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CHAPTER 1

Introduction

Profile – GOA State

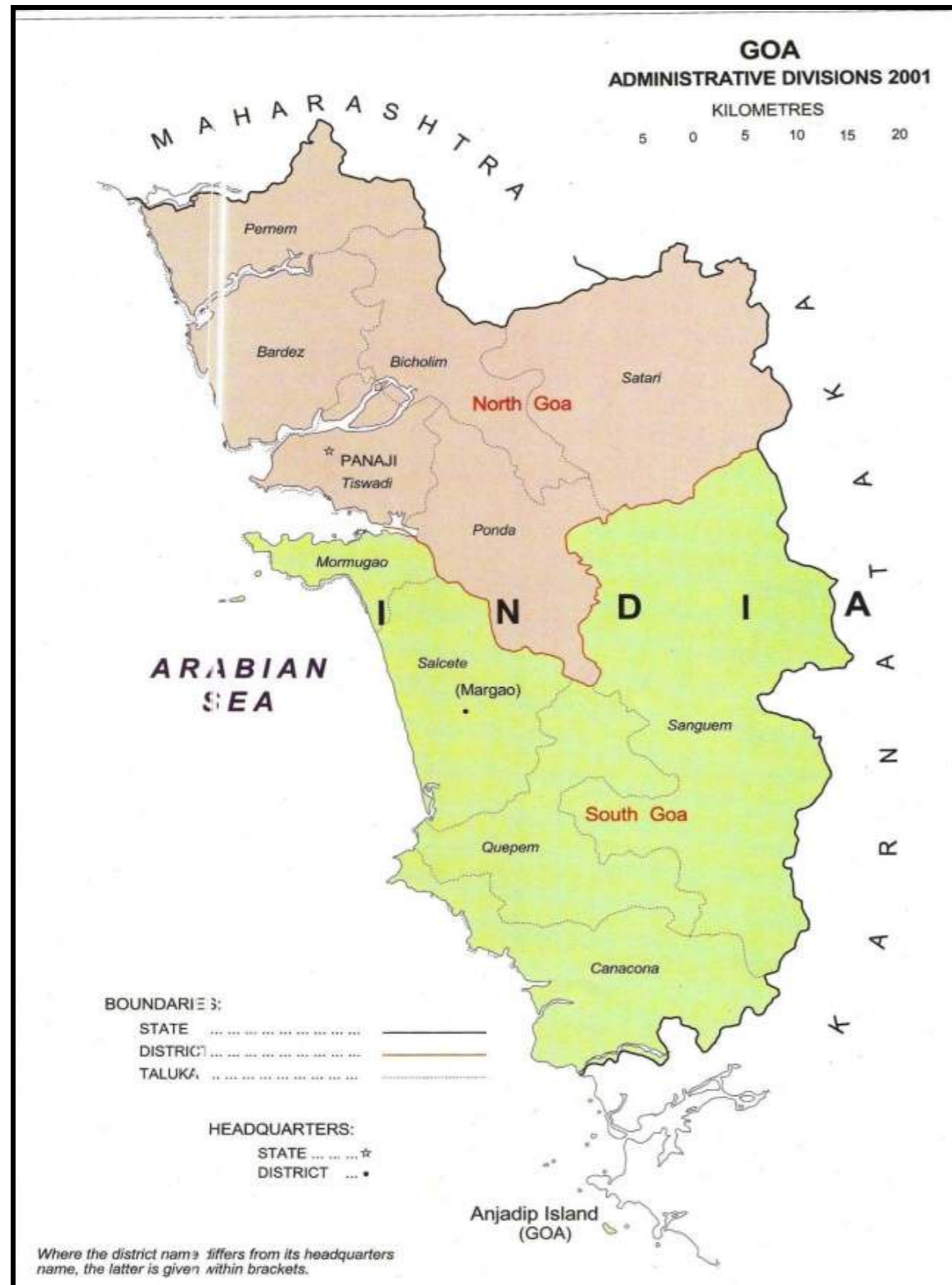
Demography

As per 2001 census the total population of the Goa state was 13, 47,668 Out of this 49.8% of the population lives in urban area and 50.2% of population in rural areas. As per 2001 Census the total population of North Goa district is 7, 58,573 with 45.05% living in urban areas and the Population of south Goa district is 5,89,095 with 55.81% living in urban areas (GOI census,2001). The municipal council wise population in the state of the Goa is given in Table 1.1. The state of Goa is also an important tourist place in India. The tourist population is almost the same as the population of the state. Goa is developing fast as a Industrialized state. Number of industrial estates is developed in the state. As a result of urbanization and industrialization there is an increase in the pollution load. Map of State Goa is enclosed in this report for reference and marked as **Map 1.1.**

Table 1.1: Municipal council wise population of Goa:

Sr. No.	Name of municipal council	Population
1	Bicholim	14913
2	Canacona	11901
3	Cuncolim	15860
4	Mapusa	40487
5	Pernem	5289
6	Quepem	12573
7	Ponda	17713
8	Sanguem	6173
9	Sanquelim	11194
10	Valpoi	7917
11	Panjim	99677
12	Margao	94383
13	Marmagoa	104758
14	Cacora	21407

Map: 1.1: The Map showing Districts, Tahasils of State Goa



1.1 Introduction To Plastic Waste Management

Increasing amounts of plastic waste are being generated following the rapid rate of urbanization. Today, there is a staggering demand for plastic products with the rising affluence and public embracement of western consumerism. However, this expansion of plastic production and consumption is having a significant impact both visibly and invisibly on the environment and society.

The problems with plastic waste may seem surprising in a country where traditional materials fulfilling the current role of plastics have existed. The winning factor for plastics is its functional superiority (convenience) and cost effectiveness. The problem becomes very visible when there is no effective care of the litter.

Plastic waste has a value, and is consequently taken care of by the informal recycling sector. Waste material that has a value is collected by the rag pickers and sold to recyclers. Despite the attempts from the formal and the informal sector, significant quantities of the plastic waste remain uncollected. Waste management is also constrained by the lack of public awareness and low municipal budgets in the country. Even when budgets are adequate for collection, safe disposal remains a major problem.

Managing waste from packaging has become increasingly difficult in developed and developing countries. As a result of the growing amounts of packaging material in the municipal waste, an increasing number of developed countries are in the process of identifying policy options that can reduce the presence of packaging in the waste.

1.2 PLASTIC INDUSTRY - SECTOR PROFILE

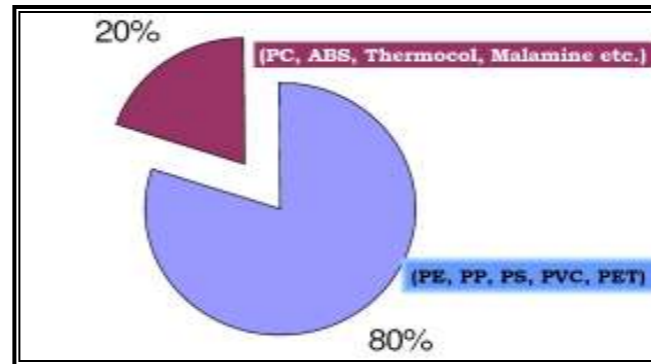


The plastic industry started with imported machines, raw materials, and processing technology in the late 1940's. The industry gained momentum in 1960, when a small naphtha cracker plant for production of ethylene was set-up. With the availability of ethylene, production facilities for HDPE and PVC were established.

The industry, using virgin and recycled plastic, operates for producing consumer goods. The polymer industry has moved a long way and has diversified to serve key sectors like agriculture, telecom, transport and packaging.

1.3 Plastic Consumption

Per capita consumption of plastics (4kg) is very low in India, as compared to the world average of 18 kg. The growth of the Indian plastic industry has been phenomenal - the growth rate (17%) is higher than for the plastic industry elsewhere in the world.



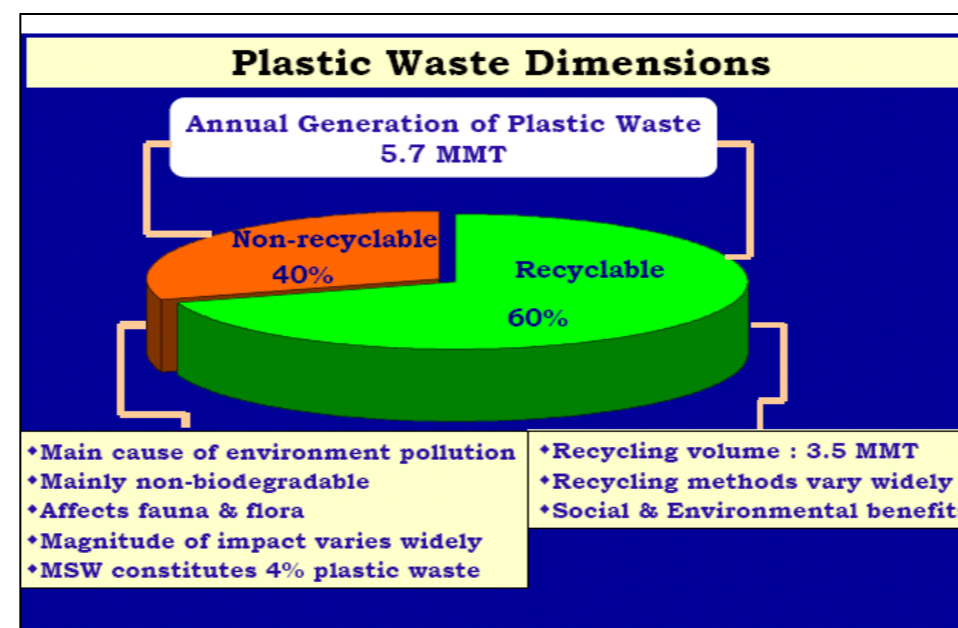
1.4 Plastics Waste: Environmental Issues and Challenges

Plastics waste is a significant portion of the total municipal solid waste (MSW). It is estimated that approximately 10 thousand tons per day (TPD) of plastics waste is generated i.e. 9% of 1.20 lacs TPD of MSW in the country. The plastics waste constitutes two major category of plastics; i. Thermoplastics and ii. Thermoset plastics. Thermoplastics, constitutes 80% and thermoset constitutes approximately 20% of total post-consumer plastic waste generated in India.

- (i) The Thermoplastics are recyclable plastics which include; Polyethylene Terephthalate (PET), Low Density Poly Ethylene (LDPE), Poly Vinyl Chloride(PVC), High Density Poly Ethylene (HDPE), Polypropylene(PP), Polystyrene (PS) etc.
- (ii) However, thermoset plastics contains alkyd, epoxy, ester, melamine formaldehyde, phenolic formaldehyde, silicon, urea formaldehyde, polyurethane, metalised and multilayer plastics etc.

The environmental hazards due to mismanagement of plastics waste include the following aspects:

- Littered plastics spoils beauty of the city and choke drains and make Important public places filthy;
- Garbage containing plastics, when burnt may cause air pollution by emitting polluting gases;
- Garbage mixed with plastics interferes in waste processing facilities and may also cause problems in landfill operations;
- Recycling industries operating in non-conforming areas are posing unhygienic problems to the environment.



1.6 Polyethylene Teraphthalate (PET)



A take back or a deposit refund system is a concept that is not new for India. It has existed for several years now with glass bottles. The price charged by the retailer for each bottle includes a deposit (usually Rs 5) refunded when the bottle is returned. Used bottles are collected, cleaned, disinfected, refilled with the same product and returned to the trading point. It is an effective system, which uses the same transport system for collection and delivery. The deposit on the bottle ensures that it is valued, and the size of the deposit is fair enough to induce the consumer to return the bottle; even if the consumer discards it, it is collected by waste pickers.

1.7 Polybag: A Major Concern

For most Indian citizens the environmental problems of plastic is due to polybags.

1.7.1 Choked soil

Polybags are non-biodegradable, which means that they do not dissolve or disintegrate into the soil. Besides, they are non-porous, and do not allow the free flow of water and air, thereby choking plants. ,

1.7.2 Choked drains

Choked drains is a serious hazard caused by the polybags, thereby causing water logging and flooding which further result in health problems due to water stagnation.

1.7.3 Animal deaths

Since cows graze freely close to the garbage bins, they ingest the plastics along with organic food waste in it. There are several cases of cows and other animals being killed due to plastic bags accumulated in their stomach.

In addition to the cows, the coastal creatures like turtles are also affected as they mistake the multi coloured polybags for jellyfishes. As they ingest them, their intestines are blocked and metabolism is impaired.

1.7.4 Food hazard

In addition to contributing to litter, polybags, particularly of recycled plastic, pose a major health hazard. The main hazards are associated with the chemicals used to colour plastic bags. Small amounts of lead and cadmium are added during the manufacture, and these could permeate into food products stored in the bags. The recycler may sell polybags for use only as a carry bag, not for food items, but the vendors, unaware of the risks of packing food products in coloured plastics, may use it for packing food items.

1.8 Rules for management of Plastic waste.

In view of the problems created due to use and littering of the plastic bags, Manufacture and use of recycled plastics carry bags and containers is being regulated in the country as per “Recycled Plastics Manufacture and Usage Rules, 1999, as amended from time to time by MoEF. The State of Goa has also enacted “Goa Non Biodegradable Rules 1996”. The main feature of this rule is to ban the use of plastic bags of less than 40 microns. Details of these rules are given in Chapter No. 5.

1.9 Status report on Plastic waste management in the State of Goa

The CPCB has asked the State Pollution Control Board to prepare survey report on Status Plastic Waste Management in Goa State. There are rules framed by MoEF stating the thickness of the plastic bags. The MoEF has also made it mandatory for the GSPCB to register the plastic units.

1.9.1 Objective / Goal

The objective of this report is to highlight the status of plastic waste management in Goa state and suggest suitable recommendations.

CHAPTER 2

Present Scenario in the State of Goa

2.1 Plastic Waste Management in Local Bodies.

In the state of Goa there are 13 municipal councils, 1 Municipal corporation and More than 150 village panchyats. After the invention of plastic bags, they are being used very liberally in all the local body areas. The plastic bags have replaced cotton and Paper bags.

Goa State is famous for International Tourism and annual tourists population is almost same as population of Goa state. The various types of plastic waste such as mineral water bottles, wrappers, plastic carry bags, pouches etc. are generated by tourists and locals.

All municipal councils and corporation are collecting plastic waste to the maximum extent possible and keeping the same at their respective dumping grounds. The plastic waste is bailed but unable to be disposed the same in scientific manner, as the same is contaminated plastic waste. Few attempts were made to wash the plastic waste, but it was not practically successful. There is problem of disposal of accumulated Plastic Waste with every local body. The approximate quantity of plastic waste generated in various Municipal Council is as follows.

Sr. No	Name of Local Body	Plastic Waste Collected in Tones per day (10 % of Total MSW)
01	Panjim Corporation	5 Tons
02	Mapusa Mun.Council	2.4 Tons
03	Pernem Mun.Council	0.05 Tons
04	Ponda Mun.Council	0.6 Tons
05	Valpoi Mun.Council	0.02 Tons
06	Bicholim Mun.Council	0.5 Tons
07	Sanquelim Mun.Council	0.3 Tons
08	Margao Mun.Council	5.0 Tons
09	Mormugao (Vasco) Mun.Council	4.5 Tons
10	Quepem Mun.Council	0.1 Tons
11	Cacora – Curchorem Mun.Council	0.3 Tons
12	Canacona Municipal Council	0.15 Tons
13	Cuncolim Municipal council	0.05 Tons
14	Sanguam Municipal council	0.15 Tons

Note : **Baling is done by all the local bodies.**

The Total plastic waste generated in urban areas is about 20 T/day. Urban population in Goa is 49.8%.Theplastic waste generated from rural areas is lso expected to be the same i.e. 20 T/day.

2.2 Plastic Waste Management in Industrial Sector.

Though Goa was not industrially advanced state earlier, now the scenario is changing. There are 19 industrial estates in the state and there is huge generation of plastic waste in the form of packing materials, containers etc. Part of this waste is collected by scrap dealers for recycling purpose. Scrap Dealers are collecting only economically recyclable Plastic waste. Low micron polybags, Soiled plastic, non reusable and non recyclable plastic waste remains in Industrial areas there by creating environmental hazards.

There are few plastic manufacturers who use imported virgin plastic granules for plastic manufacturing. There are some plastic recyclers who use on contaminated plastic waste supplied by Scrap dealers. The quantity of Plastic waste generated is much more than the quantity of plastic waste recycled.

2.3 The main issues relating to generation, collection and disposal of plastic waste in Goa are as follows.

- Littering of plastic waste due to lack of awareness and enforcement.
- Change in life style and “use and throw culture.”
- Lack of buy back policy / incentive / green taxation which would make the people to avoid littering of plastic waste.
- Lack of organized rag pickers. Increase in number of rag pickers will help in more collection, segregating and recycling of plastic waste.
- Rag Pickers are collecting only selected recyclable and non contaminated waste.
- The waste not collected by rag pickers or scrap dealers lies at municipal dumping ground.
- Out of 197 plastic manufacturing units, only 22 units are recycling units.
 - ***Large scale housing and commercial development with lack of required infrastructure to cater to such development.***
 - ***Lack of Garbage management system in village areas, leading to citizens either burning their plastics or flinging them along roadsides, in fields or open spaces.***
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CHAPTER 3

Registrations Granted

Registration

The industries are required to obtain consent under water (Prevention and Control of pollution) act, 1974 and Air (Prevention and Control of pollution) act, 1981, from State Pollution Control Board. Plastic manufacturing is considered to be a non / low polluting activity and hence coverage under the consent under these acts is not taken seriously by the industries and the GSPCB. Many industries are found to be unconsented or not having valid consent.

Lists of plastic manufacturing industries available with GSPCB and GIDC are enclosed as Annexure I.

Table showing the consolidated statement of plastic manufacturing units in the Goa.

Sr. No.	Taluka	Industries having consent of		Industries having air and water consent	Industries with air and water consent not renewed	water consent not renewed	air consent not renewed	No consent	No data	Total	Closed units
		Water	Air								
1	Bardez	0	0	0	0	8	0	15	0	23	0
2	Tiswadi	0	0	0	5	15	3	17	2	42	3
3	Canacona	0	0	1	0	0	0	3	0	4	0
4	Marmagoa	0	0	0	1	0	0	13	0	14	0
5	Pernem	0	0	0	0	4	0	3	0	7	2
6	Ponda	4	0	5	5	27	0	59	1	101	15
7	Quepem	0	0	0	0	1	0	1	0	2	0
8	Sattari	1	0	0	0	0	0	3	0	4	0
9	Sanguem	0	0	1	0	0	0	2	0	3	1
10	Bicholim	1	0	0	2	11	3	11	0	28	2
11	Salcette	11	0	4	6	28	1	29	6	85	8
	total	17	0	11	19	94	7	156	9	313	31

In the state of Goa, there are total 313 units manufacturing items made of plastic, either virgin or recycled, out of 31 units are presently closed down.. Talukawise list of the industries with appropriate classification is attached as table 3. There are 157 industries in the state of Goa who have been granted with at least one consent in last 10 years (either air or water consent). Remaining 156 industries are running without any consent form GSPCB. Out of 157 industries, 28 industries have at least one valid consent. Remaining 129 industries have expired consents (either air or water consent) and have not renewed the consent subsequently. Incomplete data is available for 9 industries.

CHAPTER 4

Inventorization

4.1 Plastic Recycling Industry

Per Capita Plastic consumption is very low in India, compared to the consumption in developed countries. Two reasons have been attributed to this. One is that the throwaway culture is yet to completely penetrate Indian society. Traditionally materials including plastics are used over and over again repairing broken plastics by simple fusion. The other reason is the wide scale recycling, which is an economically driven activity providing meaningful employment to a number of people.

4.2 Various fractions in plastic waste

- Polythene carry bags
- Plastic wrappings
- Thermocole packing material
- Plastic plates, cups, spoons, glass
- Melamine crockery
- Non-recyclable plastics waste such as gutkha pouches
- Multilayer packaging
- Laminated packaging
- Pet bottles
- Tetra packs
- Shampoo sachets.

4.3 Plastic recycling industry

. The recycling industry falls under the small sector requiring very low investments. India has high rates of recycling, but recycling does not employ state-of-the-art technologies. The reprocessing sector can be divided into the granulators and the converters. The granulators make granules from the plastic scrap and sell granules only. The converters make plastic products out of granules. The sorting of plastic scrap is done on the basis of colour, transparency, hardness, density and opacity. The sorted waste is sent to the granulators. The recycling technology employed is a mechanical process with the traditional grinding and extrusion to obtain granules.

Such units are often located in slums, and are unauthorized. Scrap storage is done in the backyards, and washing is done in open drums, and also the workers do not use any protective clothing. The major source of generation of effluents is the washing and cleaning process. The wastewater has high pollution load in terms of BOD, COD, and TSS depending on the material that was packed. Granules produced are now sold to the converters, who process the granules into finished products, by crude technology. In addition, the sector does not employ highly skilled labour, which also justifies the poor quality of recycled products.

The recycling industry has emerged parallel to the virgin plastic industry in the country.

4.4 Plastic recycling industry in Goa

Plastic recycling industry in Goa is scattered in various industrial estates.

From various sources the information regarding plastic industries has been collected and the total list of recycling industries is given in the preceding chapter. The information about the plastic recycling industries in Goa is as mentioned below,

List of Recycling Industries.

SR NO	NAME OF THE UNIT	PLOT/ SHED NO	TALUKA
1	M/s. Nitu Plast	P-75 Bicholim industrial estate	Bicholim
2	M/s. Devi Enterprises	P-86, 87, Bicholim industrial estate	Bicholim
3	M/s Shaheena Plastics	P-119B Bicholim industrial estate	Bicholim
4	M/s Indo Plast	P-9,10,11-A Bicholim industrial estate	Bicholim
5	M/s. Gold Star Plastic	P-114 Bicholim industrial estate	Bicholim
6	M/s. Zameer Plastic	SA-38 Cuncolim industrial estate	Salcette
7	M/s. Pioneer Plastics	Cuncolim industrial estate	Salcette
8	M/s. Shri Om Plastics	A-31 Madkaim industrial estate	Ponda
9	M/s. Kalpataru Industries	A-44 Madkaim industrial estate	Ponda
10	M/s. Neha Polymers	B-19 Madkaim industrial estate	Ponda
11	M/s. G K Plastic	Ashewwada, Ponda, Goa.	Ponda
12	M/s. Rajkamal Pressing Unit,	C/o. Uday P. Bhagat, Marcela, Ponda, Goa	Ponda
13	M/s. Ashweg Plastic	S.No.183, Penyamal, Nirancal, Ponda-Goa	Ponda
14	S.S. Industries	C/o. Vishal S.Chari, Vandamol, Velguem, Bicholim, Goa.	Bicholim
15	M/s. Devi Enterprises	P-1A &2A Bicholim industrial estate	Bicholim
16	M/s. Gold Star Plastic	P-114 Bicholim industrial estate	Bicholim
17	M/s Surekha Plastic Moulds	P-74 Bicholim industrial estate	Bicholim
18	Sai Tech Goa C/o V.Shankaran	Bicholim industrial estate	Bicholim

19	M/s.Devi Enterprises	P-86/87 Bicholim industrial estate	Bicholim
20	M/s. Shaheen Plastics	P-119-P Bicholim industrial estate	Bicholim
21	M/s. Shaheena Plastics	P-197-B, 119-B Bicholim industrial estate	Bicholim
22	M/s. golden fleece enterprises	Sn 630(1), moula, salcete	Salcette

Details of site visits to various manufacturing units :

72 no. of plastic waste manufacturing units were visited for the survey. Information about the location, production details, quantity, thickness of bags, consent status, water consumption, waste water generation, ETP, Air pollution control, Solid waste etc was collected during the visit. In some of the units useful data could not be collected due to closure or unavailability of responsible persons at site. The information in tabular form is annexed as annexure II.

CHAPTER 5

State policy/ Rules

5.1 Regulation of plastics carry bag manufacturing by MoEF, GoI.

Salient Features of the Plastics Manufacture and Usage (Amendment) Rules, 2003

Regulation of plastics waste, particularly manufacture and use of recycled plastics carry bags and containers is being done in the country as per “Recycled Plastics Manufacture and Usage Rules, 1999 and as amended in 2003. According to these Rules:

- ♦ No person shall manufacture, stock, distribute or sell carry bags made of virgin or recycled plastic bags which are less than 8 x 12 inches in size.
- ♦ No vendor shall use carry bags/containers made of recycled plastics for storing, carrying, dispensing or packaging of food stuffs;

- ♦ Carry bags and containers made of recycled plastic and used for purposes other than storing and packaging food stuffs shall be manufactured using pigments and colorants as per IS 9833:1981 entitled “List of pigments and colorants for use in plastics in contact with food stuffs, pharmaceuticals and drinking water”
- ♦ Recycling of plastics shall be undertaken strictly in accordance with the Bureau of Indian Standard specification: IS 14534:1998 entitled “The Guidelines for Recycling of Plastics”
- ♦ Manufacturers of recycled plastic carry bags having printing facilities shall code/mark carry bags and containers as per Bureau of Indian Standard specification: IS 14534:1998 (The Guidelines for Recycling of Plastics).
- ♦ No person shall manufacture carry bags or containers irrespective of its size or weight unless the occupier of the unit has registered the unit with respective SPCB/PCC prior to the commencement of production.
- ♦ The prescribed authority for enforcement of the provisions of these rules related to manufacturing and recycling is SPCB.
- ♦ The prescribed authority for enforcement of the provisions of these rules relating to use, collection, segregation, transportation and disposal shall be the District Collector/ Deputy Commissioner of the concerned district
- ♦ The minimum thickness of carry bags made of virgin plastics or recycled plastics shall not be less than 20 microns.
- ♦ The units manufacturing carry bags / containers shall get themselves registered with the SPCB. For this application shall be made in form I.

♦ **Recent Amendment**

The MoEF has notified and published Plastic Waste (Management & Handling) Rules 2011 on 4th Feb 2011.

5.2 Regulation of plastic waste as per Goa Non-Biodegradable Garbage (Control) Act, 1996

Salient Features of the Goa Non-Biodegradable Garbage (Control) Act, 1996

➤ **Non-Biodegradable Garbage includes**

- | | | |
|----------------------------------|-------------------------------|------------------------|
| (1) Polyethylene; | (2) Polycarbonate; | (3) Polypropylene; |
| (4) Polystyrene; | (5) Polyvinyl Chloride (PVC); | (6) ABS; |
| (7) Acetal; | (8) Acrylic; | (9) Cellulose Acetate; |
| (10) Cellulose Acetate Butyrate; | (11) Nylon. | |

- Prevent throwing or depositing non-biodegradable garbage which is not capable of being destroyed by an action of living beings, in public drains, roads and place open to public view in the State of Goa
- Local authority to provide public receptacles, depots or places for temporary deposit or collection of non-biodegradable garbage; and provide separate dustbins for temporary deposit of bio-degradable garbage and provide for the removal of contents of receptacles and arrange for recycling of the non-biodegradable garbage so collected.
- Owners and occupiers of all lands and buildings (a) to collect their the non-biodegradable garbage and to deposit in public receptacles provided by the local authority. in the area; and to provide separate receptacles or dustbins for biodegradable and Non biodegradable garbage, as prescribed by the local authority.
- The local authority authorized to remove unauthorised stacking or deposit of nonbiodegradable garbage which is a nuisance, is likely to injure the drainage and sewage system or is likely to be dangerous to life and health.
- The State Government to
 - undertake studies to determine the composition of biodegradable or non-biodegradable garbage;
 - establish measures to conduct or support research or programmes to encourage source reduction, re-use and recycling of waste;
 - conduct or support studies to determine the social and economic feasibility of household and other solid waste separation schemes, including studies of the type and amount of recyclable materials in solid wastes;
 - encourage local authorities in the State to provide readily accessible solid waste collection depots for residents who are not provided with regular garbage pick-up;
 - undertake and encourage, local authorities and other persons to implement policies to recycle waste materials, to promote energy conservation and to purchase products made from recyclable materials;
 - conduct and support research on recycling including information on operating recycling business and market information on recyclables;
 - conduct and support research on waste management and recycling, for use in educating the public, local authorities, institutions and industry;

- impose requirements on manufacturers, distributors and other persons who produce or handle commodities with respect to the type, size, packaging, labelling and composition of packaging that may or must be used and with respect to the disposal of packaging including standards for material degradability and recyclability.

An attempt of take back in Goa

Early in 1999, vexed with the littering problem, an NGO named Goa Foundation took direct action, by dumping piles of plastic bottles at the gates of the leading mineral water bottler, Bisleri. The company then agreed to put a deposit of Rs 1 on some of its plastic water bottles. However the deposit was only for the 5 liter Bisleri bottles. The take back scheme has been working fine for the 5-lit bottles in Goa. As in the case of glass bottles, even if the user does not return the bottle, the rag picker collects it and sells it to the retailer. Further, the 5 liter bottles are thicker can be reused.

Despite this, there are two crucial points that need to be addressed. The first one being that it is not enough if one packer takes up responsibility. The bottled water market is highly competitive, and there are new players entering the market within a short span of time. Hence, they have to take up this responsibility collectively and not in isolation. Secondly, the major problem of littering is associated with the 1-litre and 500 ml bottles, and a take back scheme has to cover these bottles as well. As of today, there are no incentives or penalty for the packer, to collect 1-litre and 500 ml bottles. These are also not attractive for the waste pickers, since it finds no/limited value in the trade due to a few PET recycling units existing. The industry needs to be compelled to take back the used pet bottles.

Similar exercise was done in case of tetra packs, with some success.

CHAPTER 6

Concluding Remarks

6.0 Concluding Remarks

Plastic Waste Management

I Recycling

Incentives for the recycling Industry to upgrade its recycling practices

The recycling sector is in dire need of upgrading its technologies. Although the government requires the recycling industries to adopt good recycling technologies as per the third specification in the rule, there are no incentives for the recyclers to adopt them. The government has not made an initial attempt to register (formalize) all the units after which can technology enhancement programmes be envisaged in this sector. There is need for appropriate incentives to attract these recycling units to adopt good practices. Such an enhancement in recycling practices can only result in recycled products of better quality. These goods in turn can compete with virgin products in the market.

II Alternative uses of plastic waste

Apart from recycling of plastic waste through recycling industries various other options are in experimental stage. These are mentioned below

Polymer Coated Bitumen Road

The CPCB has undertaken a project in collaboration with Thiagarajar College of Engineering Madurai to evaluate the performance of polymer coated built roads laid during 2002-2006 in different cities.

The observations are as below:

- ♦ The coating of plastics over aggregate improves Impact, Los Angeles Abrasion and Crushing Value with the increase in the percentage of plastics.
- ♦ The extracted bitumen showed almost near value for Marshall stability. The entire road was having good skid resistance and texture values.
- ♦ All the stretches in the roads have been found reasonably strong.
- ♦ The unevenness index values of these roads are nearly 3000 mm/km, which indicate a good surface evenness.
- ♦ The plastic tar roads have not developed any potholes, rutting, raveling or edge flaw, even though these roads are more than four years of age.
- ♦ Polymer coated aggregate bitumen mix performs well compared to polymer modified bitumen mix.
- ♦ Higher percentage of polymer coating improves the binding strength of the mix.
- ♦ Foam plastics have better binding values.

Plastics Waste Disposal through Plasma Pyrolysis Technology (PPT)

Plasma Pyrolysis is a state of the art technology, which integrates the thermo chemical properties of plasma with the pyrolysis process. The intense and versatile heat generation capabilities of PPT enable it to dispose off all types of plastic wastes including polymeric, biomedical and hazardous waste in a safe and reliable manner. Incidental electricity generation is also possible.

♦ **Plasma Pyrolysis Technology**

In plasma pyrolysis, firstly the plastics waste is fed into the primary chamber at 8500C through a feeder. The waste material dissociates into carbon monoxide, hydrogen, methane, higher hydrocarbons etc. Induced draft fan drains the pyrolysis gases as well as plastics waste into the secondary chamber, where these gases are combusted in the presence of excess air. The inflammable gases are ignited with high voltage spark. The

secondary chamber temperature is maintained at around 10500 C. The hydrocarbon, carbon monoxide and hydrogen are combusted into safe carbon dioxide and water. The process conditions are maintained so that it eliminates the possibility of formation of toxic dioxins and furans molecules (in case of chlorinated waste). The conversion of organic waste into non toxic gases (CO₂, H₂O) is more than 99%. The extreme conditions of Plasma kill stable bacteria such as *Bacillus stercophilus* and *Bacillus subtilis* immediately. Segregation of the waste is not necessary, as very high temperatures ensure treatment of all types of waste without discrimination.

The CPCB has initiated the study in association with Facilitation Centre for Industrial Plasma Technologies (FCIPT), Institute of Plasma Research (IPR) The objectives of the study are to conduct performance study of the PPT on 15 kg/hr prototype demonstration system developed by FCIPT/ IPR for proper disposal of plastics waste and also monitor air quality parameters e.g. suspended particulate matter (SPM), carbon monoxide (CO), hydrocarbons (HC), benzene, dioxins, furans etc. with regards to gaseous emissions. CPCB also proposes to undertake study on safe disposal of plastics waste using higher capacity (approx. 50 kg/hr) plasma pyrolysis system as in future and may set up prototype plasma pyrolysis plant on demonstration basis (15 kg/hr waste disposal capacity) at specific locations (hilly and pilgrimage) in consultation with State Government.

Conversion of Plastics Waste into Liquid Fuel

A research-cum-demonstration plant was set up at Nagpur, Maharashtra for conversion of waste plastics into liquid fuel. The process adopted is based on random de-polymerization of waste plastics into liquid fuel in presence of a catalyst. The entire process is undertaken in closed reactor vessel followed by condensation, if required. Waste plastics while heating up to 2700 °C to 3000 °C convert into liquid-vapour state, which is collected in condensation chamber in the form of liquid fuel while the tarry liquid waste is topped-down from the heating reactor vessel. The organic gas is generated which is vented due to lack of storage facility. However, the gas can be used in dual fuel diesel-generator set for generation of electricity. The process includes the steps shown ahead:

❖ Environment related observations during the process

- There are no liquid industrial effluents and no floor washings as it is a dry process.
- There are no organized stack and process emissions.
- Odour of volatile organics has been experienced in the processing area due to some leakages or lack of proper sealing.
- Absolute conversion of liquid-vapour was not possible into liquid; some portion of gas (about 20%) is connected to the generator. However, the process will be improved in full-scale plant.
- PVC plastics waste is not used and if used, it was less than 1%. In case PVC is used, the chlorine can be converted into hydrochloric acid as a by-product.
- The charcoal (charcoal is formed due to tapping of tarry waste) generated during the process has been analyzed and contain heavy metals, poly aromatic hydrocarbon (PAH) which appears to be hazardous in nature. The source of metals in charcoal could be due to the presence of additives in plastics and due to multilayer and laminated plastics.
- Monitoring of process fugitive emissions in the work area as well as emissions from the engines/diesel generator sets is necessarily required (where this liquid fuel is used) for various parameters such as CO, HCl, Styrene, Benzene, VOCs.

Reducing Agent in Blast Furnaces of Steel Industries (Feedstock Recycling)

For the smelting of Iron ore for producing pig iron, traditionally coke or pulverized coal is used in the blast furnace to generate carbon monoxide and heat. Plastics when burnt in the absence of sufficient oxygen produce CO apart from generating the heat energy. This property of plastic has been utilized in blast furnace and as such waste plastic has replaced a part of the coke or pulverized coal used for producing pig iron from iron core.

The plastic waste is first formed into suitable size either by crushing or pelletizing as necessary and subsequently injected into the blast furnace from the tuyeres at the base of the furnace with hot air. The injected plastic waste material is broken down to form reducer gas CO and H₂. The reducer gas rises through the raw material layers in the blast furnace and reacts with the iron ore. While the reducer gas reacts with the iron ore to produce pig iron, the gas after the reduction reaction is recovered at the top of the blast furnace which has an energy content of 800 Kcal / NM³ and is reused as a fuel gas in heating furnaces and generators within the steel plant.

There are two blast furnaces in Goa, one in North Goa belonging to M/s Sesa Goa located at Amona and the other in South Goa belonging to M/s Aparant located at Costi.

Use of Plastic Waste in Cement Kilns (Energy Recovery)

Plastic waste can replace approximately 15 % of normal fossil fuel in cement kilns. Successful trials have already been conducted in some cement kilns of India for agricultural waste. Like rice husk as alternative fuel. As cement Kilns are operated at a very high temp. (1500 C) there is no risk of generation of any toxic emission due to burning of plastic waste. A 1 million ton capacity cement plant can consume about 10000 -30000 MT of plastic waste annually.

III Substitutes for plastic

Status of research for finding Substitutes for plastic

Paper is the most commonly proposed substitute for plastics. Recycled or hand made paper is by and large the most expensive substitute for polybags. However, a paper bag from used paper is a possibility. Manufacturing these paper bags is a small cottage industry that has shrunk due to the introduction of polybags. The demand for such paper bags has considerably reduced in the last few years, and it has become increasingly expensive to produce them. However demand creation may help to make them cost effective. Old paper bags are possible substitutes for polybags, but they need to be bailed out from the demand slump they are facing. Here, the government could play a role in helping them out of the slump, and creating a demand for them; this would be a step to move away from polybags. Even if paper bags are bailed out from the slump they are facing, they are not convenient for packing wet products that are widely used in cuisine.

Cloth bags include bags from nylon and cotton. Cotton bags made from new cotton cloth are an inappropriate use of the expensive material. It could rather be more profitable to use this for the garment industry. So the only possibility is to use bags from old clothes. However, cloth bags do not provide similar convenience as plastic bags. It is not economical for the shopkeeper to also hand out cloth bags for every purchase. In addition, it is not convenient for women/consumers to shop after work. These practical difficulties make the cloth bag an unattractive substitute for polybags.

Jute bags have been touted by the NGOs as the most preferred alternative for polybags. In terms of an appropriate material itself, jute is a fine multiple use alternative. However, there are many structural changes required in the material for it to prove to be a viable alternative to polybags. As a material, jute is a good alternative, but its chances to replace polybags, and compete with polybags in terms of price and convenience appear to be bleak.

Biodegradable Plastics

The environmentally degradable polyolefin films are defined as those materials that contain degradation process of polyolefin article (bag/film/ sheet) under conditions of composting. Often queries are raised regarding biodegradability of plastics but clear-cut answer is not available about the biodegradability of plastics. In view of above, CPCB has initiated a study in collaboration with Central Institute of Plastics Engineering and Technology (CIPET) to establish the biodegradability and compostability (e.g. fragmentation rate, degradation rate and safety) of polymeric material available in India and abroad. The study will include:

- Inventorisation and assessment of the manufacturing status of biodegradable plastics in India particularly with reference to processing technologies and the environmental issues.
- Establishment of the degradation rate (change in chemical structure, decrease in mechanical strength, fragmentation or weight loss) of the polymeric material or plastics material under laboratory scale composting conditions
- Finding out self-life and its impact on environment (soil, water of plastics with reference to colour and additives, once it is disposed off)

Assessment of effects on foodstuffs with reference to natural colours and additives

Incentives for research and development

Bio-plastics are promising technologies of the future that can change the scenario of plastic waste management. The Government has not made any provisions in the Rule that could speed up the commercialization of these technologies. Although research is carried out in these areas, the commercialization process is still at a low key. India, where enforcement has been a major problem, the Rule may not have affected the existing situation at all.

Suggestions and Recommendations

It has to be remembered that there is no single solution to the problem of polybags and PET.

Points for consideration for action are summarized as below

- a) **Source separation and decentralization of waste management should be implemented at source in all areas urban as well as rural.**
- b) The recycling industry needs stepwise technological enhancement.
- c) The Cess or environmental tax can facilitate generation the revenues necessary for waste management.
- d) The deposit refund system could work if the government enacts a legislation mandating a take back by the packers/fillers to prevent littering of plastic products (PET in particular). The availability of clean PET waste could also stimulate recycling thereby minimizing virgin PET consumption. This can also be done for recycling of the tetrapacks, gutkaa pouches. **(As per the latest rule gutkaa, tobacco and pan masala is not to be sold in plastic sachets.)**
- e) Moving towards more sustainable products is the need of the future, and hence bioplastics as an option cannot be ignored. Research is required for removing the technical and economic weaknesses with the existing substitutes and improve their performance and make them cost effective to the consumer.
- f) The capability of Municipalities, who are responsible for collection and management of waste need to be strengthened.
- g) Organize rag pickers for collection of plastic waste. This will be beneficial for the municipalities, waste generators and waste pickers. Such reorganization would also help to ensure better quality of waste for recycling, thereby improving the quality of recycled products.
- h) State policy for active participation and cooperation of all the stakeholders at various levels. Wise governance, working in partnership with the industry and citizens is key for any transition to a sustainable society.
- i) Prevailing thickness norms and Anomaly: At present the thickness for carry bags specified by Goa state is 40 microns, by MoEF is 20 microns and For nearby state (Maharashtra) is 50 microns. Hence, MoEF should be requested to remove this anomaly and to impose common micron size of plastic bags to be manufactured and sold in all states. **(This anomaly has been removed in new notification of MoEF dated 4th Feb.2011 and for entire India 40 micron thickness will prevail.)**
- j) The waste may be segregated in recyclable (HDPE bags, LDPE bags, PP bags, Shopping bags, Milk bags, Grocery bags, Carry bags)and non recyclable (All fast food packing, lays, ghutka, pan masala, tea powder, soap wrappers, biscuit wrappers etc)components by the local bodies with the help of their MSW management department with the help of organized rag pickers. This will make recycling easy. **Local bodies can take legal action against defaulter as per Goa Non-Biodegradable Garbage (Control) Act, 1996**

k) Law enforcement : The plastic carry bag manufacturing units and recyclers should be registered as per rules. This should be done by GSPCB by giving advertisement in local papers and the plastic manufacturers association. If the industries do not co-operate action as per section 5 or 15 of Environment (protection Act 1986 should be initiated. Similarly the local bodies should be asked to provide collection places/centers for Non-Biodegradable Garbage as required as per Goa Non-Biodegradable Garbage (Control) Act, 1996, so that further awareness campaign and action can be taken to compel the owners to provide separate collection system for Non-Biodegradable Garbage at their property / land.

l) Public awareness about Plastic Waste Management

Sr. No.	Particulars	
a)	Identifying Target Groups (stake holders)	Groups of housewives, women's organization, school and college children, shopkeeper's association, cooperative housing societies, hawkers, senior citizens, N. G. O's should be identified and awareness program should be conducted on regular basis.
b)	Meetings, workshop drives planned on continuous basis	Workshops should be organized for hotel employees and other bulk generators regarding segregation of waste, For hawkers and citizens regarding prohibition of littering, For shopkeepers and municipal employees regarding segregation and treatment of waste. For recycling industries for their benefits and subsidies.
c)	Organization for Awareness and Enforcement	NGO can be indentified who are willing to work in this area.
d)	Efforts by SPCB unit	SPCB should distribute handbills, banners and hoardings to be displayed. Exhibitions and Competitions can be arranged.
e)	External expertise of Consultant	SPCB should organizing lectures of experts on various issues related to Plastic Waste Management. Workshop and seminars should be conducted.
f)	Public Awareness on Privatization	CD should be prepared and displayed on local network during commercial break. Recorded Telephonic message before dial tone.
g)	Issue of the awareness & enforcement literature- instruction	Notices should be published and distributed to people who are violating the norms.

	for cooperation and action on defaulters	
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Cuncolim	Honda	Kakoda	Kundaim	Mapusa	Pilerem	Pissurlem	Sangum	Tivim	Tuem	Verna	Canacona	Corlim	Madkaim	Margao	Sancole	Total
5	0	1	11	0	0	0	0	0	2	1	0	3	4	8	0	39
13	2	1	18	1	2	0	0	0	2	21	3	10	7	6	12	109
1	0	0	5	1	0	1	0	0	0	7	0	1	2	0	0	21
												(air)				
0	0	1	2	0	1	0	0	0	1	8	1	0	1	0	0	16
0	0	0	5	0	1	1	0	0	0	1	0	1	3	0	0	12
19	2	3	41	2	4	2	0	0	5	38	4	15	17	14	12	197

List of industries having no valid consent - Mormagoa Taluka

SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	
1	M/s Diwan Furniture,	H. No. 135, Radha Krishna Niwas, New Vaddem, Vasco	plastic furnitures and fixtures without use of wood or woodbased products									
2	M/s Kee pet products	house No. 141, A Assoy, Dabolim, Chicalim	pet bottles									
3	Shiv Polymers	C /o Naik Shrinivas Devu, Nagao,Patina, Marmugao,Goa.	Pet Bottles									

List of industries having no valid consent - Pernem Taluka												
SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	
1	Goa Antibiotics & Pharmaceuticals Ltd	Tuem, Pernem, Goa	Vials injection 150 nos.		water consent expired							
2	M/s. Anita Plastic industries	House No 89, Chawdewada, Parcem, Pernem-Goa	Plastic bags	5/1176/98	NOC expired							

List of industries having no valid consent - Ponda Taluka												
SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	
1	Asian Essel Polymers,	H.No.463, Champa Niwas, Khajordem, Borim	PVC Compound									
2	Basheer Fibre Glass,	H.No.845, Borim, Shiroda, Near Kamlabhai Hede School,	FRP Sheets									
<u>3</u>	<u>G K Plastic</u>	<u>Ashewwada, Ponda, Goa.</u>	<u>Plastic Granuls</u>									
4	Maguurish Plast	C/o Mrs.Priyaga P.Kamat, Kundaim, Ponda,Goa.	Plastic Caps(HDPC)									
5	Mahalsa Chemicals (Unit II)	C/o Naresh S.Pai,Bethoda Industrial Estate,Ponda,Goa.	PVC Regid film (Slitting)									
6	Mansi Enterprises,	C/o.Nanda Avarolli,Kundaim Industrial Estate,Ponda,Goa.	Plastic Moulding Items,Injection Moulding,Fan winding,job work,Fan motors.									
7	Morden Plastic Industries	C/o Sudhakaran Pallathe, Gothawada,Bethora, Ponda,	Plastic Moulded Goods, Job work of Plastic									
<u>8</u>	<u>Rajkamal Pressing Unit.</u>	<u>C/o. Uday P. Bhagat,Marcela,Ponda,Goa.</u>	<u>Re-Cycling of Industrial Waste</u>									
9	S N Plastic,	C/o Utpal Chodankar, Orgaon,Marcel, Ponda,Goa.	PVC sheets- folders,Plastic files.									

10	Sanjay Plastic,	C/o Sanjay R. Vani Plot No.A30, Madkaim, Ponda, Goa.	Polythene Bags (above 40 microns)										
11	Shirmila Plastic Industries,	C/o Shirmila Sanjay Vani,Madhlawada, Bethora, Ponda,	Poly Proplen Bags (Above 40 Microns)										
12	Shreesh Techno Craft,	C/o Uma Umesh Dani,Veling,Ponda,Goa.	Mixture -Fan components,assembling Moulded product for Fan Mixture										
13	Shri Krupa plastic,	Bokadbag Bandora Ponda.	Plastic moulded products, like jars, bottles, and caps.										
14	Shubham Plastics,	Plot No. 13 , Madkai Indl. Estate, Ponda	Plastic Bags										
15	Sinduchem Industry,	Mardol Ponda..	P.P. caps, lables and gold foiling.										
16	Tuflite Industries (Moulding Division)	C/o Prashant J.Kamat,Bethoda, Ponda, Goa.	FRP general Moulding,FRP Auto Components,FRP Distrubition,FRP Indl Products,FRP Indl Lining.										
17	V.Plast,	Chemul Wada, Marcel	PVC Stationery items & Toys										
18	Vee Tee Industries	C/o Shrisat Textile,Gaonkar Bldg.Ponda,Goa.	Injection moulding components										
19	B. Braun Medical (I) Pvt Ltd	S. no. 134/137, Nirancal Rd, Curti, Ponda	IV administration sets, combidyn tubing, absorble sutures, folley ballon catheters	5/1411/98	11-04-2008								
20	M/s Sharmila Palstic Industries	S.No. 283/4, Bethora, Ponda	Plastic bags	5/2840/05	NOC								
21	M/s. Akshaya Plastimers	Co., Durbhat, Ponda-Goa	PVC Compound	5/1664/99	17/04/2008								
22	<u>M/s. Ashweg Plastic</u>	<u>S.No.183,Penyamal,Nirancal,Ponda-Goa</u>	<u>Plastic Granules</u>	<u>5/811/97</u>	<u>NOC expired</u>	-							
23	M/s. Bemec Engg. Plastics,	H.No.378/2,Banastarim-Goa	Plastic injection moulded items	5/256/92	30/06/1998								
24	M/s. Dadi Plastic Industries	H.No.287,Mardol,Ponda-Goa	polypropylene bags	5/802/97	10-12-98								
25	M/s. Maduram Industries	Patontol,Bandora, Ponda-Goa	Ball pen refills	5/1722/00	24/03/2002								
26	M/s. Manisha Plastics	Gautham, Priol, Mardol-Goa	Plastic bags	5/1623/99	NOC expired								
27	M/s. Sunware Filaments Pvt. Ltd	Gopal Krishna Niwas,Shanti Nagar,Ponda-Goa	HDPE twines	5/391/94	01-11-94								

28	M/s. Super Plastic Industries	Kavelem,Ponda-Goa	Plastic bottles /jar caps	5/181/91	15/03/1993								
29	V Plast,	s no 76,marcela,ponda,goa	pvc files,folders,raffles,tubes	5/2226/02	25/10/07								
30	Yash Industries,	Block No.22, Matches Goa P.Ltd Complex, Curti	Plastic Injection moulding, rivets etc	199180									
31	M/s Shraddha Plastic	H.No. 215/8, Mardol, Ponda	PP bags, rolls, sheets	5/2647/05	30/06/2008	6/865/05	30/06/2008						
32	M/s. Asian Essel Polymers	Khorjordem,Borim-Goa	PVC Compound	5/1979/01	31/05/2010								
33	Nagush enterprises,	post mardol,ponda	plastic bags, sheets, tubes	5/2499/04	05-07-2009								
34	Shree Laxminarayan Plastic Industry,	Premises No. 592/B,Podle, Bethora,Ponda-Goa.	Pet bottles	5/2142/02	31/12/2010								
35	Essem Enginners	C/o.Mohandas Baskar Bakhle,Dhawali,Ponda,Goa.	HDPE Bottles,Containers,Screen Printing of Bottles & Cintainers.	5/3509/07	01-09-12	6/1331/07	09-01-2012						

List of industries having no valid consent - Quepem Taluka

SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	
1	Vanashree Industries,	C/o. Mrs. Aparna S.Rane,Kakoda, Quepem, Goa.	Printed Meterial (Plastic) Plastic Bags.									
2	M/s. Samata Products Ltd.,	S. No.73/3,Babul Xette Xir,Soncrem,Shiroda,Goa	PVC rigid pipes	5/778/97	NOC expired							

List of industries having valid Adir & Water consent - satteri Taluka

SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	

List of industries having valid water consent - Sanguem Taluka												
SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	

List of industries having no valid consent - Bicholim Taluka												
SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	
1	Malik Industries	c/o Sagar Prabhakar Malik,Ladfem,Bicholim,Goa.	Pet Bottles									
<u>2</u>	<u>S.S. Industries</u>	<u>C/o.Vishal S.Chari, Vandamol,Velguem, Bicholim, Goa.</u>	<u>Granuls Plastic.</u>	-								
3	M/s Malik Industries	H.No. 83, lafdem, Latambarcem VP, Bicholim	PET bottles	5/2738/05	NOC							
4	M/s. Laxmi Caps	Lower Harwalem,Sanquelim-Goa	P.P. Caps	5/1755/00	NOC expired							
5	M/s. Samarth Plastics	,S.No.127/1,Gaonkarwada,Narvem,Bicholim-Goa	Plastic measuring caps	5/729/96	22/10/2008							
<u>6</u>	<u>P-1A &2A</u>	<u>M/s. Devi Enterprises</u>	<u>Plastic granuals</u>	<u>5/2114/02</u>	<u>02-08-2008</u>							
<u>7</u>	<u>P-114</u>	<u>M/s. Gold Star Plastic</u>	<u>Plastic granules</u>	<u>5/322/93</u>	<u>30-06-1995</u>							
<u>8</u>	<u>P-74</u>	<u>M/s Surekha Plastic Moulds</u>	<u>Plastic granules</u>	<u>5/1815/2000-PCB</u>	<u>11-08-2002</u>							
9	P-105,107	M/s. Pioneer Packaging Systems	Plastic moulding	5/347/93	31/12/1995							
10	P-95	M/s.Anita Enterprises	Plastic Chips	5/3245/07	NOC							
<u>11</u>	-	<u>Sai Tech Goa C/o V.Shankaran</u>	<u>Plastic Crushing Bottles waste,Granules.Blow moulding,Injection moulding,Plastic</u>	-	-	-	<u>30/01/30099</u> <u>10/05/2006</u>					

			<u>Sheets.</u>									
<u>12</u>	<u>P-86/87</u>	<u>M/s.Devi Enterprises</u>	<u>Plastic granuels,</u> <u>Plastic powder</u>					<u>7904 dt.</u> <u>21.5.02</u>				
13	S.S. Industries,C/o.Vishal S.Chari, Vandamol,Velguem, Bicholim, Goa.	Granuls Plastic.						30/01/29867 Dt. 24/10/2005				
14	M/s. Guala Closures India Pvt. Ltd.	Upper Harvalem, Sankhali-Goa	pet preforms	5/1617/99	02-01- 2008	6/171/96	31/08/2008					
<u>15</u>	<u>P-119-P</u>	<u>Shaheen Plastics</u>	<u>Plastic granules</u>	<u>5/2209/02</u>	<u>28-02-</u> <u>2010</u>			<u>8226</u> <u>dt.17.8.2005</u>				
<u>16</u>	<u>P-197-B, 119-B</u>	<u>M/s. Shaheena Plastics</u>	<u>Plastics granuels</u>	<u>5/2209/02</u>	<u>28-02-</u> <u>2010</u>							

List of industries having no valid consent - Salcette Taluka

SR NO	NAME OF THE UNIT	Address	PRODUCT	Water Consent Details		Air Consent Details		HW Authorisation details		Records Available as per		Remarks
				No.	Validity	No.	Validity	No.	Validity	GSPCB	GIDC	
1	Everest Plastic Pipe industries.	Mugale, Sao Jose de Areal, Salcette, Goa.										
2	A.T.C.Industries,	P.O. No. 89, G/11, Jijishan Bldg., Margao.	Polymer hose assembling, Plastic components and rubber hose assembling									
3	Joha Spencer	C/o John Mazarello, Nessai, Salcete, Goa.	Plastic Injection Moulding									
4	M/s Everest Plastic Pipe industries	Mugale, Sao Jose de Areal, Salcette, Goa.	PVC pipes and fitting PVC compound and PVC profiles									
5	Seal O Pack	Ganapaga, Raia, Salcette.	paper bags, Corrugated Boxes, plastic carrybags.									
6	Shweta Enterprises	Gogal, Margao, Salcete, Goa.	Fibre Glass Moulding, FRP Items.									
7	Sweta Enterprises	C/o V.V.Nate, H.I.G.9, Gogal, Housing Bord, Salcete, Goa.	Fibre Glass Products, FRP Mouldings, Items.									

8	Westend Holdings and Instruments, Pvt, Ltd	C/o.Satish Lavande, Konkarn Infrastructure, Kurtarkar Agency, Opp., 1 B Road, Margao, Goa.	Manufacture of other plastic products.									
9	Everest Plastic Pipes,	s, no. 44/2, St. jose de areal, mugali, curtorim	PVC pies, fittings	5/2092/02	11-11-2008							
10	<u>golden fleece enterprises</u>	<u>sno630(1), moula, salcete</u>	<u>recycling of plastic scrap</u>	<u>5/2352/03</u>	<u>expired noc</u>	-	-	-	-	-	-	-
11	M/s Murdeshwar Plastics	Plot No. D3, IDC, Nessai, Margao-Goa	Injection moulded plastic items	5/3189/06-PCB	NOC							
12	M/s. Aditi Plastic Industries,	House No.120, Cotta, Chandor-Goa	Plastic bags	5/1086/97	NOC expired							
13	M/s. Industrial Marketing Company	Thonda Vaddo, Betalbatim, Salcete-Goa	glass, plastic slides, dissicant pouches, plastic droppers & rods	5/1247/98	15/12/2008							
14	M/s. Patrem Springs	Tolleband, Aquem, Alto, Margao-Goa	Production of mineral water & PVC bottles for packing	5/426/95	30/06/1997							
15	M/s. Polyseal Packaging	Shed No 378, Cavorlim, Chandor, Salcete-Goa	Plastic films & bags	5/1293/98	NOC expired							
16	M/s. Venus Plastic Pipe Industries	Survey No 44/2, Mugali, St. Jose De Areal, Curtorim, Salcete-go	PVC pipe & fittings	5/1227/98	01-09-08							
17	M/s.Alahad Plastics	Kedicotto, Cuncolim, Goa	Plastic bags	5/1934/01	23/04/2005							
18	New Sha Aerated Waters	s. no. 44/2, Mugali, St jose de areal	plastic glasses	5/2118/02	11-10-2008	6/937/05	30/11/2008					

List

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
1	M/S. Plasticon	P-37, Pilerne Industrial Estate	Plastic Blow Moulded items	500kg/	—	NOC			I/E-33Kld D-15Kld	No		P.W	
2	M/S. Taneja Enterprises	P-59-C-4, Pilerne Industrial Estate	Plastic Containers			NOC expired							
3	M/S. FMD Industries	P-92,93, Pilerne Industrial Estate	Plastic Pharmaceutical Droppers And plastic Containers & bottles	3.0tons/month		4/12/2012		0.1Kld	0.05Kld	Septik tank		recycled	
4	M/S. Mahavir Plastic Industries	D2/16, Corlim Industrial Estate	Blow moulding and injection moulding components	30000components/day		7/1/2009	No	2.0kld	0.25kld	Septic tank/soakpit	No	50-100kg/day-recycled	No

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Details	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
5	M/S. Oriyon Mouldings	C-7, Corlim Industrial Estate	Plastic Moulded products	3000 components/day		No	No			Septic tank/soak pit	No	recycled	No
6	M/S. Aqua Plast Pvt, Ltd	Corlim Industrial Estate	HDPE Moulded Items	500t/m		19/6/2001		I-200 D-800	800lpd	p/s/t treatment			
7	M/S. Lakshdweep Plastic	C-7, Corlim Industrial Estate	Plastic containers										12
8	M/S. Vimal Plastic	P-1B, Corlim Industrial Estate	Plastic bags			30/06/2008	30/06/2008			Septic tank/soak pit		recycled	
9	M/S. Funkskool (India)	S. No 24, Corlim, Tiswadi Goa	Plastic toys	31 tons/month		31/12/2008	No	49.5kld	24kld	Septic tank/soak pit		recycled	Filtered Residue of waste oil, glue cans

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Details	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
10	M/S. Manguesh Plastic Industries	P-56 (G-8), Bethora Industrial Estate	Multilayer Plastic film & articles of plastic	60MT & 30MT	55microns	v-5/2917/05-pcb/2041 date of issue 19/06/08 valid 31/03/201	N6/936 05pcb 2042 Valid 31/03/2013			I.E Nil D.E 1kld	Septic tank &soak pit	No	Plastic Waste recycled	No
11	M/S. Modern plastic Industries	C/O Sudhakara n Pallathe, Gothawada, bethorda, Ponda .	Plastic Moulded Goods, Job Work Of plastic	As per order		NOC	NOT FOUND				Septik tank & soak pit	No	Plastic waste-recycled	
12	M/S. Yash Industries	Block No.22, Matches Goa P.Ltd, Complex, curti	Plastic Injection Moulding , rivets etc	3tons/month	24/02/11				0.05kld	0.05kld	Septic tank & soak pit	No	Plastic waste is recycled	No
13	M/s. Supreme Industries Goa Ltd	Plot No 62m, 63,64, Verna Industrial estate												

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
14	M/S. polyclass industries	S-63.phaseII, verna industrial estate	Plastic injection moulding articles	3 ton/month		11/3/2009	no	30 kl /month	I.E NIL 0.1 KID	No	No	PLASTIC LUMS 10kg /month	NO
15	M/S. Sagar industries.	SC-1/28(1) verna industrial estate	Plastic injection moulding articles	8 ton /month		25/10/12	22/10/12			No	No		
16	M/S. Arlsun plast	SC-1/40(1), V ERNA industrial estate	Plasti moulding (plastic jars)			NO	NO	4-5 units /month	Septic tank			Reuse	
17	M/s. ATC industries	S-67 II - B, verna industrial estate	Plasti mouldings					0.1 kid	0.075 kid	No	No	Reuse	

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Details	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
18	M/S. Shaheen plastic	P-119-P, bicholim industrial estate	Plastic granules from scrap medicinal plastic bags	650kg/day, 25kg /bag				200L/day for cooling	500L for washing of scrap medicinal plastic	no	No		
19	M/S. Ram Plastic industries	Gal shed no-4, bicholim industrial estate	Plastic bags	60-70kg/day		NOC				Yes		Plastic waste depends on power fluctuating on, plastic waste given to Kholapur for recycling	
20	M/S. Vividha Plastic	P-117, bicholim industrial estate	Plastic bags	25kg/bag, 300kg/day depends on size		NOC Expired							
21	M/S. Jaishree Enterprises	D3-4, Bicholim Industrial Estate	Plastic Sheets & laminates	10tons/month		No	No	200L/month		No		Trims are reused	
22	M/S. Indian Plastic	P-92, Bicholim Industrial Estate.	Reprocessing of Plastic granules	400kg/day		Validity in the year 2010		0.1KLD		No	No	reused	

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Details	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
23	M/S. Gold Star Plastic	Bicholim Industrial Estate.	Plastic granules	60tons/month		30/06/1995	NOT FOUND	Domestic effluent 100ltr	Reused	Soak pit	----		
24	Amev Industries	P-43	Plastic bags	8tons/month	40microns			200L for cooling	Reused	Soak pit	No	Plastic Waste is recycled	No
25	Amev Engineering & Plastic	Shed No.D2-2	Plastic bags (Virgin printed plastic bags)	15tons/month	40microns	31/11/2010	----	200L for cooling	Reused	Soak pit	No	Plastic Waste is recycled	No
26	M/S. Arc Enterprises	D2-36 Sancoale Industrial estate	Plastic Moulded Articals	2Ton/month		No	No	40 Cubic litres/m	10cubic litres/M	No	No	Plastic waste is recycled cotton waste (5kg/month)	No
27	M/S. Jeevan Lakshmi Packing Pvt. Ltd	D2-D3, Sancoale Industrial Estate	Aluminium colusube tubes ropp cups			2129/2006 31/06 2/1/11 2129/2006			I. II.			aluminum	

Sr. No	Name of the unit	Location	Productio n Details	Quantity	Thickne ss of bags in microns	Consent Status	Air Consent	Water Consumpt ion	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
28	M/S. S.S Industries	Vandamol,, Velgeum, Bicholim	Plastic Granules							No	No	Plastic waste is recycled	
29	Devi Enterprises	P-86/87 Bicholim Industrial Estate	Plastic Granules & Plastic bags	20bags/days, 35kg/bag		Validity 2009, 5/2114/02P CB		200L/day, reused				Plastic waste is recycled	
30	Surekha Plastic Moulds	D2-23 Sancoale Industrial estate	Reprocesi ng of Plastic ,garbage bags, granules	3-400kg/day							No	Plastic waste is recycled	No
31	M/s Mipak Industries	D2-26 Sancaole Industrial estate											
32	M/s Subhash Plastic	p-235	Plastic moulded items	4 Lakh pieces		4/7/2012	4/7/2012	15- 20L/day	No waste water generated	No	No	1kg/day plastic waste is given back to the dealers	

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status		Water Details					
			Production Details	Quantity		Water Consent	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
33	M/S. vividh plastic	P-246	Plastic moulded items	1 ton / month		Expired	Expired	1000L /day for domestic purpose	500L/day domestic waste water	No	No	Pinch of material waste generated is reground & reused	
34	M/s Mudit industries	Plot no.245	Plastic packaging bags,rolls, sheet	20 tons /month		31/12/2010	31/12/2010	50L /day for domestic purpose	10L/day domestic waste water let out in septic tank& soak pit	No	No	2kg/day	
35	M/s Techno plast industries	P-22	Plastic moulding product(fan parts)	8 tons/month			No air consent	10,000L /day for domestic purpose	1000L/month let out in septic tank	No	No		

Sr. No	Name of the unit	Location	Production Details		Thickness of bags in microns	Consent Status		Water Details		ETP yes/No	APCD	Solid Waste	Hazardous Waste
			Production Details	Quantity		Water Consent	Air Consent	Water Consumption	Waste Water generation				
36	M/S. seasons polymer pvt.ltd	P-186,187&D 3-6	1200kg/month	1 ton / month		1/10/2012	1/10/2012	1000L /day for domestic purpose	2.3KLD let out in septic tank	No	No	Plastic waste (3-4 kg /day)is recycled	
37	M/s Oriental container ltd.	Plot no.327-332	700millions/annum	20 tons /month		31/3/2010	31/3/2010	6KLD used for cooling&4 KLD used for domestic purpose	1.5KLD let out in septic tank	No	No	4-5 tons plastic scrap is recycled	Spent oil of D>G set (200LO/yr) is generated

Sr. No	Name of the unit	Location	Production Details		Thickness of bags in microns	Consent Status		Water Details		ETP yes/No	APCD	Solid Waste	Hazardous Waste
			Production Details	Quantity		Water Consent	Air Consent	Water Consumption	Waste Water generation				
38	M/s jinder enterprises	Plot no.231	Blow moulding bottles	30,000nos/day		No	No	15000L/month for domestic purpose	Let out in septic tank	No	No	No	No
39	M/s mohan plastics & fibers pvt .ltd	D-25	poly bags	5T/day		No	No	50L / day domestic purpose	Let out in septic tank	No	No	100 kg plastic /month is recycled	No
40	M/s laxmi plastic	P-65	Plastics caps and bottles perfoma	10 lakh nos /month and 3-4 lakhs nos /month resp.		No	No	100L /day for domestic purpose	Let out in septic tank	No	No	5% of plastic runners is recycled	No

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status		Water Details					
			Production Details	Quantity		Water Consent	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
41	M/S. T.V plastic.	p-75	Plastic caps and closures	10,000 nos/month and 5 lakhs nos /month resp.				2L/ day	let out in septic tank	No	No	Plastic runners 200 kg/month	No
42	M/s N.K enterprises	D5,3A,3B	Plastics bottles & caps	800 bottles & 2000 caps per day		No	No	100L/day for cooling is recycled	25L/day let out in septic tank	No	No	5 kg /day plastic runners waste generated is reused .700 grms/day grey pigment powder	No

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status		Water Details		ETP yes/No	APCD	Solid Waste	Hazardous Waste
						Water Consent	Air Consent	Water Consumption	Waste Water generation				
43	M/S. mahamaya plastic	Plot no- 230	Plastic moulded items	500 kgs /month				300L/month for cooling and 100L/day for domestic	Let out in septic tank	No	No	Plastic runners(10% of product is recycled)	No
44	M/s Servoplast	P-263	Plastic items	75 kg /day		4/7/2012	4/7/2012	200L/day	200L/day Let out in septic tank	No	No	Waste(20 kg/day)s recycled	
45	Khrisna industries	P-163	Plastic granules	400T/yr				200L/day	30-L/day directed to septic tank	No	No		
46	M/S. Richa Polyplast Pvt. Ltd.	B-12	Plastic Furniture Items	20 tons per month		10/4/2011		500L/day only for domestic purpose	250L/day Domestic waste water let out in septic tank	No	No	Plastic waste is reused	No

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
47	M/S. Ramdev Plastic Industries	A-34 Madkai Industrial Estate	Plastic household items	1500 nos per day		10/4/2011	30/9/2012	1000kl/day	Waste water directed to septic tank	No	No	Plastic runners is reused	No
48	M/S. ramdev Industries	A-34/A	Plastic moulded goods	1500 nos per day		No	No	200L/day for domestic and 200L/day for process	Waste water directed to septic tank	No	No	Plastic waste	No
49	M/S.Shree Om Plastic	A-31	Plastic granules	4-5 tonns per month				200L/month	Waste water directed to septic tank	No	No	No	No

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickne ss of bags in microns	Consent Status	Air Consent	Water Consumpt ion	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
50	M/S. Ramdev Plastic Industries	A-7 & A-B	Plastic moulded goods	9T/month				300L/day for process and for domestic purpose	30L/day directed to septic tank	No	No	No	No
51	M/S. Jai Matade industries	A-1	cardboard s	20T/month				250L/day only for domestic purpose	Waste water directed to septic tank	No	No	Paper waste (500 kg/month given to scrap dealer)	No
52	M/S.Amba Industries	A-33	Plastic granules	9T/month		Valid upto 10/04/2011	Applied for air consent	200L/day	200L/day directedto septic tank	No	No	No	No
53	M/S. Sagar Industries	Plot No SC-1/28	Plastic items diagnostic cassettes	8T/month		25/10/2012	22/10/2012	200-300 l/day	Let out in septic tank & soak pit	No	No	No	
54	M/s. Jimcap Electroniocs Pvt. Ltd.	Plot No L 12(i)	Plastic film capacitors	5 lakhs no/month		18/7/2008	Applied for air consent	3000 L/day	1000L/day let out in septic tank			1.8 T/month of plastic Film sent back	Spent oil of D.G set (100kva) 20L/yr
55.	M/S. M/S. Fabrica corlinhas Pvt. Ltd	P-74	Plastic extrusions	10T/month each		No	No	6kld for cooling & 1kld for domestic	Wastw water directed to septic tank	No	No	No	

Sr. No	Name of the unit	Location	Production Details	Quantity	Thickness of bags in microns	Consent Status	Water Consent	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
56	M/S. Phill Plast	SA-15, cuncolim industrial Estate	NO RESPONSE											
57	M/S. Shrink Wrap	SA-16, cuncolim Industrial Estate	NO RESPONSE											
58	M/S. Plast Enterprises	SA- 17, cuncolim Industrial Estate	PVC heat shrinkable tubing	1ton/month		Could not be produced at the time of inspection	Could not be produced at the time of inspection		501/day		Septic tank/soak pit		No	No
59	M/S. Ashirwad Enterprises	SA-35, cuncolim Industrial Estate	Pet bottles	310/month		No	NO		200-lit/day	t	Septic tank/soak pit		30kg/month rejection sold to scrap	
60	M/s. Ganesh Pet	SA-7, cuncolim industrial estate	Pet bottles	60 Thousand/month		No	No		100lit/day L/day		Septic tank/soak pit			

Sr. No	Name of the unit	Location	Production Details	Thickne ss of bags in microns	Consent Status	Water Details							
			Production Details	Quantity	Water Consent	Air Consent	Water Consumption	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste	
61	M/S. Noble Plastic	S.N 44/2, Mugali, sao jose de Areal	Plastic glasses	5lakhs no/month	10/11/2008	10/11/2008	100lit/day		Septic tank /soak pit		rejects are recycled		
62	M/S. Everest Plastic	Mugali , sao jose de areal	Plastic pipes and door panels		10/11/2008		1000lit/month				rejects are recycled		
63	M/S Shree Sai Plastic Industries	S-10, Colvale Industrial Estate	Plastic granules										
64	M/S. Chandraorg ochem combines	A-2/10 Margao industrial Estate	Plastic powder polymer powder, gum powder		Closed								
65	M/s. Kunde Polymers	D3/3, Margao industrial estate	Plastic bags		Closed								

Sr. No	Name of the unit	Location	Production Details		Thickne ss of bags in microns	Consent Status		Water Details					
			Production Details	Quantity		Water Consent	Air Consent	Water Consumpt ion	Waste Water generation	ETP yes/No	APCD	Solid Waste	Hazardous Waste
66	M/S. Datta Gawandalkar	A2-3, Margao Industrial Estate	Plastic Bottles			Closed							
67	M/S. Bipson Plastic	A2-13, Margao Industrial Estate	Plastic items			Closed							
68	M/S Gajanan Plastic Industries	D2-12, Margao Industrial Estate	Plastic Items			Closed							
69	M/S. Rehana Packaging	Margao Industrial Estate	Plastic items, cans, mugs, buckets, pots	2tons/month		Closed							
70	M/s. Datta Gawandalkar & Sons	D2-1 Margao Industrial Estate	Plastic moulded items			Closed							
71	M/s. Suntec Moulds	S-74, Shed No. A3-18 Margao Industrial Estate	Plastic moulded parts for audio products			Closed							
72	M/s. Prakash Group of Industries	A-2/10, Margao Industrial Estate	Plastic powder of LLDPE/ LDPE/ SDPE			Closed							