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Research Article

Plastic Waste Management Strategies for Indian Cities

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ABSTRACT

Plastics have been used extensively in both food and water packaging because of their inherent properties such as low bulk densities and inertness that make them convenient carrier materials and low risk contaminants. Plastic bottles and sachets used to package iced water that is sold to people in transit points and in moving vehicles have become widespread in the Andhra Pradesh. However, the packaging revolution has not been correspondingly backed by appropriate plastic waste management policy, which has left many cities in India littered with plastic wastes; thus, creating disgusting visual nuisances and other public health problems. The paper discusses the experiences, challenges and prospects of plastic waste management in Andhra Pradesh and proposes a new model of fractional levy and polluter tax system to address this environmental eye sore. It is concluded that the current rate of environmental deterioration is likely to persist unless a long term remedial such as the polluter taxation system is carefully worked into plastic wastes management schemes in India.

Keywords: Plastic waste, polluters pay, management, environment, pollution, stakeholders

INTRODUCTION

Over the last few decades there has been a steady increase in the use of plastic products resulting in a proportionate rise in plastic waste in the municipal solid waste streams in large cities in India⁵. The adoption of a more hygienic mode of packaging food, beverages, “iced water” and other products brought plastic packaging to replace the existing cultural packaging methods (leaf wrappers, brown paper and metal cup uses) in cities and towns². This widespread replacement of the modes of packaging with plastics is an indication of the uniqueness of plastic properties such as versatility, inertness and flexibility, especially in the application areas of packaging. As a result of their unique properties, plastics have become the most favored packaging materials in commerce with firms making windfall profits and transferring the environmental cost associated with cleaning plastic waste on the general public. The factors that tend to increase the per-capita and total amount of wastes as well as their constituents in waste stream include increased population, increased levels of affluence, changes in life style, changes in work patterns, new products, redesign of products, material

substitution and changes in food processing and packaging methods¹. Cooked food is also sold on the way side and in canteens or restaurants usually sited in open spaces near work places, offices, churches, markets and schools. The food is sold to passers-by who will usually accept the food wrapped in leaves, brown paper and/or plastics. The packaging materials are most often dumped anywhere at the convenience of the population since there is usually no mechanism that allows proper disposal of these materials after consumption of the cooked food. This gave rise to indiscriminate dumping of various materials ranging from leaf wrappers through paper to plastics. But paper and leaves easily degrade in the environment whilst the plastics do not. In the past two decades, plastics have become the most favored materials in food and water packaging industry and contributing to the large rise in their proportions in the waste streams in the cities.

AN OVERVIEW OF PLASTIC USE AND PLASTIC WASTE MANAGEMENT IN ANDHRA PRADESH

It is a common phenomenon in many Sub Asian countries to have places where food and drinking water are sold to the general public cited in the open space. This is usually anywhere near offices, market places, public schools, churches and in any available open space in the central business districts (CBDs) within the cities³. The most common of this kind of trade is that practised by vendors of drinking water and food who use walkways and pavements as the premises of their businesses to market their merchandise to people in moving vehicles. In the late 1970s, it became apparent that easy spread of such food and water borne diseases as typhoid, cholera and dysentery in events of epidemics were intricately associated with these cultural practices in food and water industry. This discovery imposed a safety requirement on street vendors to institute new ways of food and water handling that would be safe and healthy so as to minimise the risk of disease episodes associated with the marketing of cooked-food and drinking water.

The growing awareness in safe and proper modes of food packaging as well as increased need for more hygienic methods of handling drinking water to safeguard public health triggered off a decade of tremendous increase in the use of plastic products in India. However, packaging process dates back to medieval times when in those days packaging was perceived as a simple process of wrapping with leaves and tree barks. Historically, it has undergone considerable revolution over the centuries and trans-gressing from the simple process to more sophisticated industrial packaging technology today. Packaging finds application in all spheres of human endeavours, notably in food industries and in product transport. Various packaging standards exist, but the most fundamental requirement or goal of packaging is sustaining life span of the products that are packaged. In the food industry, an additional requirement of packaging is the maintenance of food products in wholesome and high hygienic conditions. In those olden days, food products were carried in leaves from markets and from commercial centres, in palm fronts and in banana leaves from farms in the rural areas. Until as late as in the 70s, leaves were still used as packaging materials in the sale of food by wayside food vendors in the major cities across the sub-region⁷.

Much later in the late 1980s and early 1990s the use of paper in conventional packaging gave way for polyethylene film bags and other plastics as stringent quality standards were required in food and water packaging industries so as to minimize the incidence of food and water related epidemics in the region⁶. Several properties of polyethylene films make them unique and give them comparative advantage over the other packaging materials such as leaves and paper that were previously in use. They are lightweight, tough with low bending to rigid properties, inert and relatively un-reactive. These properties make them more convenient as carrier and hygienic packaging materials as compared to paper and leaves. Utilized basically in the iced water business initially, their application in the packaging industry was adopted in a variety of other areas such as food and beverages packaging, groceries, pipelines for potable water supply, construction and agriculture. Proliferation of plastic materials addressed the health issues relating to food and water packaging, but it also created the problem of plastic waste in the region.

In India, per capita generation of plastic wastes in various cities varies from 0.21–0.035 kg/person/day, and plastics make up between 8–9% of the component materials in the waste stream. Now most products are

packaged in polyethylene films, which form about 70% of the plastic waste in the municipal waste stream. According to the plastic materials in commerce across the sub-region include low-density polyethylene (LDPE) commonly called polyethylene films, high-density polyethylene (HDPE) and other plastics such as polypropylene, polystyrene, polyvinyl chloride (PVC) and polyethylene terephthalate (PET)⁴.

EFFECTS OF PLASTIC LITTERING IN INDIAN CITIES

The plastic wastes have virtually choked the drainage system in the urban centers of the country to such an extent that it takes only the slightest of rainfall to precipitate floods in major cities. Although different factors, such as erection of buildings and structures in water courses, have contributed to the increased incidence of flooding, lately, the significant cause of flooding in cities in India is linked to the tremendous deterioration in urban drainage systems, most of which is attributable to plastic wastes blocking the drainage systems. How can we remove the plastic wastes from our urban environment and keep our drainage system clear of plastics.

PROPOSED STRATEGY FOR SUSTAINABLE PLASTIC WASTE COLLECTION FOR INDIAN CITIES

Figure 1 illustrates fractional contributions of all actors involved in the plastic production, distribution and utilization chain-process to the burden of plastic waste pollution in developing cities. Plastic production, plastic retail and plastic use all contribute to the plastic littering in the environment. The quantity of plastic wastes each process node introduces into the environment is proportional to the strength and level of process-activities, which in turn has a direct bearing on the undertaking's marginal profit, i.e. the greater the activity level, the larger the profit margin. In principle, the only process-node that does not create plastic litter in the environment is the recycling node. Hence, the first choice of managing the plastic wastes is to recycle them. But this is not feasible, in the absence of local sustainable mechanisms for retrieving the plastic wastes from the environment.

Indeed, the lack of sustainable plastic waste retrieval process in cities of India is a major limiting factor to plastic waste management. In this respect, a tax system for plastic waste collection in Indian cities that would embrace all the actors indicated in **Fig.1** is proposed..

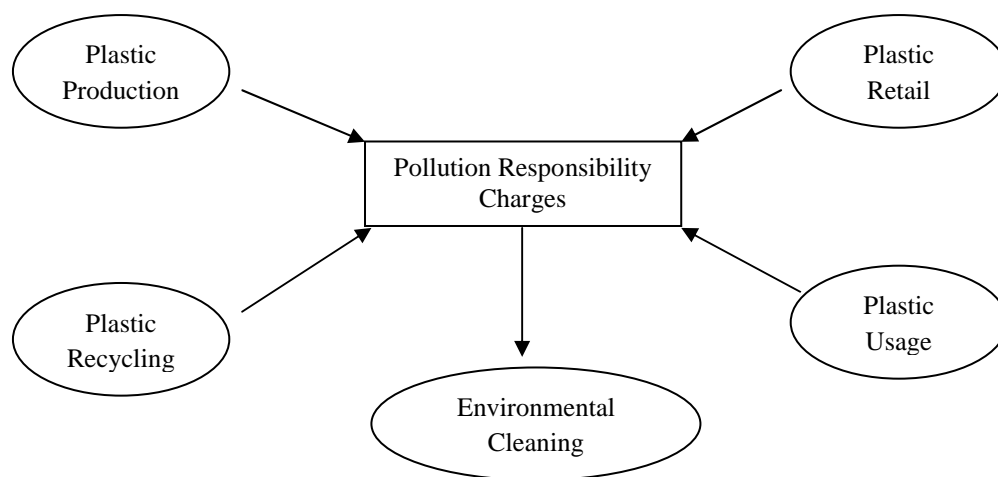


Fig.1: Proposed tax system for plastic wastes collection scheme for Indian cities

So far levy considerations on actors in plastic industry have been weak, as it has targeted predominantly the sachet water producers, who incidentally constitute only a small subset of all the actors in the plastic industry in A.P. Hence, it is necessary that one looks wider and beyond to include all the other contributors to plastic pollution as a sustainable plastic waste retrieval mechanism is formulated, which anticipate the imposition of

Well-defined plastic pollution responsibility charges that equally target all plastic producers and retailers whose products litter the streets, as well as consumers of plastics or plastic users. This would constitute a more holistic approach to evenly distributing the local plastic pollution responsibility in a magnitude

corresponding to pollution levels. For instance, as the drainage system in Indian cities is equally choked with plastics such as ice cream wrappers, black polyethylene-film bags and other plastic materials, all producers of these products need to be made to bear well-calculated pollution responsibility in order to achieve a long-term solution to the plastic waste problem. Consumers of plastics and plastic products are also liable to pollution control charge since they are the terminal actors in the plastic pollution chain, who finally leave these plastic materials in the streets. There is a need to define a new scope of coverage and appropriately devise ways of making all actors in plastic pollution accountable for retrieving the plastic wastes from the surroundings. How can this be done? A suggestion of the way out in a model of tax system is offered as follows.

Given that any undertaking or activity that generates residuals into the environment and/or degrades the environment should contribute to environmental cleaning under the "Polluter-Pays" arrangement, such undertakings and activities have a social and corporate responsibility to contribute to a plastic collection and environmental cleaning tax fund (pollution responsibility charges). As such, for the retrieval of plastic wastes from the environment from Indian cities, a plastic polluter pays (PPP) levy system should be advocated. This call for an appropriate incremental levy system (perhaps per kilogram of plastic) that takes into account the margin of plastic pollution to be placed on all actors.

A weighted proportion of the levy should be borne by producers of the plastics (production pollution levy) and a corresponding weighted proportion also borne by the consumers who patronise the plastics or plastic packaged products (consumption pollution levy). Under this incremental levy system, it is possible to estimate the production capacity of the plastic producer and then calculate on monthly basis. This production pollution levy will be a fraction of its marginal profit and the quantity of plastics produced by the producer, which then can return into the environment to cause environmental pollution, if uncollected. Now, consumers of plastic products incur consumption pollution charges by buying plastics or plastic packaged products.

This will be a certain percentage of the production pollution charges calculated based upon the rate of consumption. The consumer PPP levy is meant to instill discipline in consumers regarding the way they dispose off plastics and this levy is retrievable by the consumer based on a tax refund system (or cash-back), which is part of the proposed levy system.

The administration of the PPP levy system would be such that several plastic collection points are set up in various towns and cities across the country. This should give plastic consumers or thrash pickers an opportunity to be given cash back when they return plastic wastes to any of these points. Cash back may be dependent on a kilogram of plastic returned or any other acceptable calculation. It should be convenient for the populace to reach these plastic collection points, which can be established both in residential and commercial places, as well as in some supermarkets. In this case, when one drinks, for instance sachet iced-water, there is financial motivation to keep the sachets and return them in exchange for cash-back on the product.

Similarly, people would be encouraged to return their black plastic carrier bags to the collection points for some cash back. Otherwise, anybody who collects plastic wastes from the floor and takes back to the collection point would enjoy the corresponding cash back. If the plastic wastes are not returned to the collection point, then city/town authorities have the responsibility to use the consumer PPP levy on the plastics to pay scavengers to collect these wastes from the corridors of the cities and towns. In effect consumers of plastic products would bear a portion for the collection of the plastic wastes. The consumers, however, have the choice not to bear this levy when they return the plastic waste to the collection point.

As shown in the theoretical model in Fig. 1, the pollution responsibility charges (see arrows in Fig. 1) should result in a consolidated plastic waste cleaning fund, which, if properly managed, should be large enough to offset the cost of plastic collection and recycling. There should be a well defined set of guidelines for the application of such a fund for purposes of plastic waste management so as to avoid inherent embezzlement and misapplication of the fund.

CONCLUSION

In principle, the proposed PPP levy system spreads the responsibility of management of plastic waste among three key stakeholders: the producers of the plastics (those with high propensity of ending up as litters), the consumers of the plastics and the appropriate authorities responsible for plastic waste management. The concept is to be able to create direct value in plastic wastes such that people will be willing to collect them from the ground. Most waste scavengers in Indian cities, for instance, would quickly pick up metallic waste because locally it has ready market value; they are locally recycled into coal-pots, metallic cooking pots and many other useful metallic equipment or utensils. Bottles are also limited in the waste stream because they are picked up and resold mostly for reuse. It is, therefore, envisaged that if market value could be created in plastic waste, scavengers would start picking them as well. It is concluded that itinerant waste buyers would start moving from house to house to buy plastic waste.

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