INCENTIVES FOR ADOPTION OF ENVIRONMENTAL MANAGEMENT PRACTICES AMONG TEXTILE AND APPAREL MANUFACTURES IN SRI LANKA

D. W. K. Hemachandra[1]

ABSTRACT

Fifty eight percent of export earnings and fifty two percent of industrial employments are generated by the textile and apparel industry in Sri Lanka. Despite their economic importance the sector too contributes to environmental pollution. Surprisingly, some textile and apparel manufactures in Sri Lanka have introduced some voluntary mechanisms to reduce the level of environmental pollution caused by their operation. Existing literature has explained different reasons for their adaption decision without specifying the most powerful motive which caused their decision. In addressing this unfulfilled literature gap, the study intends to explore the most significant factors for the adoption decision among Sri Lankan textile and apparel manufactures. In addition, the study further provides an understanding of the existing legislative background as well as determining whether this legislative background provides any incentives for their adoption decision. The findings of this novel study expect to motivate non-adopters within and among industries.

Case study strategy was used in the study to achieve its objectives. The study examined factories registered in the Board of Investment of Sri Lanka. Data were collected through in-depth interviews and an industry based survey from BOI registered textile and apparel manufactures in Sri Lanka. Survey data were analysed quantitatively to identify the significant factories that drives their adoption decision. Environmental management practices are identified with four variables; ISO 14001 certification, environmental audits, water recycling procedures and material reuse as well as factory characteristics, regulatory pressures and market based pressures are identified as the explanatory variables for their adoption decision.

Accordingly, the study found that more than 96% of the factories have adopted at least one voluntary practices and are influenced by factory characteristics and market based pressures. The study revealed that the regulatory pressures are not significant and there are many issues in the existing legal background; especially in implementing and monitoring. Hence, this novel study contributes to both manufactures and policy makers by identifying the drivers and gaps in the legal system.

Keywords: Textile and Apparel Manufacturing Factories, Voluntary Environmental Management Practices, ISO 14001, Recycle, Central Environmental Authority, Environmental Protection License

[1] Department of Business Economics, University of Sri Jayewardenepura, Sri Lanka.

1. Introduction

The textile and apparel industry contributes to more than 58% of the total industrial export earnings (Central Bank of Sri Lanka, 2013) and 52% of the industrial sector employments (Department of Census and Statistics, 2014) in Sri Lanka. Approximately, 3,500 textile and apparel manufacturing factories operate at present in this sector (Department of Census and Statistics, 2014). Despite their economic importance, this industry significantly contributes to environmental pollution mainly by generating solid wastes, polluting inland water sources, and polluting air. Specifically, factories that are engaged with washing and dyeing processes generate significant level of harmful toxics with high concentration of chemicals to water resources (World Bank, 2014).

In order to control environmental pollution, command and control policies (Delmas and Toffel, 2003; Hart, 1995; Priyadarshani and Gupta, 2003; Dasgupta, Hettige and Wheeler, 2000), market based policies were introduced, both in developed and developing countries. However, regulations have not been as efficient and effective; specifically in developing countries (Anton *et al.*, 2002; Blackman and Sisto, 2005; Maxwell and Lyon, 2000). Alternatively, firms[2] have adopted environmental management practices (EMPs) (Esty and Chertow, 1997; Carraro and Leveque, 1999) to control potential negative impacts of their business operations. However, limited empirical evidence are available to reveal the drivers of such adoption practices among the industry players. Similarly, limited studies demonstrate satisfactory results on pollution control by using EMPs (Anton, 2005; Jayasinghe–Mudalige, Udugama and Ikram, 2011; Uchida and Ferraro, 2007; Florida and Davison, 2001; Pulvor, 2002).

Despite their importance and effectiveness, many firms are reluctant to adopt EMPs, claiming that high transaction costs and problems of collective efforts among industries (Ervin,Khanna,Jones &Wirkkala, 2013) are associated with it. Therefore, this novel study fulfils the literature gap as well as provides insights to the policy making process by identifying the drivers of adopting EMPs among the manufactures in the textile and apparel industry in Sri Lanka. Further, the study explores and documents existing legislative procedures that governs environmental pollution in the industrial sector. The findings of the study will motivate other operators in the textile and apparel industry by identifying the motivations for their adoption decision. Further, the identified factors will influence policy making towards pollution reduction (Jayasinghe, and Udugama 2011). The rest of the paper, organized as Section 2, provides a literature review with a brief overview of the Sri Lankan textile & apparel industry and the existing legal background, in order to establish the background for the study. Section 3 presents the research methodology and Section 4 deals with data presentation. Section 5 presents findings of the study followed by Section 6 with a discussion.

[2] One firm has more than one factory.

The study intends to achieve two specific objectives:

i. To explore the existing legal system applicable to the textile and apparel sector in Sri Lanka; and
ii. To explore the factors affecting the adoption decision among textile and apparel manufactures in Sri Lanka.

2. Literature Review

2.1. Empirical Literature

The concept of EMPs is interchangeably used with Corporate Environmental Management (CEM), Corporate Social Responsibility (CSR), Corporate Environmental Engagement (CEE) and Corporate Environmental Responsibility (CER). The concept gained corporate world attention with the events of the Burtland Report in 1987, Earth Summit in Rio in 1992, World Summit on Sustainable Development in 2002 and Earth Summit in 2012 (Nyirenda and Ngwakwe, 2014). EMPs are defined as the techniques, guidelines and ways targeted at monitoring and controlling the effect of a firms actions on the natural environment (Montabon, Sroufe and Narasimhan (2007). Similarly, Nyirenda and Ngwakwe (2014) define EMPs as actions taken by organizations and firms to remedy environmental pollution through waste management, carbon emission reduction, efficient energy use and efficient water usage. After considering these definitions, this study defines EMPs as any actions, decisions, efforts or practices taken by factories/manufactures to reduce environmental pollution caused by their operations.

There are several studies which examined the factors affecting adoption decision of EMPs among the industry players. There are different types of environmental management systems, for example: unilateral commitments by firms, public voluntary programs and joint initiatives between government and polluters (Carraro and Leveque,1999). Some studies highlight that adopting environmental management systems bring benefits to organizations (Mori and Welch, 2008; To, Lee and Yu, 2011). However, these evidences are not adequate to convince the industry players due to some misconceptions highlighted by them (Nyirenda and Ngwakwe, 2014). One of the reasons is that it requires organizational changes (Cassells, Lewis and Findlater, 2012) which create resistance among employees (Zutshi, Sohal & Adams, 2008).

According to available literature there are two main motives for factories' EMPs adoption decisions: external factors and internal factors. Government regulations are found to be the key motive behind adoption of EMPs among industry players (Henrigness and Sadorsky, 1996; Zhang et al, 2008; Potoski and Prakash, 2004; Jayasinghe and Weersink, 2004). Furthermore, environmental sanctions are found to be a way of implementing government regulations (Meegeren, 2001; Delmas 2002). In terms of relative effectiveness, government regulations through compliance and enforcement are found to be positively related with adoption decision (Helland,1998). Reijnders (2003) found that regulations through issuance of permits are more effective than other measures. A counter argument is presented by Triebswetter and Hitchens (2005) with the study conducted among German industrial

manufactures by revealing that pollution abatement initiatives did not negatively affect economic benefits. This finding emphasizes the economic benefits of adopting EMPs among industry layers. Esty and Chertow's (1997) study also revealed that the government command and control measures are effective only for a short term period, due to cost inefficiency and inflexibility to reduce environment pollution. Toffel (2005) reveals a mix of both external and internal factors on firms adoption decision. Regulatory environment and community pressures as the external factors whereas organizational characteristics are the internal factors identified by Toffel's study.

Two other external factors are the market forces and the community (Chen and Soyez, 2003). Policy makers paid attention on market based instruments as a replacement of command and control policies (Khanna and Anton, 2002). As a result, some industry players have adopted voluntary mechanisms to control pollution (Toffel, 2005). However, limited literature is available on corporate self-regulations or self-policing behaviour (Toffel, 2005). Furthermore, customers and suppliers also influence manufactures towards effective solutions towards sustainability (Prakash and Potoski, 2006). A study based on Chinese manufactures revealed that market pressure became strong for their adoption decision (Zhu et al, 2007). When customers' awareness for environmentally friendly product increase, the motivation for adoption among manufactures increase. Community pressure (Guningham et al, 2003) and their characteristics are affecting their adoption decision.

In terms of a theoretical point of view, Hart (1995) discusses the institutional theory, which highlights regulatory pressure as the most powerful instrument to influence firm's adoption decisions. According to the deterrence theory, firms follow legal obligations only to the extent at which the cost of expected penalties exceed the benefits of non-compliance (Thornton, Gunningham, Kagan, 2005). Khanna and Brouhle (2007) explain firms' behaviour with the economic theory of profit maximization, which suggests that a firm's adoption decision depends on the expected profits from such actions. Arora and Cason (1995) similarly explain firm's responses in relation to its profits maximization.[3] EMPs lead to a better compliance status in industrial pollution control (Dasgupta et al, 2000). Some firms opted to adopt voluntary mechanisms due to extra cost engaged in mandatory mechanism or political interferences (Maxwell and Lyon, 2000; Kanchana, 2000). This is specifically due to the cost saving generated from voluntary mechanisms. However, low level of punitive measures and weak legal systems hinders the voluntary adoption of EMPs (Priyadarshani and Gupta, 2003).

Interestingly, some studies find that neither market based nor regulatory pressures directly impact a firm's pollution intensity (Khanna et al., 2007; Anton, Deltas and Khanna, 2002) because some considers these effects as indirect (Anton, Deltas and Khanna, 2002). Information disclosure strategies can have a noteworthy effect on pollution and compliance levels (Foulan, Lanoie and Laplante, 2002).

[3] A variation on this is provided by Testa et al. (2011), who point to three different approaches for explaining the adoption decision: traditional neoclassical approach, revisionists approach based on the Porter hypothesis and, third, a resource based approach.

The second category of factors are the internal factors. Firm specific characteristics, which are considered internal factors, influence the adoption of EMPs; specifically among industry operators (Jayasinghe-Mudalige, Udugama, and Ikram, 2011; Delmas and Toffel, 2003; Blackman, 2009). Firm size (Arora and Cason, 1995; Jayasinghe-Mudalige, Udugama, and Ikram, 2011; Pargal and Wheeler (1996), export orientation (Christmann & Taylor,2001), plant's characteriscs (Pargal and Wheeler,1996) and managers' leadership within the firm (Delmas and Toffel, 2003) are, for example, important variables that influence firms' behaviour. For example: Arora and Cason (1995) examining factors affecting the adoption decision to 33/50 programme in the USA in 1993, found that large firms and more polluting firms voluntarily adopt this system when compared to other firms (Arora and Cason, 1995).

However, researchers have not studied the main factors which affect the adoption decisions among the factories (Liu et al, 2010). Therefore, the contribution of this study would be to identify the most important factors towards factories' adoption decision, specifically within the Sri Lankan context, where there are no such studies undertaken in the textile and apparel industry. This study's findings will be beneficial to both industry players and policy makers towards introducing sustainable business practices to control environmental pollution.

The next section in the literature review provides a brief introduction to the Sri Lankan textile and apparel industry.

2.2. Textile and Apparel Industry in Sri Lanka

The textile and apparel industry in Sri Lanka commercially started in the 1960s, limited to the local markets. After economic liberalization in the early 1970s, foreign direct investments and exports started. Low labour costs, the establishment of the Board of Investment (BOI) and the Export Processing Zones (EPZs), were able to attract foreign investors.

The textile and apparel industry recorded an USD 4.5 billion export income in 2013[4]. This represents 43% of total export earnings and 58% of total industrial export earnings in Sri Lanka (Central Bank of Sri Lanka, 2013). The United States of America (43%) and Europe (46%) are the major export markets for the Sri Lankan textile and apparel industry (Central Bank of Sri Lanka, 2013). They manufacture: sportswear, lingerie, loungewear, bridal wear, safety worker's wear, swimwear, and children's wear. These are further classified as knitted or crocheted, un-knitted and warm clothing.

However, the textile and apparel industry encountered a number of challenges; for example: suspension of the GSP+ (Generalized System of

[4] Value of GNP is SLR 8,438,960 million (64.9 USD billion). USD 1= SLR 130.
Manufacturing sector- industrial manufacturing: SLR 1,402,353 million (10.8 USD billion); Textile and Apparel: SLR 259,412 million (USD 2 billion). Textile and apparel export earnings are SLR 583,046 million at current market prices (USD 4.5 billion which is out of USD 10.4 billion of total export income).

Preferences) facility which provides the EU tax free access for Sri Lankan garments within the European Union. Thus, the industry has begun to specialize in high quality products and the use of some specific labels. For example: "Ethically Manufactured Garments", "Garments without Guilt Certification" and "Sustainable Environmental Friendly Manufacturing". With these changes the industry aims to build a reputation in high quality finished products and to make in-roads into niche markets.

The forthcoming empirical analysis focuses on the Board of Investment (BOI) registered establishments, which are largely large-scale export-oriented factories operating in the apparel and textile sector. The BOI is the governmental agency responsible for increasing foreign and domestic investment in the textile and apparel sector in Sri Lanka. Its main mandate is to provide advice and assistance to potential investors. The BOI is in charge of administering Export Processing Zones (EPZs) which offer special benefits to investors. For example: tax holidays or preferential rates, exemption from customs duty and foreign exchange controls. The EPZs are equipped with modern public infrastructure; access roads, water and sewerage facilities, security, as well as a range of business services. There are nine EPZs in Sri Lanka.

Three hundred and twenty six (326) textile and apparel manufacturing factories are registered with the BOI, including 168 factories with more than 250 employees. Further, 16 textiles and fabric manufacturing factories and 09 finishing factories (representing less than 5% of all establishments) are registered with the BOI (BOI and Central Bank of Sri Lanka, 2013). The BOI-registered factories represent 96% of the total apparel export earnings in Sri Lanka. Even though, the number of BOI registered factories are smaller (10%) when compared to the total establishments[5] in the sector, their level of contribution to the national economy is highly significant. Having understood the current situation in the textile and apparel industry in Sri Lanka, the next section introduces existing environmental regulations that are applicable to this industry.

2.3. Environmental Regulations Applicable to the Textile and Apparel Industry in Sri Lanka

The Ministry of Environment and Renewable Energy[6] is responsible for the overall management of the environment and natural resources, while the Central Environment Authority (CEA) is responsible for policy implementation and monitoring. The legislative structure delegates its legal powers to the CEA to regulate firms' /factories' behaviour. Two main instruments are used by the CEA: the Environmental Protection License (EPL) and effluent standards. The CEA similarly disseminates environmental-related information and offers laboratory testing facilities (for measuring water quality, soil and solid waste contamination, noise level, and air

[5] A total of 1,977 establishments were recorded in category 17 (Manufacturing of textiles) and 1,553 establishments in category 18 (Manufacturing of wearing apparel) in the 2011 Survey of Industries (Department of Census and Statistics, 2014). Among these, 61 in the textile sector and 335 in the apparel sector had more than 100 employees.

[6] Earlier it was the Ministry of Environment and Natural Resources.

pollution) to factories.[7] CEA offices are located in each of the nine provinces and 13 district offices. In addition, the Environment Department of the BOI is given the responsibility of monitoring environmental pollution of industries registered at the BOI. Regulations related to pollution control are mainly described in the National Environment Act No 47 of 1980 (Central Environment Authority, 1980 #504).

The Environment Protection License (EPL)

Under Section 23A and 23B of the 1988 amendment to the National Environmental Act, any new business is required to obtain project approval and EPL certificate from the CEA, before starting their operations. This license allows the right to emit or discharge pollutants in accordance with the standards and criteria set by the Act[8]. Approved projects are required to submit an Environmental Impact Assessment (EIA) report, before starting their operations describing their impact on the environment and the subsequent measures undertaken to control any excess pollution levels. General public is then informed about the approved projects through media as a third party monitoring mechanism ((Ministry of Environment and Natural Resources, 2008 #502).

According to the Act, industries are classified into three categories: A, B, and C depending on their potential level of pollution. Category A consists of 80 highly polluting industrial activities, while Category B includes 33 activities generating medium levels of pollution. Category C consists with 25 low polluting industrial activities.[9] All textile and apparel manufacturing factories are classified under either Category A or Category B. A factory is listed in Category A, if its operations involve bleaching, dyeing, printing, washing and sand blasting activities. Factories with more than 25 power looms or machines used for sizing activities; or factories which use shared or individual wastewater treatment plants with a capacity of 10,000 cubic meters per day or more; or factories that employ 200 workers or more per shift; or factories which discharge 10 cubic meters of wastewater (or more) per day or use toxic chemicals in its production process are too categorised under Category A.

A factory is listed in Category B, if it is a batik industry; or less than 10 workers are employed; or a factory with less than 25 power looms; or a factory with hand looms or knitting or embroider with more than 10 looms; or a garment with employees 25-200 per shift; or any factory which discharge 3-10 cubic meters of industrial processing waste water per day.

As mentioned earlier, an EPL is issued or renewed either by the CEA or the BOI since they are the two monitoring bodies. BOI-registered companies within the EPZs are directly monitored by the BOI's Environmental Management Department (EMD). EPZs are also indirectly monitored by the CEA since it issues an EPL for each EPZ, considering each zone as a single enterprise. Thereafter, EPL is issued to

[7] There are currently 29 registered laboratories and 41 registered consultants in the CEA.

[8] Hereafter, the Act refers to the Act No 47 of 1980 National Environment Act.

[9] Amendments to the 1980 National Environmental Act published in 2000 and 2008 provide further details regarding the issuance of the EPL for different types of activities.

individual enterprise by the BOI's Environment Management Department. Similarly, the EPL for a BOI-registered factory which is not located within an EPZ, is issued by the EMD after obtaining concurrence from the CEA based on joint inspection by CEA and BOI officers.

Every application for an EPL needs to be accompanied with a certificate which shows a sufficient amount to cover damages that may be caused to the public as a result of any activities carried out by the factory. Once granted, the license is valid for a period of one to three years, after which it is required to be renewed. Section 23D of the Act No 56 of 1988 describes the cases where the license can be suspended or cancelled. Accordingly, the CEA takes actions against a company which violates the rules by issuing a written warning, non-renewal or cancellation of EPL, penalty, and at last decision to close down the factory.

Effluent Standards

The type of waste and pollutants emitted by textile and apparel factories depend on their main activities undertaken, specifically water pollution remains the primary concern. Table 01 presents the standards set by the CEA that apply to wastewater discharge into inland surface waters. In addition to the national standards, interim standards (some less stringent standards) apply within EPZs. Factories within the BOI zones are required to maintain these interim standards set by the BOI Ordinance whereas overall EPZ (zone as an individual enterprise) is required to maintain national standards set by the National Environmental Act.

According to Section 29 of the Act, the environmental regulator has the power to monitor and inspect activities undertaken by a licensee, or to examine records, or to take samples of wastes or recycled wastes, or/ and to provide advice on waste handling. Factories are required to maintain records of their waste generation and waste handling. Violation of the set standards can result in licenses being suspended or cancelled and the factory being fined. Section 31 of the Act states that any factory manager who commits an offence is liable to imprisonment not exceeding two years, or to a fine of not less than SLR 10,000 to 100,000, or to both imprisonment and a fine.

Monitoring and Enforcement

The process for monitoring and enforcement involves licensing and inspection of Category A and B factories. According to the Act, every factory is required to obtain an EPL before starting their commercial operations and every factory has to renew its EPL annually (Category A factories) or tri-annually (Category B factories). In practice, every factory is inspected by CEA officers.

TABLE 01
Tolerance Limits for Wastewater from the Textile Industry being Discharged into Inland Surface Waters (National and Interim Standards Set by the CEA)

No.	Parameter	Unit Type of Limit	National Standards	Interim Standards
01	pH at ambient temperature		6.5 to 8.5	6.5 to 8.5
02	Temperature	^{0}C, max	40 measured at site of sampling	40 measured at site of sampling
03	Total suspended solids	mg/1, max	50	500
04	Biochemical Oxygen Demand (BOD_5) in five days at 20^0c or BOD_3 in a three days at 27^0c	mg/1, max	60	200
05	Colour	Wavelength range:	Maximum spectral absorption coefficient:	Maximum spectral absorption coefficient:
		Yellow range	436 nm ($7m^{-1}$)	400- 499 nm ($7m^{-1}$)
		Red range	525 nm ($5m^{-1}$)	500- 599 nm ($5m^{-1}$)
		Blue range	620 nm ($3m^{-1}$)	600- 750 nm ($3m^{-1}$)
06	Oil and grease	mg/1, max	10	30
07	Phenolic compounds (Phenolic OH)	mg/1, max	1.0	5.0
08	Chemical Oxygen Demand (COD)	mg/1, max	250	600
09	Sulphides (S)	mg/1, max	2.0	2.0
10	Copper, total (Cu)	mg/1, max	3.0	3.0
11	Zinc, total (Zn)	mg/1, max	5.0	10
12	Ammoniacal nitrogen (N)	mg/1, max	60	50
13	Chloride (Cl)	mg/1, max	70	900

Source: Environmental Norms, Board of Investment of Sri Lanka (2011) and National Environmental Act, No 47 of 1980 as per the gazette of the Democratic Socialist Republic of Sri Lanka, Extraordinary, No: 1534/18, Friday, February 1, 2008.

After the brief explanation of the present legislative background affecting Sri Lankan apparel manufactures, the next section presents the study methodology.

3. Methodology

As per the two objectives of the study and its epistemological assumptions, which is about the acceptable, valid and legitimate knowledge (Saunders, Lewis and Thornhill, 2016), the study stands upon the interpretivism philosophical position, since it addresses the problems in the business and management disciplines. Since the business situations are complex and unique, understanding their complexities by a researcher is important for its solutions (Saunders et al 2016). According to Saunders et al (2016) interpretivism, helps to create a richer understanding of the social world. The knowledge is created through the deductive approach. The study employed a case study strategy in achieving the study objectives. Case studies are suitable where research questions ask 'why' and 'how' questions, studying a problem in its real life settings and where the study investigates a contemporary issue (Yin, 2014). Within the case study strategy, the study was conducted through two primary data collection methods; in-depth interviews and an industry survey, in addition to secondary data sources. The study used a mixed method in achieving its objectives. One of the advantages of the mixed method is the ability to elaborate, enhance, clarify or confirmed the study findings (Saunders et al, 2016). It further improves the generalizability of findings.

The study examined the existing acts, policy briefs, minutes, and government websites relating to environmental protection and pollution control to understand and document the existing legal background of the environmental pollution in Sri Lanka. This fulfilled the first research objective. Similarly, in-depth interviews were conducted with the Directors of the Environmental Pollution Control Unit and Environmental Impact Assessment Unit of the Central Environmental Authority (CEA), the Environment Unit of the BOI Zonal office (in Katunayake Export Processing Zone), and the Statistical Unit of the BOI. Three directors of certification bodies, the Director of the System Certification Unit at the Sri Lanka Standard Institute, and the Director of the Textile Industry at the Ministry of Industry and Commerce were also interviewed. The industry survey was conducted in order to identify the factors affecting adoption decisions among manufactures in order to achieve study's second objective. The manufactures were selected from the list of firms registered at the BOI in Sri Lanka.

The survey was carried out with a closed-ended questionnaire. Survey method helps to reduce the time and cost of data collection. (Saunders et al, 2016). The data were collected during August 2013 to November 2013 as cross sectional data. The survey data were analysed quantitatively using descriptive statistics and inferential statistics. The study used a simple random sampling technique for sample selection. Simple random sample ensure the free from biasness in sample selection, since the sample must be adequate enough to derive study objectives (Saunders et al, 2016). This study frames its sampling frame as the factories registered at the BOI in Sri Lanka. There were 326 factories registered at the BOI, however only 237 factories were in operation at the time of data collection. Therefore 160 questionnaires were distributed and only 55 questionnaires were completed.

The study examined factory level data to figure-out the factors that influence firms' decisions to adopt EMPs. Following Jayasinghe and Udugama (2011), our

conceptual understanding is that the decision maker gets utility (U) from undertaking environmental management practices in the firm. Accordingly, $U_i = u[V(EMP_i|I_{ji,}F_{ki})]$, where V represents gains from adopting environmental practices by the factory and EMP_i represents different EMPs adopted by the factory (Jayasinghe and Udugama, 2011). These EMPs are influenced by regulatory and market based factors and factory's characteristics.

$$EMP_i = \alpha + \beta_j I_{ji} + \tau_k F_{ki} + e_i \quad (1)$$

where I_{ji} refers to *j* different incentives (both regulatory and market based) faced by the factory *i* for the adoption of EMPs and F_{ki} refers to the *k* factory characteristics of the *i*th factory.

We estimate the following Poisson model where the dependent variable is the number of EMPs undertaken at the factory:

$$\Pr(EMP = y) = \frac{e^{-\mu}\mu^y}{y!}, \text{ y = 0, 1, 2, 3, or 4.} \quad (2)$$

The parameter μ is called the intensity or rate parameter. The Poisson model is estimated using Maximum Likelihood.

3.1. Description of Data

The dependent variable in model (2) represents the number of EMPs adopted by a factory. Data for the analysis is collected from a survey of 55 BOI-registered factories in the Western Province in Sri Lanka, where a majority of textile and apparel factories are located.[10] The researchers randomly selected 160 factories out of the 221 BOI-registered factories operate in the Western province.[11] Questionnaires were emailed to factory managers and copies were also hand-delivered #to the highest officer in charge of safety and compliance. Following up with frequent telephone reminders, data from 55 questionnaires were. BOI-registered factories were focused on because the value addition from this sector to GDP and export earnings is significant. The survey inquired about the EMPs adoption decisions of factories with four environmental management practices; 1) ISO 14001-certification,[12] 2) water recycling, 3) material re-use, and 4) environmental audits. Availability of ISO 14001certificte with the factory means that the factory has taken voluntary actions to set targets, implement strategies, and make necessary adjustments to minimize the environmental impacts due to their production process. Water recycling means that

[10] Some two-thirds (221) of all the BOI-registered factories are located in the Western province (Colombo, Gampaha and Kalutara districts)

[11] Colombo district records the highest number of factories (163 BOI- registered factories) and the highest per capita income compared to other districts in Sri Lanka. There are 44 BOI-registered textile and apparel manufacturers and five EPZ in Gampaha district and 14 factories and one EPZ registered in Kalutara district.

[12] There are certification bodies with international accreditation to issue ISO 14001 and 9001 standards in Sri Lanka.

factories have taken necessary steps to recycle the used water/ waste water before discharging it to the sewerage system or before using it for some other purposes such as toilet flushing or gardening. Some factories have established their own waste water treatment plants whereas others have given it as a contract to a third party. Material re-use is another EMP adopted by factories in the sample. Different types of waste materials are generated such as fabric waste, cones, bulbs, water, dye, paper, cardboard, tires, food, etc. Some of these waste materials are used for the second time by factories or others. For example; fabric wastes are used at the canteen, factory floor, for boilers etc. Used cones are reused for the same purposes. Paper waste is used for making bags, and in the canteen as welfare services. Tires and plastic cans are used for gardening purposes. The fourth environmental practice is the issuance of environmental audits by factories. Environmental audits are conducted by two parties. Internal audits are carried out by compliance department, maintenance department or engineering department. They compare the energy targets, and environmental related targets with the actuals. The external audits are conducted by either certification bodies or buyers, or agents from buying office. These EMPs are presented in Table 02.

TABLE 02
Description of Environmental Management Practices

Variable	Mean Value	Description of the Variable (1= Yes; 0 = No)
ISO 14001	0.27	Factory has obtained the ISO 14001 certificate
Water Recycling	0.42	Factory recycle used water by the factory itself or contract out before releasing to sewerage system
Material Reuse	0.87	Factory re-use fabric waste, paper waste, recycled water, cans, tyres, cones, any other items
Environmental Audits	0.67	Factory produces or issues environmental audits

Source: Author constructed based on survey data.

As per the Table 02, 87% of factories have practiced material re-use whereas 67% of factories prepare environmental audits. Only 47% of factories engaged in water recycling within this sample. Among the sampled factories, only 27% of factories have obtained ISO 14001 certification. It is evident that most of the practices are positively correlated with each other practice. For example; if the factory adopted a water recycling procedures, the factory has re-used water as material reuse. Hence we summated the total number of practices adopted by each factory as presented in Table 3. The EMP in model (2) can take five possible values: 0, 1, 2, 3 and 4, where 0 refers to no EMP as presented in Table 2. For example: 1 indicates that only one of these four EMPs is undertaken.

TABLE 03
Number of EMPs Undertaken by Factories

No. of EMPs	Freq.	Cumulative Freq.	Percent	Cumulative Percent
0	2	2	4	4
1	15	17	27	31
2	16	33	29	60
3	12	45	22	82
4	10	55	18	100

Source: Factory survey.

Based on our literature review, we hypothesize that internal factors, for example: firm size, type of activities undertaken, location within an export zone and external factors, for example: pressures from different parties including market-orientation, affect factory's adoption behaviour. Firm size is measured through the number of factories owned by the company (*nofactories*). Market orientation of the factory was controlled using a dummy variable that takes the value 1 if more than 90% of its sales are exported, and 0 otherwise (*i_foreignexp*). Type of activities undertaken by a factory is captured by six dummy variables that represent factories engaged with dyeing, washing, weaving, apparel manufacturing, embroidery, and accessories (*i_dye, i_wash, i_weaving, i_apparel, i_embroid*, and *i_access*, respectively). The role of monitoring and enforcement or regulatory pressure could not be directly measured since none of the 55 factories had been fined (even though 54 out of 55 have been inspected). However, a variable was created (*av_pressure*) that indicates the firm's perception on overall pressure it feels from different sources (regulatory and market) to comply with environmental standards. Finally, it was determined if the factory is located within an EPZ or not (*i_boiepz*). The model that is presented here provides the best fit to the data. Other explanatory variables were available in the database depicted in Table 04 and some of them were not used in the model to avoid multicollinearity problems.

The survey recorded information on a number of factors as proxies for the explanatory variables identified as legislative pressures, market based pressures and factory characteristics. These include location, years in operation, type of company, share of foreign exports, monthly sales, number of employees and type of activities undertaken by a factory. Managers were also interviewed about certifications received by the factory, EMPs and presence of environmental audits at the factory level.[13] In addition to factory's characteristics, we were interested in the impact of regulatory pressures and market pressures. Managers were, thus, questioned about

[13]This information was reported by the interviewees. We visited all of the 10 case study factory sites.

inspections by environmental officers and fines they may have been received. Finally, they were asked to evaluate the level of pressure (on a scale from 1 to 5) for compliance with environmental regulations and/or adoption of EMPs, they may have received from i) the Apparel Exporters Association (AEA); ii) the Central Environmental Authority (CEA); iii) the local community; iv) from the buyers, and v) from the owners.[14]

In addition to the industry survey, in-depth interviews were conducted with the identified stakeholders. At present, there are 86 Senior Environmental Officers (SEO), 150 Environmental Officers (EO) and 250 Deputy Environmental Officers (DEO) at CEA's provincial and district offices, who are responsible for monitoring and licensing industries in all sectors.[15] Most of them are graduates from the science stream. Further, they are regularly given local as well as overseas training. There are 6 SEOs and 4 DEO and EOs at the CEA head office and they carry out inspections in factories within the Western province. In practice, a SEO goes with a DEO or EO for inspections.

Based on their inspections and complains made by public, CEA issues legal notices to the factories which violate regulations. The most common violation is non-renewal of license. In 2013, across all industrial sectors, there were 53 cases filed (39 were finalized) and 65 EPLs were cancelled (none related to textiles and apparels). The time taken to finalize a case varies. Some factories are required to establish an effluent treatment plant or to change their waste handling methods, which may require considerable time. According to the legal department of the CEA, only one textile manufacturing factory was fined for excessive water pollution during the year 2013 (this factory was not a BOI registered factory). All the variables used in the study are presented in Table 04.

[14] Owners represent owner- entrepreneurs of the factories if it is a sole proprietorship, partnership or a public limited company. If it is a public limited company the owner represents the Chairman or Managing Director. If it is a branch of the foreign company the owner represents the foreign entrepreneur.

[15]During 2013, for category A industries, after inspecting 1,192 factories across all industrial sectors, a total of 1,006 new EPL were issued; and after inspecting 2,236 factories, 2,188 EPLs were renewed. For Category B industries, 938 new EPLs were issued after completing 1,137 inspections and 793 were renewed out of 870 inspections.

TABLE 04
List of Variable and their Definitions

Variable	Mean	Description of Variable
i_Colombo	0.45	Equal to 1 if the factory is located in Colombo district, 0 otherwise
i_Gampaha	0.42	Equal to 1 if the factory is located in Gampaha district, 0 otherwise
i_Kaluthara	0.13	Equal to 1 if the factory is located in Kaluthara district, 0 otherwise
i_boiepz*	0.6	Equal to 1 if the factory is located in a BOI or EPZ zone, 0 otherwise
yearsestab	16.85	Number of years since establishment of the factory
i_solep	0.15	Equal to 1 if the company is in sole proprietorship, 0 otherwise
i_partner	0.11	Equal to 1 if the company is in partnership, 0 otherwise
i_ltdliab	0.33	Equal to 1 if the company is a limited liability company, 0 otherwise
i_group	0.29	Equal to 1 if the company belongs to a group of companies, 0 otherwise
i_brforeign	0.13	Equal to 1 if the company is a branch of a foreign company, 0 otherwise
nofactories*	8.49	Number of factories owned by the company
i_foreignexp*	0.91	Equal to 1 if more than 90% of sales are exported, 0 otherwise
i_salesgr15	0.78	Equal to 1 if average monthly sales are greater than 15 M SLR, 0 otherwise
totalemployees	843.2	Total number of employees in the factory
sh_managers	0.04	Proportion of managers
i_dye*	0.25	Equal to 1 if dyeing activities are done at the factory, 0 otherwise
i_wash*	0.27	Equal to 1 if washing activities are done at the factory, 0 otherwise
i_weaving*	0.11	Equal to 1 if weaving activities are done at the factory, 0 otherwise

(Table 04 continued)

(Table 04 continued)

i_apparel*	0.71	Equal to 1 if apparel is produced at the factory, 0 otherwise
i_accesso*	0.07	Equal to 1 if accessories are produced at the factory, 0 otherwise
i_embroid*	0.16	Equal to 1 if embroidery activities are done at the factory, 0 otherwise
nostaffems	12.29	Number of staff involved in EMS
i_degree	0.53	Equal to 1 if the highest qualified person in charge of EMS has a degree, 0 otherwise
i_iso14001	0.27	Equal to 1 if the factory is ISO 14001-certified, 0 otherwise
i_iso9001*	0.38	Equal to 1 if the factory is ISO 9001-certified, 0 otherwise
i_recycle	0.42	Equal to 1 if the factory is doing some water recycling, 0 otherwise
i_reuse	0.87	Equal to 1 if the factory is reusing any material (e.g. fabric, paper, or water), 0 otherwise
i_envaudit	0.67	Equal to 1 if the factory has undertaken some environmental audit, 0 otherwise
i_fines	0	Equal to 1 if the factory had to pay fines due to noncompliance with environmental regulations, 0 otherwise
i_inspect	0.98	Equal to 1 if the factory has been inspected, 0 otherwise
AEA pressure	2.22	Level of pressure from the Apparel Exporters Association (AEA), scale from 1 (no pressure) to 5 (highest level of pressure)
CEA pressure	3.44	Level of pressure from the Central Environmental Authority (CEA), from 1 to 5
Community pressure	2.29	Level of pressure from the community, from 1 to 5
buyer pressuree	3.96	Level of pressure from the buyers, from 1 to 5
ownerpressuree	3.76	Level of pressure from the owners, from 1 to 5
av_pressure*	3.13	Average level of pressure, from AEA, CEA, community, buyers, and owners

Source: Author constructed based on survey data.

4. Results

Most of the regulators interviewed indicated that they were moderately satisfied with the overall monitoring and enforcement process in the textile and apparel sector. They identified several factors that appear to positively influence compliance in this sector:

1. The dominance of apparel manufacturing (dry process) is itself a major factor since these firms are less polluting in general.
2. Another important factor that repeatedly came up was pressure from foreign customers: major buyers, mostly from Europe and the USA, make indirect pressure on Sri Lankan factories to comply with regulations and even international standards. To cite the Deputy Director General, Environmental Pollution Control, Central Environmental Authority "*90% of the Sri Lankan textiles and garments go to Europe and the USA, where they are concerned about environmentally friendly production methods. If a company does not obtain an EPL certificate and test reports; such as noise level report, ambient air quality report, waste water treatments' reports etc., the foreign buyers will withdraw their orders from the factory*." The factory managers who were interviewed also confirmed that they felt pressure from their international buyers. They further mention that the foreign buyers conduct their own audits, which cover employees' health and safety, production techniques, employee payments as well as environmental practices of the factory.
3. Regulators recognize that the public has also become cognizant about environmental issues with an active media that frequently reports on industrial pollution. For instance, one recent incident in a rubber manufacturing factory was reported by media and the factory was closed down as a result of community unrest. Chemical waste from this factory had contaminated local water bodies and raised severe health issues among villages (Ratnakara, 2013).
4. Regulators also believe that the CEA staff is relatively well qualified to monitor environmental pollution. All CEA staff members are graduates and have completed some form of relevant training (locally or internationally).

Based on the interviews the following issues in the implementing and monitoring are identified:

1. Number of staff is not sufficient to ensure proper monitoring. Because of the small number of staff, a factory is generally inspected only when an EPL is given or renewed. EMDs in the EPZs also suffer from staff shortages. Usually there are two to three inspectors allocated to each EPZ, while each zone commonly gathers more than 50 factories.
2. Furthermore, the laboratory facilities within the EPZs are not adequate and the environmental officers sometimes have to send samples to laboratories located outside the zone, which causes enormous delays and expense.
3. CEA officials further pointed out stringent penalties and legal bottlenecks. Many of the regulators opined that the level of fines charged to non-compliant factories

is generally small and does not provide much incentive to factories to comply with standards. In fact, the CEA has recently requested the Attorney General and the Legal Draftsman Division to increase the current fines. The CEA is also not directly responsible for fines, which have to be mandated by the courts. There are specific amounts of fines for different violations.[16] In practice, the CEA does not consider fines for first time violations.

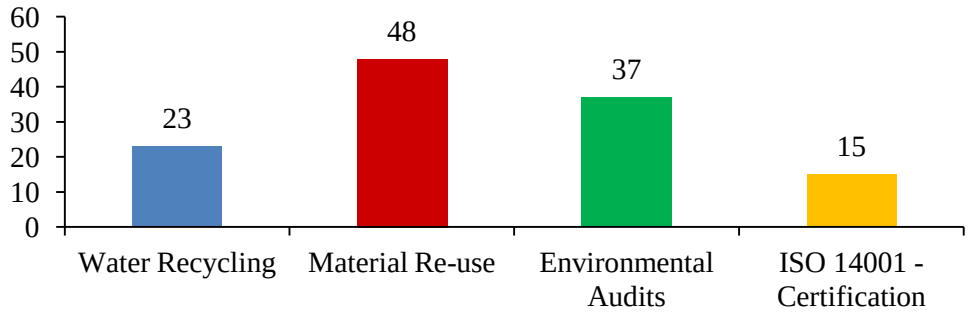
4. The whole judiciary process can take time due to practical reasons such as the number of cases to be handled by the district courts in a day, shortage of officers, etc. On average, a case can take several months to years. Thus, legal delays seem to be a major deterrent to effective implementation of regulations. They follow several prior steps such as warning in writing, filing a case, hearing a case, giving chances for appeals etc. The process is as follows:
   i. If the CEA finds any violations through their inspections or sometimes as a result of complaints made by the community, they start their legal actions.
   ii. The CEA conducts inspections once again to collect the evidence.
   iii. With the collected evidence CEA files, a case against the company.
   iv. Within the given ranges of fines under different violations, the final amount is set by the court.

According to the industry survey, 60% of the firms are located within an EPZ and 91% are export oriented (i.e., more than 90% of their sales are made outside the domestic market) (Table 04). The average length of operation of a factory is 17 years and has an average of 843 employees (ranging from 35 to 3,800). Per Sri Lanka's industry laws, a factory is large scale if it has at least 25 employees. Thus, 100% of the factories surveyed are large factories per their number of employees. Furthermore, 90% of factories are classified into category A or B due to the number of employees per shift.

Figure 01 depicts environmental management practices among the surveyed factories: 27% (15 factories) are ISO 14001-certified, 42% have water re-cycling, majority (87%) re-use material (e.g. paper and fabric), and 67% have had environmental audits. Only two factories do not undertake any EMPs, while 18% (10 out of the 55) factories are ISO 14001-certified, recycle water, reuse material, and have been audited on their environmental practices. Of those factories undertaking only one EMP, the most common practice is material reuse (11 out of 15 factories). This suggests that material re-use is one of the easiest or least-costly EMPs that firms can adopt.

[16] 1) If waste water discharge exceeds the standards set by the Act - SLR 15,000 – SLR 120,000; 2) If the factory exceeds the standard level of noise pollution – SLR 15,000-120,000; 3) An industry operating without having an EPL – SLR. 10,000 to 100,000 plus I year imprisonment or could be both; 3) In addition to the above mentioned 3 cases, there is fine on violation of EIA assessment. Maximum to SLR. 10,000; and 4). In case of air pollution, there is no specific fine stated by the act due to inability to measure air pollution from the industry.

FIGURE 01
Number of Factories Adopting Each of the Four EMPs



Source: Author constructed based on survey data.

The proportion of factories undertaking each of the four EMPs between factories outside an EPZ (22 observations) and factories located within an EPZ (33 observations) is 2:3. On average, the factories that are located within an EPZ engage more often in voluntary water recycling, are more often audited, and are more likely to have an ISO 14001 certification. Simple statistics show that factories located within an EPZ have more employees, on average, than factories located outside an EPZ but the difference is not statistically significant. In general, a factory being located in an EPZ seems to make it more environmentally friendly.

Factories with washing and dyeing operations (10 observations) were compared with the factories with dry operations (45 observations). Dyeing and washing are activities that require large quantities of water and contribute to water pollution in the textile and apparel sector. However, contrary to this generally held view, the factories that do washing and dyeing operations are more likely to voluntarily adopt the four EMPs within the surveyed factories. Thus, these firms appear to be taking on additional practices to clean than inherently dirtier sets of activities.

Management attitude regarding pressure from different stakeholders are measured from a 1-5 scale measurement. The strongest pressure comes from the buyers (3.96 on average) followed by the owners (3.76), while Apparel Exporters Association (AEA) and the community exert the least influence on factory managers' compliance decisions (Table 04).

The regression results are shown in Table 05. The Wald test indicates an overall significance of the model even if the Pseudo-R^2 is only 0.09. The average marginal effects indicate the expected change in the number of EMPs following a one-unit change in the corresponding explanatory variable. Our results in Table 05 show that factories belonging to larger companies (as measured by the number of factories belonging to the same company) are significantly more likely to undertake more EMPs. This suggests that there may be some economies of scale in

implementing EMPs, i.e., the larger the scale or replicability of the EMP practice, the more likely there will be a corporate strategy for adopting EMPs.

TABLE 05
Poisson Model, Maximum Likelihood Estimation Results (55 Observations)

	Coef.	Robust Std. Err.	P>z	Average Marginal Effect	P>z
nofactories	0.011***	0.004	0.007	0.024***	0.008
i_foreignexp	0.693***	0.169	0.000	1.200***	0.003
i_access (ref.)	-	-	-	-	-
i_dye	0.853***	0.167	0.000	2.437***	0.000
i_wash	-0.450***	0.152	0.003	-0.945***	0.000
i_weaving	0.257	0.194	0.184	0.640	0.236
i_apparel	0.334**	0.147	0.023	0.717*	0.051
i_embroid	-0.159	0.139	0.252	-0.337	0.218
i_iso9001	0.287***	0.107	0.007	0.655**	0.014
av_pressure	0.021	0.071	0.762	0.048	0.761
i_boiepz	0.207*	0.108	0.055	0.453*	0.088
constant	-0.610*	0.357	0.088		
Wald chi2(10)	74.73				
Prob>chi2	0.0000				
Pseudo R2	0.0851				

*, **, *** indicate significance at the 10, 5, and 1 percent level, respectively.
Source: Author constructed based on survey data.

As expected, a higher proportion of sales directed towards the foreign markets are associated with a significant increase in EMPs. The type of activities undertaken by the factories also has a significant impact on the number of EMPs: factories that run dyeing operations, the most polluting activity, adopt 2.4 additional EMPs on average relative to factories associated with accessories (category of activity used as the reference), while washing is associated with a reduction in the number of EMPs (-0.9 on average). Factories that produce apparel are also more likely to engage voluntarily in EMPs (the marginal effect in terms of EMPs is estimated at 0.7). One possible explanation for the latter result (something discussed during the face-to-face interviews) is that apparel manufacturers directly deal with

buyers whereas weaving and embroidery factories do not (they usually supply apparel manufacturers on contract basis). It is also interesting to note that, among BOI-registered firms, the most generally polluting firms, i.e. dying factories, undertake more EMPs. This suggests that even the most polluting firms can be transformed under the right circumstances.

The coefficient on ISO 9001-certification is significant and associated with 0.7 additional EMPs, which suggests that factories that are certified by external bodies adopt a higher number of EMPs. The ISO-9001 certification process is not focused on environmental issues. Yet, it seems to have a broader environmental effect on factories. It is also possible that such factories are also more open and pre-disposed to issues of sustainability and environmental management.

The coefficient of the variable on pressure from different sources is positive but not statistically significant. Finally, being located in an EPZ increases the number of EMPs voluntarily adopted, which might reflect some (positive) peer or neighbouring effects (i.e., factories might be influenced by what other factories within the EPZ are doing).

5. Discussion and Conclusion

The textile and apparel industry is almost equally divided between textile manufacturing and apparel manufacturing factories in the Sri Lankan context. Because of the relatively large presence of apparel manufacturing factories, Sri Lanka's textile and apparel industry is relatively less damaging to the environment. This is probably one reason why the level of compliance to environmental regulations in the textile and apparel sector is high in Sri Lanka. In a survey of 55 firms, it was found that 96% had implemented at least one environmental management practice and that almost all had been inspected but never fined. Further, discussions with officials from the Central Environmental Authority and BOI also suggest that compliance is moderately satisfactory.

One of the main reasons that the Sri Lankan textile and apparel sector operates with high voluntary environmental standards is because of the pressure from the international buyers from Europe and the USA. A majority of the firms surveyed had gone through environmental audits conducted by representatives of the major brands. The role of international buyers was also emphasized by the factory managers who were interviewed.

Several factory level characteristics influence a factory's decision to adopt environmental management practices. A factory that belongs to a group of firms is more like to increase its adoption of EMPs relative to a single factory. The type of production activity a factory is involved in is clearly important for the adoption decision. Since apparel is a dry production process, most apparel producers voluntarily adopt EMPs. Interestingly, in the acquired dataset, factories that engage in more polluting activities (such as dyeing and washing) also adopt more EMPs. This is likely because these export-oriented factories are trying to make sure that their production is clean and *perceived* to be clean. Factories are also likely to adopt EMPs if they are ISO 9001 certified, even though this certification is not related to the environment. It is also interesting to note that factories within export processing

zones fare better than those outside in terms of their environmental practices. Buyer's pressure also has a significant influence on factory EMP adoption. This is a major finding that emerges from the econometric analyses of factory level survey data.

The message for the policy maker is that the export oriented producers adopt more voluntary environmental practices. Another important finding is that, easily, any firm can adopt at least a few environmental management practices without a significant amount of investment. For example: reuse of materials and conducting environmental audits are helpful in their participation to voluntary practices as well as to reduce costs and wastes. Therefore, in their awareness raising and networking activities for the industry, policy formulating and monitoring bodies should emphasize how firms can gain in terms of accessing a broader market, improving their reputation and obtaining some internal savings by adopting EMPs.

References

Anton, W. R., Deltas, G., and Khanna, M. (2002). *Incentives For Environmental Self-Regulation And Implications.* National Center for Environmental Research and Quality Assurance.

Anton, W. R. (2005). The Choice of Management Practices: What Determines the Design of an Environmental Management System? *American Agricultural Economics Association Annual Meeting.* Providence, Rhode Island.

Arora, S., and Cason, T. N. (1995). An Experiment in Voluantry Environmental Regulation: Participation in EPA's 33/50 Program. *Journal of Environmental Economics and Management* 28(3): 271-286.

Blackman, A. (2007). Can voluntary environmental regulation work in developing countries? Lessons from case studies. RFF Discussion Paper 07-10, Resources for the Future, Washington DC.

Blackman, A. (2009). Alternative Pollution Control Policies in Developing Countries: Informal, Informational and Voluntary. RFF Discussion Paper 09-10, Resources for the Future, Washington DC.

Blackman, A., and Sisto, N. (2005). Muddling Through while Environmental Regulatory Capacity Evolves: What Role for Voluntary Agreements? RFF Discussion Paper 05-16, Resources for the Future, Washington DC.

Carraro, C., & Leveque, F. (1999). Introduction: The rationale and potential of voluntary approaches. In *Voluntary approaches in environmental policy* (pp. 1-15). Springer Netherlands.

Cassells, S., Lewis, K. V., & Findlater, A. (2012). An exploration of ISO 14001 uptake by New Zealand firms. *International Journal of Law and Management*, *54*(5), 345-363.

Central Bank of Sri Lanka. (2013). *Annual Report.* Colombo.

Central Environment Authority. (1980). *National Environment Act No 47 of 1980*. Sri Lanka: Central Environment Authority.

Christmann, P., & Taylor, G. (2001). Globalization and the environment: Determinants of firm self-regulation in China. *Journal of international business studies*, *32*(3), 439-458.

Dasgupta, S., Hettige, H., and Wheeler, D. (2000). What improves environmental compliance? Evidence from Mexican Industry. *Journal of Envrionmental Economics and Management* 39: 39-66.

Delmas, M. A. (2002). The diffusion of environmental management standards in Europe and in the United States: An institutional perspective. *Policy Sciences*, *35*(1), 91-119.

Delmas, M. A., and Toffel, M. W. (2003). Institutional Pressure and Environmnetal Management Practices. *11th International Conference of the Greening of Industry Network.* San Francisco.

Department of Census and Statistics. (2014). Retrieved July 2014, from Census and Statistics LK: http://www.statistics.gov.lk/industry/ASI%202012%20report.pdf

Ervin, D., Wu, J., Khanna, M., Jones, C., & Wirkkala, T. (2013). Motivations and barriers to corporate environmental management. *Business Strategy and the Environment*, *22*(6), 390-409.

Esty (Eds.), Thinking ecologically: The next generation of environmental policy. New Ha-

Esty, D., & Chertow, M. (1997). Thinking ecologically: An introduction. In M. Chertow and D.

Florida R, Davison D. Why do firms adopt advanced environmental practices (and do they make a difference)? Going Private: Environmental Management Systems and the New Policy Agenda. Coglianese C, Nash J, editors. Washington, DC: Resources for the Future; 2001.

Foulona, J., Lanoie, P., and Laplante, B. (2002). Incentives for pollution control: Regulation or information? Journal of Environmental Economics and Management 44 (1): 169- 187.

Gunningham, N. A., Thornton, D., & Kagan, R. A. (2005). Motivating management: Corporate compliance in environmental protection. *Law & policy*, *27*(2), 289-316.

Gunningham, N., Kagan, R. A., & Thornton, D. (2003). *Shades of green: business, regulation, and environment*. Stanford University Press.

Hart, S. L. (1995). A Natural Resource based View of the Firm. *Acadamy of Management Review* 986-1014.

Helland, E. (1998). The revealed preferences of state EPAs: Stringency, enforcement, and substitution. *Journal of Environmental Economics and Management*, *35*(3), 242-261.

Henriques, I., & Sadorsky, P. (1996). The determinants of an environmentally responsive firm: an empirical approach. *Journal of environmental economics and management*, *30*(3), 381-395.

Jayasinghe, U., and Udugama, M. (2011). Motives for firms to adopt solid waste management controls: The case of food processing sector in Sri Lanka. SANDEE Working Paper No. 60 -11, South Asian Network for Development and Environmental Economics, Kathmandu.

Jayasinghe-Mudalige, J. K., Udugama, U., and Ikram, M. M. (2011). Voluntary action of a firm on enviroment management:an empirical assessment on sri lankan food processing firms' response to the private and regulatory incentives. *55th Annual Australian Agricultural and Resource Economics Society (AARES) National Conference.*. Melbourne, Victoria, Australia.

Jayasinghe, Udith K M, and Weersink, A. (2004). Factors Affecting the Adoption of Environmental Management Systems by Crop and Livestock Farms in Canada. *Sri Lankan Journal of Agricultural Economics* 6 (1): 25-37.

Khanna, M., & Anton, W. R. Q. (2002). Corporate environmental management: regulatory and market-based incentives. *Land economics*, *78*(4), 539-558.

Khanna, M., Patricia, K., Cody, J., and Ervin, D. (2007). Motivations for voluntary environmental management . *Policy Studies Journal* 35(4): 751-772.

Khanna, M., and Brouhle, K. (2007). Effectiveness of voluntary environmental initiatives. Working Paper, Department of Agricultural and Consumer Economics. University of Illinois, Urbana- Champaign.

Maxwell, J. W., and Lyon, T. P. (2000). Self Regulation and Social Welfare: The Political Economy of Corporate Environmentalism. *Journal of Law and Economics* 43: 583-619.

Meegeren, P. V. (2001). Blue bags or refuse tourism: Social acceptance of closed policymaking. *Society & Natural Resources*, *14*(1), 77-86.

Ministry of Environment and Natural Resources. (2008). *The Gazette of the Democratic Socialist Republic of Sri Lanka: Extraordinary No. 1533/16 - Friday, January 25, 2008*. Sri Lanka: Department of Government Printing

Ministry of Environment and Natural Resources. (2008). *The Gazette of the Democratic Socialist Republic of Sri Lanka, Extraordinary: No. 1534/18 - Friday, February 01, 2008*. Sri Lanka: Department of Government Printing.

Ministry of Environment and Renewable Energy. (1980). *National Environment Act.* Colombo: Government press.

Ministry of Environment and Renewable Energy. (1988). *National Environmental (Amendment) Act, No. 56 of 1988.* Colombo: Government Press.

Ministry of Environmnet and Renewable Energy. (2000). *National Environmental (Amendment) Act, No. 53 of 2000.* Colombo: Government Press.

Montabon, F., Sroufe, R., & Narasimhan, R. (2007). An examination of corporate reporting, environmental management practices and firm performance. *Journal of operations management*, *25*(5), 998-1014.

Mori, Y., & Welch, E. W. (2008). The ISO 14001 environmental management standard in Japan: results from a national survey of facilities in four industries. *Journal of Environmental Planning and Management*, *51*(3), 421-445.

Nyirenda, G., & Ngwakwe, C. C. (2014). Environmental management practices for sustainable development: agenda for harmonization. *Ecol. Econ*, *5*, 76-85.

Prakash, A., & Potoski, M. (2006). Racing to the bottom? Trade, environmental governance, and ISO 14001. *American journal of political science*, *50*(2), 350-364.

Priyadarshini, K., and Gupta, O. K. (2003). Compliance to Environmental Regulations: The Indian Context. *International Journal of Business and Economics* 2(1): 9-26.

Pulvor, S. (2002). Green Expectations: The Intended and Unintended Consequences of Implementing A Voluntary Environmental Management Code. *American Sociological Association.* Environmental Sociology, Chicago.

Rathnakara, I. (2013). Rathupaswala factory to be relocated . *Ceylon Today* (online) 11 October 2013. Available from: http://www.ceylontoday.lk/16-44690-news-detail-rathupaswala-factory-to-be-relocated.html (accessed 14 October 2013) Testa, F., Iraldo, F., and Frey, M. (2011). The effect of environmental regulation on firms' competitive performance: The case of the building and construction sector in some EU regions. *Journal of Environmental Management* 92: 2136-2144.

Reijnders, L. (2003). Policies influencing cleaner production: the role of prices and regulation. *Journal of Cleaner Production*, *11*(3), 333-338.

Ruwanpura, K. N. (2016). Scripted Performances? Local Readings of 'Global'Health and Safety Standards in the Apparel Sector in Sri Lanka1. *Labour Conditions in Asian Value Chains*, 265.

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students* (Vol. Seventh). Harlow: Pearson Education.

The World Bank. (2014). *The World Bank Data*. Retrieved November 2013, from http://data.worldbank.org/indicator/EE.BOD.TXTL.ZS/countries

To, W. M., Lee, P. K., & Yu, B. T. (2011). ISO 9001: 2000 implementation in the public sector: a survey in Macao SAR, the People's Republic of China. *The TQM journal*, *23*(1), 59-72.

Toffel, M. W. (2005). Resolving information asymmetries in markets: The role of certified management programs.

Triebswetter, U., & Hitchens, D. (2005). The impact of environmental regulation on competitiveness in the German manufacturing industry—a comparison with other countries of the European Union. *Journal of Cleaner Production*, *13*(7), 733-745.

Uchida, Toshihiro, and Paul J Ferraro. (2007). Voluntary development of environmental management systems: motivations and regulatory implications. *Journal of Regulatory Economics* 32: 37-65.

Wen, C., & Soyez, D. (2003). The greening of industry: a research approach of industrial environmental geography. *地理研究*, *22*(5), 601-608.

Wijayasiri, J., and Dissanayaka, J. (2008). Trade and Innovation Project: The ending of the multi-fibre agreement and innovation in Sri Lankan textile and clothing industry. France: OECD.

Yin, R. K. (2014). *Case study research: design and methods* (Vol. 5th). Los Angeles, California: SAGE.

Zhang, B., Bi, J., Yuan, Z., Ge, J., Liu, B., & Bu, M. (2008). Why do firms engage in environmental management? An empirical study in China. *Journal of Cleaner Production*, *16*(10), 1036-1045.

Zhu, Q., & Sarkis, J. (2007). The moderating effects of institutional pressures on emergent green supply chain practices and performance. *International journal of production research*, *45*(18-19), 4333-4355.

Zutshi, A., Sohal, A. S., & Adams, C. (2008). Environmental management system adoption by government departments/agencies. *International journal of public sector management*, *21*(5), 525-539.

Appendix: Major Provisions in the Environmental Regulations of Sri Lanka

Rule / Act No	Clause	Remarks
National Environmental Act, No 47 of 1980	Section 9	Appointment of District Environmental Agency
	Section 10 (1)	The powers, functions and duties of the Authority
	Section 23	Environmental research
	Section 24	Furnishing of information
	Section 25	Appointment of analysts and Pollution Control Officers
	Section 31	Violation of the Act and regulations and fines
National Environmental (Amendment) Act No 56 of 1988	Section 10	Increase of power, functions and duties of the Authority
	Section 23A	Prohibition of the discharge, emission of deposit of waste into the environment
	Section 23B	Issue of a license
	Section 23C	Refer the application to Government Department or Public Corporation
	Section 23D	Suspense or cancellation of license
	Section 23E	Appeal against refusal of license
	Section 23G	Restriction on regulation and control of pollution of the inland waters.
	Section 23H	Pollution of inland waters of Sri Lanka
	Section 23L	Failure to fit and maintain prescribed control devices an offence
	Section 23U	Failure to comply with notice an offence
	Section 23X	Certificate to be prima facie evidence of facts stated therein.
	Section 23AA	Approval of prescribed projects
	Section 23BB	Submission of environmental impact assessment report

(Appendix continued)

(Appendix continued)

	Section 24A	Power to enter and inspect
National Environmental (Amendment) Act No 53 of 2000	Section 23A	Power to issue a license
Environmental Protection License Prescribed activities (Gazette notification No 1533/ 16 of 25 01 2008)	Section 23A	Prescribed activities for which a license is required
National Environmental (Protection and Quality) Regulations, No. 1 of 2008	Section 23A	Issuance of EPL for emission or disposal of waste

Source: National Environmental Act, No 47 of 1980, National Environmental Regulations 2008, 1998.