The Development Of The Eco-Industrial Park Concept In Gasing Industrial Estate, Banyuasin Regency, South Sumatra

by Memed Sueb

Submission date: 20-Sep-2022 10:21AM (UTC+0700)
Submission ID: 1904204206
File name: The_Eco-Industrial_Park_Concept_In_Gasing_Industrial_Estate.pdf (3.71M)
Word count: 5628
Character count: 33987

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THE DEVELOPMENT OF THE ECO-INDUSTRIAL PARK CONCEPT IN GASING INDUSTRIAL ESTATE, BANYUASIN REGENCY, SOUTH SUMATRA

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Abstract

The objective of this research was to develop the concept of Eco-Industrial Park (EIP) which is applicable in Gasing Industrial Estate (GIE), Banyuasin Regency, South Sumatra. In order to achieve the objective, it required an evaluation of the current conditions in the GIE, namely: the general state of location, the socialand community around the industrial area, and the existing industries; as well as the evaluation of the adequacy of GIE towards the development of EIP concept. The scope of the research aspects was synchronized with two important aspects for the development of the concept of EIP, namely fundamental principles of EIP and the conformity criteria of the EIP. The method used was a combination of qualitative and quantitative methods. Qualitative methods were used to analyze the current condition of the industrial area, to study the potential and quality of waste, to study the conformity of GIE towards the EIP concept, as well as the study of the pattern of inter-industry linkages.

On the other hand, Quantitative methods were used to obtain answers from the results of questionnaires with key informants for Prospective Analysis. The results of Gap Analysis showed that there are still many inadequacies of GIE to be a more environmentally oriented industrial area. Of the three indicators used by the conformity criteria of EIP, much improvement is still needed in order to utterly implement the concept of EIP in the area. Based on the results of Prospective Analysis, there were five determinant factors to develop the EIP concept in GIE, namely: the integration of industrial activities with the environment, the application of symbiotic mutualism among industries, the development of water infrastructure, application of more informative management, as well as, the application of the concept of green design in infrastructure development. The development of an integrated strategy of GIE can only be executed if there are good cooperation and harmonious relationship among industries in the region, as well as between industries, governments, and local communities around the industrial area.

Keywords: Gasing industrial estate, Eco-industrial park concept, Integrated strategy, Development of an industrial park.

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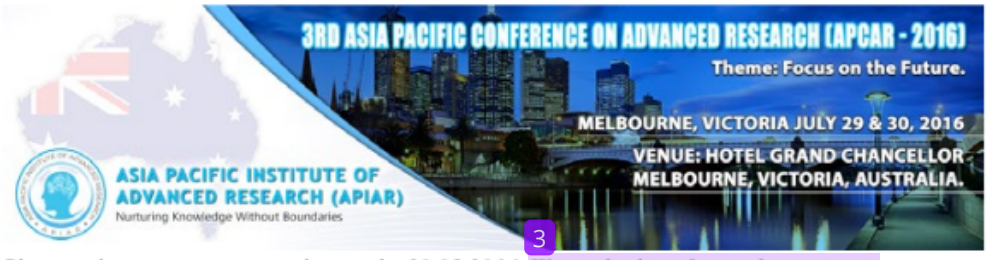

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1. INTRODUCTION

The application of industrial clusters is expected to be a means of transportation for the development of industrial activities towards a more competitive and environmentally friendly direction by the principles of industrial ecology, especially in facing globalization and international competition. An industrial cluster is an industrial area on a large land area suitable for industrial activities, controlled by an institution that is suitable for industrial activities, because of its precise location, availability of infrastructure, and easy access to transportation. Industrial activities in this area consist of various types of industries that form a business network that aims to encourage economic growth (National Industrial Zoning Committee's USA, 1967).

According to Porter (2000), the business network in this inter-company cluster can consist of suppliers of specific raw materials and inputs, or expansion downstream to markets or exporters. The business network of a cluster in this sense also includes government agencies, business associations, service providers, and other institutions that support companies in the region in fields such as research and vocational training. Marshall (1919) in Chakravorty et al. (2003) stated that there will be many benefits from the gathering of companies in a certain geographic space. The characteristics of these benefits are not enjoyed individually and on a micro-level by a company, but also by other companies. Benefits like this are often referred to as economies of localization (Hartarto, 2004).

The concept of sustainable development (sustainable development) provides demands for the industrial world to contribute to achieving a harmonious and mutually beneficial relationship between industrial activities and the surrounding environment. The concept of an industrial ecological area (Eco-Industrial Park) is an industrial response to changes in the global environment. EIP is defined as an industrial system that plans an exchange of materials and energy to minimize the use of energy and raw materials, minimize waste and waste, and ultimately be able to build an ecologically and socially sustainable economy (Lowe, 2001). In the formulation of the concept, several problems that need to be solved are: 1) What is the current condition in the Gasing Industrial Area, which includes the general condition of the location, the industries in it, as well as the supporting infrastructure for industrial activities; 2) Is the Gasing Industrial Area suitable to become an Eco-Industrial Park, and 3) How is the right Eco-Industrial Park concept applied to the Gasing Industrial Area.

2. LITERATURE REVIEW

The industry is an economic activity that processes raw materials, raw materials, semi-finished goods, or finished goods into goods of a higher value for its users, including industrial designs and engineering activities. According to

Law Number 5 of 1984 concerning the industry, the main objective of this activity is to increase the prosperity and welfare of the people fairly and equitably by utilizing funds, natural resources, cultivation products, and taking into account the balance and preservation of the environment. The relatively fast development of the industrial world is the main reason for the opening of industrial estates in certain areas in Indonesia.

According to Djojodiputro (1992), an industrial estate is a plot of land with an area of several hundred hectares which has been divided into lots with different areas according to the wishes of entrepreneurs. The area is at least equipped with roads between plots, sewage drains, integrated Waste Treatment Plant (IPAL) units, and electrical substations that are large enough to accommodate the needs of entrepreneurs who are expected to be located in that place. The development of industrial estates according to Presidential Decree No. 14/1996 aims to control space utilization, accelerate industrial growth in the regions, provide convenience for industrial activities, encourage industrial activities to be located in environmental areas. The creation of industrial areas aims to build industries in the regions in order to increase regional attractiveness to accelerate regional development and optimize the role of regional development in economic development.

Eco-Industry Park (EIP) is an evolution of the existing industrial estate concept. The concept of industrial estates, which has been widely known so far, is only a collection of industries that have almost no connection in terms of environmental management and does not pay too much attention to environmental concepts in development. The development of the co-location concept made the old concept in an industrial area which was only a collection of industries in the same area no longer valid. EIP is an industrial area concept that is directed at the exchange of material and energy from many companies located in one area to achieve economic goals (Saikku, 2006). According to Lowe (2001), the concept of EIP has two meanings, first, EIP is a business community that collaborates by involving the surrounding community to make more efficient use of resources, such as information, materials, energy, water, and natural habitats, as well as improving human resources for business interests and the surrounding community; second is that EIP is an industrial system that designs the exchange of materials and energy so that the use of energy and raw materials, as well as waste and waste, can be reduced to build a sustainable economic concept.

According to Cote and Cohen-Rosenthal (1998), EIP can be assumed as a community that functions in a particular activity which adheres to the principles of cooperation, interaction, and efficiency in the use of natural resources to preserve the surrounding environment so that the impact on the environment due to industrial activities can be minimized. Relationships that were never previously imagined in the management of industrial estates can occur in the application of

this concept. Apart from the various types it has, EIP also has differences from other industrial areas. According to Fleig (2000), the real difference between EIP and ordinary industrial areas is a significant development indicated by the high level of cooperation or local policies in the area around EIP, as well as an increase in the performance of business actors in EIP to realize a clear vision, namely achieving sustainability in the economic, social and environmental fields.

The concept of industrial ecology appears to change the paradigm which states that the industrial system is a linear system that is different when compared to nature which is a cycle. This concept attempts to look at how to realize that an industrial system should be one of the patterns in the cycle. According to Allenby (1999), to create an industry which is a cycle, there is no need for special or inherent things that must be done in the application of material management functions and various recycling systems from an industrial sector, all of which can be adjusted to the conditions of the system at hand, and the concept industrial ecology tries to help make it happen. Industrial ecology is an approach based on industrial systems and ecological principles that integrates aspects of production with consumption by the designs, benefits, or uses of products that not only can minimize the impact on the environment but can also optimize the use of natural resources, energy, and capital. The most ideal industrial ecology concept is a balance between the flow of energy and materials through several stages, the use of waste from one industry to be used as raw material or materials for other industries, and maximizing the use of energy more efficiently (Manahan, 1999). This concept implies that a system that is separate from the existing system in order to find a way to optimize the material cycle (material cycle) and pure materials, end products, production components, waste to final sales (Allenby, 1999).

Industrial ecology is a study that uses a systematic approach in its studies to integrate industrial systems and natural systems and to find ways to redesign these industrial systems. This concept is a concept for implementing sustainable development that discusses industrial systems, economic activities, and the fundamental relationship with natural systems. The concept of industrial ecology contains key elements, namely: biological analogies, the use of systems perspective, the role of technological change, the role of companies/industries, dematerialization and eco-efficiency, future-oriented research, and applications (Jelinski and Graedel, 2002).

In addition, there are several strategies to implement the industrial ecology concept known as the four elements, namely: 1) optimizing the use of existing resources; 2) creating a closed material cycle and minimize emissions; 3) dematerialization process; and 4) reduction and elimination of dependence on non-renewable energy sources (Erkman and Ramesh, 2000 in Swantomo et al; 2007). According to Swantomo et al, (2007), industrial ecology offers solutions to

create sustainable and environmentally friendly industrial development. In this concept, industrial estates are arranged in such a way that industries have a symbiotic mutualism relationship, meaning that industries in the same area must be connected to each other to increase productivity and the efficiency of their production processes.

The concept of industrial ecology as a study that combines physical, chemical, and biological interactions between industrial systems and natural or ecological systems can be applied through EIP. In other words, EIP is an application of the concept of industrial ecology which has been widely recognized. According to Salonen (2005), industrial ecology can be used as a concept in EIP management through the good implementation of the four strategic concepts of industrial ecology. EIP as an application of industrial ecology is an industrial system in which there is a planned exchange of materials and energy and seeks to reduce the use of raw materials and energy, reduce waste, and build a sustainable relationship between economy, society, and environment (Korhone, 2004).

3. RESEARCH METHODS

The research was conducted in Gasing Industrial Area, Gasing Village, Talang Kelapa District, Banyuasin Regency, South Sumatra Province. Determination of the location was based on the suitability of the research objectives (purposive sampling) and with the consideration that this industrial area is the right area for the application of the concept of an environmentally friendly industrial area in South Sumatra Province.

The research method used was a combination of qualitative and quantitative methods. Qualitative methods were used to analyse the current conditions of industrial estates, study the potential and quality of waste in industrial areas, study the potential and quality of waste in industrial areas, study the suitability of industrial areas towards the EIP concept, and study inter-industry linkage patterns. The quantitative method was used to obtain answers from the questionnaires that were given to the key information for Prospective Analysis.

The data used were primary data and secondary data. All preliminary data for this study were obtained by interview techniques and questionnaires completion to predetermined informants. The interview technique used was a semi-structured interview using a list of questions whose contents represent the existing conditions of the industrial area at this time as well as environmental problems associated with existing industrial activities.

The technique of determining informants to obtain information about industrial estates used the expert judgment method. Informants were selected based on competence and representation of stakeholders who influence the management of industrial estates, namely the local government agencies of

Banyuasin Regency and South Sumatra Province, such as the Regional Planning and Development Agency, the Regional Environmental Agency, the Office of Small and Medium Enterprises, Industry, and Trade, Gasing Village Officials, Talang Kelapa District, community leaders, industry practitioners, related businessmen, academics, and other relevant agencies that are directly related and concerned with the development of the Gasing Industrial Area. Data collection techniques were field observations, interviews, and questionnaires with key informants, and literature study. The data analysis method implemented: a) descriptive analysis; b) gap analysis; c) analysis of linkages between industries; and d) prospective analysis.

4. IMPLEMENTATION OF ECO-INDUSTRIAL PARK CONCEPT OF GASING INDUSTRIAL AREA

4.1 Current Conditions in the Gasing Industrial Area

The current conditions in the KIG area are currently at an early stage towards further development. Industries that have carried out investment activities in this area are the palm oil industry (Crude Palm Oil), the rubber industry (crumb rubber), the processed food/instant noodle industry, the concrete mixing industry, the furniture industry, the rice milling industry, and the paper and cardboard packaging industry. In addition, several potential investors are preparing the land to develop their industrial activities. Of the entire industries in KIG, five industries were the objects of this research.

The industries in KIG have various characteristics considering that this industrial area is indeed a manufacturing industrial area. According to the Eco-Industrial Park concept, the relationships between industries in one area will be very influential in developing this concept into a more environmentally friendly industrial estate management plan. This relationship, known as mutualism symbiosis between industries, is one of the fundamental principles for the development of the EIP concept in one area (Boix et al., 2014).

An industrial symbiosis is a form of industrial cooperation that has a level of interdependence that mutually exchanges materials, energy, and various other elements that can provide mutual benefits (Jacobsen, 2006). The Industrial Estate in Kalundborg, Denmark is an example of an industrial area that has successfully applied this concept. Judging from the type of industrial area that is manufacturing, industrial symbiosis is expected to be a basic strategy towards EIP which can be applied in Gasing Industrial Area. To obtain an overview of the relationships that can be developed between industries in GIS, data on industry characteristics are needed.

4.2 Gasing Eco-Industrial Park Industrial Area

The area of the Gasing Industrial Estate is located in an area that is mostly still in the form of forest areas that have fairly dense vegetation with relatively the same canopy level, thus causing no detection of HC and Pb values in the air. According to Aji (2006), dense vegetation in residential and industrial areas will cause low pollutant values such as HC and Pb. The undetected HC and Pb concentrations are also due to the relatively high wind speed around the industrial site. Wind speed will affect the distribution of pollutants. The concentration of pollutants will be reduced if the wind at the pollution site is at high speed and distributes it horizontally or vertically (Sastrawijaya, 1991).

The results of the analysis of the dust parameter (TSP) for three different locations in three industries located in Gasing Village, Talang Kelapa District showed values ranging from 99.12 µg/Nm3 to 162.20 µg/Nm3. This result is far below the quality standard that has been set based on the applicable regulations, which is 230 µg/Nm3. The dust content in ambient air generally comes from incomplete fuel combustion processes and dust emissions from open land. Although according to Rouse (1975) in Aji (2006) that smoke coming out of industrial chimneys is mostly composed of solid matter known as particulate matter (dust) and gases, land cover in locations around industrial areas is still in the form of forests with dense vegetation that can cause low dust concentration (TSP) in ambient air.

4.3 The concept of Eco-Industrial Park, Gasing Industrial Area

Important or strategic factors need to be established to develop Gasing Industrial Estate (KIG) into an industrial area with an EIP concept management. These important factors are compiled based on the fundamental principles needed in developing an environmentally friendly industrial area. The important factors that will later become programmes that need to be carried out include: 1) integration of industrial activities with the environment, 2) application of non-renewable energy use, 3) application of industrial mutualism symbiosis, 4) development of water infrastructure to reduce external supply, 5) application of informative management, 6) application of green design concept in infrastructure development, and 7) embodiment of a sustainable community. The seven programmes are then analysed using a prospective analysis strategy to determine priority programmes that need to be developed in the future for GIS. Prioritization of the seven programmes is carried out using pre-determined justification from experts or key informants. These experts or key informants have been previously selected based on the representation of stakeholders who influence the management of industrial estates. These key informants consisted of local

government agencies of Banyuasin Regency, local village officials, as well as industry practitioners located in KIG.

The results of the analysis show that of the seven priority programmes, five key factors need to be developed and get serious attention in the framework of developing GIS. The five key factors are 1 (integration of industrial activities with the environment), 2 (application of industrial mutualism symbiosis), 3 (water infrastructure development), 4 (application of informative management), and 5 (application of green design concepts in infrastructure development).

5. CONCLUSIONS

Based on the analysis of the discussion of the research results, it can be concluded as follows:

1. Gasing Industrial Estate (KIG) is a strategic industrial area adjacent to Tanjung Api-api Port, Sultan Mahmud Badaruddin II International Airport, and is between two rivers (Sungai Gasing and Sungai Kenten). The absence of construction of supporting facilities for industrial activities including industrial estate management offices, fire fighting units, and other supporting facilities (polyclinics, religious facilities, sports facilities, and commercial facilities) indicates that this area is still at an early stage towards further development.
2. Based on the Gap Analysis, it is discovered that there are still many shortcomings of KIG to become an industrial area based on the EIP concept. Of the three indicators used based on the EIP adequacy criteria, many improvements are still needed from various aspects, such as institutions, production processes, or industrial activities, as well as an increase in the economic influence on the welfare of the communities around the area.
3. Based on the results of the Prospective Analysis, there are five determinants for developing KIG in a more environmentally friendly direction, namely: integration of industrial activities with the environment, application of mutualism symbiosis between industries, development of water infrastructure, application of informative management, and application of green design concepts in development. Infrastructure. The progressive-optimistic scenario is the right scenario choice to be applied to accelerate the development of KIG towards an environmentally friendly industrial area.

5.2. Suggestions

Based on the results of this study, it is recommended to conduct further analyses that are more quantitative in nature to test industrial estate management strategies, such as stakeholder needs analysis, EIP development cost analysis, and dynamic system analysis to develop environmentally sound industrial estate modelling.

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