Awareness as a Determinant of Compliance with Environmental Regulations by Micro and Small Enterprises in the Manufacturing Sector in Nairobi, Kenya

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Abstract

This article is based on a study that examined awareness of environmental regulations as a determinant of compliance with environmental regulations by micro and small enterprises in the manufacturing sector in Nairobi City, Kenya. Considering that Kenya's economy is natural resource-based, environmental regulations compliance by this sector could lead to several benefits including increased productivity, creation of more jobs, cleaner environment, and healthier workplaces amongst other benefits. The study adopted a mixed design approach. The target population was 358 MSEs from which a sample of 10% (36 MSEs) was selected by stratified random sampling. Data was collected by administration of questionnaires supplemented by interviews and observation schedule. The study established that awareness of environmental regulations influenced compliance with environmental regulations. The study recommended that the National Environment Management Authority and other stakeholders should increase outreach to the MSEs to make them aware of the benefits of environmental regulations compliance.

Key Words: Manufacturing MSEs Nairobi; MSEs awareness of environmental regulations; MSEs compliance with Environmental regulations; awareness and compliance with environmental regulations MSEs Nairobi.

1. Introduction

Micro and Small Micro Enterprises(MSEs) in the manufacturing sector in Kenya contribute to the total employment which stood at 1.6 million people in 2005 representing 20% of the total employment in Kenya (Republic of Kenya, 2006). This figure was reportedly on the increase in the subsequent years (Republic of Kenya, 2008; Republic of Kenya, 2009). According to the Government of Kenya (Republic of Kenya, 2006), manufacturing industries including MSEs depend on natural resources for their sustainability. Muthoka *et al.* (1990) concurs that environment supplies the resources for development. However, development may give rise to environmental problems that undermine the very resources that support it such as air and water pollution arising from industrial activities (Muthoka *et al*., 1990).

According to United Nations Environment Programme (UNEP) and Micro and Small Enterprise Programme (MSEP) (2001), many MSEs in manufacturing sector, although small individually; have a significant negative impact on the environment collectively as they contribute 50% of the total pollution in Kenya.

This coupled with increased numbers of the MSEs in the sector pose serious threat to natural resources on which they depend for their sustainability (UNEP&MSEP, 2001). Negative environmental impact caused by MSEs in the manufacturing sector must be controlled because the economic losses from such impacts can be massive and can significantly erode the sector's benefits (UNEP&MSEP, 2001). Accordingly, strict attention should be paid to all kinds of industries that affect natural resources use through pollution and other effects to ensure sustainable availability of resources for the sector.

Economic Recovery Strategy for Wealth and Employment Creation (Republic of Kenya, 2002) recommended the restoration and preservation of the environment for sustainable development. This was also echoed by the Republic of Kenya (2007). In support of this recommendation, Kenya Vision 2030 strategy emphasizes the need to address problems of rising unemployment and dwindling resources in order to realize a competitive and prosperous Kenya, which aims to be a nation living in a clean, secure and sustainable environment by 2030 (Republic of Kenya, 2007). Achievement of sustainable development enhances industrialization and hence eradication of poverty.

To address this problem, all entrepreneurs in manufacturing industries including MSEs are required to comply with environmental regulations by undertaking environmental audit of their enterprises and rectifying their operations if need be, in order to reduce natural resource destruction and enhance sustainable development for increased employment creation in the sector. Environmental regulations compliance therefore serves the purpose of improving raw materials conservation for sustainable development (Republic of Kenya, 2006). According to Republic of Kenya (2000), all enterprises, including MSEs in the manufacturing sector, should comply with these environmental regulations by taking environmental audit and rectifying the activities which could be detrimental to the environment. This means that entrepreneurs should comply with all the environmental regulations regardless of the size of their enterprises in order to mitigate consequences of non-compliance such as being excluded from information, resources, international markets and closure of the business (Joshi, 2006; Malik,2002).

According to the National Environment Management Authority (NEMA, 2006), five operational policies were developed to assist in the enforcement of environmental regulations and standards. These include solid waste management operational framework, water quality operational framework, incident management operational framework, enforcement and prosecution framework and public participation and responsibility in the implementation of the NEMA operational framework. Solid Waste Management operational framework assists in the implementation of the Waste Management Regulations of 2006 and ensures definite key outcomes in the next five years. The water quality regulations of 2006 apply to drinking water, water used for industrial, agricultural and recreational purposes, water used for fisheries and wildlife and water for other purposes. Under these regulations, every person should refrain from any act which directly or indirectly causes or may cause immediate or subsequent water pollution. The water quality operational framework assists in the implementation of the water quality regulations of 2006.

Moreover, on incident management operational framework, NEMA has developed risk-based management where it has installed a 24 hour incident hotline to address any reported emergency cases. There is the enforcement and prosecution framework to punish offenders in order to ensure compliance with environmental regulations. The public is made aware of environmental compliance regulations by encouraging public participation and responsibility in the implementation of the NEMA operational framework. Thus, it is expected that compliance levels of entrepreneurs would increase and vice versa.

In spite of the high capacity for MSEs to create more jobs, and the high level of environmental degradation that they cause, and considering the importance of clean methods of production in sustaining resources, and that Kenya's economy is largely natural resource based, there seems to be no study on the factors influencing MSEs compliance with environmental regulations in Kenya.

A study by Patton and Worthington (2003) revealed that MSEs are generally aware of the effects of their operations to environment. According to Montabon, et al.(2000) this is primarily because environment is now regarded as an asset to be valued and that business managers and entrepreneurs are not only expected to improve quality, reduce costs and enhance flexibility, but they are also expected to become more environmentally responsible.

Enterprises world over are required to comply with ERs for sustainability (UNEP, 2005; Quartey, 2001; Ann *et al.*, 2007; Montabon *et al.*, 2000). Other studies elsewhere in the World had shown that MSEs are generally aware of, and can identify negative impacts their operations can have on environment. Those aware of ERs complied (Patton & Worthington, 2003; Ann *et al.,* 2007; Montabon *et. al, 2007*). Crain (2005) apparently disagrees with the above authors by arguing that there is an inherent assumption that the MSEs are actually aware and prepared to implement the ERs and avers that this is not necessarily the case. In view of the contrasting positions revealed by these studies in other countries; and the fact that no such studies had been undertaken on manufacturing MSEs in Kenya, the gap identified was lack of information on whether ERs awareness by manufacturing MSEs in Kenya influenced compliance with ERs. If the factors influencing compliance are identified and addressed and positive influences enhanced, then more MSEs would comply with environmental regulations leading to conservation of natural resources. This would enhance sustainable development and poverty eradication. This article examines awareness of environmental regulations by the manufacturing MSEs in Nairobi City, Kenya; as a determinant of their compliance with environmental regulations.

2. Methodology

The purpose of the study upon which this article is based was to examine the factors influencing compliance with environmental regulations by MSEs in the manufacturing sector in Nairobi City, Kenya.. The study adopted a mixed design approach. The target population was 358 MSEs from which a sample of 10% (36 MSEs) was selected by stratified random sampling. Data was collected by administration of questionnaires supplemented by interviews and observation schedule. Data was analysed quantitatively using SPSS and qualitatively based on the emerging themes. The study established the influence of awareness on compliance by fitting a logistic regression model, that took into account awareness of environmental regulations amongst other variables that included cost of compliance, experts capability, perceptions of benefits of compliance and business premises ownership. A logistic regression model was postulated based on Agarwal (1991) as follows:

Logit (Compliance) = $\beta_0 + \beta_1$ Awareness + β_2 Cost of ERs compliance + β_3 Experts Capability + β_4 Perceptions of Benefits + β_5 Property Ownership

Based on this model the following Null and Alternate hypotheses on the logistic regression coefficient, β_1, for awareness, were postulated and tested:-

Null hypothesis:	H_0	$\beta_1 = 0$
Alternate hypothesis:	H_1	$\beta_1 \neq 0$

The significance of the regression coefficient β_1 and the goodness of fit of the model was tested using the Pearsons Chi-square Test.

3. Results and Discussion

Awareness of the Environmental Management and Coordination Act was quite high with a majority (79.4%) being aware of the Act while the rest indicated no knowledge of it as presented in Table 1.

Table 1: MSEs Awareness of EMCA

|	**Frequency**	**Percent (%)**
Yes	27	79.4
No	7	20.6
Total	**34**	**100**

By sub-sector, there were however notable differences in awareness amongst leather products and footwear; food beverage and tobacco; and plastics and rubber with 50%, 30% and 28.6% respectively being unaware of the Act (Figure1).
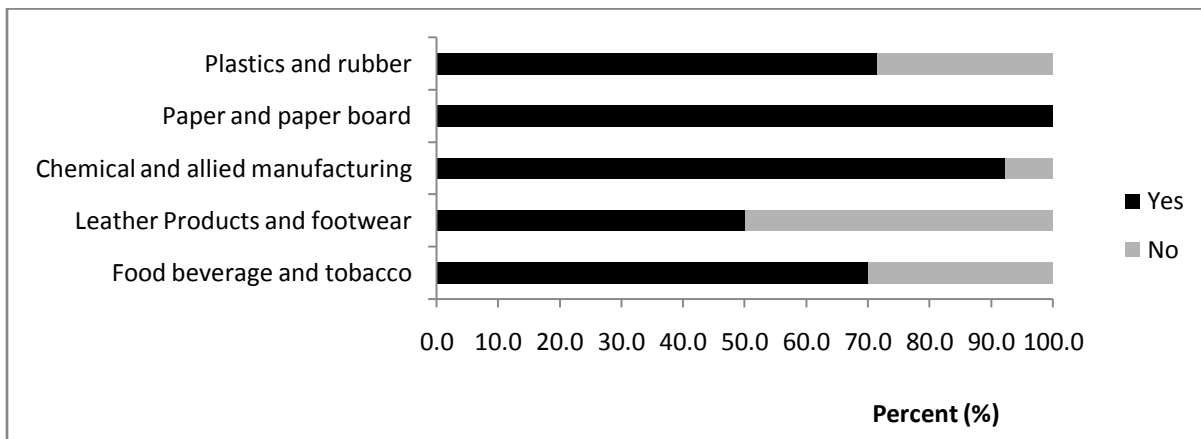
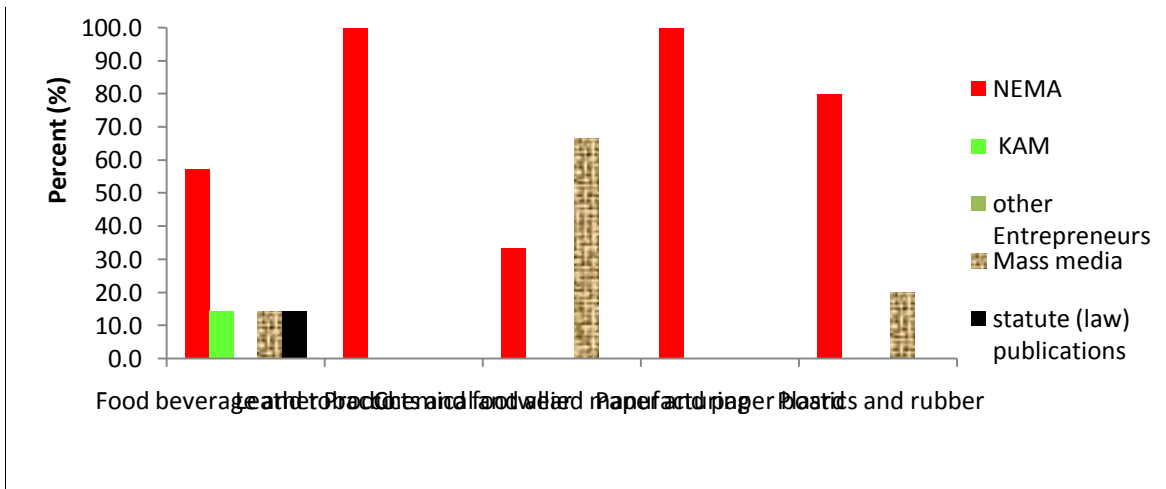**Figure 1: Awareness of EMCA by Sub-sector**

Further, given the high numbers of MSEs aware of EMCA, a high correlation of awareness of EMCA and ERs compliance was expected. However, there was a gap because 20.6% of the surveyed MSEs were still not aware of EMCA. Therefore, although the majority of MSEs were aware of EMCA and hence expected to comply with ERs, the activities of the minority that was not aware could still contribute significantly to environmental degradation and natural resource deterioration.

Of the 27 enterprises that were aware, the information was obtained from diverse sources but most dominantly from NEMA (55.56%) and the mass media (37.0%) as seen in Figure 4.4.2. Thus there is need for NEMA to intensify collaboration with other stakeholders in EMCA awareness.
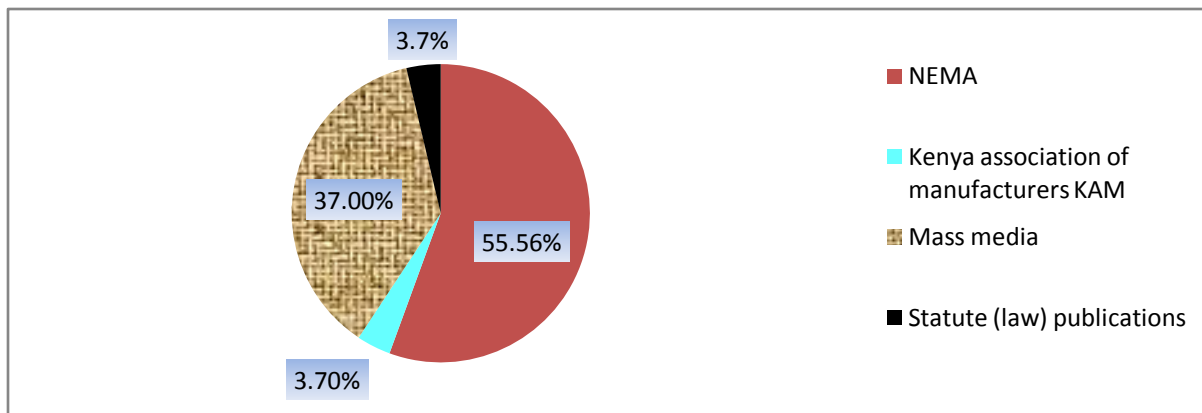
Figure 2: Sources of Information on EMCA

The results showed that by sub-sector NEMA was still the most dominant source of information amongst those who were aware of EMCA with an outreach of 57.1% on food, beverage and tobacco, 100% for each of paper and paper board, leather and footwear and 80% for plastics and rubber while the lowest outreach was on chemical and allied manufacturing at 33.33% (Figure3). The results also showed that NEMA had not been able to reach all the manufacturing enterprises especially chemical and allied where some enterprises in the sub-sector might have been producing hazardous products. NEMA should therefore intensify its awareness campaigns and increase its outreach.

Figure 3: Sources of information on EMCA by Sub-sector

On the Environmental Impact Assessment (EIA) and Environmental Audit, across all the five sub-sectors 88.2% indicated awareness (Table 2). 50% in the leather category were not aware of EIA and EA Regulations as presented in Figure 4.

Table 2: Awareness of EIA and Environmental Audit Regulations

	Frequency	Percent (%)
Yes	30	88.2
No	4	11.8
Total	**34**	**100**

Given the high numbers of MSEs aware of EA, it was expected that there would be a high correlation with compliance with ERs, but there were still gaps because 11.8% were not aware. This was significant because those not aware of EA could be causing harm to the environment due to ignorance and as such actors in dissemination need to do more. NEMA should therefore reach out to leather and footwear industries which seem to be least aware of EIA/EA.
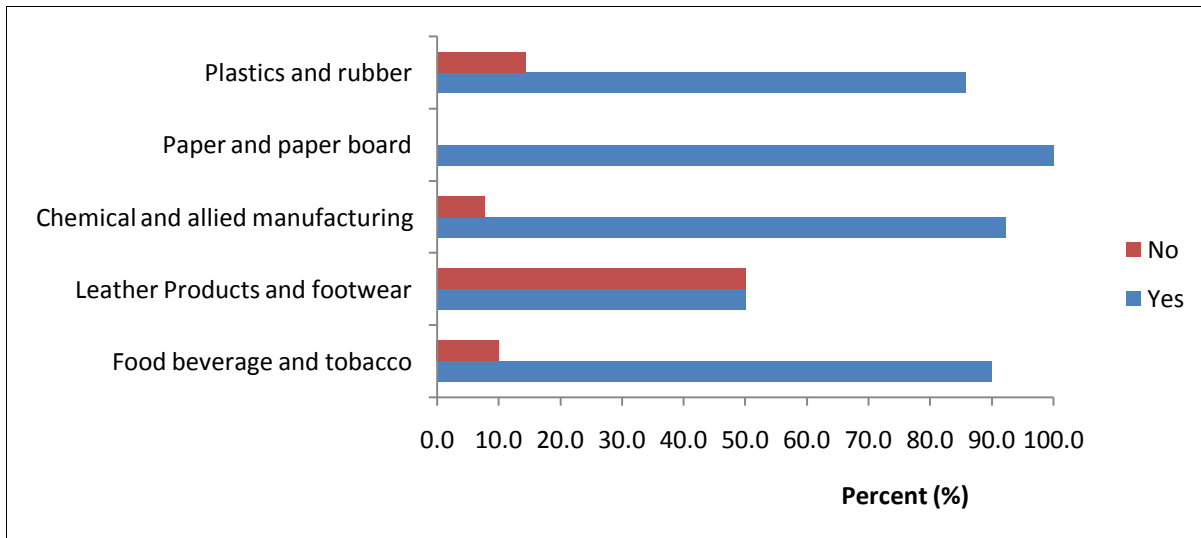

Figure 4: Awareness of EIA and EA regulations by Sub-sector

Out of the 34 enterprises surveyed, 30 were aware of EIA and EA and 27 of these (90%) were familiar with EIA and EA procedures, while a minority 10% were not familiar with EA procedures (Table 3). This showed an incomplete state of familiarity of EA/EIA procedures even amongst those aware of EIA and EA regulations.

Table 3: Familiarity with EIA/EA Procedures

	Frequency	Percent (%)
Yes	27	90
No	3	10
Total	**30**	**100**

Familiarity with EIA/EA procedures across the five sub-sectors was high except for the leather category where 50% were not familiar with EIA and EA procedures in spite of them being among the most polluting sub-sectors (Figure 5). This emphasizes the urgent need for NEMA to reach out to this sub-sector.
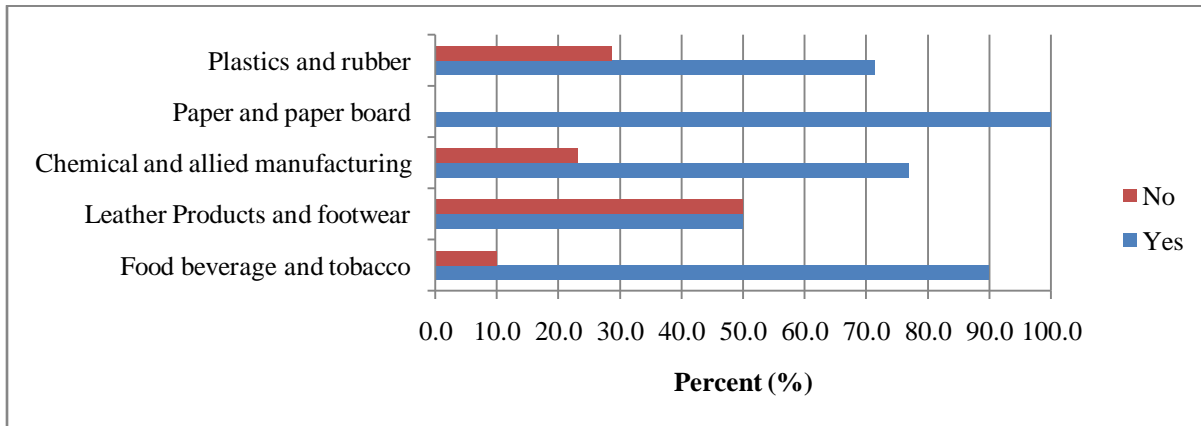

Figure 5: Familiarity with EIA/EA Procedures by Sub-sector

Of the 27 enterprises that were familiar with EIA/EA procedures 88.9% received the information from NEMA while 11.1% received it from other sources as presented in Table 4. This was an indication of inadequate participation on dissemination of information on environmental regulation procedures by the other actors expected to perform this role. This shows that there is need for these institutions to play their respective roles in dissemination of ERs procedures. Other institutions dealing with dissemination of ERs would therefore need to intensify their activities in this respect.

Table.4: Institutions Disseminating Awareness on EIA/EA Procedures

| Institution	Frequency	Percent (%)
NEMA Experts	24	88.9
Others	3	11.1
Total	**27**	**100**

A majority (83.3%) of the enterprises had an Environmental Audit carried out in the last one year as can be seen from Figure 6 which is probably attributable to the high level of awareness of EA among the surveyed enterprises (88.2%). This shows that NEMA, as the main institution that conveyed the information about EIA/EA procedures (Table 4), was making progress in convincing most of MSEs to comply.
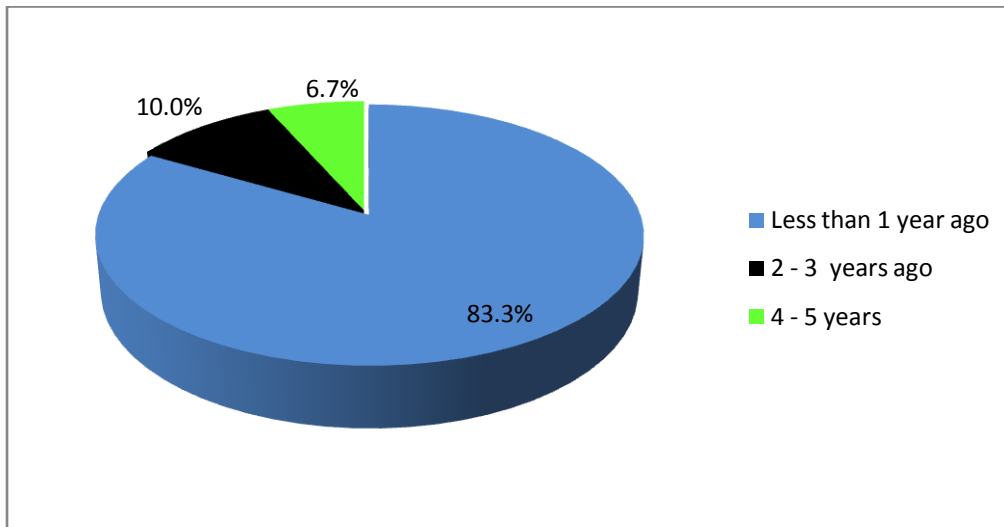
Figure 6: Time When the Last Environmental Audit was Done

Of the 30 enterprises that were aware of EIA/EA, all undertook EA. Since the time the study was undertaken (2009),of these MSes, 83.3% undertook it in the last one year (2009), 10% in the last 2-3 years (2007-2009) and 6.7% in the last 4 - 5 years (2004-2009). By sub-sector all the enterprises in the paper and paper board category had EIA/EA undertaken in the past one year while 90% in the food category had achieved the same. The least compliant was in the leather category where 50% were neither aware of EIA/EA nor had they carried out any of them as can be seen in Figure 7. This could be because NEMA had not reached out to them. Since this sub-sector is a high polluter, NEMA should try and reach them to comply with EIA/EA.

These results showed that a significant majority of those aware with EA (93.3%) regularly complied with ER and hence a high correlation between awareness of EA and its compliance. It was therefore deduced that an increase in awareness of EA should increase the level of compliance. It was also observed that in spite of knowledge that EA should be carried out annually, not all enterprises, albeit a minority of 16.7% complied with ERs regularly. This was probably due to cost of compliance which was observed to be prohibitive as emphasized by many entrepreneurs.
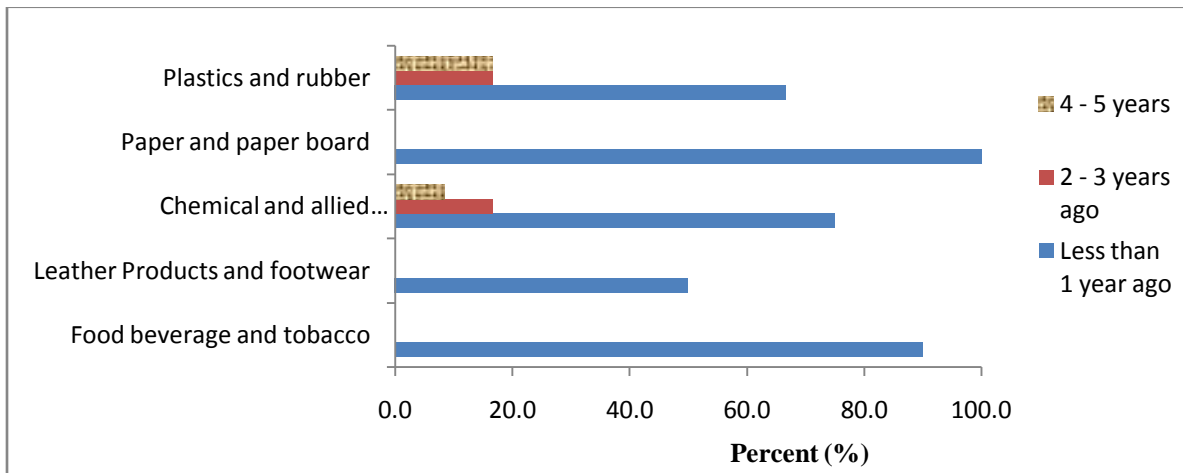

Figure 7: Time When Last Environmental Audit Was Done by Sub-sector

The results, presented in Table 5, showed that of the 30 enterprises that had undertaken an audit, 93.3% had undertaken it externally through NEMA experts/consultants while 6.7% had undertaken it internally by management or employees showing that the majority may not have an internal capability to undertake EA .

Table 5: Last Audit

	Frequency	Percent (%)
Internal (by management or employee)	2	6.7
External (by NEMA expert/consultant)	28	93.3
Total	**30**	**100**

By sub-sector only 8.3%, 50% and 11.1% of the chemical, leather and food categories respectively conducted internal EAs. All the rest used external consultants to perform the same (Figure8).
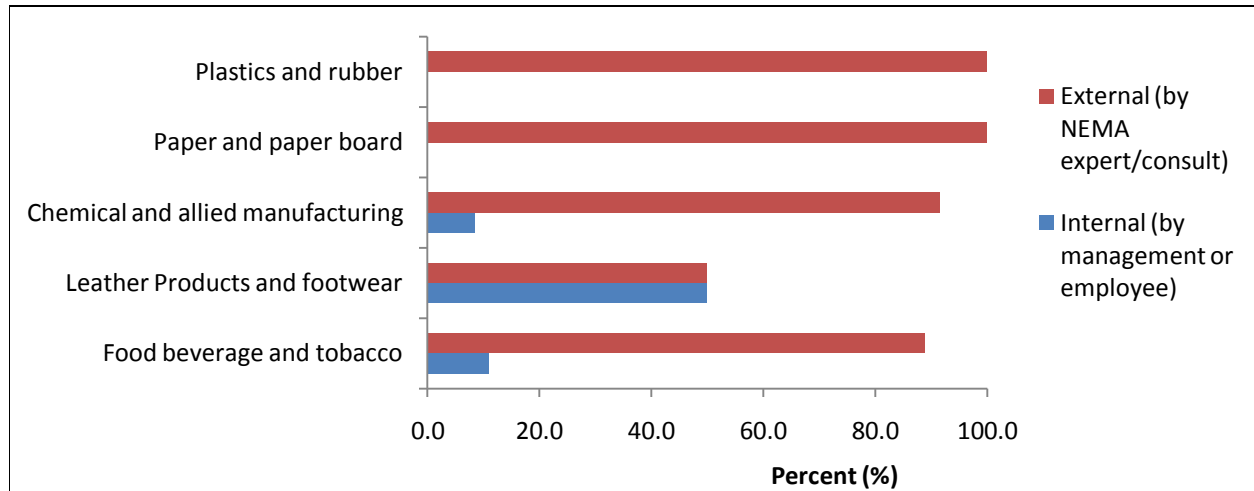
Figure 8: Last Audit by Sub-sector

According to ERs, enterprises are encouraged to have internal capability for conducting EA. Hence, there is need to implement interventions that would enhance MSEs internal capability to undertake EA. Observations provided triangulation on the findings about EMCA awareness, EIA and EA regulations and familiarity with EIA/EA procedures. It was observed that most MSEs had EA reports with recommendations on the areas of strength and areas where rectification was required. This showed that they were aware of EA. A Majority 26 out of 30 (86.7%) were already implementing some EA measures such as having protective gear and equipped with occupations health and safety attire. This was however not the case in a minority of the enterprises, 4 out of 30, representing 13.3%.

Supplementary information provided by MSEs through open discussions and probing was that many of them had contracted solid waste transporters who would clean and dispose solid waste to dumping sites authorized by NEMA. Observations confirmed that the majority were disposing their solid wastes as there was no evidence of solid waste pile up at the enterprises. Indeed some had solid waste containers placed in clearly designated areas. Others recycled their wastes appropriately, for instance plastic waste recycling.

Interviews with NEMA management revealed that as the institution responsible for ensuring compliance, it had identified awareness as critical to ERs compliance by enterprises. Indeed NEMA was at the time of the study engaged in various types of activities that bore direct and indirect linkages with spreading awareness of ERs amongst manufacturing enterprises. Some of these activities included collaboration with other institutions such as KNCPC to train entrepreneurs including those from manufacturing on cleaner production thus promoting MSEs awareness of ERs. NEMA has a department of education which trains entrepreneurs on ERs. It periodically places adverts about ERs in the print and electronic media in collaboration with other institutions. NEMA also encourages participation by MSEs in national events such as World Environment Day celebrations. It works closely with public sector institutions such as the Ministry of Agriculture, Ministry of Education, Ministry of Local Government and private sector where MSEs as members of KAM participate in ERs reviews. NEMA encourages public participation in development of polices and since MSEs are considered public they contribute to public policy reviews and formulation, such as representation in provincial development committees. To promote a positive response to ERs by MSEs, NEMA identifies the industrial sectors that have done well and award them accordingly.

The Kenya Association of Manufacturers (KAM) also makes notable contributions to propagation of ERs awareness amongst manufacturing MSEs. Asked what KAM does to ensure MSEs awareness that they should comply with ERs, KAM reported that it organizes for sensitization seminars and workshops to create awareness and educate its members on the ERs. Further, KAM disseminates information to her members through meetings, circulars, newsflashes and industry today magazines. To promote positive response to ERs by MSEs, KAM encourages her members to participate in Environment stakeholders forums in which members are encouraged to participate in formulation and reviews of regulations and therefore have opportunity to voice their challenges proactively. Members get the opportunity to get solutions to the challenges they face during ERs implementation. Further, KAM targets to recruit more members to increase their scope and their representation as the voice of manufacturers. This way, more of enterprises would be informed of ERs.

Asked about the main approach adopted to ensure enforcement, KAM concurred that the designated National Authority (NEMA) uses the annual EA to track compliance in the ERs where an improvement order is issued to lead industries to comply. The study agrees with Patton and Worthington (2003) whose study revealed that MSEs are generally aware of the effects of their operations to environment. Crain (2005) argues that there is an inherent assumption that the MSEs are actually aware and prepared to implement the EMCA regulations and avers that this is not necessarily the case. This is in contrast with the findings of this study which revealed that majority of MSEs in the manufacturing sub-sectors in Nairobi were aware of EMCA regulations and were willing to implement the ERs as indicated by the responses received.

Ann *et al.* (2007) stated that the ability of business organizations to manage their environmental performance is emerging as a strategic issue for many companies. According to Montabon, *et al.*(2000) this is primarily because environment is now regarded as an asset to be valued and that business managers and entrepreneurs are not only expected to improve quality, reduce costs and enhance flexibility, but they are also expected to become more environmentally responsible. By establishing that the majority of the surveyed enterprises felt that the environment was an invaluable resource to be conserved through ERs compliance, this study agrees with the two previous studies. From the results and the resultant discussions, it seems that it that awareness of ERs by MSEs in the manufacturing sector influence compliance with it. The study established the influence of awareness on compliance by inferential statistics by postulating and testing a logistic regression model, that took into account awareness of environmental regulations amongst other variables that included cost of compliance, experts capability, perceptions of benefits of compliance and business premises ownership. The model postulated was as follows based on Agarwal (1991):

Logit (Compliance) = $\beta 0 + \beta 1$ Awareness + $\beta 2$ Cost of ERs compliance + $\beta 3$ Experts
Capability + $\beta 4$ Perceptions of Benefits + $\beta 5$ Property Ownership

Based on this model the postulated Null hypothesis, H_0, and Alternate hypothesis, H_1, were tested:-

Null hypothesis	H_0:	$\beta 1 = 0$
Alternate hypothesis	H_1:	$\beta 1 \neq 0$

The significance of the regression coefficient $\beta 1$ and the goodness of fit of the model was tested using the Pearsons Chi-square Test. The test showed that only awareness and experts capability had p-values not exceeding 0.05. This was further confirmed by the chi-square test, which, according to Aggarwal (1991) and Mugenda and Mugenda (2008), can be used to test whether an independent variable is a significant factor influencing the dependent variable. The Pearson"s chi-square test for determining whether an independent variable is a factor influencing the dependent variable was carried out for each of the independent variables over the dependent variable. A p-value smaller than 0.05 shows significance while a p-value higher than 0.05 shows the independent variable under consideration is not a significant factor at 5% level of significance. The Pearson"s chi-square test yielded the p-values for the independent variables as presented in Table 6.

Table 6: Test of Influence of Independent Variable on ERs Compliance

Independent Variable	Pearson's Chi-square (p-value)
Awareness	0.022
Cost	0.456
Experts' capability	0.006
Perception of Benefit	0.217
Property Ownership	0.939

The results showed that the logistic regression coefficient for awareness, β1, was significant at 5% level of significance. The Null hypotheses was therefore rejected and it was concluded that awareness influenced MSEs compliance with environmental regulations.

The goodness of fit of the model was tested using the Pearsons Chi-square Goodness of Fit Test. The model goodness of fit improved with more variables entered. The p-values showed that the best fit for the model, with a p-value of 0.03, at 5% level of significant was obtained with the variables awareness, experts capability, perceptions of benefits and property ownership entered into the model,.

On the basis of the parameters obtained by running the logistic regression, the following model was fitted:

Logit (Compliance) = -2.86 - 3.43 *Awareness - 3.37 * Experts Capability + 1.46 *Perceptions +1.34*Property Ownership.

4. Conclusions

Awareness of the Environmental Management and Coordination Act (EMCA) was quite high with a majority of MSEs being aware of the Act. There were, however, notable differences in awareness amongst leather products and footwear; food beverage and tobacco; and plastics and rubber. Although many MSEs were aware of ERs, the cumulative effect of those not aware of ERs and those who were unable to comply could be destructive to environmental resources.

The results showed that NEMA had not been able to reach all the manufacturing enterprises especially chemical and allied. There was also an indication of inadequate participation on dissemination of information on environmental regulations procedures by the other actors expected to perform this role. This showed that there was need for these institutions to play their respective roles in dissemination of ERs procedures. Other institutions dealing with dissemination of ERs would therefore need to intensify their activities in this respect.

The logistic regression model that took into account awareness of environmental regulations amongst other variables including cost of compliance, experts capability, perceptions of benefits of compliance and business premises ownership showed that that the best fit for the model at 5% level of significant was obtained with the variables awareness, experts capability, perceptions of benefits and property ownership entered into the model, with a p-value of 0.03. It was concluded that awareness, with a p-value of 0.022, influenced compliance with environmental regulations.

5. Recommendations

To close the gaps on awareness on ERs, it was recommended that:

1. Government should allocate more resources, particularly expertise and create enabling environment to steer MSEs towards full compliance with the set ERs.
2. NEMA should intensify its awareness campaigns and increase its outreach including visiting production units to recommend efficient production procedures.
3. Stakeholders including Government, NEMA, KAM, Ministry of industrialization and NGOs should intensify awareness campaigns so as to reach many manufacturing MSE operators.
4. NEMA and KAM should advise on negotiated compliance so as to optimize compliance with ERs according to threats posed to the environment and thus increase MSEs sustainability.
5. Institutions of higher learning in key training institutions, whose trainees may end up in the manufacturing sector, should introduce ERs and compliance procedures in their curriculum.

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