Madras School of Economics
(Centre of Excellence in Environmental Economics)

Newsletter
ENVIS CENTRE ON ENVIRONMENTAL ECONOMICS
ENVISAGE

Volume 6 - No: 1, June, 2009

Contents

Editorial

The 21st Century could be defined as The Age of Plastic. Plastic due to its versatile property as such is not harmful to man. Even though plastic has a property to preserve food and store wet material for long, the technique used for disposing it creates problem. In India 60% of the plastics are recycled, but the process of recycling is not eco-friendly and no scientific plastic waste management or policy is in place. Continents of garbage in the oceans are killing marine life and releasing poisons that enter the human food chain. About 80 per cent of plastic found at sea is washed out from the land. The three Rs - reduce, re-use and recycle - would help tackle the problem. Plastic recycling is lagging well behind paper and cardboard. There are other challenges for plastic recycling, such as the fact that it can release toxic chemicals into the atmosphere, and that it is more expensive to recycle some plastic than to create a new product from petrochemicals.

Against this backdrop the present edition of ENVISAGE focuses on the theme PLASTIC. The lead article explains how we have become so accustomed to the ubiquitous presence of plastic that it is difficult to envision life when woods and metals were the primary materials used for consumer products. The next article elucidates whether the plastic grocery bags are sacking the environment. The "paper or plastic" conundrum that vexed earnest shoppers throughout the 1980s and 90s is largely moot today. An assessment on the comparative environmental impacts of each material is done with the consideration of the inputs of matter and energy throughout each stage of the life cycle of paper and plastic. The third article discusses the role of economic instruments in plastic waste management and provides cross country evidence on use of economic instruments.

Plastic Fantastic

We have become so accustomed to the ubiquitous presence of plastic that it is difficult to envision life when woods and metals were the primary materials used for consumer Plastic has become prevalent because it is inexpensive and it can be engineered with a wide range of properties. Plastics are strong but lightweight, resistant to being degraded by chemicals, sunlight, and bacteria, and are thermally and electrically insulating.

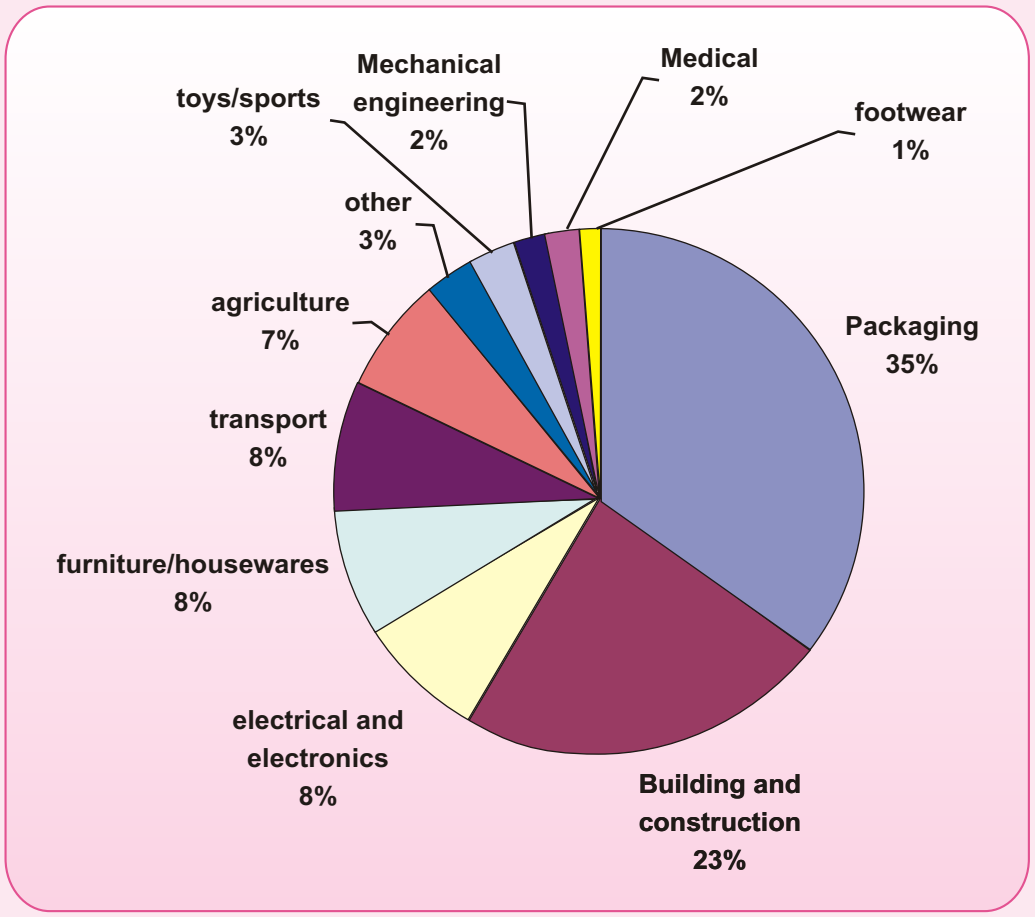
Plastics also can be custom-designed for innumerable uses, including polyethylene terephthalate for soda bottles, high-density polyethylene for milk bottles, ***polypropylene*** for ketchup bottles, ***expandable polystyrene for egg crates, low-density polyethylene*** for plastic bags, and polyvinyl chloride (PVC) for water pipes. They can be molded into many shapes, including intricate small parts, and can be drawn into thin fibers. Some can be foamed to produce high-bulk materials such as Styrofoam, further increasing their thermal insulation properties. Plastics have become a critical material in the modern economy; the annual volume of plastics produced exceeds the volume of steel that is manufactured.

Plastics were originally developed as synthetic substitutes for natural materials, such as rubber, tortoiseshell, and ivory, which were once widely used for consumer goods. The first commercially viable plastic was celluloid, developed in the latter part of the 19th century as a replacement for ivory in billiard balls, combs, brushes, and other household items. Celluloid was made from cellulose nitrates: plant fibers were nitrated in acid to form nitrocellulose, which could then be molded into various shapes. It was later used as the substrate for flexible photographic film, making motion pictures possible. Cellulose was also molded into thin sheets, cellophane, used to package consumer products. Rayon, also produced from plant fibers, was developed in 1891. The first synthetic plastic, Bakelite, was developed in 1907 by Leo Baekeland through a condensation reaction of phenol (derived from coal tar) and formaldehyde.

The world's annual consumption of plastic materials has increased from around 5 million tonnes in the 1950s to nearly 100 million tonnes today. A total of approximately 4.7 million tonnes of plastic products were used in various economic sectors in 2001.

Uses of plastic

Packaging represents the largest single sector of plastics use. The sector accounts for 35% of plastic consumption and plastic is the material of choice in nearly half of all packaged goods.



Source : Analysis of household waste composition and factors driving waste increases - Dr. J. Parfitt, WRAP, December 2003

Types of Plastic

There are about 50 different groups of plastics, with hundreds of different varieties. All types of plastic are recyclable. To make sorting and thus recycling easier, the American Society of Plastics Industry developed a standard marking code to help consumers identify and sort the main types of plastic. These types and their most common uses are:

1	ET	**Polyethylene terephthalate** - Fizzy drink bottles and oven-ready meal trays.
2	HDPE	**High-density polyethylene -** Bottles for milk and washing-up liquids.
3	PVC	**Polyvinyl chloride** - Food trays, cling film, bottles for squash, mineral water and shampoo.

	LDPE	**Low density polyethylene** - Carrier bags and bin liners.
	PP	**Polypropylene** - Margarine tubs, microwaveable meal trays.
	PS	**Polystyrene** - Yoghurt pots, foam meat or fish trays, hamburger boxes and egg cartons, vending cups, plastic cutlery, protective packaging for electronic goods and toys.
	OTHER	**Any other plastics** that do not fall into any of the above categories. - An example is melamine, which is often used in plastic plates and cups.

Benefits of plastics

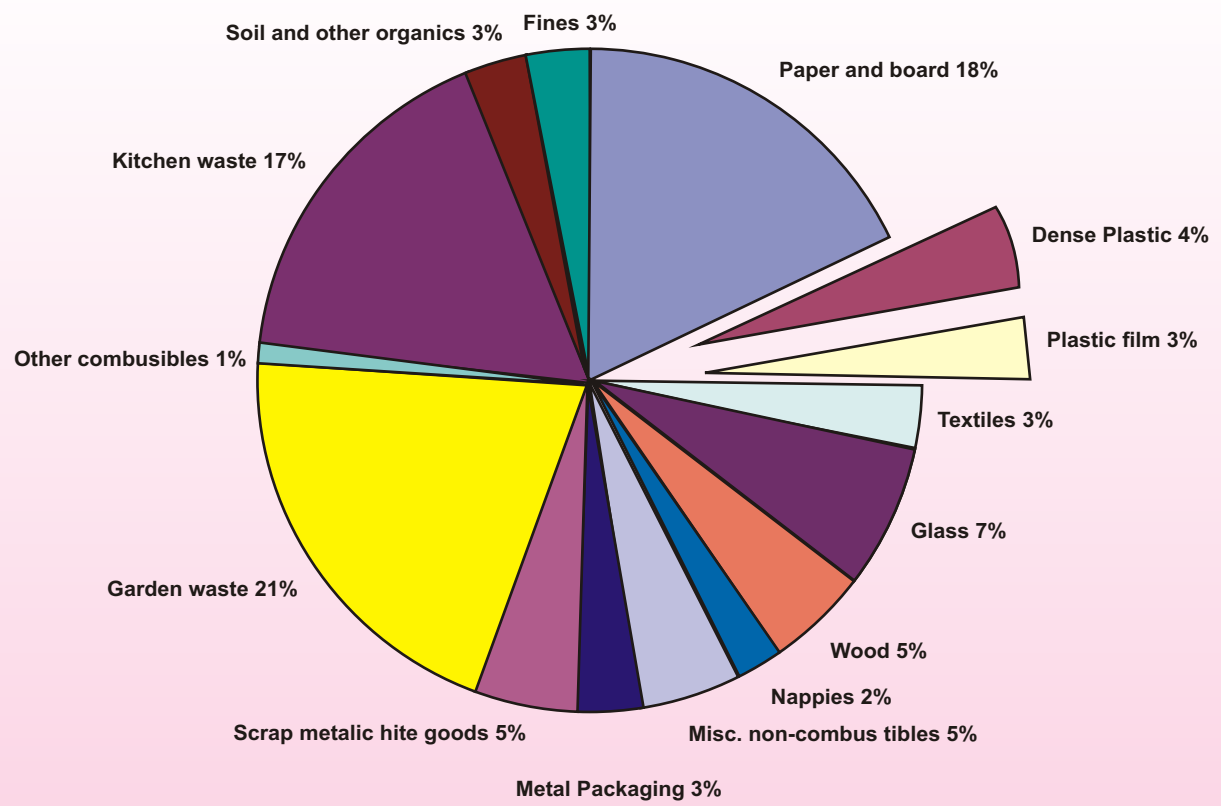
The considerable growth in plastic use is due to the beneficial properties of plastics. These include:

- Extreme versatility and ability to be tailored to meet very specific technical needs.
- Lighter weight than competing materials, reducing fuel consumption during transportation.
- Extreme durability.
- Resistance to chemicals, water and impact.
- Good safety and hygiene properties for food packaging.
- Excellent thermal and electrical insulation properties.
- Relatively inexpensive to produce.

One tonne of plastics is equivalent to 20,000 two litre drinks bottles or 120,000 carrier bags.

Why bother?

Plastics makes up around 7% of the average household dustbin



Source: Analysis of household waste composition and factors driving waste increases - Dr. J. Parfitt, WRAP, December 2002

The amount of plastic waste generated annually in India is estimated to be nearly 3 million tonnes. An estimated 56% of all plastics waste is used packaging, three-quarters of which is from households. It is estimated that only 7% of total plastic waste arisings are currently being recycled.

The production and use of plastics has a range of environmental impacts. Firstly, plastics production requires significant quantities of resources, primarily fossil fuels, both as a raw material and to deliver energy for the manufacturing process. It is estimated that 4% of the world's annual oil production is used as a feedstock for plastics production and an additional 3-4% during manufacture.

A report on the production of carrier bags made from recycled rather than virgin polythene concluded that the use of recycled plastic resulted in the following environmental benefits:

- reduction of energy consumption by two-thirds
- production of only a third of the sulphur dioxide and half of the nitrous oxide
- reduction of water usage by nearly 90%
- reduction of carbon dioxide generation by two-and-a-half times

A different study concluded that 1.8 tonnes of oil are saved for every tonne of recycled polythene produced.

In addition, plastics manufacture requires other resources such as land and water and produces waste and emissions. The overall environmental impact varies according to the type of plastic and the production method employed.

Plastics production also involves the use of potentially harmful chemicals, which are added as stabilisers or colorants. Many of these have not undergone environmental risk assessment and their impact on human health and the environment is currently uncertain. An example of this is phthalates, which are used in the manufacture of PVC. PVC has in the past been used in toys for young children and there has been concern that phthalates may be released when these toys are sucked (come into contact with saliva). Risk assessments of the effects of phthalates on the environment are currently being carried out.

The disposal of plastics products also contributes significantly to their environmental impact. Because most plastics are non-degradable, they take a long time to break down, possibly up to hundreds of years - although no-one knows for certain as plastics haven't existed for long enough - when they are landfilled. With more and more plastics products, particularly plastics packaging, being disposed of soon after their purchase, the landfill space required by plastics waste is a growing concern.

Plastic waste, such as plastic bags, often becomes litter. For example, nearly 57% of litter found on beaches in 2003 was plastic.

Hows, whats and wheres of recycling plastic

Plastics are used in a wide range of applications and some plastics items, such as food packaging, become waste only a short time after purchase. Other plastic items lend themselves to be reused many times over.

Reusing plastic is preferable to recycling as it uses less energy and fewer resources. Long life, multi-trip plastics packaging has become more widespread in recent years, replacing less durable and single-trip alternatives, so reducing waste. For example, the major supermarkets have increased their use of returnable plastic crates for transport and display purposes four-fold from 8.5 million in 1992 to an estimated 35.8 million in 2002. They usually last up to 20 years and can be recycled at the end of their useful life.

According to a 2001 Environment Agency report, 80% of post-consumer plastic waste is sent to landfill, 8% is incinerated and only 7% is recycled. In addition to reducing the amount of plastics waste requiring disposal, recycling plastic can have several other advantages:

- Conservation of non-renewable fossil fuels - Plastic production uses 8% of the world's oil production, 4% as feedstock and 4% during manufacture.
- Reduced consumption of energy.
- Reduced amounts of solid waste going to landfill.
- Reduced emissions of carbon-dioxide (CO_2), nitrogen-oxide (NO) and sulphur-dioxide (SO_2).

Plastic process scrap recycling

Currently most plastic recycling is of 'process scrap' from industry, i.e. polymers left over from the production of plastics. This is relatively simple and economical to recycle, as there is a regular and reliable source and the material is relatively uncontaminated. Process scrap represents some 250,000 tonnes of the plastic waste arisings in India

and approximately 95% of this is recycled. This is usually described as reprocessing rather than recycling.

Post-use plastic recycling

Post-use plastic can be described as plastic material arising from products that have undergone a first full service life prior to being recovered. Households are the biggest source of plastic waste, but recycling household plastics presents a number of challenges. One of these relates to collection. Kerbside recycling systems are required to regularly collect relatively small quantities of mixed plastics from a large number of sources.

Chemical or feedstock recycling

Feedstock recycling describes a range of plastic recovery techniques to make plastics, which break down polymers into their constituent monomers, which in turn can be used again in refineries, or petrochemical and chemical production. A range of feedstock recycling technologies is currently being explored. These include: pyrolysis, hydrogenation, gasification and thermal cracking. Feedstock recycling has a greater flexibility over composition and is more tolerant to impurities than mechanical recycling, although it is capital intensive and requires very large quantities of used plastic for reprocessing to be economically viable (e.g. 50,000 tonnes per year in India).

Degradable plastics

A number of retailers around the globe have recently introduced degradable carrier bags. These bags are made from plastic which degrades under certain conditions or after a predetermined length of time. There are two types of degradable plastic: bio-degradable plastics, which contain a small percentage of non oil-based material, such as corn starch; and photodegradable plastics, which will break down when exposed to sunlight.

There are a number of concerns over the use of degradable plastics. First, these plastics will only degrade if disposed of in appropriate conditions. For example, a photodegradable plastic product will not degrade if it is buried in a landfill site where there is no light. Second, they may cause an increase in emissions of the greenhouse gas methane, as methane is released when materials biodegrade anaerobically. Third, the mixture of degradable and non-degradable plastics may complicate plastics sorting systems. Last but not least, the use of these materials may lead to an increase in plastics waste and litter if people believe that discarded plastics will simply disappear.

Bio-plastics

A number of manufacturers have been exploring alternatives to plastics made from non-renewable fossil-fuels. Such alternative 'bio-plastics' include polymers made from plants sugars and plastics grown inside genetically modified plants or micro-organisms.

Health and safety concerns have arisen over potentially hazardous chemical additives to plastics and consumer pressure has contributed to manufacturers switching to plant-based plastics in such cases. For example, the world's largest toy manufacturer Mattel announced in 1999 that PVC would be replaced with plant-based plastics in new products from 2001 onwards.

Use of recycled plastic

There is a wide range of products made from recycled plastic.This includes polyethylene bin liners and carrier bags; PVC sewer pipes, flooring and window frames; building insulation board; video and compact disc cassette cases; fencing and garden furniture; water butts, garden sheds and composters; seed trays; anoraks and fleeces; fibre filling for sleeping bags and duvets; and a variety of office accessories.

It takes 25 two litre plastic drinks bottles to make one fleece garment.

Despite the wide range of recycled plastics applications, the actual tonnage of waste plastic which is returned to the material cycle is relatively small. Currently, recycled plastics are rarely used in food packaging - the biggest single market for plastics - because of concerns about food safety. A method of addressing this problem is by enclosing the recycled plastic between layers of virgin plastic to ensure the packaging conforms to hygiene standards. These multi-layered containers are now being used in some drinks bottles, but recycling cannot eliminate the colours from plastics so they cannot be used in transparent or light coloured applications.

Another constraint on the use of recycled plastics is that, to be economically viable, plastic processors require large quantities of recycled plastics, manufactured to tightly controlled specification at a competitive price in comparison to that of virgin polymer. This is a challenging task, particularly in view of the diversity of sources of waste plastics, the wide range of polymers used and the high potential for contamination of plastics waste.

What we can do

When we put plastic bottles in recycling banks, or even in bin, WE SHOULD ALWAYS REMOVE THE BOTTLE TOPS. This also enables them to be crushed more easily so they occupy less space. Further we can:

- Choose goods with minimal packaging, and which are packaged in a material that can be recycled or returned in your area.
- Try to reduce the need to throw away plastics. For example, take a reusable shopping bag to the supermarket or corner shop, or re-use the bags you were given last time. Don't accept a bag if you don't need one.

Every year, an estimated 17½ billion plastic bags are given away by supermarkets. This is equivalent to over 320 bags for every person in India.

- Rather than throwing them away, give plastic toys or containers to children's scrap stores or playgroups for reuse.
- Use plastic containers and bags again or make them into something else. For example use yoghurt pots to grow seedlings, use the top part of drinks bottles as cloches for plants and offer clean plastic carrier bags to charity shops.
- Buy products that are refillable.
- Think of ways of reducing the need for packaging. Don't add extra packaging yourself - a melon, a grapefruit or a bunch of bananas already has natural packaging - does it need to go in a plastic bag as well as your shopping bag, and does that already efficiently packaged dairy product or piece of meat really need another wrapper?
- Ask your local authority recycling officers which materials are currently collected or may be collected in the future.
- Look for products, e.g. bin liners and refuse sacks, made from recycled plastic, now available in many supermarkets. Also look out for products packaged in at least partially recycled material. For example, Shell Oil's 1 litre and 4 litre Helix oil packs now contain a proportion of recycled plastic, collected from domestic and industrial waste.
- If it does not already run one, suggest to your local authority that it considers starting a plastics recycling scheme. The development of market opportunities has meant that at the moment demand is outstripping supply of plastic bottles, so new initiatives are needed to feed the process and ensure its success.
- Encourage your local authority to buy products, such as street furniture, made from recycled plastic rather than wood.

Dr. Zareena Begum I
Assistant Professor
Madras School of Economics
zareena@mse.ac.in

Paper or Plastic

Shoppers have the opportunity to make a choice every time they make a trip to the grocery store: paper or plastic? Many consumers may wonder which type of bag is better for the environment. To assess the comparative environmental impacts of each material is not a simple matter; it requires consideration of the inputs of matter and energy throughout each stage of the life cycle of each product.

Plastics are produced from the waste products of oil refining. An analysis of the life cycle of plastic bags includes consideration of the environmental impacts associated with the extraction of oil, the separation of products in the refining process, and the manufacturing of plastics. The total environmental impact depends upon the efficiency of operations at each stage and the effectiveness of their environmental protection measures. Paper is produced from trees; environmental impacts include those associated with extracting timber and processing it for paper products. Again, the environmental impacts depend on whether the timber was obtained from a sustainably managed forest - most industrial timber products come from plantations - and the environmental management of the paper processing plant. Comparatively, plastic bags require less energy to produce.

Both paper and plastic bags have to be transported to stores, which requires energy and creates emissions. In this comparison, plastic is preferable because plastic bags are lighter in weight and more compact than paper bags. It would take approximately seven trucks to transport the same number of paper bags as can be transported by a single truck full of plastic bags.

The disposal of bags entails additional environmental impacts. If landfilled, plastic bags are more environmentally benign than paper, as they require less space; paper occupies approximately half of overall landfill volume. Plastics (not just bags) generate 14 to 28 percent of the volume of trash in general, but because much of it can be compressed, only 9 to 12 percent of the volume of waste in landfills. Although plastics do not biodegrade, modern landfills are designed in such a way that nothing biodegrades, because the waste is isolated from air and water in order to prevent groundwater contamination and air pollution. As manufacturers have continued to make their plastic packaging thinner and lighter to save materials, the percentage of landfill volume taken up by plastics has remained steady since 1970 even as plastics have become more widely used.

Stray plastic bags, which have been estimated at one to three percent of the hundreds of billions that are produced each year, are now found almost everywhere on the planet. Although littering and trash laws in developing countries have significantly reduced the amount of improperly disposed trash, many developing countries have fewer trash receptacles, landfills, and programs to handle the increasing amount of trash.

Plastic bags pose a threat to marine life, because, if ingested, the bags can block the stomach and cause starvation. Sea turtles, for example, mistake plastic bags for jellyfish. In 2002 a minke whale that washed up on a beach at Normandy was found to have 800 grams of plastic and other packaging in its stomach. Stray plastic bags can also clog sewer pipes, leading to stagnant, standing water and associated health hazards. In 2002, Bangladesh banned plastic bags after drains blocked by bags contributed to widespread monsoon flooding in 1988 and 1998. Ireland has decreased plastic bag consumption by placing a consumer tax on plastic bags. Perhaps the most strict plastic bag regulations are found in the Indian province of Himachal Pradesh, where people caught with plastic bags are fined $2000.

Dr. Zareena Begum I
Assistant Professor
Madras School of Economics
zareena@mse.ac.in

Economic Instruments and Plastic waste

The plastic waste has become an active pollution source. There is a real increase of the volume of waste correlated with economic growth. Through the functions fulfilled and the way it was made, the package satisfies the highest demands of the consumers, goods producers and transporters but equally becomes for large urban centres and the environment an active pollution source. Regardless to their origin, the continuously growing quantities of waste are hard to manage, especially in the great urban agglomerations having a negative impact over the environment. In this context, the European countries have resorted to the promotion of a rigorous ambient policy, which treats the environment as being a composing part of the companies' strategy. This strategy named by specialists as proactive combines the three aspects specific to the lasting development: economical, which proposes an efficient management of resources; social, by warning the people, the community about the direction which must be followed; ambient, because of the fact that the environment in which the company is operating is taken into consideration. In this context we discuss the scope in tackling plastic waste by means of economic instruments.

Economic instrument (EI) encompass a mix of policy instruments designed to influence producers and consumers' behaviour. EIs provide market signals in the form of a modification of relative prices (e.g. taxation on certain products) and/or a financial transfer (payment of a charge).They are more flexible, efficient and cost-effective in dealing with plastic waste. Pearce and Turner (1992) show a range of economic instruments for plastic waste in different countries.

A deposit-refund system is essentially a combination of a tax and a subsidy. The consumer of packaging/container materials is given the right to a refund if the concerned person returns the waste product to the seller, i.e. to an authorised recycling/reuse point. The distinguishing feature of the deposit-refund scheme is that it has a clever disclosure mechanism: the refund is paid when the potential polluter demonstrates compliance by returning the item that carries the refund, thus making the monitoring of illegal disposal unnecessary.

Product taxes are common in various countries in the context of plastic bags. Box 1 and 2 present a summary of the policy instruments that have been used to manage the plastic waste problem in developed and developing countries, respectively.

Box 1 : Economic Instruments used for Plastic Waste Management in Developed Countries

Country	Type of econominc instrument	Application
Austria	Deposit-refund	Refillable plastic beverage containers
Germany	Deposit-refund	Plastic beverage containers,
Italy	Product charge	Non-biodegradable plastic bags
Netherlands	Deposit-refund	Products with short life PVCs

Box 2 : Economic Instruments used for Plastic Waste Management in Developing Countries

Country Overview: Nature of problem before application of instruments	Policy Instruments Applied and Mode of Application	Results achieved
The Indian plastic industry is undergoing growth at a rate of about 17%, with the total consumption of plastics being about four million tons per annum. Current estimates put per capita consumption of plastics for India at 4kg/year compared with 80-100kg/year for developed countries. India is reported to have a relatively high plastic recycling rate of 60% as compared to the world average of 20%. The bags responsible for creating most of the littering in India have thickness of 5-10 microns.	Ban on use of plastic bags and containers made of recycled plastic for storing, carrying, and packaging of foodstuffs Technology standard that demands bags for storing, carrying, and packaging of foodstuffs be in their natural shade or white Minimum Thickness Standard of 20 microns on plastic bags made of virgin- or recycled material. Technology standard that requires carry bags and containers made of recycled plastic and used for purposes other than storing and packaging foodstuffs be manufactured using pigments as per Bureau of Indian Standard (BIS) specifications. Manufacturers of recycled plastic carry bags are required to mark them according to BIS specifications, including stating the percentage of recycled material used. Since provinces in India are empowered to take measures independently, some states tried to address the plastic waste menace by formulating their own initiatives.	The minimum thickness standard of 20microns on bags alleviated the 'fluttering' problem but not littering. The 20microns bags remained unattractive to the waste pickers and continued to litter. Success has been achieved in discouraging coloured bag use in food packing. Re-use of plastic bags by consumers has not become habitual. The desired fall in wasteful consumption has not been achieved. In general, the policy instruments had an inherent limitation in bringing about waste and litter minimization as they primarily sought to achieve this by promoting re-use and recycling. On the contrary, the root causes of littering, namely profligate consumption, indiscriminate use and disposal and effective waste management system were not adequately addressed. However, some improvements in recent years have been reported in cities and towns that have initiated strong anti-litter programs.
Before introduction of the policy instruments, the plastic bag littering problem in South Africa was so grave that the bags had come to be known as new national flowers competing with the true national flower, protea.	Minimum Thickness Standard. Ban on the manufacture, trade and commercial distribution of plastic bags made of plastic film for use within South Africa and having a wall thickness of less than 30microns A levy. Plastic bags attract a levy of 10 Rands (1.7 USD) per kilogram. The	Before the regulation, the cost of plastic bags was hidden in food prices; hence, even if consumers did not get a bag, they were still made to pay for it. With more transparency and consumers now given the choice to buy a bag or not, it is reported that consumers benefited from lower food prices.

About 8 billion plastic bags are consumed annually in South Africa; of this, large retailers account for 2.6 billion and smaller retailers the balance.

levy is targeted at the manufacturers who are expected to pass it on to the consumers. The revenue collected is targeted to, among other environmental projects, the establishment of a plastic bag recycling company.

A legal instrument providing penalties for non-compliance, i.e. any violator is made liable to (1) a fine of South African Rand (R) 100 000, or (2) imprisonment for a period of up to ten years, (3) or both; and (4) a fine not exceeding three times the commercial value of the good to which the offence was linked.

Technology Standard that stipulates a 'recyclable-friendly' ink to be used for marking and printing of plastic bags and whose quantity, on dry basis, should not be above 2.25% of the weight of the bag. The regulation applies to plastic bags given to a shopper at the point of sale (secondary packaging) and hence excludes bags used for primary packaging of loose goods, e.g. rice, flour, etc

The coming into force of the regulation resulted in a drop in wasteful consumption of bags, especially in stores where bags are charged for.

The regulation also improved public understanding as the negotiations were given wide coverage in the national and international media. Although this was not intentional, it reportedly contributed to increased environmental awareness and a significant reduction in profligate consumption of bags.

A package of instruments, including command and control, economic and information based instruments rather than a single economic instrument is more viable in dealing with plastic waste. The levy or tax can be properly related to environmental damage impacts by the incorporation of average costs for waste disposal and litter collection costs. Moreover a comprehensive education and awareness campaign is very crucial to cope up with plastic waste.

Reference:

Pearce D and Turner R.K(1992): Market Based Approaches to solid waste management, CSERGE Working Paper WM 92-02.

Dr. Sukanya Das
Lecturer
Madras School of Economics
sukanya@mse.ac.in

News To Know

Why to avoid plastics

- They're made from petroleum, a non-renewable resource.
- Their production releases toxic chemicals into the environment.
- Hormone-disrupting chemicals can migrate from some plastics into food, water, air and our mouths.

How to avoid plastics

- Microwave in ovenproof glass or ceramic. Never let plastic wrap touch heated food.
- Replace plastic travel mugs with stainless steel for hot beverages.
- Store food in glass, ceramic or stainless steel.
- For wrapped foods, best choices are butcher or waxed paper, or wood-based cellulose bags (available from Seventh Generation).
- Avoid plastic cutlery, dinnerware and styrofoam cups. Invest in reusable metal utensils and enamel picnicware or look for recycled paper products.
- Bring your own take-out container to salad bars, delis — wherever they serve with plastic
- Bring your own cloth totes (or reuse plastic bags) when shopping.
- Buy in bulk. Avoid singe-use disposable packaging.

Choose safer, sounder plastics

- When you can't avoid plastic, check container bottoms for recycling codes (in triangle with chasing arrows). Choose those easily recycled in your area, usually: #1 (PETE) and #2 (HDPE).
- Choose non-PVC cling wrap (GLAD® and HandiWrap™)

Avoid the worst plastics

- Avoid PVC vinyl; its manufacture and incineration releases toxic dioxins into the food chain.
- Avoid plastics that leach hormone-disrupting chemicals, including #3 (PVC), #6 (PS) and #7 ("Other", often polycarbonate).
- Avoid plastics that are not very recylable: #3 (PVC), #4 (LDPE), #5 (PP), #6 (PS), #7 (Other).

Cracking Down

Some countries are cracking down on the use of plastic bags. Here's a look at the issue:

- About 500 billion to 1 trillion plastic bags are used worldwide every year, according to Vincent Cobb, founder of reuseablebags.com.
- Countries that have banned or taken action to discourage the use of plastic bags include Australia, Bangladesh, Ireland, Italy, South Africa and Taiwan. Mumbai (formerly Bombay), India, also has banned the bags.
- Australians were using nearly 7 billion bags a year, and nearly 1.2 billion bags a year were being passed out free in Ireland before government restrictions, according to government estimates.
- Plastic industry trade associations were unable to provide estimates of plastic bag use in the United States. However, based on studies of plastic bag use in other nations, the environmental group Californians Against Waste estimates Americans use 84 billion plastic bags annually.
- The first plastic sandwich bags were introduced in 1957. Department stores started using plastic bags in the late 1970s and supermarket chains introduced the bags in the early 1980s.

❑ Overall, the U.S. plastics and related industries employed about 2.2 million U.S. workers and contributed nearly $400 million to the economy in 2002, according to The Society of the Plastics Industry.

Forthcoming Conferences on the theme PLASTIC

The 4th Plastics Technology Applications in Consumer Electronic Products Conference
17 – 18 September 2009
Jianguo Hotel Guangzhou

Plastic Pressure Pipes 2009
05-07 October 2009
Maritim Hotel Cologne, Germany

5th Global Plastic Electronics Conference and Showcase
26-28 October 2009
Maritim Hotel & Conference Center, Dresden, Germany
http://www.plastic-electronics-europe.com/

Wood Plastic and Natural Fiber Composites Conference 2009
26-27 October 2009
Marriott Baltimore Waterfront Hotel, Baltimore, Maryland
http://www.principiaconferences.com/conferences/conference.php?confID=17

IPCC Chief Dr. R.K. Pachauri at Madras School of Economics

IPCC chief R.K. Pachauri (left) delivering the first R. Venkataraman Endowment lecture, organised by the Madras School of Economics

On April 11, 2009 Dr. Rajendra Kumar Pachauri, Chairman, IPCC, Director-General, TERI delivered the first **R. Venkataraman Endowment lecture on** "Climate Change and Economic Development in the 21st Century" at Madras School of Economics. The function was presided by Dr. C. Rangarajan, Honorable Member of Rajya Sabha, Chairman, Madras School of Economics. Prof. D.K. Srivastava, Director, Madras School of Economics invited Dr. R. K. Pachauri and the guests for the special

lecture series. He suggested that the government needed to promote renewable energy with incentives, subsidies and a large R&D budget, while slapping taxes on polluting industries, including a tax on road space.

Delivering the first R. Venkataraman Endowment Lecture Dr. Pachauri said that the government needed to re-orient its public policy to focus on public transport options, rather than indiscriminately providing sops to small cars. "It is not the size of the car that matters, but the emissions," he said, adding that the government had adopted some suggestions on tailoring the tax on cars to reward those with lower emissions.

He further added that apart from what steps the government takes, it is up to industry to see the potential opportunities in building a climate-friendly world. Indian industry "needs to look beyond Copenhagen," he said. "They need not wait for a government commitment. They should look at the opportunities they will get in five or ten years from now, and make appropriate investments and decisions now."

Globally, the cost of mitigation would be 3 per cent of the world's GDP by 2030, said Dr. Pachauri, making it clear that the costs of ignoring the issue would be much greater. In India, wheat yields could fall 5 to 10 per cent for just one degree rise in temperature. A rise in sea-levels by just one metre would inundate 5,763 square km of coastal regions in the country, he said. Unfortunately, "social and environmental issues are often left without effective support when economic growth takes precedence," he added.

Visit our website: http://envis.mse.ac.in/