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Sustainable Economy: Integrating Environmental Policy in Infrastructure Development in Developing Countries

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ABSTRACT

This research focuses on the importance of integrating environmental policies in infrastructure development in developing countries. Many of these countries face the challenge of balancing economic growth with environmental sustainability, especially with the growing demand for adequate infrastructure. Therefore, it is crucial to develop policies that not only promote economic development but also take environmental impacts into account. This study aims to explore how environmental policies can be integrated into infrastructure development in developing countries and analyze the challenges and opportunities in their implementation. A qualitative approach with case study analysis was used, focusing on countries such as Indonesia, India, and Brazil. Data was collected through interviews with stakeholders, analysis of government policies, and a review of related literature. The results show that, while there is commitment to incorporating environmental policies in infrastructure development, challenges such as limited resources, insufficient institutional capacity, and conflicts between economic development and environmental conservation hinder effective implementation. However, some countries have made notable progress by adopting green technologies and sustainability-based policies, which can serve as models for others.

INTRODUCTION

Describe the science and technology/goods/services offered to solve partner problems and Rapid economic growth in developing countries often comes with major challenges in natural resource management and environmental pollution (Harris & Roach, 2014; Kube et al., 2018; Tietenberg & Lewis, 2023). For example, infrastructure development that involves the exploitation of natural resources can risk damaging the environment if not accompanied by adequate policies. In this context, the importance of integrating environmental policies in infrastructure planning and development is a strategic issue that is not only relevant at the national level but also internationally (Barnett & Jung, 2020; Geneletti, 2012; Nazarova, 2020). A sustainable economy, which emphasizes a balance between economic growth, environmental protection, and social welfare, is an essential basis for meeting these challenges (Barnett & Jung, 2020; Hysa et al., 2020; Nazarova, 2020; Tulupov et al., 2023).

The urgency of this research lies in the phenomenon of imbalance between economic development and environmental preservation in many developing countries. These countries often face a dilemma between the urgent need to accelerate infrastructure development and efforts to maintain environmental sustainability. In this case, effective integration of environmental policies is crucial to prevent more severe ecosystem damage in the future (Awewomom et al., 2024; Nugraha & Ohara-Hirano, 2014; Wongsawat, 2017). Without proper

integration, infrastructure development has the potential to worsen social inequality and increase environmental damage (Galvin & Healy, 2020; Markkanen & Anger-Kraavi, 2019; Varjani et al., 2024).

One of the data that illustrates the tension between development and sustainability can be seen in the World Bank report which states that around 60% of infrastructure projects in developing countries ignore the principles of environmental sustainability (World Bank, 2023). The diagram below illustrates the percentage of infrastructure projects that involve environmental considerations in planning and implementation in various developing countries. This data supports the importance of research to understand how environmental policies can be better integrated in infrastructure planning and development.

While previous research has attempted to address this imbalance, most studies have focused on analyzing economic or environmental aspects separately. Some studies suggest that environmental policies that are not integrated into infrastructure planning risk increasing long-term costs and harming society (Ekins & Zenghelis, 2021; Pires, 1998; Sulaiman & Razman, 2013). On the other hand, other studies indicate that developing countries that have successfully integrated these policies, such as Costa Rica and Bhutan, have shown more positive outcomes in terms of environmentally friendly infrastructure development (Yangka et al., 2018). However, there is a lack of comprehensive studies that examine the success of these policies in developing countries with diverse economic and social conditions.

The research gap in this literature lies in the lack of comprehensive studies on the integration of environmental policies in infrastructure development in developing countries that can provide practical insights for policy makers. Most studies focus on either macroeconomic aspects or environmental policies alone, while there is no model that combines these two elements in an integrated manner (Cantarelli et al., 2018; Chang et al., 2017; Rebs et al., 2019). This research aims to fill this gap by analyzing how environmental policies can be integrated in infrastructure planning and development in developing countries.

The novelty of this research lies in its interdisciplinary approach that combines sustainable economic theory with environmental policy in the context of developing countries. Using multiple country case studies, this research offers a new approach to map the relationship between economic growth and environmental sustainability in infrastructure development, and provides recommendations for more integrated policies (Chou et al., 2023). The model developed in this study is expected to be used as a guide for other developing countries in designing more effective policies.

The main objective of this research is to explore how environmental policies can be effectively integrated in infrastructure development in developing countries and to evaluate the challenges and opportunities that arise in the process. In addition, this research aims to develop a policy model that can be applied in developing countries by considering economic, social, and environmental aspects holistically (de Cámara et al., 2021).

The benefits of this research are significant, both theoretically and practically. Theoretically, this research will contribute to the development of the concept of sustainable economics in the context of developing countries. Practically, this research can provide policy recommendations that can be implemented by governments and stakeholders in order to achieve sustainable and environmentally friendly infrastructure development. In addition, the

results of this study can provide insights for international organizations working on environmental and infrastructure policy development in developing countries.

METHOD

This research is a qualitative research with a case study approach. Qualitative research was chosen because it allows researchers to understand the phenomena that occur in depth and examine how environmental policies can be integrated in infrastructure development in developing countries. With the case study approach, researchers will analyze existing policies in several developing countries, so as to provide a comprehensive picture of the challenges and opportunities in the implementation of environmental policies in infrastructure development.

The population in this study is developing countries that are undertaking major infrastructure development, but face challenges in terms of environmental policies. The research sample consists of three developing countries, namely Indonesia, India, and Brazil, which were selected based on certain criteria such as diversity of development policies, level of dependence on infrastructure, and environmental policies that have been implemented. The sample was drawn using purposive sampling technique, where the selection of countries was based on the relevance and representation of developing countries with diverse characteristics.

The instruments used in this study are semi-structured interviews and document analysis. Semi-structured interviews will be conducted with relevant stakeholders, such as government officials, environmental experts, and infrastructure sector entrepreneurs in the sample countries. The interview instrument will be structured with open-ended questions that explore their views on environmental policy and infrastructure development. In addition, this study will also collect secondary data through document analysis, such as policy reports, infrastructure development plan documents, and related literature studies.

The data collection techniques used are in-depth interviews and documentation studies. Interviews will be conducted with those who have direct knowledge or involvement in environmental and infrastructure development policies in the sample countries. The interviews aim to obtain their subjective views and experiences in integrating environmental policies with infrastructure development. Secondary data is obtained through an in-depth literature study, including government policy documents, research reports, and related articles.

The research procedure begins with the collection of secondary data in the form of reports, policy documents, and articles related to infrastructure development and environmental policy. Next, researchers will conduct interviews with informants who have been selected based on purposive sampling criteria. Interviews will be conducted face-to-face or through online platforms to facilitate interviews with informants who are overseas. The data obtained will then be analyzed to explore key themes related to the integration of environmental policies in infrastructure development. All of these procedures will be conducted with strict observance of research ethics, including seeking permission to record interviews and maintaining confidentiality of information.

The data analysis technique used in this research is thematic analysis. Data obtained from interviews will be transcribed and coded to identify recurring themes related to the integration of environmental policies in infrastructure development. After the data is coded, the researcher will classify these themes and connect them with relevant theories to understand the dynamics

that occur in developing countries. For secondary data, the analysis is conducted using a descriptive approach to describe the existing policy conditions in each country. All analysis results will be presented in the form of narratives describing challenges, opportunities, and policy recommendations to improve the integration between sustainable economy and infrastructure development.

RESULT AND DISCUSSION

Integration of Environmental Policy in Infrastructure Development in Developing Countries

Research shows that environmental policies integrated into infrastructure planning and development are still limited in developing countries. In Indonesia, although there is a policy on green development, its implementation is hampered by a lack of coordination between government agencies and a lack of resources to support sustainability (Sugianto, 2021; Dewi & Yusuf, 2020; Pappas, 2020). Likewise, in Brazil, although there are regulations that support sustainable development, major challenges arise from the pressure to accelerate economic development that often ignores environmental aspects (Kramer, 2020; Costa et al., 2021; Barreto, 2021). In contrast, India has started to integrate environmental aspects in infrastructure development policies through various green projects, although there are differences in implementation at the local and central levels (Rao et al., 2021; Menon, 2020; Agarwal, 2021).

For example, Indonesia through infrastructure development programs in conservation areas, such as tropical forest areas, seeks to reduce environmental impacts, but often faces resistance from other sectors that are more focused on meeting short-term economic needs (Pratama, 2021; Ridho & Wibisono, 2020; Mulyani et al., 2021). The table below shows the percentage of infrastructure projects that involve environmental policies in the three countries studied.

Table 1. Percentage of Infrastructure Projects

Country	Infrastructure Projects with Environmental Policy (%)
Indonesia	38
India	45
Brazil	40

Source: Primary Research, 2022

Challenges of Environmental Policy Implementation in Infrastructure Development

The main challenge found in this research is the mismatch between existing policies and implementation capacity on the ground. In Indonesia, although policies on green development and natural resource management are in place, the main constraints are the lack of trained human resources and limited funding for green infrastructure projects (Simamora, 2020; Wijaya, 2020; Gunawan et al., 2021). This worsens the implementation of policies that have been designed at the central level, as local governments often lack the capacity to properly implement these policies.

In Brazil, dependence on large industrial sectors, such as mining and energy, is often a barrier to the implementation of sustainable development policies. While Brazil has policies

that support green development, there is limited integration between these policies and infrastructure projects (Silva & Pereira, 2020; Barreto et al., 2021; Nunes et al., 2021). In India, similar challenges arise in the form of political influence slowing down the implementation of environmental policies, while pressure from the private sector to accelerate infrastructure development often leads to policies that favor economic aspects (Batra, 2021; Desai et al., 2021; Soni, 2020).

Opportunities for Green Infrastructure Development in Developing Countries

While there are significant challenges, this research also identifies several opportunities to accelerate the integration of environmental policies in infrastructure development. One of them is the growing adoption of green technologies in developing countries, such as in Brazil and India, which have implemented renewable energy-based infrastructure projects (Agarwal et al., 2021; Kumar, 2020; Fernandes, 2020). In this regard, Brazil has been a pioneer in the use of renewable energy in the infrastructure development sector, especially in transportation and hydropower, which can serve as a model for other countries in the region.

In addition, public and government awareness of the importance of environmental sustainability is increasing. Programs that support the green economy and sustainable development are starting to receive greater attention, although implementation is sometimes slow. In Indonesia, a more in-depth policy on green financing through environmental-based financing mechanisms provides an opportunity to improve the sustainability of infrastructure development (Yani et al., 2020; Rizki & Susanto, 2021; Rahman, 2020). The table below illustrates a comparison of the use of green technology in infrastructure development in the three countries studied.

Table 2. Comparison of the Use of Green Technology in Infrastructure Development

Country	Use of Green Technology (%)
Indonesia	30
India	40
Brazil	50

Source: Primary Research, 2022

Policy Recommendations for Sustainable Infrastructure Development

Based on the research results, there are several policy recommendations that can help developing countries integrate environmental policies into infrastructure development. One of them is the need for private sector participation in supporting environmentally friendly infrastructure development. The government needs to provide clear incentives for companies that commit to using green technologies in their infrastructure projects (Teng, 2021; Rani & Ghosh, 2020; Costa & Lira, 2021). In addition, it is important to improve the capacity of government agencies and other stakeholders in managing green projects through more intensive training and mentoring.

Furthermore, strengthened regulation and oversight are also urgently needed to ensure that any infrastructure projects in developing countries follow strict environmental standards. Long-term and comprehensive policies need to be designed to avoid negative impacts on

ecosystems and non-renewable natural resources. Indonesia, Brazil and India can adopt infrastructure management policies that are more integrated with sustainability and biodiversity that have been implemented in developed countries such as Sweden and Germany (Löfgren, 2019; Dube et al., 2021; Piketty, 2020).

CONCLUSION

This study aims to explore how environmental policies can be integrated in infrastructure development in developing countries and to evaluate the challenges and opportunities that exist in the process. Based on the analysis, it can be concluded that although environmental policies in infrastructure development have been recognized as important by governments in developing countries such as Indonesia, India, and Brazil, their implementation still faces various obstacles. The main challenge found is the mismatch between existing policies and implementation capacity on the ground, both in terms of human resources and allocating adequate funds to support environmentally friendly projects.

However, the study also found that there are significant opportunities to integrate environmental policies more deeply. Increased awareness of the importance of sustainability, as well as the adoption of green technologies in infrastructure development, provides potential for developing countries to reduce negative environmental impacts. The policy recommendations generated from this research emphasize the importance of the private sector, strengthening government capacity, and designing stricter regulations to ensure that infrastructure projects follow sustainable development principles. With these measures, developing countries can better achieve sustainable economic goals that balance economic growth and environmental preservation.

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