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Alternative model extended producer responsibility waste products of fish canning industry the concept of green manufacturing and corporate social responsibility

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Abstract

Canned fish waste is a serious problem that must be addressed, because it can cause environmental pollutions. Alternative approach to Extended Producer Responsibility (EPR) with the concept of green manufacturing and Corporate Social Responsibility (CSR) is an alternative solution for these problems. The method used in this study is a survey method using data analysis Partial Least Square (PLS). Variables of the study include green manufacturing, CSR, collection of recyclables, recyclables processing, and cost EPR. The results showed a significant effect relationship towards green manufacturing at collection of recyclables, CSR significantly affects the collection of recyclables and not significant effect on recyclables processing, collection of recyclables significant effect on the recyclables processing as well as the cost EPR, and the recyclables processing significant effect on the cost EPR.

Introduction

Extended Producer Responsibility is a policy concept in promoting environmental improvement of products and product systems (Lindhqvist, 2000). Various models of the EPR has developed one of which was developed by Walls (2006) which states that a variable collection of recyclables and recyclables processing an influential factor in sewage treatment. One of the principles in the EPR program funding policy is to incorporate costs into the price of products EPR (Bury, 2010), internalization of environmental costs into product prices are consequently influence consumer behavior changes. Therefore producers should check their waste reduction strategy (Mckerlie *et al*., 2006). One strategy is the reduction of waste within the company through green manufacturing.

Green manufacturingas a production process that uses input with relatively low environmental impact, highly efficient, and produce little or no waste or pollution (Atlas and Florida, 1998). Application of green manufacturing fish canning industry can prevent and control pollution and destruction as stated in article 6 of law no. 23 of 1997 on environmental management. In addition to green manufacturing, the Corporate Social Responsibility (CSR) can result in cost savings environment (Garay and Font, 2011).

CSR is the commitment of the company or the business world to contribute to sustainable economic development with attention to corporate social responsibility and focus on the balance between attention to aspects of economic, social and environmental (Untung, 2009; Garay and Font, 2011). CSR goal is community empowerment aimed at the creation of an independent society (Untung, 2009). Indonesian government also requires companies to implement CSR programs to comply with article 14 and 15 of law no. 18 of 2008, article 74 of company law. Article 16 paragraph 1 of law no.23 of 1997 on environmental management requires the person in charge of any business or activity must carry out waste management operating results or activities. Whereas the implementation of CSR in the fish canning company in Banyuwangi based survey in the field has not been fully implemented by the company canning fish.

Handling and management of fish waste cans are still using concept 3R (reduce, reuse, recycle). 3R concept is the basis of efforts to reduce waste and optimize the production process waste bins (Suryanto et al., 2005 in Dwiyanto, 2011). 3R concept is also applied in the city of Magelang (Nugraha *et al*., 2007), Jakarta, Tangerang, Bekasi, Depok (Widodo and Susanto, 2009), Medan (Susilo, 2011), and Semarang (Dwiyanto, 2011).

Kind of an organic waste management, especially

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canned fish, if no treatment and management will have serious implications on the environment. Metals Sn and Fe which is a base metal packaging makers belong to the class of heavy metals, so if canned food products contaminated by this metal and The food consumed by humans can cause health problems (Zheng *et al*., 2007), gastrointestinal cancer (Türkdoğan *et al*., 2003), chronic poisoning (Julianti and Nurminah, 2006), and cancer (Widaningrum *et al*., 2007).

Identification in the field showed that tin shipments to the factory for recycling to reach 4-5 tons in a single post.While deliveries three times a month, so that averaged reach 12-15 tons per month. In the amount of waste cans for packing sardines for all brands of 12 existing fish canning company in Banyuwangi is only about 2% (9,600-12,000 cans) per month, because the factory does not want to receive more canned sardines for reasons still smells fishy and often packaged in cans of sardines found many caterpillars. Total number of fish canned fish canning company distributed by PT. Blambangan Food & Packers Indonesia last was in Banyuwangi at 985,500 cans per month difference between the number of cans recycled with cans of fish are distributed by the company at 975,500-973,500 cans per month, meaning that the difference in the number of cans that are greater that have not recycled by the manufacturer. The differences in canned fish is not recycled, will cause pollution to the environment.

Based on the above it is important to do research on alternative models of EPR by combining the concept of green manufacturing and CSR, in hopes of minimizing the cost of the EPR in garbage cans sardines and can comply with article 14 and 15 of law no. 18 of 2008, article 74 of company law and article 16 of law no. 23, 1997.

Methods

Measurement

Variable green manufacturing

This variableis formed by a measurement indicators using a 5-point likert scale. The indicator refers to the results of research Deif (2011), namely colour, environmentally improvement friendly, environmentally condition friendly.

Variable corporate social responsibility

This variable is formed by a measurement indicators using a 5-point likert scale. The indicator refers to the CSR activities of the triple bottom line, which is a social spec, a spec economy, and a specification environment (Wahyudi and Azeri, 2008; Untung, 2009)

Variable collection of recyclables

This variable is formed by a measurement indicators using a 5-point likert scale. While the indicators in this study include: incentive finance, comfort or inconvenience, information and consciousness (Lindhqvist, 2000).

Variable recyclables processing

This variable is formed by a measurement indicators using a 5-point likert scale. Indicators of net production refers to Hidayat *et al.* (2009), namely clean, cheap, smart, and cooperative.

Variable cost EPR

This variable is formed by a measurement indicator using a 5-point likert scale. Indicator cost EPR refer to the reference Bury (2010), the selling price of the product.

Data collection

The data collected in this study included primary data and secondary data on 11 fish canning company in Banyuwangi. Primary data is used to analyze the effect of variable green manufacturing, CSR, collection of recyclables, recyclables processing, and cost EPR by using a 5-point likert scale. Secondary data used to describe the general state of the research area and to describe the condition of the fish canning industry enterprises in Banyuwangi.

Analysis

The method used in this study is a survey method using data analysis Partial Least Square (PLS). Ghozali (2008) suggests PLS is distribution free approach (do not assume a particular distribution of data, can be nominal, category, ordinal, interval and ratio) and PLS is a powerful method of analysis because it is not based on many assumptions, small sample size and distribution residul. Although PLS can also be used to confirm the theory, but also to explain the relationship between latent variables.

Hypothesis

Research hypothesis to be proved based on the conclusion of several previous studies as has been discussed earlier and shown in Figure 1. Green manufacturing can provide an opportunity for cost reduction, meet environmental standards, and improving corporate image (Atlas and Forida, 1998). Lindhqvist (2000) developed the concept of EPR as a policy principle to promote environmental improvement of products and product systems, and identify possible approaches to key issues in implementation of EPR. McKerlie *et al.* (2006)

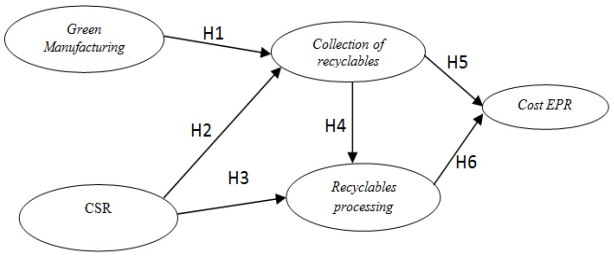

Figure 1. Conceptual framework

ature core of policy EPR is that they put some of the responsibility for the end-of-life product on the environmental impacts of original producer and seller of the product. The aim is to provide an incentive for manufacturers to make design changes that reduce waste, increase recycling such products and reusability, reduce the use of materials, and streamlining the product. Based on this, the proposed hypothesis 1, as follows: Hypothesis 1: green manufacturing affect the collection of recyclables.

CSR is the commitment of the company or the business world to contribute to sustainable economic development with attention to corporate social responsibility and focus on the balance between attention to aspects of economic, social and environmental. Where one of the benefits of CSR for the company was able to reduce costs, for example the impact of waste disposal (Untung, 2009; Garay and Font, 2011). McKerlie *et al.* (2006) policy EPR is that they put some of the responsibility for the end-of-life product on the environmental impacts of original producer and seller of the product. The aim is to provide an incentive for manufacturers to make design changes that reduce waste, increase recycling such products and reusability, reduce the use of materials, and streamlining the product. Based on this, the proposed hypothesis 2, as follows: Hypothesis 2 : CSR affect the collection of recyclables.

CSR is the commitment of the company or the business world to contribute to sustainable economic development with attention to corporate social responsibility and focus on the balance between attention to aspects of economic, social and environmental. Where one of the benefits of CSR for the company was able to reduce costs, for example the impact of waste disposal (Untung, 2009; Garay and Font, 2011). McKerlie *et al.* (2006) ature core of policy EPR is that they put some of the responsibility for the end-of-life product on the environmental impacts of original producer and seller of the product. The aim is to provide an incentive for manufacturers to make design changes that reduce waste, increase recycling such products and reusability, reduce the use of materials, and streamlining the product. Various models of the EPR has developed one of which was developed by Walls (2006) that showed that the variable recyclables processing affect on collection of recyclables. Based on this, the proposed hypothesis 3, as follows: Hypothesis 3 : CSR affect on recyclables processing.

Collection of recyclables are collecting waste for recycling with respect to comfort, awareness, and financial incentives (Lindhqvist, 2000). Various models of the EPR has developed one of which was developed by Walls (2006) that showed that the variable recyclables processing affect on collection of recyclables. Based on these, then put forward the hypothesis 4, as follows: Hypothesis 4: Collection of recyclables affect on recyclables processing.

Collection of recyclables are collecting waste for recycling with respect to comfort, awareness, and financial incentives (Lindhqvist, 2000). Based EPR models, that showed that the variable collection of recyclables (Walls, 2006). One of the principles in the EPR program funding policy is to enter into the EPR cost price of the product (Bury, 2010) Based on this, the proposed hypothesis 5, as follows: Hypothesis 5: Collection of recyclables affect cost EPR.

Recyclables processing is the process of recycling materials by developing cleaner production (OECD, 2001). Definition of net production by UNEP (United Nations Environment Programme) is a continuous application of an integrated environmental strategy and preventive nature of the processes, products and services to increase overall efficiency and reduce risks to humans and the environment (Hidayat *et al*., 2009). Variable recyclables processing is an influential factor in sewage treatment, in addition to the manufacturers must pay for recycling of waste and the costs passed on to consumers (Walls, 2006). One of the principles in the EPR program funding policy is to incorporate costs into the product price EPR (Bury, 2010). Based on this, the proposed hypothesis 6, as follows: Hypothesis 6 : Recyclables processing affect cost EPR.

The conceptual framework of the research showing the relationship between variables of green manufacturing, CSR, collection of recyclables, recyclables processing, and cost EPR can be seen in Figure 1.

Results and Discussions

Direct testing is done to determine the effect between the study variables. Basic decision hypothesis using p value of 5%, if the results obtained p value less than 5%, the hypothesis was significant, and vice versa if the p value obtained results of more than 5%, then the hypothesis is declared in significant. Directly

Table 1. Direct impact testing results

No	Influence between variables	Path coefficient	p value	Information
1	CSR →Collection of recyclables	0.624	0.000	Significant
2	CSR →Recyclables processing	0.072	0.512	Not Significant
3	Collection of recyclables → Cost EPR	1.057	0.000	Significant
4	Collection of recyclables →Recyclables processing	0.787	0.000	Significant
5	Green manufacturing→ Collection of Recyclables	0.379	0.000	Significant
6	Recyclables processing → Cost EPR	-0.193	0.015	Significant

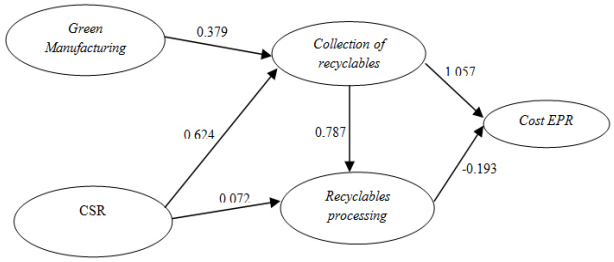

Figure 2. Line diagram hypothesis testing results

influence the test results are presented in Table 1.

Direct influence on Table 1 shows that the influence of each variable is between significant and positive. CSR with collection of recyclables is significant and positively with at 0.624 and p value less than 0.05. CSR with recyclables processing is not significantly and positively at 0.072 and p value more than 0.05. Collection of recyclables with cost EPR is significantly and positively at 1.057 and p value less than 0.05. Collection of recyclables with recyclables processing was significantly and positively at 0.787 and p value less than 0.05. Green manufacturing with collection of recyclables is significant and positively at 0.624 and p value less than 0.05. Recyclables processing with cost EPR negative and significant at -0.193 and p value less than 0.05.The path diagram of hypothesis testing results can be seen in Figure 2.

Based on the direct effect in Figure 2 and Table 1 obtained significant results between the green manufacturing with collection of recyclables, collection of recyclables with CSR, collection of recyclables with recyclables processing, collection of recyclables with cost EPR, recyclables processing with cost EPR, and not significant CSR with recyclables processing.

Correlation green manufacturing with collection of recyclables

The direct effect of the green manufacturing on collection of recyclables is positively and significantly with the magnitude of the path coefficient is 0.379 and p value less than 0.05. It means the collection of recyclables influenced by green manufacturing. Structural coefficients of the collection of recyclables at green manufacturing of 0.379, this means that the higher the ability of the fish canning companies implement green manufacturing concept, the higher the fish canning company's ability to carry out activities collection of recyclables.

Correlation CSR with collection of recyclables

The direct effect of the collection of recyclables on CSR is positively and significantly with the magnitude of the path coefficient is 0.624 and p value less than 0.05. It means the collection of recyclables influenced by CSR. Structural coefficients of the collection of recyclables at CSR of 0.624, this means that the higher the ability of fish canning company CSR activities, the higher the fish canning company's ability to carry out activities collection of recyclables.

Correlation CSR with recyclables processing

The direct effect of CSR on recyclables processing is positively and not significantly with the magnitude of the path coefficient is 0.072 and p value more than 0.05. That means recyclables processing is not affected by the CSR. Structural coefficient of CSR towards recyclables processing of 0.072, this means that the higher the ability of fish canning company CSR activities, the higher the fish canning company's ability to carry out activities recyclables processing but not significantly.

Correlation collection of recyclables with recyclables processing

The direct effect of the collection of recyclables on recyclables processing was positively and significantly with the magnitude of the path coefficient is 0.787 and p value less than 0.05. That means recyclables processing is affected by the collection of recyclables. Structural coefficients of the collection of recyclables on recyclables processing is equal to 0.787, this means that the higher the ability of fish canning company collection of recyclables activities, the increasing ability of fish canning company in the conduct of recyclables processing.

Correlation collection of recyclables with cost EPR

The direct effect of the collection of recyclables on cost EPR is positive and significant with the magnitude of the path coefficient is 1.057 and p value less than 0.05. That means collection of recyclables is affected by the cost EPR. Structural coefficient of the collection of recyclables on the cost of EPR is 1.057, this means that the higher the ability of fish canning company collection of recyclables activities, it will increase the cost of EPR fish canning company. Fleckinger and Glachant (2010), each manufacturer must comply with the requirements of decision which forced him back to collect and

treat the waste associated with its products. In line with reality, Fleckinger and Glachant assumes that producers organize themselves either individually or in collaboration with established Producer Responsibility Organization (PRO).

Correlation recyclables processing with cost EPR

Recyclables processing directly influence the cost EPR is negative and significant with the magnitude of the path coefficient was -0.193 and p value less than 0.05. That means the cost of EPR are affected recyclables processing. Recyclables processing structural coefficient of the cost of EPR is -0.193, this may imply that the higher the ability of fish canning company recyclables processing activities, then the cost EPR will reduce of fish canning company.

Recommendations on how to achieve effective implementation of EPR and efficiently, including increased incentive design, incorporating reuse and repair, expand the scope of products, managing material flow downstream, and increase operational efficiencies through the design of a fair allocation of costs (Gui *et al*., 2013).

Thorpe *et al*. (2005) studied of the program management Europe and Canada highlights the importance of devise EPR program with legislation clear which encourages product design sustainable by giving various signal to manufacturers. Recommendations legislation clear to encourage product design sustainable by giving various signal to manufacturers to advance EPR in Canada. In his research McKerlie et al. (2006) made a recommendation for advancing EPR in Canada by reducing the foot print ecology and improve material efficiency with 90% with establish policies that promote product design sustainable, loop closed material and system innovation inprovision service with reduction of resource and energy use, and to decrease environmental risks and health posed by increasing level waste.

Subramanian *et al.* (2009) studied the effect of design parameters on the EPR policies and incentive products in the supply chain coordination durable product. Consistent with the policy objectives EPR, producers and customers are asked to share the environmental costs incurred during the life cycle of the product. Plambeck and Wang (2009) examined the impact of e-waste regulation on new product introduction frequency and quality of the product. Atasu *et al.* (2009) concluded that social planners should take into account the cost of recycling and environmental impact.

Bury (2010) conducted a study on the EPR program shifts the responsibility for the operation and funding of end-of-life waste management programs for a variety of problematic and hazardous wastes and products of city and taxpayers to producers. Wiesmeth and Hackl (2011) examined EPR concept of economic stand point. As conclusion general, interaction between economic principles and technology development should observed carefully when designing incentive-compatible EPR policy.

Nahman (2010) and Nash and Bosso (2013) stated the EPR is a policy approach that requires manufacturers to finance the cost of waste collection and recycling of designated products. Kojima *et al.* (2009) stated that China and Thailand have developed regulations on e-waste recycling with common characteristics such as financial responsibility for the collection of producers and subsidies.

Li *et al.* (2012) stated that the most effective way to collect used products is through the manufacturer. Özdemir *et al.* (2012) stated that the main objective of environmental legislation derived from the EPR is a leading manufacturer for recycling initiatives and promoting the use of end product desired product design environment. Our findings indicate that the opportunity to redesign encourage more manufacturers make improvements, but the reluctance of producers to cover the initial investment can substantially reduce the effectiveness of the legislation and the amount of recycling.

Mayers and Butler (2013), this case study gives new insight and context on the practical implementation of the relevant legislation EPR both policy makers and researchers. Hickle (2013), comparative policy analysis is illustrated through EPR regulations for electronic waste, with a particular profile of program in the State of Minnesota and the Province of Ontario. Both approaches broadly reflect many considerations and governance policies and program themes that dominate EPR programs in each country.

Conclusion

Based on the results of the study, data analysis and discussion in the previous chapters, it could be concluded as follows;

1. Green manufacturing significant and positive influences on the collection of recyclables.
2. CSR significant and positive influences on the collection of recyclables.
3. CSR not significant and positive influences on the recyclables processing.
4. Collection of recyclables significant and positive influences the recyclables processing and cost EPR.
5. Recyclables processing significant and negative

influences on the cost EPR.

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