The Growing Demand For Alternative Solutions For Industrial Waste; The Experience Of Indonesia

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EXECUTIVE SUMMARY

Industrial waste management in Indonesia has some way to go before it can reach a good level of compliance to regulations and for the capacity to manage this waste to match the volume of waste generated. The reported figure of waste indicates that there remains a huge gap of approximately 16.4 percent or 1.15 million tons of industrial waste generated annually that goes unmanaged or unreported. In recent years however, some encouraging developments have been seen in the waste management business in Indonesia. This paper discusses the preliminary findings of part of a research on the drivers that are influencing the progress in compliance and capacity development in industrial waste management in Indonesia. Information from more than 234 respondents representing 92 large foreign owned and local firms was collected in a survey that focused on environmental practitioners, middle and senior managers responsible for the management of waste. In addition to the survey, several in-depth interviews were also conducted with selected individuals for their in-sights and opinions on the matter. The firm’s awareness of the potential impacts from the waste they generate, its commitment to improve on management of waste, its desire to improve the standing in the environmental ratings and disclosure program called PROPER (program for pollution control, evaluation and rating) against the backdrop of the Government’s command and control policies on the shift to adopt 3R (reuse-recycle-recovery) type waste solutions form the variables in this interacting system. Structural equation modeling was employed to test several hypotheses based on a conceptual model consisting of possible drivers encouraging growth in demand for alternative solutions. It was found that the government’s command and control policies moderated the influence of the acceptance and desire to improve on the PROPER rating towards the choice of selecting the available 3R waste management solutions. This finding suggests that policy makers who are responsible for developing strategy to manage industrial waste could perhaps consider this moderating effect when shaping their command and control policies vis-à-vis informal regulatory requirements should they desire to promote alternative and 3R type solutions for industrial waste. This research which could be relevant to the situation in other developing countries will be continued to consider aspects that can influence further development in the industrial waste management service sector in Indonesia.
INTRODUCTION

In a 2009 study conducted by the Bandung Institute of Technology’s Centre for Research for Energy Policy, it was reported that 16.4 percent or approximately 1.15 million tons of scheduled industrial waste generated annually goes unmanaged. One can assume that most of the unreported waste is possibly illegally dumped or managed by environmentally unsound or informal methods. This figure could also very well be a conservative estimate as there could be misinterpretations on the nature of the waste generated being a scheduled waste that requires reporting to the authorities.

In the past, industries looking to manage their waste in a responsible manner looked first at the regulatory compliance status of the service provider. This was of utmost importance; the waste management technology offered did not really matter. It was also true that alternative solutions to waste were not readily available till recent years with the one and only solution available being landfill.

In recent years many large foreign owned and local companies have been putting in place policies on management of waste. These policies are commonly triggered by an understanding of the impacts to the environment from their waste and reinforced by a commitment to search for alternative and friendlier solutions.

In Indonesia, the environmental ratings and disclosure program called PROPER is well established and participating firms strive to achieve a desirable rating. The research of Garcia, Shakep and Sterner (2008) supported the fact that foreign owned companies were more sensitive to the PROPER program and worked hard to meet the criterion of the ranking to ensure a good standing in the rankings each year. One would expect the foreign owned and large local firms sensitive to achieving a good rating to also focus on the evolving criterion for PROPER; including waste management aspects. Companies embracing the newly introduced criterion on 3R alternatives for management of waste stand a chance to be rewarded with a desirable rating should they also fulfill all other requirements. Mamingi, Dasgupta, Laplante and Hong (2006) in their research showed that the environmental performance of firms was affected by the disclosure of the environmental performance in the media and the awareness of this pending disclosure. The disclosure in the media of the ratings outcome, the desire to improve the standing in the ratings program and the new criterion for PROPER which includes waste management related elements may be developments that could create a new demand for alternative and environmentally friendlier options for waste.

Figure 1: Graph showing development of waste management service permits released.
After a long period of only a single solution of landfill being available for waste generators there has been progress in the release of permits for new players to provide waste services. Some energy intensive industries too are now able to provide waste solutions through thermal recovery processes. Figure 1 above shows the picture of the development in recent years of this situation in Indonesia. This trend could very well indicate that due to demand from waste generators, or perhaps a policy to encourage 3R solutions adopted by the authorities, the release of permits for new players to participate in the waste services business has been enabled.

The participation in the PROPER program has also been steadily increasing; this may mean more and more companies have to look for ways to improve on the management of their waste. This situation could also be resulting in more demand for waste services offering 3R solutions.

Figure 2: Graph showing number of companies participating in PROPER

![Graph showing number of companies participating in PROPER](image)

Macauley (2009) observed how in a matured waste market, regulation induced changes encouraged technology change and a shift in waste solutions. The waste management criterion introduced in PROPER could very well have a similar effect on the waste management business landscape as informal regulation induced changes. This growing trend of industrial waste being managed by 3R methods can be seen in figure 3 below.

Figure 3: Graph showing volume of scheduled industrial waste managed by 3R methods

![Graph showing volume of scheduled industrial waste managed by 3R methods](image)
POSSIBLE DRIVERS ENCOURAGING ALTERNATIVE WASTE SOLUTIONS

Observing the situation in Indonesia and considering the findings of Macauley (2009) on regulatory induced changes, Garcia et. al (2008) on firm’s sensitivity to the ratings programs and Mamingi et. al. (2006) on sensitivity to media exposure of the performance of firm in the ratings program, this paper explores the possible model as illustrated in figure 4 below of a system consisting of (i) the firm’s awareness of the potential impacts from the waste they generate, (ii) their commitment to improve on the management of the waste, (iii) the desire to improve their standing in the environmental ratings and disclosure program and (iv) a moderating factor of the Government’s command and control policies on waste management form the variables in this interacting system to represent the dependent variable of the shift to alternative waste management solutions offering less impact to the environmental.

Macauley (2009) found that in the matured waste market in the United States, regulatory induced changes quickly led to development of alternative solutions by service providers to fulfill the requirement of waste generators. In Indonesia the policy to adopt 3R solutions for waste and how this is reflected in the PROPER ratings criterion can be seen as an informal regulatory induced change. In addition to this, the control that the authorities have over the entry of new service providers or new solutions through the issuance of permits also form part of the command and control policy.

The above factors have been researched well in the context of more mature waste management markets in developed countries but have yet to be studied in a developing country like Indonesia. Based on the above mentioned studies and the observation of the recent developments in Indonesia, the following model was designed to illustrate the changes taking place in the industrial waste management services market.

Figure 4 - The Conceptual Model

With the above conceptual model the following hypotheses (H1-H7) were arrived at:

**H1:** The better the firm’s awareness on the impacts of the waste generated, the higher the portion of firm’s waste managed by 3R methods. We expect the higher awareness of the environmental impacts from the waste generated to drive firms to search for alternative waste solutions thereby raising the portion of waste managed by 3R methods.
H2: The stronger the firm’s commitment to improve the management of its waste, the higher the portion of firm’s waste managed by 3R methods. We expect the stronger commitment of firms to improve on the management of its waste to encourage the firms to seek better alternatives to manage waste and hence choose 3R type solutions where possible, thereby increasing the portion of its waste managed by these methods.

H3: The greater the firm’s acceptance and desire to improve the rating in PROPER, the greater the portion of waste managed by 3R methods. We expect the desire of firms to better or maintain a good rating in the PROPER program would drive firms to seek 3R solutions as this aspect is now part of the criterion for higher rating in PROPER.

H4: The stronger the government policy to encourage 3R solutions, the higher the portion of waste generated by firms to be managed by 3R methods. We expect that with clear policy to encourage firms to embrace 3R solutions, firms will seek to manage all or most of their waste with 3R methods.

H5: The government command and control policies moderate the relationship between firm’s awareness on environmental impacts from waste generated towards the portion of waste managed by 3R methods. We expect that while there is a relationship between the firm’s awareness of impacts to the environment and portion of waste managed by 3R solutions, this is however moderated by the command and control policies of the government.

H6: The government command and control policies moderate the relationship between firms’ commitment to improve on management of waste towards the portion of waste managed by 3R methods. We expect that while there is a relationship between the firm’s commitment to improve the management of its waste to the portion of waste managed by 3R methods, this is however moderated by the command and control policies of the government.

H7: The government command and control policies moderate the relationship between firm’s acceptance and desire to improve on the ratings in the PROPER program towards the portion of waste managed by 3R methods. We expect that while there is a relationship between the firm’s desire to improve the rating in the PROPER program and the portion of waste managed by 3R methods, this is however moderated by the command and control policies of the government.

RESEARCH METHODOLOGY

The survey data for this research was obtained from 234 respondents representing 92 multinational and local companies. The respondents of the survey were middle and senior managers whose role included environmental as well as waste management responsibilities. The companies selected were all the companies who have or had at a point in time employed the services of Geocycle waste services (Geocycle, a member of Holcim Group offers waste recovery solutions for industries). It can be said that these companies represented well the profile of companies participating in PROPER; aware of their environmental impacts from their operations and had already to some extend embarked on management of their waste using 3R type alternative waste management solutions. In addition to the survey, several in-depth interviews were also conducted with selected individuals connected to the waste management business for their in-sights and opinions on the matter.

The measurement of the data was made according to a Likert seven points scale, the data was then analyzed using structural equation modeling with the LISREL software version 8.80.
RESULTS AND DISCUSSION

Confirmatory analyses were conducted to validate the conceptual model as well as its measurements. For all constructs, a one-dimensional structure was found. A confirmatory factor analysis (CFA), using LISREL 8.80 with maximum-likelihood (ML) estimation following the approach of Joreskog and Sorbom (1993) was then performed on the scales. To assess the model, the following multiple fit indexes were referred to: Goodness-of-Fit Index, Root Mean Square Error of Approximation (RMSEA), Normed Fit Index (NFI), and Comparative Fit Index (CFI). Standardized data was used for all subsequent analyses. "The process of standardization eliminated the bias introduced by the differences in the scales of the attributes or variables used in the analysis" (Hair, Anderson, Tatham & Black (1995, pp 435). The overall model fit indexes indicate that the CFA model was consistent with the data, with all fit indexes being equal to or better than recommended values (GFI=.94, RMSEA=.056, NFI=.99, CFI=.99).

Description of Path Diagram in Figure 5:

AP= Firm’s Acceptance and desire to improve it’s standing in the environmental ratings program (PROPER)
EA= Firm’s Awareness of Environmental Impact due to the waste generated
GC= Government Command and Control Policy
FC= Firm’s commitment to improve on management of it’s waste
VOE= Endogenous variable of portion of the firm’s waste managed by 3R type alternative waste solutions
VOR= Observed variable for portion of waste managed by 3R type solutions
LCFC= The moderating effect of the government command and control policy towards the relationship of the firm’s commitment and portion of firm’s waste managed by 3R methods
LG CAP = The moderating effect of the government command and control policy towards the relationship of the acceptance of PROPER and the portion of firm’s waste managed by 3R methods

LG CE A = The moderating effect of the government command and control policy towards the relationship of firm’s awareness and portion of firm’s waste managed by 3R Methods

Figure 5 - Path Diagram and analysis for the conceptual model

![Path Diagram](image)

Table 2 – Outcome of the Hypothesis Testing

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Hypothesis Statement</th>
<th>t-value</th>
<th>Hypothesis Supported/Unsupported</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>The better the firm’s awareness of impacts from its waste, the higher the portion of waste managed by 3R methods.</td>
<td>0.27</td>
<td>Not supported</td>
</tr>
<tr>
<td>H2</td>
<td>The stronger the firm commitment to improve its management of waste, the higher the portion of waste managed by 3R methods.</td>
<td>-0.58</td>
<td>Not supported</td>
</tr>
<tr>
<td>H3</td>
<td>The greater the firm’s acceptance of PROPER and the desire to improve its ratings, the higher the portion of waste managed by 3R methods.</td>
<td>-0.17</td>
<td>Not supported</td>
</tr>
<tr>
<td>H4</td>
<td>The stronger the government’s command and control policies to encourage adoption of 3R waste solutions, the higher the portion of waste managed by 3R methods.</td>
<td>1.22</td>
<td>Not supported</td>
</tr>
<tr>
<td>H5</td>
<td>The government’s command and control policies moderate the relationship between firm’s awareness of impacts from its waste towards the portion of waste managed by 3R methods.</td>
<td>0.54</td>
<td>Not supported</td>
</tr>
<tr>
<td>H6</td>
<td>The government’s command and control policies moderate the relationship between firm’s commitment to improve its management of waste towards the portion of waste managed by 3R methods.</td>
<td>0.61</td>
<td>Not supported</td>
</tr>
<tr>
<td>H7</td>
<td>The government’s command and control policies moderate the relationship between the firm’s acceptance of PROPER and desire to improve the ratings towards the portion of waste managed by 3R methods.</td>
<td>2.12</td>
<td>Supported</td>
</tr>
</tbody>
</table>

The result of the structural equation model relationship analysis in Table 2 above shows that most of the hypotheses were unsupported. It is however important to consider this outcome and discuss possible reasons with insights from the in-depth interviews carried out.
Considering the responses from the in-depth interviews and feedback received while carrying out the survey, it could be possible that there are some common reasons affecting the outcome of the unsupported hypotheses. The awareness of the firm towards the impacts from its waste and the commitment to improve on management of waste did not show a significant affect on the portion of waste managed by 3R type solutions. This could have been due to the conditions limiting the possibility to treat the waste by 3R solutions imposed by the permits issued to the service providers. Some service providers, new to the waste business may also be not fully compliant with all the regulatory requirements making it undesirable for firms to deal with these service providers. In many cases, the inability of the service providers to accept all the types of waste generated by the waste generator due to permit condition limitations or the inability to provide a complete range of waste services may be hindering some waste generators to switch over to alternative waste solutions. Some respondents also mentioned that the refusal of certain waste service providers to accept only part of the waste from waste generators made it difficult for these companies to look for alternative solutions for some waste that maybe possible to be managed by 3R methods as the remaining part of their waste may not have access to any solution.

Next, the firm’s acceptance of PROPER and the desire to improve it’s ratings was found to not influence the shift to adopting more 3R type waste solutions. This outcome seems to differ from the findings of the research of Garcia et. al (2008), however if could be possible that the criterion on management of waste may not be well communicated and disseminated resulting in this unsupported hypothesis.

It was also found that the command and control policies of the authority do not influence the shift to more 3R type waste solution. This outcome seems to differ from the finding of the research of Macauley (2009) as one would have expected a similar outcome as the regulatory induced changes for adoption of 3R type solutions. The release of a good number of permits to enable waste service providers to enter the market and provide 3R type solutions should have led to an influencing affect on the portion of waste managed by alternative solutions. However, it may well be that the conditions of the requirements and the fact that perhaps the regulations were lagging behind international best practices led to this unsupported hypothesis.

Further, It was found that the moderating effect of the command and control policies on the firm’s awareness of impacts from it’s waste does not influence the shift to adopting more 3R type waste solutions. The arguments that apply to the direct effect of awareness of impacts to the shift to 3R type solutions mentioned above may also apply here. Additionally, it may be that firms at a high level of awareness are more driven by their own internal rather than external requirements.

The moderating effect of the command and control policies on the firm’s commitment to improve on management of its waste was also found to not influence the shift to adopting more 3R type waste solutions. Firms that have their own commitment to better management of waste like those with a high level of awareness may be more driven by their own internal requirements, apart from this it could also the true that the regulatory requirements are lagging behind the international best practices thus not really acting as a driving force to encourage the shift to more 3R type waste solutions.

The one supported hypothesis was found to be that of the moderating effect of the command and control policies on firms’ acceptance of PROPER and the desire to improve its ratings having an influence to the shift to adopting 3R type waste
solutions. It may be the case that for firms willing to improve its ratings and for those who understood the need to fulfill the criterion of PROPER, the command and control policies of the authorities did play a significant effect. It may well be that these command and control policies did not only directly affect the firms themselves but could have also affected the waste service providers. The conditions for a high level of compliance, technologically sound solutions and various other requirements such as insurance cover for environmental risks in the permits released all have an indirect effect to firms who would be willing to take up the services of these new waste services players. The fact that the authorities appear to be supporting the shift to 3R solutions with the release of permits, and the informal regulatory requirement in the form of the criterion for PROPER may well act in the way Macauley (2009) observed regulatory induced changes.

**CONCLUSIONS**

The findings in this paper suggest that policy makers who are responsible for developing the strategy to manage industrial waste should consider the moderating effect of the command and control policies on the firms' desire to better its PROPER ratings program by adopting 3R type waste solutions. Authorities should consider this when shaping their command and control policies vis-à-vis informal regulatory requirements should they desire to promote further alternative and 3R type solutions for industrial waste.

While not dismissing the effects of other factors considered in this study, this paper acknowledges that the command and control policies and the informal regulatory requirements in the form of the ratings program has a very significant role to play in shifting the waste management business landscape in Indonesia.

It may be the case that the outcome of this study may be somewhat different should the survey respondents be focused on foreign and large local firms separately. This may be a possible aspect to look into for further research so as to understand better what drives local firms to embrace international best practices when it comes to management of waste and at the same time encourage the waste management services business.

**ACKNOWLEDGEMENT**

The author wishes to acknowledge the opportunity to conduct the survey for this research in parallel with a customer survey project of Geocycle (Geocycle, a member of the Holcim Group is a waste solution service provider).

**REFERENCES**


