

A SCENARIO ON PLASTIC SHOPPING BAGS: ISSUES CONTINUE...

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Abstract: Human beings were using tools made from stones in their early civilization. The tools were then changed to metal: heavy, bulky, and inconvenience. The later material, called plastic, was invented as early in 1930s by Americans, British, and Germans. Plastic is widely used today in many applications (from the cheapest to the most expensive, and the simplest to the most sophisticated). The plastic bag: polyethylene (polythene) (HDPE and LDPE), other important type of plastic, is cheap, flexible, durable, convenience, and chemically resistant. However, their use and disposal contribute negative impact to environment and reinforce the perception of a wasteful society. Plastic bags as litter, create pollution problems to human beings, animals, and environment. The issues have become major concerns around the world. Suggestions to minimize the impacts of using plastic bags including the 6R approach, applying other alternative, educating people (with environmental knowledge, awareness, skills) and applying citizenship actions effectively.

Keywords: Plastic shopping bags, Polyethylene (HDPE and LDPE), Durable, Convenience, Pollution, Participation

INTRODUCTION

The use and disposal of plastic shopping bags, both consumers and through waste management activities, not only create environmental problems, but also reinforce the perception of wasteful society. Plastic bags litter creates a visual pollution problem, and affect land and aquatic wildlife, while the heavy reliance on “disposable” plastic bags by the consumers raise questions of resource consumption and efficiency.

The present media debate on plastic bags use has been invigorated by reports coming from countries like Australia, Bangladesh, India, Canada, Ireland, Japan, Korea, Nepal, New Zealand, Taiwan, America, to name a few, concerning the apparent success of the plastic shopping bag levy, for recognizing the reduction in using of plastic bags. Many governments and non-government organizations (NGOs) establish experts working groups to provide a range of options for reducing the environmental impacts from using plastic bags.

A Brief History of Plastic

Plastic was discovered early in 1930s. A German scientist, Hermann Staudinger, discovered the first synthetic rubber, known as “neoprene”—highly resistant to heat and chemicals, such as oil and gasoline. In 1933, two chemists, Eric W. Fawcett and Reginald O. Gibson, working at the British Imperial Chemical Industries Laboratory, discovered another type of plastic known as polyethylene (also called polythene), what is now used as shopping plastic bags. This plastic is cheap, flexible, durable, and chemically resistant. Today, plastic is widely used in many applications. Our whole world seems to be wrapped in plastic. Almost every product we buy, most the foods we eat, and many of the liquids we drink encase in plastic. In short, plastic is used from the cheapest to the most expensive and from the simplest to the most sophisticated applications in our life.

Types of Plastic Shopping Bags

Plastic bags are made from polyethylene, $-(CH_2CH_2)_n-$, polymers or chains of ethylene molecules, produced as a by-product of oil, gas and coal production. Polyethylene, also known as polythene, is

made into pellets, used by plastic manufacturers to produce a range of items, including plastic shopping bags.



Figure 1: Plastic bags LDPE

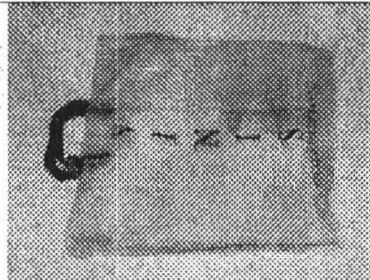


Figure 2: Plastic bags HDPE

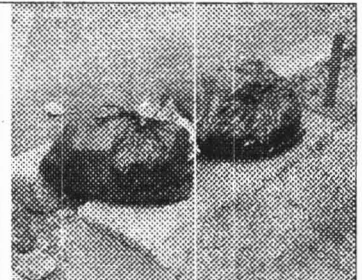


Figure 3: Black plastic bags

Two types of plastic shopping bags used in retail sectors are: (i) the 'singlet' type bag made of low density polyethylene (LDPE); and (ii) the 'boutique' style bag, made of high density polyethylene (HDPE). The LDPE plastic bag (Figure 1) is usually non-branded, used in supermarkets, take away food and fresh produce outlets. They are also used in smaller retail outlets (e.g.: service stations and newsagents). In contrast, the HDPE boutique style bags are branded and used by stores selling higher value goods (like department stores, clothing, shoe outlets, perfume outlets, etc.) (Figure 2). Plastic shopping bags are light, sturdy and easy to carry. They also have other advantage of preventing foods from leaking and are cheaper than paper. They have the potential for reuse in the home. When they are compacted, they take up less space in landfills [2].

The Issues

Two major issues related to plastic shopping bags are always on debate. The first issue is related to environment, and the second one is to social issues.

A. Environmental Issues

Littering

The environmental issues associated with plastic bags littering have been around for years. Litter studies showed that plastic bags are generally in the top twenty litter items counted. Data collected by the National Pollutant Inventory Perth Airshed Emission Study, 1988/99 during the Campaign of Clean Up Australia and Australia Beautiful suggested that plastic bags comprise around 2% of litter collected. Although this is a small portion, by their nature plastic bags are very visible component of the litter stream [5].

Litter can either be deliberate or inadvertent. The Nolan-ITU report showed that (i) 20-30 million bags were inadvertently littered from waste management activities (e.g.: landfills and garbage bins at shopping centers), and (ii) 30-50 million bags were littered away from home (both deliberate and inadvertent). Plastic bags lend themselves to inadvertent litter due to their lightness and ability to 'balloon' with wind (as a result of animal interactions with garbage bins). Litter associated with waste management activities is associated with unloading operations at landfills. The Nolan-ITU also reported that people litter between 30 and 50 million plastic bags each year, compared to 20 to 30 million bags inadvertently littered (Figure 4) during waste disposal. People tend to litter in the areas like beaches (Figure 5) and coastal sites, waterways, national parks, visitor centers, sporting venues, urban areas, and also along highways (Figure 6) [5].



Figure 4: Landfill

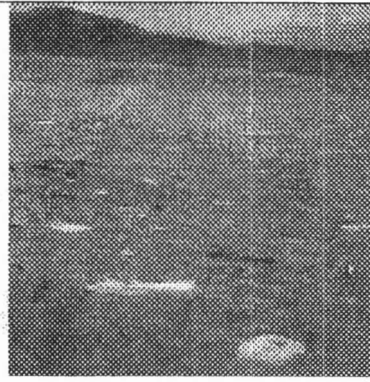


Figure 5: Floating plastics

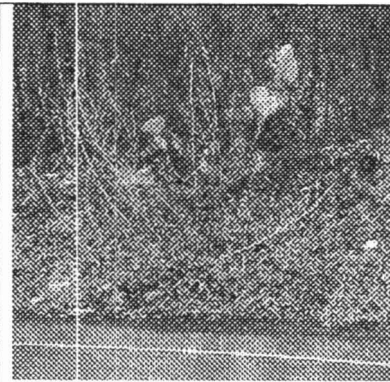


Figure 6: Highway littering

Plastic bags are more noticeable in the litter stream because of their size and difficult to break down. Plastic bags appear in the litter stream. The two most noticeable examples are littering in Sungai Penchala, Malaysia (Figure 7) [10] and Thames River in England (Figure 8). This is the result of both inadvertent and intentional littering behaviors. Inadvertent litter is usually associated with windblown litter from disposal routes such as litterbins and landfill sites. Intentional litter results from inappropriate disposal actions by consumers.

Waste Disposal

Plastic bags are a significant pollutant. Majority of them are disposed of in landfills (Figure 4). Numerous studies, like in Australia, indicated that 75% of people surveyed re-used shopping bags as 'free' bin liners which end up in landfills [5]. Bags reused for other purposes are also likely to enter the waste stream and end up in landfills. The major problem with plastic bags is that they do not readily break down in the environment. The estimate of decomposition time is ranging from 20 to 1,000 years [5]. However, people are talking about alternative of using other type of plastic bags, as the newer technology being developed. This entails the use of degradable type of plastics bags. The principal is to incorporate into plastic some chemical that is photodegradable or biodegradable or chemically treatable [4]



Figure 7: ...Sungai Penchala

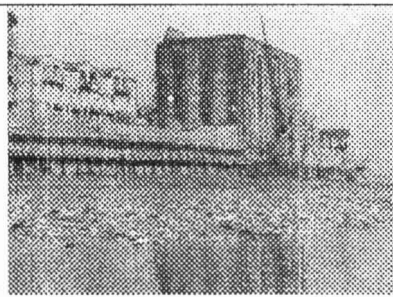


Figure 8: ...Thames River

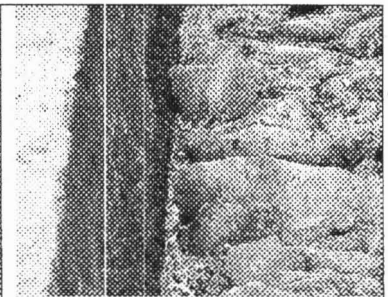


Figure 9: Clogged drain

Plastic bags also clog drain (Figure 8), waterways, threatening natural environment, and urban areas. In fact, plastic bags in the drains were identified as the major factors in the severe flooding in Dhaka, Bangladesh in 1988 and 1998 [10]. As a result, there has been a chorus of demands for a complete ban on using plastic bags. The ban on plastic bags was imposed as early in 2002 [8]. In additional case, Kuala Lumpur was hit by flash floods quite many times, the recent being in June 11, 2003 [9]. On top of the significant environmental costs, widespread use of plastic shopping bags is also costly in terms of dollars and cents. Apart from the price of the bags themselves, a great deal of money goes into collecting or cleaning the bags once they have been discarded.

Marine and Animal Injuries

The impact of plastic bags is nevertheless significant, particularly to aquatic life and in the loss of visual amenity [6]. They kill large numbers of wildlife each year through entanglement, suffocation and ingestion. Plastic bags can be mistaken for jellyfish. This makes plastic bag pollution in marine environment particularly dangerous, as birds (Figure 10), seals, turtles (Figure 11), and whales ingest

the bags then die from intestinal blockages. Some disturbingly, plastic bags are claimed as the most common man-made item seen by sailors at sea [8].

In 1995, the *State of the Marine Environment Report* found that pollution originating from Australia continent contributed up to 80% of all maritime pollution and was a major threat to the long-term health of near-shore marine system. There are also concerns relating to aesthetic (Figure 12) and health issues from materials washed onto shorelines and inshore areas, and to the impacts on aquatic life interacting with increasing amounts of non-biodegradable and possibly toxic substances [5].

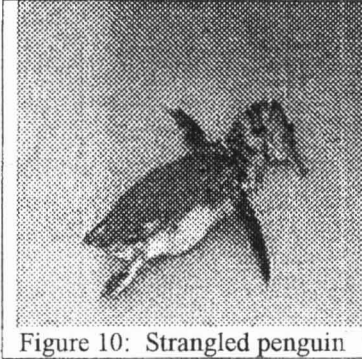


Figure 10: Strangled penguin

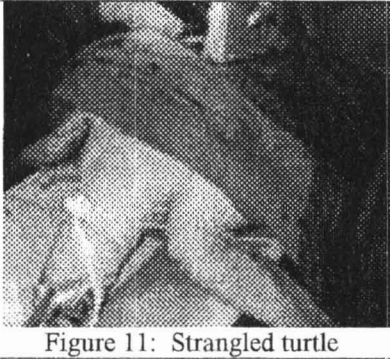


Figure 11: Strangled turtle



Figure 12: Dirty beach

Health

Environmentalists claim that the most dangerous feature of plastic is its toxicity, with black colored polythene bags (Figure 3) being the worst offenders. Several cities in neighboring India banned black plastic bags because of their toxicity. For example, entire Indian states like Himachal Pradesh and Sikkim, which border Nepal and depend on tourism revenue, strictly enforce bans on plastic bags and even fine shopkeepers, if any are found on their premises. According to activists in India who prevailed on their environment ministry to encourage the use of virgin transparent plastic, because colored plastic bags contain harmful toxic metals, like chromium and copper, which can cause allergies [10].

B. Social Issues

Plastic bags are popular with consumers and retailers. They are a functional, lightweight, strong, cheap, and hygienic way of transporting foods and goods. Despite this popularity, there appears to be widespread public concern that plastic bags are 'bad.' Many talks about environment, publics expressed concerns on a range of issues, including suggestions for alternatives and the kind of alternatives they were currently using, and suggestions for other types of plastic packaging be considered [1,4,5].

Data collected by *Clean up Australia 2001* during the Bag Yourself a Better Environment Campaign 2001 indicated that 92% surveyed said the effect of plastic bags on wildlife was a major concern (75% for landfill and 86% on rubbish). The majority respondents perceived that they were likely to use an alternative (72%), reuse plastic bags (63%), or recycle plastic bags (64%). Several reasons can be used to justify this communal targeting of plastic bags above the range of other packaging materials. They are at high volume 'add-on' packaging designed as a single use or disposable product and are not necessarily essential to product integrity. Plastic garbage can also be costly for recreational boaters and the fishing industry. Rope and plastic materials, like plastic bags, may get caught in propeller shafts or block water intakes causing major damage, expensive repairs and loss of income while vessels are repaired.

Other social issue is that plastic bags (HDPE) are the most widely and commonly used. Their high visibility (white, pale, or other color), and the extent to which their use has pervaded society, is perceived as a symbol of the 'wasteful society.' Given those alternatives are readily available, however, and the recycling collection systems have been in place, it is interesting that the majority of consumers continue to use the equivalent of one new plastic bag per day whilst complaining that 'someone' should do something about the issue.

DISCUSSIONS

The pros and cons about plastic bags used have been discussed on and on without definite solution. At one side, it is said that using plastic shopping bags is 'good' but on the other hand; it is considered 'bad' because it poses problems in life. Several issues related to these problems are viewed by many.

The Australian National Plastic Bags Working Group 2002 identified four main areas of concern related to plastic bags. They are (i) plastic shopping bags littering, (ii) resource consumption issues, (iii) plastic degradability issues, and (iv) social issues. Brief discussions on the issues are as follow.

i) Plastic shopping bags littering

The Plastic Bags Working Group 2002 recommended several actions related to plastic bags littering and consumer behavior. As indicated earlier, plastic bags littering is associated with indiscriminate waste disposal. They are light and easy to be carried or blown away by wind or interactions of animals from rubbish bins, ground or landfills [5]. Consumer positive behavior or attitude is important. People need to be environmentally educated. They should not litter plastic bags to the ground or anywhere they like. Appropriate disposal facilities should be equipped at the major recreational areas (e.g.: beaches, coastal sites, waterways, national parks, and major visitor spots), so that people can dispose their garbage, especially plastic bags, at proper places. The need to aware and care should be instilled. Positive skills have to be provided, and negative behavior should be prevented. People must be more concerned on the consequences of littering plastic bags to environment.

The *National Plastic Bags Working Group 2002*, Nolan-ITU estimated that about 6.9 billion bags (HDPE and LDPE) or 36,850 tons of plastic polymers, equivalent to 2.5% of the total plastic consumption, are consumed each year in Australia alone. HDPE and LDPE are manufactured from ethylene (a by-product of gas or oil refining), a non-renewable resource. The energy consumed in manufacturing process of one HDPE singlet bag plus the energy content of the bag is equivalent to (a) fuel consumed by driving a car 1 km is equivalent to 8.7 bags; and (b) fuel consumed by driving a 28 tons articulated truck 1 km is equivalent to 64.6 bags. In comparison, the making of plastic bag uses up to 40% less energy, produces up to 80% less solid waste, 72% less atmospheric emissions and 90% less waterborne waste, than a paper bag. Since plastic bags are lighter than paper bags, therefore, less fuel is used in distributing the plastic bags [3,5].

ii) Resource consumption issues

The other alternative to minimize the problems associated with plastic wastes is so called "6R-approach", that is reduce, reuse, recycle, react, reject and recovery towards plastic bags, whenever possible.

The *first "R is reduce*, means the practice of decreasing consumption of single-use items, disposables, and over-packaged products. Reducing the use of plastic bags can lessen the litter, harmful impact to wildlife, and the surrounding. The Nolan-ITU report had noted that due to the usefulness, they are used beyond their 'single' use design. Many plastic bags can be re-used for other purposes. Reuse applications include the use of plastic bags as waste bags or bin liners, lunch bags and general carry bags for gym or pool gear or other such uses. Reduction in the amount of raw materials used to make plastic is the first step towards minimizing overall plastic waste. The growing use of plastics in today's packaging is up to 80% lighter than of 20 years ago. This means that less energy is used in their manufacture and transport. An example where source reduction has been successfully achieved was the introduction of refill packs for detergents, which resulted in a 70% reduction in materials used.

The *PACIA National Plastic Recycling Survey 1992* indicated that 85% of people **reused** (*second "R"*) plastic shopping bags for some applications in everyday life. These include the use of (i) plastic bags as bin liners, (ii) ice cream containers for freezing our food, (iii) soft drink bottles for storing water in the car, and (iv) refills in the supermarket. Reusing plastic items gives them a longer life and reduces the total volume of waste. In supporting the campaign, the Quantum Market Research survey (2002) reported that 75% of people reused shopping bags as bin liners or waste bags, with other reuses on top

of this again. The Nolan-ITU also reported that it is likely that approximately 60% of people with 3.68 billions plastic bags are being reused in some homes for a variety of purposes [5]

The *third* "R" is **recycle**, involves collecting, processing, re-manufacturing, and marketing the materials in their original or new forms. It appears that plastic bags can be reused. It also a way to reduce the problem associated with plastic wastes. Many plastic bags do not lend themselves to recycling owing to contamination with food and ink. The cleaning prior to recycling is very expensive. For example, packaging recycling has cost Germans about DM3 per kg. Furthermore, reprocessing often leads to a downgrading of the polymer use and an increased hold-up in the system. A lack of market for recycled polymers has to large stockpiles and the dumping of waste products in other countries. Recycling of plastics is well established in Australia. The PACIA *National Plastic Recycling Survey 2002* showing an overall recycling increase from 11% in 2000 to 13.1% in 2001 [5].

The *fourth* "R" is **react**, involves in decision making towards using plastic bags. The *fifth* "R" approach involves rejecting products that do not meet consumer's environmental standards. In this particular issues, consumers **reject** not to accept in using plastic bags during shopping, instead, they can either bring their own cloth sling bag from home or request for a recyclable paper bag. This approach involves respond to retailers and manufacturers about their products and to politicians about their policies.

The *sixth* "R" is **recovery** (of energy). There are some plastics that cannot be recycled mechanically (e.g.: contaminated medical waste, food packages, personal hygiene and other packaging products like confectionery wrappers) would be uneconomic to recycle or would use more energy in the collection, sorting and cleaning than would be saved by recycling. In many parts of the world people recover the energy value from plastic. Because it comes from natural gas and crude oil, it makes sense to use it as an oil or coal substitute when it has finished its life as packaging etc. This conserves the energy resources of the world, reduces greenhouse gas emissions, and therefore practices source reduction another way! Energy recovery involves the collection of solid waste to be burned at high temperatures to produce energy for power and heating [6]. These facilities are commonly known as Waste to Energy plants. Environmentally sound Waste to Energy facilities are in place in many parts of Europe and Japan and modern plants have emission profiles enabling them to be safely operated in close proximity to major population centers. It is expected that more than 50% of waste plastics in Europe will be subject to energy recovery processes by the year 2000. Plastics in effect borrow energy from the oil and gas stream, and then return it when used as a fuel in waste to energy conversion

iii) Plastic degradability issues

Claims have been made that some bags are degradable, or they will decompose over time. Biodegradation takes place when air is present. There are three types of biodegradable plastics, namely photodegradable, starch-linked, and "bacterial" plastics [7].

Photodegradable plastics are advantageous because extensive ultraviolet radiation can disintegrate their polymeric structure rendering them open to further bacterial degradation. The problem with this is that many landfills lack sunlight, therefore, their structure remains unaltered and non-degradable. Garbage, including plastics, is buried beneath layers of soil that makes it difficult for air or sunlight to reach discarded items. The fact is that most plastic bags just don't degrade, even in a compost pile [2,7].

In an effort to overcome the problem, biochemical researchers and engineers have long been seeking to develop biodegradable plastics that are made from renewable resources (like corn-starch). The starch-linked plastics is able to break down into simpler substances by the activities of living organisms, and therefore, unlikely to persist in the environment. However, other issue arises for starch-linked plastics is that they are often weaker than regular plastics. Therefore, more polyethylene has to be used, thus increasing the amount of non-degradable materials. Furthermore, they are about 2 to 10 times more expensive than traditional plastics. On the other hand, environmentalists argue that the cheaper price of traditional plastic does not reflect their true cost when their full impact is considered. For example, when we buy a plastic bag we don't pay for its collection and waste disposal after we use it. If we added up these sorts of associated costs, traditional plastics would cost more and biodegradable might be more competitive[2,7].

The other type of biodegradable plastic, known as “bacterial” plastics, is rather new and interesting because of its actual utilization of bacteria to form biopolymer or granules of a plastic called polyhydroxyalkanoate (PHA) inside their cells. Bacteria are simply grown in the culture, and the plastic is then harvested. Scientists have to take genes from these bacteria and stitch them into corn plants, which then manufacture the plastic in their own cells. Unfortunately, producing PHA plastic is even more expensive, as yet, it is not having any success in replacing the widespread use of traditional petrochemical plastics [2,7]

iv) *Social issues*

Plastic bags are popular because they are a functional, lightweight, strong, cheap, and convenience. However, this popularity appears to become a public concern for littering activities. The Nolan-ITU report indicated that between 20-50 million bags were littered. Most of these bags are scattered on the ground, along beaches, coastal sites national parks, visitor centers, sporting venues, urban areas, and also along highways[5]. In addition to that, plastic bags will also clog drains and thus block the water flow. As a result, flood will occur and disturb people living areas, or elsewhere.

CONCLUSIONS AND RECOMMENDATIONS

Numerous studies have been funded and conducted, and recommendations have been made that steps need to be taken to minimize the problems from using plastic shopping bags. However, the issues from using plastic shopping bags are still on and unresolved. Looking back to the issues discussed above several conclusions can be made.

- i. Plastic shopping bags are popular to consumers and retailers. On the good side, they are a useful, multi-purpose functional, lightweight, strong, cheap, convenience, and hygienic way of transporting food and goods.
- ii. Plastic are used in every single activity of our everyday life, from the simplest to the most sophisticated, and from the cheapest to the most expensive.
- iii. Despite the popularity, however, there appears that plastic bags are ‘bad.’ Several issues, specifically, (a) environment, (b) health, and (c) social, are of concerned by publics related to plastic shopping bags.
- iv. Approaches are being sought to solve the problems. One alternative to minimize the problems associated with plastic wastes is so called “6R-approach” (i.e.: reduce, reuse, recycle, react, reject and recovery). Reduce involves decreasing the use of plastic bags; reuse involves using the materials over and over, over time; recycle involves collecting, processing, re-manufacturing, and marketing the materials in their original or new form; react involves making decision, and then responding through action by rejecting to retailers and manufacturers about their products, and recovery involves in getting the energy value from plastics that cannot be recycled mechanically, such as contaminated medical waste, food packages, personal hygiene products and many other packaging products

An integrated approach is most likely to be the most effective way in tackling the problems aroused from plastic shopping bags. This approach needs to be fully supported by industry, retailers and consumers, and government and non-government organizations. The conclusions resulting from the problems and issues, suggest several recommendations.

- i. Provide publics with education on environment that includes goals for knowledge, awareness, training skills, and positive participation.
- ii. Plastic shopping bags are used almost in everyday life. They are useful, cheap, and convenience. That is fine, however, encourage public to appropriate waste disposal behavior (anti-littering). Investigate current and future landfill waste management with the view to developing specific national best practice guideline to reduce litter and pollution caused by plastics.
- iii. Promote “6R program” through reducing, reusing, recycling, reacting rejecting and recovery behavior toward plastic bags. Encourage consumers and retailers to shift from single use and disposable bags to multi-use and long life bags through education and awareness programs, and by coordinating the collection of information on plastic bags alternatives and making this available to the public.

- iv. Campaign on reusable plastic bags through various communications from governments, non-government organizations, retailers, and consumers.
- v. Promote marine and land-based awareness, skills, and participation on littering, and pollution.
- vi. Investigate legislative options and scopes.
- vii. Conduct further research on all aspects: goods and bads, of plastic bags.

The true effectiveness in solving the problems arising from the plastic bags usage is unfinished, however. The ideas are suggested and the recommendations are long listed. However, the issues are still far from ending. Thus, the problems caused by using plastic bags continue....

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