

# **Palli Karma-Sahayak Foundation (PKSF)**

**Package No. PKSF/SEP/S-13.9**

## **Final Report**

**on**

**“Common service activities, Technological interventions and  
Environmental interventions requirement for Plastic Factory Sub-sector”**

Sustainable Enterprise Project (SEP)  
Represented by Palli Karma-Sahayak Foundation  
E-4/B, Agargaon Administrative Area,  
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# Introduction

## 1.0 Background of the Study

Palli Karma-Sahayak Foundation (PKSF) was established by the Government of Bangladesh in 1990 as an apex organization for poverty alleviation through employment creation. Since its inception, PKSF has been implementing various programs and projects for poverty alleviation through its Partner Organizations (POs). At present, PKSF has more than 200 active Partner Organizations throughout the country. PKSF in collaboration with the World Bank is in the process of designing a microenterprise development study titled "Sustainable Enterprise Project (SEP). The goal of this project is to increase the adoption of environmentally sustainable practices by targeted microenterprises (MEs). The research project is designed to support microenterprises in agribusiness and manufacturing clusters with a focus on areas that are environmentally stressed and/or vulnerable to climate change and natural disasters. To assist the design process PKSF has decided to study on common services analysis, technological intervention and environmental intervention required for selected subsectors, mainly in manufacturing and agribusiness clusters.

The common services for microenterprises in broad sense entails identifying the common services which are required to support the MEs and have a critical influence on productivity of MEs which may commercially viable or not. This project aims to facilitate investment in common/shared services such as design labs, artificial insemination centers, tissue culture services, micro-storage, organic composting services to increase the soil fertility etc. that will enhance the business efficiency of microenterprises, reduce environmental degradation and can also be financially viable.

The project will support the clusters to become more environmentally sustainable though the systems of enhancing low polluting environment friendly business at the cluster level. The project will also support microenterprises through environment friendly investments (energy, water and resource efficiency) in the agribusiness and manufacturing sectors to promote environmentally sustainable technologies and practices among microenterprises in environmentally vulnerable areas, induce changes in the micro-lending ecosystem, and support the adoption of basic operational safety norms in project-supported enterprises.

So, the consultant/firm has been hired throughout the competitive process to ask for identifying and describing common services which are required to support the MEs, identifying technological interventions required for this sub-sector, describing the current environmental scenario, identifying the environmental negative externalities as well as possible remedial measures and developing the value chain for that subsectors.

## **1.1 Objectives of the Study**

Prime objective of the study is to develop a regulatory guide line which can be supportive for the clusters to become more environmentally sustainable through the systems of enhancing low polluting environment friendly business at the cluster level. Specific objectives are given below:

- To explore the environmental & technological interventions which are essentially important to improve overall environment condition of the sub-sector.
- To identify the Non-Revenue Generating Physical Activities & Revenue Generating common services which will increase the productivity and help to develop value chain, market linkage and environment conditions of the ME's under the mentioned sub-sector.
- To find out Non-revenue generating physical activities which are commissioned to develop the infrastructure of that business cluster and will assist the MEs & the buyers for getting easy access to the market.
- To determine the steps to be taken to enhance Eco Labeling and Access to Premium Markets for the MEs.
- To ascertain certifications related to environment and product/service of the MEs from various agencies this will help them to get access in the premium market.
- To find out the ways of developing brand for the product/service of the cluster.

# Approach & Methodology

## 2.1 Approach

To accomplish the objectives of the study both quantitative and qualitative approach were applied. Plastic factory information collected from the primary and secondary sources. Detailed field survey conducted on plastic microenterprise that includes about raw materials, production process, product quality, human resource, labor force, profits, revenue and non-revenue generating activities, marketing, buyer, waste and their management; health safety and environmental issues.

Besides, stakeholder consultation, key informant interviews conducted to know the plastic industry related business, positive and negative aspects on society and environment, identify technological interventions and regulatory policy framework. Stakeholders under this study were covered BPGMEA, PKSf, SEP Projects PMU, SEP Project WB Mission Team, certification organizations (Inspection Body) SGS, researchers & academicians and technical experts.

Secondary and historical data and information were collected from different sources, online publications, newspaper, journal etc. to know the actual scenario of the study. A structured questionnaire modified and approved by PKSf has been used to collect the data in a tabular format.

## 2.2 Methodology

The study conducted by several methods of data collection by stratified random sampling technique has been used to collect questionnaire based primary data for analysis. Using the stratified sampling technique sub-sample were calculated which is just proportional sampling based on the strata size. Plastic factory information collected from the primary sources. A detail field inventory survey on plastic industry which include all about their raw materials, production process, product quality and quantity, marketing, buyer, waste management; health safety and environment etc. Stakeholder consultation conducted (**Appendix- 2**) to know the plastic industry related business entities and its positive and negative aspects on society and environment. Expert consultations (KII) about the technological and environmental intervention and to prepare regulatory policy framework for their auditing and certification has been performed.

### 2.2.1 Sampling Procedure and Sample Size

Sampling procedure: Three criteria usually are specified to determine the appropriate sample size, the level of precision, the level of confidence or risk, and the degree of variability. The determination of sample size for this study is concerned with the following issues under the assumption that the characteristic of the population for Urban and Rural belongs to different homogenous group:

- The standard rule for sampling frame was followed based on SRS (Simple Random Sampling).
- Probability sampling was followed.

Here the study team used stratified sampling techniques where a stratum was based on geographical location. Since the study team has no experiences of similar type of study where the clusters (MEs) are located in only two geographical location of the country, therefore, the team does not have any idea about the population standard deviation for each of the measurement. Moreover, the surveyed MEs of this study were covered in four Divisions (Dhaka, Rajshahi, Khulna and Chattogram) considering number of total MEs under mentioned four Districts were 1700 approximately. Though, answers of most of the study questions were qualitative in nature, in this case also the team did not have any idea about prevalence or proportion of the population which has the attribute in question. That's why, it was assumed 50% and to determine the minimum sample size following the Yamane equation (1967:886)<sup>1</sup>, where no need for population mean and standard deviation, has been used. So, using 95% confidence interval and total no of surveys was calculated to 182.21≈182:

$$n = \frac{N}{1 + NE^2}$$

Where,

Where,

n= Sample Size,

N= Population Size=1700,

E= 0.07 if the confidence interval is 93%

### 2.2.2 Survey Data Collection Limitations

Based on different sources of information and desk research the survey team developed list of targeted micro-enterprises for data collection survey. Nonetheless, a large number of MEs were reluctant to offer interviews to the survey team. As most of these MEs don't have any legal approval from the authority. Besides, many MEs were not exists/changed business due to not having legal documents. For example, resent fire outburst in old Dhaka, MEs of these area could not able to renew/issuing trade license from authority (City Corporation). It was the fact which affect study data collection at field level to fulfil goals.

When within an area i.e. strata survey team had to use non-probability sampling procedure instead of simple random sampling procedure which is also called snowball sampling<sup>2</sup> and snowball sampling can be applied when samples with the target characteristics are not easily accessible (Mahin N. et al 2017). Table 2.1 represents distribution of MEs, sample size and sample covered where eventually this survey team covered 181 respondents in total.

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<sup>1</sup> Yamane, Taro. 1967. *Statistics, An Introductory Analysis*, 2nd Ed., New York: Harper and Row

<sup>2</sup> *Snowball Sampling: A Purposeful Method of Sampling in Qualitative Research*. Available from: [https://www.researchgate.net/publication/324590206\\_Snowball\\_Sampling\\_A\\_Purposeful\\_Method\\_of\\_Sampling\\_in\\_Qualitative\\_Research](https://www.researchgate.net/publication/324590206_Snowball_Sampling_A_Purposeful_Method_of_Sampling_in_Qualitative_Research) [accessed Jan 30 2020].

**Table 2.1: Distribution of MEs, Targeted Sample and Sample Covered by Region**

Sl.	Division	District	Upazila/ Pourashava	ME size (approx.)	Targeted Sample Size	Sample Size covered
1.	Dhaka	Dhaka	Noyabazar	100	11	122
			Kamrangirchar	No Data 50 (assumed)	5	
			Lalbagh Atibazar Kotowali Hazaribug	1000	107	
2.	Chattogram	Chattogram	Kalurghat, Baizid Jubilee Road, Korbanicgonj Sholashahar	No Data 150 (assumed)	16	15
3.	Rajshahi	Rajshahi	Poba	50	5	3
		Bogura	Adamdighi, Shantahar	No Data 150 (assumed)	16	29
		Nawgaon	Naogaon Sadar, Balur Hat	100	11	
4.	Khulna	Jashore	Jashore Sadar	No Data 100 (assumed)	-	12
<b>5.</b>	<b>Total</b>			<b>1700</b>	<b>182</b>	<b>181</b>

*\*The MEs were mainly geographically located within Dhaka city and few other districts under Rajshahi, Khulna and Chattogram Divisions. Therefore, for more geographical representation maximum number of districts from these four divisions were considered.*

### 2.2.3 Survey Implementation and Data Analysis

For field data collection, a well-structured questionnaire was developed where expert's opinion have been taken from academician and PKSf's Research department. Seven (07) field enumerators and three experienced supervisors were deployed for field data collection. The enumerators were selected based on their previous experiences. The survey team was well trained up prior to the field investigation to ensure the proficiency and expertise on the structured questionnaire. Collected data from field survey was analysed by using Statistical Package for Social Science (SPSS) software to generate the output tables or figures in the findings section.

The survey covered four divisional headquarters and two districts (Chattogram, Bogura, Chattogram, Dhaka, Naogaon and Rajshahi ) where a total 181 MEs surveyed of which Dhaka comprised largest cluster during the survey. All of these clusters of plastic sub-sector were identified from desk research those are located in Dhaka, Chattogram, Jeshore, Bogura, Naogaon and Rajshahi. Detailed GIS Maps developed by the study team those reflects the location of surveyed MEs.

#### 2.2.4 Cluster Location

Surveyed ME's are located in different geographical locations in Dhaka, Rajshahi, Jashore, Bogura, Chattogram. The study team has conducted qualitative surveys of 181 ME's under these clusters. The largest cluster is located in Dhaka, Bogura and Naogaon District, those have been developing since 2000. Due to increasing demand of products and consumers purchase capacity, number of such micro-enterprise increased. Majority of these ME's increased in early 2000's to 2015. The industrial set up of this micro-enterprise are mostly located in residential areas. Although few of the surveyed ME's are located in BSCIC or Industrial Estates.

**Table 3.4: Cluster Information and Sample Covered**

Sl.	Division	District	Upazila/ Pourashava	Sample covered
1.	Dhaka	Dhaka	Noyabazar	122
			Kamrangirchar	
			Lalbagh Atibazar Kotowali Hazaribug	
2.	Chattogram	Chattogram	Kalurghat, Baizid Jubilee Road, Korbanicgonj, Sholashahar	15
3.	Rajshahi	Rajshahi	Poba	3
		Bogura	Adamdighi, Santahar	30
		Nawgaon	Naogaon Sadar, Raninagar	
4.	Khulna	Jashore	Jashore Sadar	12
5.	Total			181

## Location map of the surveyed microenterprise of Plastic Subsector in Dhaka

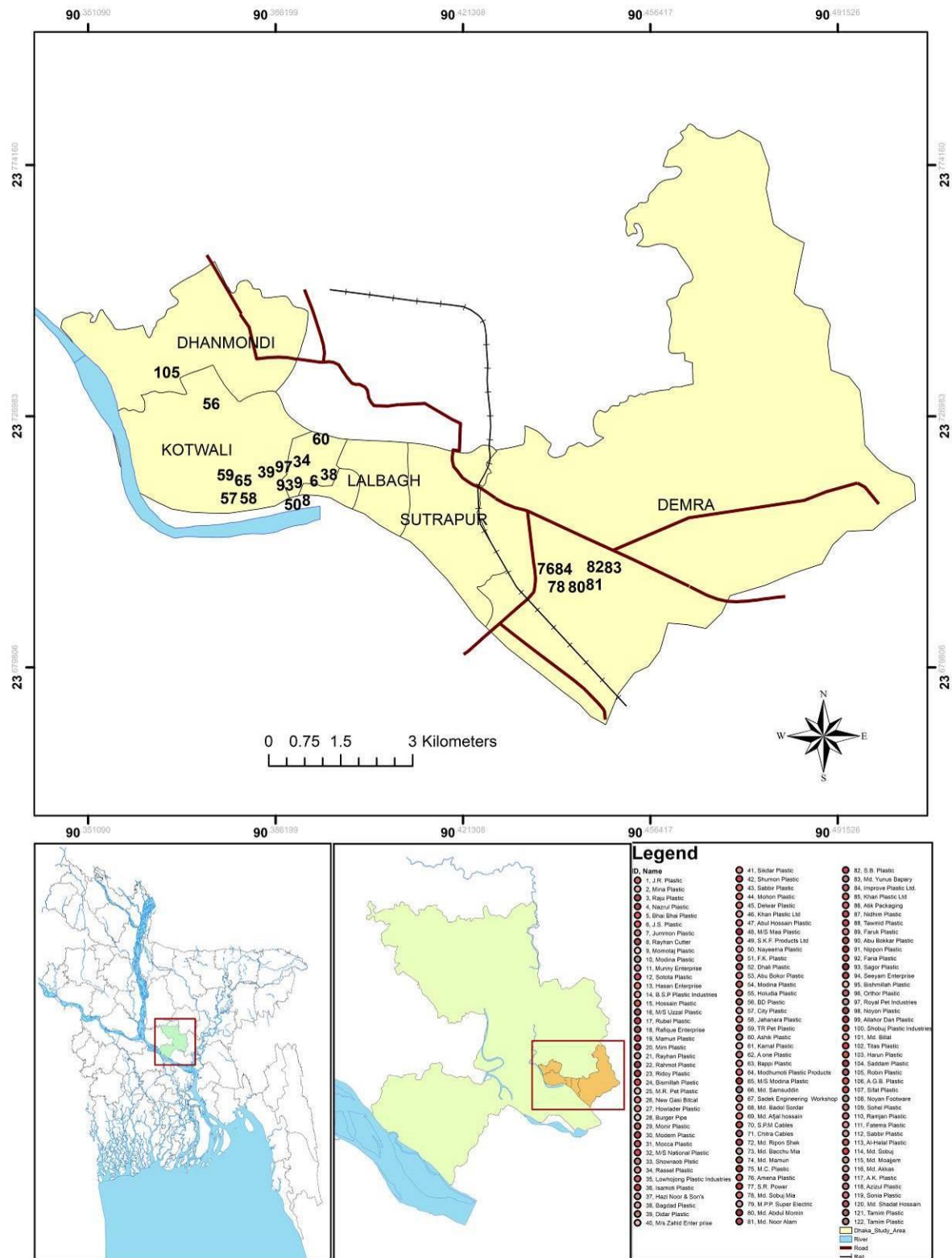
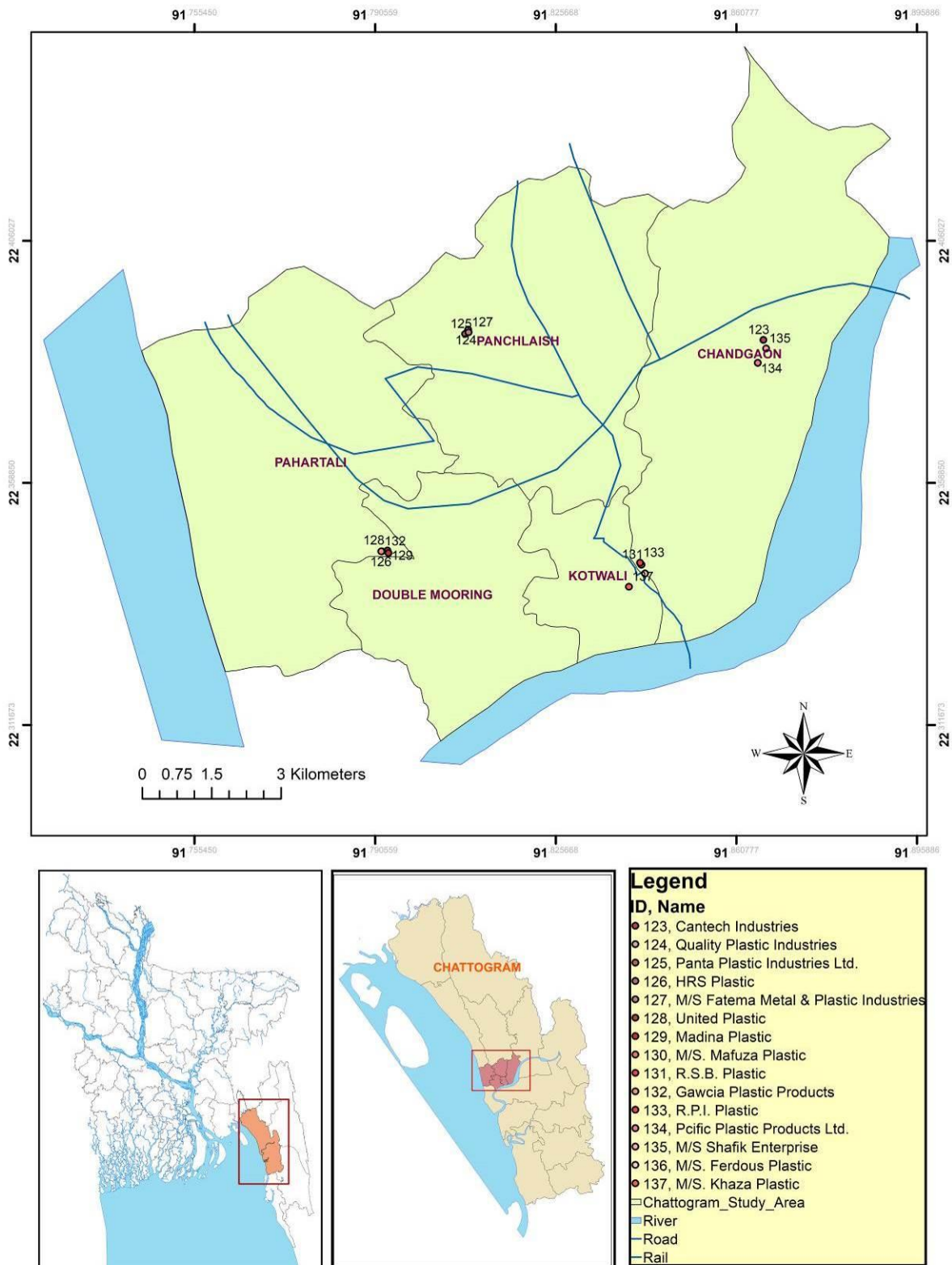


Figure 3.3: Location Map of the Surveyed MEs of Plastic Sub-sector in Dhaka

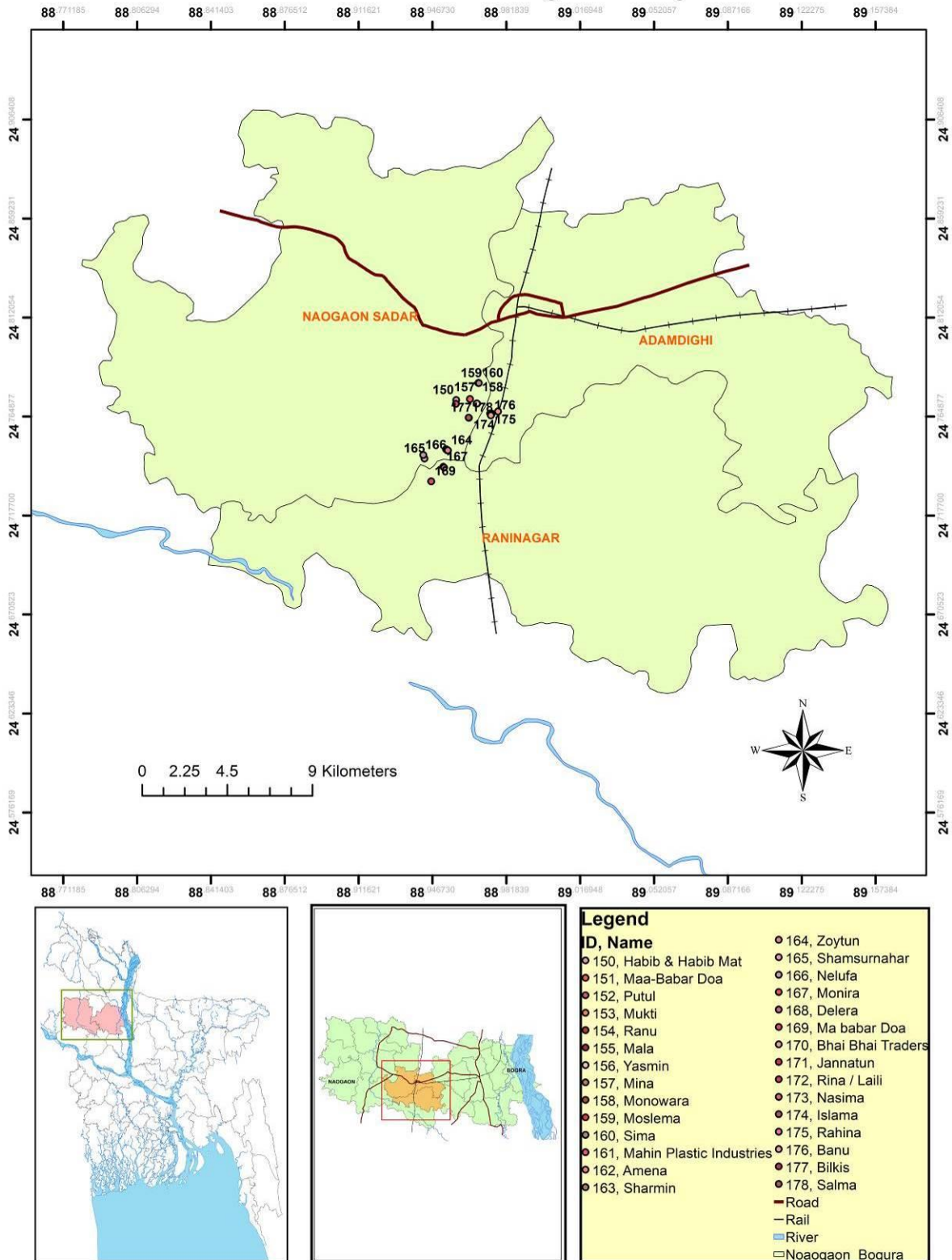


### Location map of the surveyed Microenterprise of Plastic Subsector in Chattogram



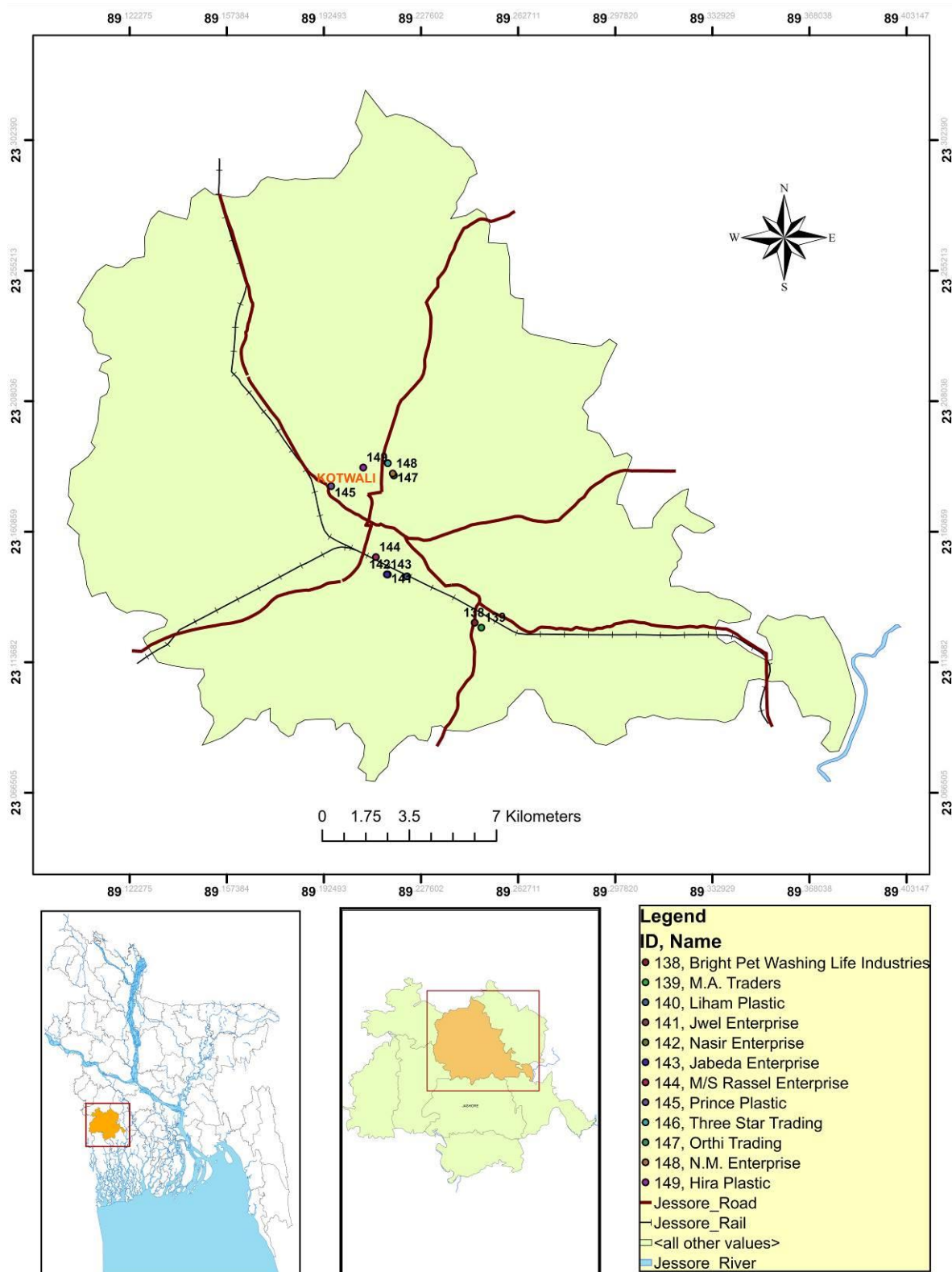
**Figure 3.4: Location Map of the Surveyed MEs of Plastic Sub-sector in Chattogram**

## Location map of the surveyed Microenterprise of Plastic Subsector in Naogaon & Bogura



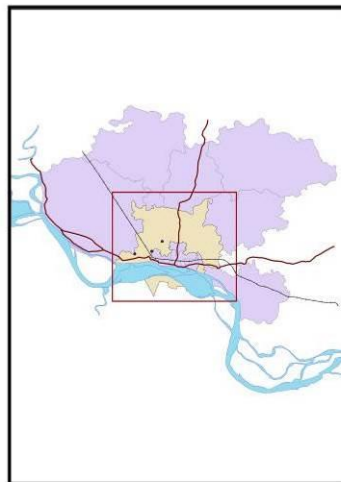
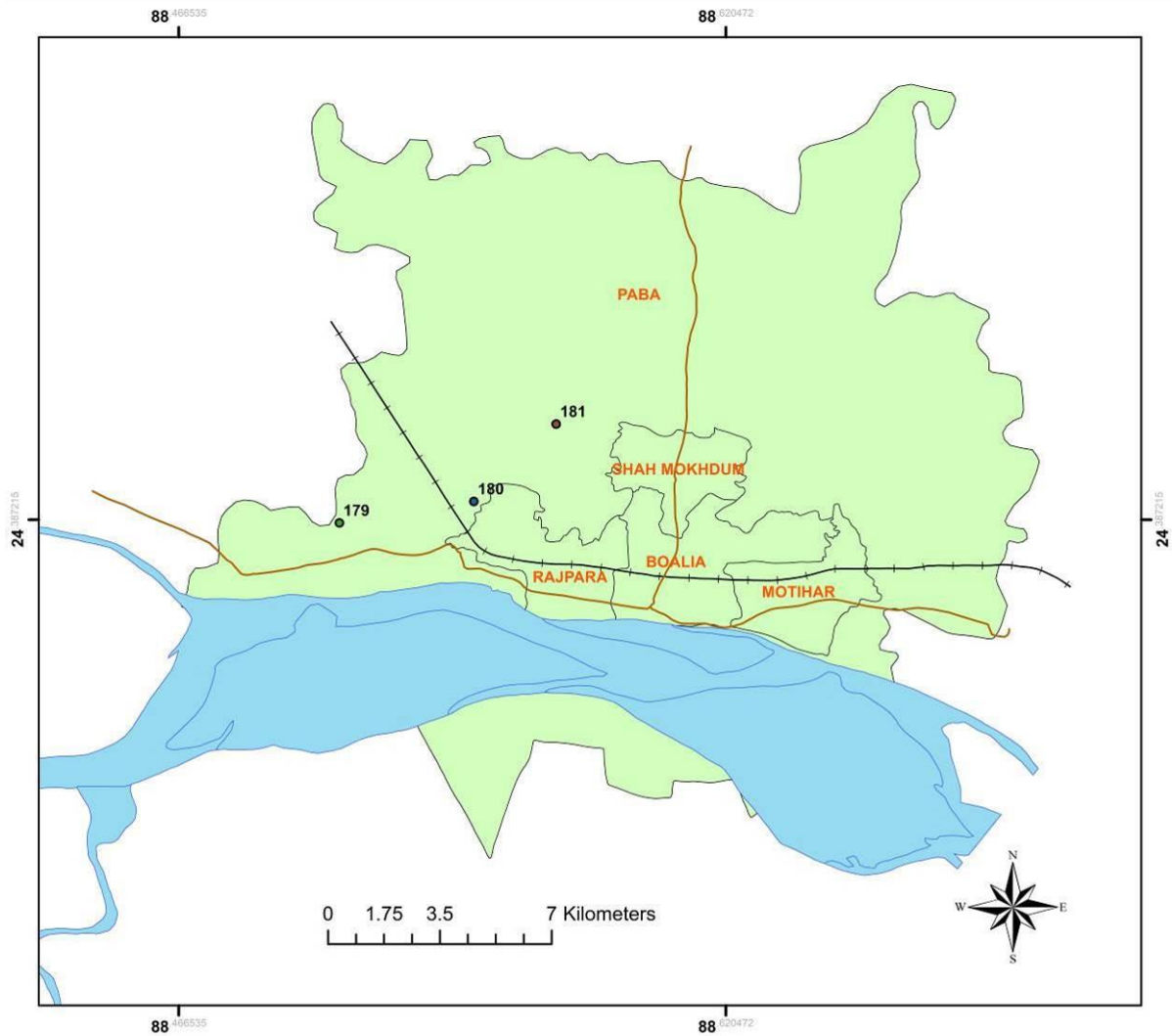
**Figure 3.5: Location Map of the Surveyed MEs Plastic sub-sector in Naogaon and Bogura**

## Location Map of Surveyed Microenterprises of Plastic Sub-sector in Jeshore



**Figure 3.6: Location Map of Surveyed MEs Plastic Sub-sector in Jeshore**

## Location Map of Surveyed Microenterprises of Plastic Sub-sector in Rajshahi



Legend	
ID, Name	
• 179, Lumex Plastic	
• 180, J.B. Plastic	
• 181, Mihil Enterprise	
<all other values>	
River	
Road	
Rail	

**Figure 3.7: Location Map of the Surveyed MEs Plastic Sub-sector in Rajshahi**

## Important Findings

### 3.1 Environmental Condition of Clusters

Surveyed micro-enterprises found making air and noise pollution and MEs (91% and 41%) were well aware about the issue. The study team has monitored air quality of the Microenterprises (PM2.5, PM 10, Temperature, Humidity, Formaldehyde and VOC) and found data gathered identified significantly higher than the standards (WHO as well as ECR, 1997) level particularly for PM2.5 and PM10. Similarly noise level found higher particularly in recycling factories during day time (ranged 71.0 – 81.3 dBA) that crossed the noise limit set by DoE

(ECR, 1997) guideline for residential area (day time 50 dBA). No significant approached taken by the MEs to mitigate environmental pollution. Among all surveyed MEs less than 5% MEs have first aid facility. While MEs were well aware about fire safety (60%), provided fire safety trainings (35%). Being working area produced dusts, VOC in air, heat working environments were found hazardous for workers. Workers working surveyed MEs were not found using proper PPEs (Gloves, Mask, Goggles) as a result major injuries could be happened. Attached toilets seen in the MEs located in Dhaka and Chattogram but were in unhygienic conditions. In Jeshore, Bogura, Naogaon and Rajshahi most of the MEs have separate toilets those were used as share basis. All the surveyed cluster requires improved toilets, although many MEs have to share toilets with others. Cluster requires few common healthy toilets (for female workers also).

ECR, 1997 categorized plastic products manufacturers as Orange-A, Orange- B and Red categories based on the product diversity and use of raw materials. 40% surveyed MEs replied that they have Environmental Clearance Certificates, 98% replied that they have

Trade License and 4% replied they had ISO Certificate.

For improvement of Environment Standards of the surveyed MEs a protocol has been suggested with some key activities need to be performed by the MEs such as Indoor Air Monitoring and Noise Level Measure, Solid waste management, Occupational Health and Safety Measures, Required Licenses (Fire, Environment), First Aid Box, Fire Safety, Firefighting Equipment, Hygienic toilet facility, Good House Keeping, Electrical Safety, Chemical Management etc.

### 3.2 Technological Interventions

Among available technologies MEs found using automated and semi-automated molding machines, and manual crushing (Dana) machine, mixing machine and Duri cutter (Plastic Pellet) machine. Most of these machines found using were second-hand and imported from China and India. Average lifetime of these machines is 10-20 years of old. Whereas, local MEs based on Old Dhaka can manufacture Mixing Machine, roller machine, Duri cutter machine and Dana machine. Similar type of machines found in MEs during the survey, those were located in Chattogram, Jashore, Rajshahi. However in Bogura and Naogaon districts different types of machines found which were loom machine, scooter machine, jacket machine and dana machines.

Using all these machines diversified products found among clusters during the field survey, for instance in cluster in Old Dhaka area all types of plastic items produced surveyed MEs particularly products plastic rubber, shoe sole, transparent plastic sheet, electrical switch board, switch, dropper, cork, jug, jar, plastic container, toys, small and large size containers, cosmetic containers, electric LED lights, shampoo bottle, egg case, RMG accessories, tags, buttons, hangers, sitting stool, recycled flecks. Similarly MEs surveyed in Chattogram produces household items, jug, mug, container, dropper, oil jar, electrical wearing, switch board etc. A completely different type of products Mat (floor) produced by MEs surveyed in Bogura and Naogaon district. While, in Jashore district -automobile parts, lights, switches, dropper, bottle lead etc. seen producing by surveyed MEs. In Rajshahi surveyed MEs were producing plastic granule, electrical switch, switch board, egg case, and electrical wiring pipes (Appendix-3).

Key part of all these products is the design which is completely depends on deices. Individual MEs making deices with the traditional lathe machine were found among all the studied business clusters. All these cluster can be introduced with modern machineries for improving design and deices. Modern CNC machine, laser cutting machine, 3D printing machine can be much more helpful, environmental friendly and ease efforts of MEs to produce (Appendix 6 suggested new technological interventions for modern machineries).

### **3.3 Non-revenue Generating Physical Activities & Revenue Generating common services**

Clusters surveyed are well equipped with non-revenue generating common services like hospitals, road connectivity, drainage systems, market facility for raw materials, fire service station, police station, utilities (gas, electricity, water supply). As per the survey findings skill training development training units were not available in the clusters. To enhance productivity of MEs training centers with modern technologies should be set up in clusters. Service center with mechanics, designer can be setup as commons service facility. To access into the better market product testing laboratory is essential which is not available at any cluster.

For revenue generating common services technology transfer in cluster is essential. Capacity building of designers with high-end modern machine for design deice (CNC Machine), product quality testing facility, 3D Printing with laser cutter machine etc. can be introduced in cluster for revenue generating common services. In addition product testing laboratories also be a solution to make sure quality of raw materials as well as finished goods. To get better price against products clusters are suffering for packaging of final finished products. This can be a solution for accessing in to better market with better packaged products. However, recycling plastic is requires to be in good condition for better output. Recycling unit with segregation centers is becoming popular in different countries to aware community based people. Promote MEs to produce diesel/petroleum following pyrolysis process incinerators from hazardous plastic wastes (electrical wastes) with environmental friendly modern technology. Besides, micro-enterprises can set-up to produce recycling plastics (bricks, tiles, paved tiles, garden fencing, building materials etc.). Bio-degradable plastic can be considered as revenue generating product. Most of the biolistic are starch based (Corn, potato, wheat, tapioca, casaba, soybean and vegetable oil) cellulose based (Wood pulp or Jute cellulose).

### **3.4 Eco Labeling and Access to Premium Markets for the MEs**

Eco Labeling is depends on product quality, production process, using of machineries, environmental and social standards of production units and obviously certification of products and production units. Eco-labelled products mainly ready for premium markets where customers are willing to pay extra for the product. None of the surveyed products have been found leveled as Eco or any products those are export quality. Eco-leveling requires end-to-end quality assurance of a products. Each and every steps need quality check and auditing, technical skill, capacity of manufacturers as well as financial inputs. Besides for producing eco-leveled products a production units must have Type-III ISO Certification on Product Quality Management System (example, ISO 9001), Environmental Management System Certificate (ISO 14001), Energy Management System (ISO 5003), Occupational Safety and Health Management System (ISO 45001).

For accessing to premium market the product as well as production unit must require to fulfill particular characteristics like – best quality product, good will of the producer in the market, diversity of product, use of modern technologies in production units, skilled workers, fulfill national laws, regulations and international standards, comply with social and environmental compliances.

### **3.5 Identify Certifications Related to Environment and Product/service of the MEs from various agencies**

Operating micro-enterprise in the Plastic sub-sector certificates and licenses requires from different authorities. Required documents such as Trade License, Fire License, Tax & VAT registration No., Environmental Clearance Certificate (ECC) etc. In this study about 81.8 per cent ME's replied that they have to obey national laws to run their business. Of which mostly (98%) MEs have Trade License, 68% aware about obtaining Fire License (but don't have), 40.5% MEs have Environmental Clearance Certificate (ECC), 36.5% and 33.1% ME have Tax and VAT registration. Interestingly 6 MEs replied that they have ISO Certificate, 10 MEs have fire license (mostly in Chattogram). Few MEs are tagged with business associations like BPGMEA, Plastic Shop Owners Association etc. MEs are facing difficulties getting/ renewing licenses because extra money, hassles, complex processes, expires very soon etc.

For export market few standard certificates are available like environmental, social and quality certificates are available ISO-14001 (Environmental Management System Certificate), ISO-45001:2018 (OHS Certificate) and for social audit and certificate SA-8000, BSCI, WRAP and SEDEX etc. On the other hand for plastic manufacturing BPA Free (Bisphenol A Free), cGMP (Current Good Manufacturing Practice) and ISO-9001 (Quality Management System certificates have to be complied by the manufacturing units.

# Conclusion & Recommendations

## 4.1 Conclusion

It is enumerated from the study that; plastic product manufacturing enterprises are facing multi-dimensional constraints to achieve environmental and social sustainability. Among those constraints most importantly poor quality of raw materials, sub-standard product quality, unhygienic working environment, lack of capacity to produce attractive designed product by using modern technology, limited access to service offer opportunities for positive intervenes of products. Obviously, this sub-sector came across a long way past few decades with the help of micro-enterprises, which is about 98% of total 5,500 plastic industrial units in the country, and a total 1.5 million skilled, semi-skilled labor forces are working in this sub-sector. This plastic sector earns approximately 120 million USD per annum through direct and indirect export of plastic goods, RMG accessories and wastes. Hence, another 35,000 crore BDT annually turnover from the domestic market. Evidences shows clearly that there has been a significant increase in the production as well as consumption of plastic items. Today precipitate direct consumption of plastic in Bangladesh is 7 kg which is way more if consider the indirect use of plastic items. However, this amount is much lower than Western Countries even though in South East Asian Countries.

The findings of this study suggest that plastic manufacturing sub-sector development efforts will have to work within the context of a problems identified, feasibly most importantly the lack of use of modern machineries and maintenance services, quality of standard raw materials and finished product testing services, diverse product quality, variation in product quality, relatively no awareness among uses about product ingredients and poor waste management system. On the other hand, lower demand as compared to higher per capita income may also offer an opportunity for growth in the future.



## **4.2 Recommendations**

### ***Policy Guideline:***

- Formulate policy for micro-enterprises to comply quality standards for plastic products including recycling units with the support of BSTI, ISO standards
- Revise policy for controlling direct and indirect import of plastic materials including virgin raw materials or finished products
- Strengthen educational bodies and research institutions with more plastic related study
- Support recycling micro-enterprises with innovative ideas and replicate globally successful projects (funded by World Bank, UNDP and donor agencies) reducing and recycling plastic pollution
- Promote bio-degradable plastics to reduce production of single use plastic products
- Support MEs with SME policy formulation to comply with national manufacturing guidelines and registrations (Trade license, Tax, VAT, ECC etc.)

### ***Environmental and Technological Interventions***

- MEs need to comply with standard protocol related to factory environmental management system, chemical management system, safety managements, occupational health and safety
- Introduce software (CAD) driven CNC machines for designing, Leaser machines for cutting and engraving, 3D for high-end plastic products
- Incorporate modern energy efficient machineries at production level with inverters and soft starters,
- Environmentally friendly incineration or pyrolysis process set-up to generate diesel/petroleum
- Promote improved technologies for recycling used plastic like machines for making bricks, tiles, paved tiles, garden fencing, building materials etc.
- Setup cluster based design and testing laboratories to assure quality products

### ***For Improving Brand from the MEs***

- Linkage MEs with design centers, big brands/ buying houses, universities for R&D, importers, testing laboratories, third party audit firms, Business Associations, DoE, City Corporation or Municipality, audit firms (quality, environmental and social)
- Availed product certificates as per requirement for improved market access