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Challenges of transforming Indonesia's circular economy in the context of electric vehicle policy

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Abstract. The circular economy is the application of sustainable industrial behavior through the implementation of low-carbon technology. Electric vehicles are one of the low-carbon technologies that are a priority for sustainable business policies in Indonesia. Ecological modernization is characterized by the existence of policy-based structures and mechanisms that support sustainable technologies. The ecological modernization study observed in this paper is a policy instrument for developing sustainable infrastructure and technology that supports sustainable business through Presidential Regulation Number 55 of 2019. In addition, the government has issued a ban on nickel ore exports since January 1, 2020. However, the ban on Indonesia's nickel ore exports has become a free trade dispute through the European Union's lawsuit to the WTO (World Trade Organization). The transformation of Indonesia's circular economic policy faces the dilemma of the global free trade structure. Furthermore, the transformation of Indonesia's circular economy policy provides a perspective that ecological modernization is a business with a new, greener face that does not touch the transformation of the order of power relations in a just global structure. However, the circular economy narrative focuses more on the agenda of building business opportunities that lacks narratives on the reorganization of ecological relations.

1. Introduction

The green industrial revolution presents the discourse of a low-carbon economy as a necessity to build a sustainability transformation. Sustainability transformation requires contestation and various political interests and power to generate penetration of technology, markets, and state structures that build processes, institutions, and related instruments [1]. The emphasis on sustainability transformation is on governance breakthroughs and decision-making for the implementation of low-carbon technologies. Low-carbon technology answers the need for clean energy that has emerged since the emergence of the Paris Agreement which gives global responsibility to keep the global earth temperature below 2°C. In line with the Paris Agreement, China has established a carbon peak policy before 2030 and carbon neutrality before 2060 which encourages low carbon technology policies, one of which is producing electric vehicles [2]. Low-carbon technology in the transportation sector provides an opportunity for the development of the electric vehicle industry by up to 60% [3]. Electric vehicles provide benefits to public health due to the substantial reduction in emissions compared to fossil fuel vehicles that are likely to be developed in the ASEAN region [4]. In addition, the need for low-carbon transportation fills 29% of the market in Indonesia which is beneficial for sustainable behavior in metropolitan cities with high population growth [5].



Indonesia has the opportunity to develop the electric vehicle industry to build a sustainability structure and transformation of sustainability. Through the deployment of electric vehicles, fossil fuel energy will be reduced by 8.8% by 2040 [6]. In addition, the opportunity for the electric vehicle industry to respond to the challenge that the transportation sector in Indonesia produces the second largest CO₂ (carbon dioxide) emission reaches 117.9 million or 25.9% of the total CO₂ emissions [6]. The electric vehicle industry, related to the abundance of nickel raw material, is the main attraction for China to build an industrial park in the form of Indonesia's Morowali Industrial Park (IMIP) in Bahodopi, Morowali district, Central Sulawesi Province [7]. IMIP is a Chinese investment that has been established since 2011 under President Susilo Bambang Yudhoyono and continued under President Joko Widodo [8]. Chinese investment is a series of Chinese diplomacy under the leadership of President Xi Jinping titled the Belt and Road Initiative (BRI) which is in line with Indonesia's development structure which prioritizes foreign investment for Indonesia's economic growth [9].

The hallmark of implementing a green economy is the presence of new technological approaches to building innovative marketing system models [10]. In addition, the circular economy as an implementation of a green economy involves a technocentric approach to seize market opportunities as an instrument for the practice of SDGs [11]. Based on the World Economic Forum report that global battery demand will increase by 25% by 2030, this is a big market opportunity [12]. Indonesia can seize this opportunity because Indonesia is a producer of one of the battery components, namely nickel which covers 29.8% of world production [12]. Through Presidential Regulation Number 55 of 2019 regarding the acceleration of the electric vehicle battery industry development program, Indonesia has become a legal umbrella for building renewable energy challenges in line with the Paris Agreement goals [13]. However, Indonesia faces the challenge of a lawsuit from the European Union to the WTO in the development of the electric vehicle battery industry. Ironically, the European Union has a long and iconic history of building sustainable policies and regulations [14].

This paper aims to highlight the challenges of sustainable transformation of Indonesia's circular economy in applying the SDGs principles. In addition, this paper focuses on the phenomenon of the development of the electric vehicle industry and the challenges faced by Indonesia.

2. Research Framework

The idea of this paper uses the line of thought of ecological modernization. Discussion of sustainable transformation followed by circular economy discourse and low carbon technology using the conceptual modernization of ecology and circular economy. The building of discussion of ecological modernization and circular economy helps the author's understanding of sustainable global structures and domestic empirical realities.

2.1. Ecological modernization

Ecological modernization theory is a discussion of socio-ecological theory that pays attention to the role of the state and state regulations in the management of environmental protection through a bureaucratic approach [15]. Economic and market developments in the 1990s gave rise to environmental policy discourse to ensure economic growth follows ecological thresholds. However, the thought of ecological modernization does not have a major concern with ecological thresholds because it provides space for the discourse of economic growth by providing a middle way structure that accommodates capital accumulation and encourages bureaucratic arrangements for the implementation of policies that are pro-environmental. Ecological modernization focuses on technical efficiency because it provides support for sustainable consumption and the pursuit of prosperity so that the component of the ecological threshold does not become a serious discussion [16]. Furthermore, Fudge and Rowe also view that ecological modernization does not emphasize the structure of sustainable behavior.

Ecological modernization identifies two options for overcoming the state bureaucratic deadlock in the formulation of pro-environmental decision-making [15]. Arthur P.J. Mol (1995) describes pro-environmental policies with the reality that the policies taken are reactive towards preventive or how the policy possibilities are from centralization to decentralization to policies that provide a way for

sustainable practices and behavior. State rationality considers economic mechanisms to develop markets with the transfer of responsibilities, incentives, and division of tasks between the state and the market. Thus, ecological modernization is a reorientation of the interaction of the state and the market that forms a position and role to encourage a transformation process that takes into account ecological aspects. Furthermore, the three stages of ecological modernization theory include the role of technological innovation, critical attention to the role of the state in the formulation of environmental policies and breakthrough market solutions. The combination of technological innovation, state, and market rebuilding institutions and building a new culture is an indicator of ecological modernization practice [17].

The application of ecological modernization is influenced by the technocentric order because it involves the dominance of the role of the state in building a sustainable structure. In the post-Paris Agreement developments in 2015, the world is faced with the fact that it is a shared responsibility to keep the earth's temperature rise no more than 1.5 °C. This encourages global acceleration in terms of the technocentric order for the success of the circular economy. Circular economy as a concept with a sustainability narrative that helps to observe and understand sustainability discourse which is formulated in ecological modernization and sustainable development [18]. However, the modernization of ecology and the derivation of the circular economy discussion show gaps. Based on the observations of Corvelec et al. (2022) that the technocentric order creates a discursive gap between policies regarding socio-ecological challenges in this century because policy instruments only promote circulation with a top-down approach. The technocentric order builds a circular economy narrative by promoting market efficiency while maintaining the pace of production and consumption [19].

2.2. Circular economy

Circular economy is a relevant term to explain the structure of production and consumption that is in line with the principle of sustainability. The circular economy is a strong narrative in presenting the SDGs because of the discourse on building a new production model to achieve the SDGs [11]. In addition, the circular economy is a tool to understand the narrative of the sustainability of the application of the green economy raised by academics, businesspeople, and policy makers [18]. Furthermore, D'Amato (2021) states that the circular economy offers a solution regarding the resources and distribution of technologically driven socio-ecological technical systems for the rearrangement of new production and consumption systems. So that circular economy jargon is more dominant in practical because it is a practical transformation to answer deadlocks and challenges of a sustainable order. This circular economy is tendency that stems from the strength of international political capital, foreign policy lobbying and China's financial capital which influence sustainable orders [8]. A sustainable order is a necessity in sustainable economic activities by considering and paying attention to the value chain in production and consumption patterns with an ongoing material cycle [20].

A circular economy is based on an ideological agenda dominated by economic interests to depoliticize sustainable growth stemming from the European Union narrative [19]. The European Union has long narrated that it has a concern for the environment. However, the latest development is that the circular economy narrative is a tool for the European Union to deal with the problem of stagnant economic growth [21]. Furthermore, Leipold (2021) describes the circular economy as a solution to the economic problems of the European Union by requiring governance at the macro level. This governance strategy is a win-win strategy for the European Union because it has the legitimacy of ideas and interests of the global economy with the 'power of global lobbying'. In addition, China's hegemonic interest in global politics is to increase industrial capacity through regulations with the green transformation title that emphasizes government capacity to build a strong state and spur technological innovation [22]. However, Corvellec et al. (2022) views the circular economy as minimal to the narrative of justice and does not address the gap between the earth's biophysical threshold and the interests of economic growth.

3. Material and Method

Qualitative method is the method used in this paper by presenting discourse analysis. The conceptual use of ecological modernization is an application of the application of the middle-range concept that presents discourse analysis which becomes storylines built by actors to become public discourse through various policy-based practices [17]. Marten A. Hajer is a thinker of the concept of ecological modernization who formulates the methodology for applying ecological modernization. According to him, ecological modernization is based on an attractive storyline with an emphasis on regulations in dealing with environmental problems as a positive-sum game. The storyline in the context of implementing a green economy with a focus on policy discourse and the application of the Indonesian electric vehicle industry is observed in this paper. The use of literature studies provides an understanding of the discourse on the application and development of the latest circular economy.

4. Results and Discussion

The results and discussions consist of three topics, namely the potential of Indonesia's circular economy, the challenges of transforming Indonesia's circular economy, and the ecological modernization of the periphery countries.

4.1. The potential of Indonesia's circular economy

This discussion focuses on central stakeholders having responsibility for specific sectors that are guided by government policies that produce policies that are observed in the study of ecological modernization. [16] In this discussion, there are observations regarding the Indonesian government's policies including the electric vehicle policy, the nickel export ban policy, and the potential of the Indonesian electric vehicle industry.

4.1.1. Electric vehicle policy. Indonesia's electric vehicle industry policy is supported by the Presidential Regulation Number 55 of 2019 with policy instruments covering 4 derivatives of Ministerial level regulations. The policy instruments include Basic Calculation of the Imposition of Motor Vehicle Tax and Motor Vehicle Transfer Fee, Provision of Electricity Charging Infrastructure for Battery-Based Electric Motor Vehicles, Calculation of Domestic Component Level Value for Domestic Battery Electric Vehicles, and regarding Battery-Based Electric Motor Vehicles in Completely Decomposed and Incomplete Decomposed State [13]. The Presidential Regulation is to encourage citizens to buy and use electric vehicles with zero emissions. In addition, the stipulated financial incentives derived from the derivative of the regulation are discounts for charging EVs in households where the electricity rate between 10 PM and 5 AM is reduced by 30% [13]. Another thing, the derivative of the Presidential Regulation targets domestic electric car production. By 2025, the growth of electric cars in Indonesia is targeted to reach 20% of the market. [23] The Indonesian Ministry of Industry has set a production target of 400,000 four-wheeled electric vehicles and 1.76 million two-wheeled vehicles by 2025 [4].

In addition, there are also two government regulations that strengthen the electric vehicle penetration policy. The first is Government Regulation Number 79 of 2009 concerning energy conservation regarding that the central Government and regional Governments provide incentives to domestic producers of energy-saving equipment who are successful in carrying out energy conservation as well as energy users who use energy greater than or equal to 6000 (six thousand) equivalent tons of oil per year. Based on this, electric vehicles are categorized as clean technology as stipulated in Indonesia's energy mix policy of 7.7% [4]. The second is Government Regulation number 79 of 2014 regarding national energy policy which emphasizes that the central government and local governments provide fiscal and non-fiscal incentives to encourage diversification of energy sources and renewable energy development [23]. In addition, the government has complemented the electric vehicle policy with a policy of banning nickel ore exports as an effort to support the availability of supporting materials for electric vehicle batteries [13]. This is supported by the Ministry of Energy and Mineral Resources Regulation Number 13 of 2020 regarding the Provision of Electric Charging Infrastructure for Battery Electric Vehicles [4].

4.1.2. *Nickel export ban policy.* Another legal basis to support the Indonesian electric vehicle industry is the law stipulated by regulation number 4 of 2009 concerning mineral and coal mining which requires the process and purification of domestic mining products. The policy for refining mining products is complemented by government regulation number 1 of 2014 which is the second amendment to government regulation number 23 of 2010 regarding the implementation of the mineral and coal mining business [24]. The regulation requires mining companies in Indonesia to have smelters to process raw materials into semi-finished and finished materials. Other complementary regulations are government regulation number 23 of 2010 and the regulation of the Minister of energy and mineral resources which requires mining companies to process and purify mineral materials as value-added products before export [23].

The next development on August 28, 2019, the Government of Indonesia through the Minister of Energy and Mineral Resources Regulation Number 11 of 2019 contained a ban on the export of nickel ore. The regulation is an effort to encourage the interests of domestic industry and mining products have added value when exported thereby increasing foreign exchange for the country. The ban on exports of raw minerals is effective on January 1, 2020. The ban on exports of nickel ore minerals has caused the European Union to react strongly [24]. The European Union has a steel industry that provides strategic economic value. So that the ban on Indonesia's nickel ore exports will affect the European Union's steel industry because the EU's second largest supply of nickel comes from Indonesia [12]. At the end of 2020, the European Union submitted a claim to the World Trade Organization (WTO) regarding the Indonesian government's policy regarding the ban on nickel exports. The European Union accused Indonesia of violating the rules on export and import restrictions as stipulated in the General Agreement on Tariffs and Trade (GATT) [12].

Indonesia has energy potential to encourage the development of electric vehicles. It is estimated that the electricity demand for electric vehicles is 19 GWh with energy demand for four-wheeled vehicles of 5.3 GWh and two-wheeled vehicles of 1.8 GWh which can be achieved through the national renewable energy policy [12]. Furthermore, Pandyaswargo et al. (2021) predicts that Indonesia will be able to meet its domestic needs through 23% of new energy in 2025 and can increase its capacity to 31% in 2050 [12].

4.1.3. *Potential of Indonesia's electric vehicle industry.* The Indonesian government, through the Ministry of Energy and Mineral Resources, is in the midst of activating renewable energy targets and the energy mix with a projection of 2050-2060. In addition, the government has also designed a transformation of sustainability policies with the concrete form of opening investment in sustainable business. The investment opportunity that Indonesia is eyeing is the promotion of local electric vehicles with a target of 25% of electric vehicle production operations and the determination of 40% domestically manufactures electric vehicle parts [12]. However, the policy has not yet demonstrated a life cycle assessment to measure potential risks to the environment in the future. According to Nuss and Eckelman (2014) that the burden on the environment originating from the metal industry needs to be a serious observation regarding the cumulative energy policy [25]. The use of metal, in this case nickel as raw material for electric vehicle batteries, has become an issue to replace fossil fuel vehicles. However, the potential risk in the future due to the accumulation of the use of metal materials for shifting from fossil fuels needs to be considered as a policy to face new risks in the future.

4.2. *Challenges of transforming Indonesia's circular economy*

The challenges of Indonesia's circular economy transformation discussed here include the European Union and the sustainability narrative, the EU's lawsuit to the WTO, and the challenges of Indonesia's electric vehicle industry.

4.2.1. *The European union and the sustainability narrative.* The European Union has produced success stories through the enactment of environmental legislation for 50 years [26]. Since the 1970s, the European Union's environmental policies have been integrated with economic policies in the region.

The EU's binding institutional regulations have encouraged a business model that applies ecologically sustainable growth which narrates that the European Union has succeeded in applying the principle of sustainability [14]. Furthermore, the European Union commission encourages circular economy narratives and discussions as an instrument to achieve the Sustainable Development Goals by 2030 [11].

4.2.2. EU lawsuit to WTO. In July 2014, the European Union and 16 other WTO member countries negotiated the Environmental Goods Agreement (EGA) which aims to remove trade barriers that are categorized as 'green goods' [14]. 'Green goods' identified by Hojnik (2018) are a vital component of sustainable development aimed at overcoming air pollution and supporting renewable energy. However, the term 'green goods' does not apply to the European Union when faced with Indonesia's renewable energy policy. The European Union's lawsuit against Indonesia to the WTO was faced by the Indonesian government as an effort for economic sovereignty over natural resources for the national interest [24]. Indonesia's nickel export ban is a policy that does not violate international trade law. On the other hand, the European Union emphasized the request for consultation with Indonesia regarding raw materials for the European Union's steel production needs. This is seen by the European Union as a form of trade barriers by Indonesia which is detrimental to the European Union.

4.2.3. Challenges of the Indonesian electric vehicle industry. The Indonesian electric vehicle industry faces several problems including the accessibility and quality of electricity. One of them, Indonesia does not yet have large-scale energy storage so that the adoption of electricity quality to accelerate the Indonesian electric vehicle industry is facing challenges [2]. These challenges include information on the use of environmentally friendly electric vehicle technology, limited home charging and public charging infrastructure, the high price of electric vehicles causing the adoption of policies to use electric vehicles to experience limitations [13]. Another challenge is the formal legal incentive policy that causes the adoption of the use of electric vehicles to be hampered because it is access to the upper middle class. Another obstacle is the incentive to shift the use of fossil fuel vehicles to the use of vehicles using fuel that depends on the charging station [23].

4.3. Ecological modernization of periphery countries

Ecological modernization is an industrial construction that takes into account the sustainability norms of modern society. Modernization is characterized by the belief that the use of sustainable technology can be mediated by the state and the market that intervenes in social relations, industrial practices, and regulatory regimes that encourage green economy practices [10]. Indonesia's ecological modernization is understood to use the implementation of a circular economy which is a problem solving in dealing with climate change and continuing sustainability that can be implemented in cities in Indonesia [20]. The implementation of a circular economy is believed to have a positive effect on the level of employment, green investment and the creation of a workforce that considers environmental aspects. However, the implementation of a circular economy in Indonesia faces the dilemma of a global production division of labor that has long established Indonesia as a peripheral country. Countries that produce raw materials that are in a peripheral structure that supply materials to core industrial countries. The order as a peripheral country that focuses on foreign investment experiences social ecological risks in the form of uprooting the livelihoods of local communities due to ecosystem damage. For example, the social ecological risks that have been faced by Bahadopi residents after IMIP was operational [26]. The implementation of Indonesia's circular economy faces the hegemony of the European Union. The European Union has an environmental policy hegemony which is characterized by the existence of bargaining power and strategies that can build consensus [27]. In addition, Deters (2019) also describes that the strength of the European Union is the power of supranational actors which causes regulations to be supported by the majority vote so that they are able to build integration [27]. This integration led to the successful implementation of the European Union's environmental policy.

5. Conclusion

Indonesia has built a commitment to implementing a circular economy to achieve successful implementation of sustainable development. One form of implementing Indonesia's circular economy is making policies to support the use of electric vehicles and the electric vehicle battery industry. The policy of using low-carbon technology initiated by state policies that embrace the market is an indicator of the application of the concept of ecological modernization. However, the concept of ecological modernization applied in this case shows that the policy of using low-carbon technology that integrates the interaction of the state and market cannot be separated from the hegemonic intervention of the global core structure. One of them is China's geopolitical and foreign policy hegemony in the context of the Belt and Road Initiative which has succeeded in spreading its political-economic interests but has created socio-ecological risks in Indonesia on behalf of China's green industry interests. In addition, Indonesia as a developing country faces a dilemma in building an industry with sustainable technology products because of the European Union trade competition lawsuit. On the other hand, the European Union shows the paradox that the sustainability narrative which is its trademark does not provide political will to Indonesia's interests in building its sustainable business because the EU's economic and business interests are more important.

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