



Nickel export ban policy in Indonesia - a path to sustainable economic development?

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ABSTRACT

Electric-based vehicles (EV) come as an option for the solution over the GHG emissions problem resulting from energy production and transportation. Background. The demand for nickel, as a vital component of the lithium-ion batteries used in EV increases significantly and Indonesia plays a critical role as the owner of the world's largest nickel reserve. While exporting raw materials can increase national income, Indonesia misses out on the opportunity to capture higher value-added benefits from downstream processing and manufacturing. The nickel export ban policy is proposed by the Indonesian government as an effort to encourage the growth of the domestic nickel processing industry and capture higher value from the country's nickel resources. From the creation of domestic value addition, industrial development, and sustainable resource management, it is hoped that Indonesia will move toward sustainable economic development. Methods. This paper reviewed component required to assess the nickel export strategy for long-term economic growth. We used a straightforward approach, outlining each sustainability principle's underlying objectives and providing justifications for why it should be considered in the nickel sector. By citing justifications for their advantages and justifications for their risks, we analyzed the existing policy. Results and discussions. Indonesia's nickel sector does not comply with sustainability principles and is used as a raw material for electric vehicle batteries, but it may only benefit a few people rather than the general welfare of the community. Conclusion. Therefore, the government's decision to impose a ban on nickel exports is correct, but it must be accompanied by efforts to improve both in terms of technology and policies regarding natural resource management. To control the power inclination to ensure sustainability and equality that sustainable natural resource management promotes, further study of the political component is required.

KEYWORDS: environmental protection; economy; natural resource management; nickel; policy; sustainable economic development

1. Introduction

In the GHG Inventory Report (KLHK, 2020) Indonesia produced Green House Gases (GHG) of 1,866,552 Gg CO₂e in 2019 with the energy sector, includes emissions resulting from energy production and transportation as the dominant contributor. Global climate problems that occur due to high GHG emissions, most of which are contributed using fossil fuel vehicles. Electric-based vehicles are considered better for the environment because they do not emit GHG during the usage. In Indonesia, there are 117 batteries and 54 chargers, of which 60% are Valve-Regulated Lead-Acid (VRLA) batteries and the remaining 40% are lithium-ion (Wijaya et al., 2021). Only 5% of consumers have negative feelings about electric vehicle items, largely because there aren't any rapid charging stations and

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they're very expensive. (Anwar *et al.*, 2023). In addition, hybrid vehicles, a solution during the transition to electric vehicle technology is implemented so that people can gradually adapt (Iskandar, 2021).

Humans have been using nickels for centuries. We can find products with nickel content from cutleries, batteries for our smartphones and components for aircrafts as well as electronic devices. This natural resource has the nickname "the mother of industry", which translates to as the backbone that underpins other industrial sectors, such as automotive industry (Siahaan *et al.*, 2021). Nickel has ferromagnetic qualities and a high thermal and electrical conductivity, although its conductive and magnetic properties are inferior to those of silver and iron, respectively (Barceloux, 1999). Usually the presence of nickel (Ni) ore is obtained along with other types of metals including copper (Cu), iron (Fe), arsenic (As), and platinum (Pt) (Syarifuddin, 2022).

Battery for EV that was produced in Indonesia has cheaper price since having and producing the nickel resource inside the same country can cut production cost by more than 50% (Ulfa *et al.*, 2021). Rising demand for nickel, cobalt, and lithium for EV batteries appears to raise the usage of the country's geological reserves which can be resolved by recycling and substitution technology at various levels. This prevention method seems to decrease the risk of geological and geopolitical supply disruption because of EVs (Habib *et al.*, 2020). Accumulation of steps described before may help to facilitate Indonesia's plan to switch to EVs, but it might have an adverse effect on the environment in mining and battery producing locations. Utilizing Indonesia's natural resources, particularly nickel, for energy conversion puts environmental conditions at risk by accelerating deforestation, degrading marine habitats, and harming coastal fishermen's livelihoods. (Laia, 2021; Syarifuddin, 2022). Apart from that, mining locations, which are generally in remote areas, can contribute to local area development in the form of CSR because it has a large Net Gain Coefficient (NGC) (Soelistijo, 2013).

Nickel contributes greatly to damage socio-economic aspect that is caused by its price and supply risk (Santillán-Saldivar *et al.*, 2021). On one hand, the presence of big exploration companies is beneficial for upstream mining side, turning concealed mineral deposits into exploitable resources and reserves, on the other hand leaving the downstream side to be untouched. For years, Indonesia's mining sector was an export-oriented industry, with materials sent to sophisticated industrial nations namely European states, Japan, and South Korea. Indonesia enjoyed the status quo of being a material exporter, even the fact is generally acknowledged that adding more value to the goods through processing before export rather than raw commodities would be a better strategy for the country (Dinata *et al.*, 2020).

Measures to reduce GHG emissions by transitioning to electricity-based energy using nickel-based batteries will increase mining activities and expand the land usage of Indonesia's forest which will resulting in a repeated failure after the program to reduce emissions from deforestation and degradation, known as REDD+ (Adam *et al.*, 2021). The goal of environmentally sustainable economic development is to use political and economic systems to encourage and discourage environmentally harmful and unsustainable forms of economic growth, in line with the win-win principle of sustainability (Miller & Spoolman, 2018).

This paper aims to evaluate the nickel export ban policy to sustainable economic development, especially in the correlation of natural capital management and economic growth. It is hoped that this writing will provide an overview of the potential for developing of nickel industry, namely raw material of battery, as well as the impact on environmental, social, and economic aspects.

2. Methods

In selecting articles for this work, we focused on sustainability, specifically the notion of sustainable economic growth, which is required in the nickel business. The article was chosen for review based on the following criteria: (i) A significant connection to the review article's issue (sustainable economic development), (ii) significant relation to the review articles related issue (sustainability principles featured in sustainable economic development), (iii) natural resources management (especially those that address nickel mining), (iv) policy (policy that is important in ensuring a sustainable resources), (v) publication period (not since 2019, so as to address issues from the most recent development) and (vi) issues and problems (to allow for critical assessments).

These were accumulated by searching on Science Direct and Google Scholar websites, with the keyword "Nickel Mining", "Natural Resources Management", "Circular Economy", and "Sustainable Economic Development". A total of 31 Publication were retrieved, of which 29 were journal articles, 2 book chapters and 6 others.

This work reviewed a total number of 29 different articles on sustainability principles. Nickel Mining (with 12 articles), Natural Resources Management (with 6 articles), Policy (with 2 articles), and lastly 9 articles are the sustainable economic development highlighted in this work for creating a sustainable economy.

The emphasis is on the nickel industry's potential in the social, economic, and environmental fields. Duplicates were eliminated after the articles were compiled to make place for unique content. The resources were distributed among the writers in order for them to summarize, critically examine, and review each part based on their specific skills and preferences on each emphasized sustainability concept. This review task took two months to complete, beginning with the literature search and ending with the final compilation.

3. Result and Discussion

In 2022, Indonesia had the export revenue of USD 291.88 billion, which a portion of USD 235.61 billion was resulted from exports from oil and gas. However, the high value of exports is not in line with the value of foreign exchange reserves which has decreased and is only worth US\$7.7 billion (Tempo, 2023). From the same report from Tempo, it states that there were illegal nickel mines that used original but fake documents, generally a joint venture of a large group of businessmen from China who made local and central chiefs part of the board of commissioners (Tempo, 2023). This irresponsible action is very detrimental to the country as only prioritizing personal gain of certain groups.

In 2009, the government is starting to pay attention to natural resources with Law No. 4 of 2009 concerning Mineral and Coal Mining, especially in meeting energy needs by making laws that aim to regulate the management of mineral and/or coal mining on the basis of benefits, fairness and balance; partiality to the interests of the nation; participatory, transparency, and accountability; and sustainable and environmentally sound. This law is then detailed in a Government Regulation No 23 of 2010 Concerning the Implementation of Mineral and Coal Mining Business Activities which requires mining companies to process and refine minerals as added value products before exporting them overseas. Later, the regulation was amended by Government Regulation Number 1 of 2014 concerning the Second Amendment to PP 23 of 2010 about the Implementation of Mineral and Coal Mining Business Activities. This amendment content was allowing the companies to export raw materials with a very limited quantity with the requirement of having a set of management or refining facilities inside the country. The government regulation continues to be amended and, in the amendment, the four companies are allowed to export raw minerals with the condition of a minimum nickel content. This arrangement states in Regulation of the Minister of Trade No. 1 Year 2017, Article 3 Paragraph 1: "Mining products in the form of raw material or ore, as well as mining products that do not comply with the minimum

processing and/or refining limits, are mining products that are prohibited from exporting, with the exception of certain mining products."

In 2019, the Government informed the ban on the export of raw materials and nickel that have been processed into ore which came into effect on January 1, 2020 through ESDM Minister Regulation Number 11 concerning the Second Amendment to ESDM Minister Regulation Number 25 Years. The effort to protect Indonesia's nickel resources was set to be the background of these ministerial regulations issuance. While the number of nickel smelters in Indonesia increase significantly, a regulated measure to control the activity is needed.

According to the Ministry of Energy and Mineral Resources, Indonesia's nickel reserves are estimated to be available only until 2029. The increase of Indonesia's domestic nickel consumption is neglectable due to the increasing demand for domestic smelters. Furthermore, the growth of electric car industry will be more massive in the future and needs more nickel as the components for the lithium battery. Therefore, the government imposed ban on nickel ore export in order to provide nickel reserves, therefore to avoid scarcity (Siahaan et al., 2021). The ban on nickel ore export also benefits the economic stability inside the country since the price of processed materials is less volatile to global price fluctuation. Developing local processing places inside the country would support industrial growth, contribute to the national income and creating job opportunities (Dinata et al., 2020).

Mining industry has an important role to improve the environment and social condition in order to obtain the sustainability of their operation, therefore it is necessary for them to disclose environmental responsibility properly in accordance with applicable standards but in practice, PT. Vale (located in Indonesia) as the largest nickel contributor in the world, has not been optimal in several aspects, including in providing health facilities and mitigating agricultural problems around the nickel mining area (Murdifin et al., 2019). These Chinese-Indonesian smelting consortiums inadvertently created an industrial oligopsony, setting the price of nickel at very cheap rates that ultimately harmed the profit margins of most large-scale mining firms and ASM groups (Camba, 2021). These are in line with previous findings that Financial Management (FM) and Mineral Resource Management (MRR) have asymmetric relationships that the increases one of them will reduces the other one (Peng et al., 2023).

Brown's Plan B for shifting to a more environmentally and economically sustainable future has four main goals: (1) stabilize population growth, (2) stabilize climate change, (3) eradicate poverty, and (4) restore the earth's natural support systems (Miller & Spoolman, 2018). That economic practical should employ nature's cycle in terms of material, energy, and nutrition and in return have to benefit the environment (Korhonen et al., 2018). Internationally accepted, the nickel export ban policy in Indonesia has goals to preserve natural resources from shortage and value-added benefits export products such as batteries rather than nickel ore (Siahaan et al., 2021).

The domestic value addition of the nickel ban policy in Indonesia refers to the government's objective of promoting the processing and manufacturing of nickel products within the country. A study from Sun et al., 2023 provides empirical evidence that environmental regulations coordinate the development of the ecological environment and the upgrading of Chinese exports, which is also of enlightening significance to other developing countries in the transition to a high-quality development path. By restricting the export of raw nickel ore, Indonesian's government aims to encourage the establishment and growth of domestic nickel smelters, refineries, and downstream industries. From economic perspective, key benefits and value additions associated with this policy are job creation and employment; increased revenue and export earnings; technology transfer and knowledge development; diversification of the economy; dan environmental sustainability.

The development of domestic nickel processing facilities can lead to the creation of job opportunities in various sectors, including mining, smelting, refining, and manufacturing of downstream nickel products. The mine's growth and increased employment in the region

are both driven by the improving nickel value (Maskuroh et al., 2023). This can contribute to reducing unemployment rates and improving the livelihoods of the local workforce.

By promoting domestic processing, Indonesia aims to capture more value from its nickel resources. Exporting processed nickel products instead of raw ore can result in higher export earnings due to the added value of the processed products. This can contribute to increased government revenue, economic growth, and trade balance improvement.

Establishing domestic nickel processing facilities requires technological expertise and know-how. Encouraging investment in smelters and refineries can facilitate technology transfer from foreign investors, leading to the development of local technical capabilities and knowledge in nickel processing and related industries. This can have long-term benefits for Indonesia's industrial and technological development.

Overreliance on raw material exports, such as nickel ore, can make an economy vulnerable to price fluctuations and market volatility. By promoting domestic value addition, Indonesia aims to diversify its economy by moving up the value chain and reducing dependence on a single commodity. This can lead to a more resilient and sustainable economic structure.

Domestic nickel processing can offer opportunities to implement stricter environmental regulations and standards. By processing nickel within the country, Indonesia can exercise greater control over mining practices, waste management, and pollution reduction. This can contribute to minimizing the environmental impact associated with nickel extraction and processing.

It's Important to note that the successful implementation of the domestic value addition policy requires investment in infrastructure, supportive regulations, and a competitive business environment. The government's efforts in attracting domestic and foreign investments and providing necessary incentives and support can play a crucial role in realizing the value addition potential of the nickel ban policy.

Definition of circular economy is an economy constructed from societal production-consumption systems that maximizes the service produced from the linear nature-society-nature material and energy throughput flow (Korhonen et al., 2018). The EC is expanding the list of indicators in individual areas of CE, particularly those related to waste from the agri-food sector and green public procurement. The indicator are EU self-sufficiency in raw materials; Share of secondary raw materials in the demand for raw materials; Trade in secondary raw materials; and Patents related to recycling and secondary raw materials (Smol et al., 2020). Foreign Direct investment (FDI) is believed to be an indicator that helps the growth of developing countries in Asia, but in fact natural resource concessions do not have a significant influence on the economic growth of developing countries in Asia, it puts a heavy burden on the use of fossil fuel energy (Huang et al., 2020). The mine environmental loss control mechanism uses ecosystem functionality costs to control environmental losses in mines, providing incentives for sustainable mining and more flexibility in policy formulation (Shiquan et al., 2022). Regarding post-mining, all direct and indirect costs from the plan can be calculated, as well as an additional 5% inflation cost from the total direct and indirect costs to account for an increase in prices when the work will be conducted (Yuliyani et al., 2021). The costs associated with preventing, minimizing, or making up for the negative environmental effects of mining activities depend on mine development level and population density also the number of harmful gas emissions affected by the type of mineral (Badakhshan et al., 2022). The effort to improve the competitiveness of Indonesian export commodities has been made with the aid of investment from China. Together, both countries cooperate to develop the downstream industry. However, investment from China has also created opportunities for abusing power in mid-stream market. For example, when the sale price of the nickel ore falls below market price, the local miners are forced to sell their mining results to China-controlled smelters. In the long term, these minimal profits will be insufficient to offset the damage caused by the mining industry in the environment (Dinata et al., 2020). To overcome this issue, a calculated measure is needed to establish a fair and transparent nickel trading system inside the country. This measure will begin with preparing, calculating and setting a benchmark for "Nickel Price Index" to all market

participants. The proposed Nickel Price Index will ensure that local mining companies and foreign buyers pay similar price for nickel to encourage fairness for all parties. As of the publication of this report, Indonesia still does not have a Nickel Price Index. As a result, the price of nickel can occasionally fluctuate widely. Public investments and international policy are needed to shift common value settings and enable more sustainable consumer decisions (Lehmann, 2020).

Renewable energy technology innovation has various effects on mineral resources' green utilization efficiency, depending on regional location, industrial structure, and human capital level changes (Feng et al., 2023). Examples of cases that need attention in nickel mine management efforts that, Tesla, which is established as a leader in producing electric-based sports car, is an automotive and energy storage company originating from the United States. The value of the product has a price range from 2.25 billion rupiah to 4.4 billion rupiah. The plan to grant nickel concessions to Tesla, which produces cars for personal use, is not in line with the sustainable development efforts. Increasing both the number and quality of private vehicles regardless of the shifting to electric vehicles will not solve environmental problems, namely efforts to reduce GHG emissions it tends to concentrate on the production of private vehicles rather than public vehicles, raising concerns that this will only serve to benefit certain parties rather than the welfare of the community. Generally, renewable energy systems can reduce the use of fossil fuels, but the extraction and distribution of raw materials like rare earth metals essential cost energy, and if other controls in the system are not prompted concurrently, negative impact happen in a short time (Lehmann, 2020).

On the other hand, some of the negative impacts arising from mining activities that still occur in Indonesia today, such as:

a. Continuous Clearing of New Land (Suritno et al., 2022)

Many cases have occurred in Indonesia related to mining companies in expanding industrial areas illegally, there are cases when they take local community land to expand their business. As happened in Waleh Village, North Weda District, Central Halmahera, complaints are filed by the local community that there is no form of accountability from both industry and the government in terms of land acquisition owned by the community, which previously the land was used as agricultural land and plantations to fulfill the needs of the community. The majority of residents of North Weda Village relies on their work as coconut farmers to provide for their daily needs; however, the existence of nickel mining causes farmers to lose plantation land, and soil fertility, affecting locals' quality of life through a variety of natural disasters, seasonal changes, environmental harm, and unpredictable conflicts.

Also, People who live nomadically in the forest lose their homes and ancestral graves and experience intimidation during the operational process, the tribes included in the mining concession consist of 9 tribes including the Hongana Manyawa, Kokarebok, Folajawa, Komao, Ngoti-Ngotiri, Sakaulen, Namu, Mein, and Talen tribes (Laia, 2021; Survival, 2023).

b. Environmental damage (Syarifuddin, 2022)

Currently in the island of Sulawesi (Indonesia) is facing the danger of natural socio-ecological disasters due to the rise of nickel mining. (Syarifuddin, 2022). When land clearing occurs continuously, it will have an impact on the environment, starting from land use change which was previously a forest as a place to absorb water reserves instead of being cut down for mining areas so that environmental damage occurs such as floods, loss of soil fertility, air pollution, water to disruption of marine life ecosystems. As happened in Marowali, Central Sulawesi, the mining industry discharges smelter or tailings waste directly into the free sea, which has an impact on aquatic ecology which causes loss of biodiversity such as the extinction of Morowali coral reefs, siltation of changes in the seabed. The disposal of tailings wastes due to nickel mining into the sea causes damage to aquatic ecology, another thing that happened in Laroenai Village, Marowali Regency is currently experiencing sedimentation, mangrove forests used for crab cultivation have been damaged, due to nickel mining mud sediment deposits.

c. Impacting people's income (Hasriati et al., 2019)

Also, Nickel mining activities in Konawe Islands Regency, Southeast Sulawesi, precisely on Wawonii Island, where the majority of people in Wawonii are farmers and fishermen, threatening the agricultural sector, which will cause crop failure and loss of local fishermen's catch sources (Anugrah, 2022). The presence of the mining industry in an area on the one hand can improve the economy of the local community, but on the other hand there is a group of people who actually experience difficulties in terms of meeting their daily needs. As happened, the impact of nickel mining felt by the community in South Konawe has an effect on farm income, namely the decline in agricultural land productivity since 2011. Nickel mining will impact to the quality of the land, resulting in degradation of the land, specifically the soil fertility. Therefore, farmers must spend much more than usual, for the needs of fertilizers and pesticides used by farmers in large quantities to increase the fertility of agricultural soil. Based on the research conducted, it was found that the difference in costs required by rice farming with the condition of land affected by nickel mining, costs for the land is four times greater than with land conditions that are not affected, and for the use of seeds on land with conditions affected by nickel mining need 25% more unaffected land.

The sustainable development strategy is currently being applied by almost all countries, especially in Indonesia as a developing country. There are policies related to nickel mining towards economic sustainable development which includes industrial development. In order to catch up with other developed countries, Indonesia reinforces state-owned entities (BUMN) to grow the national development strategies and encourage structural transformation. The dominant emerging market industrial policy focuses on cross-border trade (export and import), which is divided into trade and investment, aiming to protect local enterprises by controlling the level of competition in the domestic economy or implementing requirements with the aim of increasing socioeconomic benefits within the country. The presence of state-owned entities in strategic industries differs in every country and tends to be more widespread in developing countries. The presence of state-owned entities in the natural resources sector and the mining and energy sectors can contribute to industry pilots by creating the chain of values ranging from upstream to downstream operations (Kim & Sumner, 2021). It is stated in the UUD 1945 article 33 paragraph 3 that the earth and water and all their contents must be utilized as much as possible for the prosperity of the Indonesian people, because natural resources are developed into economic capital through techno-economic transformation and subsequently become social capital for society as a whole facing a better future life based on a global welfare, security and environment approach. In any case, policy approaches to minimise losses of materials and increase recycling capacities are necessary amendments (Lehmann, 2020).

However, reviewing from the recent cases and condition, the linkage of the Indonesian nickel mining industry to the social economy of the community still needs to be considered. While, Indonesian nickel mining industry contributes to increase the income of the local community, on the other hand it actually contributes to the damage to the surrounding environment. Moreover, it is unfortunate to say that there is no form of accountability from the mining company to compensate the community who bear the loss in the first place. Indonesia's mining policy has been regulated in the Regulation of the Minister of Trade of the Republic of Indonesia Number 96 of 2019 concerning Export Provisions for Basil Mining Products Processing and Refining that what is meant as mining products from processing and/or refining is non-renewable natural resources extracted from the bowels of the earth of Indonesia that have been processed and / or refined in the form of metal minerals, non-metallic minerals and rocks that have complied with the minimum limits of processing and/or refining. Export is the activity of removing goods from the customs area. The meaning of the Production Operation Mining Business License, hereinafter referred to as the Production Operation Mining Business Permits, is a business license granted after the completion of the exploration IUP to carry out the stages of production operation activities.

The Ministry of Energy and Mineral Resources estimates that Indonesia's nickel reserves will protect the nation's diminishing nickel resources until 2029. At the same time, the number of nickel smelters built in Indonesia is rising, which is supported by predictions that the electric car industry will eventually use nickel derivative products in the form of lithium batteries. As a result, the Indonesian government restricts nickel ore exports in order to preserve nickel stocks and avoid shortages. This is reinforced by Law No. 4 of 2009 on Mineral and Coal Mining, which states that as a non-renewable natural resource, coal mining is a national wealth regulated by the state for the greatest prosperity of the people. The concept of the mining industry sector carried out by Indonesia's government can be said to have actually been wrong from the beginning, this is because there is no policy from the government to provide limits on the amount of mining product production to the industry, instead there is only the granting of Mining Business Permits every year. In the framework of sustainable development, we must think about the long-term carrying capacity of the environment, but some industries only survive or are temporary because there is no policy from the state that limits mining production, only by granting mining permits. In addition, the context in the mining sector of several regions in Indonesia is still controlled by private parties and interested colleagues, finally in terms of community rights and constitutionally in the 1945 Constitution article 33 paragraph 3 is not implemented properly.

criminal groups' are distinguished the regions by their natural resource wealth, which has produced unique patterns of violence. (Herrera & Martinez-Alvarez, 2022). The big problem is that in general permits issued by the state are managed by certain parties to cooperate with third parties, so that the granting of approval is not derived from the government, it often happens when managed by third parties only focusing on the interests of a group of people. It is important that the power should be addressed as a compliment in order to actualize governance of sustainable natural resources. Political approaches are still required for disseminating the outcomes and ensuring both sustainability and equality (Hakkarainen et al., 2022). Institutions are seen as mediators between individual behaviours and resource use and are designed to create or constrain opportunities for populations caught up in power relations but it needs to be legitimization. (Ballet et al., 2020).

4. Conclusion

Utilizing economic principles that, in practice, must take into account the natural cycles of resources, energy, and nutrients to benefit the environment, therefore, sustainable economic development can be achieved. Political and economic systems can be used to support and discourage forms of economic practices those are environmentally harmful and unsustainable. Due to ongoing issues in the environment, social, and economic spheres, the current state of Indonesia's nickel sector does not comply with sustainability principles. Additionally, nickel is used as a raw material for EV's battery in hope to combat environmental issues, including initiatives to lower GHG emissions, however it's possible that using the process of utilizing this natural resource may only benefit a few people rather than the general welfare of the community. Hence, policy should change the framework conditions to encourage the industry and consumers to change their business and consumption patterns based on common values.

Indonesia is obligated to regulate and execute the operation of nickel industry in the most sustainable way from environmental, social, and economic perspective. This can be accomplished by implementing sustainable resource management, industrial development, and nickel natural resource value addition. Therefore, the government's decision to ban nickel exports is appropriate, however, it is crucial that this decision be accompanied by initiatives to technology advancement and natural resource management policies to prioritize the welfare of the people, the environment, and the national income. To summarize, power must be handled in addition to sustainable natural resources, and

political measures are required to maintain sustainability and equality. Thus, the necessity for further research on the political aspect of natural resources management.

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