evaluated based on environmental regulations applicable in Indonesia.

Next, a comparison of court decisions is carried out in order to show that the use of EIA can increase the punishment of corruption perpetrators. The court decisions that were analyzed were natural resource corruption cases handled by the KPK from 2007 to 2018 with more than 30 people convicted. We compared prison sentences, fines and restitution imposed by courts. This study is limited to descriptive, statistical analysis of similarities and differences in the locus of delicti and location of trials, as well as the types of criminal charges brought against the defendants. We also checked the profiles of the defendants.

4. Case Study of the EIA Implementation on Corruption Case in Indonesia

This research selected one corruption case that was handled by the Indonesian Corruption Eradication Commission (CEC) since 2017 and had been finalized in court in 2021. It was the corruption case of nickel mining license in southeast Sulawesi Indonesia with NA (as the suspect's initial), the former governor of southeast Sulawesi. This case is related to the abuse of authority in approving and issuing the Mining Permit in Southeast Sulawesi province in 2008-2014.

This case could act as an ideal study case because it is the first corruption case in Indonesia that used EIA in the investigation and prosecution process. In this context, EIA was used to prove how the act of corruption have an impact on environmental damage. Some techniques used in investigations are: (a) Satellite Image Analysis or Remote Sensing for land cover analysis; (b) Field Survey for environmental damage analysis with physical and biological aspect criteria; and (c) Environmental Economic Analysis.

4.1. Satellite image analysis for land cover analysis

Corruption in mining licenses in Southeast Sulawesi has an impact on changing the land cover. Remote sensing was conducted in mining areas where the mining permits were issued illegally.

(1) June 28th, 2009   (2) Oktober 19th, 2015
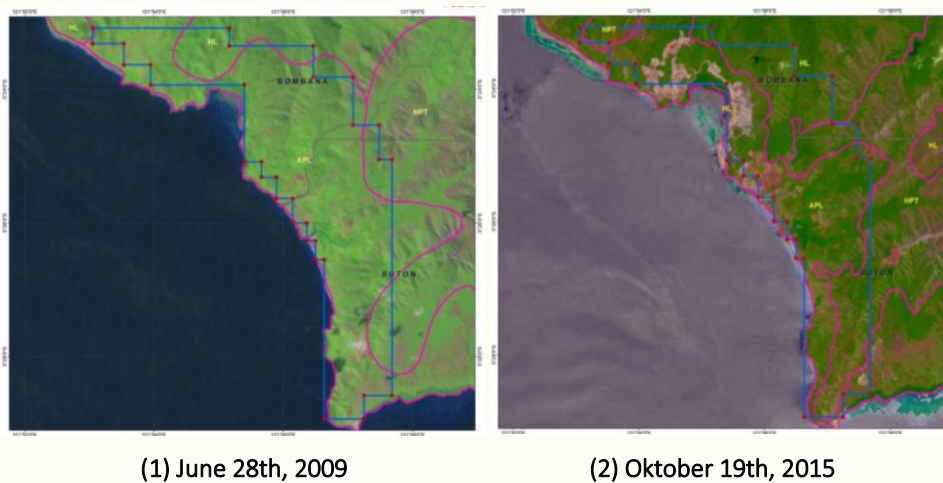
Picture: Satellite Image
(National Institute of Aeronautics and Space of Indonesia, 2017)

Figure (1) shows the results of overlaying the Exploration Map and the Forest and Waters Area Map of Southeast Sulawesi Province with Landsat imagery dated June 28, 2009. The overlaying method was carried out to show the condition of the land cover before the issuance of the Exploration Permit. It showed that the land cover condition prior to the issuance of Exploration Permit and Production Operation Permit was still dominated by vegetated land (depicted in green color).

Then, the figure (2) showed the results of the overlay with the Landsat image recorded on October 19, 2015. Based on the figure (2), the mine openings/areas in the image were whitish to reddish in color. In addition, based on this image, it appeared that the Production Operation permit area overlapped with the Other Use permit Areas, Limited Production Forests, and Protected Forests. The next analysis was to measure the estimated area of the mine that caused the loss of land cover. The measurement results yielded an estimated total area of 357,20 hectare

4.2. Field survey for environmental damage analysis

The results of the analysis of environmental damage in mining areas with illegal licenses were shown in the table below:

Table 1. Environmental Damage

Physical and biological aspect	Damage criteria	Result
Vegetation	< 50 %	0%; No vegetation found
Soil solum	< 50 cm	0 cm; No soil solum found
Erosion	> 0,9 mm	soil erosion 20-30 cm
Topography	>40%	rocks on the surface 70-80%
Conclusion: There is environmental damage		

Source: Wasis, 2017 with modification.

The results of the field survey conducted by expert witnesses showed that all aspects of environmental damage, namely vegetation, soil solum, erosion and topography were above the threshold for damage criteria. So it can be concluded that environmental damage has occurred at the location where the observation was made.

4.3. Environmental economic analysis

The area of environmental damage due to activities was 357,20 hectares as estimated by satellite imagery. Based on the valuation method, the environmental damage that occurred caused losses worth USD 288,741,408.55 with details as shown in Table 2.

Table 2. Environmental Damage Loss

Aspect	Value (USD)
Ecological Loss	
Revive the function of the water system	20,808,951.79
Cost of water management	545,732.65
Erotion control	143,550.89
Land formation	11,962.57
Nutrient recycler	110,294.94
Waste decomposer	10,407.44
Loss as a result of biodiversity and genetic resource losses	
Cost of biodiversity loss	64,597.90
Cost of losing genetic resources	9,809.31
Loss due to the release of carbon to air	773,021.56
Economic Loss	83,492,548.91
Restoration Cost	182,770,530.59
Total	**288,741,408.55**

5. Comparison of Penalties with and without Consideration of Environmental Impacts

Since its establishment in 2002, the CEC has successfully prosecuted several corruption cases related to natural resources and brought 30 defendants to justice. But in these cases, the impact of environmental damage has not been considered. The average and median final and binding prison sentence (in kracht) in the 30 cases was five years, yet the recovery and return of state losses and profits are typically only a small fraction of the overall impact. A summary of the sentencing decisions, including consideration of environmental impacts, is presented in Table 3.

Table 3. Comparison with and without consideration of environmental impact

No	Year	Names of suspect are disguised by using initials	Verdict	Sentence		
			State Financial Losses (USD)	Prison	Fine (USD)	Restitution (USD)
			Without EIA			
1	2007	SAF, Former Governor of East Kalimantan	23,120,000.00	4 years	16,666.67	0
2	2009	TAJ, Former Regent of Pelalawan	80,000,000.00	11 years	33,333.33	820,000.00
3	2009	AR, Former Head of Riau Forestry	59,266,666.67	5 years	16,666.67	100,000.00
4	2009	AAN, Former Member of the House of Representatives	0	8 years	16,666.67	0
5	2011	AA, , Former Regent of Siak	20,066,666.67	4 years	16,666.67	56,666.67
6	2011	ST, Former Head of Riau Forestry	10,200,000.00	5 years	16,666.67	0
7	2013	BH, Former Regent of Kampar	34,600,000.00	2 years 6 months	33,333.33	0
8	2013	SHM, CEO PT HIP & PT CCM	0	2 years 8 months	13,333.33	200,000.00
9	2013	AAB, Former Regent of Buol	0	7 years 6 months	33,333.33	0
		Average		5 years	21,851.85	
			With EIA			
1	2018	NA, Former Governor of Southeast Sulawesi	0	12 years	66,666.67	180,000.00

Sources: Authors' data processing

Table 3 provides a summary of sentencing decisions in corruption cases, both with and without consideration of environmental impacts. The analysis reveals that punishments for corrupt acts that take into account environmental impacts are generally more severe than those that do not. Specifically, the average prison sentence for corruption cases involving environmental damage is 12 years, which is considerably longer than the average sentence of approximately 5 years for cases that do not take into account

environmental impacts. Similarly, the fine penalty for cases involving environmental damage is USD66,666.67, which is significantly higher than the fine penalty of USD21,851.85 for cases without consideration of environmental impact. These findings demonstrate the importance of considering environmental impacts in corruption cases to ensure that the punishment is commensurate with the severity of the crime and the harm caused.

Despite the importance of EIA in combating natural resource corruption in Indonesia, there are several challenges and limitations in its implementation. One major challenge is the limited availability of environmental experts who are willing to provide expert testimony in corruption cases, partly due to pressure from litigants. Another significant limitation is the additional time and cost required to conduct EIAs in corruption cases. These challenges and limitations hinder the effective application of EIA in anti-corruption efforts, underscoring the need for measures to address these issues and ensure that environmental considerations are adequately incorporated into the anti-corruption framework.

6. Conclusion

The results of this study showed that EIA can help corruption cases investigation by some EIA techniques. Some techniques used in investigations are: (a) Satellite Image Analysis or Remote Sensing for land cover analysis; (b) Field Survey for environmental damage analysis with physical and biological aspect criteria; and (c) Environmental Economic Analysis. The punishments for corrupt acts that take into account environmental impacts are generally more severe than those that do not. Specifically, the average prison sentence for corruption cases involving environmental damage is 12 years, which is considerably longer than the average sentence of approximately 5 years for cases that do not take into account environmental impacts. Similarly, the fine penalty for cases involving environmental damage is USD66,666.67, which is significantly higher than the fine penalty of USD21,851.85 for cases without consideration of environmental impact.

Efforts to combat corruption in Indonesia must prioritize environmental damage by utilizing Environmental Impact Assessments (EIA) to determine the extent of harm caused by corrupt activities. By considering the environmental impact of corruption, law enforcement agencies potentially impose more severe penalties on offenders, thereby serving as a deterrent against future misconduct. Moreover, the Indonesian government should reformulate its approach to corruption in the natural resource sector by prioritizing environmental protection and strengthening the capacity of law enforcement agencies to investigate and prosecute corruption cases. This involves revising laws and regulations to ensure stronger environmental protections and promoting transparency and accountability in decision-making processes. Effective law enforcement is imperative to ensure sustainable development in Indonesia and safeguard the environment and the livelihoods of local communities.

References

Alilou, H., Rahmati, O., Singh, V.P., Choubin, B., Pradhan, B., Keesstra, S., Ghiasi, S.S., Sadeghi, S.H., 2019. Evaluation of watershed health using Fuzzy-ANP approach considering geo-environmental and topo-hydrological criteria. J. Environ. Manag. 232, 22–36. https://doi.org/10.1016/j.envman.2018.11.019.

Arabameri, A., Rezaei, K., Cerda, `A., Conoscenti, C., Kalantari, Z., 2019. A comparison of statistical methods and multi-criteria decision making to map flood hazard susceptibility in Northern Iran. Sci. Total Environ. 660, 443–458. https://doi.org/10.1016/j.scitoenv.2019.01.021.

Arts, J., Runhaar, H. A., Fischer, T. B., Jha-Thakur, U., Van Laerhoven, F., Driessen, P. P., & Onyango, V. (2012). The effectiveness of EIA as an instrument for environmental governance: reflecting on 25 years of EIA practice in the Netherlands and the UK. Journal of Environmental Assessment Policy and Management, 14(04), 1250025.

Ayele, G.T., Teshale, E.Z., Yu, B., Rutherfurd, I.D., Jeong, J., 2017. Streamflow and sediment yield prediction for watershed prioritization in the upper Blue Nile river basin, Ethipia. Water 9 (10), 782. https://doi.org/10.3390/w9100782.

Boyd, M., Devero, A., Frias, J., Meyer, J., & Ross, G. (2010). A note on policies for the oil and gas sector. *Bulletin of Indonesian Economic Studies*, 46(2), 237-248. doi:10.1080/00074918.2010.486111

C. Roos D.P. Cilliersa,b, F.P. Retiefb, R.C. Albertsb, A.J. Bond, Regulators' perceptions of environmental impact assessment (EIA) benefits in a sustainable development context, *Environmental Impact Assessment Review* 81 (2020) 106360

Crenna, E., Secchi, M., Benini, L., & Sala, S. (2019). Global environmental impacts: data sources and methodological choices for calculating normalization factors for LCA. The International Journal of Life Cycle Assessment, 24, 1851-1877.

Dahal, B., Anup, K. C., & Sapkota, R. P. (2020). Environmental impacts of community-based home stay ecotourism in Nepal. The Gaze: Journal of Tourism and Hospitality, 11(1), 60-80.

Firozjaei, M. K., Sedighi, A., Firozjaei, H. K., Kiavarz, M., Homaee, M., Arsanjani, J. J., ... & Alavipanah, S. K. (2021). A historical and future impact assessment of mining activities on surface biophysical characteristics change: A remote sensing-based approach. Ecological Indicators, 122, 107264.

Fischer, T. (2014). Disaster and risk management: The role of environmental assessment. Journal of Environmental Assessment Policy and Management, 16(03), 1401003

Gillani, S. A., Saif-ul-Rehman, H. H. A., Rehman, A., Ali, S., Ahmad, A., Junaid, U., & Ateeq, Z. (2019). Appraisal of Urban Heat Island over Gujranwala and its Environmental Impact Assessment using Satellite Imagery (1995-2016). Science and Technology, 1(01), 1-14.

Glasson, J., & Therivel, R. (2019). Introduction To Environmental Impact Assessment (5th ed.). *Routledge*. https://doi.org/10.4324/9780429470738

Ifrani, & Nurhayati, Y. (2017). The enforcement of criminal law in the utilization and management of forest area having impact toward global warming. *Sriwijaya Law Review*, 1(2), 157-167. doi:10.28946/slrev.Vol1.Iss2.40.pp157-167

Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., & Hertwich, E. G. (2016). Environmental impact assessment of household consumption. Journal of Industrial Ecology, 20(3), 526-536.

Kumar, V., & Yarrakula, K. (2022). Environmental impact assessment of limestone quarry using multispectral satellite imagery. Earth Science Informatics, 15(3), 1905-1923.

LaJeunesse Connette, K. J., Connette, G., Bernd, A., Phyo, P., Aung, K. H., Tun, Y. L., ... & Songer, M. (2016). Assessment of mining extent and expansion in Myanmar based on freely-available satellite imagery. Remote Sensing, 8(11), 912.

Laurance, W. F. (2004). The perils of payoff: Corruption as a threat to global biodiversity. *Trends in Ecology and Evolution*, 19(8), 399-401. doi:10.1016/j.tree.2004.06.001

Mohamed, M. M., & Elmahdy, S. I. (2017). Remote sensing of the Grand Ethiopian Renaissance Dam: a hazard and environmental impacts assessment. Geomatics, Natural Hazards and Risk, 8(2), 1225-1240.

Mohammed, E. Y. (2009). Measuring the benefits of river quality improvement using the Contingent Valuation Method: The case of the Ping River, Chiang Mai, Thailand. Journal of environmental assessment policy and management, 11(03), 349-367.

Mori, A. (2018). Impact of the china-induced coal boom in indonesia: A resource governance perspective. China's climate-energy policy: Domestic and international impacts (pp. 167-197) doi:10.4324/9781351037587-10

Nasir, M., Bakker, L., & van Meijl, T. (2022). Coal mining governance in indonesia: Legal uncertainty and contestation. *Australian Journal of Asian Law*, 22(1), 53-67

National Institute of Aeronautics and Space of Indonesia (2017) Report on the analysis of PT AHB mining area in Buton district and Bombana district of Southeast Sulawesi province based on remote sensing satellite data. To support the investigation process by the Corruption Eradication Commission of Indonesia.

Navas, G., Mingorria, S. & Aguilar-González, B. (2018) Violence in environmental conflicts: the need for a multidimensional approach. *Sustain Sci* 13, 649–660. https://doi.org/10.1007/s11625-018-0551-8

Nemecek, T., Jungbluth, N., i Canals, L. M., & Schenck, R. (2016). Environmental impacts of food consumption and nutrition: where are we and what is next?. The International Journal of Life Cycle Assessment, 21, 607-620.

Palmer, C.; (2001) The extent and causes of illegal logging: an analysis of a major cause of tropical deforestation in Indonesia. (CSERGE Working Papers). *Centre for Social and Economic Research on the Global Environment (CSERGE)*: London, UK

Pinto, E., Morrison-Saunders, A., Bond, A., Pope, J., & Retief, F. (2019). Distilling and applying criteria for best practice EIA follow-up. Journal of environmental assessment policy and management, 21(02), 1950008.

Prakasa, S. U. W., Hariri, A., Arifin, S., & Asis, A. (2022). Forestry Sector Corruption and Oligarchy: A Case Study of the Laman Kinipan Indigenous People, Central Kalimantan. *Unnes Law Journal: Jurnal Hukum Universitas Negeri Semarang*, 8(1), 87- 104. https://doi.org/10.15294/ulj.v8i1.55904

Riyadi, B. S. (2020). Culture of abuse of power due to conflict of interest to corruption for too long on the management form resources of oil and gas in indonesia. *International Journal of Criminology and Sociology*, 9, 247-254. doi:10.6000/1929-4409.2020.09.23

Rodrigues, M. V. C., Guimarães, D. V., Galvao, R. B., Patrick, E., & Fernandes, F. (2022). Urban watershed management prioritization using the rapid impact assessment matrix (RIAM-UWMAP), GIS and field survey. *Environmental Impact Assessment Review*, 94, 106759.

Smith, J., Obidzinski, K., Subarudi, S., & Suramenggala, I. (2012). Illegal logging, collusive corruption and fragmented governments in kalimantan, indonesia. *Illegal logging: Law enforcement, livelihoods and the timber trade* (pp. 91-109) doi:10.4324/9781849771672

Souza, A. P. D., Teodoro, P. E., Teodoro, L. P. R., Taveira, A. C., de Oliveira-Júnior, J. F., Della-Silva, J. L., ... & da Silva Junior, C. A. (2021). Application of remote sensing in environmental impact assessment: a case study of dam rupture in Brumadinho, Minas Gerais, Brazil. Environmental Monitoring and Assessment, 193(9), 606.

Supreme Court of Indonesia (2021) Judgment of Review number 412 PK/PID.SUS/2021 dated December 22, 2021.

Umam, A. K., Whitehouse, G., Head, B., & Adil Khan, M. (2020). Addressing corruption in post-soeharto indonesia: The role of the corruption eradication commission. *Journal of Contemporary Asia*, 50(1), 125-143.

Wasis, B (2017) Report on the calculation of losses due to land and environmental damage caused by PT AHB mining in Buton District and Bombana District, Southeast Sulawesi Province. To support the investigation process by the Corruption Eradication Commission of Indonesia.

Zulaiha, A. R., & Angraeni, S. (2018). Menerapkan Biaya Sosial Korupsi Sebagai Hukuman Finansial dalam Kasus Korupsi Kehutanan. *Integritas: Jurnal Antikorupsi*, 2(1), 1–24. https://doi.org/10.32697/integritas.v2i1.136