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Strategies for the Recovery and Recycling of Plastic Solid Waste (PSW): A Focus on Plastic Manufacturing Companies

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Abstract

Attributes possessed by plastic materials have contributed sustainably to the development of the plastic industry. However, despite these positive aspects of plastics, plastic industries have continued to face a number of challenges into the recovery and recycling of plastic for waste reduction and resource utilization. The study assessed the strategies that would positively influence plastic manufacturing and recycling companies to recover and recycle plastic solid wastes. A total of 15 plastic manufacturing and recycling companies were investigated in Zambia and the results showed favourable responses towards the recovery and recycling of PSW. The results have an economic, social and environmental impact for the plastic manufacturing and recycling companies as well as for the relevant decision makers in the waste management sector.

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1. Introduction

The rise in the rate of plastic solid waste (PSW) generation over the last decade is alarming in most developed and developing nations. In fact, this can be attributed to the many advantageous properties possessed by plastic materials over other materials. The sad part about most of these plastic products is that, most of them are packaging products. Approximately 50% of plastics are produced into disposable single-use applications .i.e. packaging [1]. Meaning, most of them are used as once-of products and in a short space of time, they become solid waste. As a result of this, most nations have developed strategies aimed at the recovery of this waste type. Waste policies and

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legislations such as land fill bans and restrictions, deposit-refund systems; Extended Producer Responsibility (EPR) etc. have been established.

Most African nations are still facing the challenges of managing packaging waste and in particular plastic solid waste. Despite the fact that most of these nations have waste policies and legislations regarding the management of solid waste, it is still a sorry case. According to [2], due to the nonexistence or ongoing constraints on waste management facilities for various waste streams, the gap between legislations and waste management policy and the actual waste management practices is widening. With this in mind, it is necessary to look at other strategies that can work in the recovery and management of PSW. This research addresses the challenge of PSW in Africa from a different perspective.

This study attempts to determine and analyze the strategies that importantly influence plastic manufacturing and recycling companies to recover and recycle plastic solid wastes. The recovered plastic solid wastes are either open-loop or close-loop recycled in order to achieve sustainable manufacturing. The research also attempts to outline the strategies for achieving effective and efficient resource utilization for sustainable waste management from a manufacturers' perspective. A number of strategies addressing the aspects of sustainability are presented in the form of a questionnaire to plastic manufacturing and recycling companies in order to establish the way forward to sustainable manufacturing from recovered plastic solid wastes.

1.1 Recovery and recycling

From the invention of other routes in the production process of plastics, it is not surprising to note that, the plastic industry has developed massively. With these developments, this product has brought with it many demits associated with waste management. However, due to the development of many technologies and systems, the generated plastic wastes can be recovered and recycled for sustainable manufacturing and resource management.

Recycling has a number of benefits as opposed to landfilling; it saves energy and natural resources which leads to the reduction of production costs, generates income and job creation for the unemployed and poor and reduces the costs of landfilling and waste management [3, 4]. According to [5] evidence to show that, empirically remanufacturing and recycling processes saves, energy, labor, materials and production lead time reduction exists.

Recycling of plastic solid wastes is one way of achieving sustainable manufacturing. According to [6] recycling turns waste materials into financial, environmental and societal resources. As a result of this, most manufacturing companies are motivated to recover materials from the supply-chain as long as it profits them sustainably. Consequently, this study investigates strategies that can contribute to sustainable recovery of plastic wastes and hence contribute to sustainable manufacturing. Sustainability in service or manufacturing industries results in the creating of goods or services by utilizing systems and processes that conserve natural resources and energy, have no pollution and are economically sound and safe for communities and employees. [7,8]. However, recycling is an option that can be considered sustainable by manufacturing companies as it conserves resources, reduces transportation costs and disposal of solid wastes as well as protracting landfills lives [9]. [1] affirms that recycling of plastics reduces environmental impacts and resource depletion. With these benefits of recycling, it is important for developing economies facing the challenges of PSW to consider tipping into these benefits. One way of tipping into the benefits of plastic recovery and recycling is for African nations to investigate the sustainable strategies that can work in their nation's context.

A number of studies have investigated strategies for the recovery of wastes. However, most of these studies have investigated the strategies that influence households or communities to participate in recovery programs of waste [10, 11, 12, 13]. Other studies have investigated service and manufacturing on environmental sustainability [15]. [16] conducted a study on what makes manufacturing companies more desirous of recycling. While some studies from an African perspective have focused on the recovery and recycling of MSW [17, 18]. This study takes a different approach by investigating the technological, economical, environmental concerns and legislations, market and social strategies from the plastic manufacturing company's perspective to enhance sustainable manufacturing and waste management.

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