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# Envis Eco-Echoes

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FOR PLASTICS IN  
THE ENVIRONMENT

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

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## Editorial



The positive contributions of plastics for keeping our environment clean and safe have been published in different editions of Eco-Echoes Newsletters. The McKinsey cLCA report prepared for the International Council of Chemical Associations (ICCA) shows the reduction in the Green House Gas Emissions by Chemical Industries in general and various applications of plastics in particular. (Eco-Echoes April – June 2009). The Life Cycle

Analysis of Plastics in Packaging brought

out by Indian Institute of Technology, Delhi (IIT – D) shows the saving in energy and reduction in emission of various gases to air and water due to the use of plastics as a packaging material compared to the alternatives. (Eco-Echoes January – March 2004). Similarly the report of Indian Institute of Packaging on the Role of Plastics in Conservation of Food Resources gives the details of the fact that 'Plastics in packaging provides a hygienic and safe environment for food and medicines by protecting them against contamination while keeping food fresh throughout use (Eco-Echoes January – March 2007). Other editions carried information on Solid Waste Management and Plastics Recycling – Economic and Ecological Options (Eco- Echoes October – December 2006).

Readers of this edition, who had not gone through these articles published in earlier editions of the Newsletter, may like to visit ICPE website [www.icpeenvs.nic.in](http://www.icpeenvs.nic.in) and search for these Newsletters.

In the current edition we reproduce the Executive Summary of Life Cycle Assessment for Three Types of Grocery Bags – Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper, studied by Boustead Consulting & Associates (BCAL), USA. These studies with scientific evidence dispel the myths about plastics in general and plastics packaging and plastic carry bags / grocery bags in particular.

ICPE ENVIS Eco-Echoes will be continuously focusing its attention to bring out the scientific facts on all environmental issues and position with respect to plastics. Through a series of release of pictorial illustrations along with explanatory notes, the environmental and other benefits of various applications of plastics would be published.

Comments are welcome.

**T. K. Bandopadhyay**

*Editor*

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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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## Life Cycle Assessment for Three Types of Grocery Bags Recyclable Plastic; Compostable, Biodegradable Plastic; and Recycled, Recyclable Paper

### Executive Summary

In the pursuit to eliminate all that is not green, plastic seems to be a natural target. Its widespread use in products and packaging, some say, has contributed to environmental conditions ranging from increased pollution to overloaded landfills to the country's dependence on oil. In response, some cities have adopted legislation that bans plastic grocery bags made from polyethylene in favor of bags made from materials such as cloth, compostable plastics, or paper.

But will switching from grocery bags made from polyethylene to bags made from some other material guarantee the elimination of unfavorable environmental conditions? We know that every product—through its production, use, and disposal—has an environmental impact. This is due to the use of raw materials and energy during the production process and the emission of air pollutants, water effluents, and solid wastes.

More specifically, are grocery bags made other materials such as paper or compostable plastics really better for the environment than traditional plastic grocery bags? Currently, there is no conclusive evidence supporting the



argument that banning single use plastic bags in favor of paper bags will reduce litter, decrease the country's dependence on oil, or lower the quantities of solid waste going to landfills. In addition, there is limited information on the environmental attributes of compostable plastics and how they fare against traditional plastic grocery bags or paper bags.

To help inform the debate about the environmental impacts of grocery bags, the Progressive Bag Alliance contracted with Boustead Consulting & Associates (BCAL) to conduct a life cycle assessment (LCA) on three types of grocery bags: a traditional grocery bag made from polyethylene, a grocery bag made from compostable plastics (a blend of 65% EcoFlex, 10% polylactic acid or PLA, and 25% calcium carbonate), and a paper grocery bag made using at least 30% recycled fibers. The life cycle assessment factored in every step of the manufacturing, distribution, and disposal stages of these grocery bags. It was recognized that a single traditional plastic grocery bag may not have the same carrying capacity as a paper bag, so to examine the effect of carrying capacity, calculations were performed both on a 1:1 basis as well as an adjusted basis (1:1.5) paper to plastic.

BCAL compiled life cycle data on the manufacture of polyethylene plastic bags and compostable plastic bags from the Progressive Bag Alliance. In addition, BCAL information on the compostable plastic resin EcoFlex from the resin manufacturer BASF. BCAL completed the data sets necessary for conducting life cycle assessments using information extracted from The Boustead Model and Database as well as the technical literature. BCAL used the Boustead Model for LCA to calculate the life cycle of each grocery bag, producing results on energy use, raw material use, water use, air emissions, water effluents, and solid wastes.

The results show that single use plastic bags made from polyethylene have many advantages over both compostable plastic bags made from EcoFlex and paper bags made with a minimum of 30% recycled fiber.

When compared to 30% recycled fiber paper bags, polyethylene grocery bags use energy in terms of fuels for manufacturing, less oil, and less potable water. In addition, polyethylene plastic grocery bags emit fewer

global warming gases, less acid rain emissions, and less solid wastes. The same trend exists when comparing the typical polyethylene grocery bag to grocery bags made with compostable plastic resins—traditional plastic grocery bags use less energy in terms of fuels for manufacturing, less oil, and less potable water, and emit fewer global warming gases, less acid rain emissions, and less solid wastes.

The findings of this study were peer reviewed by an independent third party with significant experience in life cycle assessments to ensure that the results are reliable and repeatable. The results support the conclusion that any decision to ban traditional polyethylene plastic grocery bags in favor of bags made from alternative materials (compostable plastic or recycled paper) will result in a significant increase in environmental impacts across a number of categories from global warming effects to the use of precious potable water resources. As a result, consumers and legislators should reevaluate banning traditional plastic grocery bags, as the unintended consequences can be significant and long-lasting.

*Published with the permission from  
Boustead Consulting & Associates Ltd.*



## Plastic Grocery Bags

In the national effort to go green, several states, counties, and cities are turning their attention to plastic grocery bags made from polyethylene because of the perception that plastic bags contribute to local and global litter problems that affect marine life, occupy the much needed landfill space with solid waste, and increase U.S. dependence on oil.

To address these environmental issues, and perhaps in seeking to follow the example of other countries such as Australia and Ireland, legislators in several cities across the United States have proposed or have already passed ordinances banning single use polyethylene plastic grocery bags in favor of bags made from alternative materials such as cloth, paper, or compostable plastic. Legislators state that they believe that these new laws and proposals will reduce litter, reduce the use of fossil fuels, and improve the overall environmental impacts associated with packaging used to transport groceries.

Before we examine whether plastic bags cause more environmental impacts than the alternative materials proposed, we should first consider the most commonly proposed alternatives, which tend to include: cloth bags, compostable plastic bags, and paper bags.

Reusable cloth bags may be the preferred alternative, but in reality, there is no evidence that most, or even a majority of, customers will reliably bring reusable bags each time they go shopping.

Comment from the Editor, ENVIS Eco-Echoes:

*Comparison of re-usable cloth bags should be made with re-usable plastic bags only and not with one time or limited time use plastic bags*

Compostable plastic bags, although available, are in short supply as the technology still is new, and therefore cannot currently meet market demand. So it appears that the proposed laws banning plastic grocery bags may simply cause a shift from plastic bags to the only alternative that can immediately supply the demand—paper bags.

Therefore, is legislation that mandates one packaging material over another environmentally responsible given that all materials, products, and packaging have environmental impacts? The issue is whether the chosen alternatives will reduce one or several of the identified environmental impacts, and whether there are any trade-offs resulting in other, potentially worse, environmental impacts.

To help inform the debate on the environmental impacts of grocery bags, and identify the types and magnitudes of

environmental impacts associated with each type of bag, the Progressive Bag Alliance contracted Boustead Consulting & Associates (BCAL) to conduct a life cycle assessment (LCA) on single use plastic bags as well as the two most commonly proposed alternatives: the recyclable paper bag made in part from recycled fiber and the compostable plastic bag.

Life cycle assessment is the method being used in this study because it provides a systems approach to examining environmental factors. By using a systems approach to analyzing environmental impacts, one can examine all aspects of the system used to produce, use, and dispose of a product. This is known as examining a product from cradle (the extraction of raw materials necessary for producing a product) to grave (final disposal of the product). LCA has been practiced since the early 1970s, and standardized through several organizations including SETAC (Society of Environmental Toxicology and Chemistry) and ISO (International Standards Organization). LCA studies examine the inputs (resources and energy) and outputs (air emissions, water effluents, and solid wastes) of each system and thus identifies and quantifies the effects of each system, providing insights into potential environmental impacts at local, regional, and global levels.

## Final Disposal Solid Waste Options: Recycling, Combustion with Energy Recovery, Landfill and Composting

### Recycling

A major goal of recycling is to reduce the generation of solid waste. The bag making process for grocery bags generates paper and plastic waste. The majority of this waste, known as mill waste, is recycled internally. Therefore, in this study BCAL treated mill waste as a closed loop recycling effort that returned the waste to the production process.

All of the grocery bags are recyclable to other paper and plastic products. EPA data from 2005 show that 21% of the kraft paper grocery bags are recycled and 5.2 % of the plastic grocery bags are recycled. The allocation decision for these recycled materials is that the recycled materials are not burdened with any inputs or outputs associated with their previous manufacture, use, disposal prior to recycling.

BCAL used this allocation approach, and treated the recycled materials as diverted waste.

Diverted waste, like raw materials, are burdened with their intrinsic feedstock value and are subsequently burdened with the resource use, energy consumption, and environmental releases associated with their collection, cleaning and reprocessing, use, and disposal.

Therefore, the inherent feedstock energy value of the recycled material is assigned to the diverted waste.

With respect to the degradable plastic bags, BCAL assumed that initially the same rate that applies to recycling of standard plastic bags (5.2%) would be appropriate for the rate sent to composting. This reflects a conservative approach using only data that currently reflect consumer behavior with regard to plastic bags. It is expected that the percentage of degradable plastic bags sent to composting will actually be higher once they are made available and collection can occur within municipalities, making it easier for the general consumer to send these bags through a different route of disposal.

### Global Warming

One important issue that is currently being addressed using LCA studies is an examination of the contribution that industrial systems make to climate change. The work of the Intergovernmental Panel on Climate Change (IPCC)<sup>12</sup> provides a framework for aggregating data on those air emissions that are thought to be significant contributors to global warming. The aggregated effect of any system can be summarized as a parameter known as Global Warming Potential (GWP) or carbon dioxide equivalent. Any gaseous emission that is thought to contribute to global warming is assigned a value equal to the equivalent amount of CO<sub>2</sub> that would be needed to produce the same effect. Multiplying each gaseous emission by its CO<sub>2</sub> equivalent allows the separate effects of different emissions to be summed to give an overall measure of global warming potentials.

The major greenhouse gases of importance in this eco-profile are carbon dioxide, methane and nitrous oxide. The results tables provided previously (see Section on LCA Results) showed the global warming impacts (with carbon dioxide equivalents) up to the collection of the grocery bags.

Impact Summary of Various Bag Types (Carrying Capacity Equivalent to 1000 Paper Bags)			
	Paper(30% Recycled Fiber)	Compostable Plastic	Polyethylene
Total Energy Usage (MJ)	2622	2070	763
Fossil Fuel Use (kg)	23.2	41.5	14.9
Municipal Solid Waste (kg)	33.9	19.2	7.0
Greenhouse Gas Emissions (CO <sub>2</sub> Equiv. Tons)	0.08	0.18	0.04
Fresh Water Usage (Gal)	1004	1017	58

The following table estimates the global warming impacts just from the collection and disposal of the grocery bags.

As discussed previously, two scenarios will be considered for the kraft paper bags, the first is a worst-case scenario that follows the basic decomposition reaction for cellulose and the second scenario is one that estimates carbon sequestration for paper in MSW landfills.

The recyclable plastic bags will not degrade in the landfill; all the inherent feedstock energy and emissions will be sequestered. Therefore, there are no carbon dioxide emissions from recyclable plastic bags in landfills.

### Summary and Conclusions

Recent efforts by legislators to ban traditional plastic bags on the basis of environmental impact have reignited the debate surrounding single-use grocery bags, and whether there are any environmental trade-offs in switching from bags made with polyethylene to bags made from alternative materials.

This life cycle assessment was commissioned to examine the overall environmental impacts associated with the typical single-use polyethylene plastic grocery bag, compared with grocery bags made from compostable plastic resin and grocery bags made from 30% recycled paper.

Life cycle assessment is a useful analytical tool because it allows for the examination of an entire production system from cradle to grave, thus examining the full range (global, regional, and local impacts) of environmental issues at once rather than examining individual components of a system or individual products or processes. This broad picture analysis is important because environmental effects range from global (greenhouse gases), to regional (acid rain/solid waste) or local (toxic releases) impacts.

And while there often is excellent information on local environmental effects, few complete data sets are available to understand the contributions production systems are making to global and regional environmental problems.

**These study results confirm that the standard polyethylene grocery bag has significantly lower environmental impacts than a 30% recycled content paper bag. This supports conclusions drawn from a number of other studies looking at similar systems. In addition, this report also shows that the typical polyethylene grocery bag has fewer environmental impacts than a compostable plastic grocery bag made from a blend of EcoFlex (BASF), polylactic acid, and calcium carbonate, when compared on a 1:1 basis, as well as when the number of bags is adjusted for carrying capacity so that the comparison is 1.5:1. Surprisingly, the trend is the same for most of the individual categories of environmental impacts. No one category showed environmental impacts lower for either the compostable plastic bag or the paper bag.**



## J. D. Sarvodaya

New Delhi: 22nd April 2010

ICPE conducted an Awareness program for selected eco-club students of class VIII, IX and X. Approx 50 Students attended the Programme along with their teachers.



## Air Force Bal Bharathi School

New Delhi: 05th May 2010

ICPE on the invitation of the Air Force Bal Bharathi School, had conducted an Awareness programme on 'Plastics and Environment', Approx. 280 Students of Class VIII and six Teachers attended the programme.



## SVT College of Home Science

Mumbai: 27th April 2010

ICPE on the invitation of the SVT College of Home Science, had conducted a session on Plastics in the Environment under the Theme : Global Warming - An Environmental Concern, Approx. 50 Final year Students and their respective Teachers attended the Programme.



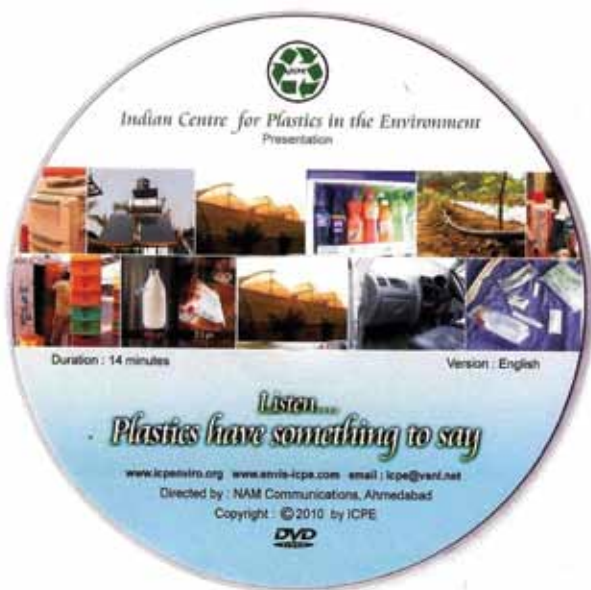
# Anti – Child Labour

## Anti Child labour - Chembur Jetvan garden



Awareness Programme was organised at Chembur area among the children rescued under Anti-child Labour Law

## “Plastics have something to say



Listen Plastics have something to say in Hindi was released in May 2010

You can download the complete DVD from ICPE Website  
<http://icpeenvis.nic.in/new-video.html>  
<http://icpeenvis.nic.in/new-videoH.html>





The Plastic industry in North Eastern Region is relatively immature in comparison to the other parts of India at present. But with Assam Gas Cracker project progressing, the future prospect of Plastic sector in North East is bound to increase.

The commissioning of Brahmaputra Crackers and Polymers Limited will establish the domain of North East region on the petro chemical map of the country and will bring a new era of economic growth for the state as well as the region.

The connectivity to South East Asian country is being seriously addressed by the Central Govt.

### Gas Cracker Project in Assam beckons the Plastic Industry

A joint venture agreement for the Assam Gas Cracker project has been signed among GAIL (India) Ltd. Numaligarh Refinery Ltd. (NRL) Oil India Ltd. (OIL) and Assam Government here. These entities are also the promoters of the joint venture company implementing the project.



The integrated petrochemical complex being set up Lepetkata, Dibrugarh, at a cost Rs. 5,460 crore will be implemented by a joint venture company Brahmaputra Crackers and Polymers Ltd (BCPL) promoted by GAIL with 70% equity participating. The remaining 30% equity is shared equally among OIL, NRL and the Assam Government. The project will be completed in 2012. The work progress is in full swing and 60% work is already complete.

The feedback for the petrochemical complex is 6.0 million standard cubic meters of gas per day (mmsemd) from Oil India Ltd, Duliajan, and 1.35 mmsemd from Oil & Natural Gas Corporation up to March 31, 2012 and 1.00 mmsemd, thereafter. The petrochemical complex would also utilize 1,60,000 tonnes per annum (tpa) of petrochemical grade naphtha from NRL. The complex will comprise a gas separation plants. The complex has been configured with a capacity of 2,00,000 TPA of HDPE and LLDPE and 60,000 TPA of propylene.

### North East International Plastrofair:

NE International Plastro Fair 2010 unfolds enormous opportunities for the Small & Medium entrepreneurs dealing in Plastic Raw Material, Machinery, Finished Product and allied sectors to explore and collaborate to take their business to greater heights. This initiative is a joint effort of Gail(India) Ltd, Govt. of Assam, Numaligarh Refinery Ltd and Oil India Ltd.

This 4 day mega event will be an ideal meeting place for the entrepreneurs to meet the Indian Plastic Processing community – processors, machinery, manufacturers, additive manufacturers and all other associated with this industry. The Indian Plastic Industry will be participating in this mega event at large to offer you their skills, machineries and best practices which will benefit the entrepreneurs of this region. New product ideas and processing techniques will emerge to take the North East Plastic Industry a few steps forward.



## North East International Plasto Fair, Guwahati: May 21-24, 2010

The Fair was organised by Plastindia Foundation and Federation of Industry & Commerce of North Eastern Region.

ICPE participated in the fair, displaying various panels and samples to bring awareness on one the importance and benefits of plastics for the environment and various methods of scientific disposal and recycling of plastics waste.



## “National Evaluation Workshop of ENVIS Centres – 2010”

5th – 6th April, Gangtok, Sikkim

The National Workshop was organised by ENVIS Directorate of Ministry of Environment and Forests for evaluating the performance of the 76 ENVIS Centres across the country. Sh. T. K. Bandopadhyay, Coordinator of the Centre and Sh. Sudheer Khurana, Sr. Programme Officer of ICPE ENVIS Centre, attended the Evaluation Workshop and made presentations.

Sh. Nilkanth Ghosh, Statistical Adviser and Head of ENVIS Directorate in the MoEF and the Secretary – Science & Technology and Climate Change, Govt. of Sikkim addressed the delegates. Sh. B. P. Dhungel – Hon’ble Minister of Forest, Environment & Wildlife Management etc Departments, Government of Sikkim, inaugurated the Workshop.



Clean road of Gangtok Sikkim



Inauguration of ENVIS Workshop



The Workshop in progress



Litter-free Gangtok Sikkim



The pouch that brings you milk and the bag you carry for shopping are made from same material.

## How can a plastic bag be harmful?

For more information visit [www.icpeenvi.nic.in](http://www.icpeenvi.nic.in)

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



**Do not litter.  
Plastics are recyclable.**

Milk Packaging is substantially dependent upon Plastics. One of the biggest challenges for India is to further expand the dairy network so that hygienic packaged milk can be made available to the vast population safely and conveniently. Plastic pouch remains as the most safe, convenient and environment friendly packaging material. Additionally it is the most cost effective packaging material. Plastics pouch save energy, water consumption, transportation fuel and emissions of various volatile organic compounds (VOC) during manufacturing, compared to the alternate mode of packaging. Plastic pouch used for the packaging of liquid milk is made of a plastics material – Polyethylene, which is absolutely safe in terms of its use in contact with ready to eat or drink food products, drinking water and pharmaceutical packaging.

Normal plastic carry bags are made of the same material as that of milk pouch – Polyethylene. The attributes, which have made the use of plastics pouch safe for milk, exists for carry bags also. Still it is alleged that Plastics 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 poor littering habits coupled with inadequate infrastructure for waste management has created the disposal problem of solid waste, including the plastic waste 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 unviable, 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. Plastics Bags are 100% recyclable. Plastics Bags are Environment friendly.