ANALYSIS OF THE COOPERATION POTENTIALITIES FOR PLASTICS RECYCLING IN THE MAHARASHTRA REGION

Final report

RÖCHLING STIFTUNG
Consistently Responsible

GKV Gesamtverband Kunststoffverarbeitende Industrie e.V.

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OPPI - Organization of Plastics Processors of India, Mumbai, India
On behalf of: Röchling Foundation, Mannheim, Germany

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FOREWORD

With the continued growth of the Indian economy the demand for plastic products increases. This brings with it the risk of environmental pollution, especially in the Indian cities. A danger that goes beyond the Indian borders: From the countryside plastic waste is introduced via rivers and coasts in the oceans and harming the marine environment.

Used plastic products across rivers or on the coasts are the main source of global pollution of the seas, called marine litter. A precondition for sustainable growth is to create efficient recycling systems for used plastic products in India.

The Röchling Foundation measures of this task to a high level of urgency as it is our social responsibility to identify ways that will help dealing responsible with our environment and our resources. Indian companies are aware of the issue of plastics recycling. The visit of a delegation of the Organization of Plastics Processors of India (OPPI) in March 2012 was a first step to initiate a continuous know-how transfer. The expansion of existing networks will increase relevance in the future.

The present study provides facts and data about framework conditions and structures of plastics recycling in the Indian State of Maharashtra and therefore delivers useful information for the development of future cooperation projects. Future steps will aim to profile the region as a lighthouse. The objective is to promote the networking and knowledge transfer between German and Indian companies in the plastics industry.

I wish you a pleasant reading.

Burckhard Frank
Member of the Board of Curators
of the Röchling Foundation

MANAGEMENT SUMMARY

One challenge all newly industrialising countries are facing is the growing amount of waste going along with growing consumption. Because of environmental issues, plastic waste, which is not biodegradable, should be processed and re-used. Plastic waste should be seen as a valuable resource.

Cooperation between developed countries and emerging countries offer opportunities to share experiences in building appropriate and economically viable recycling structures. This study aims to provide initial facts to explore cooperation potentialities on the example of the metropolis Mumbai in the Indian State of Maharashtra. The present report summarizes the results of an interview study that was carried out in August 2013 on behalf of the Röchling Foundation. The study tested the political framework, legal requirements and execution, basic information on quantity and quality of plastics waste, waste management structures and technologies as far as the interaction of the actors and stakeholders in plastics waste management.

The results show a strong demand for adequate recyclates from the plastics converters. While the recycling of industrial waste is well developed, there is considerable potential in the recycling of post-consumer waste. A lack of proper sorting and logistics functions has to be stated. The import of adequate plastic waste is severely limited by strict regulations.

INTRODUCTION

One challenge all newly industrialising countries are facing is the growing amount of waste going along with growing consumption. This waste is to share plastic waste, which is not biodegradable. Cities and rivers in the developing world are littered with plastics. Because of environmental reasons non-biodegradable waste should be processed and re-used. Plastic waste is a valuable resource. Most emerging countries still have not developed coherent and functioning systems for the collection and recovery of plastic waste.[1] This also applies to the Indian economy, with 1.2 billion inhabitants, one of the largest in the world. In contrast Germany has diverse and extensive experience in the successful development and operation of recycling systems for plastic waste.

This led the Röchling Foundation 2011 on the initiative to help solve this global environmental problem. In a first step, a delegation of the developing Indian plastics recycling industry was invited to a delegation visit to Germany to transfer knowledge on the system of plastic waste recovery and recycling in Germany and learn about the technologies used.

Based on the impressions of this delegation visit in March 2012, the idea to strengthen the cooperation between India and Germany was expressed by the Indian delegation participants.

To establish concrete long-term sustainable partnerships between companies and institutions in India and Germany, a better knowledge of the specific conditions for the collection and recovery of plastic waste in India is required on German side. Based on the existing relationships and the importance of the region as an industrial center of the Indian economy, the investigation was focused on the Indian State of Maharashtra. The present study was created with the aim of using the example of Maharashtra State to provide an overview of the state of the art of recycling of plastic waste in India. The aim of this study is to show promising opportunities for cooperation between Indian and German companies and institutions to strengthen plastics recovery and plastics recycling in India. Action areas for possible lighthouse projects should be identified. For this reason, the study is aimed at decision-makers in industry, politicians and leaders of NGOs.

This final report presents the results of an analysis carried out in August 2013 by the national organisations of the plastics converting industry Organisation of Plastics Processors of India (OPPI), Mumbai, German Association of Plastics Converters (GKV), Bad Homburg as far as BKV Ltd., Frankfurt am Main, a think tank company of the German plastics industry. The project is made possible by the Röchling Foundation, Mannheim.

[1] *O. Möllenstädt: Good Solution. In: Development+Cooperation, Vol. 39 2012, No. 10, p. 388-389.*

[2] *Ministry of Environment and Forests, Notification, Municipal Solid Wastes (Management and Handling) Rules, New Delhi, the 25th September, 2000*

1 METHODOLOGY

Due to the mainly qualitative issues a series of expert interviews with key stakeholders from industry, administration and NGOs has been established as a suitable method to collect the desired information.

As key stakeholders the following actors have been identified: Local government, local executive, NGOs, plastic converters, plastic recyclers, associations of the plastics industry and institutions of waste collection, marketing and management in the region of Mumbai.

As key stakeholders the following actors have been identified: Local government, local executive, NGOs, plastic converters, plastic recyclers, associations of the plastics industry and institutions of waste collection, marketing and management in the region of Mumbai.

The survey is to provide a coherent picture of the following aspects of plastics recovery in the region of Mumbai:

- **Political framework, legal requirements and execution,**
- **basic information on quantity and quality of plastic waste, waste management structures, and technologies and**
- **the interaction of the actors and stakeholders in plastic waste management.**

For this purpose a questionnaire which is differentiable on each target group was designed by Consultic Marketing and Industry Consulting Ltd., Alzenau on behalf of the project partners (see Annex I). The interviews were conducted from 20th to 22nd August 2013 by Dr. Oliver Möllenstädt, Managing Director GKV and Mr Ulrich Schlotter, Head of Projects BKV Ltd. The documentation during the interviews was performed by consultants of Marketlytics Ltd., Bangalore, Mumbai office Mr Hitesh Vora and Ms Irene Ungerer. The analysis of the interview results and debriefing of the interviewers was carried out by Consultic.

2 LEGAL FRAMEWORK FOR THE RECOVERY OF PLASTICS IN MAHARASHTRA REGION

Managing solid waste in India, like in most parts of the world, is a duty of the municipalities. The Government of India, Ministry of Environment and Forest has notified Municipal Solid Waste Rules in the year 2000, which describe the management and handling of solid waste. The rules are mandatory for all municipalities, irrespective of their size and population. The implementation of the Municipal Solid Waste Rules aim to support the municipal authorities to improve the solid waste management systems in the municipalities and includes criteria for the following six aspects: Collection of municipal solid wastes, segregation of municipal solid wastes, storage of municipal solid wastes, transportation of municipal solid wastes, processing of municipal solid wastes and disposal of municipal solid wastes.[2] The rules provide that littering shall be prohibited in the cities, towns and urban areas. Biodegradable and nonbiodegradable waste will be collected in a separate collection at pre-informed timings on a day-to-day basis using suitable covered vehicles. Municipal authorities will undertake programmes in order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and promote recycling or reuse of segregated materials. Municipal authorities have to establish and maintain storage facilities. Land filling is restricted to nonbiodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. The Pollution Control Boards of the States as well as national and international institutions guide the cities and towns in implementing the rules in a given time frame. The implementation of the rules up to present was slow and incomplete. This is e.g. due to lack of public awareness, lack of sufficient knowledge on benefits of segregation, lack of resources for procurement of tools and modern vehicles and lack of support from the authorities in creating disposal facilities.[3]

[3] *Eco Friend and Co., Practically Feasible and Economically Viable Method of Disposal of Plastic Waste, Mumbai 2009*

[4] *Ministry of Environment and Forests, Notification, Recycled Plastics Manufacture and Usage Rules, New Delhi, the 2nd September, 1999*

[5] *Ministry of Environment and Forests, Notification, Recycled Plastics Manufacture and Usage Amendment Rules, New Delhi, the 1st July 2002*

[6] *Ministry of Environment and Forests, Notification, Recycled Plastics Manufacture and Usage Amendment Rules, New Delhi, the 17th June 2003*

[7] *Maharashtra Non-Biodegradable Garbage (Control) Ordinance, 3rd March 2006*

[8] *Indian Centre for Plastics in the Environment, ENVIS, Volume 3, Issue 4, Oct.–Dec. 2005, p. 1-5*

3 SELECTION OF INTERVIEW PARTNERS

Furthermore different activities were undertaken by several bodies to control manufacturing, usage and recycling of plastics. The technical standards for the recycling of plastics in India are summarized in the standard of the Bureau of Indian Standards IS 14534:1998 titled "Guidelines for Recycling of Plastics". The Central Government notificated the Recycled Plastics Manufacture and Usage Rules in 1999.[4] These rules prohibit vendors to store foodstuffs in carry bags or containers made of recycled plastics and specify the labeling of recycling plastic carrier bags. The Recycled Plastics Manufacture and Usage Amendment Rules concretise the legal points regarding the permissible size of commercialized plastic carrier bags and a registration requirement for manufacturers.[5,6]

The State of Maharashtra has implemented the federal rules by the Maharashtra Non-Biodegradable Solid Waste Rules.[7] The Maharashtra Plastic Carry Bags Manufacture and Usage Rules 2006 mentions that plastic or recycled plastic shall not be less than 50 microns and of size 20 to 30 cms. The Municipal Corporation of Greater Mumbai notified rules on solid waste management in 2006. These rules take into consideration the aspects prohibition of littering, segregation, storage, delivery and collection of municipal solid waste, citizens' empowerment and mandatory support by municipal authority.[8]

The selection of the limited number of interview partners followed suggestions of OPPI. In this case, it was considered important that the interview partners selected are representing the key stakeholders identified sufficiently. The following persons took part in the study:

Institution	Role	Interview partners
Mumbai Municipal Corporation	Local governing body, responsible for waste management	Mr Ghadge, Chief Engineer
Shakti Plastics Industries	Plastics recycling firm, recycler of industrial waste and consumer waste	Mr Vinod Podar, Prorprietor
Aum Impex	Plastics recycling firm, recycler, importer and exporter of industrial waste (e.g. PC, ABS)	Mr Nitin Metha, Partner
Nilkamal Plastics	Large plastic processor of moulded plastics products, Manufacturer of moulded furniture and container systems	Mr Sharad V. Parekh, Managing Director Mr Ambekar, Vice President Technology
Reliance Industries Ltd.	Reliance Industries Ltd. is the second largest company in India and an important plastics manufacturer (e.g. PP, PE, PVC, polyester fibres). Reliance Industries is the world's largest polyester producer.	Mr Gera, Assistant Vice President Business Development Mr K.S. Ravi Kumar, Head Technical Services
Government of Maharashtra, Environment Department	Environmental authority of the State of Maharashtra	Mr Rajeev, Principal Secretary
The Supreme Industries Ltd.	The Supreme Industries Ltd. is India's largest plastic converter (e.g. films, packaging, technical parts, container systems).	Mr V.K. Taparia, Executive Director
Stree Mukti Sanghatana	Stree Mukti Sanghatana is a female rights organization. The Parisar Vikas programme launched by the Stree Mukti Sanghatana with the cooperation of the Municipal Corporation of Greater Mumbai aims to address the problems of waste management and of self- employed women engaged in collecting waste.	Mrs Jyoti Mhapsekar, President Mr Banerjee, Director Sampurn earth Environment Solutions Pvt Ltd.

Indian Centre for Plastics in the Environment	The Indian Centre for Plastics in the Environment (ICPE) set up on the recommendation of a task force constituted by the Ministry of Environment and Forests is a body registered under Society Act. It is a nodal agency recognized by the Government of India to handle all issues related to plastics and environment in the country. The founder members of ICPE are the Chemicals and Petrochemical Manufacturers Association (CPMA), an apex body representing the chemicals and petrochemical producers and Plastindia Foundation, the apex body of major associations, organisations and institutions connected with plastics with common objectives to promote the development of the plastics industry in India.	Mr P.P. Kharas, Mr Vijay Merchant, Members of the ICPE Governing Council

4
INTERVIEWS AND RESULTS

The interviews were based on a prepared questionnaire which was used as an outline. The questions were grouped in 7 major points:

- **Legal Frame / Governmental Institutions & Organizations,**
- **General Attitude towards Recycling / Personal Impressions,**
- **Plastic Waste Generation & Segregation,**
- **General Waste Management & Plastics Waste Collection,**
- **Waste Treatment & Plastics Waste Recycling,**
- **Plastics Processing and Re-Use of Recyclates,**
- **Trade with Plastics and Plastic Waste.**

Due to the different positions of the interview partners in the stakeholder group the emphasis on the topics was adopted adequately during the meetings.

a // Legal Frame / Governmental Institutions & other Organizations

i // Legal Frame / Governmental Institutions

To understand better the importance of the implementation of regulations on provincial and local basis appointments with the Environment Department of the Government of Maharashtra and the Municipal Corporation of Greater Mumbai (MCGM) were agreed. In the first case any answers on the prepared questionnaire were refused. MCGM was very open and explained the waste management system within Mumbai also giving information on the plastics waste sector. The essential result was the fact that:

- **A waste collection system is established.**
- **Close collaboration with an NGO, Stree Mukti Sanghatana (see table chapter 3) according to the separate collection of plastics waste.**
- **MCGM claims compliance with the federal law pertaining to the separate collection of dry and wet waste.**

Other stakeholders give a different picture on the enforcement of existing legislation in the Mumbai region:

- **Lack of enforcement of existing waste regulation;**
- **Political significance of waste management in the state of Maharashtra is not the first priority amongst other issues;**
- **No enforcement of existing regulations by the authorities;**
- **Supreme court guidelines exist but they are not enforced or just ignored;**
- **No strategy for a sound waste management system by the authorities;**
- **No steady development of a waste management system over the time.**

Summing up this information from stakeholder groups out of the administrative level, the plastics industry as well as an important NGO of the Mumbai region only very limited support can be expected from the public administration for a structured waste management focusing on plastics recovery and recycling.

ii // Organizations / Players in the Plastics Waste & Recycling Sector

The Indian Plastics Industry is involved for almost 20 years in the field of environmental issues pertaining to plastics also covering plastics waste recycling and educational issues. The activities are bundled in an organization called "The Indian Centre for Plastics in the Environment" (ICPE). The ICPE buys any kind of plastics and pays today 5-6 rupees per kg. The ICPE works also together with Stree Mukti Sanghatana on educational issues.

Stree Mukti Sanghatana organises the collection of plastics waste, the sorting and on a simple basis some pre-treatment steps to achieve a higher value for the collected plastics materials. The Stree Mukti Sanghatana is also active in the field of education of their members as well as in school programs. The collected material is derived mainly from commercial sites based on contracts between the organization and the individual companies. There are other organizations active in the waste collection. Traders buy the collected plastic material, offering prices up to 20 rupees per kg of mixed plastics.

Summing up this information forms the impression that mostly commercial waste is collected whereas plastics from household waste are dumped or littered except for more wealthily areas where the collection and sorting is done by housemaids, the waste is then sold to waste pickers.

iii // Improvement of Waste Management & Collection in the Area of Mumbai: Measures on Governmental & Authority Level

The interview partners stated unanimously that it is necessary for a sound waste management system that:

- **Waste management structures should start from a local level not on federal level;**
- **A close cooperation between authorities and the private sector is necessary;**
- **The operative business should be in the hands of private companies;**
- **Misbehaviour should be punished severely the penal law has to be amended adequately.**

Summarizing the facts it can be stated:

- **Laws and regulations on collection of plastics waste are not implemented sufficiently;**
- **Laws and regulations on a federal level often ignore the local structures already; implemented in the field of collection and recovery as well as the personnel behaviour;**
- **All activities in the field of plastics collection and recycling are on a private basis and are motivated by economic interests;**
- **A proper waste management system for plastics waste is not available for the collection and the recycling of commercial waste, household waste due to the lack of a proper collection system is not used as a resource for plastics recycling.**

b // General Attitude towards Recycling / Personal-Impressions

People generally become more and more aware of waste management and environmental issues, but the legal framework and the lack of education of people active in the separate waste collection are limiting the development.

c // Plastics Waste Generation & Segregation

i // Plastics Waste Generation

Within the interviews a wide range of different figures about the waste in total and the contained amount of plastics were given. For the amount of plastics waste in the state of Maharashtra 10 kg per capita was given. It was claimed that 25 percent of the household waste is plastics, in Germany the comparable data show below 10 percent. Out of the total 7000 tons per day, 9 percent of it is plastic waste. A statistical report on the plastics production and consumption in India will be found in Annex II. The data concerning waste and plastic waste given show a wide range and are not proven.

ii // Main problem / waste segregation by households

While the commercial plastic waste is collected by waste pickers the household waste is collected as mixture of all residues. This results in heavy contamination of the plastics as part of the waste stream. Even when diverse fractions are sorted out at the dump, these plastic fractions can't meet the specifications of the plastics converting industry due to the odor. The reason is seen in the lack of education of the people as well as the lack of proper legislative measurements or the proper enforcement of existing regulations. As appropriate measures school programs or more general educational programs and the enforcement of a "dry and wet collection system" were mentioned. Summarizing this part of the interviews shows that there is a lack of

coherent data on waste and plastics waste dispersed in such streams. The willingness of the municipalities to implement proper collection systems is low or due to social structures impossible on a top down approach.

d // General Waste Management & Plastics Waste Collection

Under this section aspects of general waste management were addressed as well as special aspects regarding plastic waste.

i // Waste Management in general

Due to growing wealth the amount of waste is rising. It is expected that the tonnage growth from today 10 million tons to 30 million tons until the end of the decade. That would equal approx. 2.4 kg per capita assuming a population of 1.2 billion people. Germany has about 43 million tons of household waste which equals about 530 kg per capita[9]. This includes waste collected in the grey bin as well as bulky waste and other separately collected waste from households. A separate collection from households in Mumbai is organized by 11 dry waste centers in Mumbai. These centers are operating on a profit basis. Their net earnings are reported to be at approx. 100.000 rupees which equals approx. 1.200 Euro per month. No information about material breakdown and the quantities handled could be given.

ii // Collection of Plastics Waste

- **The waste collection and final treatment is operated by private companies as well as municipality services.**
- **Usually most of the valuable components of the waste is already separated by waste pickers before the municipal garbage collection has the chance to catch it.**
- **About 1 percent of the household waste is collected in bins.**
- **There is no area-wide collection of plastics waste. Some household waste is separated in households with a higher living standard by housemaids so up to 50 percent of the plastic waste is separated and sold to waste pickers.**
- **In some areas organizations like Advanced Location Management (ALM) takes care of collections from apartments segregating dry waste from wet waste.**
- **Up to 30 percent of the plastic within the household waste is separated directly by waste pickers before the daily truck comes to collect the waste.**
- **The Mumbai Municipal Corporation has set up self-help groups, provided them with vehicles, to collect trash from apartments, hotels and organizations.**

Whereas the waste pickers are oriented towards value added collection and separating appropriated parts from the common waste stream, the official waste collectors are not interested in value creation from household waste, they act as service provider for collection and disposal of waste.

iii // Role of Waste Pickers ("Rag Pickers")

Plastic waste from commercial sites is often collected on a contract basis by so called "Waste Pickers". The work is also done by women, sometimes organized in structures like Stree Mukti Sanghatana. The interviews gave the impression that:

- **Those organizations make a structured approach for the collection of plastics waste feasible, also educational structures are available for members.**
- **Within the collectors there is not much knowledge about plastics, plastics types and the treatment of plastics to perform a high level recycling (PET wasn't collected because the waste pickers thought it has no value).**
- **In general the waste pickers offer the only structure to collect materials for recycling.**
- **Today the waste pickers are offered approx. 20 rupees per kg of plastics by local peddlers. Selling directly to recyclers offers a 20 to 30 percent higher revenue. Usually the recycler asks for further specification and higher volume than it can be provided by a single person. In average a person can collect between 30 to 40 kg per day. That limits the income to approx. 600 rupee per day (approx. 7 Euros per day).**
- **Further on the activities are limited by the lack of transport possibilities and space to set up a proper pre-treatment.**

[9] *Homepage Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany, www.bmu.de*

e // Waste Treatment & Plastics Waste Recycling

i. Waste treatment in general

The waste management system is characterized by collection and transport action of the waste to an open dump. The Mumbai Municipal Corporation is operating a sorting plant. No information about the capacity and the target fractions could be obtained. The acceptance of energy recovery is very low, reasoned by the lack of an adequate regulation for emission control of incinerators. The four existing legal landfills in Mumbai are operated by the Mumbai Municipal Corporation.

ii // Statements on general Treatment and Recycling of Plastics Waste

Structural deficits within the plastics recycling industry:

- **Small companies acting on an individual basis; about 3000 - 4000 companies;**
- **Mostly not very skilled in the field of plastics;**
- **Sorting technology is very limited, sorting is mostly done on manual labor;**
- **No infrastructure to make use of non recyclable fractions;**
- **Cost structures within the process chain of plastics recycling are not known. Focus of activity within the recycling industry:**
- **The focus of the recycling activities is on commercial waste approx. 80 percent of the plastics recycling.**
- **Household waste provides approx. 20 percent of the recycling input.**

iii // Plastics Recycling Activities related to specific Products and Polymers

Special attention within the plastics recycling is given to PET. PET bottles are most valuable stream within the post-consumer waste. Up to 50 rupees per kg bottles is paid (approx. 60 Eurocent per kg = 600 Euro per ton; In Germany that is the price for washed and clean flake). The Reliance Group is dominating the PET recycling market in India they recycle about 80 percent of the collected PET. Due to legal restrictions there is no bottle to bottle recycling, the material is converted into fibers. PVC is hard to find anymore in the bottle market. Also PVC is imported from Germany, up to 5000 t/a. Post-consumer plastics wastes from other applications are playing only a minor role (approx. 1 percent). Problems are seen in the field thin multilayer films which can't be recycled.

iv // Technologies

The chances for other pathways beside material recycling are seen – for the time being – not very good. Interest was shown in the developments of small scale pyrolysis. With regard to plastics waste, people increasingly realize the value of PET and PET-bottles. Due to missing collection infrastructures and a lack of technological capabilities, recycling activities for other plastics waste like EPS, electronic/electric waste and films are actually very limited.

f // Plastics Processing and Re-Use of Recyclates

The import of plastics waste – e.g. from Europe – is a major feedstock for the plastics recyclers in India. The reason-own waste streams are not easy to use is seen in the lack of quality of the collected material. The plastics converting industry often refuses to use recyclates due to the lack of quality. Outlets for recyclates are applications not typical for plastics materials. For plastics recyclers it is very hard to get production scrap because most of that material is recycled in house. More reliable data on the market for recyclates were not available.

g // Trade with Plastics and Plastics Waste

The strict regulation of the market by the Indian government is seen as a major hurdle for the plastics recycling industry in India. The import of plastics waste is limited to so called export zones and taxed with high duty. The export of waste in general is possible also for plastics waste. About 3000 t/a are shipped out of the country.

5
SUMMARIZING THE RESULTS FROM THE INTERVIEWS

There is a market pull for adequate recyclates from the plastics converters. Up to now only in exceptional cases post-consumer waste can be used to meet the customer specifications. The recycling of commercial waste is well developed but can not satisfy quantitatively the market demand. The import of adequate waste streams is hindered by a restrictive legislation.

Activities for the recycling of plastics from the post-consumer sector started but due to missing of sound legislative borderlines, missing infrastructure, missing knowledge about structure of markets, stakeholder positions within the value chain and technology, the efforts are very limited.

A special role to provide adequate qualities and quantities of plastic waste for recycling could play organizations like Stree Mukti Sanghatana providing organizational skills and being open for educational programs thus providing the chance of a higher income to their members. A better understanding of individual stakeholder groups of the whole value chain in the field of plastics recycling their interests and needs seems necessary to achieve adequate qualities satisfying the market demands.

6
RECOMMENDATIONS

The authors of the report recognized the willingness of all stakeholders in the value chain of plastics recycling to develop plastics recycling in India to a further stage. All actors in the value chain depend on the competitiveness of the measures taken. The competing process for waste handling is the landfill. Within this situation a strictly market driven process should be chosen, including the whole value chain.

A key role for the success is the waste collection, determining the quality of the plastics waste and the effort to put in within the pre-treatment process to meet in the final recycling stage the specifications of the user of these recyclates.

Organizations of the waste pickers – like Stree Mukti Sanghatana – provide the necessary access to the waste pickers, offering in principle the structures for training and education on the one hand and at the other offering their members the chance for a better income by widening the amount of principal valuable waste.

Considering the above mentioned we are convinced that on the descript basis the project should be promoted to next stage.

LITERATURE

Eco Friend and Co., Practically Feasible and Economically Viable Method of Disposal of Plastic Waste, Mumbai 2009

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O. Möllenstädt, Good Solution, In: Development+Cooperation, Vol. 39 2012, No. 10, p. 388- 389.

ANNEX I

GUIDELINE TO ANALYSE

"Possibilities for implementation of stronger recycling and recovery activities for post-consumer plastics waste in the area of Mumbai"

Elaborated for
BKV, GKV and Röchling Stiftung

Target Groups (please select)

☐	Local government	1
☐	Local executive	2
☐	NGO	3
☐	Plastics converters	4
☐	Plastic recycler	5
☐	Association of the plastics industry	6
☐	Waste management / informal market / waste collecting	7

… in the area of Mumbai

Target of the project:
Identify potentials for cooperation in the field of plastics recovery.

Target of the interviews determine:

☐ Political frame, legal standards and execution
☐ Basic information according plastic waste, waste management structures and technologies
☐ Private and public players and other stakeholders

Date: .....
Time: ..... of interview.
Participators:
Interviewed Person: .....
Interviewer: .....
Other participants: .....

A Political framework, legal requirements and execution (Questions 1 – 12)

1. How would you classify the political significance of waste management in the state of Maharashtra? (primary for target groups 1, 2, 3, 6)* From your point of view is it of

☐ Top priority thus having impact on political decision making in other areas, please specify
☐ Rather mid-level importance
☐ Only low significance, new waste management regulations usually need to be modified, restricted in favour of other political areas, please specify

Please explain your selection:

.....

.....

Plastic Waste collection (1, 4, 6)

2. Let us please look at the current regulations in the state of Maharashtra regarding waste collection. Are there any regulations specifically dealing with the collection of plastic waste either for plastic waste resulting from private households or from the commercial / industrial sector?

Private Households

☐ Yes
☐ No

Commercial / industrial sector

☐ Yes
☐ No

3. If yes, what is the legal framework setting the requirements and practice of **plastic waste collection**? Please specify the related laws, regulations?

.....

.....

4. Would you please briefly describe what kind of **plastic waste** is concerned and what the special requirements as regardsplastic waste collection are? (e. g. plastics packaging)

.....

.....

5. To which extend are these **plastic waste collection** related regulations being observed by the players involved? Would you please provide some either positive or negative examples that demonstrate current adherence of plastic waste collection? Are there any quotes for collecting?

.....

.....

6. Does the legal framework for **plastic waste collection** include any penalties in the case of not observing legal requirements?

.....

.....

* Numbers indicate most relevant target groups

Plastic waste treatment, i.e. sorting, recycling and recovery (1, 4, 6)

7. Would you please consider now the legal framework dealing with **plastic waste treatment** in the state of Maharashtra? Are there any regulations, specifically determining plastic waste treatment, either for plastic waste resulting from private households or from the commercial / industrial sector, e. g. quota for recycling and recovery?

Private households

☐ Yes
☐ No

Commercial / industrial sector

☐ Yes
☐ No

8. If yes, would you please specify the related laws, regulations?

.....

.....

9. Would you please briefly describe what kind of plastic waste is concerned and what the special requirements as regards **plastic waste treatment** are?

.....

.....

10. To which extend are these **plastic waste treatment** related regulations being observed by the players involved? Would you please provide some either positive or negative examples that demonstrate current adherence of plastic waste treatment?

.....

.....

11. Does the legal framework for plastic waste treatment include any penalties in the case of not observing legal requirements?

.....

.....

Organizational structure of waste management (1, 2, 3, 4, 5, 6)

12. How is plastic waste management being organized in the state of Maharashtra? How far are public and private bodies being involved in setting regulations, executing waste management, and legal supervision? If necessary please make a distinction between plastic waste resulting from the private sector and those from the industrial sector.
Please indicate the bodies in charge and specify any exceptions, e.g. depending on the kind of plastic waste, e. g. packaging, plastic bottles etc.

.....

.....

Plastic waste resulting from private households and industrial and commercial activities

Please fill in your comments

	Public bodies					
	State level	Regional level	Local level	Other public	Private companies	Others
Setting legal framework						
Proposing regulations						
Setting technical standards						
Supervision						
Waste collection						
Recycling						
Waste recovery						
Others						

13. Requirements and restrictions for companies respectively players acting in the market. Are there any requirements, qualifications, approvals or restrictions according companies and players acting in the plastic waste management market e. g. for

- ☐ Collectors / collecting
- ☐ Recycling
- ☐ Landfill management
- ☐ Or Others

Please describe for the different steps:

.....

.....

14. Financial aspects
How would you describe the financing structures and flows regarding plastic waste management collecting and treatment e. g.

- ☐ are there any general public fees for private households respectively public and private bodies
- ☐ does the collector pay any fees e. g. for bottles, films, etc.
- ☐ are there any fees for disposal, etc.

.....

.....

15. Recycling and competitors: Now would you describe the competition "landscape" in the plastic recycling sector.

15.1 Competition between individual recyclers in India respectively in the area of Mumbai

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15.2 Competition between recycling and usage of plastic waste as RDF e. g. in cement killns

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.....

15.3 Competition between domestic recyclers and exports for recycling e. g. to China or other countries.

.....

.....

B Basic information on plastic waste, waste management structures, and technologies (1, 2, 3, 5, 6, 7)

16. Are there any indications or estimates available on the total volume of plastic waste in the State of Maharashtra?
Total plastic post consumerwaste (indicate the year .....) = ... kt= 100%

☐ Post Consumerhousehold waste = ... kt = ...%
☐ Post Consumer industrial waste = ... kt = ...%

17. Are there any statistics describing the volume of plastic waste by application more in detail? Please provide the data below as far as available.

Source / application	**kt**	**% of total**	**Comments**
Household Packaging			
Industrial Packaging			
Construction			
Automotive			
WEEE (waste from electrical or electronic equipment			
House ware			
Agriculture			
Others			
Total		**100 %**	

18. Are there any applications leading to dangerous content of plastic waste? Please specify the kind of application and the content concerned.

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19. Let us now please look at the plastic waste streams. How is plastic waste usually being collected in your country? Who is in charge of collecting which kind of plastic waste?

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20. Are there any statistics describing the volume of plastic waste by waste stream more in detail? Please provide the data below as far as available.

Plastic waste streams	**Tons**	**% of total**	**Comments**
Residual household waste			
Bulky household waste			
Separate collection by municipalities (non-packaging)			
Sales packaging collected			
WEEE collection			
Municipal waste generated by commercial activities			
Commercial / industrial waste			
Commercial packaging waste collected			
ELV (end-of-life vehicle) waste			
Other recycling systems			
Total		**100 %**	

If not possible in the structure mentioned above, please describe the waste management streams in your words and structure:

21. Which plastic waste streams are being faced with the most valuable content? (e.g. PET bottle collection)

22. What is the current practice of disposing or recycling of plastic waste?

23. Do you have any estimate or statistic figure on the importance of the various ways of handling plastic post consumerwaste?

Source / application	**Total Generation**		**Mechanical Recycling**		**Energy recovery**		**Landfill**		
	In kt	**% share**	**In kt**	**% share**	**In kt**	**% share**	**In kt**	**% share**	
Household Packaging									**100 %**
Industrial Packaging									**100 %**
Construction									**100 %**
Automotive									**100 %**
WEEE (waste from electrical or electronic equipment									**100 %**
House ware									**100 %**
Agriculture									**100 %**
Others									**100 %**
Total		**100 %**	**100 %**						

24. Are there any standards bindingly determining the routes of waste management? If yes please specify or name the major standards**.**

25. Which of the following types of plastic management capacities exist in the state of Maharashtra? Do you have any estimate on the number of such facilities?

Existing plastic waste management capacities	**Exist**	**Number of facilities**	**Comments**
Municipal plastic waste collecting systems			
WEEE collecting systems			
ELV collecting systems			
Incineration plants			
Sorting plants			
Landfills			
Mechanical recycling plants			
Others:			
Others:			

26. Are you aware of any data showing the cost of plastic waste management? If yes would you please provide s some key figures or estimates you know? For instance:

- ☐ Total cost of plastic waste management per capita:
- ☐ Investment for plastic waste collecting facilities spent per year:
- ☐ Investment for plastic waste incineration plants spent per year:
- ☐ Investment for mechanical recycling facilities spent per year:
- ☐ Any other figure on investment or operational costs related to plastic waste management

27. Are there any imports of plastic waste that is being handled in the state of Maharashtra? If yes would you please specify the kind of plastic waste, its origin and volume, and the ways it is being handled?

28. Does the State of Maharashtra exports any plastic waste or recycled products? If yes please specify the kind of waste or recycled products being exported, the receiving countries and the revenues generated by these exports.

C Actors and stakeholders in plastic waste management in the state of Maharashtra (1, 2, 3, 6, 7)

29. What are the major actors on public level determining the legal framework and the standards for plastic waste management?

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30. What are the major public / commercial players on along the various plastic waste streams, e.g.

☐ Plastic waste collection companies .....
☐ Plastic waste recycling companies .....
☐ Plastic waste incineration plants .....
☐ Plastic waste landfill operators .....
☐ Supervisory boards .....
☐ Others: .....

31. Who are the major opinion leaders having impact on political decision making as regards plastic waste management?

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32. What are the key research institutes being involved in plastic waste management including recovery and recycling of plastic waste?

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.....

33. Which actors and stakeholders would you recommend to get in touch with for further cooperation and activities?

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34. Final question: Do you see a chance for or are you interested in a cooperation with potential German partners e. g. regarding

☐ Waste management and collecting
☐ Sorting and recycling technology
☐ Converting into products and marketing of products
☐ Financial partnership
☐ etc.

Please describe.

☐ Not interested at all, because …

.....

.....

☐ Interested in ….

.....

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MANY THANKS FOR YOUR ANSWERS AND PARTICIPATION!

ANNEX II

Fig. 1: Indian Plastics Industry Snapshot as on 2011

Major Raw Materials	Nos.	12
Processing Units	Nos.	> 50,000
Turnover (Processing Industry)	Euro Billion	13
Capital Asset (Polymer Industry)	Euro Billion	8.4
Raw Material Produced	MMT	7.3
Raw Material Consumed	MMT	> 8
Employment (Direct, Indirect/Downstream)	Million	4.25
Export Value (Mainly Polymers)	Euro Billion	1.45
Processing Machines Installed Till Date	Euro Billion	13.23 +
Installed Processing Capacity	MMT	20 +
By 2020		
Demand Potential	20.000 MMT	
Addition Employment	~ 4.0 Million	
Investment Opportunities (For the entire plastic industry)	16.92 Billion Euro	

Fig. 2: The Status of the Downstream Processing Industry as on 2010-11

Sector	Consumption Virgin (KT)	Operating Rate	Installed Capacity (KT)	Machines (Nos)
Films	1,681	42-54 %	3,382	12,330
Pipes	1,276	24-37 %	4,750	5,000
PP/HD Woven Sacks	800	40 %	2,000	1500
Extrusions	709	27-88 %	1,968	2,930
Mouldings	2,500	30-40 %	6,400	60,00
Reprocessing Pelletisers	1,125	75 %	1,500	5100

Fig. 3: The Status of the Downstream Processing Industry as on 2010-11

Sector	Consumption Virgin (KT)	Operating Rate	Installed Capacity (KT)	Machines (Nos)
Monolayer	756	54 %	1,400	8,300
Multilayer	410	51 %	800	1,000
Pipes	351	37 %	950	1,000
PP/HD Woven Sacks	800	40 %	2,000	1,500
Extr. Coating	87	39 %	223	295
PPTQ Film	260	43 %	600	2,700
PVC Pipe	925	24 %	3,800	4,000
Injection Moulding	2,100	39 %	5,400	52,500
Blow Moulding	400	40 %	1,000	7,500
Monofilaments	92	49 %	185	900
Calendered Sheets	96	35 %	275	40
BOPP Films	190	42 %	450	30
Fibres & Fil.	92	88 %	105	70
PVC Wires & Cables	102	27 %	450	8,75
PVC Blown Film & Sheet	65	49 %	132	300
Sheet Lines	30	15 %	200	205
Other Extrusion ETC	210	40 %	530	545
Reprocessing Palletisers	1,125	75 %	1,500	5,100

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