ICPE
INDIAN CENTRE FOR PLASTICS IN THE ENVIRONMENT

Envis Eco-Echoes

Management of Plastics, Polymer wastes and Bio-polymers and impact of Plastics on the Eco-system

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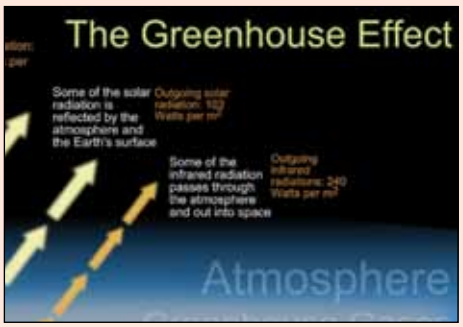
Plastics : Facts – Issues – Solutions



Did you know that if plastics in packaging were replaced by traditional materials, **CO_2 emissions would increase 7 times over, adding to the greenhouse effect ?**

CO_2 x 7

Source: Plastics Europe / Gesellschaft für umfassende Analysen

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Editorial

The versatility of plastics and the advantages they offer such as preservation, protection, light weight, hygiene, cost effectiveness, ease of processing, its amenability to be produced in different forms, sizes and shapes as per consumer preference, make it an ideal choice for packaging of an array of products – most importantly in the food and medical sectors. However, there are misconceptions and myths about plastics alleging this class of products as environment unfriendly. Plastics leave the least Carbon Footprint on earth. Plastics Packaging saved 220 Million Tons of CO_2 equivalent of Green House Gas in the world (in 2005). Emissions of CO_2, SO_2, NOx etc to air and COD and BOD in water during production of plastics are minimum compared to alternative materials. The comparisons have been provided.

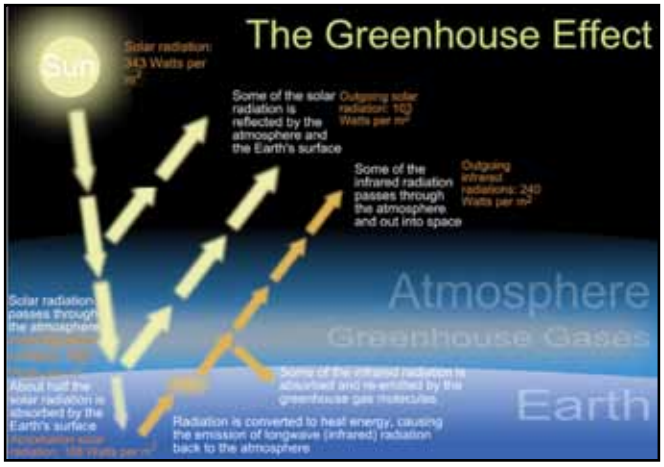
As per specific LCA study report by credible scientific institution like the IITs, energy saving by using plastics as packaging material compared to alternatives – glass and jute bag for liquid Milk and Atta are 81% and 86% respectively. The entire pharmaceutical industry is depended on plastics as the main packaging material for all liquid formulations and solid tablet products. In this edition efforts have been made to bring forward the facts, backed by scientific evidence, to prove that plastics are among the best environment friendly materials on earth. The need for establishing proper Solid Waste Management system and creating Mass Awareness against littering has been discussed. In the Data Sheet, information on the sector-wise consumption of major plastics raw materials in India has been provided. Any comment on the contents of this edition may please be forwarded to the Editor.

Comments may be forwarded to ICPE ENVIS Centre.

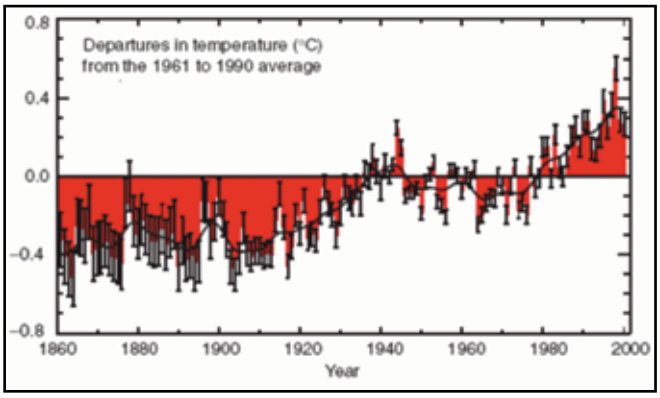
Subscription Information:

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

The Sun is the basic source of energy for the Earth. In the natural phenomenon, about 50% of Sun's radiation reaching earth is absorbed by the earth's surface. Some of the radiation is reflected by the atmosphere and the earth's surface, back to the space. This was the scenario till about 150 years ago. However since the beginning of the industrial revolution during mid-eighteenth century, the position started changing. The earth's atmosphere was filled up with different types of pollutants including some gaseous molecules, which are named as Green House Gases (GHG). These gas molecules caused to reflect some amount of the radiation in its reflection path, back to the earth's surface.



This re-entering phenomenon of the Sun's radiation has been occurring significantly since the beginning of the industrial revolution in the world causing a slow but steady increase in the in the earth's atmospheric temperature. This continuous increase in earth's atmospheric temperature is an alarming situation on which the whole world leaders are concerned about.



Trend of temperature increase during last 150 yrs is shown in the picture.

Various ways and means to reduce this increasing trend of accumulation of GHG in the earth's atmosphere by making policy frame work acceptable to all concerned, are being discussed by the leaders of all countries of the world.

Global Warming potential

Global warming potential (GWP) is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming. Major Green House Gases and their potential effect over a life time of 100 years are as given below:

a. Carbon-di-oxide (1)

b. Methane (21)

c. Nitrous Oxide (298)

d. Hydro fluorocarbons (14800)

e. Per fluorocarbons (1430)

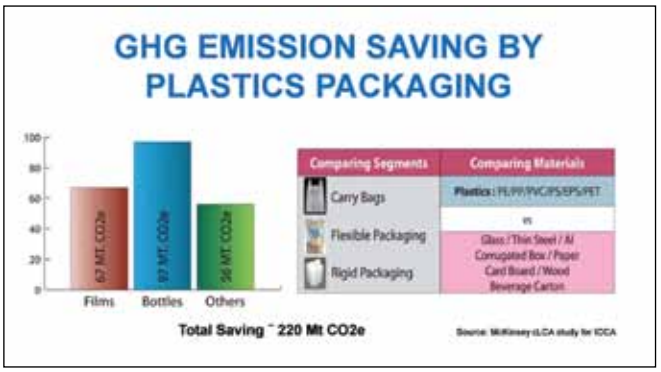
f. Sulphur hexafluoride (22800)

The figures in parenthesis indicate the degree of potential effects of various gases taking the effect of Carbon-di-oxide as 1.

Green House Gas emissions by different sectors of human activities are given below:

Invariably there is an attempt to reduce generation of these gases by human activities. While there are conflict of development interest and environmental issues among the less developed, developing and developed countries for adopting a particular policy frame, there should not be any conflict in adopting one policy – increase in the use of

plastics, wherever possible. This is because plastics reduce generation of Green House Gases to a great extent, besides various other benefits, at a lesser cost, compared to the alternatives materials.



This means that plastics reduce the Green House Gas emissions in the earth's atmosphere compared to its alternatives like paper, glass, steel, aluminum, paper, card board and wood. McKinsey Study included carry bags, flexible packaging and rigid packaging as comparison segments.

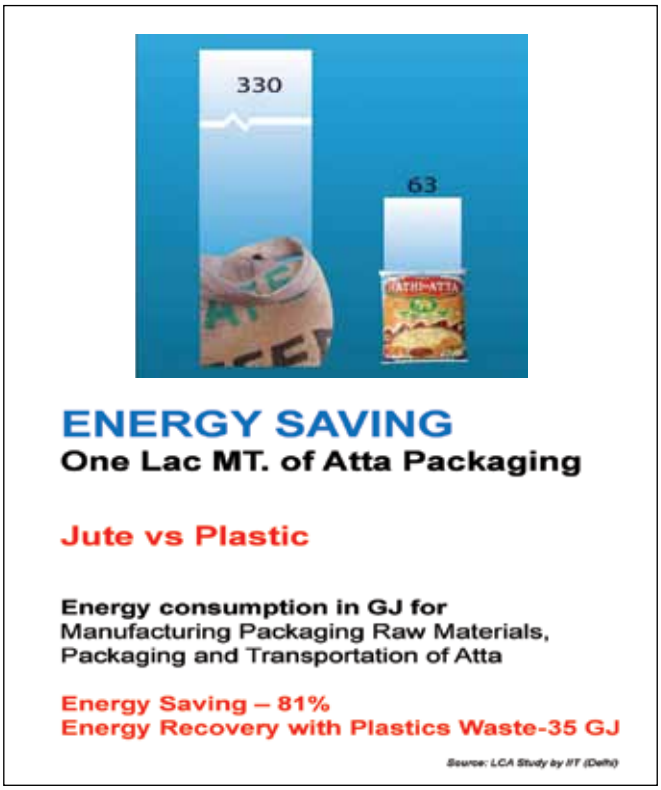
Did you know that if plastics in packaging were replaced by traditional materials, **CO_2 emissions would increase 7 times over, adding to the greenhouse effect ?**

Source: Plastics Europe / Gesellschaft für umfassende Analysen

In other words plastics create lesser environment burden in the earth's atmosphere in the form of Green House Gases compared to all the alternatives including paper.

Energy Saving

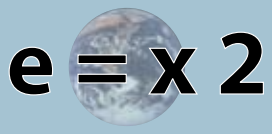
Conservation of energy is one of the most important traits in the preservation of our environment. Plastics consume the least energy for the producing various items of utilities for essential commodities.



While comparing the energy consumption for the packaging of essential commodities like milk and atta (flour) it is observed that plastics save more than 86% and 81% energy for manufacturing packaging raw material, packaging and transportation of milk and atta respectively. Translated in to the ground reality, the saving of energy for the packaging of milk and atta by plastics compared to alternatives in India is more than the energy consumption in the city of Delhi.

In general, it has been estimated that if plastics packaging were to be replaced by alternative materials, world energy consumption would have doubled.

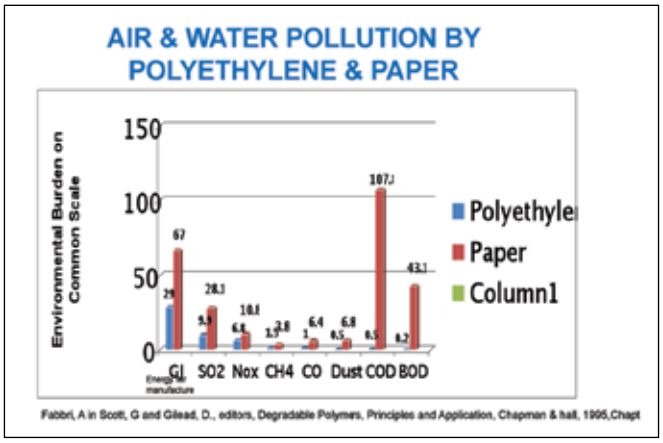
Did you know that if plastics in packaging were replaced by traditional materials, **world energy consumption** would **double ?**



Source: Plastics Europe / Gesellschaft für umfassende Analysen

Emissions by plastics and the alternatives

Facts stand at scientific revelations that emissions during production of plastics are far less compared to those of alternatives. These excess emissions cause long term damage to the environment silently, although those are not seen by naked eyes.



Fabbri, A in Scott, G and Gilead, D., editors, Degradable Polymers, Principles and Application, Chapman & hall, 1995,Chapt

Environmental Burden During Production of Raw Material & Bags

Environmental Burden in kg	Jute Bag	Plastic Bag
Air Pollution		
CO	54.3	0.9
CO2	6610.2*	780*
SOx	134.8	5.2
Nox	66.1*	4.8*
CH4	39.5	3.2
HCL	5.3	0
Dust	67.6	1.4
Water Pollution		
Suspended Solids	352.3	0.2
Chlorides	4535.0	0.1

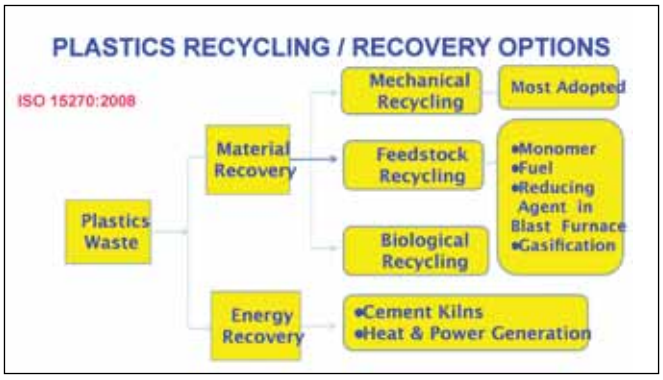
The Environmental Burden During Transportation of The Finished Bags

Emission	Gms/km	Excess Emission for jute Bags	Plastic Bags
CO2	781*	11907.3*	Taken as Basis
CO	4.5	64.0	Taken as Basis
HC	1.1	15.6	Taken as Basis
NOx	8*	113.9*	Taken as Basis
Particulates	0.36	5.1	Taken as Basis
Total Regulated Tailpipe Emission	13.96	198.5	Taken as Basis

*High potential for Global Warming

Despite the distinctive advantages of plastics, plastics waste continues to create disposal problem giving rise to waste management issues. When closely analysed, it is observed that while rigid plastic waste of any kind is not found in the MSW stream, as those are collected systematically by the waste pickers for recycling purpose and earning valuable wealth in return, thin plastics carry bags and some types of flexible packaging materials made of multi layered plastic materials remain uncollected in the MSW stream. A special type of a plastic packaging material – Thermocol or Expanded Polystyrene (EPS), also comprises the bulk of the plastics waste in the municipal solid waste.

Plastics are 100% recyclable. Various options of plastics recycling have been described under the International Standards.



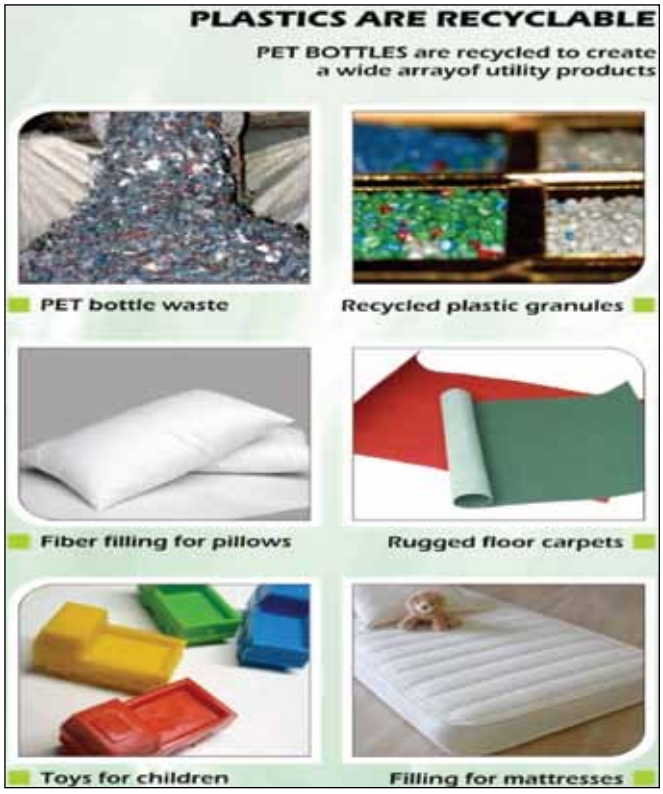
Mechanical Recycling – Conventional

It is the most preferred and widely used Recycling Process due to its cost effectiveness and ease of conversion to useful products of daily use. The basic requirement is Homogeneous and Clean Input.

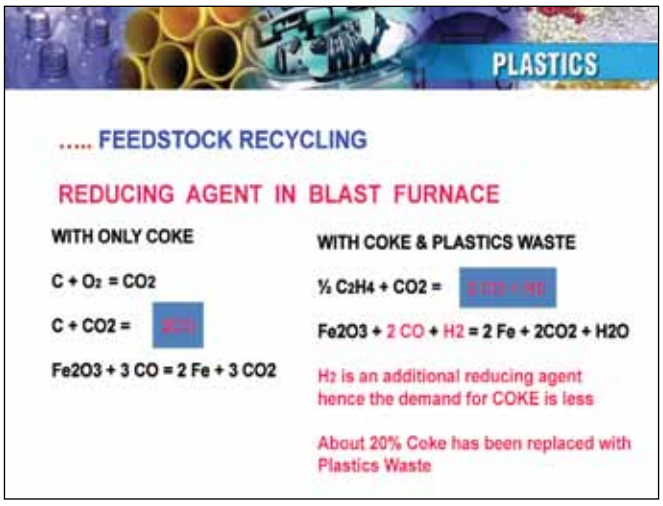
Mechanical Recycling Steps are:

Collection – Identification – Sorting – Grinding/Shredding – Cleaning – Drying – Separating – Agglomerating / Mixing – Extruding / Compounding – Palletizing – Fabrication to End Product

Feedstock Recycling



- Catalytic Depolymerisation Reaction Takes Place In The Absence Of Oxygen And At Temperature Below 350° C.
- Clean Operation - No Possibility Of Dioxin Formation Limitation
- Availability Of Waste Plastics At Low Cost



ENERGY RECOVERY: CO-PROCESSING OF PLASTICS WASTE IN CEMENT KILNS

Advantages:

All Types Of Mixed Plastics Waste Can Be Used Without Adequate Cleaning

- Cleaner Emissions (Compared To Only Coal)
- 60 – 65 % Replacement Of Coal - (Germany)
- Indian Trial By Acc & Icpe With 5% Replacement Was Successful
- Process Approved By Cpcb In Indian Condition
- At 10% Replacement Rate - 170 Cement Kilns In India Can Dispose Of The Entire Plastics Waste Generated In The Country Today

Calorific Values:

Polyethylene	:	46 Mj/Kg
Polypropylene	:	44 Mj/Kg
Polyamide (Nylons)	:	32 Mj/Kg
Pet	:	22 Mj/Kg
Coal	:	29 Mj/Kg

Plastics Waste in Road Construction:

Polyethylene / Polypropylene / Polystyrene Multilayered Plastics – All Can Be Used

For 10% replacement of Bitumen, 1 KM long and 7 feet width Road requires 1 MT of Plastics Waste and 9 MTs of Bitumen in the bottom layer. Road with seal coat requires extra Plastics Waste.

For achieving all these solutions, the first step is segregation of Dry & Wet waste at the source.

Solid Waste Management

Solution to Plastics Waste Disposal Problem

Segregation of Waste at Source

Proper System for Collection of Segregated Waste

Incentives / Encouragement for Recycling

Upgradation of the Existing Mechanical Recycling Technology

Encouragement for Alternate Methods of Recycling / Recovery

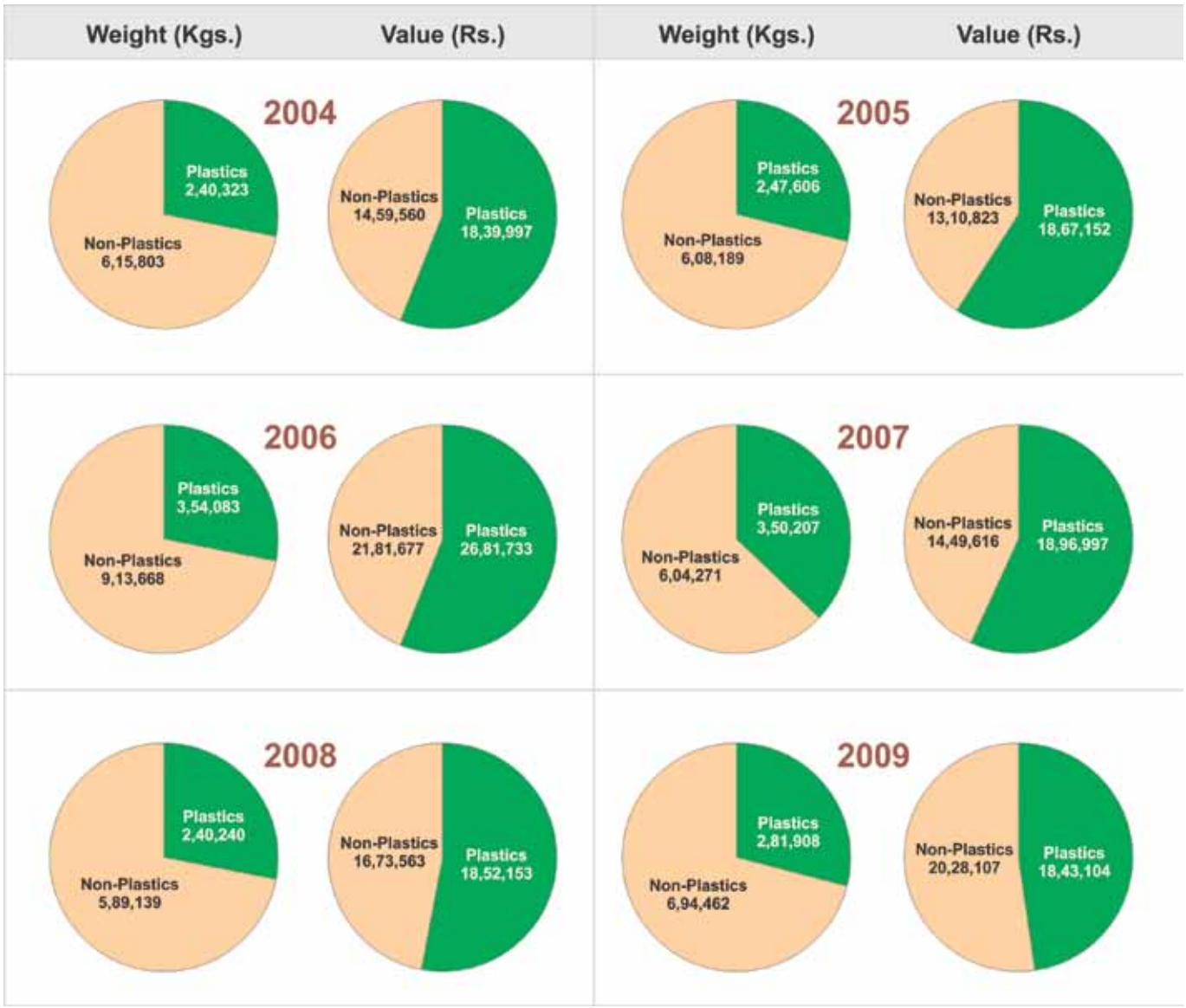
- Co-processing in Cement Kilns / Energy Recovery
- Conversion to Fuel
- Construction of Asphalt Road
- Conversion to Basic Chemical

Steps Involved:

- BMC provides Space , Secured sheds & Collection Vehicles
- Rag Pickers collect Dry Waste from Society Buildings and segregate into different categories
- Segregated dry waste is packed & stored in secured sheds
- Segregated waste is sold to waste dealers periodically which is recycled by respective recyclers
- Minor quantity of non-recyclables go to landfills (Can be directed towards cement kilns)

About 80 waste pickers collected, segregated and sold about 1000 MTs of Dry Waste in select areas of 6 Wards of Mumbai in 2010 and earned about Rs. 4000/ per month/ per head. Mumbai Municipal Corporation provided waste collection vehicles and segregation place – free of cost.

Dry Waste Collection Data in Wards Under the Model Project - Mumbai



WARDS	**"A" / "D" / "F" - N / "M" – (E & W) / "S" / "T" / "K" – (E)**
BUILDINGS	**≈ 1000**
RAGPICKERS	**50 IN 2003 AND 80+ IN 2008/9**
NGOs	**Stree Mukti Sangathana FORCE**

PARTNERS

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EXPLANATORY NOTE

Explanatory Note to the mass awareness campaign (See message on back cover)

Edible oil is an essential commodity which requires appropriate packaging to safeguard its quality over a period of time against being rancid due to the reaction with atmospheric oxygen and other gases. Plastic pouches have proven to be most efficient and cost effective solution to provide safe and unadulterated oil to the consumers. Plastic pouches save energy, water and fuel consumption and emissions of various volatile organic compounds (VOC) during manufacturing and subsequent transportation, compared to the alternate mode of packaging. Polyethylene which is absolutely safe in terms of its use in contact with ready to eat or drink food products is the predominant plastics material used for manufacturing these edible oil pouches.

Normal plastic carry bags are made of the same material which is used in manufacturing Edible Oil Pouches – Polyethylene. The attributes, which have made the use of plastic pouches safe, exists for carry bags also. Still it is alleged that plastic carry bags are not environment friendly. Consider these facts revealed by Life Cycle Impact Studies conducted by credible International Organisations:

- Normal plastic carry bags consume only about 35% of energy compared to that required for manufacturing paper and compostable plastic carry bags.
- The weight of equivalent paper bags is 9 times more than plastic carry bags, which necessitates 10 times more transportation trips for paper bags consuming more fuel and thus causing more environmental pollution.
- Millions of trees would have to be cut every year to manufacture paper carry bags, if normal plastic carry bags are banned.
- Normal plastic carry bags manufacturing process consume only about 5% fresh water compared to that of paper or compostable plastic bags. In real terms, this saving can meet the drinking water requirement of millions of people.
- Plastic bags generate 60% less Green House Gas (GHG) Emission than uncomposted paper bags and 79% less GHG Emissions than composted paper bags. The saving is much more when the comparison is made with compostable plastic or jute bags.
- Plastics bags are recyclable. Paper bags also are recyclable; however it takes 91% more energy for recycling equivalent weight of paper than that of plastics. Compostable or jute bags are not recyclable.
- Paper bags generate 70% more air pollutants and 50% more water pollutants than normal plastic bags do during manufacture.
- Energy Saving during manufacture of raw materials, production and transportation of plastic bags compared to jute bags is 81%.
- Environmental Burden with respect to Air and Water pollution during Production of Raw Material and Bags for Plastic Bags is much less than that created by Jute bags.

Our bad littering habits coupled with inadequate infrastructure for waste management has created the disposal problem of solid waste, including the plastic waste especially in the urban areas. Discontinuation of Plastic bags is no solution and will rather multiply the problem many fold. This will add to the woes of common man as the so called alternatives are nonviable, costly and place greater burden on the environment. The challenge facing us is to improve the solid waste management system and create awareness among general mass against littering.

The solution lies in Segregation of Waste at Source and arrangement for Recycling of all recyclable waste. Plastic Bags are 100% recyclable. Plastic Bags are Environment friendly.

DATA SHEET

Consumption of Commodity Plastics in India: 2010 – 11 Total consumption ….7311 KT

Sector - wise PP Industry Consumption 10-11	
PP	
RAFFIA	899
TQ	220
IM HP	483
ICP	423
RCP	92
BOPP	281
EXT	77
F&F	160
TTL	**2635**

Sector - wise HDPE Industry Consumption 10-11	
HDPE	568
Raffia+MF	269
GP Blow Moulding	282
Medium/Large Blow Moulding	131
HD/HM Film	329
Pipe	221
IM	216
Others	33
TTL	**1481**

Sector - wise LDPE Industry Consumption 10-11	
LDPE	899
GP	99
HD	49
MP	56
EC	64
IM	16
W&C	8
AL	18
Others / Pharma	**15**
TTL	**325**

Sector-wise LLDPE Industry Consumption 10-11	
LLDPE	99
Butene Film	568
HAO Film	113
Roto Moulding	112
Extrusion Coating	84
High Flow	91
Others	13
TTL	**981**

Sector - wise PVC Industry Consumption 10-11	
PVC	269
Pipe- WS	594
Pipe- Irrigation	372
Pipe- Sewerage	163
Pipe- Plumbing	155
Pipe- Flexible	51
Pipes Total	**1335**
Wire & Cables	124
Films	92
Calendered Products	135
Sheets	21.4
Fittings	62.6
Profiles	57.9
Foot wear	43.2
Blow moulding	2.7
Others	14.8
TTL	**1889**

Source: Industry

The pouch that packs your cooking oil and the bag you carry for shopping are made from the same material.

That's why plastic bags are not harmful.

For more information visit **www.icpeenvis.nic.in**

Issued in public interest by Indian Centre for Plastics in the Environment.

ICPE
REUSE • RECYCLE • RECOVER

Do not litter.
Plastics are recyclable.