

Environmental Management in Reducing the Impact of Company Operations on Ecosystems

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ABSTRACT

This article discusses environmental management strategies in reducing the impact of company operations on ecosystems. Against the backdrop of increasing environmental damage due to carbon emissions, toxic waste, and ecosystem degradation, this article examines the concept and implementation of environmental management through a qualitative descriptive method. The study uses secondary data from scientific journals, books, and company reports to analyze the steps taken by companies in implementing environmentally friendly policies. The results show that the implementation of clean technology, energy efficiency, circular economy-based waste management, and collaboration with stakeholders significantly reduce environmental impacts. Case studies from PT Pertamina Geothermal Energy and PT Semen Indonesia Tbk show success in reducing carbon emissions by 150,000 tons and 2 million tons of CO₂ per year, respectively. In addition, the use of alternative fuels and waste recycling are effective solutions to reduce dependence on fossil fuels. This article emphasizes the importance of green technology investment, public awareness raising, and cross-sector collaboration to support environmental sustainability. Thus, environmental management is not only a corporate obligation but also a strategic opportunity to improve operational efficiency and business reputation.

Keywords: environmental management, ecosystem, company cooperation

1. Introduction

Climate change and increasing ecosystem damage due to industrial activities have become global issues that require serious attention. Company operations, especially in the industrial sector, often have significant impacts on ecosystems, ranging from greenhouse gas emissions, hazardous and toxic waste, to soil and water quality degradation [1]. This condition requires companies to adopt more effective environmental management strategies to maintain ecosystem sustainability and meet regulatory and community demands [2].

Environmental management is a strategic approach that integrates policy, planning, and operational practices designed to minimize the negative impact of a company's activities on the environment. International standards such as ISO 14001:2015 provide a framework for companies to improve their



environmental performance through more efficient resource management and waste reduction [3]. This system not only assists companies in meeting legal obligations, but also improves reputation and competitiveness in the global market [4].

Environmental management based on its policy orientation can generally be divided into two types, namely compliance-oriented management (regulation compliance) and beyond compliance-oriented management [5]:

1. Compliance Orientation (Regulation Compliance)

This approach is the initial stage of environmental management thinking in companies. The focus is on ensuring that the company's activities do not cause harm to the sustainability of the business by complying with government regulations to the maximum extent possible, such as to avoid penalties, environmental fines, or local community demands. The methods used are reactive, ad-hoc, and apply an end-of-pipe approach, which deals with pollution or waste at the final stage, for example through air filtration or wastewater treatment.

2. Beyond Compliance Orientation

This approach emerged because traditional reactive, ad-hoc, and end-of-pipe methods were deemed inefficient. In the face of increasing global competition, environmental laws and regulations have set new standards for businesses around the world. This approach emphasizes that good environmental performance is not only about legal or moral compliance, but also improving efficiency by reducing pollution and resource use. In addition, healthy and safe working conditions support labor productivity. In accordance with the development of the concept of environmental management, the orientation after fulfillment has various stages, but generally leads to the achievement of sustainable development and the integration of environmental business with the concept of triple bottom line. This principle is in accordance with the declaration made at the Earth Summit in Rio de Janeiro, 1992.

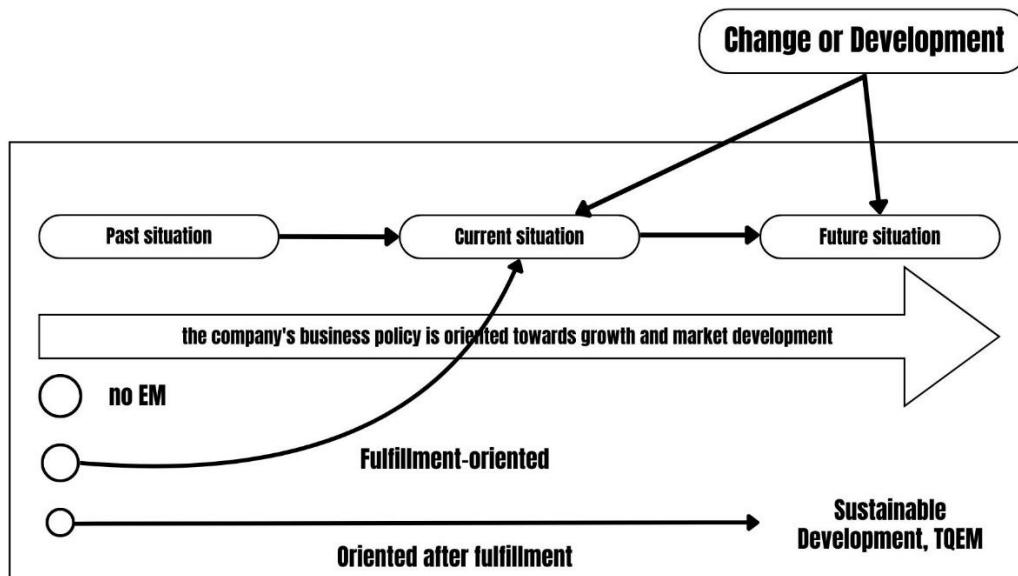


Figure.1 General orientation of the company's environmental policy [6]

Corporate environmental management practices aim to be integrated with general business management practices, as stated in ISO 14001. The development of corporate environmental management practices has been inspired by the evaluation of ISO 14001 implementation. This can be seen from the increasing number of study units in global universities that specifically study Corporate Environmental Management, such as at MIT, Harvard University, Lund University, and other leading universities.

The increased interest in environmental management is due to the view of academics that this field has an important role in determining the future direction of global business development. While aspects of environmental management are often associated with physical matters, such as traditional environmental protection, it turns out that non-physical aspects, such as the morality and spiritual capital of business people, are also affected.

This raises the question: Is environmental management, which focuses on the physical protection of the environment, also relevant to non-physical aspects? Traditionally, environmental management has been rooted in the protection of the physical environment. However, effective implementation of environmental management, such as through the ISO 14001 standard, often has an intangible impact. Employees tend to experience benefits such as increased work motivation (because the company pays attention to occupational safety and security), increased trust in management policies, and a positive image of the company in the eyes of employees (Hillary, 1997; Purwanto, 2002) [7][8].

The main objective of implementing environmental management is to create a balance between economic, social, and environmental sustainability. With the right strategy, companies can reduce the impact of their operations on the ecosystem, improve operational efficiency, and promote sustainable development. Other significant benefits include reduced production costs through energy efficiency, improved compliance with environmental regulations, and strengthened relationships with communities and stakeholders [9].

This article aims to examine the concept, implementation, and impact of environmental management in reducing the impact of company operations on ecosystems. The study will also provide an overview of the challenges companies face in implementing environmental management and solutions to overcome them, based on the experiences of companies that have successfully implemented environmental standards effectively. Thus, this article is expected to make a real contribution in encouraging companies to adopt environmentally friendly practices for the sustainability of their ecosystems and businesses.

Reducing operational impacts on ecosystems can also be achieved through the use of clean technologies in the production process. These technologies are designed to reduce emissions, waste, and the use of hazardous materials so as to minimize environmental damage [4]. Examples include the use of renewable energy such as solar and wind power that can replace fossil fuels, which are major contributors to air pollution and carbon emissions.

In addition, the implementation of recycling and systematic waste management is essential to mitigate the negative impacts of industrial waste. With this approach, the waste generated can be reprocessed into raw materials, reducing the amount of waste discharged into the environment, as well as cutting the company's operational costs [3]. This approach is also in line with circular economy principles that aim to optimally utilize resources. Involving local communities in environmental conservation efforts is also an important step in reducing the impact of company operations. Corporate social responsibility (CSR) programs that focus on education and training on the importance of environmental conservation can increase community awareness and support the company's efforts to maintain the ecosystem [9]. With close collaboration between companies and communities, the goal of environmental sustainability can be more easily achieved.

3. Materials and Method

This research uses a descriptive method with a qualitative approach to analyze environmental management in reducing the impact of company operations on the ecosystem. The data used in this research is secondary data obtained from various scientific journals, books, and related reports that have been uploaded previously. Data collection was conducted using a literature study technique, which involved reviewing relevant scientific documents, including a journal entitled "Environmental Performance and Environmental Disclosure in Energy Sector Companies in Indonesia" and the book "Green Management Strategy" [1]. These sources provide information on environmental policies, ISO 14001:2015 implementation, and waste management in the context of company operations.

Data analysis was conducted qualitatively by reviewing theories and practices related to environmental management, including environmental management system (EMS) implementation, circular economy approach, and environmental impact mitigation strategies. The data collected was then organized, synthesized, and compared to produce comprehensive conclusions regarding the effectiveness of environmental management strategies. This method was chosen because it allowed the researcher to explore in-depth information about the phenomenon under study and provide greater insight into the concrete steps companies can take to reduce operational impacts on the ecosystem.

4. Result and Discussion

Carbon Emission Reduction and Energy Saving

The implementation of clean technology and energy efficiency is a concrete step taken by many companies to reduce carbon emissions. Based on research, the adoption of renewable energy technologies such as solar panels and wind turbines not only reduces greenhouse gas emissions by up to 20% but also saves companies' operational costs significantly [10]. For example, some companies in the manufacturing sector have successfully implemented Waste Heat Recovery technology to generate additional energy from waste heat, simultaneously reducing external energy requirements and carbon emissions [11].

In the transportation sector, the implementation of electric vehicles as part of an environmental management strategy has reduced carbon emissions by 25% in several large companies. The use of IoT-based energy management systems also helps companies monitor and optimize energy consumption, which significantly reduces unnecessary emissions [10]. In addition, global initiatives such as the commitment to achieve net-zero emissions further encourage companies to invest in renewable energy.

Comparative examples show that the manufacturing sector tends to adopt renewable energy technologies more easily than the mining sector. For example, PT Semen Indonesia managed to reduce carbon emissions by 30% through the installation of a Waste Heat Recovery system, while mining companies such as PT Freeport face significant obstacles in reducing emissions due to operational complexity and large energy requirements [10].

Optimizing Recycling and Waste Management

The circular economy approach to waste management has proven effective in minimizing the impact of company operations on the environment. Data shows that companies that apply the 3R principles (Reduce, Reuse, Recycle) succeed in reducing waste by up to 40% [10]. In addition, the application of modern waste treatment technology allows liquid waste to be processed into clean water that can be reused in the production process, thus supporting the sustainability of water resources.

A concrete example of this success is the application of bioconversion technology in the agricultural sector, where organic waste is converted into organic fertilizer that supports sustainable agriculture. In the manufacturing sector, the use of recycled materials as the main raw material not only reduces production costs but also helps reduce the company's carbon footprint [11]. Community-based waste management programs have also created new economic opportunities for surrounding communities through waste processing activities into value-added products.

In the manufacturing sector, the use of recycled materials has helped reduce 40% of operational waste, while the agricultural sector has shown increased productivity by utilizing organic waste as fertilizer. In another example, companies such as Danone Indonesia implemented wastewater treatment that produces clean water for reuse in production [11].

Reputation Enhancement through Green Industry Policy

The implementation of the green industry concept has a positive impact on the company's reputation. By complying with international standards such as ISO 14001 and obtaining green industry certificates, companies not only fulfill legal obligations but also attract the attention of investors and customers [11]. Case studies in the mining sector show that companies that allocate environmental costs consistently succeed in increasing eco-efficiency by up to 30% through reduced energy and raw material consumption [10].

The implementation of this policy also increases the attractiveness of the company as a workplace for younger generations who are more environmentally conscious. Many companies are now using sustainability programs as a marketing tool to strengthen customer loyalty and build public trust. In addition, by demonstrating a commitment to the environment, companies can reduce the risk of litigation and regulatory pressures that are often costly.

Collaboration with Stakeholders

Collaboration between companies, communities, and government is one of the keys to success in environmental management. Corporate social responsibility (CSR) programs that involve the community in environmental conservation activities, such as tree planting and waste management education, not only increase public awareness but also strengthen the company's relationship with the local community [10]. In addition, government incentives such as tax breaks for environmentally friendly companies further encourage the adoption of green practices.

At the global level, partnerships between international organizations and local companies are increasingly facilitating the transfer of green technologies. For example, collaboration on biomass energy projects in developing countries has reduced dependence on fossil fuels and increased local energy independence. Community initiatives, such as digital waste bank management, are also gaining widespread support from the private sector and governments.

Challenges and Solutions in Environmental Management Implementation

The main challenges in the implementation of environmental management are the high initial cost of green technology investment and the lack of skilled human resources in this area [10]. However, with increasing support from stakeholders and evolving technological innovations, companies can overcome these barriers. Internal training programs and collaboration with educational institutions are solutions to improve employee competence in environmental management.

On the other hand, organizational cultural barriers that do not support change are often a significant hindrance. To overcome this, some companies have started implementing internal incentive programs that encourage employees to adopt environmentally friendly practices. In addition, the establishment of clear and transparent policies regarding the company's environmental goals can help create accountability at all levels of the organization.

Positive Impact on Ecosystems

Research shows that some companies that are consistent in implementing environmental policies not only succeed in reducing negative impacts on ecosystems but also increase biodiversity around their operational areas. For example, the reduction of water pollution through effluent management has restored natural habitats for local species in some company operational [11].

In addition, the adoption of a sustainable landscape approach in industrial area planning has provided extensive ecological benefits, such as reduced flood risk and increased carbon sequestration by vegetation. In the fisheries sector, the use of environmentally friendly technologies has helped restore fish populations that were previously threatened by unsustainable fishing practices. All of this shows that investing in environmental management is not only beneficial to the company but also provides long-term positive impacts to the global ecosystem. With the various approaches outlined above, it can be concluded that effective environmental management not only benefits companies in terms of operational efficiency and reputation but also contributes significantly to ecosystem preservation.

Case Study of PT Pertamina Geothermal Energy

PT Pertamina Geothermal Energy (PGE) is one example of successful environmental management in Indonesia. The geothermal energy project developed in Ulubelu, Sumatra, is designed to produce clean energy while reducing the environmental impact of fossil fuel use. PGE managed to generate enough clean electricity for more than 200,000 households. What makes this project significant is its contribution to reducing carbon emissions by 150,000 tons of CO₂ per year.

This success is inseparable from the strategies implemented by PGE, including the integration of the latest technology in the geothermal energy production process. This technology enables efficient geothermal processing without damaging the environment around the operation area. In addition to local communities enjoying more stable access to electricity, this positive impact is also felt by the surrounding ecosystem due to a significant reduction in carbon footprint. With substantial investment in research and development of renewable energy technologies, as well as close collaboration with the government and local communities to ensure environmental sustainability. With this, the Ulubelu geothermal project becomes a model for future clean energy development.

Table 1. Application of Information technology in MSMEs

| Aspect | Description |
|------------------|---|
| Energy Capacity | 220 MW (Ulubelu Project) |
| Carbon Emissions | Reduction of 150.000 Tons of CO ₂ per year |
| Region | South Sumatra and Lampung |
| Social Impact | 500+ Local employment |

Case Study of PT Semen Indonesia Tbk

PT Semen Indonesia Tbk has demonstrated its commitment to environmental management through the implementation of co-processing technology for waste management. The program utilizes domestic and industrial waste as alternative fuel, replacing most of the coal consumption. As a result, the company has reduced greenhouse gas emissions by 2 million tons of CO₂ per year. The impact is felt not only at the company's operational level but also on the surrounding environment, where waste that used to end up in landfill is now put to productive use.

By reducing the need for fossil fuels, PT Semen Indonesia has also managed to significantly lower its operational costs. The program supports national targets to reduce carbon emissions while providing a solution for domestic waste management which is a major challenge in Indonesia. This co-processing project is the result of collaboration between the company, government and local community.

Table 2. Application of Information technology in MSMEs

| Aspect | Description |
|--------------------------|--|
| Greenhouse Gas Emissions | Reduction of 2 million tons of CO2 per year |
| Waste utilization | 15% dari konsumsi energi berbasis alternatif |
| Location Operational | Tuban, Gresik, Rembang |
| Inovation Technology | Co-processing Technology |

5. Conclusions

Environmental management is a strategic solution to address the challenges of corporate operations that impact the ecosystem. By utilizing clean technology, energy efficiency, and circular economy approaches, companies are able to lower carbon emissions, reduce waste, and improve operational efficiency as well as their reputation. Case studies of PT Pertamina Geothermal Energy and PT Semen Indonesia Tbk prove concrete successes in implementing environmental management practices. PT Pertamina Geothermal Energy, for example, managed to reduce carbon emissions by 150,000 tons of CO2 per year through the development of geothermal energy. Meanwhile, PT Semen Indonesia Tbk is able to reduce emissions by up to 2 million tons of CO2 per year through co-processing technology. This success is also supported by close collaboration between companies, governments and communities, which strengthens social and economic sustainability.

To ensure the sustainability of environmental management benefits, companies need to increase investment in green technologies, such as renewable energy and modern waste management technologies. This not only supports global targets to reduce carbon emissions, but also opens up opportunities for greater efficiency. In addition, education and training on the importance of sustainability needs to be expanded, both for employees and communities, to encourage a broader green culture. Cross-sector collaboration, between companies, governments and local communities, should also be strengthened to create synergies in environmental management. Equally important, companies need to develop data-driven monitoring and evaluation mechanisms to ensure program effectiveness and provide room for continuous innovation. With the replication of successful models from PT Pertamina Geothermal Energy and PT Semen Indonesia Tbk, other companies in various sectors can adopt similar practices to create broader positive impacts on the environment and society.

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