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Organised by NDTV and Cuffe  
Parade Residents Association  
(CPRA)**

**Mumbai on 5th June 2012**



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# Envis Eco-Echoes

Volume 13 • Issue 2 • Apr-June, 2012

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FOR PLASTICS IN  
THE ENVIRONMENT

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### Area of Activity

**Capacity Enhancement Programme  
on Management of Plastics, Polymer  
Waste and Bio-Polymers, Impact of  
Plastics on Eco-System**

### Head of Institution

**Mr. K. G. Ramanathan**

President - GC



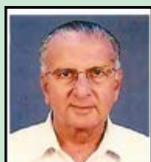
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*Member - EC*



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# Editorial



Issues related to apparent environmental problems created by post consumer have been assessed world over including in India. It is well recognised and accepted by the Government of India that the problems created by the use of plastic bags is primarily due to the shortcomings in the waste management system. It is also recognised that in India, indiscriminate littering of all types of waste – be it wet waste like leftover food put in a plastic bag or any dry waste including plastics waste, pose a great challenge to the waste management system.

Government of India, from time to time, came out with various Notifications / Rules to curb the problems caused by Municipal Solid Waste, Bio-Medical Waste, Plastics Waste, Electronics Waste etc. Although various agencies have put in their efforts for implementing the Government Rules, however a lot more is still to be done. One very important aspect which is apparently missing is lack of awareness among the common mass. We cannot put the blame on the common mass for this situation. For, it is the one billion plus people of India, who could almost eradicate the dreaded disease – Polio, from the country, within a span of less than two decades. The success lies in the fact that there was a massive and continuous propaganda in the electronic media educating the general mass of the importance of Polio Vaccination for their children.

Similarly, there is a need for a massive campaign against littering throughout the country informing the general mass on the possible damage to the environment due to this bad practice. People's participation can make any Plan / Programme successful. Unfortunately, there is no Awareness Campaign in the mass media, especially in the Electronic Media.

ICPE, on its part has been propagating the proper methods of plastics waste management from its collection, segregation and recycling by various technologies. We have carried out the copies of the presentation made in one important forum in New Delhi. It is important to keep in mind that plastics waste issue cannot be tackled in isolation. It is required to put emphasis on total Solid Waste Management issues of which plastics waste is a small part.

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### Subscription Information:

ENVIS is sent free of cost to all those interested in the information on Plastics and Environment.

Readers are welcome to send their suggestions, contributions, articles, case studies, and new developments for publication in the Newsletter to the ICPE-ENVIS address.

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### Editor

Mr. T. K. Bandopadhyay

# Students Awareness Programme at SIES (Nerul) College, Navi Mumbai

A Student programme ENTORNO 12 – an annual event attended by students from various colleges in Mumbai, was organised at SIES College of Arts, Science & Commerce, Nerul on 28th Jan 2012. The Environment Department of the College and ICPE initiated a Debate among the students on the subject "Plastics.....Good or Harmful for the Environment". A panel of judges comprising Shri P.V. Narayanan – Ex-Director, IIP and Ex-Professor, IIEEMP (SIES College, Nerul) and Dr. (Ms) Jyoti Koliyar, Head of Environmental Science Dept. SIES, Nerul. 3 Teams spoke for the Plastics and 3 teams spoke against it. First and Second

Prizes were won by Teams who spoke for Plastics. 2 Consolation prizes were given to 2 teams – one who spoke against Plastics and one to the other. After the debate competition, the analysis of various points which were discussed by the students during the debate was made by Shri T.K. Bandopadhyay highlighting the specific incomplete information collected by the students and projecting the correct scientific facts. After the analysis, the 10 minutes ICPE Film "Listen! Plastics have something to say" was screened. This could clear the myths among the students.



# Awareness Programmes Organised by NDTV and Cuffe Parade Residents Association (CPRA) Mumbai on 5th June 2012

On the Environment Day, media major NDTV had organised for a Plastics Waste Collection Campaign at various locations of Mumbai (and other cities) in partnership of ICPE and NGO – Stree Mukti Sangathana (SMS).

Alert residents responded to the campaign and volunteered to deposit old plastics and electronics waste in the Waste Collection Centres. In the afternoon, CPRA

had organised a Seminar on Plastics Waste Management in the Institute of Chartered Accountants on India Hall.

ICPE participated in the seminar. On behalf of ICPE, Sh. K. G. Ramanathan – President Governing Council, assured the Association of ICPE cooperation in the field of Waste Management, especially Plastics Waste Management in the area.



# Awareness Programme through Film Festival on Environment & Wildlife, New Delhi

CMS Vatavaran, an ENVIS Centre, had organised a Film Festival on Environment and Wild Life, in collaboration with Ministry of Environment and Forests, in Delhi during 6 – 10 December, 2011. ICPE had participated in the Film Festival and had screened Awareness Films produced by ICPE. On behalf of ICPE Sh. Arunava Guha and the Ms. Geetha Murali had attended the five day Exhibition. Panels on Awareness were displayed. Following films/videos were screened:

1. Living in the Age of Plastics – ICPE film in English
2. Listen Plastic Have Something to Say – A ICPE film in English & Hindi
3. Eco Cool - Cartoon film for children and the Film on recycling ( prepared for Plastindia 2006)
4. A film on Waste Management – Stree Mukti in English & Hindi
5. Plastic Recycling – A Plastindia film in English & Hindi
6. Plastic in Daily Life – A video in English & Hindi
7. Road video of ICPE
8. Solid Waste Management – A Step Forward (made by IPF – Kolkata)
9. Solution to Plastic Waste Management – A video in English & Hindi

(All of these are available in ICPE ENVIS website)  
[www.icpeenvnis.nic.in](http://www.icpeenvnis.nic.in)

ICPE's awareness booklets, It's My World and Point-counterpoint & Frequently Asked Questions were distributed. The visitors were very appreciative of ICPE's efforts in plastics waste management and anti-littering messages and the good display of educative material. Some of the visitors from media like Hindustan Times, Jaya TV, Andhra Jyothi and JANSATTA commended that ICPE is initiating an interesting fresh idea on Plastic Waste Management and message on Eco-friendly use of Plastics.

Films on Road Making, Listen Plastic Have Something to Say, Solid Waste Management, and Solutions to Plastic Waste Management etc were appreciated by the visitors.

The festival delegates included eminent people from the corporate sector, civil society, Government Departments, UN agencies, Embassies, Media, Universities and schools across the globe. More than 5000 visitors attended the film festival over a period of 5 days. There were requests for organising such awareness programs in schools and colleges.



# Workshop on Plastics Waste Management & Recycling Technologies New Delhi

Central Institute of Plastics Engineering & Technology – (CIPET) under the programme initiative of the Department of Chemicals & Petrochemicals (DCPC), Ministry of Chemicals & Fertilizers, Government of India, had organised a One Day - Workshop on Plastics Waste Management & Recycling Technologies at Hotel THE CLARIDGES, New Delhi on the 21st March, 2012.

The Secretary – Mr. Jose Cyriac and the Joint Secretary – Ms. Neelkamal Darbari, both addressed the select invitees and explained that plastics are essential part of our modern life and there is nothing wrong with plastics.

Some form of Plastics earns the bad name for the littering and inadequate waste management of it. Both of them expressed the need for taking the Plastics Waste Management and Recycling initiatives by the stake holders in a meaningful way.

Mr. Tushar K. Bandopadhyay of ICPE made a technical presentation on Plastics Waste Management & Recycling Technologies highlighting the benefits of Plastics, major issues / challenges and solutions through effective Dry Waste Management and selecting appropriate Technology Options for Recycling and Recovery.



## Presentation

**WORKSHOP ON  
PLASTICS WASTE MANAGEMENT  
&  
RECYCLING TECHNOLOGIES**

Organised by  
CIPET With The Support of  
Department of Chemicals & Petrochemicals,  
Ministry of Chemicals & Fertilizers, Govt. of India in association with  
Plastic industries / Associations and UNIDO-ICAMT

THE CLARIDGES, NEW DELHI  
21<sup>ST</sup> MARCH, 2012

Tushar Bandopadhyay  
Indian Centre for Plastics in the Environment

**Major Applications of Plastics**

- Agriculture
- Healthcare / Medical
- Education
- Pipes for Water, Gas and Sewerage
- Building & Construction – Flooring / Doors & Windows / Drainage Pipes, Water Storage Tanks, Construction Linings etc
- Cables
- Electricals & Electronics Equipments
- Thermal Insulation
- Automobile, Aviation & Railways
- Packaging ..... 35 - 40%
- Household
- Furniture
- Toys & Others

**Major Sources of Plastics Waste, in Urban India, Requiring Attention for Management and Handling -**

**Packaging**

- Flexible Packaging
  - Thin Carry Bags
  - Film / Bag Packaging
  - Multilayer and Laminates
- EPS
- Disposable - Bottles\* / Cups / Cutlery

\* Resolved to a great extent

**Other Types of Plastics Waste Do Not Reach the MSW Stream in India**

**These are Collected Beforehand From The Source of Waste Generation**

**Organised and Unorganised Collection Network for Recycling Exist in Urban Area**

**Thus This Does Not Create A Management Issue**

# Presentation

## Issues

- Littered and Uncollected Waste / Plastics Waste
- Mixing up of Plastics Waste with Wet Waste at the Source of Waste Generation
- Inadequate Infrastructure for Waste Handling & Disposal
- Absence of Adequate Dedicated Plastics Waste Collection Centres

## HOW MUCH PLASTICS WASTE? (IN MSW STREAM)

NO SPECIFIC ALL INDIA SURVEY

THE VOLUME COULD BE ESTIMATED FROM MSW DATA

## SOLID WASTES

### CURRENT STATISTICS

Total MSW	...	57	Mn MTA
Bio - Medical Waste	...	500	MTD (250 - 300 gms/day/bed) (182500 MTA)
E - Waste	...	470,000	MTA

(Includes plastics waste)

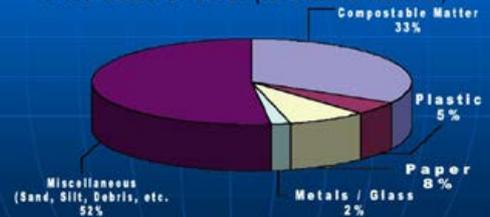
Source: ... M & M, Govt

Plastics Waste in MSW @ 5 - 8 % ... 2.5 Mn MTA

Actual Amount is Much Less Than 2 Mn Tons As 5 to 8 % figure is Valid for Larger Cities

## PLASTICS IN MSW - MUMBAI

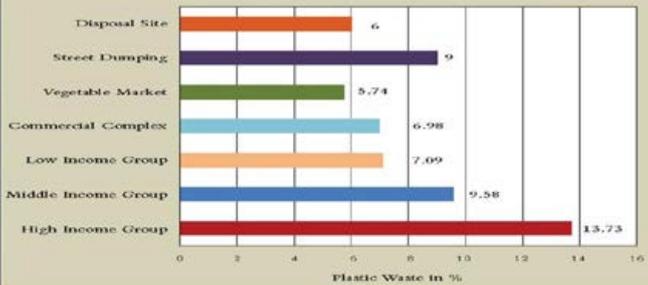
Percentage of quantities in the waste at Goral (landfill in Mumbai)



Source: NEERI study - 2003

## PLASTICS IN MSW - MUMBAI

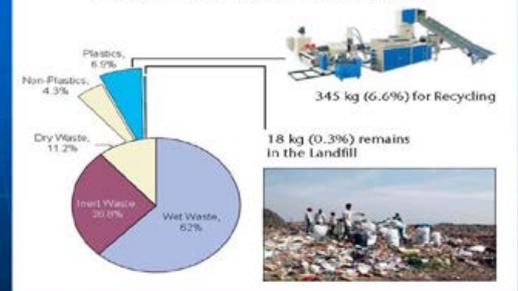
### Plastic Waste at Different Locations



Figures for Mumbai, Source: MSWAI - 2009

## PLASTICS IN MSW - MUMBAI

### CHARACTERISATION OF TOTAL WASTE



Figures for Droneri Dumping Yard, Mumbai, Source: Environmental Guidelines - 2009

## Solid Waste Management



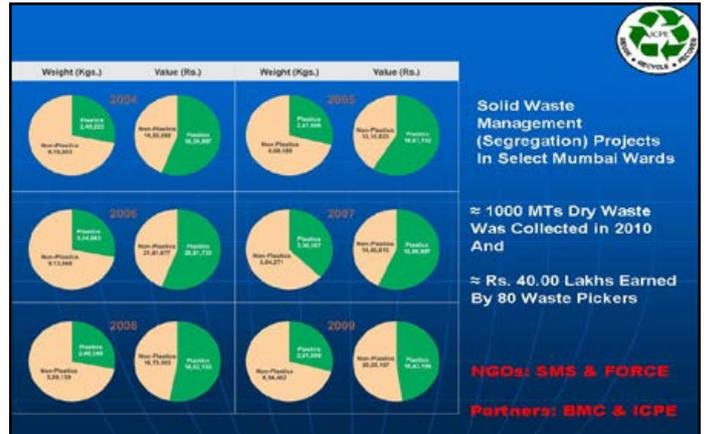
## Segregation of Dry Waste at Source - Model Projects



# Presentation

## Steps Involved in The Model Project at Select Mumbai Wards

- BMC Provides Space , Secured Sheds & Collection Vehicles
- Waste Pickers Collect Dry Waste From Society Buildings And Segregate The Same Into Different Categories
- Segregated Dry Waste Is Packed & Stored In Secured Sheds
- Segregated Waste Is Then Sold To Waste Dealers Periodically Which Is Recycled By Respective Recyclers
- Minor Quantity Of Non-recyclables Go To Landfills (Can Be Diverted Towards Cement Kilns For Energy Recovery)



Similar Models are in Place in Some Other Parts of the Country in Isolation and Not As a General Practice

Despite Government Regulations Being in Force



## Government Regulations

- As per Existing MSW Rules of 2000, Dry and Wet Waste Are Required to be Segregated at the Source of Waste Generation for Collection by the Municipality Authorities Separately for Safe Disposal or Recycling.
- New Regulation of 2011 Emphasises Involvement of Manufacturers for the Setting up of Collection Centres for Plastics Waste in Line with the Principles of Extended Producer's Responsibility (EPR).



## RECYCLING AND RECOVERY OPTIONS For PLASTICS WASTE MANAGEMENT

PREVAILING PRACTICE



## PLASTICS RECYCLING / RECOVERY OPTIONS



## Recycling Statistics - India

Traditionally Indians Opted for Recycling way back in the 60's as a Source of Earning. Today the Status is -

- Numbers of Organised Recycling Units: ≈ 3500
- Numbers of Unorganised Recycling Units: ≈ 4000
- Manpower: Direct ≈ 0.6 Mn, Indirect ≈ 1 Mn
- Plastics Recycled per annum ≈ 3.6 Mn MTs
- Estimated Investment in Plant & M/c ≈ Rs. 1500 Mn

Source: CIPCI Study for CPCB (2007)



## Mechanical Recycling –

Conventional & Most Followed Process

### LIMITATIONS

REQUIRES HOMOGENIOUS & CLEAN INPUT



# Presentation



## FEEDSTOCK RECYCLING

### CONVERSION TO BASIC MONOMER

- HIGH TECHNOLOGY AND LIMITED APPLICATIONS IN INDIA



### CONVERSION TO FUEL



ALL TYPES OF MIXED PLASTICS WASTE CAN BE USED WITHOUT ELABORATE CLEANING



- COMMERCIAL SCALE PRODUCTION IN MEDIUM SCALE STARTED IN THE INDIA DURING 2003 – 04

#### LIMITATION:

INPUT COST AROUND Rs. 3 – Rs. 5 per Kg FOR SELLING THE FUEL @ Rs. 20 – 25 per Liter for a Viable Project

- AT LEAST TWO SMALL PLANTS OPERATE ON A REGULAR BASIS – TOTAL CAPACITY ABOUT 10 – 12 MTD.
- MULTI NATIONAL COMPANIES TAKEN INTEREST IN THE PROCESS FOR SAFE DISPOSAL OF THEIR OWN PLASTICS WASTE.
- ENCOURAGEMENT AWAITED FROM LOCAL CIVIC BODIES.



## FEEDSTOCK RECYCLING

### Reducing agent in blast furnace

Up to 40% Replacement of Coke Established  
A 3 Mn TPA Plant can use 0.6 Mn tons Waste Plastics

This Recycling Process Yet To Be Established In India



## ENERGY RECOVERY - CO-PROCESSING IN CEMENT KILN



- All Types of Mixed Plastics Waste Can be Used
- Segregation And Cleaning Not Required



## ENERGY RECOVERY

### CO-PROCESSING IN CEMENT KILNS

- Cleaner emissions (compared to coal)
- > 60 % Replacement of Coal Established - (Germany)
- ≈ 5% REPLACEMENT TRIAL BY ACC & ICPE IN INDIA SUCCESSFUL
- At 10% Replacement Rate - 170 Cement Kilns In India Could Dispose Of The Entire Plastics Waste Generated In The Country Today With Additional Benefit of Reduction in The Use Of Fossil Fuel - Coal



## ... ENERGY RECOVERY

### CALORIFIC VALUES

Polyethylene	:	46 MJ/kg
Polypropylene	:	44 MJ/kg
Polyamide (Nylons):	:	32 MJ/kg
PET	:	22 MJ/kg
Coal	:	29 MJ/kg



## ISSUE

WHO WILL BEAR THE COST OF COLLECTION & TRANSPORTATION OF THE WASTE UP TO THE CEMENT KILN ?

PROCESS IMPLEMENTED IN SOME STATES OF INDIA WITH THE INTERVENTION OF CPCB

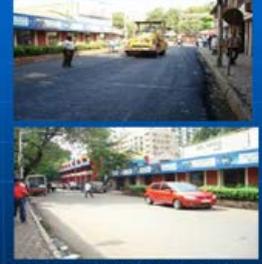
# Presentation

## PLASTICS WASTE IN ROAD CONSTRUCTION



Bidyasagar Street – Kalyani, Near Kolkata, West Bengal  
05/04/2009

## ... PLASTICS WASTE IN ROAD CONSTRUCTION



ASPHALT PLANT OF BMC, WORLI, MUMBAI

Prof. V S AGHASE ROAD DADAR, MUMBAI

## ... PLASTICS WASTE IN ROAD CONSTRUCTION



BAWANA, DELHI

## Plastics Waste used in Road Construction



- PE / PP / PS / EPS : 10 – 15% Replacement of Bitumen Established with Proven Benefits
- Multilayered Plastics & EPS @ 15% of total Plastics Waste Have been Used

*For 1 KM long and 7 feet wide Road, 1 MT of Plastics Waste is used with 9 MTs of Bitumen.*

450, 000 KM Rural Road in India Can Use more than 0.5 Mn Tons of Plastics Waste

## Mechanical Recycling of Mixed Plastics



LUMBER AS WOOD SUBSTITUTE

INDIAN MACHINERY MANUFACTURER OFFERING SMALLER & CHEAPER PLANT

## SUMMARY



**Issues:**  
Recycling / Recovery of Multilayer / Laminated Plastics Packaging Waste

### Solutions:

Any one of the following recycling / recovery process can scientifically and effectively be used for Multilayer / Laminated Plastics:

- Feedstock Recycling – Conversion to Fuel
- Energy Recovery – Co-processing in Cement Kiln
- Construction of Asphalt Road
- Mechanical Recycling – Moulding into Compressed Board / Lumber

**All These Options Are Effective When The Waste Generated Is Segregated At The Source And Is Handled & Recycled / Recovered Appropriately**

## Do Not Litter. Keep Your Environment Clean.

- Segregate and Throw Waste Only in Waste Bins.
- Use Two Bins – One for Wet Waste, One for Dry Waste.

Plastics, Metals, Paper ...  
Can be recycled into useful products.

Waste Food and other Biodegradable Waste.  
Can be composted into manure.



Municipal Corporation of Greater Mumbai



Indian Centre for Plastics in the Environment

(www.icpenviro.org)

# DATA SHEET

## Environmental burden by Paper and Plastic (Polyethylene) carry bags - Life Cycle Assessment (LCA) report by Boustead Consulting and Associates (BCAL), USA,

Boustead Consulting and Associates (BCAL), USA, was entrusted to conduct a Life Cycle Assessment (LCA) on three types carry bags: a traditional carry bag made from polyethylene, a carry bag made from Compostable plastics and a paper carry bag made using at least 30% recycled fibre. BACL is a well-known organisation engaged in conducting LCA studies for the last 25 years and is recognised by prestigious organisations of the status of American Chemistry Council (ACC), USA. The findings are given in the table below.

	<b>Impact Summery of Various Bag Types (Carrying Capacity Equivalent to 1000 paper Bags)</b>		
	<b>Paper (30% Recycled Fibre)</b>	<b>Compostable Plastic</b>	<b>Polyethylene</b>
<b>Total Energy Usage (MJ)</b>	2622	2070	763
<b>Fossil Fuel Use (Kg)</b>	23.2	41.5	14.9
<b>Municipal Solid Waste (Kg)</b>	33.9	19.2	7.0
<b>Green House Gas Emissions (CO2e. Tons)</b>	0.08	0.18	0.04
<b>Fresh Water Usage (Gal)</b>	1004	1017	58

In terms of absolute figures, for manufacturing 1 Mn number of paper bags, we require 2622000 MJ of total energy which is equivalent to 728333 kwh energy whereas for manufacturing the same number of plastic carry bags, we require 211000 kwh – a saving of about 71% energy. However, the LCA reports show that plastic bags are reused several times while paper bags can be mostly used only once. Hence actual energy savings in real sense in case of reusable plastic bags is much more. Similar is the case for fresh water saving in case of manufacture of plastics carry bags.

**The full report of Boustead LCA Study is available in ICPE ENVIS website**

**In real terms, an estimated 700 trees are required to be cut to manufacture 10, 00, 000 paper carry bags.**

Basis:

1. 1 MT of paper requires pulp from 14 mature trees. (Reference evidence shows that depending on type of paper, pulp from approximately 10 to 17 trees is required to manufacture 1 Ton of Paper).
2. One paper bag weighs 50 Gms.

# ISSUED IN PUBLIC INTEREST BY INDIAN CENTRE FOR PLASTICS IN THE ENVIRONMENT

Carry Your Own Bags



Reuse Them

Do Not Litter



Segregate and Throw Waste Only in Waste Bins  
Use Two Bins - One For Wet Waste, One for Dry Waste

Save Electricity / Save Environment



Plastics Save Electricity

Say No To THIN Plastic Bags



Use Plastics Bags > 50 Microns

Save Trees / Use Plastics



Save Environment

Save Water / Use Plastics



Save Environment