Environmental Impacts and Mitigation Measure of Garment Industries in Myanmar

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Abstract

Environmental impacts concern as the garment industry expands in Myanmar. In this research, it is focused on the survey of the Initial Environmental Review (IER), Assessment of Environmental Impacts and development of proposed mitigation measure for reducing environmental impacts for Garment industry, Hlaing Thar Yar Township of Yangon City. The impacts of garment industry's production process were analyzed and assessed based on the data from IER survey, criteria for the assessment of environmental impact and the effects of significant environmental impact. According to the results of IER survey, even though the staffs and employees do not have knowledge about environmental impacts, they are able to reduce the pollution from their industry by adopting solid waste management, energy conservation, and water reducing process in their industry. Finally, the proposed mitigation measure is described in this research to reduce environmental impacts in their industry.

Keyword –Assessment of Environmental Impacts, Initial Environmental Review, Garment Industry, Mitigation Measure

1. Introduction

The purpose of this research is to investigate the current situation of environmental performance of garment industry by mean of Initial Environmental Review (IER) through environmental audit for this industry, to analyze and assess significant environmental impacts of garment industry and to make recommendations and suggestions for achievement of mitigation measure in this industry. Garment industry generates waste water, air pollution, noise pollution and solid waste.

In this research, it is focused on the survey of the Initial Environmental Review (IER) at a garment industry to know the current environmental situation of this industry. And then, Assessment of Environmental Impacts of this industry was conducted based on the data from IER survey and lab results. The Initial Environmental Review (IER) survey has carried out at the garment industry in Hlaing Thar Yar Township, Yangon Region. Map of the location of study area is shown in figure 1.

Figure 1. Map of the location of Study Area

2.Methodology

In this study, the methodology consists of four steps as shown in Figure 2;

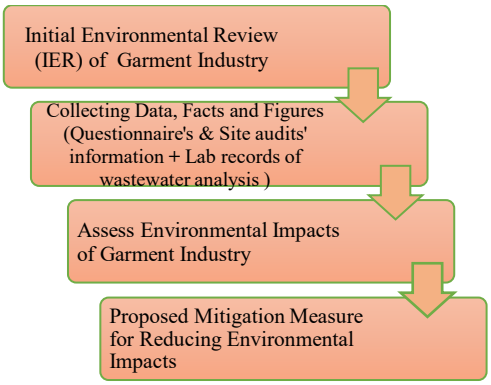

Figure 2. Flow Diagrams of Methodology

2.1. Initial Environmental Review of Garment Industry

In this research, the production processes of garment industry were mainly focused for the IER survey. It consisted of 25 questions that were adaptable with the conditions of garment industry. In this questionnaire, questions about the background information of this industry, and also questions to identify the environmental aspects and to assess the environmental impacts such as air pollution, water pollution, noise pollution and solid waste were prepared.

2.2. Collecting Data, Facts and Figures by IER Survey

The second step is to perform questionnaire survey and site-visit interviews about the current environmental circumstances of this industry as the IER survey. In this study, questionnaire survey and interview with General Manager, 3 Supervisor, 2 staff and 8 employees responsible for this industry were carried out by using the IER questionnaires. And then the results of air pollution, water pollution and noise pollution were collected by environmental laboratory results.

The environmental impact of air pollution, water pollution and solid waste was assessed by considering Impact Volume (M) and Duration(D), Range (R) and Probability(P) respectively. The criteria for assessing the significance of environmental impact are described in Table 1. [1]

2.3. Assessment of Environmental Impact

Based on the results of this IER survey, assessment of environmental impact was performed by focusing on air pollution, water pollution, noise pollution and solid waste. For this analysis, information about air pollution, water pollution, noise pollution and solid waste from this industry was obtained from visual inspection with the manager, employees and results from lab records. Significant Impacts (*SP*) were estimated using the following formula: [1]

$$Significant\ Impact\ (SP) = (Impact\ Volume + Duration + Range) \times Probability\ Rate$$

Significant Impact (SP) = (Impact Volume + Duration + Range) × Probability Rate

Table 1. Criteria for the Assessment of Environmental Impact

Assessment Methods	Measurements				
	1	2	3	4	5
Impact Volume	No significant impact	slight impact on the environment	Medium and environmental effects	No high level of impact but has environmental impact	Highly significant impact and environmental impact
Duration	0-1 year	2-5 years	6-15 years	15 years	Always
Range	Within the compound of Industry	Within the Industrial Zone	In the Township of Industrial zone	In the Local Country	In another country
Probability Rate	Absolutely not possible	May be not possible	May be possible	May be Absolutely possible	Exact probability

Table 2. Effects of Significant Environmental Impact

Rank	Significant Impact (I)	Impact Level
1	Less than 15	Very Low
2	15-29	Low
3	30-44	Medium
4	45-59	high
5	60 or above	Very High

2.4. Proposed Mitigation Measure for Reducing Environmental Impacts

After finishing this study, the Proposed Mitigation Measure was performed to present the situation of current environmental impacts in this industry based on IER analysis and results of lab records in order to reduce environmental impacts effectively. And also, proposed mitigation measure required for reducing environmental impacts at this industry was described in this research.

3. Results and Discussion

The results of this research are presented in the following order; firstly, description of results from the Initial Environmental Review (IER) survey and site investigation, secondly, assessment of environmental impact to control the industrial pollution and finally, the development of proposed mitigation measure for the garment industry (Hlaing Thar Yar). There were four main types of pollution that were observed in this research. They are (1) indoor air pollution, (2) water pollution (3) noise pollution and (4) solid waste.

Environmental Impact based on the criteria mentioned in Table 1 and the effect of significant environmental impact caused by air pollution, water pollution, noise pollution and solid waste of this industry were calculated by using above *SP* formula as shown in Table 5.

3.1. Results of Initial Environmental Review (IER) Survey and Site Investigation

The questionnaire survey for the IER consists of 25 questions under the 6 categories. Then, the results of this survey were tabulated in Table 3.

3.2. Process of Garment Industry

In this industry, there are three main types of production departments such as raw material receiving, production and packaging. Generally, in

each type of department, it has various types of production processes. And then, the types of waste from this production processes of garment industry are described in Table 4.

Table 3. Results of IER Survey and Site Investigation

No	Categories of questions	Results of the IER survey and site investigation
1.	Background Information of Garment Industry	1. It is Garment industry. 2. Their product is garment cloth. 3. It has above 2000 employees. 4. Production rate is 1,500,000 item /month roughly. 5. Their industry uses electricity (sometime use fuel for generator), ground water, woven fabric and knitted fabric etc. 6. Their industry obeys Laws and regulations of YCDC issued from time to time. 7. It has been registered by the industrial zone's authority. 8. They do not know about environmental management system. 9. Their industry did not receive any complaints from public about pollution.
2.	Air Pollution	1. It causes indoor air pollution and emit $PM_{2.5}$ .and PM_{10}. 2. It uses high technology machine and air sucker fan and cooling system.
3.	Water Pollution	1. Their industry does not have wastewater treatment plant. 2. Their industry does not use any chemical and biological technology. 3. They do not reuse water. 4. It does not have monitoring system of water quality of wastewater. 5. It uses about 16000 gal/day.
4.	Solid waste	1. It has license for disposing the waste into landfill. 2. It has solid waste management system (SWM). 3. They dispose solid waste such as by product of garment and also has SWM for recycling pieces of fabric (by product).
5.	Noise pollution	1. It does not have any noise control management. 2. It does not control noise pollution for employees but uses ear phone to reduce noise.
6.	Control of natural resource usage	1. It uses 2900 units of electricity and 16000 gal /day of soft water. 2. It does not use any technology to save amount of water usage. 3. It uses carefully as required amount of energy to save the amount of electricity usage. 4. No participation for the control of water resource.

Table 4. Types of Wastes and Production Processes from Garment Industry

Type of Waste	Particulate Matter (PM)	Noise	Waste-water	Solid waste
• Production process	• Cutting • Boiler Emission	• All Sewing line	• Fabric Relaxing	• Cutting • Sewing

3.3. Assessment of Environmental Impact

Assessment of Environmental Impact based on the criteria mentioned in Table 1, the Effect of Significant Environmental Impact based on the criteria mentioned in Table 2 and the analysis of environmental impact caused by air pollution, water pollution ,noise pollution and solid waste of this industry were calculated by using Significant Impact (*SP)* formula as shown in Table 5.

According to the assessment method, very low levels of impact will not have a significant impact on the environment and employees. Medium impact can have minimal impact on the environment and employees. Therefore, it is necessary to make plans for mitigation measure at this stage. High and very high impacts can have significant impacts on the environment and employees.

Therefore, mitigation measures for the environment and employees should be implemented during the project.

In Table 6, it was found that the effluent discharged from this industry had nearly met the effluent standards of Yangon City Development Committee (YCDC). In table 7, results of noise quality tests are less than standard. Therefore, it cannot cause environmental impact due to water pollution, noise pollution according to the regulations of YCDC. Moreover, solid waste from production processes sold another industry to produce recycling products. Thus, solid waste cannot cause environmental impacts.

In table 8, many of air quality parameters are agree with standard but $PM_{2.5}$ and PM_{10} are more than standard. Thus, it should be carefully reduced by mean of mitigation measure plan.

PM_{10} is particulate matter 10 micrometers and $PM_{2.5}$ is particulate matter 2.5 micrometers in diameter. $PM_{2.5}$ is generally described as fine particles.

3.4. Proposed Mitigation Measure for Reducing Environmental Impact

The proposed mitigation measure was developed in this research in order to assist this industry for reducing the environmental impacts and also provides useful solutions, suggestions and guidance not only to reduce consumption of natural resources but also to improve health and safety of workers in this industry.

In this proposed mitigation measure, the general requirements necessary to approach the standardized environmental management for sustainable development of this industry were expressed as shown in table 9.

Table 5. Summary of Potential Environmental Impacts Assessment of Garment Industry

No	Environmental Factors	Risks Resources Sector	Potential Environmental Impact					Significant Impact level
			Impact amount	Duration	Range	Probability	Significance of Im	

							pact	
1.	Water Quality	• Wastewater used for production and disposal of domestic wastewater • wastewater that daily employees use	2	2	2	3	18	Low
2.	Air Quality	• Emit from Cutting Process • Exhaust gas from a backup generator • Emit from Boiler	3	2	2	3	21	Low
3.	Noises and vibrations	• Transport of raw materials • Driving the machine during production process • Driving backup generator	3	1	1	3	15	Low
4.	Hazardous Solid Waste	• Office and factory's damage lamps frames and bulbs • Iron bars from old building	1	1	1	3	9	Very Low
5.	Non-Hazardous Solid Waste	• fabric Pieces from Cutting process • Solid waste from Office supplies • Solid Wastes that employees dispose daily	1	1	1	3	9	Very Low

Table 6. Results of Wastewater Quality of Garment Industry

No	Quality Parameter	Results		Guideline Value
		Quantity	Units	
1.	P^H	11.2	-	6 - 9
2.	BOD	48	Mg/l	≤50 Mg/l
3.	COD	128	Mg/l	≤250 Mg/l
4.	DO	2.0	Mg/l	10 Mg/l
5.	TS	8132	Mg/l	-
6.	TSS	1600	Mg/l	≤50 Mg/l
7.	TDS	6532	Mg/l	≤2000Mg/l
8.	Nitrate	12.0	Mg/l	NG
9.	NH_3- N	0.84	Mg/l	NG
10.	Phosphate	4.8	Mg/l	NG
11.	Oil & Grease	6	Mg/l	≤10 Mg/l

Sources; ISO TECH Laboratory

Table 7. Results of Noise Quality in Garment Industry

No.	Measure Location	Emission (Min)	Emission (Max)	Unit	Stand - ard
1.	Cutting Line	70.3	71.5	dB (A)	85 dB (A)
2.	Sewing Line	70.4	72.2		
3.	Over Lock	78.9	82.2		
4.	Near Boiler & Stream m/c	70.3	74.2		

Sources; Ecological Laboratory (ALARM)

Table 8. Results of the Air Quality Assessment in Garment Industry

No	Parameter	Results	Unit	Avg. Period	Guideline Value
1.	NO_2	197.07	$\mu g/m^3$	1 hr	200
2.	PM_{10}	54.99	$\mu g/m^3$	24 hr	50
3.	$PM_{2.5}$	40.96	$\mu g/m^3$	24 hr	25
4.	SO_2	308.35	$\mu g/m^3$	10min	550
5.	CO_2	291.60	ppm	24 hr	NG
6.	CO	434.61	ppb	24 hr	NG
7.	Temp	29.60	°C	24 hr	NG
8.	O_3	39.26	$\mu g/m^3$	8 hr	100
9.	Hydro - Carbon	8.85	ppm	24 hr	NG
10.	CH_4	36.57	ppm	24 hr	NG
11.	VOCs	0.084	ppm	24 hr	NG

Sources; Ecological Laboratory (ALARM)

By reducing Garment Industry's energy consumption, it can not only reduce environmental impacts, but also reduce factory costs.

Today, resources efficiency; cleaner production and waste minimization are very important for sustainable development of environmental conservation of Myanmar.

Thus, this mitigation measure intends to solve future environmental problems such as water resources scarcity and also to reduce air pollution normally and to sustain health & safety of workers in this industry.

Table 9. Impacts and Mitigation Measure for Reducing Environmental Impacts of Garment Industry

Impacts	Mitigation Measure
External resources	
Water Quality	• Directing water recyclers to cool down to reduce overuse of freshwater • Should have water and wastewater monitoring system
Air Quality	To reduce $PM_{2.5}$ and PM_{10}, it should be made the following; • Being a Water Scrubber System in Chimney • Elevate the length of the chimney • Particle detectors should be installed between the boiler and the Chimney

	• To promote the engine's performance • Using of quality fuel • Long-term fruit trees should be planted to reduce environmental impact
Noise and Vibration	• Monitoring of control of the equipment used • Allotment of work breaks to reduce the impact of workers on noise • Planting trees that can absorb noise
Solid Waste	• Separate wastes that can be disposed of on a daily basis by recyclable and non-recyclable garbage • Systematic disposal of staff's daily garbage
Human Resources	
Health and Safety in the Workplace	• Providing adequate light in the area of sewing line • Wearing nose masks, Apron; Cap during work, as it can cause respiratory and pulmonary diseases while working • Placing dangerous warnings, etc.
Other	
Reduce energy consumption	• Installing water meters to monitor water usage • Record monthly or annual water usage • Check if water supply piping has been broken • Repair of broken pipelines • Turn off the lights during breaks • Use of LED lights in the factory

4. Conclusion

Based on the results of IER survey, the current environmental circumstance of the garment industry was known and this research found that this garment industry did not have awareness of environmental management. However, this industry was willing to adopt environmental good practices in their industry and then they participated in the IER survey of this research.

Assessment of environmental impacts due to air, water and noise pollution indicated that this industry could cause low environmental impact due to their production processes.

Assessment of Environmental Impacts of solid waste described that this industry could affect very low environmental impact due to the solid waste generated from their production processes.

In this research, proposed mitigation measure was developed to help for reducing environmental impacts and also to prevent future environmental problems and then to sustain health & safety of workers in this industry.

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