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Development of Environmental Policy in Indonesia regarding Mining Industry in Comparison with the United States and Australia: The Lesson That Can Be Learned

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Indonesia is a developing country that has a major contribution to the coal producing in the world. As coal based energy still in high demand globally, eventually growing coal mining industry in Indonesia is also inevitable. Consequently, severe environmental problems due to the mining activity will also increase and escalate. Hence, environmental protection is prominent to be carried out in order to minimize the negative impact of mining. The most important tool to control the environmental issues within a country is a proper policy that well implemented and controlled. However, due to the lack of history of environmental pollution because of mining, the environmental mining policy in Indonesia is not well integrated to overcome issues regarding mining activity. This study aims to understand the current situation and suggest several improvements to Indonesia environmental mining policy by comparing the policy conditions with the other two countries, the United States and Australia that both have a long story in dealing with environmental pollution because of coal mining activities. Moreover, the latter is developed countries that have a large part of coal mining activities within them that considered environmentally well managed.

Keywords: Environmental mining policy, Indonesia, United States, Australia, Comparison

1. Introduction

Indonesia has an abundant natural resources which highly profitable to be extracted. In fact, the mining industry in Indonesia becomes the vital sector that brings off great income when coal and/or ore are exported. Fossil based energy, including oil, gas and coal, production sectors in Indonesia accounts for over 25% of all government revenues, 20% of exports, and nearly 40% of total direct foreign investment¹. Along with good investment climate in the mining industry, development of this sector is growing rapidly based on thirty-year track record in regulating and encouraging mining investment². However, this development is not in balance with the mining policy formulation, especially in the environmental protection sector³.

Numerous mining in Indonesia already reached its final stage, where several had the post-closure stage, that requires strong regulation in the environmental sector in order to ensure the reclamation and rehabilitation is well conducted. With the current situation, where the undetailed and not strong imposing environmental mining policy is far from adequate to control the mining company regarding environmental problems caused by mining activity, Indonesia government needs to improve

its policy as well as technology before it is too late to be implemented and the government has to be responsible to take over the pollution control from small to intermediate mining companies. The unfortunate example can be seen in Japan, even though this country is a developed country and ranked 39th in the environmental performance index⁴. Up until now, its government still need to treat in the total 80 plants for water pollution of active generation mine drainage⁵. These sites have been handled or taken over mostly because of irresponsibilities of the mining company, which not controlled at that time, thus end up as abandoned mines⁶. Furthermore, now there are more than 5000 suspended and abandoned mines throughout Japan, and the mine pollution has occurred at about 450 sites that handled by Japan Oil, Gas and Metals National Corporation⁷ by using government capital. Extreme cases can also be observed from the People's Republic of China. This country has more than 1.5 million sites that has been polluted by heavy metals in 2011⁸, thus make China in severe condition that affect its mining policy, forcibly changed from economically to environmentally-oriented. Example for toxic acidic water pollution on the mine site is provided in Fig. 1.

In addition to mine water pollution, mining activity

may have diverse environmental pollution, from the soil (acidic soil or metal pollution), air (dust problems and flying rock), vibration (blasting wave that can damage buildings because of the energy wave), water (high concentration of heavy metals, salinity or acidity, etc.) and many more⁹⁾. In order to minimize negative impact of the environment pollution because of mining activity, not only the awareness from each company, small to big scale, but also government control should be improved. This is due to the main orientation of a company should be about benefit, whether or not their action is economical for them. Therefore, government should be able to make sure that environmental issues are still considered by the company, both in the short and also the long term planning during life of mine¹⁰⁾. The improvement of government control needs to be carried out from all of the aspects, starts from the policy formulation to the policy implementation.



Fig. 1 Acid mine drainage in Indonesia coal mine

Developing countries experience complex, serious and fast-growing pollution problem compared to developed countries which have growing concerns about global environmental issues⁶⁾. This is because mostly the environmental problems that faced by developed countries already has strong regulations that can control current issues. They also have more resources to solve environmental problems, by the mean of technology and funding¹¹⁾. In contrast, developing countries struggle on two conflicting classes, issues caused by underdevelopment and caused by activities for economic development¹²⁾. In another word, developed country state policy is generally environment-drive while developing country state policy is economic-driven¹³⁾. Therefore, as the measure to improve mining environmental policy of Indonesia as a developing country, comparative study of mining environmental policy in Indonesia is conducted. Australia and the United States are chosen as the comparison. By reflecting on one of the well-maintained country that highly rely to the mining industry, Australia and the

United States, hopefully there will be a lesson or two about the environmental regulation that can be learned. Moreover, Australia and the United States are two developed countries that have a long history in mining, thus interesting finding by comparing these countries was expected.

In the mining environmental policy study, Indonesia as the subject of study is uncommon to be found. Previous studies compared Indonesia environmental policy with other developing countries¹⁴⁾¹⁵⁾. However, those studies published before the era of resignation of the an authoritarian Presidency in Indonesia that significantly altered its government, for example the change of centralization towards decentralization, as a form of democracy³⁾. This event also shifted the atmosphere of mining investment, which starting to grow rapidly. In contrary, Australia as Indonesia's neighboring country showed less dynamic changes related to its government policy. Moreover, the United States of America were also relatively stable during the period when Indonesia had major changes in the political situation. Furthermore, both Australia and United States are considered as developed countries also recognized as the largest mining country in the world¹⁶⁾.

The contrast difference between these countries with Indonesia therefore made this comparative study interesting, as there are lesson that can be learned from each country. In addition, these countries have major coal mining that used for domestic and also export usage, thus the environmental issues that are or will be faced should be more or less similar. Therefore, studying one of country policy might be able to be applied to other countries too. Indonesia as the main focus of this study will also be predicted for its future, especially for what to do for comprehend future environmental problems regarding mining.

2. The national regulatory of mining policy

The mining sector is a source of wealth in developing countries due to the revenue that is produced during its exploitation. The high return on investment in this industry is the main interest that still keeping mining as one of the top of the industry to be carried out, especially because the consistency of growing demand of energy needs with respect to the growing population in the world that heavily depend on the fossil energy. Therefore, developing countries compete with each other to change and/or modify their environment of mining investment to make it attractive to foreign investment. The change and modification include the mining policies and also legislation, not only to promote the investment, but also be more regulatory climate attractive to the international mining community.

However, coal and ore mineral exploitation at the same time will also degrade the physical and social environment, at least in the surrounding mining area and not to mention the vast area that it may degrade as a

consequence of the large scale of mining usually take place. Fortunately, this effect can be minimized, furthermore eliminated, if the activity is managed properly. Mining activity contributes to environmental degradation because of its exploitation process, usually in massive scale, mostly through water pollution and damage to the ecosystem¹⁷⁾. Further environmental problems, both come from strip and underground mining, can be easily spotted in surrounding active mines area. This can be taken form on the washed top soil that causing erosion and accumulated solid matters in the water. If the chemical reaction occurs, such as weathering of rocks, acid mine drainage can be generated. The chemical contamination because of acid mine drainage can damage the soil, make it difficult to be re-vegetated in the reclamation process. It also affects human health by increasing the toxic levels arsenic, as an example, that has been associated with cancer, cardiovascular and neurological damage. Not to mention the increasing level of other toxic heavy metals which common to be found in the acid mine drainage¹⁸⁾¹⁹⁾.

The global coal industry itself exists in most every region since the deposits are spread around Europe, Asia, America and Australia. The United States had the largest share of the coal global source even though the produced coal is mainly for domestic usage²⁰⁾. Australia is also developed country that once depend on its source of exported coal, even though its production now mainly used nationally, which similar like the United States.

The international mining world already has grown concerned about its activity that can cause such a severe problem to the environment. It is not rare to find environmental pollution from mining in the world, that not only altered the life of people in surrounding, but also destroys ecosystems and moreover killed hundreds of people. In the United States, even coal-fired steam power plant was said as the source of half mercury emission within the country²¹⁾. Due to this concern, discussions and meetings were held to achieve a more environmentally friendly mining, which further changed the of mining environmental policy in a good way. The most prominent is the global mining initiatives (the GMI). The series of global events affected a country significantly, thus also shifted the paradigm of mining.

2.1 General information on environmental mining policy in Indonesia

Indonesia has a unitary government of political system, defines as where the power comes from a single source (national government), with two levels of sub-national governments composed of 34 provinces and 508 local governments²²⁾. The management of resources in Indonesia is based on the 1945 Constitution of the Republic Indonesia

"The land, the waters and the natural riches contained therein shall be controlled by the State and exploited to the greatest benefit of the people."(Article 33, The 1945

Constitution of the Republic Indonesia)

Therefore, the people prosperity become the main concern for energy resources management policy in Indonesia. This includes the policy that should be pro-environment, thus make Good Mining Practice (GMP) become the spirit of the mining performers²³⁾. GMP is formulated by the government, which also contained in the Law. GMP itself means a mining activity that: follow the law and rules, well-planned, apply appropriate technologies that are based on effectiveness and efficiency, conserve excavated materials, control and maintain the function of the environment, ensure safety, accommodate the will and participation of society, generate added value of mined, improve the welfare rate of the surrounding communities as well as create a sustainable development of unrennewable resources. Therefore, in the spirit of GMP implementation, environment is one of the important concerns that should be controlled and maintained for its function.

The prominent mining policy in Indonesia is the Basic Mining Law of 1967, which also provides basic law for environmental protection in the mine. The Basic Mining Law of 1967 delegates the authority of regulating mining operations to the Minister (now under the Energy and Mineral Resources Ministry) and also grant Mining Authorities to the Indonesian mining firms. This also includes the authority to cancel Mining Authorities. The Basic Mining Law provides penalties for mining without Mining Authorities.

The Basic Mining Law also regulates about national performance standard for land protection. However, the law only states that after completion of mining, the holder of the Mining Authorization is obliged to restore the disturbed land in such condition as not to evoke any danger²⁴⁾. Unfortunately, this the only sentence that mention about reclamation, which too general as a law compared to the United States or Australian Law. US (the Surface Mining Control and Reclamation Act) and Australia (Common Wealth Law and the Environemnet Protection and Biodiversity Conservation Act 1999). Law in the United States and Australia specified a requirement for restoring land to be capable to support its supporting usage prior mining was conducted. Moreover, there is no requirement for preservation of topsoil, reclamation or control on on-site and off-site environmental effects of water pollution. Therefore, due to the lack of specified law in the Basic Mining Law 1967 about environmental protection, numerous laws and regulations thus formulated. The very first regulation about environmental regulation of mining in Indonesia is regulation No. 4 of 1977 by the Minister of Mines that regulate about the Prevention and Handling of Disturbance and Pollution of the Environment Caused by General Mining³⁾²⁵⁾²⁶⁾. The issuance of this law then was followed by the issuance of the Director General of Mines of Decrees 7/1978 and 9/1978 about the

prevention and mitigation of damage caused by surface mining, mineral processing and refining²⁷). More decrees and the law is then issued, by following the current condition of mining pollution, such as: Decree No. 7/1978 about reclamation plan, Decree 1211/1995 about the obligation on the Mine Manager to take preventive measures against the possibility of environmental damage and pollution, and many more. Current Indonesia rules and law regarding environmental

managements are explained briefly in Fig. 2. Even though Indonesia government has been trying to regulate issue on the environmental mining, the development of the environmental mining policy in Indonesia is considered too slow since it follows the current needs and situation that are faced by mining, while the pollution actually can be predicted prior the incident by doing an assessment.

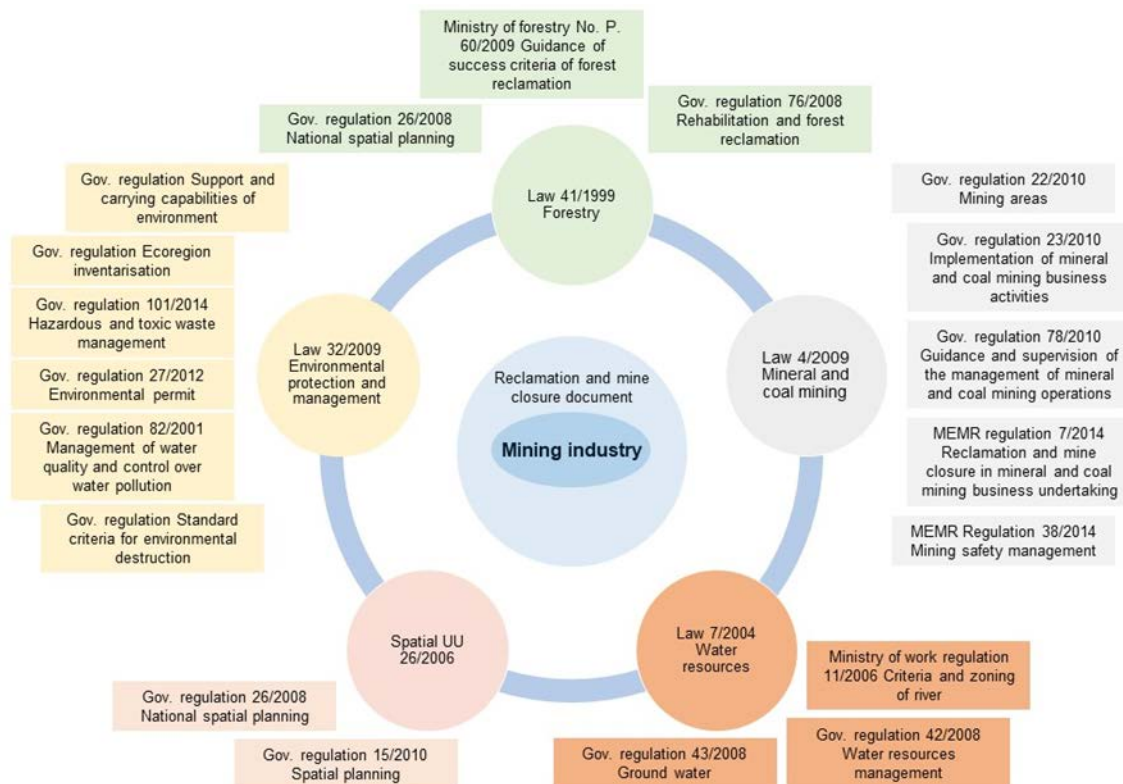


Fig. 2 Summary of Indonesia Law and Rules regarding environment managements

2.2 General information on environmental mining policy in the United States and Australia

2.2.1 The United States

The United States has a federal system of government, as ruled in the Constitution of the United States, which specified the powers of the national government and reserved all other powers to the states or the people²⁸). The reserved powers of the states include the authority to make regulations designed to promote the public convenience as well as those to promote general public safety, health and etc. This quite similar like in Indonesia, where the power of regulation is divided into local and central government. However, comparing to sub-national division in Indonesia that powerless, states in the United States have their own power to authorize their people without have to wait direction from national government. On the practical, there is no clear division of

responsibility in the United States, but the issue between national, state and local regulations apply to different aspects thus confusion can be avoided.

The United States has a common law system stems from English tradition at the federal level, except of Louisiana, which is based on judicial review of legislative acts²⁹). Regarding the environmental mining policy, the United States regulation of coal mining is nationally owned by the Office of Surface Mining Reclamation and Enforcement (OSM) for the responsibility for regulating environmental effects of surface. This is based on the Surface Mining Control and Reclamation Act of 1977 (SCMRA).

Prior the 1977, some states already had surface mining regulatory programs, therefore with some exception permits for new mines issued after the Act still require compliance with national performance standard³).

Mining permits were reissued after approved state regulatory program established, or followed the national program if the state did not have regulatory program. After the program is established, no surface mines could be commenced or continued without getting permission. Permits may be issued under approved state or national program for no more than 5 years with the right for renewal that gives the authorities to correct deficiencies or terminate operations. New permit cannot be issued to the individual or firm that already showed outstanding violation of the previous permit which is different from Indonesia.

In order to control state regulatory program, the mine inspector, each from the state and also national will have an inspection of the mining site. Mine inspections are conducted by both state regulatory authorities and OSM, which each mine should have a regular full inspection periodically. The point system is used to count the violation, where the points translate directly into dollars as fine. The fine keeps increase following the inflation. Indonesia has no comparable legislation. Points of mine inspection based on National Performance Standards, consists of preservation of topsoil, hydrologic balance and water quality, limited reservoir construction (relate to reclamation, for example, in making pit lake as the way of mine closure method), blasting and safety, reclamation and revegetation. Moreover, OSM inspector will also perform monitoring the state inspector.

2.2.2 Australia

Australia is a country that has a federal system as its legal governing method, consists of six states and two self-governing territories³⁰. Each of state and self-governing territories has their own legislature, an executive and judicial government. In Australia system, it still has correlation with Britain, that put Queen Elizabeth II as Australia's formal head of state. Similar like the United States, Australia is also based on common law, that taken its law from case law and precedent. In this case, different with the United States that only refer to its own cases, Australia looks up also to English as sources of law.

The power to make laws with respect to mining is determined by the Constitution of Australia³¹. However, since the Constitution of Australia does not specify coal as a matter on the list, the power to legislate of coal mining falls to the states. The system of legislative in Australian territories is different from the state, where it still regulated by the Commonwealth, but they still have their own power to enact and regulate their own mining legislation.

The Australian Constitution does not contain any express or implied rights to life or a healthy and sustainable environment, similar like Indonesia. As a result, the Commonwealth approach to environmental issues has been tangential, because no formal involvement of the Commonwealth in it. Therefore, in

addition to the specific mining laws and regulations of states, the Commonwealth still has powers under the Constitution that cover the major issues that may overlap its interaction with state and territory mining laws, for example in these two below points:

1. Environmental protection

This includes regulation of the environmental effects of mining in Environmental Protection Act 1994 (EPA) based on Commonwealth and Queensland laws. It may also be regulated by the Environmental Protection and Biodiversity Conservation Act in 1999 (EPBC Act).

2. Native title

Native title and indigenous cultural heritage are regulated by the Commonwealth, therefore when the exploration and exploitation are carried out in those areas, the Commonwealth can also enact.

Not only the Commonwealth and state law, but numerous mining companies also follow to the international standards such as ISO 14001 for Environmental Management Systems. Moreover, the Commonwealth Department of Resources, Energy and Tourism has also published Guidelines on Best Practice on Environmental Management in Mining.

3. Cross comparison between countries

Fundamental difference between Indonesia and the United States together with Australia is the government system. With the unitary government, Indonesia has smaller number of governance personnel, thus make it more efficient from economical point of view. However, due to its single and decisive legislation, the government tends to have slow response and sometimes small issues cannot be kept to a higher level, which then easily to be forgotten. It is in contrast with the United States and Australia that have a federal system, where both central and state have the power to regulate and control the mining activities. This makes the policy formulation as well as the response of incident or violation significantly faster. The issue that happens can also be controlled immediately, thus prompt action can be carried out, thus minimize the issue to escalate.

However, due to the decentralization in Indonesia after reformation era, the role separation between central government and sub-national (local government) can be carried out. Unfortunately, Indonesian basic law, the 1945 constitution, provides no source of power for the sub-national, which makes the local government powerless and depend on the national direction to determine the authority. Moreover, the coordination between the related division (central and local government) is not integrated. Therefore, the Indonesian government should specify in more detail about the authority of local government in order to be able to have better work flow that include the coordination between local and central government.

Similar like the United States that has OSM to be appointed as representative of central government in

controlling the mining activities, the law in Indonesia delegate minister of Energy and Mineral Resources to have authority to regulate the mining operation. However, in Indonesia overlapping functions seem to always happen due to the multiple functions that should be acted by the government agencies. Because of environmental protection is also the duty of environmental ministry, this caused confusion in separation of authority between Energy and Mineral Resources and Environment ministry. Not to mention about Forestry ministry. Lack of communication process, due to the complicated structure within the institution as well as bureaucracy, make the situation more intricate.

Not only in the function, interestingly overlapping is also found in Indonesia law that issued by each ministry. In Australia, since its constitution does not contain any implied rights to sustainable environment, the regulation specifically authorized to states to regulate their environmental protection by following EPA and EPBC Act, that should be based on Commonwealth and Queensland laws. However, with the similar condition of lack basic constitution regarding environment, Indonesian ministries attempt to regulate each possible

issue regarding environment but fails to have holistic and integrated law. The United State has proven to have decent law that has best implemented to its situation. By having one specific law of national standard issued by OSM, each state needs to follow this regulation and adjust it based on their situation and also in the approval of OSM. State and OSM have their communication line in order to find the most efficient and effective in solving environmental issues.

Regarding the law, Indonesia environmental mining policy is also not very specific in regulating the issue compared to the United States and Australia. Numerous threshold limits that are specified in the latter countries law are not explained or even stated in Indonesia law. Moreover, in some cases when the threshold and standard is stated, the number still far higher than the United States and Australia that make it easier to be fulfilled and give room for pollution to occur. The example of those thresholds is listed in the Table 1. As can be seen, compared to the United States and Australia, discharge water from mines in Indonesia is way higher, thus make it probably more poisonous to be consumed than the other two countries.

Table 1: Comparison of standards

Parameter	Indonesian Discharge Limits (a)	Indonesian Discharge Limits (b)	US Discharge Limits: New Sources (c)		US Drinking Water Standards (d)	AUS EPL 558 and 1389	World Bank Effluent Limits (f)
			1 day max	30 day ave	max	max	
Total Suspended Solids (TSS)							
	Mining (mg/L)	400	400	70	35	30	50
	Processing (mg/L)	400	200	70	35	30	50
pH		5 – 9	6 – 9	6 – 9	6 – 9	6.5 – 8.5	6 – 9
Total Iron (Fe)	(mg/L)	10	7	6	3	0.3	3.5
Total Manganese (Mn)	(mg/L)	5	4	4	2	0.005	5

Sources: (a) (Ministry of Environment, 1995) (b) (Ministry of Environment, 2003) (c) & (d) U.S. Code of Federal Regulations, (e) Australia *Protection of the Environment Operations Act* (1997) – Environmental Protection License (f) (World Bank, 1995)

Furthermore, there is a fund of abandoned mine reclamation by the United States Treasury, for acquisition and restoration of unclaimed lands by uncontrolled surface and underground mining operations in the past. In the United States, until 2000 coal mining altered about 2.4 million hectares of natural landscape that originally forest. Moreover, every year the waste of coal generated in the United States reached until 130 million tons. By reflecting to the previous incidents, the United States government prepares the worst case scenario with a special allocation in order to have sufficient funding to

treat abandoned mine. Indonesia government also needs to prepare for this kind of scenario for the future.

Overall, compared to Indonesia, the United States and Australia destructive environmental and economic impacts of surface and underground coal mining with the out land reclamation is well documented and generally recognized. Therefore, the law and regulation, which is already specified in the SCMRA, EPA and EPBC can be more than enough to regulate the impact of surface mining. Brief summary of the difference between Indonesia, US and Australia is listed in Table 2.

Table 2: Differentiating factors of 3 countries

Differentiating factors	Indonesia	United States	Australia
Government system	Unitarian	Federal	Federal
Authorization	Central government that delegated to the Energy and Mineral Resources Ministry	Both for national, state and local regulations	Both for the Commonwealth and states
Law and regulations	Central and local government, some overlapping	National and states, in synchronization with each other	Regulate specifically by states
Environmental Standard	General and high thresholds	Specific with strict thresholds	Same with ISO, thus more specific
Documentation of environmental issues on mining	Not clear	Well documented, used as references of law	Well documented, used as references of law

4. Conclusions

In this study, comparison of environmental mining policy between Indonesia, the United States and Australia based on their current condition was carried out. The findings can be summarized as follows:

1. The Indonesia government system that different from the United States and Australia has significant impact on environmental mining problem solving method. Unitarian government system implies the slower response in facing problems that need immediate action. However, following the decentralization stage due to the reformation era, Indonesia has central and local government that might have similar function with the states in a federal system of the United States and Australia. Unfortunately, current condition in Indonesia shows that the local government as the sub-national division is still powerless based on the lack of laws which specified its authority. The coordination between local and central government is not good enough that need to be improved in the future.

2. Overlapping due to the authorization in central government is not clearly delegated enough between some ministries, especially for environmental issue. As the result, some laws are overlapped and even in a contradictory manner. It is also worsened by the less communication between institution due to the complicated bureaucracy. It is suggested to be strongly improved.

3. Indonesia standard, limit and threshold regarding environmental is still too general compared to the United States and Australia. Some numbers even still too high which give space for pollution to occur. Therefore, these should be reviewed in order to have strong environmental regulation in the future.

4. Lack of documentation of incidents and events regarding environmental problems is found in Indonesia, compared to the United States and Australia that has a

long history and really well documented. Good documentation is important in order to recognize the repetitive events that need to be avoided in the long term countermeasure.

5. It is important for Indonesia government to examine their current issue regarding environmental problem in mining and do comprehensive action for solving it, by involving all stakeholders.

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References

- 1) Yusgiantoro, Purnomo. "Energy and Mining Sector Update", Presentation to the U.S. – Indonesia Society by the Minister of Energy and Mineral Resources, Republic of Indonesia, December 19, Washington, D.C.(2003).
- 2) PWC (PricewaterhouseCoopers). *Mining in Indonesia: Investment and Taxation Guide*. Jakarta: PricewaterhouseCoopers (2017).
- 3) Hamilton, M. S. *Mining Environmental Policy – Comparing Indonesia and the United States*. Ashgate Publishing Limited. England. (2005).
- 4) Hsu, A., D. Esty, M. Levy, A. de Sherbinin. "Environmental Performance Index". New Haven, CT: Yale University. Available online at: <http://dx.doi.org/10.13140/RG.2.2.19868.90249>. (2016).
- 5) Nagai, C., Furuya, H. & Asano, H. "Research and

- Development of Acid Mine Drainage Treatment Technology in Japan”. – In: Water Institute of Southern Africa & International Mine Water Association: *Proceedings, International Mine Water Conference*. - p. 600- 605 (2009).
- 6) JICA. “Japan’s Experiences in Public Health and Medical Systems”. Tokyo: Institute for International Cooperation Japan International Cooperation Agency (2005).
 - 7) JOGMEC (Japan Oil, Gas and Metals National Corporation) website: <http://www.jogmec.co.jp>. Accessed on November 2017.(2017).
 - 8) Yusei Masaki. *Evergreen Joint Journal of Novel Carbon Resources Sciences & Green Asia Strategy*, Vol. **03**, Issue 02, pp. 59-67, September (2016)
 - 9) Lottermoser, B.G. *Mine Wastes, Characterization, Treatment, Environmental Impacts*, 3rd Ed. Springer-Verlag, Berlin. (2010).
 - 10) Richards D.J. *The Industrial Green Game, Implications for Environmental Design and Management*, National Academy of Engineering, National Academy Press, Washington, DC. (1997).
 - 11) Horak J. “Environmental Issues in Developed and Developing Countries: A View from the Chemical Community in the Czech Republic”. In: Sikdar S.K., Diwekar U. (eds) *Tools and Methods for Pollution Prevention*. NATO Science Series (2. Environmental Security), Vol 62. Springer, Dordrecht (1999).
 - 12) B. Bowonder, *Progress in Physical Geography* **11**(2):246-259 (1987).
 - 13) Masahito Tanaka. *Evergreen Joint Journal of Novel Carbon Resources Sciences & Green Asia Strategy*, Vol. **04**, Issue 04, pp. 1-7, December (2017)
 - 14) Modak, P., and Biswas, AK., *Conducting Environmental Impact Assessment for Developing Countries*, United Nations University Press, New York. (1999).
 - 15) Dick J. and L. Bailey, “Indonesia’s Environmental Assessment Process (AMDAL): Progress, Problems and a Suggested Blueprint for Improvement”, Jakarta & Halifax: Environmental Management in Indonesia Project (1992).
 - 16) Reichl, C., Schatz, M., and Csak., G. *World Mining Data Vol. 32*. International Organizing Committee for the World Mining Congresses: Vienna. Available online at www.wmc.org (2017).
 - 17) Dutu, Richard. *Energy Policy*, **98**, 51-519. (2016).
 - 18) Siva Prasad Dontala, T. Byragi Reddy, and Ramesh Vadde, *Procedia Earth and Planetaria Science*, 11, 2 – 7 (2015).
 - 19) Younger, P. L. *Mine Water: Hydrology, Pollution, Remediation*. Kluwer Academic Publisher: The Netherland (2002).
 - 20) US Energy Information Administration (US EIA). *Coal Exports and Imports*. EIA: New York (2016).
 - 21) US Environmental Protection Agency (US EPA). “Regulatory Impact Analysis for the Final Mercury and Air Toxics Standards”. Research Triangle Park, NC. (2011).
 - 22) OECD and United Cities and Local Governments. *Profile Indonesia*. Available on the Internet at:<https://www.oecd.org/regional/regional-policy/profile-Indonesia.pdf> (2016).
 - 23) Gautama, Rudy Sayoga, *Proc. 4th Environmental Technology and Management Conference*, Bandung (2011)
 - 24) Republic of Indonesia, Basic Mining Law, UU No 11, Jakarta: The Ministry/ State Secretary of The Republic of Indonesia (1967).
 - 25) Ministry of Mines, Prevention and Measures for Disturbance and Pollution Affected by Open Cut Mining, Decree No. 07/DU/1978, Jakarta: Ministry of Mines and Energy, Republic Indonesia (1977).
 - 26) Ministry of Mines, Pencegahan dan Penanggulangan terhadap Gangguan dan Pencemaran Sebagai Akibat Usaha Pertambangan Umum, Decree No. 04/P/M/1977, Jakarta: Ministry of Mines and Energy, Republic Indonesia (1977)
 - 27) Subagyo, Iskandar. “Environmental Enforment for Mining in Indonesia”. UNCTAD Seminar on Capacity Building for Environmental Management in Asian/Pacific Mining, Jakarta, Indonesia. September 6-8. (1994).c
 - 28) Members of the Advisory Commission on Intergovernmental Relations, *State Constitutions in the Federal System*, Washington , DC (1989)
 - 29) William Burnham, *Introduction to the Law and Legal System of the United States*, 4th ed. (St. Paul, MN: Thomson West, (2006)
 - 30) Australian Government, available at <https://www.australia.gov.au/about-government/how-government-works> (09January 2018)
 - 31)McNamara, N. “The Environmental Regulation of Mining: An International Comparison”, Ph.D. Dissertation, School of Law of the University of Southern Queensland, Australia. (2009).